BART TO LIVERMORE EXTENSION PROJECT DRAFT ENVIRONMENTAL IMPACT REPORT

Volume 2 of 3

Section 3.I Biological Resources through Chapter 6 List of Preparers and References

State Clearinghouse No. 2012082104

San Francisco Bay Area Rapid Transit District

July 2017

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DRAFT ENVIRONMENTAL IMPACT REPORT

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Prepared for:

BART

San Francisco Bay Area Rapid Transit District

By:

URBAN PLANNING PARTNERS INC.

Urban Planning Partners, Inc.
388 17th Street, Suite 230
Oakland, CA 94612

With:

Arup North America, Ltd.
ESA, Environmental Science Associates
Ramboll Environ

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I. BIOLOGICAL RESOURCES

1. Introduction

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

For the purpose of this analysis, the study area for potential direct impacts includes the collective footprint—the combined footprints of the Proposed Project, Diesel Multiple Unit (DMU) Alternative, and Express Bus/Bus Rapid Transit (BRT) Alternative. In addition, the bus routes and bus infrastructure improvements 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 and within the street rights-of-way (ROWs), are addressed programmatically in this analysis, as described in Chapter 2, Project Description. To produce a comprehensive species list for the study area, the analysis considered sensitive wildlife and plant resources that are documented within 5 miles of the collective footprint.

The analysis presented in this section is based on a review of existing information and results from site surveys, which include the following:

- Focused and reconnaissance-level wildlife, botanical, and wetland surveys performed by Environmental Science Associates (ESA) from 2013 to 2016[1, 2, 3, 4, 5]
- City of Dublin General Plan[6]

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[1] Environmental Science Associates, 2013a. BART to Livermore Extension (BLVX) Project Consolidated Biological Resources Report, Site 7 [I-580 Corridor Area], Alameda County, California. Prepared for the San Francisco Bay Area Rapid Transit District. October.

[2] Environmental Science Associates, 2013b. BART to Livermore Extension (BLVX), Consolidated Biological Resources Report, Site 2 [Isabel North], Alameda County, California, Prepared for the San Francisco Bay Area Rapid Transit District, October.

[3] Environmental Science Associates, 2013c. BART to Livermore Extension (BLVX), Consolidated Biological Resources Report, Site 1 [Isabel South], Alameda County, California, Prepared for the San Francisco Bay Area Rapid Transit District. November.

[4] Environmental Science Associates, 2013d. BART to Livermore Extension (BLVX), Consolidated Biological Resources Report, Site 3 [Laughlin Road Area], Alameda County, California, Prepared for the San Francisco Bay Area Rapid Transit District, October.

[5] Environmental Science Associates (ESA), 2014. BART to Livermore Extension Project, Rare Plant Survey Report, Prepared for the San Francisco Bay Area Rapid Transit District. June.

[6] City of Dublin, 2013a. City of Dublin General Plan

- City of Dublin, Eastern Dublin Specific Plan[7]
- City of Dublin, Dublin Crossing Specific Plan EIR[8]
- City of Livermore, El Charro Specific Plan Final EIR[9]
- City of Pleasanton, Stoneridge Drive Specific Plan/Staples Ranch Final EIR[10]
- California Department of Transportation (Caltrans), Environmental Assessment/Initial Study Interstate Highway (I-) 580 Eastbound HOV Lane Project from East of Greenville Road to Hacienda Drive[11]
- The 2010 East Alameda County Conservation Strategy (EACCS)[12]
- U.S. Fish and Wildlife Service (USFWS), Programmatic Biological Opinion for U.S. Army Corps of Engineers (USACE) Permitted Projects Utilizing the EACCS that May Affect Federally Listed Species in East Alameda County, California[13]
- USFWS, Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon[14]
- USFWS, Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants; Final Rule[15]
- California Department of Fish and Wildlife (CDFW), Biogeographic Data Branch, California Natural Diversity Database (CNDDB), Rarefind 5[16]

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[7] City of Dublin, 1994. Eastern Dublin Specific Plan. Available at: http://dublinca.gov/DocumentCenter/View/7776.

[8] City of Dublin, 2013b. Dublin Crossing Specific Plan Draft Environmental Impact Report. June. Available at: http://www.ci.dublin.ca.us/DocumentCenter/View/4739.

[9] City of Livermore, 2007. Final Environmental Impact Report for the El Charro Specific Plan. April. Available at: http://www.cityoflivermore.net/citygov/cedd/planning/charro.htm, accessed April, 2016.

[10] City of Pleasanton, 2008. Stoneridge Drive Specific Plan/Staples Ranch Final Environmental Impact Report. Available at: http://www.cityofpleasantonca.gov/gov/depts/cd/planning/specific/stoneridge.asp.

[11] California Department of Transportation (Caltrans), 2006. Environmental Assessment/Initial Study I 580 Eastbound HOV Lane Project from East of Greenville Road to Hacienda Drive. September.

[12] ICF International, 2010. East Alameda County Conservation Strategy. Final Draft. October. (ICF 00906.08.) San Jose, CA. Prepared for East Alameda County Conservation Strategy Steering Committee, Livermore, CA.

[13] United States Fish and Wildlife Service (USFWS), 2012. Programmatic Biological Opinion for U.S. Army Corps of Engineers Permitted Projects Utilizing the East Alameda County Conservation Strategy that May Affect Federally Listed Species in East Alameda County, California (Corps File Number 2011 00230S). May 31.

[14] United States Fish and Wildlife Service (USFWS), 2005a. Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon, Portland, Oregon, xxvi+ 606 pages.

[15] United States Fish and Wildlife Service (USFWS), 2006. Federal Register Final Rule; Endangered and Threatened Wildlife and Plants: Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants. Federal Register 71(28):7118 7316.

[16] California Department of Fish and Wildlife (CDFW), 2016. Rarefind 5. Biogeographic Data Branch, California Natural Diversity Database, August 4.

- USFWS, Species List of Federal Endangered and Threatened Species[17]
- California Native Plant Society (CNPS), Electronic Inventory of Rare and Endangered Vascular Plants of California[18]
- USFWS, Endangered and Threatened Wildlife and Plants: Revised Designation of Critical Habitat for California Red-Legged Frog; Final Rule[19]

No scoping comments pertaining to biological resources were received in response to the Notice of Preparation for this EIR or during the public scoping meeting held for the EIR.

2. Existing Conditions

This subsection describes the existing conditions for biological resources, including the regional context, the local setting and survey methods, vegetation communities, special-status plant and wildlife species, accounts of species occurrence, wetlands and other waters, critical habitats, and wildlife corridors.

a. Regional Overview

The study area is located within eastern Alameda County within the Dublin, Livermore, and Altamont United States (U.S.) Geological Survey 7.5-minute quadrangles. Topographically, the study area includes a range of elevations, including approximately 330 feet above mean sea level at the Dublin/Pleasanton BART Station (Dublin/Pleasanton Station) and approximately 510 feet above mean sea level at the Cayetano Creek Area. The overall slope and aspect of the study area falls in an east-to-west direction.

The study area generally runs parallels to I-580, within highly urbanized landscapes in the cities of Dublin, Pleasanton, and Livermore. However, the study area also extends through agricultural and grazing lands in the vicinity of Isabel South Area and the Cayetano Creek Area. The study area encompasses a variety of land uses that include the existing I-580 transportation corridor and residential, commercial, and industrial uses. Undeveloped areas both north and south of I-580 support agriculture and open space land uses, with annual grassland and ruderal habitats as the most common habitat types north of I-580 in

[17] United States. Fish and Wildlife Service (USFWS), 2016. Species List of Federal Endangered and Threatened Species. Available at: www.fws.gov/sacramento/es/spp_lists/auto_list.cfm, accessed August 5, 2016.

[18] California Native Plant Society, Rare Plant Program. 2017. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.45). Available at: http://www.rareplants.cnps.org, accessed 10 July 2017.

[19] United States Fish and Wildlife Service (USFWS), 2010. Federal Register Final Rule; Endangered and Threatened Wildlife and Plants: Revised Designation of Critical Habitat for California Red Legged Frog. Federal Register 50(17): 12816-12959.

undeveloped areas. South of I-580, non-urbanized areas support recreation (e.g., Las Positas Golf Course), limited agriculture, and open space. Approved and planned urban development in the cities of Dublin and Pleasanton has reduced much of the remaining open space in the western portion of the study area.

Drainages that extend through the study area include Line G-1-1, Chabot Canal, Line G-2 (Hewlett Canal), Tassajara Creek, Line G-3, Cottonwood Creek, Collier Canyon Creek, Isabel Creek, Arroyo las Positas, and Cayetano Creek, as well as several smaller aquatic features. With the exception of Arroyo las Positas, these watercourses have been channelized and culverted where they intersect the I-580 corridor (see Section 3.H, Hydrology and Water Quality).

b. Local Setting and Survey Methodology

Focused and reconnaissance-level botanical, wildlife, and wetland surveys were performed within the collective footprint at the Dublin/Pleasanton Station Area, I-580 Corridor Area, Isabel North and South Areas, and at the Laughlin Road Area between 2013 and 2016 by ESA biologists. A list of focused field surveys, including survey dates and findings is presented in Table 3.I-1. Areas where surveys were not completed due to access limitations to private property are also listed in Table 3.1-1 and described below.

- **Rare Plant/Botanical Surveys.** Focused botanical surveys were performed in 2013 and 2014 to identify the potential distribution of special-status plants in the study area. Botanical surveys included all accessible portions of the study area. Botanical surveys remain outstanding in some portions of the study area, as listed in Table 3.I-1 below. Prior to performing surveys, a list of target plant species was identified based on the data searches above. Botanical surveys were performed by ESA on July 1, 2, 8, 9, 10, 15, 16, and 17, 2013; October 10, 2013; and April 14–15, 2014. Upon reviewing known rare plant reference sites, the July 2013 survey period was determined to be appropriate for observing summer-blooming alkali-dependent special-status plant species. Nearby botanical reference sites at the Springtown Preserve in the city of Livermore were conducted on July 1, 2013, to verify that target alkali species were blooming and identifiable in the region.[20] These botanical surveys are considered to provide a comprehensive assessment of rare plant resources within these areas.

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[20] Environmental Science Associates, 2013a. BART to Livermore Extension (BLVX) Project Consolidated Biological Resources Report, Site 7 [I-580 Corridor Area], Alameda County, California. Prepared for the San Francisco Bay Area Rapid Transit District. October.

TABLE 3.I-1 COMPLETED AND PENDING SURVEYS FOR THE PROPOSED PROJECT AND BUILD ALTERNATIVES

Geographic Subarea	Completed Surveys	Pending Surveys
Dublin/Pleasanton Station Area	Rare plants: July and October 2013 and April 2014 Wildlife: July 2013 and February 2016 Wetland assessment: July 2013	Rare plants surveys pending in portions of the Arnold Road Staging Area
I-580 Corridor Area	Rare plants: July and October 2013 and April 2014 Wildlife: July 2013 Wetland assessment: July 2013	Rare plants surveys pending at the North Canyons Parkway Staging Area and grasslands north of Croak Road
Isabel North Area	Rare plants: July and October 2013 and April 2014 Wildlife: July 2013 Wetland assessment: July 2013	--
Isabel South Area	Rare plants: July and October 2013 and April 2014 Wildlife: July 2013 Wetland assessment: July 2013	--
Cayetano Creek Area	--	Rare plants, wildlife, wetland assessment
Laughlin Road Area	Rare plants: July and October 2013 and April 2014 Wildlife: July 2013 Wetland assessment: July 8 and 9, 2013	--

Notes: -- = None.
Source: ESA, 2013a,b,c,d; Arup, 2017.

- **Wildlife Surveys and Wetlands Assessments.** Wildlife surveys were performed by ESA biologists on July 8, 12, and 18, 2013.[21] A routine delineation of waters of the U.S. and State was performed within the study area on July 1 and 18, 2013 and August 1, 2013. Follow-up surveys on February 9, 2016 and August 18, 2016 confirmed prior survey findings and considered the potential presence of sensitive resources in the study area. Prior to surveys, ESA biologists queried the CDFW, CNDDB, CNPS Online Electronic Inventory of Rare and Endangered Vascular Plants of California, and the USFWS Online Species List of Federal Endangered and Threatened Species to identify known biological resources within the study area. Based on these surveys and database searches, habitat suitability for special-status species was determined, as well as the presence of any sensitive natural communities or potential waters of the U.S. and/or State, as described below.

[21] Environmental Science Associates, 2013a. BART to Livermore Extension (BLVX) Project Consolidated Biological Resources Report, Site 7 [I-580 Corridor Area], Alameda County, California. Prepared for the San Francisco Bay Area Rapid Transit District. October.

Biological surveys were unable to be completed in portions of the collective footprint due to lack of access to private property. As listed in Table 3.1-1, biological surveys could not be performed for the following areas: (1) construction staging areas—Arnold Road Staging Area, North Canyons Parkway Staging Area, Storage and Maintenance Facility Staging Areas (in Cayetano Creek Area); (2) collective footprint (permanent areas)—portion of I-580 Corridor Area (grasslands north of Croak Road) and the Cayetano Creek Area. Therefore, the assessment of biological resources described herein for these areas is based on available scientific data, the EACCS habitat and species modeling, and analysis of aerial photos by plant, wildlife, and wetland specialists.

c. Vegetation Communities

The major vegetation communities and habitat types within the study area consist of urban/developed, agricultural, grasslands, riparian, ruderal, and mesic herbaceous (wetland) plant communities. The communities of plant and wildlife species likely to occur in these areas are described below. The vegetation communities in the study area are shown in Table 3.I-2 and in Figures 3.I-1a and 3.I-1b.

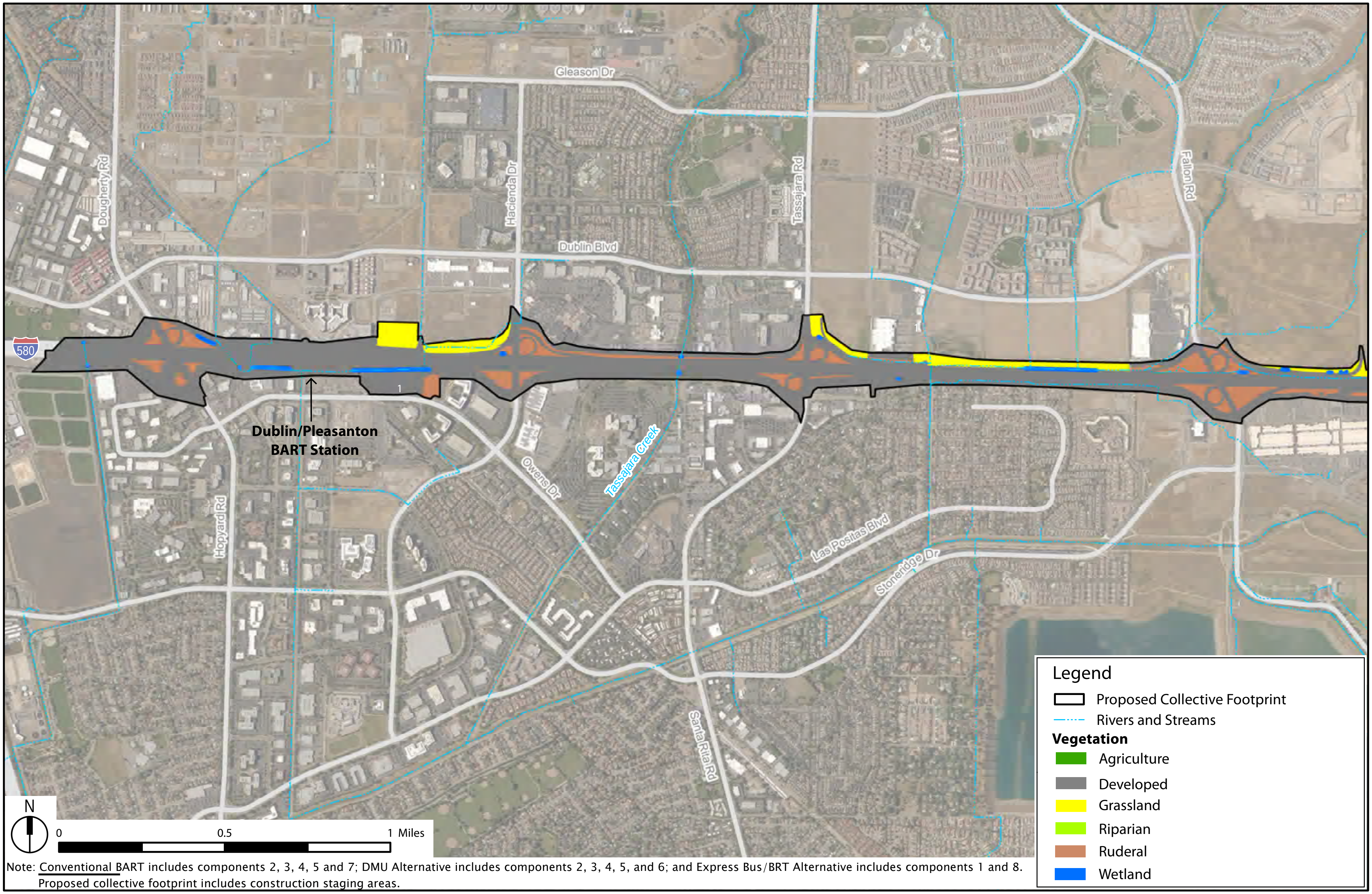
TABLE 3.I-2 VEGETATION COMMUNITIES IN THE STUDY AREA

	Conventional BART Project	DMU Alternative (with EMU Option)	Express Bus/BRT Alternative	Enhanced Bus Alternative
Urban/Developed	✔	✔	✔	✔
Ruderal	✔	✔	✔	--
Grassland	✔	✔	✔	--
Agricultural	✔	✔	--	--
Riparian	✔	✔	✔	--
Wetland/Aquatic	✔	✔	✔	--

Notes: ✔ = present; -- = not present; DMU = diesel multiple unit; EMU = electric multiple unit; BRT = bus rapid transit. The bus infrastructure improvements under the Enhanced Bus Alternative, as well as the Proposed Project and other Build Alternatives, are anticipated to be constructed within existing street ROW.
Source: ESA, 2013a,b,c,d; Arup, 2017.

(1) Urban/Developed Areas

Urban and developed land uses are the predominant habitat type within the study area. Generally, such areas support structures or developed landscapes with extensive asphalt and concrete. Ornamental landscaping is sometimes present and includes non-native decorative plants and a limited number of native plant species. Many common wildlife species use urban areas for foraging, roosting, and/or nesting. These include native



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. Proposed collective footprint includes construction staging areas.

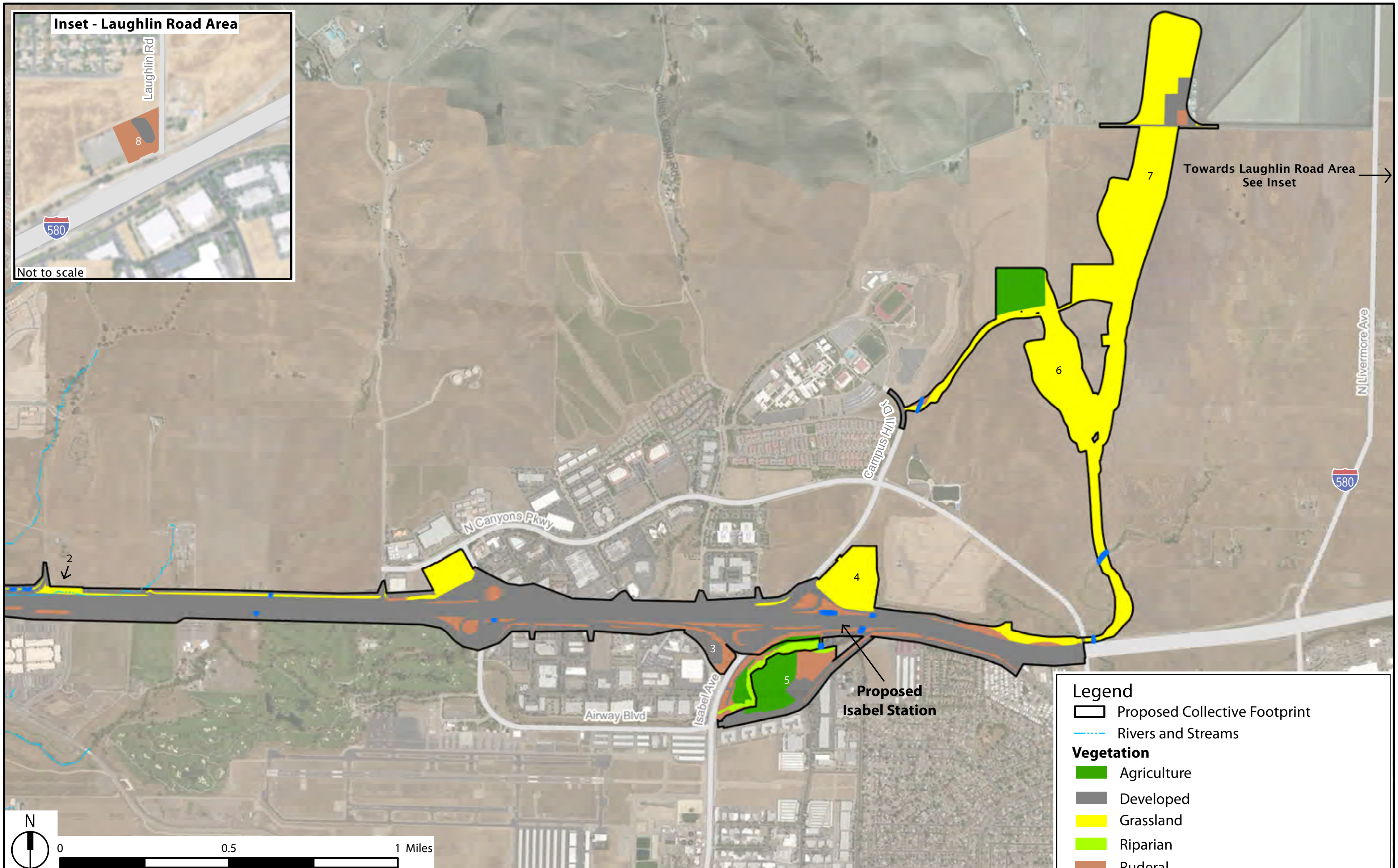
Source: Microsoft, 2017; Arup, 2017; ESA, 2013a,b,c,d.

BART to Livermore Extension Project EIR

Figure 3.I-1a

Biological Resources

Vegetation Communities in the Study Area – Western Project Corridor



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. Proposed collective footprint includes construction staging areas.

Source: Microsoft, 2017; Arup, 2017; ESA, 2013a,b,c,d.

BART to Livermore Extension Project EIR

Figure 3.I-1b
Biological Resources
Vegetation Communities in the Study Area – Eastern Project Corridor

animals that have adapted well to living in close proximity to human populations, such as Sierran treefrog (*Pseudacris sierra*), western fence lizard (*Sceloporus occidentalis*), barn swallow (*Hirundo rustica*), and raccoon (*Procyon lotor*), among others, as well as non-native species that include Virginia opossum (*Didelphis virginiana*), house sparrow (*Passer domesticus*), and European starling (*Sturnus vulgaris*). In addition, urban and developed areas in the study area may support common bats such as the Mexican free-tailed bat (*Tadarida brasiliensis*).

(2) Ruderal

Ruderal vegetation consists of non-native species of plants that occur in disturbed areas such as construction materials staging areas, roadsides, and other regularly disturbed sites. Such habitat was identified throughout the study area where the most common ruderal species detected were bristly ox-tongue (*Helminthotheca echioides*), yellow star-thistle (*Centaurea solstitialis*), Italian thistle (*Carduus pycnocephalus*), and short-pod mustard (*Hirschfeldia incana*), though many grassland species also occur in this habitat type. Ruderal habitat was identified generally along I-580 and at the I-580 interchanges, including at the Dublin/Pleasanton Station Area, I-580 Corridor Area along the roadway shoulder, Isabel South Area, a small portion of the Cayetano Creek Area, and at the Laughlin Road Area, among other locations.

(3) Grassland Areas

Annual grassland habitat occurs in many of the undeveloped portions of the study area. This vegetation community occurs in fields located north and south of the I-580 Corridor Area and is mainly dominated by introduced grasses and forbs. In the Dublin/Pleasanton Station Area, the Arnold Road Staging Area supports grasslands. Such habitat was also noted in the I-580 Corridor Area within the North Canyons Parkway Staging Area, and at the Isabel North Area. Grasslands are the dominant habitat at the Cayetano Creek Area and surround the Laughlin Road Area, although this vegetation community does not occur within the footprint in this area. Within the study area, grasslands are dominated by common weedy species such as wild oat (*Avena barbata*), rip-gut brome (*Bromus diandrus*), and summer mustard (*Hirschfeldia incana*), Smilo grass (*Oryzopsis miliacea* var. *miliacea*), wild radish (*Raphanus sativus*), and Italian thistle (*Carduus pycnocephalus*) also occur within grasslands. Other identified species include soft chess (*Bromus hordaceous*), red-stemmed filaree (*Erodium cicutarium*), vetch (*Vicia* spp.), and yellow star-thistle (*Centaurea solstitialis*), with vegetative associates that include Mediterranean lineseed (*Bellardia trixago*), field bindweed (*Convolvulus arvensis*), fiddleneck (*Amsinckia menziesii*), and prickly lettuce (*Lactuca serriola*), and an occasional coyote brush (*Baccharis pilularis*).

Alkali meadow is a perennial grassland community that occurs in limited portions of the study area. This community, which totals about 0.18 acre in areas north of I-580 at Croak

Road, is regulated as a sensitive natural community by the CDFW. In addition, this community may occur on lands in the Cayetano Creek Area. Dominant vegetation species in alkali meadows include saltgrass (*Distichlis spicata*), with lesser amount of alkali mallow (*Malvella leprosa*), and alkali heath (*Frankenia salina*).

Many of the annual grassland areas are grazed; grazing lands typically support a greater diversity of wildlife species in comparison to cultivated agricultural fields. Reptiles commonly found in local grasslands include western fence lizard (*Sceloporus occidentalis*), common garter snake (*Thamnophis sirtalis*), and western rattlesnake (*Crotalus viridis*). Bird species that breed in grasslands include northern harrier (*Circus cyaneus*), burrowing owl (*Athene cunicularia*), western meadowlark (*Sturnella neglecta*), and California horned lark (*Eremophila alpestris*). Birds that commonly forage in grasslands include turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), white-tailed kite (*Elanus leucurus*), and golden eagle (*Aquila chrysaetos*). Several mammal species use grasslands, including western harvest mouse (*Reithrodontomys megalotis*), California ground squirrel (*Otospermophilus beecheyi*), black-tailed jackrabbit (*Lepus californicus*), black-tailed deer (*Odocoileus hemionus columbianus*), coyote (*Canis latrans*), and red fox (*Vulpes vulpes*). Undeveloped grasslands north of I-580 in the Livermore area are additionally considered to support San Joaquin kit fox (*Vulpes macrotis mutica*), though this species has not been detected within 5 miles of the study area since 1989.[22]

(4) Agricultural

Agricultural land uses within the study area are limited to a portion of the Isabel South Area that is used for corn and melon production and areas that are subject to dry land farming in a portion of the Cayetano Creek Area. Agricultural land varies in the degree to which it supports native plant and animal species; generally, intensively farmed areas provide very limited habitat for wildlife. Currently, the portion of the Isabel South Area that is under active agriculture does not support native plant communities. However, wildlife species, particularly migrating waterfowl and raptors, may use these areas for foraging and/or roosting. The edges of agricultural fields and rubble piles, where disturbance is minimized, may also provide opportunities for burrowing animals, such as California ground squirrel. The Isabel South Area is traversed by Arroyo las Positas, a creek that supports various species of reptiles and amphibians, as discussed below.

[22] California Department of Fish and Wildlife (CDFW), 2016. Rarefind 5. Biogeographic Data Branch, California Natural Diversity Database, August 4.

(5) Riparian

Riparian vegetation generally refers to shrubby or woody vegetation occurring along streams and riverbanks, and is considered here separately from freshwater emergent wetlands. Riparian areas comprise one of the most biologically diverse habitats in the region, providing important avian nesting habitat and foraging habitat as well as cover for many amphibians, reptiles, birds, and mammals, including special-status species such as the California red-legged frog (*Rana draytonii*). These areas may also function as dispersal corridors, allowing animals to move between upland and aquatic habitats.

Existing drainage features that support woody riparian vegetation within the study area include Tassajara Creek, Cottonwood Creek, and Arroyo las Positas.[23] These drainage features support an assemblage of riparian vegetation, including various arroyo willow (*Salix lasiolepis*), narrow-leaf willow (*Salix exigua*), valley oak (*Quercus lobata*), California walnut (*Juglans californica*), and cottonwood (*Populus fremontii*).[24, 25] These drainages are considered fairly low quality habitat, having undergone modification through channelization, resulting in steep channel banks, and also as a result of a predominance of non-native invasive species. Mature arroyo willow stands occur below the ordinary high water mark of these drainage features, forming a dense overstory above each channel.

Drainages within the study area have been largely modified for flood control purposes and portions have been impacted by grazing. As a result, riparian vegetation is sparse and has been replaced in some areas by freshwater emergent vegetation such as cattails and rushes, as well as exotic species from the surrounding grasslands and urban areas.[26]

(6) Wetland

Wetlands are natural communities that depend on year-round or seasonally dependable sources of water. There are several different types of jurisdictional wetlands within the study area: riparian, freshwater emergent, and seasonal. As discussed in the Regulatory Framework subsection below, the USACE is the lead federal agency charged with protecting federally jurisdictional wetlands. The distribution of aquatic features in the study area under the jurisdiction of the USACE was estimated through ground surveys of

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[23] Note that woody riparian vegetation was not identified in Cayetano Creek.

[24] Environmental Science Associates, 2013a. BART to Livermore Extension (BLVX) Project Consolidated Biological Resources Report, Site 7 [I-580 Corridor Area], Alameda County, California. Prepared for the San Francisco Bay Area Rapid Transit District. October.

[25] Environmental Science Associates, 2013c. BART to Livermore Extension (BLVX), Consolidated Biological Resources Report, Site 1 [Isabel South], Alameda County, California, Prepared for the San Francisco Bay Area Rapid Transit District. November.

[26] City of Livermore, 2004. City of Livermore General Plan: 2003-2025, Open Space and Conservation Element.

accessible parcels and a review of aerial imagery for parcels where ground surveys have yet to be undertaken. Based on this assessment, the distribution of potential jurisdictional features in the study area is shown in Table 3.I-3 and in Figure 3.I-2a and Figure 3.I-2b. A formal delineation of wetlands, waters of the U.S., and/or waters of the State has yet to be performed.

Within the study area, freshwater emergent wetlands occur in perennial creeks and semi-permanent intermittent drainages, including Chabot Canal, Line G-2, Tassajara Creek, Line G-3, Cottonwood Creek, Collier Canyon Creek, Arroyo las Positas, and Cayetano Creek, among other locations.[27] A list of the freshwater emergent wetlands is provided in Table 3.I-3 and in Figures 3.I-2a and 3.I-2b. Freshwater emergent wetlands within the study area contain obligate[28] wetland species, including bulrush (*Schoenoplectus acutus*), watercress (*Rorippa officinale*), yerba mansa (*Anemopsis californica*), broadleaved pepperweed (*Lepidium latifolium*), and nutsedge (*Cyperus eragrostis*). Additional species within freshwater emergent wetlands can include Mexican rush (*Juncus mexicanus)*, salt grass (*Distichlis spicata*), cutweed (*Gnaphalium palustre*), Dalis grass (*Paspalum dilatatum*), watergrass (*Echinochloa crus-gali*), bird's foot trefoil (*Lotus corniculatus*), rabbit's foot grass (*Polypogon monspeliensis*), and fog fruit (*Phyla nodiflora*). Some perennial creeks within the study area support small stands of cattails (*Typha latifolia*).

The seasonal wetland features within the study area are vegetated with annual herbaceous species typically found with ephemeral depressions in California. Combinations of Mediterranean barley (*Hordeum marinum* var. *gussoneanum*), wooly heads (*Psilocarpus oregonus*), Italian rye grass (*Festuca perenne*), loosestrife (*Lythrum hyssopifolia*), rabbit's foot grass, fiddle dock (*Rumex pulcher*), wooly marbles (*Psilocarphus brevissimus*), popcorn flower (*Plagiobothrys* sp.), and purselane speedwell (*Veronica peregrina* var. *xalapense*) were observed in the numerous topographic depressions within the annual grasslands and along roadsides of the study area where soils have been compacted to a point where water ponds above the soil surface. [29, 30]

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[27] Freshwater emergent wetlands are freshwater shallow water habitats that commonly support emergent plants (erect, rooted, and non-woody plants that are mostly above water).

[28] An obligate wetland plant species is one that almost always occurs in wetlands.

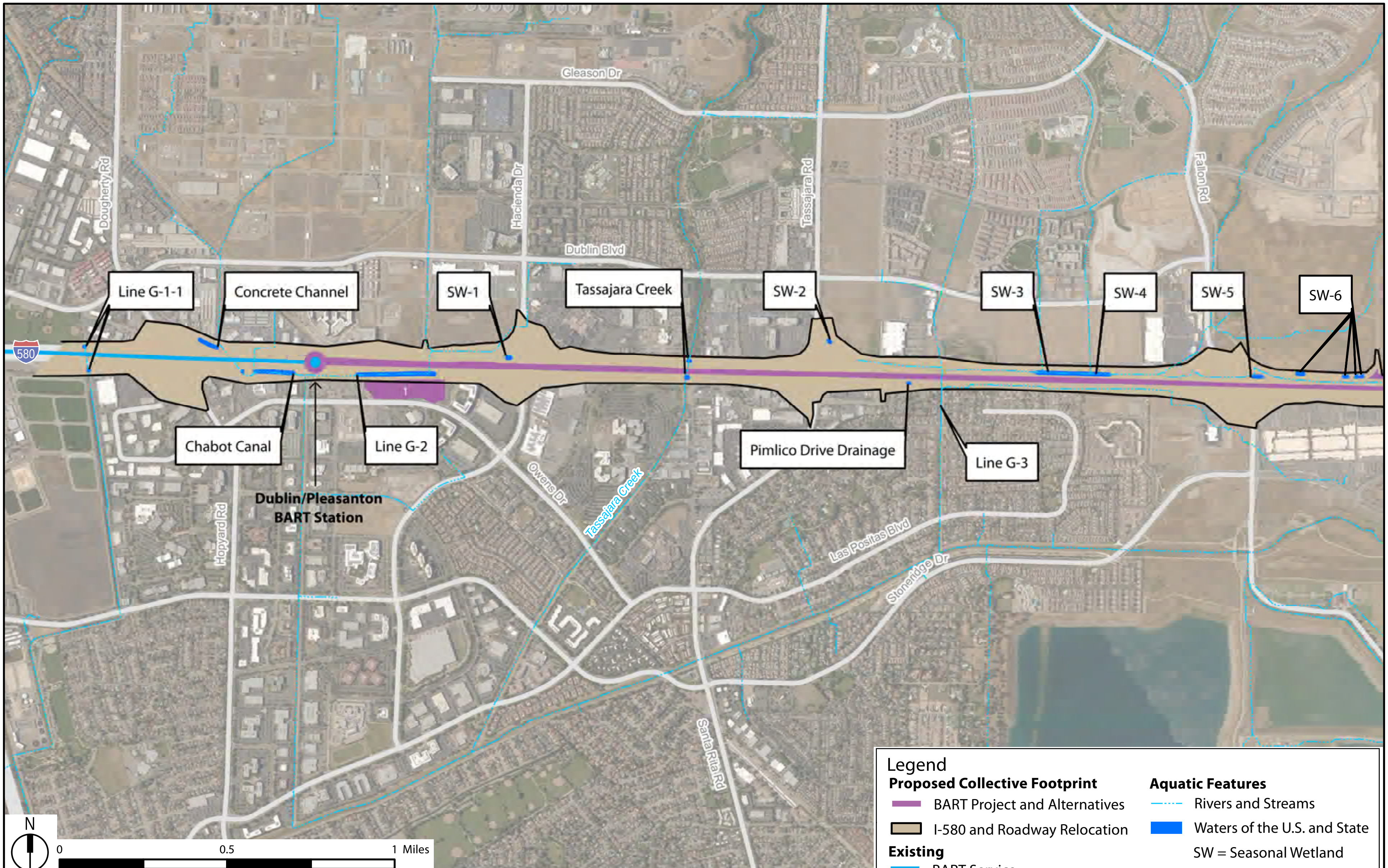
[29] Environmental Science Associates, 2013a. BART to Livermore Extension (BLVX) Project Consolidated Biological Resources Report, Site 7 [I-580 Corridor Area], Alameda County, California. Prepared for the San Francisco Bay Area Rapid Transit District. October.

[30] Environmental Science Associates, 2013c. BART to Livermore Extension (BLVX), Consolidated Biological Resources Report, Site 1 [Isabel South], Alameda County, California, Prepared for the San Francisco Bay Area Rapid Transit District. November.

TABLE 3.I-3 DRAINAGES AND AQUATIC FEATURES IN THE STUDY AREA

	Conventional BART Project	DMU Alternative (with EMU Option)	Express Bus/ BRT Alternative	Enhanced Bus Alternative
Dublin/Pleasanton Station Area				
Line G-1-1 (IC)	--	✓	✓	--
Concrete Channel (FEW)	--	✓	✓	--
Chabot Canal (PC/FEW)	--	✓	✓	--
Line G-2 (PC)	--	--	✓	--
I-580 Corridor Area				
SW-1 (FEW)	-	✓	--	--
Tassajara Creek (IC/FEW)	✓	✓	✓	--
Pimlico Drive Drainage (FEW)	✓	✓	--	--
Line G-3 (FEW)	✓	✓	--	--
SW-2 (FEW)	✓	✓	--	--
SW-3 (FEW)	✓	✓	--	--
SW-4 (FEW)	✓	✓	--	--
SW-5 (FEW)	✓	✓	--	--
SW-6 (FEW)	✓	✓	--	--
Cottonwood Creek (IC)	✓	✓	--	--
SW-7 (FEW)	✓	✓	--	--
Collier Canyon Creek (culverted) (IC)	✓	✓		
SW-8 (FEW)	✓	✓	--	--
Isabel North Area				
None	--	--	--	--
Isabel South Area				
Arroyo las Positas (PC)	✓	✓	--	--
Cayetano Creek Area				
Isabel Creek (IC)	✓	✓	--	--
Arroyo las Positas (PC/FEW)	✓	✓	--	--
Cayetano Creek (IC and PC/FEW)	✓	✓	--	--
Pond-1	✓	--	--	--
Laughlin Road Area				
None	--	--	--	--

Notes: PC = perennial creek; IC = intermittent creek; SW = seasonal wetland; FEW = freshwater emergent wetland; DMU = diesel multiple unit; BRT = bus rapid transit; EMU = electric multiple unit. -- = not within footprint. The Enhanced Bus Alternative, as well as the bus improvements under the Proposed Project and other Build Alternatives, would be located within the existing street ROWs.
Source: ESA, 2013a,b,c,d; Arup, 2017.

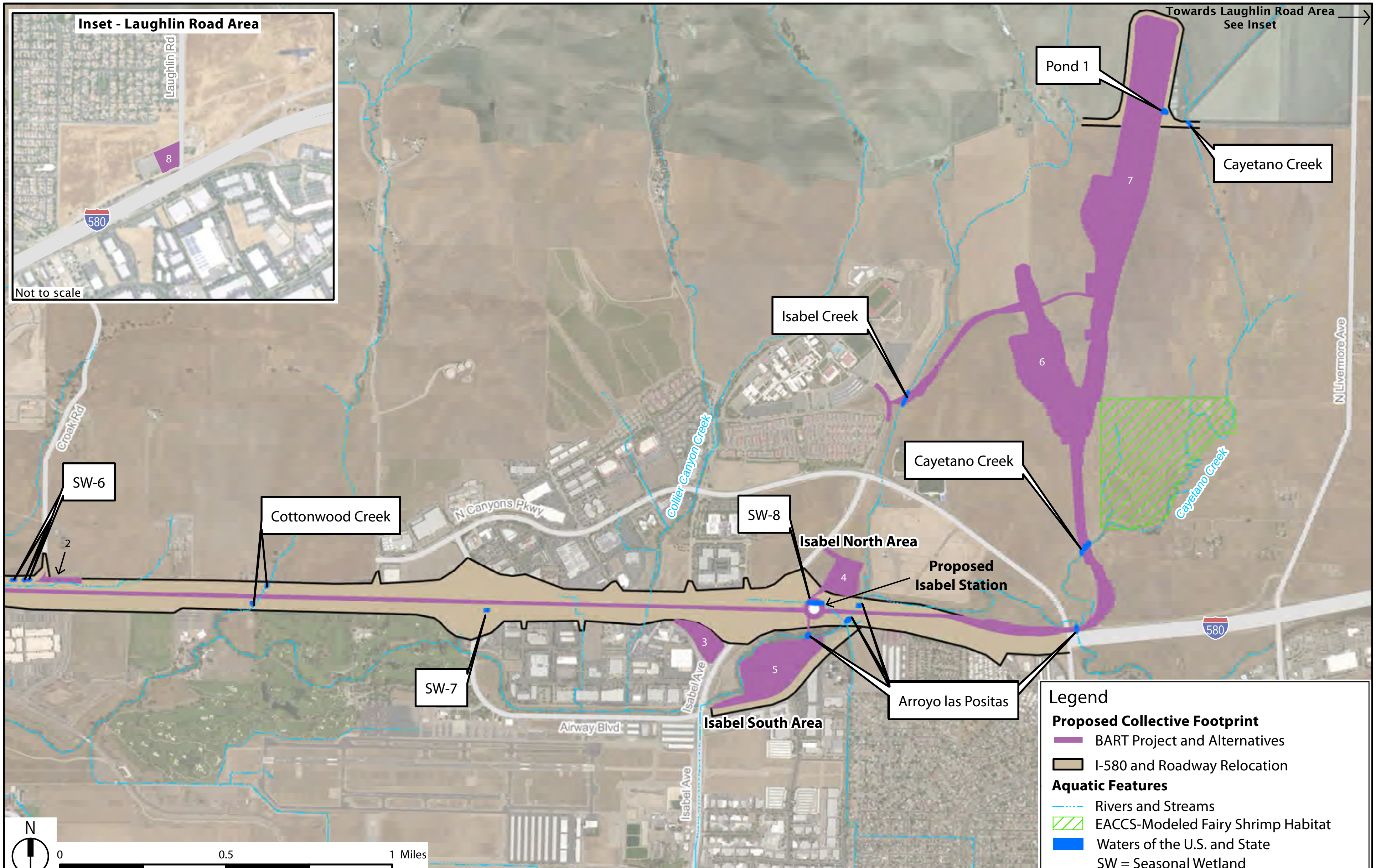


Note: Conventional BART includes components 2, 3, 4, 5 and 7; DMU Alternative includes components 2, 3, 4, 5, and 6; and Express Bus/BRT Alternative includes components 1 and 8.

Source: Microsoft, 2017; Arup, 2017; ESA, 2013a,b,c,d.

BART to Livermore Extension Project EIR

Figure 3.I-2a
Biological Resources
Waters of the U.S. and State in the Study Area – Western Project Corridor



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: Microsoft, 2017; Arup, 2017; ESA, 2013a,b,c,d.

BART to Livermore Extension Project EIR

Figure 3.I-2b
Biological Resources
Waters of the U.S. and State in the Study Area – Eastern Project Corridor

Vernal pools are seasonal wetlands that occur in grasslands and support a unique assemblage of plants and amphibians. They are formed in slight depressions over bedrock or hardpan soils that allow water to pool during the winter and spring rains. Because vernal pools are a unique habitat and tend to be isolated from each other, they often support species that are endemic (i.e., restricted) to vernal pools or even to pools in that particular region. As a result of this endemism and the dramatic decline in the number and extent of vernal pools due to agriculture and development, vernal pools are identified as a Sensitive Natural Community by the CDFW and many vernal pool-dependent plants and animals are special-status species protected by the State of California (State) or federal government. Several seasonal pools were identified during field surveys in the area located north of Croak Road (identified as SW-6 in Figure 3.I-2a. Vernal pool areas that were modeled in the EACCS in the Cayetano Creek Area were avoided by project design (see EACCS-modeled fairy shrimp habitat, Figure 3.I-2b).

Special-status species associated with these aquatic features are discussed in the following subsection, Special-Status Species.

d. Special-Status Species

Several species known to occur in the study area are considered special-status because of their recognized rarity or vulnerability to various causes of habitat loss or population decline. Some of these species receive specific protection from federal or State endangered species legislation. Other species have been designated as sensitive based on the following: adopted policies and expertise of State resource agencies; organizations with acknowledged expertise; or policies adopted by local governmental agencies such as counties, cities, and special districts to meet local conservation objectives. These species are collectively referred to herein as special-status species.

Special-status species include the following:

- Species listed, proposed, or candidate for listing as Threatened or Endangered by the USFWS pursuant to the federal Endangered Species Act (FESA) of 1969, as amended
- Species listed as Rare, Threatened, or Endangered by the CDFW pursuant to the California Endangered Species Act (CESA) of 1970, as amended
- Species designated as Fully Protected under Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) of the California Fish and Game Code
- Species designated by the CDFW as Species of Special Concern

- Plant species identified as CNPS Rank 1B and 2B[31]
- Species not currently protected by statute or regulation, but considered rare, threatened, or endangered under CEQA

A list of special-status plant and animal species occurring within the study area was compiled based on data in the CNDDB and California CNPS literature, review of the USFWS species list generated for the study area, and biological literature for the region. Special-status species with the potential for occurrence within the study area are described below. The reported occurrences of special-status species in the region are shown on Figure 3.I-3; Table 3.I-4 shows the potential species and habitats likely to occur in the study area.

The special-status species identified as potentially occurring in the study area include longhorn fairy shrimp (LHFS); vernal pool fairy shrimp (VPFS); California tiger salamander (CTS); California red-legged frog (CRLF); western pond turtle (WPT); burrowing owl (BUOW); American badger; San Joaquin kit fox (SJKF); and nesting birds and raptors that include the golden eagle, loggerhead shrike, tricolored blackbird, California horned lark, and northern harrier.

In addition, several locally occurring rare plants are considered to have a moderate potential to occur in portions of the collective footprint where botanical surveys have not been conducted, as noted in the Local Setting and Survey Methodology subsection above, including the Cayetano Creek Area.

The discussion of plant and wildlife species in this section is focused on those species for which suitable habitat is present and that have been known to occur in the study area. Special-status species confined to special habitat types (e.g., chaparral or sand dunes), suitable soil substrates (e.g., serpentine soils), and/or suitable elevation clines that do not occur in the study area are not expected to be present, and therefore are not included in the detailed accounts below.

[31] Recent modifications to the CNPS Ranking System include a new Threat Code extension to listed species (e.g., List 1B.1, List 2.2 etc.). A Threat Code extension of .1 signifies that a species is seriously endangered in California; .2 is fairly endangered in California; and .3 is not very endangered in California.

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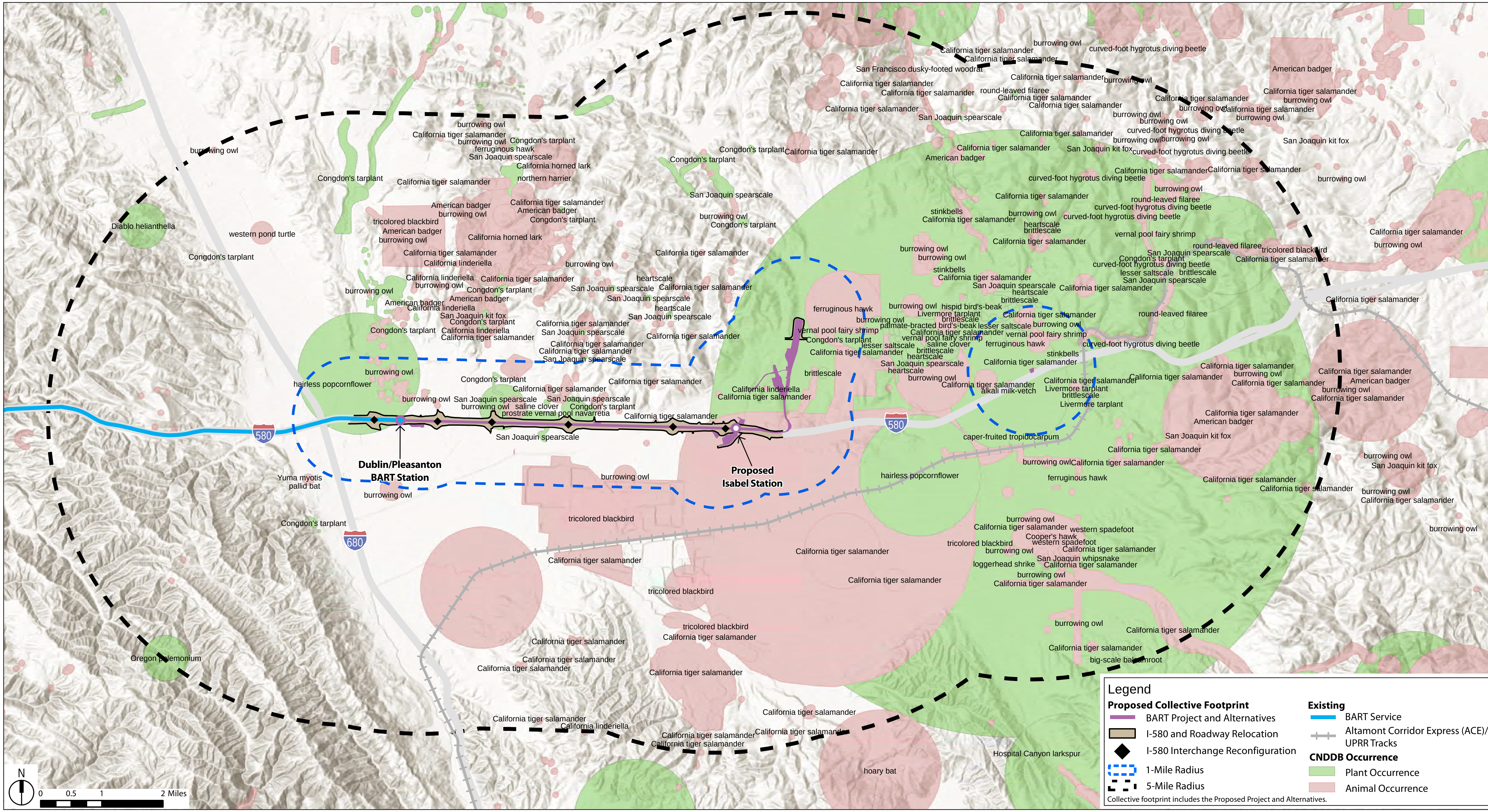

Source: ARUP, 2017; CDFG, 2016; CDFW, 2017a.

BART to Livermore Extenstion Project EIR

Figure 3.I-3
Biological Resources
Sensitive Species Occurrences

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TABLE 3.I-4 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Common Name	Scientific Name	Status	Habitat and Seasonal Distribution in California	Likelihood of Occurrence
WILDLIFE				
Invertebrates				
Longhorn fairy shrimp	*Branchinecta longiantenna*	**Fed:** FE **CA:** none	**General**: Locally endemic to rock outcrop pools in the Altamont Hills. **Micro**: Inhabit small, clear-water depressions in sandstone pools.	**Low:** Suitable habitat (rock outcrop pools) does not occur in the project corridor. Seasonal wetlands north of Croak Road provide low-quality habitat, with no LHFS occurrences documented from the region in comparable habitat.
Vernal pool fairy shrimp	*Branchinecta lynchi*	**Fed:** FT **CA:** none	**General**: Endemic to the grasslands of the Central Valley, Central Coast mountains and South Coast mountains, in rain-filled pools. **Micro**: Inhabit small, clear-water sandstone-depression pools and grassed swale, earth slump, or basalt-flow depression pools.	**Moderate-High:** VPFS are reported from the Livermore area, with modelled near the collective footprint in the Cayetano Creek Area. Vernal pools and grassland swales north of I-580 at Croak Road provide potential habitat for this species.
Callippe silverspot butterfly	*Speyeria callippe callippe*	**Fed:** FE **CA:** none	**General**: Found in grazed and ungrazed grasslands where its larval food plant, *Viola pedunculata,* grows. **Micro**: Occurs in hilly terrain with a mixture of topographic relief, often near their preferred nectar plants, which include mints, thistles, and California buckeye.	**Low:** There are no occurrences reported in the region and the collective footprint is not modeled as habitat by the EACCS.
Fish				
Central California coastal steelhead Distinct Population Segment	*Oncorhynchus mykiss*	**Fed:** FT (NOAA Fisheries) **CA:** none	Includes *O. mykiss* populations below natural and manmade impassable barriers in streams from the Russian River to Aptos Creek, and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers.	**Low:** Efforts to bring steelhead into the Alameda Creek Watershed are ongoing; steelhead spawning in Alameda Creek tributaries has been reported. Resident trout in upper Arroyo Mocho may be protected as Central California coast steelhead; however, steelhead would not occur in the study area due to lack of access and unsuitable habitat.

TABLE 3.I-4 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Common Name	Scientific Name	Status	Habitat and Seasonal Distribution in California	Likelihood of Occurrence
Reptiles				
Western pond turtle	*Actinemys marmorata*	**Fed:** none **CA:** SSC	**General**: A thoroughly aquatic turtle of ponds, marshes, rivers, streams, and irrigation ditches with aquatic vegetation. **Micro**: Need basking sites and suitable (sandy banks or grassy open fields) upland habitat for egg-laying.	**Present:** Though not observed in the study area, WPTs are known from Arroyo las Positas, Tassajara Creek, and Chabot Canal, and additionally expected in Cayetano Creek. This species may be identified in drainages along the I-580 Corridor Area, grasslands north of Croak Road, and in the Cayetano Creek Area.
Amphibians				
California tiger salamander (central population)	*Ambystoma californiense*	**Fed**: FT **CA**: ST	**General**: Central Valley DPS listed as threatened. Santa Barbara and Sonoma counties DPS listed as endangered. **Micro**: Need underground refuges, especially ground squirrel burrows and vernal pools or other seasonal water sources, for breeding.	**Present:** Potential CTS breeding sites occur in stream habitats north of I-580 at Cayetano Creek in vernal pools and ponds within 0.5 mile of the Cayetano Creek Area. Species may be encountered in upland areas north of Croak Road, in the Cayetano Creek Area. CTS could additionally stray into the developed Laughlin Road Area; however, upland habitat is not present on site.
California red-legged frog	*Rana draytonii*	**Fed**: FT **CA**: SSC	**General**: lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. **Micro**: Requires 11-20 weeks of permanent water for larval development. Must have access to aestivation habitat.	**Present:** Potential CRLF breeding and non-breeding aquatic refugia sites occur in stream habitats north of I-580 at Cayetano Creek and Arroyo las Positas near the Cayetano Creek Area; also potentially in the later stream at the Isabel South Area. Non-breeding upland habitat occurs north of Croak Road and in the Cayetano Creek Area. CRLF could stray into the developed Laughlin Road Area; though, upland habitat is not present on site.

TABLE 3.I-4 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Common Name	Scientific Name	Status	Habitat and Seasonal Distribution in California	Likelihood of Occurrence
Western spadefoot	*Spea hammondii*	**Fed:** none **CA:** SC	**General**: breeds in ephemeral pools in open grassland habitat; remain underground for much of the year. **Micro**: requires 2 to 18 weeks of standing water for larval development.	**Low to Moderate:** Occurrences are reported from the U.S. Department of Energy Sandia National Laboratories area approximately 5 miles southeast of the Cayetano Creek Area. This species is not known from habitat north of I-580. Vernal pools in the Cayetano Creek watershed may provide potential breeding.
Birds				
Cooper's hawk	*Accipiter cooperi*	**Fed**: none **CA**: WL	Nests in dense oak and riparian woodland	**Moderate to High:** Potential nesting habitat is available in riparian habitats bordering the I-580 Corridor Area and in association with riparian habitat at the Isabel South Area.
Sharp-shinned hawk	*Accipiter striatus*	**Fed**: none **CA**: WL	Nests in dense oak and riparian woodland	**Moderate to High:** Potential nesting habitat is available in riparian habitats bordering the I-580 Corridor Area and in association with riparian habitat at the Isabel South Area.
Tricolored blackbird	*Agelaius tricolor*	**Fed:** none **CA:** SC	**General**: highly colonial species, most numerous in central valley and vicinity. Largely endemic to California. **Micro**: requires open water, protected nesting substrate, and foraging area with insect prey within a few kilometers of the colony.	**Moderate (nesting).** Suitable nesting habitat may potentially occur in the Cayetano Creek corridor in the Cayetano Creek Area, though nesting has not been reported in this area. Habitat otherwise does not occur in the study area.
Golden eagle	*Aquila chrysaetos*	**Fed:** BGEPA **CA:** SFP	**General:** Nests on cliffs or tall trees, breeding from late Jan-Aug. with a peak from Mar-July. Preferred foraging habitat is annual grasslands that support small mammals such as rabbits and ground squirrels.	**Low (nesting)/High (foraging):** Potential foraging habitat for golden eagle occurs in annual grasslands located north of I-580 between Pleasanton and Livermore, and in the Cayetano Creek Area. Nesting habitat is not available in the study area.

TABLE 3.I-4 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Common Name	Scientific Name	Status	Habitat and Seasonal Distribution in California	Likelihood of Occurrence
Western burrowing owl	*Athene cunicularia hypugea*	**Fed:** none **CA:** SSC	**General**: Open, dry, annual or perennial grasslands, deserts and scrublands characterized by low-growing vegetation. **Micro**: Subterranean nester, dependent upon burrowing mammals, most notably the California ground squirrel.	**High:** This species is not reported in the study area, and evidence of presence was not noted during reconnaissance-level surveys. A stable BUOW population occurs locally at Camp Parks. Annual grasslands located north of I-580, at the Isabel North and South Areas, in staging areas, and at the Cayetano Creek Area provide potential habitat for this species.
Swainson's hawk	*Buteo swainsoni*	**Fed:** none **CA:** ST	**General**: Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, and agricultural or ranch. **Micro**: Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	**Low (nesting):** Swainson's hawk nesting has not been documented on the study area or within the greater Livermore-Amador Valley. The nearest nest site to the study area is in Byron in the vicinity of Bethany Reservoir, 7.5 miles east of the developed Laughlin Road Area and 10.5 miles east of the Cayetano Creek Area. The study area does not have foraging habitat within 10 miles of an active nest, or active Swainson's hawk foraging areas.
Northern harrier	*Circus cyaneus*	**Fed:** none **CA:** SSC	**General**: Coastal salt and fresh-water marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas. **Micro**: nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	**Moderate (nesting):** One nesting occurrence was identified within 5 miles of the study area. Suitable nesting habitat is present north of I-580 and in the Cayetano Creek Area.
White-tailed kite	*Elanus leucurus*	**Fed:** none **CA:** SFP	**General**: Rolling foothills and valley margins with scattered oaks, and river bottomlands or marshes next to deciduous woodland. **Micro**: Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	**Moderate:** Nesting occurrences are reported at Camp Parks about 1.5 miles from the Dublin/Pleasanton Station Area and Lawrence Livermore National Labs 1.5 miles south of the Laughlin Road Area. Potential nesting sites are available at the Isabel South Area and Laughlin Road Area.

TABLE 3.I-4 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Common Name	Scientific Name	Status	Habitat and Seasonal Distribution in California	Likelihood of Occurrence
California horned lark	*Eremophila alpestris actica*	**Fed:** none **CA:** SSC	**General:** Nests and forages in short-grass prairie, mountain meadow, coastal plain, fallow fields, and alkali flats.	**High:** Potential nesting areas occur in and near grasslands bordering the I-580 Corridor Area, the Isabel North and South Areas, the Cayetano Creek Area, staging areas, and grasslands bordering the Laughlin Road Area.
Loggerhead shrike	*Lanius ludovicianus*	**Fed:** none **CA:** SSC	**General:** Breeds mainly in shrublands or open woodlands with a fair amount of grass cover and areas of bare ground. **Micro:** Require tall shrubs or trees (also use fences or power lines) for hunting perches, territorial advertisement, and pair maintenance; open areas with short grasses, forbs, or bare ground for hunting.	**High:** Species is generally known from grasslands with shrub cover in the region. Potential nesting areas occur in and near grasslands bordering the I-580 Corridor Area, the Cayetano Creek Area, staging areas, and grasslands bordering the Laughlin Road Area.
Mammals				
Pallid bat	*Antrozous pallidus*	**Fed:** none **CA:** SSC	**General**: A wide variety of habitats is occupied, including grasslands, shrublands, woodlands, and forests from sea level up through mixed conifer forests. The species is most common in open, dry habitats with rocky areas for roosting. **Micro**: Roosts in buildings, caves, tree hollows, crevices, mines, and bridges.	**Moderate:** There are no occurrences reported within 5 miles of the study area. It is possible that this species could roost in highway bridge structures within the I-580 Corridor Area.
Townsend's big-eared bat	*Corynorhinus townsendii*	**Fed:** none **CA:** SC	**General:** Found in all habitats except subalpine and alpine habitats, and may be found at any season throughout its range. **Micro:** Roost in caves, mines, and tunnels with minimal disturbance but can also be found in abandoned open buildings or other human-made structures. Recently detected in hollowed trees. Conspicuous rooster, sensitive to disturbance.	**Low:** There are no CNDDB occurrences reported within 5 miles of the study area. No suitable habitat was detected in the study area.

TABLE 3.I-4 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Common Name	Scientific Name	Status	Habitat and Seasonal Distribution in California	Likelihood of Occurrence
American badger	*Taxidea taxus*	**Fed:** none **CA:** SSC	**General:** Dry, open grasslands with friable soil for dens.	**Moderate:** Potential habitat is available in and near grasslands bordering the I-580 Corridor Area, the Cayetano Creek Area, and grasslands surrounding the Laughlin Road Area.
San Joaquin kit fox	*Vulpes macrotis mutica*	**Fed:** FE **CA:** ST	**General:** Arid grasslands and open scrubland, where friable soils are present. Historically, habitat included native alkali marsh and saltbrush scrub. **Micro:** Grasslands with friable soils are principal habitat for denning and foraging; SJKFs will dig own dens, use banks in sumps or roadbeds, or use existing dens, use human-made culverts and abandoned pipes.	**Moderate**: Only historical records document SJKF presence within 5 miles of the study area; however, habitat suitability is presumed in annual grasslands in the Cayetano Creek Area and some grasslands north of I-580. Isolation of the Isabel North Area and Isabel South Area from surrounding urbanization limits SJKF access.
PLANTS				
Alkali milk-vetch	*Astragalus tener* var. *tener*	**Fed:** none **CA:** none **CRPR:** 1B.2	**General**: Valley grassland, alkali sink, freshwater wetlands, wetland-riparian. **Micro**: Often found in large vernal pools. Blooming May-June.	**Low-Moderate:** Not identified during focused surveys of the I-580 Corridor Area, Isabel North and South Areas, or staging areas. Surveys have yet to be undertaken at the Cayetano Creek Area, and some grasslands north of I-580 where potential is considered low to moderate. Suitable alkali habitat near the Cayetano Creek Area is primarily beyond the Proposed Project and DMU footprints.
Heartscale	*Atriplex cordulata* var. *cordulata*	**Fed:** none **CA:** none **CRPR:** 1B.2	**General**: Chenopod scrub, meadows and seeps, valley and foothill grassland, sandy; saline or alkaline. **Micro**: Found at elevations between 0 and 1,230 feet. Blooming Apr-Oct.	**Low-Moderate:** Not identified during focused surveys of the I-580 Corridor Area, Isabel North and South Areas, or staging areas. Surveys have yet to be undertaken at the Cayetano Creek Area, and some grasslands north of I-580 where potential is considered low to moderate. Alkali habitat near the Cayetano Creek Area is primarily beyond the Proposed Project and DMU footprints.

TABLE 3.I-4 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Common Name	Scientific Name	Status	Habitat and Seasonal Distribution in California	Likelihood of Occurrence
Brittlescale	*Atriplex depressa*	**Fed:** none **CA:** none **CRPR:** 1B.2	**General**: Chenopod scrub, meadows, seeps, playas, valley and foothill grassland, vernal pools, clay; alkaline habitats. **Micro**: Found at elevations ranging from 0 to 1,050 feet. Blooming Apr-Oct.	**Low-Moderate:** Not identified during focused surveys of the I-580 Corridor Area, Isabel North and South Areas, or staging areas. Potential habitat in some grasslands north of I-580 and in grasslands and alkali habitat near the Cayetano Creek Area where botanical surveys have yet to be undertaken.
San Joaquin spearscale	*Etriplex joaquiniana*	**Fed:** none **CA:** none **CRPR:** 1B.2	**General**: Chenopod scrub, alkali meadow, and valley and foothill grassland. **Micro**: In seasonal alkali wetlands or alkali sink scrub with *Distichlis*, *Spicata*, *Frankenia*, etc. 0 to 984 feet. Blooming Apr-Oct.	**Low-Moderate:** Not identified during focused surveys of the I-580 Corridor Area, Isabel North and South Areas, or staging areas. About ten plants were detected during surveys in 2016; about 100 feet from the Access Roadway area near Campus Hill Drive. Potential habitat in some grasslands north of I-580 and in grasslands and alkali habitat near the Cayetano Creek Area where botanical surveys have yet to be undertaken.
Lesser saltscale	*Atriplex minuscula*	**Fed:** none **CA:** none **CRPR:** 1B.1	**General:** Shadscale Scrub, Valley Grassland, and Alkali Sink **Micro:** usually occurs in non-wetlands, but occasionally found in wetlands; Blooming: May-Oct.	**Low-Moderate:** Not identified during focused surveys of the I-580 Corridor Area, Isabel North and South Areas, or staging areas. Potential habitat in some grasslands north of I-580 and in grasslands and alkali habitat near the Cayetano Creek Area where botanical surveys have yet to be undertaken.
Round-leaved filaree	*California macrophylla*	**Fed:** none **CA:** none **CRPR:** 1B.1	**General:** Cismontane woodland; valley and foothill grassland **Micro:** clay soils; Blooming: Mar-May	**Low-Moderate:** Not identified during focused surveys of the I-580 Corridor Area, Isabel North and South Areas, or staging areas. Potential habitat in some grasslands north of I-580 and in grasslands near the Cayetano Creek Area where botanical surveys have yet to be undertaken.

TABLE 3.I-4 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Common Name	Scientific Name	Status	Habitat and Seasonal Distribution in California	Likelihood of Occurrence
Congdon's tarplant	*Centromadia parryi* ssp. *congdonii*	**Fed:** none **CA:** none **CRPR:** 1B.1	**General**: Valley and foothill grassland. **Micro**: Alkaline soils; sometimes described as heavy white clay. 0 to 750 feet. Blooming May-Nov.	**Low-Moderate:** Not identified during focused surveys of the I-580 Corridor Area, Isabel North and South Areas, or staging areas. Potential habitat in some grasslands north of I-580 and in grasslands and alkali habitat near the Cayetano Creek Area areas where botanical surveys have yet to be undertaken.
Hispid salty bird's-beak	*Chloropyron molle* ssp. *hispidum*	**Fed:** none **CA:** none **CRPR:** 1B.1	**General**: Meadows and seeps, playas, valley and foothill grassland, alkaline habitats. **Micro**: Found at elevations ranging from 1 to 500 feet. Blooming Jun-Sep.	**Low:** CNPS and CNDDB have recorded occurrences of this species within the Springtown area of Livermore. Not observed during focused surveys and not expected due to the avoidance of alkali scald habitat by project design.
Palmate-bracted salty bird's-beak	*Chloropyron palmatum*	**Fed:** FE **CA:** SE **CRPR:** 1B.1	**General**: Chenopod scrub, Valley and foothill grassland, and alkaline habitats. **Micro**: Found at elevations ranging from 164 to 1,295 feet. Blooming May-Oct.	**Low:** CNPS and CNDDB have recorded occurrences of this species within the Springtown area of Livermore. Not observed during focused surveys and not expected due to the avoidance of alkali scald habitat by project design.
Livermore tarplant	*Deinandra bacigalupii*	**Fed:** none **CA:** SC **CRPR:** 1B.2	**General**: Meadows and seeps. **Micro**: Alkaline soils; found at elevations ranging from 492 to 607 feet. Blooming Jun-Oct.	**Low-Moderate.** Not identified during focused surveys of the I-580 Corridor Area, Isabel North and South Areas, or staging areas. Potential habitat is available in some grasslands north of I-580 and in grassland habitat near the Cayetano Creek Area where botanical surveys have yet to be undertaken.
Recurved larkspur	*Delphinium recurvatum*	**Fed:** none **CA:** none **CRPR:** 1B.2	**General:** Shadscale Scrub, Valley Grassland, Foothill Woodland. **Micro:** Usually occurs in non-wetlands, but occasionally found in wetlands. Blooming Mar-Jun.	**Low-Moderate.** Not identified during focused surveys of the I-580 Corridor Area, Isabel North and South Areas, or staging areas. Potential habitat is available in some grasslands north of I-580 and in grassland habitat near the Cayetano Creek Area where botanical surveys have yet to be undertaken.

TABLE 3.I-4 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Common Name	Scientific Name	Status	Habitat and Seasonal Distribution in California	Likelihood of Occurrence
Diamond-petaled poppy	*Eschscholzia rhombipetala*	**Fed:** none **CA:** none **CRPR:** 1B.1	**General:** Valley Grassland **Micro:** unknown Blooming: Mar-Apr	**Low-Moderate.** Not identified during focused surveys of the I-580 Corridor Area, Isabel North and South Areas, or staging areas. Potential habitat is available in some grasslands north of I-580 and in grassland habitat near the Cayetano Creek Area where botanical surveys have yet to be undertaken.
Saline clover	*Trifolium depauperatum* var. *hydrophilum*	**Fed:** none **CA:** none **CRPR:** 1B.2	**General**: Marshes and swamps, valley and foothill grassland, and vernal pools. **Micro**: Mesic, alkaline sites, 0 to 984 feet. Blooming Apr-Jun.	**Low-Moderate:** CNDDB and CNPS have recorded occurrences of this species within the Greenville Road area. Not identified during focused surveys of the I-580 Corridor Area, Isabel North and South Areas, or staging areas. Potential habitat is available in some grasslands north of I-580 and in grassland habitat near the Cayetano Creek Area where botanical surveys have yet to be undertaken.
Critical Habitat				
Vernal pool fairy shrimp critical habitat	n/a	**Fed:** critical habitat	n/a	**None:** Critical habitat for this species does not occur in the study area.
California red-legged frog critical habitat	n/a	**Fed:** critical habitat	n/a	**None:** Critical habitat for this species does not occur in the study area.

Notes: n/a = not applicable; DPS = distinct population segment; CRPR = California Rare Plant Rank;
NOAA Fisheries = National Oceanic and Atmospheric Administration Fisheries Service.
Special-status Plant and Wildlife Species: Plant and Wildlife that were included in this table generally have a CRPR of 1 or 2, and were either observed within the study area by a ESA biologist, or contained within the query of the (1) CNDDB; (2) USFWS Endangered Species List; and/or (3) CNPS Online Inventory.
Status Codes:

Federal (USFWS or NOAA Fisheries):
BGEPA = Bald and Golden Eagle Protection Act
FE = Listed as Endangered by the Federal Government
FT = Listed as Threatened by the Federal Government
FPE = Proposed for Listing as Endangered
FPT = Proposed for Listing as Threatened
FSC = Former Federal Species of Special Concern (list is no longer maintained)
FD = Federal Delisted Species
FC = Candidate for Federal listing

State (CDFW):
SE = Listed as Endangered by the State of California
ST = Listed as Threatened by the State of California
SR = Listed as Rare by the State of California (plants only)
SSC = California species of special concern
SC = California Candidate for listing as Endangered
SFP = California fully protected species
WL = Watch list
CNPS: *California Rare Plant Rank*: Rank 1A = Plants believed extinct; Rank 1B = Plants rare, threatened, or endangered in California and elsewhere; List 2 = Plants rare, threatened, or endangered in California but more common elsewhere

TABLE 3.I-4 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR IN THE STUDY AREA

Common Name	Scientific Name	Status	Habitat and Seasonal Distribution in California	Likelihood of Occurrence

Unless otherwise noted, Habitat and Seasonal Distribution in California is derived from habitat requirements provided by the CNDDB. Blooming period for plant species is derived from the CNPS Online Inventory.
Likelihood of occurrence evaluations: A rating of "present" indicates that the species has been observed in the study area; "high" potential indicates that this species is expected to occur on site or occurs locally to the area; "moderate" indicates that suitable habitat exists in the study area; "low" potential indicates that the study area is outside of the species' described range or suitable habitat is absent.
Source: CDFW, 2016.

e. Accounts of Species Occurrence

A brief description of those special-status plant and wildlife species that have been identified or are expected to occur in the study area is provided below. Table 3.I-5 summarizes the potential distribution of special-status species in the study area based on the data presented in Table 3.1-4.

TABLE 3.I-5 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR – SUMMARY BY GEOGRAPHIC SUBAREA

	Dublin/ Pleasanton Station Area	I-580 Corridor Area	Isabel North Area	Isabel South Area	Cayetano Creek Area	Laughlin Road Area
WILDLIFE						
Longhorn fairy shrimp		✔			✔	
Vernal pool fairy shrimp		✔			✔	
Callippe silverspot butterfly	Low likelihood to occur					
Central California coastal steelhead	Low likelihood to occur					
Western pond turtle	✔	✔		✔	✔	
California tiger salamander		✔			✔	✔
California red-legged frog		✔	✔	✔	✔	✔
Western spadefoot					✔	
Cooper's hawk		✔		✔		
Sharp-shinned hawk		✔		✔		
Tricolored blackbird (nesting)			✔		✔	
Golden eagle (nesting)	Low likelihood to occur					

TABLE 3.I-5 SPECIAL-STATUS WILDLIFE AND PLANT SPECIES WITH POTENTIAL TO OCCUR – SUMMARY BY GEOGRAPHIC SUBAREA

	Dublin/ Pleasanton Station Area	I-580 Corridor Area	Isabel North Area	Isabel South Area	Cayetano Creek Area	Laughlin Road Area
Western burrowing owl (nesting)	✔	✔	✔	✔	✔	✔
Swainson's hawk (nesting)	Low likelihood to occur					
Northern harrier (nesting)		✔			✔	
White-tailed kite (nesting)				✔		✔
California horned lark		✔	✔	✔	✔	✔
Loggerhead shrike (nesting)	✔	✔	✔	✔	✔	✔
Pallid bat		✔		✔		
Townsend's big-eared bat	Low likelihood to occur					
American badger		✔			✔	✔
San Joaquin kit fox		✔			✔	✔
PLANTS						
Alkali milk-vetch		✔			✔	
Heartscale		✔			✔	
Brittlescale		✔			✔	
San Joaquin spearscale		✔			✔	
Lesser saltscale		✔			✔	
Round-leaved filaree		✔			✔	
Congdon's tarplant		✔			✔	
Hispid salty bird's-beak	Low likelihood to occur					
Palmate-bracted salty bird's beak	Low likelihood to occur					
Livermore tarplant		✔			✔	
Recurved larkspur		✔			✔	
Diamond-petaled poppy		✔			✔	
Saline clover		✔			✔	

Notes: ✔ = present or potentially present (i.e., either high – is expected to occur on site or occurs locally to the area or moderate – suitable habitat exists in the study area); for species with low potential to occur, the study area is outside of the species' described range or suitable habitat is absent.
Sources: ESA, 2013a,b,c,d; Arup, 2017.

(1) Wildlife

Longhorn Fairy Shrimp (*Branchinecta longiantenna*). LHFS are described from several vernal pool habitat types in California, ranging from small, clear, sandstone outcrop pools to large, turbid, alkaline, grassland pools; however, in Alameda and Contra Costa Counties this species is only described from a small series of sandstone outcrop pools.[32] The two isolated Bay Area populations of this species are located just over 2 miles northeast of the Laughlin Road Area, at Souza Ranch in the Brushy Peak Preserve and the Vasco Caves Preserve.[33] Both of these locations are shallow sandstone rock-outcrop pools. Designated critical habitat for this species does not occur within the study area.

The potential for this species to occur in the collective footprint is described below from west to east along the project corridor.

- In the I-580 Corridor Area, several seasonal pools north of Croak Road, collectively referred to as SW-6, provide potential low quality habitat for this species (see Figure 3.I-2a); together, these pools are approximately 0.025 acre. Repeated livestock movement in the adjoining pasture created a few shallow depressions just north of the fenceline; hence, any widening of Croak Road to the north would impact a portion of these features. Portions of these features are within the collective footprint.
- Potential habitat for special-status vernal pool invertebrates described in the BART to Livermore Extension Program EIR (PEIR)[34] at the Isabel North Area is outside of the collective footprint. Changes to the project configuration have avoided the seasonal wetland area identified north of I-580 and west of Isabel Avenue (see Draft PEIR, Figure 3.9-2b, page 3.9-6). Hence, the Program EIR statement that "0.5 and 2 acres of wetlands could be filled" that provide vernal pool invertebrate habitat does not apply to the Proposed Project and Build Alternatives.
- Within the Cayetano Creek Area, a large vernal pool complex that may support LHFS (and VPFS, discussed below) was identified by modeling and remote sensing techniques. As shown in Figure 3-I-2b, this area is adjacent to the collective footprint.[35] While preliminary findings suggest the absence of seasonal pools and LHFS habitat in the collective footprint in the Cayetano Creek Area due to sloping topography, this species or its potential habitat could be present at these locations as surveys have yet to be completed due to access limitations to the private property.

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[32] Eng, L.L., D. Belk, and C.H. Erikson, 1990. California Anostraca: Distribution, Habitat, and Status. Journal of Crustacean Biology Vol. 10 No. 2.

[33] ICF International, 2010. East Alameda County Conservation Strategy. Final Draft. October. (ICF 00906.08.) San Jose, CA. Prepared for East Alameda County Conservation Strategy Steering Committee, Livermore, CA.

[34] San Francisco Bay Area Rapid Transit District (BART), 2010. BART to Livermore Extension Final Program Environmental Impact Report. Available at: https://bart.gov/sites/default/files/docs/Bart-to-Livermore-EIR-WEB_0.pdf, accessed April 26, 2017.

[35] ICF International, 2010. East Alameda County Conservation Strategy. Final Draft. October. (ICF 00906.08.) San Jose, CA. Prepared for East Alameda County Conservation Strategy Steering Committee, Livermore, CA.

- Habitat for this species does not occur in the already developed portions of the Laughlin Road Area or other geographic subareas along the project corridor.

Vernal Pool Fairy Shrimp (*Branchinecta lynchi*). VPFS occur in a variety of vernal pool habitats, ranging from small, clear, sandstone rock pools to large, turbid, alkaline, and grassland valley floor pools. Although the species has been collected from large vernal pools, it tends to occur in smaller ones. Most commonly they occur in grass- or mud-bottomed swales, or basalt flow depression pools in unplowed grasslands.[36] The CNDDB reports VPFS in seasonal wetland habitat in and near the Springtown Preserve, approximately 1 mile from the Cayetano Creek Area. Designated critical habitat for this species does not occur in the study area.

The potential for this species to occur in the collective footprint is described below from west to east along the project corridor.

- Seasonal pools in the I-580 Corridor Area, totaling approximately 0.025 acre, were identified north of Croak Road that may support this species (see feature SW-6 on Figure 3.I-2a).
- Seasonal pools that support this species are not located at the Isabel North and Isabel South areas, based on field surveys. As described for LHFS, changes to the project configuration have avoided the seasonal wetland area identified north of I-580 and west of Isabel Avenue.
- As described for LHFS above, based on a review of aerial photos and the EACCS model, vernal pool habitat is anticipated in the Cayetano Creek Area. As shown in Figure 3-I-2b, this area is adjacent to the collective footprint.[37] While preliminary findings suggest the absence of seasonal pools and VPFS habitat in the collective footprint in the Cayetano Creek Area due to sloping topography, this species or its potential habitat could be present at these locations as protocol-level surveys have yet to be completed due to access limitations to the private property.
- Comments received on the PEIR discussed the unique character and sensitivity of vernal pools on BART's Greenville/Laughlin Road properties, which are adjacent to the Laughlin Road Area (see Regional Water Quality Control Board [RWQCB] comment 8.9

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[36] United Stated Fish and Wildlife Service (USFWS), 2005b. Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants in California and Southern Oregon; Evaluation of Economic Exclusions From August 2003 Final Designation, Final Rule 70:154 FR, U.S. Department of the Interior, Fish and Wildlife Service. August 11.

[37] ICF International, 2010. East Alameda County Conservation Strategy. Final Draft. October. (ICF 00906.08.) San Jose, CA. Prepared for East Alameda County Conservation Strategy Steering Committee, Livermore, CA.

in the Final PEIR (pg. 4-59). [38] The location of the Laughlin Road Area, which is the footprint for the remote parking lot in the Express Bus/BRT Alternative, was selected to avoid the sensitive vernal pool complexes.[39] (The footprints of the Proposed Project and other Build Alternatives do not include the Laughlin Road Area or extend as far to the east.)

Callippe silverspot butterfly (*Speyeria callippe callippe*). The Callippe silverspot butterfly generally occurs in grazed and ungrazed grasslands where its larval food plant, Johnny jump-up (*Viola pedunculata*), is available. The three primary habitat requirements of the Callippe silverspot butterfly are characterized as grasslands that support Johnny jump-ups, hilltops near suitable habitat for mate location, and availability of nectar plants.[40] Adult Callippe silverspot butterflies may forage for nectar from mints, thistles, and California buckeye. Callippe silverspot butterflies may also forage for nectar in other habitats as well, sometimes visiting disturbed areas and the margins of riparian areas and oak woodlands. This species seems to prefer topographically diverse areas, with adults gathering on hilltops during the May to July flight season as they search for mates. There are no Callippe silverspot butterfly occurrences reported from the Livermore-Amador Valley and the EACCS modeling did not identify suitable annual grasslands in the study area that would support Callippe silverspot butterfly. This species is not expected in the study area based on published species range descriptions, including the description provided in the EACCS.[41]

Central California coast steelhead (*Oncorhynchus mykiss*). Adult steelhead spend 2 to 3 years in the open ocean before returning to their natal streams to spawn. Juveniles spend 1 to 2 years in freshwater before migrating to the ocean. Landlocked central California coast steelhead are known to occur in Alameda Creek and its tributary, Arroyo Mocho upstream from the city of Livermore. The only creek near the study area that could support steelhead is the Arroyo Mocho, more than 0.5 mile south of the collective footprint. The BART weir and associated rubber dams on lower Alameda Creek in the city of Fremont impede the passage of steelhead into the upper Alameda Creek watershed and the Livermore-Amador Valley; hence, due to instream impediments, this species is not

[38] San Francisco Bay Area Rapid Transit District (BART), 2010. BART to Livermore Extension Final Program Environmental Impact Report. Available at: https://bart.gov/sites/default/files/docs/Bart-to-Livermore-EIR-WEB_0.pdf, accessed April 26, 2017.

[39] Environmental Science Associates, 2013d. BART to Livermore Extension (BLVX), Consolidated Biological Resources Report, Site 3 [Laughlin Road Area], Alameda County, California, Prepared for the San Francisco Bay Area Rapid Transit District, October.

[40] ICF International, 2010. East Alameda County Conservation Strategy. Final Draft. October. (ICF 00906.08.) San Jose, CA. Prepared for East Alameda County Conservation Strategy Steering Committee, Livermore, CA.

[41] Ibid.

expected in the study area.[42] The Arroyo las Positas and other drainages that traverse the I-580 corridor do not provide habitat for this species.

Western pond turtle (*Actinemys marmorata*). This aquatic turtle ranges throughout much of California, from the Sierra Nevada foothills to the coast and in coastal drainages from the Oregon border to the Mexican border. They typically inhabit ponds, slow-moving streams and rivers, irrigation ditches, and reservoirs with abundant emergent and/or riparian vegetation. The WPT requires adjacent uplands (i.e., within 656 to 1,300 feet [200 to 400 meters] of water) for nesting and egg laying, typically in soils with high clay or silt component on unshaded, south-facing slopes. In colder climates, they may spend the winters hibernating in these upland habitats. WPT are presumed present within all perennial and intermittent drainages located along or adjacent to the study area, and may be encountered in association with drainages in the Dublin/Pleasanton Station Area, along the I-580 Corridor Area (grasslands north of Croak Road), the Isabel South Area, and in the Cayetano Creek Area.

California tiger salamander (*Ambystoma californiense*). CTS is principally an upland species found in annual grasslands and in the grassy understory of valley-foothill hardwood habitats in Central and Northern California. They require underground refuges (usually ground squirrel or other small mammal burrows), where they spend the majority of their annual cycle. Between December and February, when seasonal ponds begin to fill, adult CTS engage in mass migrations to aquatic sites during a few rainy nights and are explosive breeders.[43]

During drought years when ponds do not form, adults may spend the entire year in upland environments, while juveniles may spend 4 to 5 years in their upland burrows before reaching sexual maturity and breeding for the first time.[44, 45] Adult CTS swiftly disperse after breeding and have been documented to travel up to 423 feet (129 meters)

[42] A weir is a structure designed to alter the characteristics of the river or creek flows.
[43] Barry, S.J. and H.B. Shafer, 1994. The Status of the California Tiger Salamander (Ambystoma californiense) at Lagunita: a 50 year update. Copeia 1994:159 164.
[44] Petranka, James W., 1998. Salamanders of the United States and Canada. Smithsonian Institution Press.
[45] Trenham, P., H.B. Shaffer, W.D. Koenig, and M.R. Stromberg, 2000. Life History and Demographic Variation of the California tiger Salamander (Ambystoma californiense), (2):365 377, Copeia.

the first night after leaving a breeding pond.[46] Adult CTS readily aestivate[47] in grasslands near ponds and at great distances from breeding ponds. Adults are routinely known to travel distances greater than 0.62 mile (1 kilometer) from breeding ponds and have been documented at distances of 1.2 miles (2 kilometers) or more from breeding sites.[48] Typical aestivation sites include the burrows of California ground squirrel and valley pocket gopher (*Thomomys bottae*).

CTS occur in the foothill grasslands of the Mount Diablo Range and throughout undeveloped grasslands generally located north of I-580 and the city of Livermore. As shown on Figure 3.I-3, the CNDDB documents greater than five CTS breeding occurrences in grasslands located approximately 0.5 mile north of the I-580 Corridor Area and Cayetano Creek Area.

CTS may be encountered in select grasslands, ruderal habitat, and some developed areas that occur north of I-580. Upland areas where CTS are expected to occur within the collective footprint are within the I-580 Corridor Area and the Cayetano Creek Area (see Figures 3.I-4a and 3.I-4b). These areas may be used for aestivation, foraging, and dispersal. The developed portions of Laughlin Road Area may additionally provide CTS dispersal habitat, as potential breeding sites occur in grasslands surrounding the site. Typical CTS breeding habitat in seasonal wetlands and stock ponds was not identified in the immediate collective footprint; however, portions of Cayetano Creek could sporadically support instream breeding. Breeding has been observed in calm pools that form in lower order intermittent streams in the Altamont Hills, such as Cayetano Creek. Designated critical habitat for this species does not occur in the study area.

California red-legged frog (*Rana draytonii*). CRLFs are largely aquatic frogs found at ponds and slow-moving streams with permanent or semi-permanent water. This species opportunistically migrates into upland habitats due to normal dispersal behavior. This species may aestivate in upland environments when aquatic sites are unavailable or environmental conditions are inhospitable. If water is unavailable, they shelter from dehydration in a variety of refuges, including boulders, downed wood, moist leaf litter, and small mammal burrows. Adult, sub-adult, and juvenile frogs actively disperse from aquatic breeding sites, using annual grasslands, ruderal areas, and woodlands as cover.

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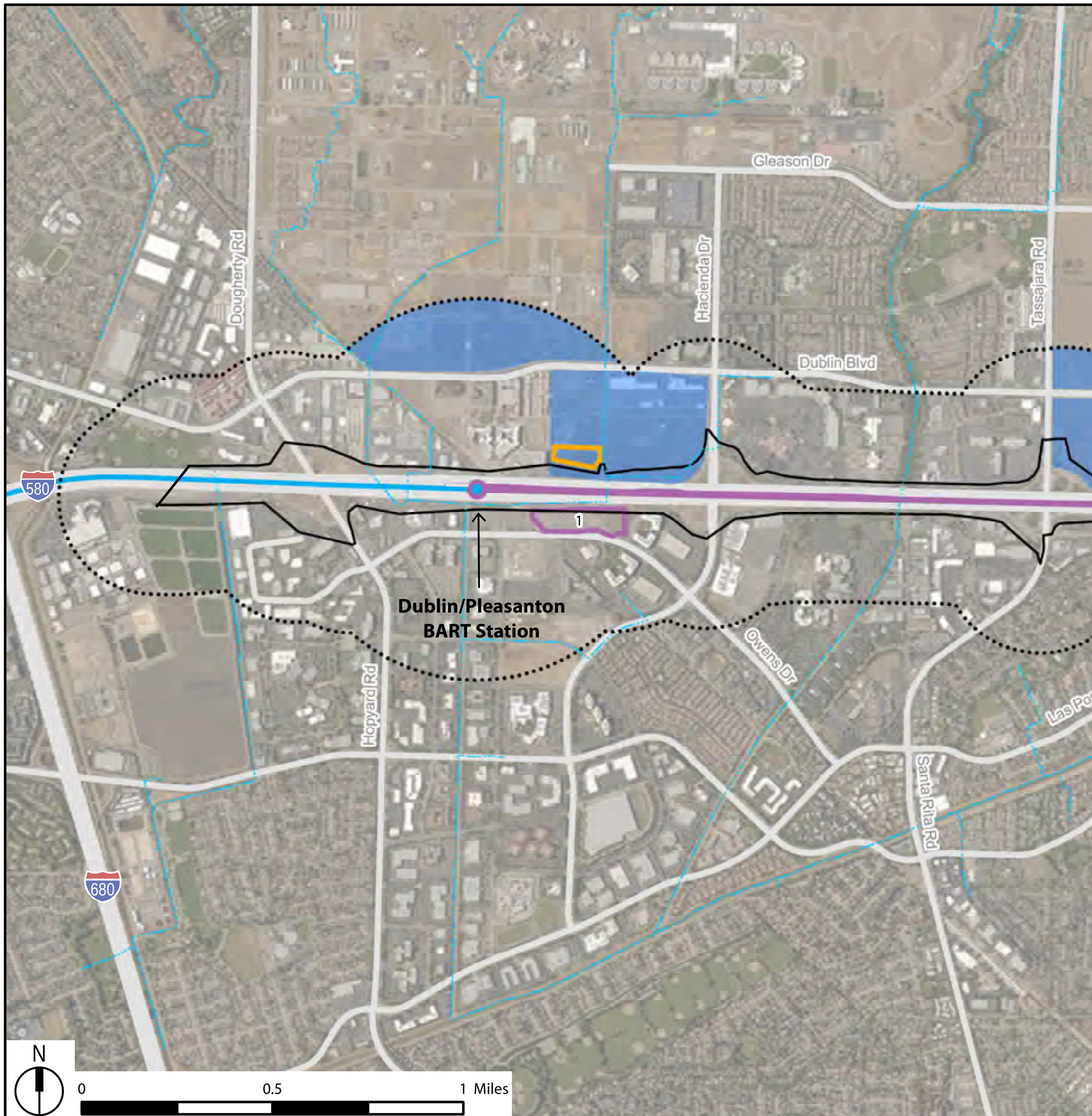
[46] Loredo, I., D. Van Vuren, and M.L. Morrison, 1996. Habitat use and migration behavior of the California tiger salamander. Copeia 1996:895 901.

[47] Aestivation is a state of animal dormancy, similar to hibernation, characterized by inactivity and a lowered metabolic rate that is entered in response to high temperatures and arid conditions.

[48] Orloff, S, 2007. Migratory Movements of California Tiger Salamander in Upland Habitat – A Five Year Study, Pittsburg, California. Prepared for Bailey Estates, LLC. May.



Legend

Proposed Collective Footprint
- BART Project and Alternatives
- I-580 and Roadway Relocation
- Study Area
- Construction Staging Areas

Existing
- BART Service
- Rivers and Streams

Potential Habitat
- Western Burrowing Owl (BUOW)
- California Red-legged Frog (CRLF)
- BUOW and CRLF
- California Tiger Salamander (CTS) and CRLF
- BUOW, CRLF, CTS, and San Joaquin Kit Fox (SJKF)

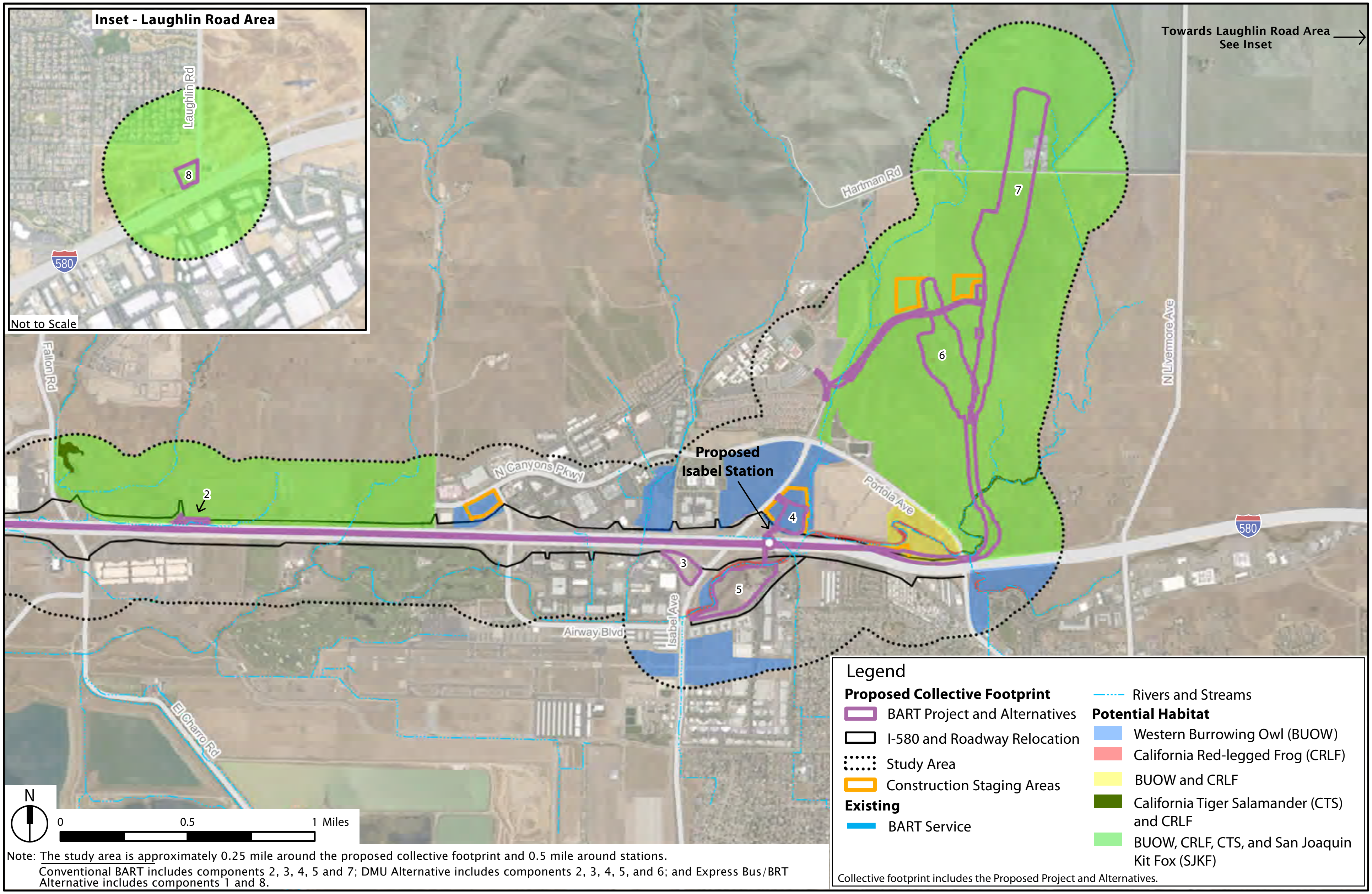
Collective footprint includes the Proposed Project and Alternatives.

Note: The study area is approximately 0.25 mile around the proposed collective footprint and 0.5 mile around stations.
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: Microsoft, 2017; Arup, 2017; ESA, 2013a,b,c,d.

BART to Livermore Extension Project EIR

Figure 3.I-4a
Biological Resources
Potential Habitat for CTS, CRLF, BUOW, and SJKF – Western Project Corridor



Note: The study area is approximately 0.25 mile around the proposed collective footprint and 0.5 mile around stations.
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: Microsoft, 2017; Arup, 2017; ESA, 2013a,b,c,d.

BART to Livermore Extension Project EIR

Figure 3.I-4b
Biological Resources
Potential Habitat for CTS, CRLF, BUOW, and SJKF – Eastern Project Corridor

Historically, CRLF occurred along the coast from the vicinity of Point Reyes National Seashore, Marin County, and inland from Redding, Shasta County, southward to northwestern Baja California, Mexico.[49] The majority of CRLF occurrences in the San Francisco Bay Area are from Contra Costa and Alameda Counties.

As shown on Figure 3.I-3, there are numerous CRLF occurrences documented in annual grasslands north of the I-580 Corridor Area and near the Cayetano Creek Area.[50] Based on these survey findings, CNDDB-reported occurrences, and a review of potentially suitable upland and aquatic habitat, areas within the study area where CRLF may occur are shown in Figures 3.I-4a and 3.I-4b.[51, 52, 53, 54]

This species is documented in Cayetano Creek within the Cayetano Creek Area, and adult and juvenile frogs may be encountered in upland habitats throughout the Cayetano Creek Area. Both breeding and non-breeding aquatic habitat that may support this species is present in Arroyo las Positas, and the Isabel North Area and Isabel South Areas. Near the Isabel North and South Areas, instream and upland habitat is better suited for this species north of I-580, though CRLFs may be encountered within the Arroyo las Positas riparian corridor at the Isabel South Area as well. Habitat for CRLF does not occur in the developed Laughlin Road Area; however, there are no impediments to this species potentially wandering onto the site from grassland habitat east of Laughlin Road.

Ongoing focused CRLF surveys performed by the Zone 7 Water Agency in Chabot Canal, Line G-2, and Tassajara Creek between 2001 and 2016 have not identified CRLF in these

[49] Jennings, M. R., and M. P. Hayes, 1994. Amphibian and reptile species of special concern in California. Final Report to the California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA. pp. 225.

[50] California Department of Fish and Wildlife (CDFW), 2016. Rarefind 5. Biogeographic Data Branch, California Natural Diversity Database, August 4.

[51] Environmental Science Associates, 2013a. BART to Livermore Extension (BLVX) Project Consolidated Biological Resources Report, Site 7 [I-580 Corridor Area], Alameda County, California. Prepared for the San Francisco Bay Area Rapid Transit District. October.

[52] Environmental Science Associates, 2013b. BART to Livermore Extension (BLVX), Consolidated Biological Resources Report, Site 2 [Isabel North], Alameda County, California, Prepared for the San Francisco Bay Area Rapid Transit District, October.

[53] Environmental Science Associates, 2013c. BART to Livermore Extension (BLVX), Consolidated Biological Resources Report, Site 1 [Isabel South], Alameda County, California, Prepared for the San Francisco Bay Area Rapid Transit District. November.

[54] Environmental Science Associates, 2013d. BART to Livermore Extension (BLVX), Consolidated Biological Resources Report, Site 3 [Laughlin Road Area], Alameda County, California, Prepared for the San Francisco Bay Area Rapid Transit District, October.

drainages, as shown in Figure 3.I-5. Based on these findings, CRLF is not anticipated at the Dublin/Pleasanton Station Area.[55]

Western spadefoot (*Spea hammondii*). The western spadefoot uncommonly occurs in association with ephemeral pools in open grassland habitats. There are two known occurrences documented in the Livermore-Amador Valley; both from the U.S. Department of Energy Sandia National Laboratories area, approximately 5 miles southeast of the study area. This species remains underground for much of the year, emerging to breed in seasonal wetland pools during the rainy season. Though not documented within the study area, potential breeding habitat may be present in the large vernal pool complex located in the Cayetano Creek watershed in the Cayetano Creek Area.

Cooper's hawk (*Accipiter cooperii*). Cooper's hawks nest in dense forested habitats near freshwater and forage mostly on small birds and mammals, although they will take reptiles and amphibians. Their peak nesting season is May through July, but can occur anywhere from March to August.[56] Cooper's hawk nesting is not documented in the study area. Potential nesting habitat is available in association with riparian corridors that occur on the I-580 Corridor Area and at the Isabel South Area.

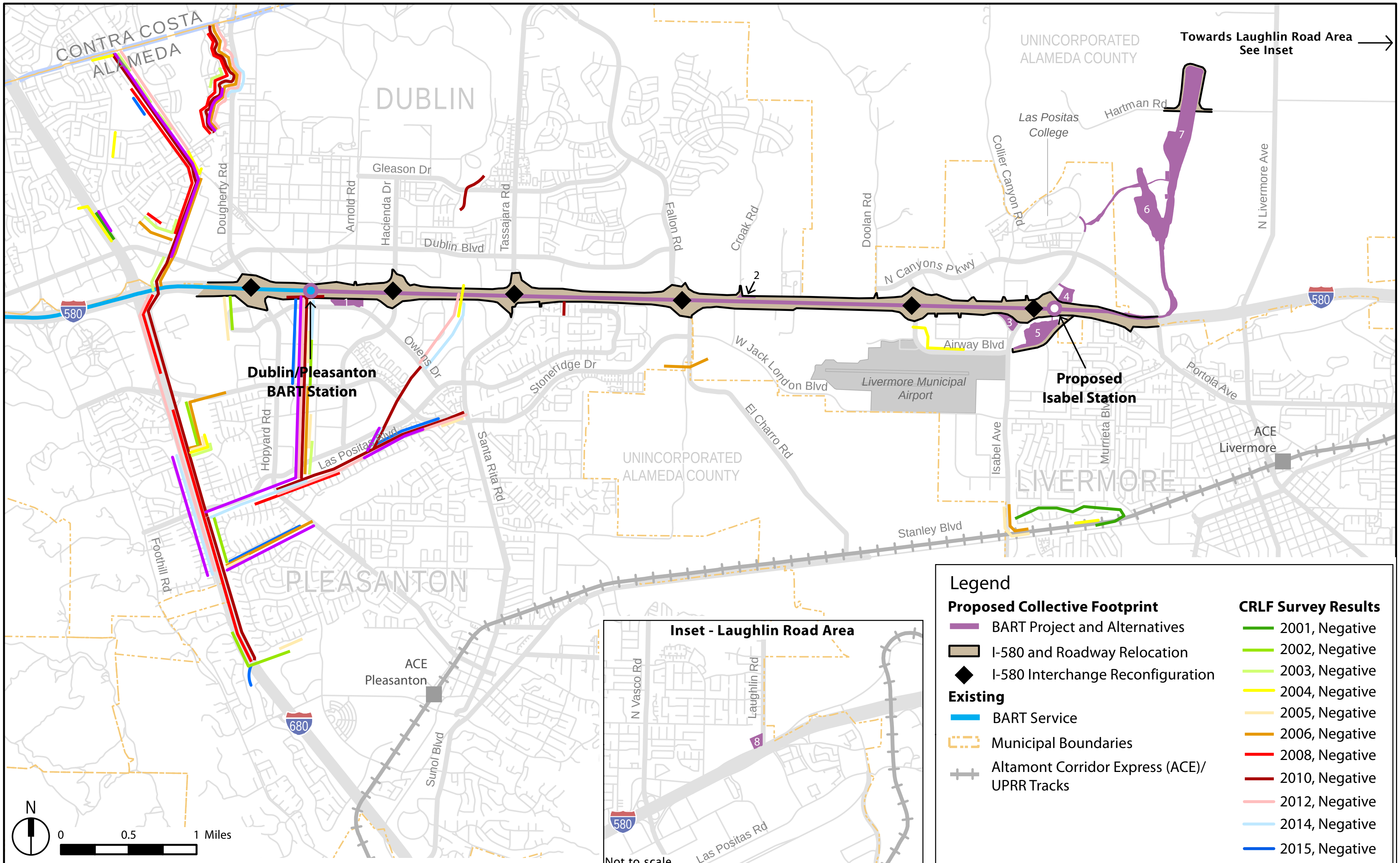
Sharp-shinned hawk (*Accipiter striatus*). The sharp-shinned hawk occupies a wide variety of forests and woodland habitats, ranging from mixed deciduous forests, riparian woodlands, to oak woodlands, among others. Like the Cooper's hawk, this species forages in dense forested habitats near freshwater and forages mostly on small birds, though they will take small mammals, frogs, lizards, and insects. This species is not documented to nest in the study area. Potential nesting habitat is available in association with riparian corridors that occur at the I-580 Corridor Area and at the Isabel South Area.

Tricolored blackbird (*Agelaius tricolor*). Tricolored blackbirds are a colonial species that nest in dense vegetation in and around freshwater wetlands. When nesting, tricolored blackbirds generally require freshwater wetland areas large enough to support colonies of 50 pairs or more. They prefer freshwater emergent wetlands with tall, dense cattails or tules for nesting, but will also breed in thickets of willow, blackberry, wild rose, or tall herbs. During the nonbreeding season, flocks are highly mobile and forage in grasslands, croplands, and wetlands.[57] Nesting is not documented from the study area and during

[55] Pittman, B., 2001 to 2016. Protocol level survey findings for California red legged frog in Chabot Canal (for years 2001, 2002, 2003, 2004, 2005, 2006, 2008, 2010, 2012, 2014, 2015, and 2016).

[56] Zeiner, D.C., W.F. Laudenslayer, Jr., and K.E. Mayer, 1988. California's Wildlife, Vol. I III, California Department of Fish and Game.

[57] Ibid.



Note: For all years surveyed, results were negative (no CRLF observations).
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; Zone 7, 2016.

BART to Livermore Extension Project EIR

Figure 3.I-5
Biological Resources
Summary of Zone 7 Water Agency CRLF Survey Findings

reconnaissance surveys, no nesting colonies were detected. Tricolored blackbirds may sporadically breed in the study area where suitable habitat is available. Such habitat is potentially available in emergent wetland vegetation present in Arroyo las Positas within the Isabel North Area, and along Cayetano Creek in Cayetano Creek Area.

Golden eagle (*Aquila chrysaetos*). Golden eagles occur throughout California from sea level, to approximately 11,500 feet. They feed mostly on rodents and rabbits but will take other mammals, birds, reptiles, and some carrion. Golden eagles require open woodland or grassland for foraging and tall trees or steep cliffs for breeding. They can also be found in open, rolling country grasslands or savannahs, farms, chaparral, and at the desert edge. Golden eagle nesting habitat does not generally occur within the study area; however, foraging habitat is potentially present at the Cayetano Creek Area.

Western Burrowing owl (*Athene cunicularia*). BUOW are year-long residents in generally flat, open dry grasslands, pastures, deserts, and shrub lands, and in grass, forbs, and open shrub stages of pinyon-juniper and ponderosa pine habitats. This species uses communal ground squirrel and other small mammal burrow colonies for nesting and cover, as well as artificial structures such as roadside embankments, levees, berms, and rubble piles, and have been observed within railroad ROWs. They prefer open, dry, nearly level grassland or prairie habitat and can exhibit high site fidelity, often reusing burrows year after year.

Occupancy of suitable BUOW habitat can be verified at a site by observation of a pair of BUOW during their breeding season (March to August) or, alternatively, by the presence of molted feathers, cast pellets, prey remains (rodents, small reptiles, and large insects), eggshell fragments, or excrement (guano or must), near or at a burrow. There are several historic BUOW occurrences reported within 0.5 mile of the study area, though no known extant occurrences within or adjacent to study area. The distribution of potential habitat for BUOW is based on the known or suspected presence of California ground squirrels within grasslands and ruderal habitats, as shown in Figures 3.I-4a and 3.I-4b. Potential nesting habitat was identified in grasslands near the Dublin/Pleasanton Station Area, in grasslands both north and south of the I-580 Corridor Area, at the Isabel North and South areas, at the Cayetano Creek Area, and grasslands surrounding the Laughlin Road Area.

Swainson's hawk (*Buteo swainsoni*). Swainson's hawks are large migratory hawks that nest in North America and winter in southern South America. Swainson's hawks begin arriving in California in late February and depart for their wintering grounds in early

September.[58] Nests are typically constructed in sturdy trees within or near agricultural lands, riparian corridors, and roadside trees. Nests are composed of a platform of sticks, bark, and fresh leaves. Swainson's hawks reside in the Central Valley from March through October, with eggs typically laid in April and early May (peaking in late April). Swainson's hawks are not known to nest in the Livermore area and the nearest described nesting site is greater than 7.5 miles east of the Laughlin Road Area. For these reasons, this species is not expected in the study area.

Northern harrier (*Circus cyaneus*). Northern harriers breed and forage in a variety of open (treeless) habitats (freshwater marsh, brackish and saltwater marshes, wet meadows, weedy borders of lakes, rivers and streams, annual and perennial grasslands, including those with vernal pools, weed fields, ungrazed or lightly grazed pastures) that provide adequate vegetative cover, an abundance of suitable prey, and scattered hunting, plucking, and lookout perches such as shrubs or fence posts. Harriers nest on the ground, mostly in undisturbed areas within patches of dense, tall vegetation. Harriers feed on a broad variety of small- to medium-size vertebrates, primarily rodents and passerines (small birds). Northern harriers could nest within annual grasslands north of the I-580 Corridor Area and the Cayetano Creek Area.

White-tailed kite (*Elanus leucurus*). The white-tailed kite breeds between February and October and feeds on rodents, small reptiles, and large insects in fresh emergent wetlands, annual grasslands, pastures, and ruderal vegetation. Unlike other raptors, kites often roost and occasionally nest communally; therefore, disturbance of a relatively small roost or nesting area could affect a large number of birds. Suitable foraging habitat occurs within the study area. Suitable nesting habitat exists in mature eucalyptus and other trees located at the Isabel South Area and potentially in and near the Laughlin Road Area.

Loggerhead shrike (*Lanius ludovicianus*). The loggerhead shrike prefers open country with short vegetation: pastures with fence rows, old orchards, mowed roadsides, cemeteries, golf courses, agricultural fields, riparian areas, and open woodlands. They feed primarily on insects or small rodents in grasslands adjacent to woodland areas. During the breeding season the loggerhead shrike can nest near isolated trees or large shrubs with thorns; when trees or shrubs are lacking, birds will also build in brush piles, tumbleweeds, or hardwood debris.[59] Suitable nesting sites in the form of shrubs within

[58] Woodbridge, B., 1998. Swainson's Hawk (Buteo swainsoni), in The Riparian Bird Conservation Plan: a strategy for reversing the decline of riparian associated birds in California. California Partners in Flight.

[59] Yosef, R., 1996. Loggerhead Shrike (*Lanius ludovicianus*). In Birds of North America, No. 231 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

annual grasslands were noted near the Dublin/Pleasanton Station Area, I-580 Corridor Area, Isabel North and South Areas, Cayetano Creek Area, and at the Laughlin Road Area.

Pallid bat (*Antrozous pallidus*). The pallid bat is common in arid regions with rocky outcroppings, particularly near water. This gregarious species usually roosts in small colonies of 20 or more individuals in rock crevices and buildings but occasionally roosts in caves, mines, rock piles, highway structures (i.e., box culverts, overpasses), and tree cavities. This species chiefly feeds on the ground although it occasionally takes prey in flight within approximately 3 to 10 feet of the ground or from the surfaces of vegetation. Prey items include scorpions, crickets, centipedes, beetles, grasshoppers, cicadas, and katydids, as well as lizards and rodents. This bat could roost in bridges along the I-580 Corridor Area in association with I-580 underpasses or box culverts and the Isabel South Area due to the presence of mature trees and access to water.

Townsend's big-eared bat (*Corynorhinus townsendi*). The Townsend's big-eared bat is reported from a variety of habitat types, including coniferous forests, mixed mesophytic forests, deserts, native prairies, riparian communities, active agricultural areas, and coastal habitat, ranging from sea level to 10,826 feet.[60] Their typical habitat is arid western desert scrub and pine forest regions. The CNDDB does not report any locations for this species within 10 miles of the study area. [61]

Townsend's big-eared bats occur throughout the Western U.S. with their distribution strongly correlated with the availability of caves and cave-like roosting habitat, including abandoned mines. Cave-type habitat is absent from the study area and the few eucalyptus trees in these areas do not provide habitat for this species.

American badger (*Taxidea taxus*). In California, American badgers occupy a diversity of habitats. Grasslands, savannas, and mountain meadows near the timberline are preferred, though they can be found in deserts as well. The principal requirements seem to be sufficient food, friable soils, and relatively open, uncultivated ground.

Badgers range throughout California, except for the humid coastal forests of northwestern California in Del Norte County and the northwestern portion of Humboldt County.[62] This species occurs in low densities in grassland habitats surrounding the Livermore-Amador

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[60] Western Bat Working Group, 2005. Online species accounts, Western Bat Working Group, 2005. Website: http://wbwg.org/western bat species/.

[61] California Department of Fish and Wildlife (CDFW), 2016. Rarefind 5. Biogeographic Data Branch, California Natural Diversity Database, August 4.

[62] Williams, D.F., 1986. Mammalian Species of Special Concern in California. Wildlife Management Division Administrative Report 86 1. California Department of Fish and Game. Sacramento, California. June.

Valley with potentially suitable habitat in in grasslands that occur north of the I-580 Corridor Area, the Cayetano Creek Area, and surrounding the Laughlin Road Area.

San Joaquin kit fox (*Vulpes macrotis mutica*). The SJKF is a permanent resident of arid grasslands and open scrubland where friable (easily crumbled) soils are present. Dens are required year-round for reproduction, shelter, temperature regulation, and protection from predators. Historically, habitat for this species included native alkali marsh and saltbush scrub of the valley floor, but the availability of such habitats has diminished markedly due to agricultural conversion. Grasslands with friable soils are considered the principal habitat for denning, foraging, and dispersal, while open oak woodlands provide lower quality foraging and dispersal habitat. SJKF will use habitats that have been extensively modified by humans, including grasslands and scrublands with active oil fields, wind turbines, and agricultural matrices.[63] In the northern portion of its range, California ground squirrels are a chief component of the SJKF diet.[64]

SJKF occur only in and around the Central Valley, inhabiting open habitat in the San Joaquin Valley and surrounding foothills. SJKF population densities are greatest in the southern portion of their range. SJKF populations in the northern portion of their range are highly fragmented and sparsely distributed.[65] Only historical records document SJKF presence within 5 miles of the study area; however, habitat suitability is presumed in annual grasslands in the Cayetano Creek Area and some grasslands north of I-580. The potential distribution of habitat that may support SJKF is shown in Figures 3.I-4a and 3.I-4b. The Isabel North and South areas are surrounded by urban development, which limits SJKF access; therefore, this species is not anticipated in these areas. In addition, this species is not expected within the developed Laughlin Road Area; however, potentially suitable habitat is available in grasslands that surround this area.

(2) Rare Plants

Protocol-level rare plant surveys were completed in July 2013, October 2013, and April 2014 for the accessible portions of the study area as described in Table 3.I-1. While no rare plants were identified in the collective footprint, one species was detected about 100 feet outside of the collective footprint, as discussed below.

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[63] United Stated Fish and Wildlife Service (USFWS), 1998. Recovery plan for upland species of the San Joaquin Valley, California, U.S. Department of the Interior, Fish and Wildlife Service, Region 1, Portland, OR.

[64] Hall, Jr., F.A., 1983. Status of the San Joaquin kit fox, *Vulpes macrotis mutica*, at the Bethany Wind Turbine Generating Project site, Alameda County, California, California Department of Fish and Game.

[65] Orloff, S., F. Hall, and L. Speigel, 1986. Distribution and Habitat Requirements of the San Joaquin Kit Fox in the Northern Extreme of Their Range. Transactions of the Western Section of the Wildlife Society, 22: 60 70.

None of the species listed below were identified during focused surveys of the following areas: the I-580 Corridor Area, the Isabel North and Isabel South areas, or construction staging areas. However, as noted in the Local Setting and Survey Methodology subsection above, several large grassland areas that provide potential habitat remain to be surveyed due to access limitations to private property. Within these areas, potential habitat is considered limited in the Arnold Road Staging Area (within the Dublin/Pleasanton Station Area) and at the North Canyons Parkway Staging Area (within the I-580 Corridor Area). In addition, for areas where these species could be present in the Cayetano Creek Area (i.e., in alkali habitat), the design of the Proposed Project and DMU Alternative was modified to avoid sensitive alkali areas where rare plants are most likely to occur.

The following species were detected during surveys near the study area (but not within the collective footprint).

- **San Joaquin spearscale (*Etriplex joaquiniana*).** San Joaquin spearscale is a member of the goosefoot (Chenopodiaceae) family that occurs in chenopod scrub, meadows and seeps, playas, and valley and foothill grassland habitats at elevations ranging from 1 to 984 feet. The flowering period for this species is April through October. Potential habitat is present in some grasslands north of the I-580 Corridor Area and in grasslands and alkali habitat near the Cayetano Creek Area. This species was not identified during focused surveys of the I-580 Corridor Area or Isabel North and South Areas. However, about 10 San Joaquin spearscale plants were detected during surveys in 2016 about 100 feet outside of the collective footprint (for the proposed access road from Campus Hill Drive). In addition, potential habitat is considered limited in the Arnold Road Staging Area and at the North Canyons Parkway Staging Area, where botanical surveys have not been finalized.

The following species were not detected during surveys.

- **Alkali milk-vetch (*Astragalus tener* var. *tener*).** Alkali milk-vetch is a member of the Fabacea family that occurs in valley grassland, alkali sink, freshwater wetland, and riparian-wetland communities and alkali playa and vernal pool habitats at elevations of 0 to 60 feet. The flowering period for this species is March to June. This species has been recorded in the east Livermore area both north and south of I-580. Potential occurrence for this species is considered low to moderate in the Arnold Road Staging Area, North Canyons Parkway Staging Area, and Cayetano Creek Area.
- **Heartscale (*Atriplex cordulata*).** Heartscale is a member of the goosefoot (Chenopodiaceae) family that occurs in saline or alkaline habitats, including chenopod scrub, meadows and seeps, and valley and foothill grasslands, at elevations ranging from 1 to 1,230 feet. The flowering period of this species is April to October. Grasslands north of the I-580 Corridor Area and in the Cayetano Creek Area are considered low to moderate habitat for this species.

- **Brittlescale (*Atriplex depressa*).** Brittlescale is a member of the goosefoot (Chenopodiaceae) family that occurs in chenopod scrub, meadows and seeps, alkaline/clay vernal pools, and alkaline valley and foothill grasslands at elevations ranging from 1 to 1,050 feet. The flowering period of this species is May to October. Grasslands north of the I-580 Corridor Area and in the Cayetano Creek Area are considered low to moderate habitat for this species.
- **Lesser saltscale (*Atriplex minuscula*).** Lesser saltscale is an annual herb of the Chenopodiaceae family that is endemic to California. This species is reported from shadscale scrub, valley grassland, and alkali sink habitats. Grasslands north of the I-580 Corridor Area and in the Cayetano Creek Area are considered low to moderate habitat for this species.
- **Round-leaved filaree (*California macrophylla*).** Round-leaved filaree is an annual herb in the geranium family (Geraniaceae) that occurs in association with clay soils in annual grasslands and foothill woodlands. This species blooms from March to May. Potential habitat is available in some grasslands north of the I-580 Corridor Area and in grasslands and alkali habitat near the Cayetano Creek Area.
- **Congdon's tarplant (*Centromadia parryi* var. *congdonii*).** Congdon's tarplant is a member of the sunflower (Asteraceae) family and occurs in valley and grassland habitats with alkaline soil substrates. The flowering period for this species is May to October, and occurs at elevations ranging from 1 to 750 feet. Potential habitat is available in some grasslands north of the I-580 Corridor Area and in grasslands and alkali habitat near the Cayetano Creek Area. This species is reported near the Dublin/Pleasanton Station (Figure 3.I-3).
- **Livermore tarplant (*Deinandra bacigalupii*).** The Livermore tarplant is a member of the sunflower (Asteraceae) family and blooms from June to October. It is an annual herb occurring in meadows and seeps with alkaline soil substrates at elevations ranging from 492 to 607 feet. This species has been previously recorded south of the I-580 Corridor Area and within the vicinity of Greenville Road (Figure 3.I-3). Potential habitat is available in some grasslands north of the I-580 Corridor Area and in grassland habitat near the Cayetano Creek Area.

The following species were not detected during surveys. Potential habitat is considered limited in the Arnold Road Staging Area and at the North Canyons Parkway Staging Area, where botanical surveys have not been finalized. Potential habitat is available in some grasslands north of the I-580 Corridor Area and in grassland habitat near the Cayetano Creek Area.

- **Recurved larkspur (*Delphinium recurvatum*).** Recurved larkspur is a perennial herb of the Ranunculaceae family that occurs in poorly drained, alkali grasslands, shadscale scrub, or foothill woodlands at elevations below 2,400 feet. This species blooms from

March to May, and therefore was not covered by focused botanical surveys in 2013. No occurrences are reported near the study area.

- **Diamond-petaled poppy (*Eschscholzia rhombipetala*).** The diamond-petaled poppy is a member of the poppy family (Papaveraceae) that was historically known from seven sites in the inner Coast Ranges. It now exists as two extant populations in the northern Carrizo Plain in San Luis Obispo County and on Lawrence Livermore National Laboratory property in Alameda County, where it was discovered in 1997. It has been described from areas of nearly barren clay soils and from fallow grasslands. This species blooms from March to April.
- **Saline clover (*Trifolium depauperatum* var. *hydrophilum*).** Saline clover is a member of the legume (Fabaceae) family and blooms from April to June. It is found in marshes and swamps, valley and foothill grasslands in alkaline soil substrates, and vernal pools at elevations ranging from 0 to 984 feet. It is threatened by development, trampling, road construction, and vehicles. Occurrences are reported north of the I-580 Corridor Area, just west of El Charro Road (Figure 3.I-3).[66]

The following species were not observed during focused botanical surveys and are not expected in the study area because the design of the Proposed Project and DMU Alterative would avoid alkali scald habitat. In addition, potential habitat is not present at the Arnold Road Staging Area or at the North Canyons Parkway Staging Area.

- **Hispid salty bird's-beak (*Chloropyron molle* ssp. *hispidum*).** Hispid salty bird's-beak is a member of the figwort (Scrophulariaceae) family and blooms from June to September. It is a bristly, much-branched annual, green-root parasitic species, and 4 to 16 inches tall. It occurs in meadows, seeps, playas, and valley and foothill grassland with alkali soil substrates at elevations ranging from 1 to 155 feet.
- **Palmate-bracted salty bird's beak (*Chloropyron palmatum*).** It is a hemiparasitic member of the figwort (Scrophulariaceae) family and blooms from May to October. This annual herb occurs in chenopod scrub, valley and foothill grasslands with alkaline soil substrates at elevations ranging from 164 to 1,295 feet.

f. Wetlands and Other Waters of the U.S. and/or Waters of the State

Wetlands, waters of the U.S., and/or waters of the State within the study area include but are not limited to seasonal wetlands, riparian scrub, and freshwater marsh habitats. As explained in the Regulatory Framework subsection below, the State considers wetland features that may not be jurisdictional "waters of the U.S." under federal law to be

[66] California Department of Fish and Wildlife (CDFW), 2016. Rarefind 5. Biogeographic Data Branch, California Natural Diversity Database, August 4.

protected "waters of the State" under California law. Streams and surface waters that extend through the collective footprint include the following (from west to east): Line G-1-1, Chabot Canal, Line G-2, Tassajara Creek, Line G-3, Cottonwood Creek, Collier Canyon Creek, Isabel Creek, Arroyo las Positas, Cayetano Creek, and other unnamed surface water features and drainages. In addition, several seasonal wetlands are present in the study area and several drainages pass beneath the I-580 corridor in culverts.

Some of these watercourses have been historically channelized and altered for storm drainage management or for agricultural purposes. The distribution of observed wetlands within the study area corresponds to subtle differences in topography, soils, and land use. Creeks are found throughout the study area, while most of the wetlands are found in the non-urban areas of Pleasanton and Livermore, north of I-580, in the Cayetano Creek Area, and near, but not within the Laughlin Road Area.

g. Critical Habitat

Although federally designated critical habitat does occur in the study area, it is not present within the collective footprint. Designated critical habitat for the CTS and CRLF occurs approximately 0.3 mile north and west of the proposed tail tracks and storage and maintenance facility within the Cayetano Creek Area. Designated critical habitat for the VPFS and CRLF occurs approximately 0.1 mile northeast of the Laughlin Road Area.

h. Wildlife Corridors

Wildlife corridors are areas of generally linear habitat that connect areas of suitable wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or human disturbance. The fragmentation of open space areas by urbanization creates isolated islands of wildlife habitat. The study area is not part of major recognized wildlife corridors or travel routes, as much of it is urbanized and movement corridors are fragmented by I-580. Hence, wildlife may encounter existing substantial barriers when attempting to move through the study area.

Wildlife movement activities usually fall into one of three movement categories: (1) dispersal (e.g., juvenile animals from natal areas, or individuals extending range distributions); (2) seasonal migration; and (3) local movements related to home range activities (foraging for food or water, defending territories, searching for mates, breeding areas, or cover). Several terms have been used in various wildlife movement studies, such as wildlife corridor, travel route, habitat linkage, and wildlife crossing, to refer to areas in which wildlife move from one area to another. To clarify the meaning of these terms and facilitate the discussion of wildlife movement in this analysis, these terms are defined as follows:

- **Travel Route** – A landscape feature (such as a ridgeline, drainage, canyon, or riparian strip) within a larger natural habitat area that is used frequently by animals to facilitate movement and provide access to necessary resources (e.g., water, food, cover, den sites). The travel route is generally preferred because it provides the least amount of topographic resistance in moving from one area to another. It contains adequate food, water, and/or cover while moving between habitat areas and provides a relatively direct link between target habitat areas.
- **Wildlife Corridor** – A piece of habitat, usually linear in nature, that connects two or more habitat patches that would otherwise be fragmented or isolated from one another. Wildlife corridors are usually bounded by urban land areas or other areas unsuitable for wildlife. The corridor generally contains suitable cover, food, and/or water to support species and facilitate movement while in the corridor. Larger, landscape-level corridors (often referred to as habitat or landscape linkages) can provide both transitory and resident habitat for a variety of species.
- **Wildlife Crossing** – A small narrow area, relatively short and generally constricted in nature, that allows wildlife to pass under or through an obstacle or barrier that otherwise hinders or prevents movement. Crossings typically are man-made and include culverts, underpasses, drainage pipes, and tunnels to provide access across or under roads, highways, pipelines, or other physical obstacles. These often represent choke points along a movement corridor.

The California Wilderness Coalition report Missing Linkages: Restoring Connectivity to the California Landscape refers to the Altamont Hills area as a connectivity choke-point based on the fact that grassland areas north and south of I-580 are divided by the freeway.[67] The Altamont Hills were identified as a connectivity choke point for movements of SJKF, golden eagle, BUOW, California condor, and CTS. Numerous barriers were mentioned for the Altamont Hills linkage: I-580; Altamont Hills wind turbine development; development and expansion of Los Vaqueros Reservoir; the California Aqueduct; and loss of habitat from development in the cities of Brentwood, Antioch, and Tracy. Maintaining adequate habitat cover at the Greenville Road crossing within the Altamont Corridor Express train corridor was identified as a restoration priority. This crossing area is located 0.8 mile east of the Laughlin Road Area.

Urbanized areas in the cities of Dublin, Livermore, and Pleasanton were not described in the Missing Linkages report because wildlife travel routes and wildlife corridors have been confined to stream corridors by urbanization.

[67] California Wilderness Coalition, 2000. Missing Linkages: Restoring Connectivity to the California Landscape. November.

Portions of the study area that could serve as wildlife crossings, as defined above, include the creeks that cross I-580. Creek crossings along I-580 in the project corridor include Chabot Canal, Tassajara Creek, Cottonwood Creek, Collier Canyon Creek, and Arroyo las Positas. The animals that currently use these areas are habituated to the lighting, noise, and vibration from I-580 traffic.

Several creeks and arroyos in the study area serve as active movement corridors for large mammals, evidenced by considerable tracks and wildlife observations during 2013 to 2016 surveys. For example, during ESA's reconnaissance-level wildlife surveys on July 7, 2013, two black-tailed deer (a female and fawn) were observed at the Isabel South Area, while three mature bucks were observed beneath tree cover approximately 0.25 mile to the northeast, across I-580. Wildlife tracks beneath the freeway showed substantial movement of deer and raccoon beneath the freeway along Arroyo las Positas. Similarly, on July 18, 2013, three deer were observed in the box culvert beneath I-580 at Cottonwood Creek. Based on observed wildlife use, the Arroyo las Positas and Cottonwood Creek riparian corridors offer wildlife crossing opportunities at I-580.

ESA biologists identified a potential local wildlife travel route near Cayetano Creek within the Cayetano Creek Area where CTS and CRLF could disperse back and forth from aquatic breeding habitat in the creek to upland refugia habitat further west.

A summary of known and potential wildlife corridors as they occur within the study area is included in Table 3.I-6.

TABLE 3.I-6 WILDLIFE CORRIDORS IN THE STUDY AREA

	Dublin/ Pleasanton Study Area	I-580 Corridor Area	Isabel North Area	Isabel South Area	Cayetano Creek Area	Laughlin Road Area
Wildlife Corridor		✓		✓	✓	

Notes: ✔ = potentially present
Source: ESA, 2013a,b,c,d; Arup, 2017.

3. Regulatory Framework

This subsection describes the federal, State, and local environmental laws and policies relevant to biological resources.

(1) Federal Regulations

This section describes federal regulations pertaining to special-status species and wetlands. The USFWS administers the FESA (16 United States Code [U.S.C.] 153 et seq.), Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703–711), and the Bald and Golden Eagle Protection Act (16 U.S.C. 668) as described below. The USACE administers Section 404 of the Clean Water Act (CWA) as described below.

(a) Federal Endangered Species Act

Federal Endangered Species Act Section 7 and Section 10

Under the FESA, the Secretary of the Interior and the Secretary of Commerce have joint authority to list a species as threatened or endangered (16 U.S.C. 1533[c]). Two federal agencies oversee FESA. The USFWS has jurisdiction over plants, wildlife, and resident fish, and the National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries) has jurisdiction over anadromous fish and marine fish and mammals. The FESA Section 7 mandates that all federal agencies consult with the USFWS and NOAA Fisheries to ensure that federal agency actions do not jeopardize the continued existence of a listed species or destroy or adversely modify critical habitat for listed species (see the discussion below under Critical Habitat). The FESA prohibits the unauthorized take of any fish or wildlife species listed as threatened or endangered, including the destruction of habitat that could hinder species recovery.

FESA Section 10 requires the issuance of an incidental take permit before any public or private action may be taken that would harm, harass, injure, kill, capture, collect, or otherwise hurt any individual of an endangered or threatened species. The permit requires preparation and implementation of a habitat conservation plan that provides specific measures to avoid, offset, or minimize impacts on endangered or threatened species.

Critical Habitat

The USFWS designates critical habitat for listed species under the FESA. Critical habitat designations are specific areas within a geographic region that are occupied by a species and determined to be critical to its survival in accordance with the FESA. Federal entities issuing permits or acting as a lead agency must show that their actions do not negatively affect the critical habitat to the extent that it impedes the recovery of the species. Designated critical habitat is not within the collective footprint.

(b) Protection of Nesting Birds – Migratory Bird Treaty Act

The MBTA (16 U.S.C. 703, Supp. I, 1989) prohibits the killing, possessing, or trading of migratory birds, bird parts, eggs, and nests, except in accordance with regulations prescribed by the Secretary of the Interior. The MBTA prohibits direct and indirect acts, though harassment and habitat modification are not included unless they result in direct loss of birds, eggs, or nests. The list of birds covered by the MBTA essentially includes all native birds.

(c) Bald and Golden Eagle Protection Act

Under the Bald and Golden Eagle Protection Act, it is illegal to import, export, take (which includes molest or disturb), sell, purchase, or barter any bald eagle or golden eagle or part thereof.

(d) Clean Water Act

The USACE administers Section 404 of the CWA. Section 404 regulates activities in wetlands and other waters of the U.S. Wetlands are a subset of waters of the U.S. Waters of the U.S. are defined in the Code of Federal Regulations (CFR) (33 CFR 328.3[a]; 40 CFR 230.3[s]) as follows:

1. All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide.
2. All interstate waters, including interstate wetlands. (Wetlands are defined by the federal government [33 CFR 328.3(b), 1991] as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances support, a prevalence of vegetation typically adapted for life in saturated soil conditions.)
3. All other waters—such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds—the use, degradation, or destruction of which could affect interstate or foreign commerce. This includes any waters with the following current or potential uses:
    a. That are or could be used by interstate or foreign travelers for recreational or other purposes
    b. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce
    c. That are used or could be used for industrial purposes by industries in interstate commerce

4. All impoundments of waters otherwise defined as waters of the U.S. under the definition.
5. Tributaries of waters identified in paragraphs (1) through (4).
6. Territorial seas.
7. Wetlands next to waters identified in paragraphs (1) through (6).
8. Waters of the U.S. do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the CWA, the final authority regarding the CWA jurisdiction remains with the U.S. Environmental Protection Agency (328.3[a][8] added 58 CFR 45035, August 25, 1993).

(2) State Regulations

This section describes State regulations pertaining to special-status species and wetlands. The CDFW administers several laws and programs designed to protect fish and wildlife resources, as discussed below.

(a) California Endangered Species Act

The CESA protects plant and wildlife species that have been designated by the CDFW as threatened or endangered. The CESA prohibits the take of endangered and threatened species. Under the CESA, take is defined as "hunt, pursue, catch, capture, or kill" or attempt to do so. The definition of take does not include harm or harassment of State-listed species or the destruction of their habitat. In accordance with the CESA, the CDFW has jurisdiction over State-listed species (California Fish and Game Code 2070). Additionally, the CDFW maintains lists of species of special concern that are defined as species that appear to be vulnerable to extinction because of declining populations, limited ranges, or continuing threats.

(b) Fully Protected Species – Fish and Game Code Sections 3511, 4700, 5050, and 5515

Fully protected species may not be taken or possessed at any time, and no licenses or permits may be issued for their take, except for collecting these species for necessary scientific research, relocation of bird species for the protection of livestock, or pursuant to a natural community conservation plan. Many fully protected species have also been listed as threatened or endangered species under the more recent endangered species laws and regulations; however, because the original statutes have not been repealed or amended, the legal protection of "no take" is still applicable.

(c) Protection of Nesting Birds – Fish and Game Code Sections 3503 and 3513

Section 3503.5 states that it is "unlawful to take, possess, or destroy the nests or eggs of any such bird of prey (i.e., species in the orders falconiformes and strigiformes) except as otherwise provided by this code or any other regulation adopted hereto." Section 3513 states that it is also unlawful to take or possess any migratory non-game bird (or part of such migratory non-game bird) as designated in the MBTA. Disturbance that causes nest abandonment and/or reproductive failure is considered a take by the CDFW. This statute does not provide for the issuance of an incidental take permit.

(d) Species of Special Concern

The CDFW maintains a list of candidate-endangered species and candidate-threatened species. California candidate species are afforded the same level of protection as listed species. California also designates species of special concern, which are species of limited distribution, declining populations, diminishing habitat, or unusual scientific, recreational, or educational value. These species do not have the same legal protection as listed species or fully protected species, but may be added to official lists in the future. The CDFW intends the species of special concern list to be a management tool for consideration in future land use decisions, including CEQA reviews.

(e) California Native Plant Protection Act

California Fish and Game Code Section 1900–1913, also known as the Native Plant Protection Act, is intended to preserve, protect, and enhance endangered or rare native plants in California. The act directs CDFW to establish criteria for determining what native plants are rare or endangered. Under Section 1901, a species is endangered when its prospects for survival and reproduction are in immediate jeopardy from one or more causes. A species is rare when, although not threatened with immediate extinction, it is in such small numbers throughout its range that it may become endangered if its present environment worsens. The act also directs the California Fish and Game Commission to adopt regulations governing the taking, possessing, propagation, or sale of any endangered or rare native plant.

Vascular plants identified as rare or endangered by the CNPS, but which may have no designated status or protection under federal or State endangered species legislation, are defined with the following California Rare Plant Ranks:

1. Rank 1A: Plants presumed extinct
2. Rank 1B: Plants rare, threatened, or endangered in California and elsewhere
3. Rank 2: Plants rare, threatened, or endangered in California, but more numerous elsewhere

4. Rank 3: Plants about which more information is needed (a review list)
5. Rank 4: Plants of limited distribution (a watch list)

In general, plants appearing on CNPS Lists 1A, 1B, or 2 are considered to meet the criteria of endangered, rare, or threatened under CEQA Guidelines Section 15380. Additionally, plants identified on CNPS Lists 1A, 1B, or 2 meet the definition of Section 1901, Chapter 10 (Native Plant Protection Act) and Sections 2062 and 2067 (CESA) of the California Fish and Game Code as rare or endangered species.

(f) Lake and Streambed Alterations

Under Sections 1600–1607 of the California Fish and Game Code, the CDFW has jurisdictional authority over rivers, streams, and lakes from which fish and wildlife derive benefit. Under Section 1602, the CDFW regulates projects that will (1) divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake designated by the department in which there is at any time an existing fish or wildlife resource or from which these resources derive benefit; (2) use material from the streambeds designated by the department; or (3) result in the disposal or deposition of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake designated by the department. A proponent of a project that has the potential to affect a stream or lakebed is required to notify the CDFW of the proposed activity.

The ephemeral drainages within the study area are likely to meet the California Fish and Game Code's definition of a stream and would be subject to CDFW regulation, and the CDFW would need to be notified before undertaking activities in the ephemeral drainages. It is likely that the CDFW would require a lake or streambed alteration agreement for construction across these drainages.

(g) Porter-Cologne Water Quality Control Act

The State's authority in regulating activities in wetlands and waters in the Plan Area resides primarily with the State Water Resources Control Board, acting through its nine RWQCBs. The Porter-Cologne Water Quality Control Act prohibits unpermitted discharges of waste, including discharges of dredged or fill material, to waters of the State. The State Water Resources Control Board considers "waters of the State" to include all surface and subsurface waters, including waters that do not meet the jurisdictional criteria for "waters of the U.S." under the federal CWA. All of the wetlands and waterways in the study area are waters of the State, which are protected under the Porter-Cologne Act.

In addition, under the CWA, the State must certify that each USACE permit action meets State water quality objectives (CWA Section 401). Water quality certifications are issued by the RWQCBs. Any condition of water quality certification is then incorporated into the USACE Section 404 permit authorized for the project.

(3) Local Regulations

(a) East Alameda County Conservation Strategy

The EACCS, finalized in October 2010, is a regional conservation strategy that is intended to provide an effective framework to protect, enhance, and restore natural resources in eastern Alameda County, while improving and streamlining the environmental permitting process for impacts resulting from infrastructure and development projects. The Conservation Strategy focuses on impacts on biological resources such as endangered and other special-status species as well as sensitive habitat types (e.g., wetlands, riparian corridors, rare upland communities). The study area for the Conservation Strategy encompasses 271,485 acres, or approximately 52 percent of Alameda County. The EACCS study area completely covers the study area for the BART to Livermore Extension Project, including the cities of Dublin, Livermore, Pleasanton and the unincorporated Alameda County.

The EACCS is not a formal Habitat Conservation Plan under federal law or Natural Community Conservation Plan under State law that authorizes incidental take of listed species. Instead, the EACCS's purpose is to provide a baseline inventory of biological resources and conservation priorities that will be utilized by local agencies and regulatory agencies during project-level planning and environmental permitting. To this end, the EACCS describes how to avoid, minimize, and mitigate impacts on selected special-status species and sensitive habitats. By implementing the Conservation Strategy, local agencies can more easily address the legal requirements relevant to these species. Projects and activities that will benefit from this Conservation Strategy include urban and suburban growth and a variety of road, water, and other needed infrastructure construction and maintenance activities.[68] BART intends for the BART to Livermore Extension Project to be consistent with the conservation strategies and mitigation guidance established by EACCS.

(b) Local Tree Protection Ordinances

Although BART is exempt from compliance with local land use ordinances under California Government Code Sections 53090 and 53091, BART acknowledges that trees can be considered local resources and local tree ordinances are used to identify protected trees.

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[68] East Alameda County Conservation Strategy, 2017. East Alameda County Conservation Strategy Document (Working Draft). Available at: www.eastalco-conservation.org/documents/031809-ch1-introduction.doc, accessed March 26.

Alameda County Regulation of Trees in County Right-of-Way

Chapter 12.11 of the Alameda County General Ordinance Code contains the Regulation of Trees in County ROW, which requires approval for the removal of any tree within the County ROW that meet the following criteria: any woody perennial plant characterized by having a single trunk or multi-trunk structure at least 10 feet high and having a major trunk that is at least 2 inches in diameter taken at breast height and 4.5 feet from the ground. The criteria also includes species of plants that are generally designated as trees, any trees that have been planted as replacement trees under the county tree ordinance, or any trees planted by the county.

City of Dublin Heritage Tree Ordinance

Chapter 5.60 of the City of Dublin Municipal Code contains the Heritage Tree Ordinance which establishes regulations controlling the removal of and the preservation of heritage trees within all properties within the city. Section 5.60.040 defines heritage trees as follows:

1. Any oak, bay, cypress, maple, redwood, buckeye, and sycamore tree having a trunk or main stem of 24 inches or more in diameter measured at 4 feet, 6 inches above natural grade
2. A tree required to be preserved as part of an approved development plan, zoning permit, use permit, site development review, or subdivision map
3. A tree required to be planted as a replacement for an unlawfully removed tree

City of Pleasanton Tree Preservation Ordinance

Chapter 17.16 of the City of Pleasanton Municipal Code contains the Tree Preservation Ordinance, which promotes and protects the public health, safety, and general welfare by providing for the regulation of planting, maintenance and removal of heritage trees within the city. Section 17.16.006 defines heritage tree as follows:

1. Any single-trunked tree with a circumference of 55 inches or more measured 4.5 feet above ground level
2. Any multi-trunked tree of which the two largest trunks have a circumference of 55 inches or more measured 4.5 feet above ground level
3. Any tree 35 feet or more in height
4. Any tree of particular historical significance specifically designated by official action
5. A stand of trees, the nature of which makes each dependent upon the other for survival or the area's natural beauty

City of Livermore Street Trees and Tree Preservation

Chapter 12.20 of the City of Livermore Municipal Code contains the Street Trees and Tree Preservation Ordinance. The Ordinance is divided into two articles, Article I: Street Trees and Article II: Preservation of Trees. Section 12.20.160 defines protected tree as a tree that meets the following criteria:

1. Any tree located on private property occupied by single-family residential development that meets the following criteria:
   a. Any tree with a circumference at breast height of 60 inches or more
   b. Any California native (see Table 3.I-7) tree having a circumference at breast height of 24 inches or more

TABLE 3.I-7 NATIVE TREES IN THE CITY OF LIVERMORE

Scientific Name	Common Name
Acer macrophyllum	Big leaf maple
Aesculus californica	California buckeye
Alnus rhombifolia	Alder
Arbutus menziesii	Madrone
Juglans hindsii californica	California black walnut
Pinus sabiniana	Grey pine
Platanus racemosa	California sycamore
Quercus agrifolia	Coast live oak
Quercus berberidifolia	Scrub oak
Quercus chrysolepis	Canyon live oak
Quercus douglasii	Blue oak
Quercus kelloggii	California black oak
Quercus lobata	Valley oak
Quercus wislizenii	Interior live oak
Umbellularia californica	California bay

Source: City of Livermore Municipal Code, Title 12, Chapter 12, Article 20.

2. Any tree located on private property occupied by commercial, industrial, institutional (i.e., religious, public agency, hospital, care facilities, etc.), mixed-use or multifamily residential (two or more units) development with a circumference at breast height of 24 inches or more
3. Any tree located on an undeveloped or underdeveloped property, regardless of zoning district, use, or development status, for which new development is proposed, with a circumference at breast height of 18 inches or more

4. Any tree located in an open space, riparian, or habitat area with a circumference at breast height of 18 inches or more
5. Any tree approved as part of a site plan approval, or required as a condition of approval for a development project, zoning use permit, use permit or other site development review
6. Any tree designated by the city council as determined to be an ancestral tree
7. Any tree listed on the city's ancestral tree inventory
8. Any tree required to be planted as mitigation for unlawfully removed trees

4. Impacts and Mitigation Measures

This subsection lists the standards of significance used to assess impacts, discusses the methodology used in the analysis, 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 on biological resources are considered significant if the Proposed Project or one of the Alternatives would result in any of the following:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS
- Have a substantial adverse effect on State or federally protected wetlands (including but not limited to marsh, vernal pool, and coastal) or waters through direct removal, filling, hydrological interruption, or other means
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the CDFW or USFWS
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites
- Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat conservation plan
- Result in loss of protected trees as identified in a local tree preservation policy or ordinance

b. Impact Methodology

The methodology used to evaluate the significance of biological resource impacts is described below. The Electric Multiple Unit (EMU) Option would have the same impacts as the DMU Alternative; therefore, the analysis and conclusions for the DMU Alternative also apply to the EMU Option.

The analysis of the Enhanced Bus Alternative, which addresses the potential impacts of construction of the bus infrastructure improvements and operation of the bus routes at a programmatic level, would also apply to the bus improvements and feeder bus service under the Proposed Project and other Build Alternatives. Therefore, the analyses and conclusions for the Enhanced Bus Alternative also apply to the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, and are not repeated in the analysis of the Proposed Project and other Build Alternatives.

Project components will be evaluated using the above significance criteria. Three principal components of the guidelines outlined above will be considered:

- Magnitude of the impact (e.g., substantial/not substantial)
- Uniqueness of the affected resource (rarity)
- Susceptibility of the affected resource to perturbation (sensitivity)

The evaluation of significance must consider the interrelationship of these three components. For example, a relatively small magnitude impact to a State or federally listed species would be considered significant because the species is very rare and is believed to be very susceptible to disturbance. Conversely, a plant community such as annual grassland is not necessarily rare or sensitive to disturbance. Therefore, a much larger magnitude of impact would be required to result in a significant impact. Impacts are generally considered less than significant if the habitats and species affected are common and widespread in the region and the State. Impacts are considered beneficial if the action causes no detrimental impacts and results in an increase of habitat quantity and quality.

The analysis of potential impacts of the Proposed Project and Alternatives to biological resources relies on a literature review, biological reconnaissance surveys, focused wildlife surveys, and coordination with appropriate permitting agencies, including the USFWS and CDFW. The literature review was conducted to determine the federal and State-listed endangered, threatened, and special-status wildlife species that have the potential to occur within the study area. The assessment considered the survey findings and impact analyses of the program-level EIR prepared for the BART to Livermore Extension Project[69] as well as the Environmental Assessment and permitting documents for the Caltrans I-580 Westbound High Occupancy Vehicle Lane Project, which traverses the study area.[70] Additional sources used in the analysis are presented in the Introduction subsection above. The review also included a search of the CNDDB Electronic Inventory for the nine U.S. Geological Survey 7.5' topographic quadrangles that surround the collective footprint.

As discussed in the Local Setting and Survey Methodology subsection above, focused botanical surveys and reconnaissance-level wildlife surveys were conducted for the study area. However, due to access limitations to private property, biological surveys could not be performed for the following areas: (1) construction staging areas – Arnold Road Staging Area, North Canyons Parkway Staging Area, Storage and Maintenance Facility Staging Areas (in Cayetano Creek Area); (2) collective footprint (permanent areas) – portion of I-580 Corridor Area (grasslands north of Croak Road) and the Cayetano Creek Area. In these areas, the analysis relied upon modeled habitat suitability in the EACCS[71] to estimate potential impacts to plant and wildlife resources.

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[69] San Francisco Bay Area Rapid Transit District (BART), 2010. BART to Livermore Extension Final Program Environmental Impact Report. Available at: https://bart.gov/sites/default/files/docs/Bart-to-Livermore-EIR-WEB_0.pdf, accessed April 26, 2017.

[70] California Department of Transportation (Caltrans), 2006. Environmental Assessment/Initial Study I 580 Eastbound HOV Lane Project from East of Greenville Road to Hacienda Drive. September.

[71] ICF International, 2010. East Alameda County Conservation Strategy. Final Draft. October. (ICF 00906.08.) San Jose, CA. Prepared for East Alameda County Conservation Strategy Steering Committee, Livermore, CA.

c. Summary of Impacts

Table 3.I-8 summarizes the impacts of the Proposed Project and Alternatives described in the analysis below.

TABLE 3.I-8 SUMMARY OF BIOLOGICAL RESOURCES IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project[b]**	**DMU Alternative (with EMU Option)[b]**	**Express Bus/BRT Alternative[b]**	**Enhanced Bus Alternative**
Construction					
Project Analysis					
Impact BIO-1. Adversely affect special-status plants, either directly or through habitat modifications during construction	NI	LSM	LSM	LSM	NI
Impact BIO-2. Adversely affect vernal pool fairy shrimp and longhorn fairy shrimp during construction	NI	LSM	LSM	NI	NI
Impact BIO-3. Adversely affect California tiger salamander and California red-legged frog during construction	NI	LSM	LSM	LSM	NI
Impact BIO-4. Adversely affect western spadefoot during construction	NI	LSM	LSM	NI	NI
Impact BIO-5: Adversely affect western pond turtle during construction	NI	LSM	LSM	LSM	NI
Impact BIO-6: Adversely affect western burrowing owl during construction	NI	LSM	LSM	LSM	NI
Impact BIO-7: Adversely affect nesting raptors and other nesting birds during construction	NI	LSM	LSM	LSM	LSM
Impact BIO-8: Adversely affect special-status bats during construction	NI	LSM	LSM	LSM	NI
Impact BIO-9: Adversely affect American badger during construction	NI	LSM	LSM	NI	NI

TABLE 3.I-8 SUMMARY OF BIOLOGICAL RESOURCES IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project[b]**	**DMU Alternative (with EMU Option)[b]**	**Express Bus/BRT Alternative[b]**	**Enhanced Bus Alternative**
Impact BIO-10: Adversely affect San Joaquin kit fox during construction	NI	LSM	LSM	LSM	NI
Impact BIO-11: Have a substantial adverse effect on State or federally protected wetlands or waters during construction	NI	LSM	LSM	LSM	NI
Impact BIO-12: Have a substantial adverse effect on riparian habitat or sensitive natural communities during construction	NI	LSM	LSM	LSM	NI
Impact BIO-13: Interfere with the movement of native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites during construction	NI	LS	LS	NI	NI
Impact BIO-14: Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat conservation plan during construction	NI	NI	NI	NI	NI
Impact BIO-15: Result in loss of protected trees identified in local policies or ordinances	NI	LSM	LSM	LSM	NI
Cumulative Analysis					
Impact BIO-16(CU): Adversely affect, species identified as a candidate, sensitive, or special-status, during construction under Cumulative Conditions	NI	SU	SU	LS	LS

TABLE 3.I-8 SUMMARY OF BIOLOGICAL RESOURCES IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project[b]**	**DMU Alternative (with EMU Option)[b]**	**Express Bus/BRT Alternative[b]**	**Enhanced Bus Alternative**
Impact BIO-17(CU): Have a substantial adverse effect on State or federally protected wetlands or waters during construction under Cumulative Conditions	NI	LS	LS	LS	NI
Impact BIO-18(CU): Have a substantial adverse effect on riparian habitat or sensitive natural communities during construction under Cumulative Conditions	NI	LS	LS	LS	NI
Impact BIO-19(CU): Interfere with the movement of native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites during construction under Cumulative Conditions	NI	LS	LS	NI	NI
Impact BIO-20(CU): Result in loss of protected trees identified in local policies or ordinances under Cumulative Conditions	NI	LS	LS	LS	NI
Operational					
Project Analysis					
Impact BIO-21: Have a substantial adverse effect on plant or wildlife species, riparian habitat or other sensitive natural community, protected wetlands or waters, migratory wildlife corridors, or protected trees during operations	NI	LS	LS	NI	NI

TABLE 3.I-8 SUMMARY OF BIOLOGICAL RESOURCES IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project[b]**	**DMU Alternative (with EMU Option)[b]**	**Express Bus/BRT Alternative[b]**	**Enhanced Bus Alternative**
Cumulative Analysis					
Impact BIO-22(CU): Have a substantial adverse effect on plant or wildlife species, riparian habitat or other sensitive natural community, protected wetlands or waters, migratory wildlife corridors, or protected trees during operations under Cumulative Conditions	NI	LS	LS	NI	NI

Notes: NI=No impact; LS=Less-than-Significant impact, no mitigation required; LSM=Less-than-Significant impact with mitigation; SU=Significant and unavoidable, even with mitigation or no feasible mitigation available.
[a] All significance determinations listed in the table assume incorporation of applicable mitigation measures.
[b] The analysis of the Enhanced Bus Alternative also applies to the feeder bus service and bus improvements under the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, as described in the Impact Methodology.

d. Environmental Analysis

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

(1) Construction Impacts

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

Construction associated with the Proposed Project and Build Alternatives would permanently affect potential biological resources through ground disturbing activities. Therefore, many of the construction impacts described below are considered to be permanent (rather than temporary). Short-term construction impacts such as temporary use of construction laydown areas, outside the permanent project footprint, are also considered. Such laydown and staging areas will be restored following use, and therefore are temporary impacts.

(a) Construction – Project Analysis

The majority of the collective footprint is in developed/urbanized areas, including within the I-580 freeway median, and would not result in direct impacts to special-status plant or wildlife species. However, as described in the Existing Conditions subsection above, several special-status plants, invertebrates, amphibians, reptiles, birds, and mammals are known to occur or have the potential to occur within the study area and could be impacted during construction of the Proposed Project or Build Alternatives. These species include one State candidate rare plant (Livermore tarplant) and several non-listed rare plants that are generally associated with grasslands or alkali soil conditions. In addition, special-status animal species with potential to occur in the study area include VPFS, CTS, CRLF, WPT, loggerhead shrike, tricolored blackbird, golden eagle and other nesting birds, pallid bat, American badger, and SJKF.

Within the Alameda Creek watershed, potential steelhead habitat occurs in Alameda Creek and upper Arroyo Mocho, which are outside of the project area. Steelhead seasonal fish passage would not occur through the study area as: (1) this species does not have access to the Livermore Valley; (2) the watercourses that extend through the study area are either intermittent (i.e., seasonally dry) or have warm water that would not support steelhead; and (3) the headwaters of drainages in the study area do not provide steelhead habitat. Presently, the BART weir and associated rubber dams on lower Alameda Creek in the city of Fremont impede the passage of steelhead into the upper Alameda Creek watershed and the Livermore-Amador Valley; hence, due to instream impediments and lack of habitat, this species is not expected in the project area. Therefore, the Proposed Project and Build Alternatives would have no impact to steelhead.

Potential impacts to plants are described below, followed by a discussion of potential impacts to wildlife.

Impact BIO-1: Adversely affect special-status plants, either directly or through habitat modifications during construction.

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

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, 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, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect habitat of special-status plants. 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 special-status plants during construction. **(NI)**

Conventional BART Project. Based on the findings of focused and reconnaissance-level botanical surveys, several special-status plants are known to occur in the study area that could be impacted by construction of the Proposed Project. While no known rare plant populations occur in the footprint of the Proposed Project, for the purposes of this EIR, it was conservatively assumed that the special-status plants that occur regionally within similar grasslands or alkali habitats that are found within the Proposed Project footprint could be encountered in areas that have not been surveyed, listed in Table 3.I-1 (Arnold Road Staging Area, grasslands north of Croak Road, North Canyons Parkway Staging Area, and in the Cayetano Creek Area). As described in the Existing Conditions subsection above, the following non-listed rare plant species could occur in these areas: Alkali milk-vetch; Heartscale; Brittlescale; San Joaquin spearscale; Lesser saltscale; Round-leaved filaree; Congdon's tarplant; Livermore tarplant; Recurved larkspur; Diamond-petaled poppy; and Saline clover.

The distribution of potential habitat for these rare plants (seasonal wetland and alkali habitat) was considered during the design and siting of the proposed storage and maintenance facility and tail tracks in the Cayetano Creek Area, to reduce potential habitat impacts. In addition, as described in Chapter 2, Project Description, the project design would maintain the hydrologic connectivity of seasonal wetlands within Cayetano Creek Area, to minimize and/or avoid potential indirect impacts to seasonal wetland and alkali habitat. Culverts would be placed at regular intervals under the BART tail tracks to maintain an even surface flow from the higher elevations to the shallow valley floor, replicating the existing hydrologic situation.

However, as special-status plant surveys have not been finalized due to access limitations to private property within the Arnold Road Staging Area, grasslands north of Croak Road, North Canyons Parkway Staging Area, and in the Cayetano Creek Area, impacts to special-status plants could be potentially significant—if such plants are present—due to the potential for take of individual plants. Therefore, the Proposed Project could have potentially significant direct impacts to currently unidentified populations of special-status plants. This impact would be reduced with implementation of **Mitigation Measure BIO-1.A,** which requires the completion of protocol-level botanical surveys at the Arnold Road Staging Area, grasslands north of Croak Road, North Canyons Parkway Staging Area, and in the Cayetano Creek Area to verify the presence or absence of rare plants in the footprint. In addition, if rare plants are identified within the Proposed Project footprint, potential direct impacts would be reduced with implementation of **Mitigation Measure BIO-1.A**, which would ensure impacts were minimized and/or prevented via avoidance strategies and protective measures where feasible, and **Mitigation Measure BIO-1.B**, which provides compensation for impacts to rare plant populations through plant salvage, restoration and habitat enhancement where avoidance is infeasible. General measures provided in **Mitigation Measure BIO-3.C** would additionally protect rare plant populations, if present. With implementation of these mitigation measures, potential impacts would be reduced to a less-than-significant level. **(LSM)**

DMU Alternative. The DMU Alternative would generally have a similar footprint to the Proposed Project, with additional improvements at the Dublin/Pleasanton Station Area and a different footprint for the storage and maintenance facility in the Cayetano Creek Area. Thus, the DMU Alternative would have the similar potential to result in significant impacts to rare plant species. As described above, botanical surveys have yet to be finalized for the Arnold Road Staging Area, grasslands north of Croak Road, North Canyons Parkway Staging Area, and Cayetano Creek Area. Potential impacts to rare plant species in these areas would be reduced to a less-than-significant level with implementation of **Mitigation Measures BIO-1.A** and **BIO-1.B**, which provide focused surveys for rare plants, avoidance of plant species, and compensation for impacts to rare plant populations through plant salvage, restoration, and habitat enhancement. General measures provided in **Mitigation Measure BIO-3.C** would additionally protect rare plant populations, if present. **(LSM)**

Express Bus/BRT Alternative. No rare plant resources were identified within the Express Bus/BRT Alternative footprint during focused botanical surveys within the Dublin/Pleasanton Station Area and the Laughlin Road Area. However, botanical surveys remain to be finalized within the Arnold Road Staging Area, so rare plants could be detected within this area. Potential impacts to rare plant species would be reduced to a less-than-significant level with implementation of **Mitigation Measures BIO-1.A** and **BIO-1.B**, which provide focused surveys for rare plants, avoidance of plant species, and compensation for impacts to rare plant populations through plant salvage, restoration, and habitat enhancement. General measures provided in **Mitigation Measure BIO-3.C** would additionally protect rare plant populations, if present. **(LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs east of the Dublin/Pleasanton Station. Areas where bus improvements would be constructed would be within urban/developed land, which does not support rare plants. In addition, the limited amount of construction anticipated for installation of bus-related infrastructure improvements, including bus bulb-outs, bus shelters, and signage, would result in a minor amount of ground disturbance within developed areas. Therefore, the Enhanced Bus Alternative would have no impacts to rare plants, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative could have potentially significant impacts on special-status plants. The following mitigation measures would reduce potential impacts: **Mitigation Measure BIO-1.A**, which would require botanical surveys in areas that have not been surveyed and avoidance of plant species where feasible; **Mitigation Measure BIO-1.B**, which would compensate for impacts to rare plants that cannot be avoided; and general measures provided in **Mitigation Measure BIO-3.C** (see **Impact BIO-3** below), which would additionally protect rare plant populations, if present. With implementation of these mitigation measures, potential impacts would be reduced to a less-than-significant level.

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

Mitigation Measure BIO-1.A: Botanical Surveys for Areas Not Previously Surveyed and Refinement of Project Design (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

Focused botanical surveys shall be conducted in areas of the footprint for the adopted project, which have not been surveyed (i.e., portions of the Arnold Road Staging Area, grasslands north of Croak Road, North Canyons Parkway Staging Area, and Cayetano Creek Area) using the most recent CFDW special-status plant survey guidelines to identify the presence and distribution of rare plants. Currently, the most recent rare survey protocol is the 2009 guidance.[72] Botanical surveys shall document the location, extent, and size of rare plant populations, if present, and shall be used to inform the planned avoidance of rare plant populations whenever possible.

To the extent feasible, based on the survey results and consistent with site constraints, the final project design shall avoid and minimize impacts on identified special-status plant populations located within and adjacent to the adopted project footprint and construction staging areas. During construction, BART and its contractors shall locate facilities to avoid sensitive plant populations and shall install exclusion fencing and/or silt fencing around sensitive plant populations with as buffer of at least 25 feet between the fence and the nearest plants to minimize the potential for direct and indirect impacts, such as fugitive dust and accidental intrusion into sensitive areas.

[72] California Department of Fish and Game (CDFG), 2009. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities, State of California, California Natural Resources Agency. November 24.

Mitigation Measure BIO-1.B: Salvage and Relocation of Rare Plants that Cannot be Avoided (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

In areas where avoidance of rare plants is not feasible, BART shall salvage and relocate special-status plants through the following steps. A qualified botanist shall develop and implement a Restoration and Mitigation Plan in accordance with CDFW guidelines and in coordination with the CDFW. At a minimum, the plan shall include the following elements:

1. Collection of reproductive structures from affected plants
2. A description of micro-habitat conditions necessary for each affected target species
3. Seed germination requirements (e.g., 70 percent germination)
4. Restoration techniques for temporarily disturbed occurrences, if applicable
5. An assessment of the selected transplant and enhancement site (e.g., grasslands and seasonal wetlands habitat owned by BART in the Cayetano Creek watershed, grasslands on BART properties near Laughlin Road, or other available transplant locations)
6. Success and performance criteria (i.e., 70 percent survival of annual species, no woody invasive species shall be present, and herbaceous invasive species shall not exceed 5 percent cover)
7. A 5-year monitoring program to characterize long-term success of the planting/transplanting program.

Impact BIO-2: Adversely affect vernal pool fairy shrimp and longhorn fairy shrimp, either directly or through habitat modifications during construction.

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

Most of the potential habitat for special-status vernal pool invertebrates described in the alignment alternatives previously studied by BART in the PEIR at the Isabel/I-580 Station, Greenville Yard, and Vasco Yard tail tracks (up to 10 and 15 acres of potential habitat, depending upon alternatives) is not within the collective footprint of the Proposed Project and Build Alternatives in this EIR and would not be impacted.[73] The RWQCB commented on the Final PEIR (RWQCB comment letter, Comment 13; FEIR comment 8.13 on page 4-61) that the Draft PEIR did not demonstrate that impacts to such resources could be mitigated to less-than-significant levels, and that the described impacts at the Greenville Yard may not be mitigatable; the RWQCB suggested removal of the Greenville area from alternatives that are carried forward. In response, BART removed the alternative from subsequent consideration. The Proposed Project, DMU Alternative/EMU Option, and Enhanced Bus Alternative avoid any use of the Greenville site. The current Express Bus/BRT Alternative's remote parking facility only includes developed portions of the Greenville site (within the Laughlin Road Area) that do not support vernal pool habitat. Potential impacts to vernal pool habitat have been avoided or substantially reduced compared to prior designs and are described 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, Altamont Corridor Express, and the LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect habitat of VPFS and LHFS. 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 VPFS and LHFS during construction. **(NI)**

Conventional BART Project. The LHFS has very limited distribution in rock outcrop pools in the Altamont Hills that are several miles from the Proposed Project. While there is a low likelihood that LHFS may be found in the pools within the footprint of the Proposed Project, this analysis conservatively assumes that LHFS may occur in all potentially suitable habitat that has not been surveyed to determine species' presence or absence.

Potential habitat for VPFS includes three seasonal features in the I-580 Corridor Area, north of Croak Road, totaling approximately 0.025 acre (see SW-6 on Figure 3.I-2a). In

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[73] San Francisco Bay Area Rapid Transit District (BART), 2010. BART to Livermore Extension Final Program Environmental Impact Report. Available at: https://bart.gov/sites/default/files/docs/Bart-to-Livermore-EIR-WEB_0.pdf, accessed April 26, 2017.

addition, habitat for VPFS may occur within a modeled seasonal wetland complex located in the Cayetano Creek Area (see EACCS-modeled fairy shrimp habitat on Figure 3.I-2b). Focused surveys could not be performed in this area to verify the occurrence of habitat or determine species' presence due to lack of access to private property. Because this area is outside of the Proposed Project footprint, no direct impacts to VPFS are anticipated in the Cayetano Creek Area; LHFS is not expected to occur at this location. There are no other locations within the Proposed Project footprint that contain seasonal wetlands that could support VPFS or LHFS.

Therefore, it is anticipated that Proposed Project would result in direct impacts to approximately 0.025 acre of potentially occupied VPFS and possibly LHFS habitat just north of Croak Road. These construction-related impacts would be potentially significant. However, these impacts would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-2**, which requires focused surveys for vernal pool invertebrates, provides avoidance measures for known and potential vernal pool invertebrate habitat, and requires compensation for impacts to occupied habitat, as well as **Mitigation Measure BIO-3.C,** which would provide general protection measures for special-status species. **(LSM)**

DMU Alternative. The DMU Alternative would have a similar footprint to the Proposed Project, with the addition of improvements in the Dublin/Pleasanton Station Area and a different footprint for the storage and maintenance facility in the Cayetano Creek Area. Potential habitat for VPFS and LHFS does not occur in the Dublin/Pleasanton Station Area, and thus, the DMU Alternative would have similar impacts as the Proposed Project in the I-580 Corridor Area, north of Croak Road, totaling approximately 0.025 acre (see SW-6 on Figure 3.I-2a). In addition, habitat for VPFS may occur within a modeled seasonal wetland complex located north of Cayetano Creek in the Cayetano Creek Area (see EACCS-modeled fairy shrimp habitat on Figure 3.I-2b). These construction-related impacts would be potentially significant. However, as described above for the Proposed Project, these impacts would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-2**, which requires focused surveys for vernal pool invertebrates, provides avoidance measures for known and potential vernal pool invertebrate habitat, and requires compensation for impacts to occupied habitat, as well as **Mitigation Measure BIO-3.C,** which would provide general protection measures for special-status species. **(LSM)**

Express Bus/BRT Alternative. There is no potential habitat for VPFS or LHFS in the Express Bus/BRT Alternative footprint—in the Dublin/Pleasanton Station Area, along the portion of the I-580 Corridor Area within the footprint (Hacienda Drive to Tassajara Road/Santa Rita Road), or the Laughlin Road Area. Therefore, construction of the Express Bus/BRT Alternative would have no direct or indirect impact to VPFS or LHFS, and no mitigation measures are required. **(NI)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs. Areas where bus improvements would be constructed would be within urban/developed land that does not support VPFS or LHFS, or their habitat. In addition, the limited amount of construction anticipated for installation of bus-related infrastructure improvements, including bus bulb-outs, bus shelters, and signage, would result in a minor amount of ground disturbance within developed areas. Therefore, the Enhanced Bus Alternative would have no direct or indirect impacts to VPFS or LHFS, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project and DMU Alternative would have potentially significant impacts to the federally listed VPFS and LHFS. However, with implementation of **Mitigation Measure BIO-2,** which requires focused surveys to identify potential or occupied habitat in I-580 Corridor Area (north of Croak Road) and Cayetano Creek Area, provides vernal pool invertebrate habitat avoidance measures, and requires compensatory mitigation for habitat losses, as well as **Mitigation Measure BIO-3.C** (see **Impact BIO-3** below), which provides general protection measures for special-status species, potential impacts would be reduced to a less-than-significant level.

As described above, the Express Bus/BRT Alternative and Enhanced Bus Alternative would not have significant construction-related impacts to fairy shrimp species; therefore, no mitigation measures are required for these alternatives.

Mitigation Measure BIO-2: Consult with USFWS and Reduce Impacts on Vernal Pool Invertebrates and Their Habitat in the I-580 Corridor Area – north of Croak Road and Cayetano Creek Area (Conventional BART Project and DMU Alternative/EMU Option).

1. BART, in consultation with the USFWS, shall either (1) conduct a protocol-level survey for VPFS and LHFS, or (2) assume presence of VPFS and LHFS in areas of potential habitat. Surveys shall be conducted by qualified biologists in accordance with the most recent USFWS guidelines or protocols to determine the time of year and survey methodology (survey timing for these species is dependent on yearly rainfall patterns and seasonal occurrences, and is determined on a case-by-case basis). The surveys may be done as part of the 404 permit process, if a 404 permit is required.

2. If surveys reveal no occurrences of federally listed vernal pool invertebrates, no further mitigation would be required.

3. If surveys determine the occurrence of one or more special-status vernal pool invertebrate species, or if BART, in consultation with the USFWS, assumes presence of federally listed vernal pool invertebrates in all affected habitats, no net loss of

habitat shall be achieved through avoidance, preservation, creation and/or purchase of credits. The selected measures may be part of the permitting process.

4. Where feasible, all vernal pool invertebrate habitat shall be avoided. If habitat that can be avoided is identified within 250 feet of construction activities, a USFWS-approved biologist (monitor) shall inspect any construction-related activities to ensure that no unnecessary take of listed species or destruction of their habitat occurs. In addition, a qualified biologist shall delineate the boundary of the Cayetano Creek vernal pool complex modelled in the EACCS and shall be present during any construction activities that occur within 250 feet of the vernal pool complex (see Figure 3.I-2b; also shown in Figures D-5 and D-6 of EACCS' Appendix D).

5. BART shall ensure that an appropriate number of acres, as approved by USFWS during consultation, are created and preserved to mitigate for direct or indirect impacts on vernal pool invertebrate habitat. In accordance with compensatory guidance provided in the EACCS Biological Opinion, BART will provide compensatory mitigation for the permanent loss of occupied or presumed occupied listed invertebrate habitat at a 3-to-1 ratio or other ratio approved by the USFWS. Compensatory mitigation would be provided by one or a combination of the following mechanisms:
   a. Establishment of a conservation easement on lands owned or acquired by BART (preferably on lands within the Cayetano Creek watershed, if available) where seasonal pools can be created and protected to compensate for habitat losses. At a 3-to-1 ratio, compensatory mitigation needs would be approximately 0.075 acre of created pool habitat. Lands would be set aside and managed through a permanent conservation easement to be owned and managed by BART or a third-party easement holder. The perpetual management and monitoring of the conservation lands shall be funded by an endowment fund that is tied to the easement manager and the conservation easement.
   b. Participation in a USFWS-approved vernal pool invertebrate mitigation bank program such as the Mountain House Conservation Bank with purchase of appropriate vernal pool creation and preservation credits to mitigate for anticipated vernal pool habitat losses.

Impact BIO-3: Adversely affect California tiger salamander and California red-legged frog, either directly or through habitat modifications during construction.

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

Areas of potential direct impacts to CTS and CRLF upland habitat are shown in Table 3.I-9 for the Proposed Project and DMU Alternative footprints. There is no wetland or upland habitat within the Express Bus/BRT Alternative footprint and no such habitat would be affected by the Enhanced Bus Alternative, or the feeder bus improvements under the Proposed Project or other Build Alternatives, which would be located within the existing street ROWs. Potential impacts are described below.

TABLE 3.I-9 POTENTIAL DIRECT IMPACTS TO CTS AND CRLF HABITAT

	CTS Habitat (Acres)		CRLF Habitat (Acres)	
Potential Habitat by Geographic Subarea	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Conventional BART Project**	**DMU Alternative (with EMU Option)**
Potential Upland Habitat				
Dublin/Pleasanton Station Area	--	--	--	--
I-580 Corridor Area	11.39	11.43	19.72	19.76
Isabel North Area	--	--	0.024	0.024
Isabel South Area	--	--	0.183	0.183
Cayetano Creek Area	110.88	63.18	110.88	63.18
Total Upland Area	**122.27**	**74.61**	**130.79**	**83.12**
Potential Aquatic Habitat				
I-580 Corridor Area (SW-6)	0.025	0.025	--	--
Isabel South Area (Arroyo las Positas)	--	--	0.045	0.045
Cayetano Creek Area (Arroyo las Positas)	--	--	0.083	0.083
Cayetano Creek Area (Cayetano Creek, lower)	0.137	0.142	0.137	0.142
Cayetano Creek Area (Pond-1 at Hartman Road)	0.061	--	0.061	--
Total Aquatic Area	**0.223**	**0.167**	**0.326**	**0.270**

Note: -- = none or not applicable.
There is no wetland or upland habitat within the Express Bus/BRT Alternative footprint and no such habitat would be affected by the Enhanced Bus Alternative, or the feeder bus improvements under the Proposed Project or other Build Alternatives, which would be located within the existing street ROWs.
Source: ESA, 2013a,b,c,d; Arup, 2017.

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, and the LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect habitat of CTS and CRLF. 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 CTS and CRLF during construction. **(NI)**

Conventional BART Project. As shown in Table 3.I-9 and Figures 3.I-4a and 3.I-4b, the Proposed Project would result in the permanent loss of approximately 122.27 acres of potential upland aestivation and dispersal habitat for CTS and approximately 130.79 acres for CRLF. For both species, these areas principally occur in annual grasslands north of the I-580 Corridor Area near Croak Road and in the Cayetano Creek Area. In addition, habitat for CRLF occurs in the Isabel North Area and Isabel South Area.

Additionally, the Proposed Project would result in the loss of approximately 0.223 acre of aquatic breeding for CTS and approximately 0.326 acre for the CRLF. Aquatic breeding habitat for CTS is potentially located as follows: approximately 0.025 acre at SW-6 in the I-580 Corridor Area; and approximately 0.137 acre in Cayetano Creek and approximately 0.061 acre at Pond-1 in the Cayetano Creek Area. Aquatic habitat for the CRLF includes the following areas: non-breeding CRLF aquatic refugia habitat of approximately 0.045 acre in Arroyo las Positas at the Isabel South Area; and approximately 0.083 acre in Arroyo las Positas, approximately 0.137 acre at Cayetano Creek, and approximately 0.61 acre Pond-1 at the Cayetano Creek Area. An unknown number of CTS and CRLF could be subject to take during construction as a result of ground disturbance within upland habitat and aquatic habitat areas, resulting in a potentially significant impact to CTS and CRLF.

These impacts would be reduced to a less-than-significant level with the implementation of **Mitigation Measure BIO-3.A**, which includes a survey of potential habitat to determine presence of species and measures to avoid and minimize the direct take of individual CTS and CRLF, **Mitigation Measure BIO-3.B**, which provides for habitat compensation and enhancement consistent with USFWS guidance under the EACCS Biological Opinion, and **Mitigation Measure BIO-3.C**, which provides general protection measures for special-status species. (**LSM)**

DMU Alternative. Potential direct habitat impacts to CTS and CRLF are presented in Table 3.I-9 and areas of potential species habitat are shown in Figures 3.I-4a and 3.I-4b. The DMU Alternative would include many of the same areas within the Proposed Project footprint, with the addition of improvements in the Dublin/Pleasanton Station and a different footprint for the storage and maintenance facility in the Cayetano Creek Area. Within the Dublin/Pleasanton Station Area, construction of the DMU Alternative would affect portions of Line G-1-1, a concrete channel, Chabot Canal and Line G-2 (Hewlett Canal). The Dublin/Pleasanton Station Area does not provide upland or aquatic habitat for CRLF or CTS. Therefore, no impacts would occur to CTS or CRLF in this area.

The DMU Alternative would result in the permanent loss of approximately 74.61 acres of potential upland aestivation and dispersal habitat for CTS and approximately 83.12 acres for CRLF. Habitat for both species principally occurs in annual grasslands north of the I-580 Corridor Area near Croak Road and in the Cayetano Creek Area. In addition, habitat for CRLF occurs in the Isabel North Area and Isabel South Area. Additionally, the DMU Alternative would result in the loss of approximately 0.167 acre of aquatic breeding for CTS and approximately 0.270 acre for the CRLF. Aquatic breeding habitat would be similar to the Proposed Project, with the exception that areas affected within the Cayetano Creek Area would differ in some areas due to the different footprint for the DMU Alternative, as shown in Table 3.1-9.

Within disturbance areas, an unknown number of CTS and CRLF could be subject to take during construction as a result of ground disturbance within upland habitat and aquatic habitat areas, resulting in a potentially significant impact to CTS and CRLF. However, as described above for the Proposed Project, these impacts would be reduced to a less-than-significant level with the implementation of **Mitigation Measure BIO-3.A**, which includes a survey of potential habitat to determine presence of species and measures to avoid and minimize the direct take of individual CTS and CRLF, **Mitigation Measure BIO-3.B**, which provides for habitat compensation and enhancement consistent with USFWS guidance under the EACCS Biological Opinion, and **Mitigation Measure BIO-3.C**, which provides general protection measures for special-status species. (**LSM)**

Express Bus/BRT Alternative. Construction of the Express Bus/BRT Alternative would affect portions of Line G-1-1, an unnamed concrete channel, Chabot Canal, and Line G-2 within the Dublin/Pleasanton Station Area (see Figure 3.I-2a). However, the Dublin/Pleasanton Station Area does not provide upland or aquatic habitat for CRLF or CTS, nor does the portion of the I-580 Corridor Area within the footprint of the Express Bus/BRT Alternative. Therefore, no impacts would occur to CTS or CRLF at these locations. Construction of the remote parking lot at the Laughlin Road Area would occur within developed and disturbed areas that do not provide habitat for CTS or CRLF. However, while the Laughlin Road Area does not provide upland or aquatic habitat for CTS or CRLF, based on the proximity of this area to potential CTS breeding sites and CRLF habitat in

Altamont Creek, CTS or CRLF may seasonally enter the site and could be subject to mortality during construction. Therefore, impacts to CTS and CRLF habitat would be potentially significant under the Express Bus/BRT Alternative.

These impacts would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-3.A**, which provides a survey of potential habitat to determine presence of species and protection measures for CTS and CRLF during construction; **Mitigation Measure BIO-3.B**, which provides compensatory habitat to mitigate for the loss and disturbance of CTS and CRLF habitat; and **Mitigation Measure BIO-3.C,** which would provide general protection measures for special-status species. **(LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs. Areas where bus improvements would be constructed are within urban/developed land that does not support CTS or CRLF, or their habitat. In addition, the limited amount of construction anticipated for installation of the infrastructure improvements would result in a minor amount of ground disturbance, which would occur within developed areas. Therefore, the Enhanced Bus Alternative would have no construction-related impacts to CTS and CRLF, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant impacts to CTS and CRLF habitats. However, with implementation of **Mitigation Measure BIO-3.A**, which includes a survey of potential habitat to determine presence of species and measures to avoid and minimize the direct take of individual CTS and CRLF; **Mitigation Measure BIO-3.B**, which provides for habitat compensation and enhancement consistent with USFWS guidance under the EACCS Biological Opinion; and **Mitigation Measure BIO-3.C,** which would provide general protection measures for special-status species, potential impacts would be reduced to a less-than-significant level. In addition, BART will obtain take authorization from the USFWS and CDFW to address the anticipated take of CTS and authorization from the USFWS for take of CRLF, which may result in additional protective measures beyond those described herein.

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

Mitigation Measure BIO-3.A: Consult with USFWS, Survey Potential Habitat, and Reduce Impacts on Special-status Amphibians during Construction (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

The following actions shall be implemented prior to and during construction:

1. BART shall assign a Designated Biologist approved by the USFWS and CDFW to monitor construction activities within potential CTS and CRLF habitat. General minimum qualifications are a 4-year degree in biological sciences or other appropriate training and/or direct experience in surveying, identifying, and handling CTS and CRLF. Resumes for USFWS-approved Designated Biologists shall be provided to the USFWS no later than 30 days prior to construction for approval.
2. A detailed amphibian relocation plan shall be prepared at least 3 weeks before the start of groundbreaking, and submitted to USFWS for review. The purpose of the plan is to standardize amphibian relocation methods and relocation sites.
3. The Designated Biologist shall survey the work sites that provide potential CTS or CRLF habitat, as identified in Figures 3.I-4a and 3.I-4b, within 2 weeks prior to construction. If these species are not identified, construction can proceed at these sites. If CTS or CRLF (or their tadpoles or eggs) are found, the biologist shall contact USFWS to coordinate animal relocation consistent with agency requirements. The USFWS-approved Designated Biologist shall be allowed sufficient time to move frogs and/or salamanders from work sites before work begins. The biologist shall use professional judgment to determine whether (and if so, when) the CTS and/or CRLF are to be moved.
4. BART and its contractors shall install amphibian-exclusion fencing (e.g., silt fence or ERTEC brand fence) around the entire construction zone for construction activity in the Cayetano Creek and Croak Road areas.
5. Areas that provide potential habitat will be monitored during construction to identify, capture, and relocate sensitive amphibians, if present.
6. A Designated Biologist shall be present at the active work sites until CTS and CRLF have been removed, and habitat disturbance has been completed. Thereafter, the Designated Biologist shall perform regular spot checks to ensure compliance with permits; or if allowed by permits, the contractor or BART shall designate a person to monitor on-site compliance with all minimization measures. A Designated Biologist shall ensure that this individual receives training consistent with USFWS and/or CDFW requirements.

Mitigation Measure BIO-3.B: Provide Compensatory Habitat to Mitigate for the Loss and Disturbance of CTS and CRLF Habitat (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

BART shall provide USFWS- and CDFW-approved off-site compensatory habitat mitigation consistent with USFWS and/or CDFW permit requirements to compensate for impacts to upland and aquatic habitat that is occupied by CTS and CRLF, or presumed occupied by resource agencies. The EACCS Biological Opinion, which sets the standard for Livermore Valley habitat compensation requirements, determines the amount of required mitigation lands based on the relative habitat values of impacted lands and mitigation lands. The amount of mitigation land will be determined by the USFWS and CDFW using standards and procedures defined in the EACCS, which calculates a ratio based on habitat quality and the location of the impact site, and the relative quality and location of mitigation lands. Based on the relatively high habitat values for CTS and CRLF in the footprint and the use of local, high-value mitigation lands it is estimated that the adopted project will require compensatory mitigation for upland habitats at a ratio between 2.5-to-1 and 3-to-1 for areas that are permanently impacted, and between 1:1 and 1.5-to-1 ratio for areas that are temporarily disturbed.[74] The final replacement ratios and related amount of mitigation land determined by the USFWS and CDFW during the FESA and CESA permitting processes shall be based on the assessed functions and values of agency-approved mitigation lands such as the Ohlone West Conservation Bank in southern Alameda County, or a comparable bank.

Mitigation Measure BIO-3.C: General Measures for Biological Resources Protection during Construction (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

The following measures shall be implemented at all construction sites to avoid and minimize direct and indirect impacts to special-status species and their habitat:

1. A qualified biologist shall conduct a training session for all construction personnel working within sensitive species habitat. At a minimum, the training shall include a description of special-status species and their habitat, federal and/or State penalties for harming sensitive species or their habitat, general measures that are being implemented to conserve these species as they relate to the adopted project, and the boundaries within which construction shall occur, when work occurs near sensitive habitats.

[74] For permitting purposes, the CFDW and USFWS often define “temporary” impacts as those that are minimally impacting and have a duration of 3 months or shorter.

2. During work activities, all trash that may attract predators shall be properly contained, removed from the work site, and disposed of regularly. The contractor shall remove all trash and construction debris from work areas on a daily basis.
3. All fueling and maintenance of vehicles and other equipment and staging areas shall occur at least 65 feet from any riparian habitat or water body.
4. To minimize the possibility of inadvertent special-status species mortality, construction vehicles shall observe a maximum 20-miles-per-hour speed limit within the construction site and on private roads.
5. To prevent accidental entrapment of special-status wildlife species during construction, all excavated holes or trenches greater than 2 feet deep shall be covered at the end of each work day by suitable materials, or escape routes shall be installed (such as earthen materials or wooden planks). Before filling holes or trenches, they shall be thoroughly inspected for trapped animals. Exclusion fencing shall be used around the entire construction zone for construction activity in the Cayetano Creek and Croak Road areas.
6. All food-related trash items (such as wrappers, cans, bottles, and food scraps) shall be disposed of in closed containers and removed daily from the construction site.
7. To prevent harassment and mortality of special-status wildlife or destruction of their dens, no pets shall be allowed in the construction area.

Impact BIO-4: Adversely affect western spadefoot, either directly or through habitat modifications during construction.

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

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, and the LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect habitat of western spadefoot. 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 western spadefoot during construction. **(NI)**

Conventional BART Project. Although the Proposed Project may remove potential non-breeding upland dispersal habitat for the western spadefoot, the Proposed Project would not impact potential aquatic breeding habitat, which occurs outside the Proposed Project footprint. The footprint in the Cayetano Creek Area would be located outside of the vernal pool complex in the Cayetano Creek watershed that could support western spadefoot breeding (see EACCS-modeled fairy shrimp habitat on Figure 3.I-2b). Due to lack of access to private property, this complex has not been surveyed for western spadefoot presence. The Proposed Project is located approximately 5 miles from the nearest CNDDB-reported western spadefoot observation; hence, the likelihood of species presence is considered low. However, because of the presence of potential aquatic breeding habitat in seasonal wetlands in the Cayetano Creek watershed, there is the potential that adult or juvenile western spadefoot may be encountered during construction and subject to mortality.[75]

Therefore, impacts to western spadefoot could be potentially significant in the Cayetano Creek Area due to construction-related direct mortality of individuals, if present. These potential impacts would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-3.A**, which requires wildlife exclusion fencing to protect CTS and CRLF and would also provide protection for the western spadefoot, **Mitigation Measure BIO-3.C,** which provides general protection measures for special-status species, and **Mitigation Measure BIO-4**, which provides preconstruction surveys to identify this species in the footprint and relocation of species if encountered. **(LSM)**

DMU Alternative. The DMU Alternative would generally have a similar footprint to the Proposed Project, with the addition of improvements in the Dublin/Pleasanton Station Area and a different footprint for the storage and maintenance facility in the Cayetano Creek Area. Potential habitat for western spadefoot does not occur in the Dublin/Pleasanton Station Area, and thus, the DMU Alternative would have similar impacts as the Proposed Project. These construction-related impacts would be potentially significant. However, as described above for the Proposed Project, these potential impacts would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-3.A**, which requires wildlife exclusion fencing to protect CTS and CRLF and would also provide protection for the western spadefoot, **Mitigation Measure BIO-3.C,** which provides general protection measures for special-status species, and **Mitigation**

[75] California Department of Fish and Wildlife (CDFW), 2016. Rarefind 5. Biogeographic Data Branch, California Natural Diversity Database, August 4.

Measure BIO-4, which provides preconstruction surveys to identify this species in the footprint and relocation of species if encountered. **(LSM)**

Express Bus/BRT Alternative. Habitat for western spadefoot does not occur within the Express Bus/BRT Alternative footprint. Therefore, construction of the Express Bus/BRT Alternative would have no direct or indirect construction-related impacts to western spadefoot, and no mitigation measures are required. **(NI)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs. Areas where bus improvements would be constructed would be within urban/developed land that does not support western spadefoot. Therefore, the Enhanced Bus Alternative would have no construction-related impacts to western spadefoot, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project and DMU Alternative would have potentially significant impacts on western spadefoot. However, with implementation **Mitigation Measure BIO-3.A** above, which requires wildlife exclusion fencing to protect CTS and CRLF and would also provide protection for the western spadefoot, **Mitigation Measure BIO-3.C** above, which provides general protection measures for special-status species, and **Mitigation Measure BIO-4**, which provides preconstruction surveys to identify this species in the footprint and relocation of species if encountered, potential impacts to individuals would be reduced to a less-than-significant level.

As described above, the Express Bus/BRT Alternative and Enhanced Bus Alternative would not have significant construction-related impacts on this species; therefore, no mitigation measures are required for these alternatives.

Mitigation Measure BIO-4: Preconstruction Survey and Avoidance Measures for the Western Spadefoot (Conventional BART Project and DMU Alternative/EMU Option).

Within 24 hours of the start of construction activities within approximately 0.25 mile of upland areas with potential western spadefoot habitat (i.e., the vernal pool complex at Cayetano Creek (see EACCS-modeled fairy shrimp habitat on Figure 3.I-2b), a qualified biologist shall survey upland areas to determine the presence of the western spadefoot. The qualified biologist shall be responsible for the survey and for the relocation of western spadefoot consistent with CFDW requirements. Spadefoot surveys can be performed concurrently with other special-status wildlife surveys.

Impact BIO-5: Adversely affect western pond turtle, either directly or through habitat modifications during construction.

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

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, and the LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect habitat of WPT. 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 WPT during construction. **(NI)**

Conventional BART Project. WPT have the potential to regularly or seasonally occur in all drainages and canals located within the footprint of the Proposed Project, and within some adjoining upland areas. High-quality habitat for this species was identified in Arroyo las Positas and Tassajara Creek. This species is additionally expected to seasonally use portions of Cayetano Creek, Cottonwood Creek, and other drainages that traverse the Proposed Project footprint along the I-580 corridor. Upland areas where this species may be encountered include grasslands north of Croak Road and in the Cayetano Creek Area.

Temporary impacts to WPT would occur during construction activities in or around habitat supporting WPT. Individual mortality could result from heavy equipment or other construction activities within or adjacent to WPT habitat. Therefore, impacts to WPT would be potentially significant. This impact would be reduced to a less-than-significant level through the implementation **Mitigation Measure BIO-3.C**, which provides general protection measures that would protect WPT, and **Mitigation Measure BIO-5**, which would require focused surveys for WPT and measures to avoid and minimize impacts to individual turtles. **(LSM)**

DMU Alternative. The DMU Alternative would generally have a similar footprint to the Proposed Project, with additional impacts to Line G-1-1, concrete channel, Chabot Canal, and Line G-2. Therefore, construction of the DMU Alternative could occur in areas with

WPT and would result in potentially significant impacts to this species. This impact would be reduced to a less-than-significant level through the implementation **Mitigation Measure BIO-3.C**, which provides general protection measures that would protect WPT, and **Mitigation Measure BIO-5**, which would require focused surveys for WPT and measures to avoid and minimize impacts to individual turtles. **(LSM)**

Express Bus/BRT Alternative. During habitat assessment surveys, potential habitat for WPT was identified in Line G-2 within the Express Bus/BRT Alternative footprint in the Dublin/Pleasanton Station Area. Line G-2 does not provide perennial habitat that would support turtles on a continued basis, but turtles that occur intermittently in this drainage could be subject to mortality during construction. WPT habitat is not present within the Laughlin Road Area. Due to the potential for WPT to intermittently occur in Line G-2, impacts to WPT would be potentially significant. This impact would be reduced to a less-than-significant level through the implementation **Mitigation Measure BIO-3.C**, which provides general protection measures that would protect WPT, and **Mitigation Measure BIO-5**, which would require focused surveys for WPT and measures to avoid and minimize impacts to individual turtles. **(LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs. Areas where bus improvements would be constructed would be within urban/developed land that does not support WPT. In addition, the limited amount of construction anticipated for installation of bus-related infrastructure improvements, including bus bulb-outs, bus shelters, and signage, would result in a minor amount of ground disturbance, which would all be within developed areas. Therefore, the Enhanced Bus Alternative would have no construction-related impacts to WPT, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant impacts on WPT habitat. However, with implementation of **Mitigation Measure BIO-3.C** above, which provides general protection measures that would protect WPT, and **Mitigation Measure BIO-5**, which would require focused surveys for WPT and measures to avoid and minimize impacts to individual turtles, potential impacts would be reduced to a less-than-significant level.

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

Mitigation Measure BIO-5: Preconstruction Surveys and Relocation of Western Pond Turtle (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

Within 24 hours of commencement of construction activities in undeveloped areas within 0.25 mile of streams and drainages (i.e., within potential WPT habitat), a qualified biologist shall survey upland areas, creeks and other ponded areas to determine species' presence. Upland areas shall be examined for evidence of nests as well as individual turtles. The qualified biologist shall be responsible for the survey and for the relocation of WPT consistent with CFDW requirements. Construction shall not proceed until all WPT observed in the construction area have been captured and relocated. If a WPT nest is observed, with approval from the CDFW, the biologist shall move eggs to a suitable location or facility for incubation (e.g., the Sonoma State University Biology Department) and release hatchlings into the same creek system the following autumn. This mitigation measure does not apply at any construction activity at the Laughlin remote parking site.

Impact BIO-6: Adversely affect western burrowing owl, either directly or through habitat modifications during construction.

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

Areas of potential direct impacts to BUOW upland habitat are shown in Table 3.I-10 for the Proposed Project and Build Alternatives. Potential impacts are described 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, Altamont Corridor Express, and the LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect habitat of western BUOW. 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 western BUOW during construction. **(NI)**

TABLE 3.I-10 POTENTIAL DIRECT IMPACTS TO BUOW UPLAND HABITAT

Potential Habitat by Geographic Subarea	Conventional BART Project	DMU Alternative (with EMU Option)	Express Bus/BRT Alternative	Enhanced Bus Alternative
Dublin/Pleasanton Station Area	6.18[a]	9.71	6.96	--
I-580 Corridor Area	29.50	29.64	--	--
Isabel North Area	15.70	15.70	--	--
Isabel South Area	--	--	--	--
Cayetano Creek Area	109.78	62.89	--	--
Laughlin Road Area	--	--	--	--
Total Area	161.98	117.94	6.96	0

Notes: -- = none or not applicable.
[a] At the Dublin/Pleasanton Station Area, the area within the within the Proposed Project footprint consists of the Arnold Road Staging Area only. The Enhanced Bus Alternative, as well as the bus improvements under the Proposed Project or other Build Alternatives, would be located within the existing street ROWs and would not affect BUOW upland habitat.
Source: ESA, 2013a,b,c,d; Arup, 2017.

Conventional BART Project. Annual grasslands in the Proposed Project footprint provide potential BUOW breeding and foraging habitat. Grasslands within the footprint provide varying degrees of habitat quality for this species. Potential habitat for BUOW occurs within each of the geographic subareas within the Proposed Project footprint. Potential habitat includes the annual grassland areas identified in Figure 3.I-4a and Figure 3.I-4b, and lands adjacent to the Arnold Road Staging Area and north of Arroyo las Positas, just beyond the Isabel South Area, where BUOW, if present, could be subject to indirect project impacts such as harassment or increased stress on owls, reduced reproduction, or increased predation. These areas and surrounding annual grasslands, ruderal (disturbed) areas, and agricultural lands provide potential breeding and foraging habitat for BUOW.

The habitat assessment survey completed for the Proposed Project identified potential habitat for BUOW within the Arnold Road Staging Area. While this area is not known to support BUOW, the presence of California ground squirrel burrows in annual grasslands and ruderal areas on the western portion of the staging area presents the potential for BUOW habitation. Inspection of the approximately 10 ground squirrel burrows identified on site did not yield evidence of BUOW presence, such as pellets, prey remains, white wash, feathers, or nest ornamentation.[76] The Camp Parks Reserve Forces Training Area

[76] City of Dublin, 2001. Dublin Transit Center Draft Environmental Impact Report. July.

located about 2 miles away is known to support a robust population of BUOW, and another recorded observation detected owls within 1 mile of the study area.[77]

No records from the CNDDB or other sources identify BUOW colonies or aggregations in or adjacent to the Proposed Project footprint, and BUOW has not been recently documented within the footprint. However, focused BUOW surveys have not been conducted to verify the local distribution of this species. If present, BUOW could be exposed to direct impacts such as mortality and habitat loss and indirect impacts such as harassment or increased stress on owls, reduced reproduction, increased predation, and risks posed by the need to find and compete for available burrows.

The Proposed Project would result in the direct loss of up to approximately 161.98 acres of grassland habitat that could support BUOW nesting or foraging habitat, as shown in Table 3.I-10. As shown in Figures 3.I-4a and 3.I-4b, much of the potential BUOW habitat is located on the northern edge of I-580 in annual grasslands; however, these areas are unlikely to support the species because they are subject to dry land farming, or are undergoing development. It is anticipated that Cayetano Creek Area has the highest quality habitat for BUOW, and thus, BUOW is assumed to be potentially present. This area has potential to support BUOW because it supports grasslands and is assumed to have California ground squirrel burrows.

If present, BUOW in grasslands and ruderal habitat could be exposed to direct and indirect project impacts. Direct impacts to BUOW related to construction and earthmoving activities could affect BUOW through direct mortality of adults or nestlings if nest burrows are present in areas where the soil is disturbed. Construction of the Proposed Project would indirectly affect BUOW through the loss of habitat (foraging, roosting, and wintering habitat) and/or by disrupting adult reproductive behavior if owl pairs are nesting within 500 feet of construction during the nesting season (March to June). Therefore, impacts to BUOW would be potentially significant.

This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-3.C**, which provides general protection measures that would apply to protect BUOW, **Mitigation Measure BIO-6.A**, which provides for a survey of potential habitat areas and measures to avoid and minimize the take of BUOW during construction, and **Mitigation Measure BIO-6.B**, which provides for habitat compensation and enhancement consistent with CDFW guidance under the EACCS. (**LSM)**

[77] California Department of Fish and Wildlife (CDFW), 2016. Rarefind 5. Biogeographic Data Branch, California Natural Diversity Database, August 4.

DMU Alternative. The DMU Alternative would generally have a similar footprint to the Proposed Project, and would also include the Dublin/Pleasanton Station Area, which provides habitat for the species. In total, the DMU Alternative would affect up to approximately 117.94 acres of potential BUOW habitat (see Table 3.I-10). Therefore, construction of the DMU Alternative would result in potentially significant impacts to BUOW. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-3.C**, which provides general protection measures that would apply to protect BUOW, **Mitigation Measure BIO-6.A**, which provides for a survey of potential habitat areas and measures to avoid and minimize the take of BUOW during construction, and **Mitigation Measure BIO-6.B**, which provides for habitat compensation and enhancement consistent with CDFW guidance under the EACCS. (**LSM)**

Express Bus/BRT Alternative. Potential habitat for BUOW is located in the Dublin/Pleasanton Station Area and Laughlin Road Area, but not within the portion of the I-580 Corridor Area in the footprint (Hacienda Drive to Tassajara Road/Santa Rita Road). In total, the Express Bus/BRT Alternative would affect up to approximately 6.96 acres of potential BUOW habitat (see Table 3.I-10). If BUOW are present on site at the time of construction, the Express Bus/BRT Alternative could have a significant impact on the BUOW. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-3.C**, which provides general protection measures that would apply to protect BUOW, **Mitigation Measure BIO-6.A**, which provides for a survey of potential habitat areas and measures to avoid and minimize the take of BUOW during construction, and **Mitigation Measure BIO-6.B**, which provides for habitat compensation and enhancement consistent with CDFW guidance under the EACCS. (**LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs in urban/developed land that does not support BUOW or their habitat. Therefore, the Enhanced Bus Alternative would have no construction-related impacts to BUOW, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant impacts on BUOW habitat. However, with implementation of **Mitigation Measure BIO-3.C** above, which provides general protection measures that would apply to protect BUOW, **Mitigation Measure BIO-6.A**, which provides for a survey of potential habitat areas and measures to avoid and minimize the take of BUOW during construction, and **Mitigation Measure BIO-6.B**, which provides for habitat compensation and enhancement consistent with CDFW guidance under the EACCS, potential impacts would be reduced to a less-than-significant level.

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

Mitigation Measure BIO-6.A: Preconstruction Surveys for Burrowing Owl (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

BART shall implement the measures identified below within suitable BUOW habitats identified in Figures 3.I-4a and 3.I-4b, to reduce potential impacts and avoid and minimize the direct and indirect impacts to BUOW. In advance of construction and consistent with the 2012 CDFW Staff Report on Burrowing Owl Mitigation, BART shall complete BUOW Take Avoidance Surveys within the adopted project footprint and adjacent accessible areas within 500 feet of the footprint using CDFW's 2012 survey methodology.[78] Under this protocol, at least four survey visits shall be performed by a qualified biologist within 14 days of ground disturbance following CDFW's 2012 Staff Report guidance for take avoidance surveys. The final survey shall be conducted within 24 hours prior to ground disturbance to verify that owls are absent and would not be directly impacted.

Additional surveys may be required when the initial disturbance is followed by extended periods of inactivity. Up to four or more survey visits performed on separate days may be required to assure with a high degree of certainty that site modification and grading will not take owls. The full extent of the preconstruction survey effort shall be described and mapped in detail (e.g., dates, time periods, area[s] covered, and methods employed) in a biological report that will be provided for review to the CDFW.

In addition to the above survey requirements, the following measures shall be implemented to reduce impacts to BUOW:

1. Exclusion areas and fencing. Construction exclusion areas (e.g., orange exclusion fence or signage) shall be established around occupied BUOW burrows, where no disturbance shall be allowed. During the nonbreeding season (September 1 through January 31), the exclusion zone shall extend at least 160 feet around occupied burrows. During the breeding season (February 1 through August 31), exclusion areas shall extend 250 feet around occupied burrows (or farther if warranted to avoid nest abandonment).

[78] California Department of Fish and Game (CDFG), 2012. Staff Report on Burrowing Owl Mitigation, State of California, Natural Resources Agency, Department of Fish and Game. March 7.

2. If BUOW are detected during surveys, a Burrowing Owl Exclusion Plan shall be prepared consistent with CDFW guidance to confirm the methodology used to identify and close active and potential BUOW burrows within the work area.[79] Upon completion, the Burrowing Owl Exclusion Plan shall be submitted for review to the CDFW. The Burrowing Owl Exclusion Plan shall address the following components:
   a. Confirmation by site surveillance that the burrow(s) are empty of BUOWs and other species prior to use of a fiberoptic endoscope (scoping)
   b. The type of burrow scope and appropriate timing of scoping to avoid impacts
   c. Occupancy factors to look for and what will guide determination of vacancy and excavation timing (one-way doors should be left in place 48 hours to ensure BUOWs have left the burrow before excavation, visited twice daily and monitored for evidence that owls are inside and can't escape, i.e., look for sign immediately inside the door)
   d. How the burrow(s) will be excavated. Excavation using hand tools with refilling to prevent reoccupation is preferable whenever possible (may include using piping to stabilize the burrow to prevent collapsing until the entire burrow has been excavated and it can be determined that no owls reside inside the burrow)
   e. Removal of other potential owl burrow surrogates or refugia on site
   f. Photographing the excavation and closure of the burrow to demonstrate success and sufficiency
   g. Monitoring of the site to evaluate success and, if needed, to implement remedial measures to prevent subsequent owl use to avoid take
   h. How the impacted site will continually be made inhospitable to BUOWs and fossorial mammals (e.g., by allowing vegetation to grow tall, heavy disking, or immediate and continuous grading) until development is complete
3. Artificial burrow creation. If an occupied BUOW burrow is confirmed on the project footprint, one or more artificial burrow locations shall be appropriately located and installed to facilitate BUOW relocation, consistent with the 2012 CDFW Staff Report on Burrowing Owl Mitigation. The number of artificial burrows shall be proportionate to the number of occupied burrows that are directly impacted by the project. If owls are present, the Burrowing Owl Exclusion Plan shall discuss artificial burrow creation and shall include the following:
   a. A brief description of the project and preconstruction activities

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[79] Ibid.

b. The mitigation measures that will be implemented for BUOW
c. A description of potential conflicting site uses or encumbrances
d. A comparison of the occupied burrow site(s) and the artificial burrow site(s) (e.g., vegetation, habitat types, fossorial species use in the area, and other features)
e. Artificial burrow(s) proximity to the project activities, roads, and drainages
f. Artificial burrow(s) proximity to other burrows and entrance exposure
g. Photographs of the site of the occupied burrow(s) and the artificial burrows
h. A map of the project area that identifies the burrow(s) to be excluded as well as the proposed sites for the artificial burrows
i. A brief description of the artificial burrow design
j. Description of the monitoring that will take place during and after project implementation, including information that will be provided in a monitoring report
k. A description of the frequency and type of burrow maintenance, as applicable

Mitigation Measure BIO-6.B: Off-site Compensatory Habitat for Burrowing Owl (Conventional BART Project and DMU Alternative/EMU Option).

BART shall compensate for permanent losses to potential BUOW foraging habitat at a minimum 1-to-1 ratio. Mitigation may be provided concurrent with other mitigation commitments, such as requirement to protect upland habitat for CTS, CRLF, or SJKF, provided that potential foraging habitat is available for BUOW on mitigation lands.

Impact BIO-7: Adversely affect nesting raptors and other nesting birds, either directly or through habitat modifications during construction.

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

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, and the LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect habitat of nesting raptors and other nesting birds. 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 nesting raptors and other nesting birds during construction. **(NI)**

Conventional BART Project. Several common and special-status avian species may forage and/or nest within habitats that would be directly or indirectly impacted by the Proposed Project during construction. It is possible that riparian, grassland, and agricultural areas, among others, could support nesting by Cooper's hawk, sharp-shinned hawk, red-tailed hawk, red-shouldered hawk, white-tailed kite, northern harrier, and other raptors, as well as California horned lark, loggerhead shrike, and tricolored blackbird, among other special-status birds. Undeveloped grasslands north of the I-580 Corridor Area and in the Isabel North Area may also support nesting by the BUOW, as described in **Impact BIO-6** above. Grassland areas serve as potential foraging areas for golden eagle. Golden eagle nesting is not expected in grassland areas within the study area, as these areas are devoid of suitable nesting trees. The above-mentioned species are protected as California Species of Special Concern and/or under Fish and Game Code. Other native birds, including nests and eggs, are also protected during nesting by the Fish and Game Code.

Construction activities, including grading and removal of trees, shrubs, and other nesting habitat during the breeding season, could result in significant direct mortality of protected birds. Human disturbances and construction noise could cause nest abandonment, death of young, or loss of reproductive potential at active nests located near project activities. For these reasons, direct and indirect impacts to nesting raptors and other nesting birds would be potentially significant. However, with the implementation of **Mitigation Measure BIO-7**, which would require preconstruction nesting bird surveys during the breeding season and protective buffers around nests, impacts to raptors, special-status, and common bird species would be reduced to less than significant. **(LSM)**

DMU Alternative. The DMU Alternative would generally have a similar footprint to the Proposed Project, with the addition of improvements in the Dublin/Pleasanton Station Area, and thus would have a similar potential to result in significant impacts to nesting raptors and other nesting birds. However, implementation of **Mitigation Measure BIO-7**, which would require preconstruction nesting bird surveys during the breeding season and protective buffers around nests, impacts to raptors, special-status, and common bird species would be reduced to less than significant. **(LSM)**

Express Bus/BRT Alternative. The Express Bus/BRT Alternative's construction activities occur in areas near the Dublin/Pleasanton Station Area, along the portion of the I-580 Corridor Area, and Laughlin Road Area. The Laughlin Road Area could support nesting raptors or other protected avian species. During the avian nesting season, common but protected birds such as mourning dove, house finch, and American robin, among others, may nest in or near the study area. The Laughlin Road Area additionally supports numerous trees that could support nesting raptors such as Cooper's hawk, sharp-shinned hawk, red-tailed hawk, and red-shouldered hawk, among others.

If nesting birds are present at the time of construction, construction activities associated with the Express Bus/BRT Alternative could result in direct mortality of nesting birds. Indirect impacts from construction noise, vibrations, and increased human presence could disturb adult birds, causing nest abandonment, death of young, or loss of reproductive potential at active nests near the footprint of the Express Bus/BRT Alternative. Therefore, construction of the Express Bus/BRT Alternative could result in potentially significant direct or indirect impacts to nesting birds. However, implementation of **Mitigation Measure BIO-7**, which would require preconstruction nesting bird surveys during the breeding season and protective buffers around nests, impacts to raptors, special-status, and common bird species would be reduced to less than significant. **(LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs. Although these areas are developed, street trees provide habitat for common nesting birds. During the avian nesting season, common but protected birds such as mourning dove, house finch, and American robin, among others, may nest on buildings, within signage, or in trees in the urbanized construction area. The Enhanced Bus Alternative could inadvertently take raptors or other protected bird species. Therefore, impacts to nesting birds would be potentially significant. However, implementation of **Mitigation Measure BIO-7**, which would require preconstruction nesting bird surveys during the breeding season and protective buffers around nests, impacts to raptors, special-status, and common bird species would be reduced to less than significant. **(LSM)**

Mitigation Measures. As described above, the Proposed Project and Build Alternatives would have potentially significant impacts on nesting raptors and other nesting birds. However with implementation of **Mitigation Measure BIO-7**, which would require preconstruction nesting bird surveys during the breeding season and protective buffers around nests, potential impacts would be reduced to a less-than-significant level.

Mitigation Measure BIO-7: Identify and Avoid Active Nesting Birds during Nesting Season (Conventional BART Project, DMU Alternative/EMU Option, Express Bus/BRT Alternative, and Enhanced Bus Alternative).

If construction activities are scheduled to occur during the avian breeding season (February 1 through August 31), BART or its contractor shall implement the following measures to avoid potential adverse effects to nesting raptors and other common and special-status nesting birds.

1. No more than two weeks prior to construction, a qualified biologist shall perform preconstruction surveys for nesting birds within 500 feet of construction areas, where access is available. If preconstruction surveys indicate that nests are inactive or potential habitat is unoccupied during the construction period, no further mitigation is required.

2. If active nests are detected during preconstruction surveys, BART shall create a no-disturbance buffer around active raptor nests and nests of other special-status birds during the breeding season, or until it is determined that young birds have fledged. Buffers shall be at least 250 feet for raptors and at least 150 feet for other nesting birds. Nests initiated within the active construction area may have reduced buffer sizes due to the increased tolerance of disturbance. Reductions to nest buffer distances may be allowed on a case-by-case basis in coordination with the CDFW based on site-specific factors such as the existing disturbance levels, the species of nesting bird, and the magnitude of the proposed disturbance.

Impact BIO-8: Adversely affect special-status bats, either directly or through habitat modifications during construction.

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

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, and the LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect habitat of special-status bats. 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 special-status bats during construction. **(NI)**

Conventional BART Project. It is possible that breeding and nonbreeding bats could roost in the large eucalyptus trees on the Isabel South Area, and in trees and structures in other areas. Crevices in highway bridge structures beneath I-580 could provide roosting habitat for pallid bat. Based on their known range and available habitat in the project corridor, the pallid bat is the only special-status bat species that could be impacted by the Proposed Project. Construction activities that cause the displacement of a pallid bat maternity roost, or bat eviction from roosts during winter months could result in mortality of individual bats. Indirect impacts from construction noise and vibrations could disturb pallid bats, causing roost abandonment, death of young, or loss of reproductive potential at roosts near the footprint of the Proposed Project. Therefore, impacts to the pallid bat would be potentially significant. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-3.C,** which provides general protection measures that would apply to these species, and **Mitigation Measure BIO-8,** which would require preconstruction surveys and avoidance measures for the bat. **(LSM)**

DMU Alternative. The DMU Alternative would generally have a similar footprint to the Proposed Project, with the addition of improvements in the Dublin/Pleasanton Station Area and some differences in the Cayetano Creek Area. Thus, this alternative would result in the same potentially significant impacts to the pallid bat as described for the Proposed Project. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-3.C,** which provides general protection measures that would apply to these species, and **Mitigation Measure BIO-8,** which would entail preconstruction surveys and avoidance measures for the bat. **(LSM)**

Express Bus/BRT Alternative. Construction activities associated with the Express Bus/BRT Alternative would occur in areas that could support pallid bat. If roosting pallid bats are present at the time of construction, construction activities associated with the Express Bus/BRT Alternative could result in direct mortality of individual bats evicted from active roosts. Indirect impacts from construction noise and vibrations could disturb pallid bats, causing roost abandonment, death of young, or loss of reproductive potential at roosts near the footprint of the Express Bus/BRT Alternative. Therefore, construction of the Express Bus/BRT Alternative could result in potentially significant direct or indirect impacts to pallid bat. This impact would be reduced to a less-than-significant level with the implementation of **Mitigation Measure BIO-3.C,** which provides general protection measures that would apply to these species, and **Mitigation Measure BIO-8,** which would entail preconstruction surveys and avoidance measures for the bat. **(LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs. Areas where bus improvements would be constructed would be within urban/developed land that does not support the pallid bat or their habitat. Therefore, the Enhanced Bus Alternative would have no construction-related impacts to these species, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant impacts on pallid bat habitat. However, with implementation of **Mitigation Measure BIO-3.C** above**,** which provides general protection measures that would apply to these species, and **Mitigation Measure BIO-8**, which requires preconstruction surveys and avoidance measures if bat species are present, potential impacts would be reduced to a less-than-significant level.

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

Mitigation Measure BIO-8: Preconstruction Surveys and Avoidance Measures for Pallid Bat (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

1. Prior to construction activities (i.e., ground clearing and grading, including tree removal) within 200 feet of bat habitat, a qualified biologist shall survey for special-status bats. If no evidence of bats (e.g., direct observation, guano, staining, or strong odors) is observed, no further mitigation shall be required.
2. If evidence of bats is observed, BART and its contractors shall implement the following measures to avoid potential impacts on breeding populations:
    a. A no-disturbance buffer of 200 feet shall be created around active bat roosts during the breeding season (April 15 through August 15). Bat roosts initiated during construction are presumed to be unaffected by the indirect effects of noise and construction disturbances. However, the direct take of individuals is prohibited.
    b. Construction activities near features showing evidence of active bat activity shall occur during the period least likely to affect bats, as determined by a qualified bat biologist (generally between February 15 and October 15 for winter hibernacula, and between August 15 and April 15 for maternity roosts). If the exclusion of bats from potential roost sites is necessary to prevent indirect impacts due to construction noise and human activity adjacent, bat exclusion activities (e.g., installation of netting to block roost entrances) shall also be conducted during these periods. BART shall coordinate any relocation or bat exclusion efforts in advance with the CDFW.

Impact BIO-9: Adversely affect American badger, either directly or through habitat modifications during construction.

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

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, and the LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect habitat of American badger. 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 American badger during construction. **(NI)**

Conventional BART Project. American badgers are a non-listed species that occur sporadically in the region. While they are not documented in the study area, undeveloped grasslands are generally suitable habitat for this species. Potential habitat is available in and near grasslands north of the I-580 Corridor Area and within the Cayetano Creek Area. If present, American badgers could be directly affected during construction, resulting in mortalities. Furthermore, construction disturbances, including noise and dust and the movement of equipment and personnel could reduce local habitat quality for badgers in grasslands located adjacent to work areas. Therefore, impacts to the American badger would be potentially significant. This impact would be reduced to a less-than-significant level with the implementation of **Mitigation Measure BIO-3.C,** which provides general protection measures for the species, and **Mitigation Measure BIO-9**, which would require preconstruction surveys and avoidance measures if badgers are present. **(LSM)**

DMU Alternative. The DMU Alternative would generally have a similar footprint to the Proposed Project, with the addition of improvements in the Dublin/Pleasanton Station Area. Thus, this alternative would result in the same potentially significant impacts to American badger as described for the Proposed Project. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-3.C,** which provides general protection measures for the species, and **Mitigation Measure BIO-9**, which would require preconstruction surveys and avoidance measures if badgers are present. **(LSM)**

Express Bus/BRT Alternative. Based on the findings of the reconnaissance survey, the local species' distribution, and surrounding development, the American badger is not expected in annual grasslands or ruderal areas at the Dublin/Pleasanton Station Area. Similarly, due to already existing urban development at the Laughlin Road Area, it is unlikely that American badger would be encountered in this area. Therefore, no impacts are expected to the American badger from the Express Bus/BRT Alternative. **(NI)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs. Areas where bus improvements would be constructed would be within urban/developed land that does not support American badger or their habitat. In addition, the limited amount of construction anticipated for installation of bus-related infrastructure improvements would result in a minor amount of ground disturbance, all of which would be within developed areas. Therefore, the Enhanced Bus Alternative would have no construction-related impacts to these species, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project and DMU Alternative would have potentially significant impacts on American badger habitat. However, with implementation of **Mitigation Measure BIO-3.C** above, which provides general protection measures that would apply to these species, and **Mitigation Measure BIO-9**, which would require surveys and avoidance measures for the American badger, potential impacts would be reduced to a less-than-significant level.

As described above, the Express Bus/BRT Alternative and Enhanced Bus Alternative would not have significant construction-related impacts to badger habitat; therefore, no mitigation measures are required for these alternatives.

Mitigation Measure BIO-9: Preconstruction Surveys and Avoidance Measures for American Badger (Conventional BART Project and DMU Alternative/EMU Option).

BART or its contractor shall minimize impacts on badgers through a combination of worker training, preconstruction surveys, and passive animal relocation, if required. BART shall implement the following measures to avoid potential impacts to American badgers:

1. Concurrent with other required preconstruction wildlife surveys (e.g., SJKF and BUOW), a qualified biologist shall perform a preconstruction survey to identify the presence of American badgers. If this species is not found, no further mitigation shall be required.

2. If badgers are identified, they shall be passively relocated using burrow exclusion (e.g., installing one-way doors on burrows) or similar CDFW-approved exclusion methods. When unoccupied dens are encountered outside of work areas but within 100 feet of proposed activities, vacated dens shall be inspected to ensure they are empty and temporarily covered using plywood sheets or similar materials.

3. If badger occupancy is determined at a given site within the work area, the construction manager should be informed that work should be halted. Depending on the den type, reasonable and prudent measures to avoid harming badgers shall be implemented and may include seasonal limitations on construction near the site (i.e., restricting the construction period to avoid spring-summer pupping season), and/or establishing a construction exclusion zone around the identified site, or resurveying the den a week later to determine species presence or absence.

Impact BIO-10: Adversely affect San Joaquin kit fox, either directly or through habitat modifications during construction.

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

Areas of potential direct impacts to SJKF upland habitat are shown in Table 3.I-11. There is potential upland habitat within the Proposed Project and DMU Alternative footprints. However, there is no potential habitat within the footprint of the Express Bus/BRT Alternative and no such habitat would be affected by the Enhanced Bus Alternative, or the feeder bus improvements under the Proposed Project or other Build Alternatives, which would be located within the existing street ROWs. Potential impacts are described 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, Altamont Corridor Express, and the LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect habitat of SJKF. 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 SJKF during construction. **(NI)**

TABLE 3.I-11 POTENTIAL DIRECT IMPACTS TO SJKF UPLAND HABITAT

Potential Habitat by Geographic Subarea	Conventional BART Project	DMU Alternative (with EMU Option)	Express Bus/BRT Alternative	Express Bus/BRT Alternative
Dublin/Pleasanton Station Area	--	--	--	--
I-580 Corridor Area	11.32	11.36	--	--
Isabel North Area	--	--	--	--
Isabel South Area	--	--	--	--
Cayetano Creek Area	110.61	62.89	--	--
Laughlin Road Area	--	--	--	--
Total Area	121.93	74.26	0	0

Note: -- = none or not applicable.
There is no SJKF upland habitat within the Express Bus/BRT Alternative footprint and no such habitat would be affected by the Enhanced Bus Alternative, or the feeder bus improvements under the Proposed Project or other Build Alternatives, which would be located within the existing street ROWs.
Source: ESA, 2013a,b,c,d; Arup, 2017.

Conventional BART Project. As listed in Table 3.I-11 and shown on Figures 3.I-4a and 3.I-4a, construction of the Proposed Project would cause the direct and permanent loss of approximately 121.93 acres of annual grasslands within the historical range of the SJKF. Habitat impacts would occur north of the I-580 Corridor Area due to highway relocation (approximately 11.32 acres) and in association with the loss of annual grasslands in the Cayetano Creek Area (approximately 110.61 acres). Based on the data presented in the EACCS, the USFWS and CDFW consider all continuous annual grasslands north of I-580 as potentially suitable SJKF habitat, as these areas historically provided habitat for this species. However, due to variety of reasons, including development trends, an increase in incompatible land uses, and increased traffic in Alameda County, SJKF populations have not been confirmed in the Livermore-Amador Valley for several decades. The loss of potential SJKF habitat would be considered a significant impact.

The loss of grassland habitat under the Proposed Project would not restrict potential SJKF dispersal corridors, which generally occur in Altamont Hills, farther east of the Proposed Project footprint. Thus, the Proposed Project would not have a significant impact on regional SJKF movement.

Although the Isabel North and Isabel South Areas are both currently characterized by annual grasslands, they are isolated from SJKF habitat by urban development. Specifically, the permanent wildlife exclusion fencing on the northern edge of Portola Road installed for the construction of Shea Homes – Sage Project, approximately 0.2 mile north of the Isabel North Area, eliminates SJKF access to the Isabel North Area. The Isabel South Area is isolated from potential SJKF habitat by I-580.

In summary, the SJKF are not expected to forage, den, or travel through or within the Proposed Project footprint; however, they are presumed present because this species has historically occurred in this area. If they are present at the time of construction, SJKF could be subject to direct impacts that include accidental injury or mortality. Therefore, impacts to SJKF would be potentially significant.

Potential impacts to individual SJKF and their habitat would be reduced to a less-than-significant level with the implementation of the following measures: **Mitigation Measure BIO-3.C**, which provides general protection measures that would apply to SJKF such as vehicle speed limits within SJKF habitat, regular removal of trash that may attract predators, and actions to prevent entrapment in open holes and trenches; **Mitigation Measure BIO-10.A**, which requires preconstruction surveys and protection measures to avoid and minimize the take of SJKF during construction; and **Mitigation Measure BIO-10.B**, which provides compensatory habitat to mitigate for the loss and disturbance of SJKF habitat. **(LSM)**

DMU Alternative. The DMU Alternative would generally have a similar footprint to the Proposed Project, with the addition of improvements in the Dublin/Pleasanton Station Area and some differences in the Cayetano Creek Area. This alternative would cause the direct and permanent loss of approximately 74.26 acres of annual grasslands within the historical range of the SJKF, as listed in Table 3.I-11 and shown on Figures 3.I-4a and 3.I-4a. Impacts include approximately 11.36 acres of habitat in the north of the I-580 Corridor Area and approximately 62.89 acres of habitat in the Cayetano Creek Area. Within these areas, the DMU Alternative could result in potentially significant direct and indirect impacts to SJKF. Potential impacts to individual SJKF and their habitat would be reduced to a less-than-significant level with the implementation of the following measures: **Mitigation Measure BIO-3.C**, which provides general protection measures that would apply to SJKF such as vehicle speed limits within SJKF habitat, regular removal of trash that may attract predators, and actions to prevent entrapment in open holes and trenches; **Mitigation Measure BIO-10.A**, which requires preconstruction surveys and protection measures to avoid and minimize the take of SJKF during construction; and **Mitigation Measure BIO-10.B**, which provides compensatory habitat to mitigate for the loss and disturbance of SJKF habitat. **(LSM)**

Express Bus/BRT Alternative. SJKF is not expected in annual grasslands or ruderal areas within the Dublin/Pleasanton Station Area or along the portion of the I-580 Corridor Area within the footprint (Hacienda Drive to Tassajara Road/Santa Rita Road due to site isolation from potential SJKF habitat). In addition, due to existing urban development at the Laughlin Road Area, it is unlikely that SJKF would be encountered at this site. Therefore, the Express Bus/BRT Alternative would result in no impacts to SJKF habitat. Because the Laughlin Road Area is bordered by potential SJKF habitat on three sides, the implementation of **Mitigation Measure BIO-3.C** would avoid impacts to this species by providing training to construction personnel so they can identify potential threats to SJKF, vehicle speed limits, regular removal of trash that may attract predators, and actions to prevent entrapment in open holes and trenches. This measure would reduce potential impacts to SJKF to a less-than-significant level. **(LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs in urban/developed land that does not support SJKF or their habitat, and would require a limited amount of construction activity and ground disturbance. Therefore, the Enhanced Bus Alternative would have no impacts to the SJKF, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project and DMU Alternative would have potentially significant impacts to SJKF habitat. However, potential impacts to individual SJKF and their habitat would be reduced to a less-than-significant level with the implementation of the following measures: **Mitigation Measure BIO-3.C** above, which provides general protection measures that would apply to SJKF such as vehicle speed limits within SJKF habitat, regular removal of trash that may attract predators, and actions to prevent entrapment in open holes and trenches; **Mitigation Measure BIO-10.A**, which requires preconstruction surveys and protection measures to avoid and minimize the take of SJKF during construction; and **Mitigation Measure BIO-10.B**, which provides compensatory habitat to mitigate for the loss and disturbance of SJKF habitat.

For the Express Bus/BRT Alternative, due to its location near SJKF habitat, implementation of **Mitigation Measure BIO-3.C** above, which provides general protection measures that would apply to SJKF, would reduce potential impacts to less-than-significant levels.

As described above, the Enhanced Bus Alternative would not have significant construction-related impacts to the SJKF; therefore, no mitigation measures are required.

Mitigation Measure BIO-10.A: Preconstruction Surveys and Avoidance Measures for the San Joaquin Kit Fox (Conventional BART Project and DMU Alternative/EMU Option).

1. The following measures, which are intended to reduce direct and indirect construction-related impacts on SJKF, are derived from the USFWS San Joaquin Kit

Fox Survey Protocol for the Northern Range and the USFWS Standardized Recommendations for Protection of the San Joaquin Kit Fox.[80, 81] These measures shall be implemented by BART or its contractor for construction areas in the I-580 Corridor Area (i.e., the grasslands north of I-580, between Fallon Road and Collier Canyon Road), within the Cayetano Creek Area, and in the Laughlin area (identified in Figures 3.I-4a and 3.I-4b). Preconstruction surveys shall be conducted within 200 feet of work areas to identify potential SJKF dens or other refugia in and surrounding work sites. A qualified biologist shall conduct the survey for potential SJKF dens 14 to 30 days before construction begins. All identified potential dens shall be monitored for evidence of SJKF using a tracking medium or an infrared beam camera to determine the current use. If no activity is detected, the den should be destroyed immediately to preclude subsequent use.

2. If SJKF occupancy is determined at a given site, the construction manager should be immediately informed that work should be halted within 200 feet of the den and the USFWS and CDFW contacted. Depending on the den type, reasonable and prudent measures to avoid effects to SJKF could include seasonal limitations on construction at the site (i.e., restricting the construction period to avoid spring-summer pupping season), and/or establishing a construction exclusion zone around the identified site, or resurveying the den a week later to determine species presence or absence.

3. Nighttime vehicle traffic shall be kept to a minimum on non-maintained roads. Off-road traffic outside the designated work site shall be prohibited in areas of SJKF habitat.

Mitigation Measure BIO-10.B: Provide Compensatory Habitat to Mitigate for the Loss and Disturbance of San Joaquin Kit Fox Habitat (Conventional BART Project and DMU Alternative/EMU Option).

BART shall provide off-site compensatory mitigation for habitat impacts to SJKF consistent with USFWS and/or CDFW permit requirements. The EACCS Biological Opinion, which sets the standard for Livermore Valley habitat compensation requirements, determines the amount of required mitigation lands based on the relative habitat values of impacted lands and mitigation lands. The amount of mitigation land that will be required shall be determined during consultation with the

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[80] United States Fish and Wildlife Service (USFWS), 1999. San Joaquin Kit Fox Survey Protocol for the Northern Range, U.S. Department of the Interior, Fish and Wildlife Service. June.

[81] United States Fish and Wildlife Service (USFWS), 2011. Standardized Recommendations for Protection of the San Joaquin Kit Fox Prior to or During Ground Disturbance, U.S. Department of the Interior, Fish and Wildlife Service, April.

CDFW and USFWS using standards and procedures defined in the EACCS, which calculates a compensation ratio based on habitat quality and the location of the impact site, and the relative quality and location of mitigation land. It is estimated that compensatory mitigation will be required at an approximately 3-to-1 ratio for SJKF habitat areas that are permanently impacted. The final mitigation area will be calculated using the EACCS standards and procedures described in **Mitigation Measure BIO-3.B** for CTS and CRLF. Habitat compensation ratios determined by the USFWS and CDFW during the FESA and CESA permitting processes shall be based on the assessed functions and values of the impacted lands and those of the approved compensation lands or agency-approved SJKF mitigation site.

Impact BIO-11: Have a substantial adverse effect on State or federally protected wetlands (including but not limited to marsh, vernal pool, and coastal) or waters through direct removal, filling, hydrological interruption, or other means during construction.

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

An informal wetland assessment identified the general distribution of potentially jurisdictional features in the footprints of the Proposed Project and Build Alternatives, as shown in Figures 3.I-2a and 3.I-2b and summarized in Table 3.I-12. Potential impacts are described below.

TABLE 3.I-12 POTENTIAL DIRECT IMPACTS TO JURISDICTIONAL WETLANDS, OTHER WATERS OF THE U.S. AND WATERS OF THE STATE

	Aquatic Features (Acres)		
Geographic Subarea/ Aquatic Features	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**
Dublin/Pleasanton Station Area			
Line G-1-1 (IC)	--	0.002	0.001
Concrete Channel (FEW)	--	0.028	0.055
Chabot Canal (PC/FEW)	--	--	0.118
Line G-2 (Hewlett Canal) (PC)	--	--	0.366
I-580 Corridor Area			
SW-1 (FEW)	--	0.015	--
Tassajara Creek (IC/FEW)	0.013	0.014	0.0
Pimlico Drive Drainage (FEW)	<0.001	0.000	--

TABLE 3.I-12 POTENTIAL DIRECT IMPACTS TO JURISDICTIONAL WETLANDS, OTHER WATERS OF THE U.S. AND WATERS OF THE STATE

	Aquatic Features (Acres)		
Geographic Subarea/ Aquatic Features	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**
SW-2 (FEW)	0.005	0.005	--
SW-3 (FEW)	0.072	0.071	--
SW-4 (FEW)	0.083	0.083	--
SW-5 (FEW)	0.010	0.010	--
SW-6 (FEW)	0.025	0.025	--
Cottonwood Creek (IC)	0.013	0.013	--
SW-7 (FEW)	0.009	0.009	--
SW-8 (FEW)	0.124	0.124	--
Isabel North Area			
None	--	--	--
Isabel South Area			
Arroyo las Positas (PC)	0.045	0.045	--
Cayetano Creek Area			
Isabel Creek (IC)	0.026	0.023	--
Arroyo las Positas (PC/FEW)	0.083	0.083	--
Cayetano Creek (IC/FEW)	0.137	0.142	--
Cayetano Creek (IC/FEW at Hartman Road)	0.006	--	--
Pond-1 (at Hartman Road)	0.061	--	--
Laughlin Road Area			
None	--	--	--
Summary by Habitat Type			
Freshwater emergent wetland	0.327	0.371	0.055
Perennial creek	0.128	0.129	0.484
Intermittent creek	0.195	0.194	0.001
Pond	0.061	--	--
Total Area	0.711	0.693	0.540

Notes:
FEW = freshwater emergent wetland; IC = intermittent creek; PC = perennial creek; -- = no impact
This table summarizes the potential waters of the U.S. and State within the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative. The Enhanced Bus Alternative, as well as the bus improvements under the Proposed Project and other Build Alternatives, would be located within the existing street ROWs and would not affect wetlands or waters.
Source: ESA, 2013a,b,c,d; Arup, 2017.

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, and the LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect wetlands, waters of the U.S., and/or waters of the State. 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 State or federally protected wetlands or waters during construction. **(NI)**

Conventional BART Project. An informal wetland assessment identified the general distribution of potentially jurisdictional features in the study area, as identified in Figure 3.I-2a and Figure 3.I-2b and summarized in Table 3.I-12; a formal wetland determination has not yet been performed. Potential jurisdictional features in the Proposed Project footprint include Line G-1-1, Chabot Canal, Line G-2, Tassajara Creek, Line G-3, Cottonwood Creek, Collier Canyon Creek, Isabel Creek, Arroyo las Positas, and Cayetano Creek, as well as several smaller aquatic features, as identified in Table 3.I-12 and Figures 3.I-2a and 3.I-2b). Construction of the Proposed Project would result in the fill and/or shading of approximately 0.711 acre in wetlands, waters of the U.S., and/or waters of the State. This estimate is based on the collective footprint, which includes both permanent project facilities and temporary construction staging areas. However, the exact footprint of temporary staging areas has not yet been determined. For purposes of worst-case impact analysis, the total of 0.711 acres is conservatively assumed to represent permanent impacts. In the event that a portion of these acres is not needed following construction, the area would be restored pursuant to **Mitigation Measure BIO-11.B**.

The design of the Proposed Project is intended to avoid and protect water features identified during this initial assessment to the greatest extent feasible, through established setback zones from drainages and seasonal wetlands. Specifically, the proposed tail tracks and storage and maintenance facility in the Cayetano Creek Area have been sited to avoid a large vernal pool complex that was modeled in the EACCS.[82] These efforts resulted in the avoidance of vernal pools in the Cayetano Creek Area.

Portions of the Proposed Project footprint support wetlands, waters of the U.S., and/or waters of the State under regulatory jurisdiction of the USACE and RWQCB. Also, the Proposed Project would result in impacts to the streambed and banks under jurisdiction of CDFW. Anticipated impacts include the bridging and filling of wetlands, waters of the U.S., and/or waters of the State that were identified within the project footprint, as identified in Table 3.I-12. This disturbance would affect both areas classified as wetlands and channels that are considered wetlands, waters of the U.S., and/or waters of the State.

This direct loss of wetlands, waters of the U.S., and/or waters of the State would be considered a potentially significant impact. In addition, prior to disturbing any jurisdictional water features, BART would obtain all required permit approvals from the USACE, CDFW, RWQCB, and all other agencies with permitting responsibilities for construction activities within jurisdictional features. Potential impacts would be reduced to a less-than-significant level through the implementation of **Mitigation Measure BIO-11.A**, which avoids and minimizes impacts to wetlands, waters of the U.S., and/or waters of the State to the greatest extent practicable, and **Mitigation Measure BIO-11.B**, which provides compensation for impacts through wetland restoration and/or creation. **(LSM)**

DMU Alternative. Potential impacts to protected wetlands under the DMU Alternative would be similar to those discussed for the Proposed Project; however, this alternative would have additional impacts to jurisdictional wetland habitat at the Dublin/Pleasanton Station Area and I-580 Corridor Area, and fewer impacts to aquatic features in the Cayetano Creek Area, as shown in Table 3.I-12. In total, the construction of the DMU Alternative would result in the fill and/or shading of approximately 0.693 acre of wetlands, waters of the U.S., and/or waters of the State. The direct loss of State or federal jurisdictional wetlands or waters under the Proposed Project would be a significant impact. This estimate is based on the collective footprint, which includes both permanent project facilities and temporary construction staging areas. However, the exact footprint of temporary staging areas has not yet been determined. For purposes of worst-case impact analysis, the total of 0.693 acres is conservatively assumed to represent permanent impacts. In the event that a portion of these acres is not needed following construction, the area would be restored pursuant to **Mitigation Measure BIO-11.B**.

[82] ICF International, 2010. East Alameda County Conservation Strategy. Final Draft. October. (ICF 00906.08.) San Jose, CA. Prepared for East Alameda County Conservation Strategy Steering Committee, Livermore, CA. [Figure D-6 in Appendix D].

Prior to disturbing any jurisdictional water features, BART would obtain all required permit approvals from the USACE, CDFW, RWQCB, and all other agencies with permitting responsibilities for construction activities within wetlands, waters of the U.S., and/or waters of the State. Potential impacts would be reduced with the implementation **of Mitigation Measure BIO-11.A**, which avoids and minimizes impacts to wetlands and other waters to the greatest extent practicable, and **Mitigation Measure BIO-11.B**, which provides compensation for impacts through wetland restoration and/or creation. **(LSM)**

Express Bus/BRT Alternative. The Express Bus/BRT Alternative would widen I-580, cantilever a portion of I-580 over Chabot Canal/Line G-2, and require the relocation of a portion of Line G-2, potentially affecting approximately 0.54 acre of wetlands, waters of the U.S., and/or waters of the State in the Dublin/Pleasanton Station Area, as shown in Table 3.I-12. The direct loss of State or federal jurisdictional wetlands or waters is considered a significant impact. This estimate is based on the collective footprint, which includes both permanent project facilities and temporary construction staging areas. However, the exact footprint of temporary staging areas has not yet been determined. For purposes of worst-case impact analysis, the total of 0.54 acres is conservatively assumed to represent permanent impacts. In the event that a portion of these acres is not needed following construction, the area would be restored pursuant to **Mitigation Measure BIO-11.B**.

Prior to disturbing any jurisdictional water features, BART would obtain all required permit approvals from the USACE, CDFW, RWQCB, and all other agencies with permitting responsibilities for construction activities within jurisdictional areas. Potential impacts would be reduced with the implementation of **Mitigation Measure BIO-11.A**, which avoids and minimizes impacts to wetlands and other waters to the greatest extent practicable, and **Mitigation Measure BIO-11.B**, which provides compensation for impacts through wetland restoration and/or creation. **(LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs. Areas where bus improvements would be constructed would be within urban/developed land that does not support wetlands, waters of the U.S., and/or waters of the State. In addition, the limited amount of construction anticipated for installation of bus-related infrastructure improvements would result in a minor amount of ground disturbance within developed areas. The Enhanced Bus Alternative would have no construction impacts to wetlands, waters of the U.S., and/or waters of the State, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant impacts to wetlands, waters of the U.S., and/or waters of the State. However, with implementation of **Mitigation Measure BIO-11.A**, which avoids and minimizes impacts to wetlands and other waters to the greatest extent practicable, and **Mitigation Measure BIO-11.B**, which provides compensation for impacts through wetland restoration and/or creation, potential impacts would be reduced to a less-than-significant level.

As described above, the Enhanced Bus Alternative would not have significant construction-related impacts on this resource, and no mitigation measures are required for this alternative.

Mitigation Measure BIO-11.A: Avoid and Minimize Impacts to Wetlands, Waters of the U.S. and/or Waters of the State (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

Final project design shall avoid and minimize the fill of wetlands, waters of the U.S., and/or waters of the State to the greatest practicable extent based on the delineation required by **Mitigation Measure BIO-12.A** that will delineate wetlands, waters of the U.S., and/or waters of the State within the adopted project footprint. Areas that are avoided shall be subject to best management practices under the National Pollutant Discharge Elimination System Permit Construction General Permit, as described in **Impact HYD-6** (Hydrology and Water Quality). The location of wetlands near work areas shall be identified on site plans and wildlife exclusion fencing shall be installed near wetlands to avoid and minimize direct impacts to these areas.

Mitigation Measure BIO-11.B: Compensatory Mitigation for Wetlands, Waters of the U.S. and/or Waters of the State (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

To offset unavoidable temporary and permanent impacts to wetlands, waters of the U.S., and/or waters of the State identified in Table 3.I-12 and to be verified through formal delineation (see **Mitigation Measure BIO-12.A**), restoration and compensatory mitigation shall be provided through the following mechanisms:

1. Purchase or dedicate land to provide wetland preservation, restoration, or creation in a ratio of at least 1-to-1 (i.e., no net loss). Wetland mitigation requirements may be adjusted in the final conditions of the 404 permit, 401 water quality certification, and streambed alteration agreement issued by the USACE, RWQCB, and CDFW, respectively. Where practical and feasible, on-site mitigation shall be implemented. If the use of on-site mitigation is not practical and feasible to meet resource agency-required compensatory mitigation requirements, BART shall satisfy the remaining portions of the obligation through the purchase of mitigation credits through an approved wetland mitigation bank.
2. If on-site mitigation is used, a wetland mitigation and monitoring plan shall be developed by a qualified biologist in coordination with the USACE, CDFW, and/or RWQCB that details mitigation and monitoring obligations for temporary and

permanent impacts to wetlands, waters of the U.S., and/or waters of the State due to construction activities. Enhancement methods such as riparian planting and channel modifications that are proposed within channels that are managed by the Alameda County Zone 7 Water Agency would be subject to review and approval by Zone 7. Such mitigation opportunities are potentially available in Arroyo Mocho and South San Ramon Creek.

3. The wetland mitigation and monitoring plan will provide a basis for the reestablishment of wetlands in identified mitigation areas, such as temporary staging areas following construction. The plan will include at a minimum:
   a. A summary of wetland impacts based on final project design.
   b. A description of mitigation areas and monitoring and reporting requirements.
   c. Mitigation ratios for lost habitat.
   d. Site preparation requirements.
   e. Specifications for planting and/or seeding (e.g., what species and how many plantings) to replace impacted plants.
   f. Seasonal considerations for planting and site maintenance.
   g. An irrigation strategy.
   h. A post-restoration monitoring schedule that provides for quarterly review of restoration areas during the first year and biannual inspections in subsequent years up to 5 years.
   i. Annual success criteria, including annual plant survivorship and vigor, to be determined by counting individuals of each species and comparing the counts to the numbers originally planted for that species. A minimum survival rate of 70 percent of installed plants is required for all years, including at least 2 years post-irrigation.
   j. Means for controlling invasive species near plantings.
4. The wetland mitigation and monitoring plan shall be submitted to the USACE, CDFW, and RWQCB for review and approval.
5. If monitoring suggests that the performance standards outlined above are not being met, corrective actions shall be implemented. Possible contingency measures include but are not limited to the following:
   a. Replanting of native trees and shrubs.
   b. Adjusting the quantity and timing of irrigation to develop a schedule that better meets the characteristics of the site and the needs of the plants.

c. Installing additional protective wire cages around plants to minimize damage from wildlife or other sources.

d. Incorporating additional monitoring events in an attempt to address site deficiencies proactively.

e. Adjusting the weed maintenance methods or schedule to address specific problems that arise.

Impact BIO-12: Have a substantial adverse effect on riparian habitat or sensitive natural communities identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service during construction.

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

Potential direct impacts to wetlands, waters of the U.S., and/or waters of the State are described in **Impact BIO-11** above and shown in Table 3.I-12. The Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would impact wetlands, waters of the U.S., and/or waters of the State; however, the Enhanced Bus Alternative would not affect such areas. Some of these areas support riparian habitat and sensitive natural communities (e.g., wetlands) that would be subject to impacts during construction, as described 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, Altamont Corridor Express, and the LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could adversely affect riparian habitat or sensitive natural communities. 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 riparian habitat or sensitive natural communities during construction. **(NI)**

Conventional BART Project. Construction of the Proposed Project would require the relocation of I-580 and related freeway overcrossings of several ephemeral and perennial drainages that support riparian vegetation, in addition to construction of new overcrossings for BART facilities. The preliminary wetland assessment identified a total of approximately 0.711 acre of wetlands, waters of the U.S., and/or waters of the State in the footprint of the Proposed Project where riparian habitat would be encountered (see Table 3.I-12; also discussed in **Impact BIO-11**). The Caltrans ROW widening of I-580, generally by up to 46 feet (typically 23 feet in the westbound and 23 feet in the eastbound direction) would permanently impact woody riparian habitat (e.g., willow-cottonwood habitat) at Tassajara Creek, Cottonwood Creek, and Arroyo las Positas and non-woody riparian habitat (e.g., bulrush-cattail habitat) at these streams.

The Proposed Project may permanently affect up to approximately 0.025 acre of alkali meadow, a CDFW-regulated sensitive natural community, within feature SW-6 located north of I-580 at Croak Road (see Table 3.I-12). Furthermore, for lands in the Cayetano Creek Area that were not surveyed due to limited access to the private property, the extent of sensitive natural communities, including alkali meadow, was characterized by remote techniques; therefore, the actual extent or precise types of sensitive natural communities in these areas could vary.

Impacts described above to CDFW-identified sensitive natural communities would be considered potentially significant. These impacts would be reduced through the implementation of **Mitigation Measure BIO-11.A** above, which would minimize and compensate for impacts to sensitive natural communities associated with wetlands, as well as **Mitigation Measure BIO-12.A** and **Mitigation Measure BIO-12.B**, which includes sensitive resource avoidance, impact minimization, restoration of temporarily disturbed sensitive natural communities, and compensation for permanent, unavoidable losses through restoration, enhancement, creation, and preservation. With implementation of these measures, potential impacts on sensitive riparian plant communities would be reduced to a less-than-significant level. **(LSM)**

DMU Alternative. The DMU Alternative would generally have a similar footprint to the Proposed Project, with the addition of improvements in the Dublin/Pleasanton Station Area and some differences in the Cayetano Creek Area. In total, the preliminary wetland assessment identified approximately 0.693 acre of wetlands, waters of the U.S., and/or waters of the State in the DMU Alternative footprint where riparian habitat would be encountered. In addition, to impacts described above for the Proposed Project that would also occur under the DMU Alternative, this Alternative would impact approximately 0.030 acre of freshwater emergent wetland habitat at the Dublin/Pleasanton Station Area that is associated with Line G-1-1 and an unnamed concrete channel north of I-580. Wetlands are regulated by the USACE, RWQCB, CDFW, and their removal would be considered potentially significant. Therefore, impacts on riparian habitat and sensitive natural communities would be potentially significant.

As described for the Proposed Project above, these impacts would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-11.A** above, which would minimize and compensate for impacts to sensitive natural communities associated with wetlands, as well as **Mitigation Measure BIO-12.A** and **Mitigation Measure BIO-12.B**, which includes sensitive resource avoidance, impact minimization, restoration of temporarily disturbed sensitive natural communities, and compensation for permanent, unavoidable losses through restoration, enhancement, creation, and preservation. With implementation of these measures, potential impacts on sensitive riparian plant communities would be reduced to a less-than-significant level. **(LSM)**

Express Bus/BRT Alternative. The Express Bus/BRT Alternative would relocate portions of I-580 at the Dublin/Pleasanton Station Area and within a portion of the I-580 Corridor Area, and construct the new parking lot at the Laughlin Road Area. Specifically, at the Dublin/Pleasanton Station, approximately 1,400 feet of Chabot Canal would be relocated to the south by approximately 50 to 70 feet, where it would be reconstructed to the same configuration as the existing channel. In total, the preliminary wetland assessment identified approximately 0.540 acre of wetlands, waters of the U.S., and/or waters of the State in the Express Bus/BRT Alternative footprint where riparian habitat occurs, as shown in Table 3.I-12. Impacts to regulated sensitive vegetation communities (riparian habitat) would be considered significant in accordance with USACE and CDFW regulations. However, sensitive upland plant communities do not occur in the footprint of the Express Bus/BRT Alternative and would not be impacted.

Impacts to riparian habitat would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-11.A,** which would avoid, minimize, and compensate for the loss of wetlands and associated sensitive natural communities, and **Mitigation Measure BIO-12.A**, which includes sensitive resource avoidance, impact minimization, restoration of temporarily disturbed sensitive natural communities, and compensation for permanent, unavoidable losses through restoration, enhancement, creation, and preservation. **(LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs in urban/developed land that does not support sensitive natural communities. Therefore, the Enhanced Bus Alternative would have no construction-related impacts to these species, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant impacts to riparian habitat and sensitive natural communities. However, potential impacts would be reduced to a less-than-significant level with implementation of the following measures: **Mitigation Measure BIO-11.A** above, which would minimize and compensate for impacts to wetlands, including both riparian habitat and sensitive natural communities associated with wetlands, waters of the U.S., and/or waters of the State; **Mitigation Measure BIO-12.A**, which includes sensitive resource avoidance and impact minimization; and **Mitigation Measure BIO-12.B** (applies to Proposed Project and DMU Alternative only), which provides for the restoration of temporarily disturbed sensitive natural communities, and compensation for sensitive natural community losses through restoration, enhancement, creation, and preservation.

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

Mitigation Measure BIO-12.A: Identify and Avoid Sensitive Natural Communities (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

Prior to submitting permit applications to the USACE, CDFW, and RWQCB, BART shall retain a qualified biologist to conduct a formal wetland delineation survey and identify the distribution of sensitive natural communities within and adjacent to the footprint of the adopted project. Focused wetland and vegetation surveys shall be performed on private lands where surveys could not be performed in the Cayetano Creek Area to describe the presence and distribution of sensitive natural communities that may be avoided by the project, or cannot be avoided and require compensation. The location of CDFW-regulated sensitive natural communities (e.g., alkali meadow and riparian habitat) shall be illustrated on construction specification drawings and labeled for avoidance to help contractors avoid these areas.

Mitigation Measure BIO-12.B: Compensate for Impacts to CDFW-regulated Sensitive Upland Plant Communities (Conventional BART Project and DMU Alternative/EMU Option).

This measure compensates for impacts to CDFW-regulated sensitive natural communities such as alkali meadow that occur within the footprint of the adopted project but outside of wetland habitats (which are addressed in **Mitigation Measure BIO-12.A**). To compensate for impacts to CDFW-regulated sensitive natural communities, BART shall prepare and implement a revegetation plan, further described below, to provide the basis for reestablishing sensitive natural communities.

The revegetation plan shall quantify the total impacted acreage of sensitive vegetation communities and include mitigation ratios for lost habitat of a minimum 1-to-1 based on acreage. The plan will include at a minimum an identification of mitigation areas, site preparation requirements, specifications for planting and/or seeding (e.g., what species and how many plantings), seasonal considerations for planting and site maintenance, the proposed irrigation strategy, performance criteria (e.g., 70 percent survival of plantings 5 years following installation, and 70 percent of plants exhibiting fair or better condition), any contingency measures that may be anticipated, and a provision for semi-annual monitoring and reporting. The plan shall also include the following:

1. Annual success criteria, including annual plant survivorship and vigor, to be determined by counting individuals of each species and comparing the counts to the numbers originally planted for that species. A minimum survival rate of 70 percent of installed plants is required for all years, including at least 2 years post-irrigation.
2. Means for controlling invasive species near plantings.
3. A description of mitigation areas and monitoring and reporting requirements.
4. The restoration plan shall be submitted to the CDFW for review and approval.
5. If monitoring suggests that the performance standards outlined above are not being met, corrective actions shall be implemented. Possible contingency measures include but are not limited to the following:
   a. Replanting of restoration areas
   b. Adjusting the quantity and timing of irrigation to develop a schedule that better meets the characteristics of the site and the needs of the plants
   c. Installing additional protective wire cages around plants to minimize damage from wildlife or other sources
   d. Incorporating additional monitoring events in an attempt to address site deficiencies proactively
   e. Adjusting the weed maintenance methods or schedule to address specific problems that arise

Impact BIO-13: Interfere with the movement of native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites during construction.

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

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, and the LAVTA would be constructed.

In addition, population and employment increases throughout Alameda County would result in continued land use development, including construction of both residential and commercial uses. Construction of these improvements and development projects could interfere with the movement of resident or migratory fish species or impede the use of native wildlife nursery sites. 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 movement of resident or migratory fish species or impediment of native wildlife nursery sites during construction. **(NI)**

Conventional BART Project. Much of the Proposed Project footprint would be along the I-580 corridor, which already serves as a substantial barrier to the north-south movement of wildlife. However, areas of the Proposed Project footprint that cross creeks along I-580—Chabot Canal, Tassajara Creek, Cottonwood Creek, and Arroyo las Positas—serve as wildlife crossings. The animals that currently use these areas are habituated to the lighting, noise, and vibration from I-580 traffic. At these locations, the Proposed Project would use free span bridges and would not alter the configuration of existing box culverts beneath the highway at these crossings, although the length of some culverts may be extended. Deer readily use both Cottonwood Creek and Arroyo las Positas as crossing corridors beneath I-580. Five black-tailed deer were observed during the site assessment, including a doe within the Arroyo las Positas corridor south of I-580 and three bucks beneath a large valley oak on the creek corridor immediately north of I-580. Wildlife tracks beneath I-580 identified in the survey showed that deer and raccoon make extensive use of the wildlife corridor beneath the highway at multiple locations.[83] The Proposed Project is not expected to substantially modify or degrade the stream movement corridors to an extent that would preclude use by wildlife during construction.

Numerous wildlife species are expected to use Cayetano Creek and the surrounding lands in the Cayetano Creek Area for movement and dispersal between the creek and surrounding upland habitat. In this area, the Proposed Project has been designed to allow water drainage under the tail tracks, supporting the continued movement of natural water into the vernal pool swales. In addition, the track alignment would be porous to smaller wildlife species such as CTS and CRLF. Smaller terrestrial wildlife species such as California ground squirrel, raccoon, gray fox, and coyote may cross beneath the tail track alignment through culverts that will be constructed to facilitate water passage. The

[83] Environmental Science Associates, 2013c. BART to Livermore Extension (BLVX), Consolidated Biological Resources Report, Site 1 [Isabel South], Alameda County, California, Prepared for the San Francisco Bay Area Rapid Transit District. November.

movement of large animals will not be obstructed at Cayetano Creek, as the tail tracks will bridge the creek and allow large animals such as deer to cross under the tracks. The tunnel section will also provide an unobstructed travel corridor over the tracks. The tail tracks and fenced storage yard, which would be about 1.5 miles long, would modify the dispersal opportunities of native non-migratory wildlife species, but the local movement of wildlife within adjoining natural areas would not be blocked. The bridge and tunnel will maintain overland access through corridors both east-west and north-south in the tail tracks area. No established native resident or migratory wildlife movement corridors, migratory fish corridors, or native wildlife nursery sites were identified in the Proposed Project footprint. Therefore, the Proposed Project would have less-than-significant impacts on the movement of resident or migratory fish species or impede the use of native wildlife nursery sites, and no mitigation measures are required. **(LS)**

DMU Alternative. The DMU Alternative would generally have a similar footprint to the Proposed Project, with the addition of improvements in the Dublin/Pleasanton Station Area and some differences in the Cayetano Creek Area. The DMU Alternative would have less-than-significant impacts to: the movement of native resident or migratory fish or wildlife species; established native resident or migratory wildlife corridors; movement of fish species; or the use of native wildlife nursery sites. Therefore, and no mitigation measures are required. **(LS)**

Express Bus/BRT Alternative. The Express Bus/BRT Alternative would relocate I-580 at the Dublin/Pleasanton Station Area, along a portion of I-580 Corridor Area, and construct a parking lot on developed lands at the Laughlin Road Area. No wildlife movement corridors or native wildlife nursery sites were identified in these areas. Therefore, the Express Bus/BRT Alternative would have no impact impacts to: the movement of native resident or migratory fish or wildlife species; established native resident or migratory wildlife corridors; movement of fish species; or the use of native wildlife nursery sites. Therefore, and no mitigation measures are required. **(NI)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs. Areas where bus improvements would be constructed would be within urban/developed land, which does not support established native resident or migratory wildlife corridors. In addition, the limited amount of construction anticipated for installation of bus-related infrastructure improvements would result in a minor amount of ground disturbance, which would all be within developed areas. The Enhanced Bus Alternative would have no construction-related impacts to established native resident or migratory wildlife corridors, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to movement of wildlife species, wildlife corridors, or native nursery sites, and no mitigation measures are required.

Impact BIO-14: Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat conservation plan during construction.

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

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, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses would occur under the No Project Alternative. There are no habitat conservation plans, natural community conservation plans, or other approved habitat conservation plans that cover the study area. Therefore the No Project Alternative is considered to have no impacts related to conflicts with provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat conservation plan during construction. **(NI)**

Conventional BART Project and Build Alternatives. There are no habitat conservation plans, natural community conservation plans, or other approved habitat conservation plans that address areas within the footprints of the Proposed Project and Build Alternatives. The EACCS is not a regulatory document and is not an adopted habitat conservation plan, natural community conservation plan, or otherwise approved habitat conservation plan. However, as a regional planning guidance document, the EACCS provides agency-approved guidance on how to avoid, minimize, and mitigate impacts on selected special-status species and sensitive habitats that occur in the Livermore Valley. BART intends that the adopted project and mitigation measures be consistent with the conservation strategies and mitigation guidance established by EACCS. Therefore, the Proposed Project and Build Alternatives would have no impacts related to conflicts with provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat conservation plan. **(NI)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to conflicts with provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat conservation plan, and no mitigation measures are required.

Impact BIO-15: Result in loss of protected trees identified in local policies or ordinances during construction.

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

BART is exempt under State law from compliance with local land use ordinances, including local tree ordinances that have been established to protect native trees, heritage trees, and street trees. Although not legally required to comply with local ordinances, BART considers the protection of trees a priority and considers that removal of trees that are protected under local ordinances would constitute a significant impact as described 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, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could conflict with local policies or ordinances protecting biological resources. 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 on local policies or ordinances protecting biological resources during construction. **(NI)**

Conventional BART Project. Potentially protected, landscape trees are present within the I-580 Corridor Area and Isabel South Area and native trees are also located at the Isabel South Area. For example, at the Isabel South Area, the construction of the pedestrian overcrossing and touchdown structures that would span Arroyo las Positas would require removal of a number of native trees, potentially including arroyo willow, narrow leaf willow, valley oak, California walnut, and cottonwood within an approximately 50-foot wide work corridor. Some native coast live oak trees may also be subject to removal. Therefore, the Proposed Project could directly impact protected trees by removing them or could indirectly impact them during construction by compressing their root zones, if construction equipment operates close to the trees. Impacts to protected trees would be potentially significant. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-15**, which would require an inventory of protected trees, protection of trees to remain on the site, and the replacement of trees that are removed, consistent with local guidelines**. (LSM)**

DMU Alternative. The DMU Alternative would generally have a similar footprint to the Proposed Project and would also include construction at the Dublin/Pleasanton Station Area. Thus, the DMU Alternative would have potentially significant impacts to protected trees. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-15,** which would require an inventory of protected trees, protection of trees to remain on the site, and the replacement of trees that are removed, consistent with local guidelines**. (LSM)**

Express Bus/BRT Alternative. The Express Bus/BRT Alternative would have the potential to impact protected street trees at the Dublin/Pleasanton Station Area, north of I-580 between Hacienda and Tassajara, and in the Laughlin Road Area. This alternative could directly impact protected trees by removing them or could indirectly impact them during construction by compressing their root zones, if construction equipment operates close to the trees. Therefore, impacts to protected trees would be potentially significant. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-15**, which would require an inventory of protected trees, protection of trees to remain on the site, and the replacement of trees that are removed, consistent with local guidelines**. (LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed along existing street ROWs. Areas where bus improvements would be constructed would be within urban/developed land and would not require the removal of protected trees. Therefore, the Enhanced Bus Alternative would have no direct or indirect construction-related impacts to protected trees, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant impacts to protected trees. However, with implementation of **Mitigation Measure BIO-15**, which would require an inventory of protected trees, protection of trees to remain on the site, and the replacement of trees that are removed, consistent with local guidelines, potential impacts would be reduced to a less-than-significant level.

Mitigation Measure BIO-15: Conduct an Inventory of Protected Trees, Protect Trees that Remain, and Plant Replacement Trees (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

BART shall retain a certified arborist to identify and evaluate trees within the permanent and temporary construction footprint. A report shall be prepared and submitted to BART to (1) document the number, size, species, and health of trees within the footprint and construction staging areas; and (2) identify which trees will be removed and which will be retained. BART shall then mitigate the loss of trees based on the following or equivalent protective measures depending on the size and health of trees to be removed.

1. Prior to the start of construction, BART shall install exclusion fencing at the dripline of any tree that will not be removed and prohibit any parking or storage of

materials inside the fence. During construction, fencing shall be monitored to ensure continued protection of trees.

2. Mitigation shall be provided by planting replacement tress of the same species for removal of native trees larger than 24 inches in circumference measured at 4 feet, 6 inches above natural grade. For trees within open space, riparian, or habitat area, mitigation shall be provided for any tree with a circumference of 18 inches or more above natural grade.

(b) Construction – Cumulative Analysis

The geographic study area for cumulative impacts is the area within approximately a 2.0-mile radius of the collective footprint, to ensure that the analysis for biological resources considered species-relevant areas and potential associated cumulative projects.

Cumulative projects identified in Section 3.A, Introduction to Environmental Analysis, and Appendix E that are considered in this cumulative analysis are listed in Table 3.1-13. These projects were selected for their potential to contribute to the incremental loss of biological resources and wildlife habitat. Environmental analysis is either underway or completed for many of these projects, and several have recently been constructed. However, potential impacts to biological resources were estimated for the purposes of determining cumulative impacts related to projects for which environmental review has not yet been completed. The temporal period for the analysis of cumulative project impacts to biological resources is based on the project construction periods, during which time most impacts occur, together with longer-term timing of project mitigation requirements.

As described in **Impact BIO-14** above, the Proposed Project and Build Alternatives would have no impact related to conflicts with provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or State habitat conservation plan. Therefore, the Proposed Project and Build Alternatives would not contribute to cumulative impacts related to these plans.

Impact BIO-16(CU): Adversely affect, either directly or through habitat modifications, species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service during construction under Cumulative Conditions.

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

TABLE 3.I-13 LIST OF CUMULATIVE PROJECTS CONSIDERED IN THE BIOLOGICAL RESOURCES CUMULATIVE ANALYSIS

Project Name/Number	Potential Cumulative Impacts
Kaiser Dublin Medical Center (D7)	Rare Plants, CRLF, BUOW[84]
Grafton Plaza Mixed Use Development (D6)	CRLF and BUOW (estimated)
IKEA Retail Center/Project Clover (D4)	BUOW (estimated)
Dublin Crossing Specific Plan (D1)	Rare Plants, WPT CRLF, BUOW[85], wetlands
Fallon Gateway (D9)	CTS, CRLF, BUOW (estimated)
Dublin/Pleasanton Station Parking Expansion	Rare Plants, BUOW
The Shoppes (L1)	CRLF, BUOW (estimated)
Crosswinds site (L3)	CRLF, BUOW (estimated)
Sywest site (L4)	CRLF, BUOW (estimated)
Livermore Valley Charter School (L7)	CTS, CRLF, BUOW, SJKF (estimated)
Las Positas College (L13)	CTS, CRLF, BUOW, SJKF (estimated)
Shea Homes – Sage Project (L14)	CTS, CRLF, BUOW, AMBA, SJKF[86]
Gillig Bus Manufacturing (L12)	BUOW (estimated)
Oaks Business Park (L10)	BUOW (estimated)
Isabel Neighborhood Plan	CTS, CRLF, BUOW, SJKF (estimated)

Note: Project number and name correspond to Table 1 in Appendix E.
Sources: ESA, 2013a,b,c,d; Arup, 2017; City of Dublin, 2016; City of Dublin 2013b; First Carbon Solutions, 2014.

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, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could result in adverse effects to special-status plant or wildlife species. 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. Therefore, the No Project Alternative is considered to have no adverse impacts to special-status plant or wildlife species during construction. **(NI)**

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[84] City of Dublin, 2016. Draft Environmental Impact Report for Kaiser Dublin Medical Center Project. January 28. Available at: http://dublinca.gov/DocumentCenter/View/12964.

[85] City of Dublin, 2013b. Dublin Crossing Specific Plan Draft Environmental Impact Report. June. Available at: http://www.ci.dublin.ca.us/DocumentCenter/View/4739

[86] First Carbon Solutions, 2014. Shea Homes Sage Project Modified Initial Study/Addendum City of Livermore, Alameda County, California. May 9. Available at: http://laserfiche.cityoflivermore.net/WebLink8/0/doc/201662/Page1.aspx.

Special-status Plants

Conventional BART Project and Build Alternatives. Of the projects identified in Table 3.I-13, those with potential direct impacts populations to special-status or rare plants are the Dublin Crossing Specific Plan and the Kaiser Dublin Medical Center. However, some of the projects listed in Table 3.I-13 may be unsurveyed; hence, the potential exists to encounter additional, unidentified rare plant populations within the cumulative study area. No projects on the cumulative list identify impacts to alkali habitat at the Springtown Alkali Preserve, the regional area where the most sensitive rare plants occur.

The Dublin Crossing Specific Plan EIR proposed a project-level mitigation measure to mitigate potential impacts to the non-listed Congdon's tarplant, which was documented between 1995 and 2000 in disturbed areas at the edge of parking lots and abandoned roads.[87] The Dublin Crossing Specific Plan EIR relied upon implementation of general project-level measures to protect this species, consistent with CDFW guidance.

For the Kaiser Dublin Medical Center, rare plants were not known from the site prior to publication of the EIR; however, rare plant surveys were not yet completed. The mitigation approach relied upon focused surveys for Congdon's tarplant and San Joaquin spearscale prior to construction (which is underway in 2017), and if found, through the acquisition, protection, and subsequent management of other existing rare plant occurrences to be determined through mitigation planning with the CDFW and the City of Dublin. The CNDDB reports no rare plant resources on the site; thus, it is not known if this project impacted rare plants.

For the Proposed Project and Build Alternatives, protocol-level in-season botanical surveys have been performed for most of the study area, but remain to be completed within portions of the footprint, as described in **Impact BIO-1**. Potential impacts to rare plants that may occur in areas that could not be surveyed due to access limitations on private property would be reduced to a less-than-significant at the project level with implementation of **Mitigation Measures BIO-1.A** and **BIO-1.B**, which require the completion of focused rare plant surveys and compensation for impacts to rare plant populations through plant salvage, restoration, and habitat enhancement. General measures provided in **Mitigation Measure BIO-3.C** would additionally protect rare plant populations, if identified.

For the list of cumulative projects identified in Table 3.I-13, either the projects were proposed in areas that do not support rare plants, or impacts to plants were minor and

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[87] City of Dublin, 2013b. Dublin Crossing Specific Plan Draft Environmental Impact Report. June. Available at: http://www.ci.dublin.ca.us/DocumentCenter/View/4739

less than significant. With implementation of the above measures, impacts related to special-status plants would be minimized and/or avoided. In addition, each of the cumulative projects is required to comply with federal and State laws that protect rare plants, including the California Native Plant Protection Act and Sections 2062 and 2067 (CESA) of the California Fish and Game Code as rare or endangered species, which will identify, avoid, and mitigate significant impacts to native plants that are considered rare or endangered. Nonetheless, the sensitivity of rare plant resources and the historic and ongoing reduction of potential rare habitat suggest that despite good-faith efforts to curtail their loss and to restore their habitat, the cumulative impact to special-status plants would be potentially significant and unavoidable. **(SU)**

Vernal Pool Fairy Shrimp and Longhorn Fairy Shrimp

Conventional BART Project and Build Alternatives. One project was identified, the Dublin Crossing Specific Plan, which discussed potential impacts to LHFS and VPFS (as well as vernal pool tadpole shrimp [*Lepidurus packardii*], which is not expected in the study area). Following focused surveys in 2002, 2003, 2012, and 2013, these species were not identified in the Dublin Crossing Specific Plan planning area.[88] No other projects were identified with potential impacts to LHFS or VPFS. Potential impacts to VPFS from the Proposed Project and DMU Alternative, estimated at up to approximately 0.025 acre of potential low quality habitat for this species north of Croak Road in feature SW-6, would be reduced to a less-than-significant level with implementation of **Mitigation Measure BIO-2,** which requires focused surveys for VPFS and LHFS**,** avoidance measures for known and potential habitat, and compensation for impacts to occupied habitat, and **Mitigation Measure BIO-3.C,** which provides general protection measures for plants and wildlife. Because the Proposed Project and Build Alternatives projects are the only cumulative projects with potential impacts to LHFS and VPFS, and the relatively minor project-level impacts (approximately 0.025 acre in a single pool) are considered less-than-significant with mitigation, cumulative impacts would also be less than significant for these species. With implementation of these measures, impacts to VPFS and LHFS would be minimized and/or avoided. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future projects, would result in less-than-significant cumulative impacts to LHFS and VPFS, and no additional mitigation measures are required. **(LS)**

California Tiger Salamander and California Red-legged Frog

Conventional BART Project and Build Alternatives. As identified by ESA biologists and presented in Table 3.I-13, 10 projects are expected to provide potential non-breeding

[88] Ibid.

upland habitat for CTS and/or CRLF. Of these, upland CRLF habitat is recognized in the Dublin Crossing Specific Plan EIR, Kaiser Dublin Medical Center EIR, and the Shea Homes – Sage Project, which additionally identifies potential upland CTS habitat.[89, 90,91] The other projects on the cumulative list occur in close proximity (within approximately 1 mile) of potential CRLF aquatic habitat, or are connected to open space habitat that is considered by the EACCS to support either CTS or CRLF.[92]

The Dublin Crossing Specific Plan EIR did not identify potential impacts to CTS; however, re-alignment of the ephemeral drainage was considered to potentially impact CRLF and its habitat, a less-than-significant project impact.[93] The Kaiser Dublin Medical Center Project CEQA analysis considered that the CTS had been locally extirpated from the area following the extensive grading and development in the area between 2003 and 2011; hence, no impacts were identified to this species. For CRLF, no aquatic features were identified on the Kaiser Dublin Medical Center site that could support this species, though ponds located directly west of the site were documented as potential sources of CRLF.[94] The EIR identified no barriers to CRLF movement onto the site and mitigation identified exclusion fencing and other preconstruction measures to minimize impacts to this species. The project identified no direct habitat impacts or cumulative impacts to CRLF. The Shea Homes–Sage Project CEQA review concluded that the project would disturb approximately 131.6 acres of non-native grassland habitat that could support special-status species; presumably, including upland habitat for CTS and CRLF. Aquatic breeding or non-breeding habitat for CTS and CRLF was not identified on the site.[95]

The Proposed Project, DMU Alternative, and Express Bus/BRT Alternative identified the potential for project-level impacts to individual CTS and CRLF. As identified in Table 3.I-9, the Proposed Project would impact up to approximately 122.27 acres of potential upland aestivation and dispersal habitat for CTS and approximately 130.79 acres for CRLF that

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[89] Ibid.

[90] City of Dublin, 2016. Draft Environmental Impact Report for Kaiser Dublin Medical Center Project. January 28. Available at: http://dublinca.gov/DocumentCenter/View/12964.

[91] First Carbon Solutions, 2014. Shea Homes Sage Project Modified Initial Study/Addendum City of Livermore, Alameda County, California. May 9. Available at: http://laserfiche.cityoflivermore.net/WebLink8/0/doc/201662/Page1.aspx.

[92] ICF International, 2010. East Alameda County Conservation Strategy. Final Draft. October. (ICF 00906.08.) San Jose, CA. Prepared for East Alameda County Conservation Strategy Steering Committee, Livermore, CA.

[93] City of Dublin, 2013b. Dublin Crossing Specific Plan Draft Environmental Impact Report. June. Available at: http://www.ci.dublin.ca.us/DocumentCenter/View/4739

[94] City of Dublin, 2016. Draft Environmental Impact Report for Kaiser Dublin Medical Center Project. January 28. Available at: http://dublinca.gov/DocumentCenter/View/12964.

[95] First Carbon Solutions, 2014. Shea Homes Sage Project Modified Initial Study/Addendum City of Livermore, Alameda County, California. May 9. Available at: http://laserfiche.cityoflivermore.net/WebLink8/0/doc/201662/Page1.aspx.

would occur in annual grasslands located north of I-580 near Croak Road, at the Isabel North Area and at the Cayetano Creek Area (Figure 3.I-4b). The Proposed Project would result in the loss of approximately 0.223 acre of aquatic breeding for CTS and approximately 0.326 acre for the CRLF (see Table 3.I-9). The DMU Alternative would impact up to approximately 74.61 acres of upland CTS habitat and approximately 83.12 acres of CRLF habitat. The DMU Alternative would result in the loss of approximately 0.167 acre of aquatic breeding for CTS and approximately 0.270 acre for the CRLF (see Table 3.I-9). These impacts would be reduced to a less-than-significant level with the implementation of **Mitigation Measure BIO-3.A**, which reduces project-level impacts on CTS and CRLF; **Mitigation Measure BIO-3.B**, which provides habitat compensation and enhancement consistent with USFWS guidance under the EACCS Biological Opinion; and **Mitigation Measure BIO-3.C**, which provides general protection measures for plants and wildlife. While impacts to CTS and CRLF upland habitat were identified in the cumulative impact scenario, no individual or cumulative impacts to CTS or CRLF breeding habitat were identified for projects on the cumulative project list (Table 3.I-13). In addition, each of the cumulative projects is required to comply with federal and State laws that protect CTS and CRLF, including the FESA and CESA, which will identify, avoid, and mitigate significant impacts to these species. Therefore, the loss of habitat for CTS and CRLF from the cumulative projects is collectively less than significant. With implementation of above-identified mitigation measures, potential impacts to CTS and CRLF from the Proposed Project and Build Alternatives would be minimized and mitigated in compliance with federal and State requirements. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future projects, would result in less-than-significant cumulative impacts to CTS and CRLF, and no additional mitigation measures are required. **(LS)**

Western Spadefoot

Conventional BART Project and Build Alternatives. No other cumulative projects were identified with potential impacts to western spadefoot; hence, no cumulative scenario impacts were identified for this species. Potential project-level impacts to western spadefoot would be mitigated to a less-than-significant level through the implementation of **Mitigation Measure BIO-3.A**, which provides measures during construction that would avoid and minimize the take of special-status amphibians, **Mitigation Measure BIO-3.C**, which provides general protection measures for plants and wildlife, and **Mitigation Measure BIO-4**, which provides specific measures to be implemented prior to construction to avoid and minimize the take of western spadefoot. With implementation of these measures, project-level impacts to western spadefoot would be minimized and/or avoided. The cumulative projects are expected to have no impact to this species. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future projects, would result in less-than-significant cumulative impacts to western spadefoot, and no additional mitigation measures are required. **(LS)**

Western Pond Turtle

Conventional BART Project and Build Alternatives. Of the projects identified in Table 3.I-12, only the Dublin Crossing Specific Plan project recognized potential project-level impacts to WPT.[96] The Dublin Crossing Specific Plan EIR proposed preconstruction surveys that would relocate WPT from active work areas to minimize the potential take of this species. The principal habitat for this species in the Livermore-Amador Valley occurs in drainages and channels that are seldom subject to project-level disturbance. The Proposed Project and Build Alternatives would impact potential aquatic habitat that could support WPT at several stream crossings where the I-580 Corridor Area would be relocated. This would result in small, less-than-significant loss of potential WPT habitat (potential impacts to wetlands, however, would be significant and are considered separately) and potential project-level impacts to individual turtles. Because high-quality habitat for WPT occurs in stream channels throughout the Dublin, Pleasanton, and Livermore areas, and the cumulative projects would not substantially alter or degrade upland or aquatic habitat used by this species, no cumulative-scenario impacts were identified to this species. In addition, each of the cumulative projects is required to comply with State laws that protect WPT, including CEQA protections that apply to species of special concern. Potential project-level impacts to WPT would be mitigated to a less-than-significant level through the implementation of **Mitigation Measure BIO-5**, which would require preconstruction surveys for WPT. With implementation of this measure, impacts related to WPT would be minimized and/or avoided. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future projects, would result in less-than-significant cumulative impacts to WPT, and no additional mitigation measures are required. **(LS)**

Western Burrowing Owl

Conventional BART Project and Build Alternatives. Among the projects identified in Table 3.I-13, the Dublin Crossing Specific Plan area supports occupied BUOW habitat, the Kaiser Dublin Medical Center EIR acknowledges the potential for BUOW to forage over the site, and 11 others were generally identified during ESA's review that provide potential foraging, nesting, or wintering habitat. The Dublin Crossing Specific Plan is the only site known to support active BUOW activity. BUOW are also generally known from the vicinity of Livermore Airport; hence, nearby projects on undeveloped land, including the Gillig Bus Manufacturing Project and Oaks Business Park Project, may provide potential nesting,

[96] City of Dublin, 2013b. Dublin Crossing Specific Plan Draft Environmental Impact Report. June. Available at: http://www.ci.dublin.ca.us/DocumentCenter/View/4739

foraging, and wintering opportunities for this species.[97] It is estimated that many or most of the projects identified in Table 3.I-13 could provide project-level mitigation to avoid and minimize potential impacts to BUOW. Such measures are identified for the Kaiser Dublin Medical Center, Dublin Crossing Specific Plan, and Shea Homes Sage Project.[98, 99] The Shea Homes Sage Project is the only project in Table 3.I-13 that provides compensatory mitigation to offset the loss of BUOW nesting and foraging habitat.[100] For the projects where a CEQA review was available, none were found to have a significant cumulative impact on BUOW. As identified in **Impact BIO-6** (Burrowing owl), it is estimated that the Proposed Project would result in the direct loss of up to approximately 161.98 acres of grassland habitat, including some areas that could support BUOW nesting, foraging, and/or wintering habitat. Potential project-level impacts to WPT would be mitigated to a less-than-significant level through the implementation of **Mitigation Measure BIO-6.A**, which provides measures to avoid and minimize the take of BUOW during construction and **Mitigation Measure BIO-6.B**, which provides habitat compensation and enhancement consistent with CDFW guidance. With implementation of these measures, project-level impacts related to BUOW would be minimized and/or avoided. In addition, each of the cumulative projects is required to comply with federal and State laws that protect BUOW, including the MBTA, Fish and Game Code, and CEQA protections that apply to species of special concern. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future projects, would result in less-than-significant cumulative impacts to BUOW, and no additional mitigation measures are required. **(LS)**

Nesting Raptors and Other Nesting Birds

Conventional BART Project and Build Alternatives. The potential for direct and indirect impacts to nesting birds is common to each of the cumulative projects identified in Table 3.I-13. Each of these projects is required to comply with federal and State laws that protect nesting birds, including the Fish and Game code and the MBTA, to avoid direct impacts to nesting raptors and nesting birds. For the Proposed Project and Build Alternatives, proposed activities during the nesting season could cause project-level impacts to raptors, and to special-status and common bird species. Potential project-level impacts to nesting raptors and other nesting birds would be mitigated to a

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[97] California Department of Fish and Wildlife (CDFW), 2016. Rarefind 5. Biogeographic Data Branch, California Natural Diversity Database, August 4.

[98] City of Dublin, 2013b. Dublin Crossing Specific Plan Draft Environmental Impact Report. June. Available at: http://www.ci.dublin.ca.us/DocumentCenter/View/4739

[99] City of Dublin, 2016. Draft Environmental Impact Report for Kaiser Dublin Medical Center Project. January 28. Available at: http://dublinca.gov/DocumentCenter/View/12964.

[100] First Carbon Solutions, 2014. Shea Homes Sage Project Modified Initial Study/Addendum City of Livermore, Alameda County, California. May 9. Available at: http://laserfiche.cityoflivermore.net/WebLink8/0/doc/201662/Page1.aspx.

less-than-significant level through the implementation of **Mitigation Measure BIO-7**, which would require the identification and avoidance of active nesting birds during nesting season. With implementation of this measure, impacts related to nesting raptors and other nesting birds would be minimized and/or avoided. In addition, each of the cumulative projects is required to comply with federal and State laws that protect nesting raptors and other nesting birds, which will identify, avoid, and mitigate significant impacts to these species. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future projects, would result in less-than-significant cumulative impacts to nesting raptors and other nesting birds, and no additional mitigation measures are required. **(LS)**

Pallid Bat and American Badger

Conventional BART Project and Build Alternatives. No other cumulative projects were identified with potential impacts to American badger or special-status bats; hence, no cumulative impacts were identified for these species. Under the Proposed Project and DMU Alternative, potential project-level impacts could occur in the Cayetano Creek Area for the American badger or in association with large eucalyptus trees on the Isabel South Area and in other study area trees and structures for the pallid bat. These species have not been identified from the study area; however, the Draft EIR analysis conservatively considered that they may be encountered based on the availability of potentially suitable habitat. Potential project-level impacts to American badger and special-status bats would be mitigated to less-than-significant levels through the implementation of **Mitigation Measure BIO-8**, which would require preconstruction surveys for pallid bat and **Mitigation Measure BIO-9**, which would require preconstruction surveys and avoidance measures for American badger. With implementation of these measures, project-level impacts related to pallid bat and American badger would be minimized and/or avoided. In addition, each of the cumulative projects is required to comply with State laws that protect WPT, including CEQA protections that apply to species of special concern. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future projects, would result in less-than-significant cumulative impacts to pallid bat and American badger, and no additional mitigation measures are required. **(LS)**

San Joaquin Kit Fox

Conventional BART Project and Build Alternatives. None of the cumulative projects identified in Table 3.I-13 report potential impacts to SJKF or their habitat. Upon ESA's review of the project list, three projects occur in or near areas where potential SJKF habitat was reported by the EACCS.[101] These include the Livermore Valley Charter School, Las Positas College, and Shea Homes – Sage Project. The Livermore Valley Charter School involved a 19-acre grassland site in an area that is dominated by similar development. While grasslands were present on this site, surrounding development makes it unlikely that SJKF would utilize this site. Similarly, Las Positas College improvements include eight new buildings, demolition of 15 buildings and temporary structures, and other improvements that are internal to the existing college footprint and are located adjacent to areas that are considered potential SJKF habitat. Direct impacts to SJKF or SJKF habitat loss are not expected from these actions. The Shea Homes – Sage Project, which is under construction, is located within historic SJKF habitat; however, potential direct impacts to SJKF and their habitat were not identified during the CEQA review.[102] Potential project-level impacts to SJKF would be mitigated to a less-than-significant level through the implementation of **Mitigation Measure BIO-10.A**, which provides measures to avoid and minimize the take of SJKF during construction and **Mitigation Measure BIO-10.B**, which provides habitat compensation and enhancement consistent with CDFW guidance under the EACCS. With implementation of this measure, project-level impacts related to SJKF would be minimized and/or avoided. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future projects, would result in less-than-significant cumulative impacts to SJKF, and no additional mitigation measures are required. **(LS)**

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 to special-status plants or wildlife during construction, and no additional mitigation measures, beyond those identified for the project impacts (Proposed Project and Build Alternatives) would be required.

Impact BIO-17(CU): Have a substantial adverse effect on State or federally protected wetlands (including but not limited to marsh, vernal pool, and coastal) or waters of the U.S. and/or waters of the State through direct removal, filling, hydrological interruption, or other means during construction under Cumulative Conditions.

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

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[101] ICF International, 2010. East Alameda County Conservation Strategy. Final Draft. October. (ICF 00906.08.) San Jose, CA. Prepared for East Alameda County Conservation Strategy Steering Committee, Livermore, CA.

[102] First Carbon Solutions, 2014. Shea Homes Sage Project Modified Initial Study/Addendum City of Livermore, Alameda County, California. May 9. Available at: http://laserfiche.cityoflivermore.net/WebLink8/0/doc/201662/Page1.aspx.

No Project Alternative. As described in **Impact BIO-11**, the No Project Alternative would have no impacts related to wetlands, waters of the U.S., and/or waters of the State during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project, DMU Alternative, and Express Bus/BRT Alternative. Most of the cumulative projects have no impacts on wetlands, waters of the U.S., and/or waters of the State as defined by Section 404 of the CWA. The Dublin Crossing Specific Plan Project proposed to realign portions of a stream channel; however, it did not identify the extent of jurisdictional wetlands that would be affected by the proposed project.[103] All of the other projects identified in Table 3.I-13 appear to occur in upland habitats that do not support wetlands, waters of the U.S., and/or waters of the State. Construction of the Proposed Project would result in the permanent fill and/or shading of an estimated 0.711 acre of wetlands, waters of the U.S., and/or waters of the State, approximately 0.693 acre under the DMU Alternative, or 0.540 acre under the Express Bus/BRT Alternative. Potential project-level impacts to wetlands, waters of the U.S., and/or waters of the State would be mitigated to a less-than-significant level through the implementation of both **Mitigation Measures BIO-11.A**, which would require wetlands and other waters avoidance and minimization of impacts and **Mitigation Measure BIO-11.B**, which would require compensatory mitigation for wetlands and other waters. With implementation of the above measures, project-level impacts to jurisdictional wetlands would be minimized and/or avoided by the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative. In addition, each of the cumulative projects is required to comply with federal and State laws that protect wetlands, waters of the U.S., and/or waters of the State, including the federal and State CWAs, Sections 1600–1607 of the California Fish and Game Code, and the Porter-Cologne Water Quality Control Act. Impacts to wetlands, waters of the U.S., and/or waters of the State are closely regulated and require comprehensive mitigation from the USACE, CDFW, and RWQCB. In addition, the majority of the cumulative projects occur in upland areas that do not support wetlands, waters of the U.S., and/or waters of the State; hence, the magnitude of the impact on wetlands/waters within the Livermore-Amador Valley from these projects is considered minor. Compliance with federal and State laws protecting these resources will ensure that the cumulative projects adequately avoid and mitigate significant impacts. As a result of the required federal and State permitting, impacts to wetlands, waters of the U.S., and/or waters of the State from cumulative projects are collectively less than significant. Within the context of these limited, fully mitigated impacts to wetlands, waters of the U.S., and/or waters of the State, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, in combination with past, present, and probable future projects, would result in less-than-significant

[103] City of Dublin, 2013b. Dublin Crossing Specific Plan Draft Environmental Impact Report. June. Available at: http://www.ci.dublin.ca.us/DocumentCenter/View/4739

cumulative impacts to wetlands, waters of the U.S., and/or waters of the State, and no additional mitigation measures are required. **(LS)**

Enhanced Bus Alternative. As described in **Impact BIO-3** above, the Enhanced Bus Alternative would have no impacts on State or federally protected wetlands or waters during construction. Therefore, the Enhanced Bus Alternative would not contribute to cumulative impacts. **(NI)**

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 to wetlands, waters of the U.S., and/or waters of the State during construction, and no additional mitigation measures, beyond those identified for the project impacts (Proposed Project, DMU Alternative, and Express Bu/BRT Alternative) would be required.

Impact BIO-18(CU): Have a substantial adverse effect on riparian habitat or sensitive natural communities identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service during construction under Cumulative Conditions.

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

No Project Alternative. As described in **Impact BIO-12**, the No Project Alternative would have no impacts related to riparian habitat or sensitive natural communities during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project, DMU Alternative, and Express Bus/BRT Alternative. For most cumulative projects in Table 3.I-13, no impacts were identified to riparian habitat or sensitive natural communities. The Dublin Crossing Specific Plan Project proposes to realign portions of a stream channel that may support emergent vegetation; however, the DEIR did not identify impacts to any riparian habitat or sensitive natural communities.[104] All of the other projects identified in Table 3.I-12 appear to occur in upland, non-riparian habitats that do not support sensitive natural communities. The Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would each impact riparian habitat in named and unnamed drainages to varying degrees, and there is potential that unsurveyed portions of the Proposed Project and DMU Alternative sites could support a small amount of unidentified sensitive natural communities. Potential impacts to sensitive natural

[104] Ibid.

communities appear to be unique to the Proposed Project and Build Alternatives and were not identified for other cumulative projects. Potential project-level impacts to sensitive natural communities would be mitigated to a less-than-significant level through the implementation of **Mitigation Measure BIO-12.A**, which requires measures during construction to avoid and minimize the loss of sensitive natural communities, and **Mitigation Measure BIO-12.B**, which requires measures to minimize and compensate for impacts to sensitive natural communities.

In addition, each of the cumulative projects is required to comply with federal and State laws that protect sensitive natural communities, including the federal and State CWAs (for wetland-associated plant communities) and protections afforded to CDFW-recognized special-status natural communities under CEQA. Impacts to sensitive natural communities that occur in aquatic environments are closely regulated and require comprehensive mitigation from the USACE, CDFW, and RWQCB. Most of the cumulative projects occur in areas that do not support sensitive natural communities; hence, the magnitude of the impact on these resources within the Livermore-Amador Valley from these projects is considered limited. Compliance with federal and State laws protecting these resources will ensure that the cumulative projects adequately avoid and mitigate significant impacts. As a result of the required federal and State permitting, impacts to sensitive natural communities from cumulative projects are collectively less than significant. Within this context of relatively limited, mitigated impacts to sensitive natural communities, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have a limited contribution to cumulative impacts that would be fully mitigated through implementation of a comprehensive mitigation and monitoring plans that would be subject to USACE, CDFW, and RWQCB review and approval. With implementation of these measures, impacts related to sensitive natural communities would be minimized and fully mitigated. Therefore, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, in combination with past, present, and future projects, would have less-than-significant cumulative impacts to riparian habitat and sensitive natural communities, and additional mitigation measures are not required. **(LS)**

Enhanced Bus Alternative. As described in **Impact BIO-12** above, the Enhanced Bus Alternative would have no impacts on riparian habitats or sensitive natural communities during construction. Therefore, the Enhanced Bus Alternative would not contribute to cumulative impacts. **(NI)**

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 to riparian habitats or sensitive natural communities during construction, and no additional mitigation measures, beyond those identified for the project impacts (Proposed Project, DMU Alternative, and Express Bus/BRT Alternative) would be required.

Impact BIO-19(CU): Interfere with the movement of native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites during construction under Cumulative Conditions.

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

No Project Alternative. As described in **Impact BIO-13**, the No Project Alternative would have no impacts related to the movement of resident or migratory fish species or use of native wildlife nursery sites during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and DMU Alternative. Of those projects identified in Table 3.I-13, only the Shea Homes Sage Project CEQA analysis identified potential impacts on the movement of native resident or migratory fish or wildlife species. The EIR prepared for that project concluded that such interference would be less than significant following the dedication of conservation easements for on-site drainages and funding of open space preservation and management.[105] The analysis found that the Shea Homes Sage Project area is not a wildlife movement corridor, as this site is surrounded by Isabel Avenue to the west, Portola Avenue to the north and east, and I-580 to the south, which serve as formidable barriers to wildlife movement. Additionally the existing Arroyo las Positas wildlife movement corridor would not be modified by the project. Hence, the Proposed Project would not reduce wildlife movement opportunities when considered in conjunction with the Shea Homes – Sage Project.[106]

Among the other projects considered in Table 3.I-13, no other projects were identified with impacts to the movement of native resident or migratory fish or wildlife species, or with established native resident or migratory wildlife corridors, or that would impede the use of native wildlife nursery sites. In combination with these projects, neither the Proposed Project nor DMU Alternative would substantially modify or reduce fish or wildlife movement opportunities, or interfere with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites beyond those identified at the project-level analysis. Therefore, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, in combination with past, present, and probable future projects, would result in less-than-significant cumulative impacts to movement of native resident or migratory fish or wildlife species, established native resident or migratory wildlife

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[105] First Carbon Solutions, 2014. Shea Homes Sage Project Modified Initial Study/Addendum City of Livermore, Alameda County, California. May 9. Available at: http://laserfiche.cityoflivermore.net/WebLink8/0/doc/201662/Page1.aspx.

[106] Ibid.

corridors, movement of fish species, or the use of native wildlife nursery sites, and no additional mitigation measures are required. **(LS)**

Express Bus/BRT Alternative and Enhanced Bus Alternative. As described in **Impact BIO-13** above, the Express Bus/BRT Alternative and the Enhanced Bus Alternative would have no impacts to movement of native resident or migratory fish or wildlife species, established native resident or migratory wildlife corridors, movement of fish species, or the use of native wildlife nursery sites during construction. Therefore, the Express Bus/BRT Alternative and the Enhanced Bus Alternative would not contribute to cumulative impacts. **(NI)**

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 to wildlife movement impacts, and therefore, no mitigation measures are required.

Impact BIO-20(CU): Result in loss of protected trees identified in local policies or ordinances during construction under Cumulative Conditions.

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

No Project Alternative. As described in **Impact BIO-15**, the No Project Alternative would have no impacts related to any local policies or ordinances protecting biological resources during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project, DMU Alternative, and Express Bus/BRT Alternative. As described in **Impact BIO-15** above, BART is exempt under State law from compliance with local land use ordinances, including local tree ordinances that have been established to protect native trees, heritage trees, and street trees. Although not legally required to comply with local ordinances, BART considers the protection of trees a priority and considers that removal of trees that are protected under local ordinances would constitute a significant impact.

Among the other projects considered in Table 3.I-13, no other projects were identified with significant impacts to protected trees. The Proposed Project would have a minor impact on protected trees, with impacts mostly limited to ornamental trees and street trees that would be replaced consistent with local tree protection ordinances. Potential project-level impacts to protected trees would be mitigated to a less-than-significant level through the implementation of **Mitigation Measure BIO-15**, which provides that trees within the construction footprint that are protected by local ordinances shall be enumerated and protected, if to be retained, or replaced. While the Proposed Project, DMU

Alternative, and Express Bus/BRT Alternative would be subject to the above mitigation measure, other future development would also be subject to the same local ordinances and policies in the cities of Dublin, Pleasanton, and Livermore, and in Alameda County, and measures similar to those identified below would be implemented, should a potentially significant impact to trees occur. Therefore, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, in combination with past, present, and probable future projects, would result in less-than-significant cumulative impacts to protected trees and heritage trees, and no additional mitigation measures are required. **(LS)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would have no impacts on protected trees as described in **Impact BIO-15** above. Therefore, this alternative would not contribute to cumulative impacts to trees, heritage trees, or tree preservation. **(NI)**

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 to protected tree impacts during construction, and no additional mitigation measures, beyond those identified for the project impacts (Proposed Project, DMU Alternative, and Express Bus/BRT Alternative) would be required.

(2) Operational Impacts

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

(a) Operations – Project Analysis

Impact BIO-21: Have a substantial adverse effect on plant or wildlife species, riparian habitat or other sensitive natural community, protected wetlands or waters, migratory wildlife corridors, or protected trees during operations.

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

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 the Proposed Project or any of the Build Alternatives. The planned and programmed transportation improvements and continued land use development under the No Project Alternative could adversely impact biological resources during operations. 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 biological resources during operations. **(NI)**

Conventional BART Project and DMU Alternative. Operation of the Proposed Project or DMU Alternative would not result in direct or indirect impacts to biological resources, beyond those described below for construction activities, as operations would not result in additional ground disturbing activities. While the Proposed Project or DMU Alternative would introduce new permanent facilities/structures and operation of trains, buses, and other sources of disturbance associated with human activity and transit use—such as traffic and noises—most of this activity would occur in areas that are already urbanized and would not create additional impacts to sensitive or regulated wildlife, botanical, or wetland resources. No other cumulative projects were identified that would interfere with the movement of native resident or migratory fish or wildlife species, or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.

However, under the Proposed Project and DMU Alternative, operational activities at the storage and maintenance facility would occur in a less-urbanized area—in the Cayetano Creek Area. Maintenance activities would typically occur within buildings or structures at the storage and maintenance facility. Train activity would also occur within the fenced storage yard and on the tail tracks throughout the day, and particularly in the morning and evening hours when many animals are active. Maintenance activities and train operations would not influence the behavior of smaller animals such as amphibians and small mammals, which are largely unmindful of such activities. However, such activities, which would be a change from the existing conditions that have little or no human activity in the area, would be detectable to larger, mobile wildlife such as grassland birds, raccoon, gray fox, coyote, deer, and similar species. While some species, possibly including deer, could avoid the edge of facilities during periods of active train movement, it is anticipated that these wildlife species would continue using the grasslands and open space around the tail tracks and fenced storage and maintenance facility, as they would become habituated to these operations. Therefore, during operation, the Proposed Project and DMU Alternative would have less-than-significant impacts to biological resources, and no mitigation measures are required. **(LS)**

Express Bus/BRT Alternative and Enhanced Bus Alternative. Similar to the operation of the Proposed Project described above, the Express Bus/BRT Alternative and Enhanced Bus Alternative would not result in direct or indirect impacts to biological resources, beyond those described below for construction activities, as operations would not result in additional ground disturbing activities. In addition, while these alternatives would introduce new permanent facilities/structures and operation of trains, buses, and other sources of disturbance associated with human activity and transit use—such as traffic and noises—this activity would occur in areas that are already urbanized and would not create additional impacts to sensitive or regulated wildlife, botanical, or wetland resources. Furthermore, no other cumulative projects were identified that would interfere with the movement of native resident or migratory fish or wildlife species, or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. Therefore, during operation, the Express Bus/BRT Alternative and Enhanced Bus Alternative would have no impacts to biological resources, and no additional mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts to biological resources during operations, and therefore, no mitigation measures are required.

(b) Operations – Cumulative Analysis

The geographic study area for cumulative impacts is the area within approximately a 2.0-mile radius of the collective footprint, to ensure that the analysis for biological resources considered species-relevant areas and potential associated cumulative projects.

Cumulative projects identified in Section 3.A, Introduction to Environmental Analysis, and Appendix E that are considered in this cumulative analysis are listed in Table 3.1-13.

Impact BIO-22(CU): Have a substantial adverse effect on plant or wildlife species, riparian habitat or other sensitive natural community, protected wetlands or waters, migratory wildlife corridors, or protected trees during operations under Cumulative Conditions.

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

No Project Alternative. As described in **Impact BIO-21**, the No Project Alternative would have no impacts related to adverse effects on plant or wildlife species, riparian habitat or other sensitive natural community, protected wetlands or waters, migratory wildlife corridors, or protected trees during operations. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and DMU Alternative. As described in **Impact BIO-21** above, the Proposed Project and DMU Alternative would have a less-than-significant impact on biological resources during operations. In addition, the cumulative projects considered in Table 3.I-13, would have no operational impacts to plant or wildlife species, riparian habitat or other sensitive natural community, protected wetlands or waters, migratory wildlife corridors, or protected trees. Therefore, the Proposed Project and DMU Alternative, in combination with past, present, and probable future projects, would result in less-than-significant cumulative impacts to biological resources, and no additional mitigation measures are required. **(LS)**

Express Bus/BRT Alternative and Enhanced Bus Alternative. As described in **Impact BIO-21**, the Express Bus/BRT Alternative and Enhanced Bus Alternative would have no impacts related to adverse effects on plant or wildlife species, riparian habitat or other sensitive natural community, protected wetlands or waters, migratory wildlife corridors, or protected trees during operations. Therefore, the Express Bus/BRT Alternative and Enhanced Bus Alternative would not contribute to cumulative impacts. **(NI)**

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 to on plant or wildlife species, riparian habitat or other sensitive natural community, protected wetlands or waters, migratory wildlife corridors, or protected trees during operations, and therefore, no mitigation measures are required.

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).

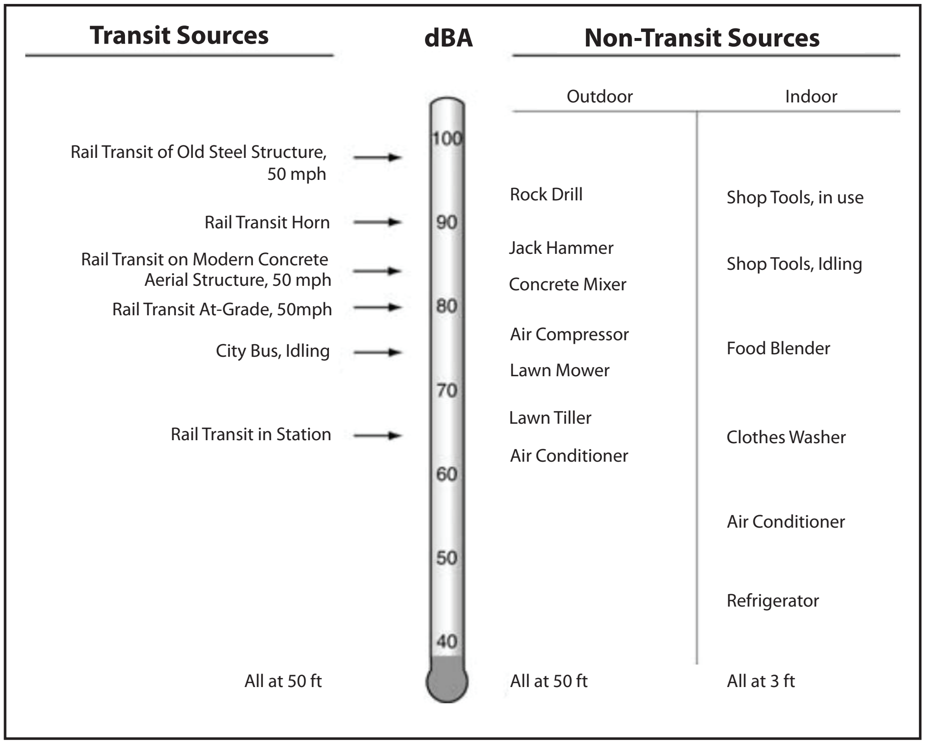
Vibration levels near transit systems are influenced by several factors, which may include the following:

- 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)

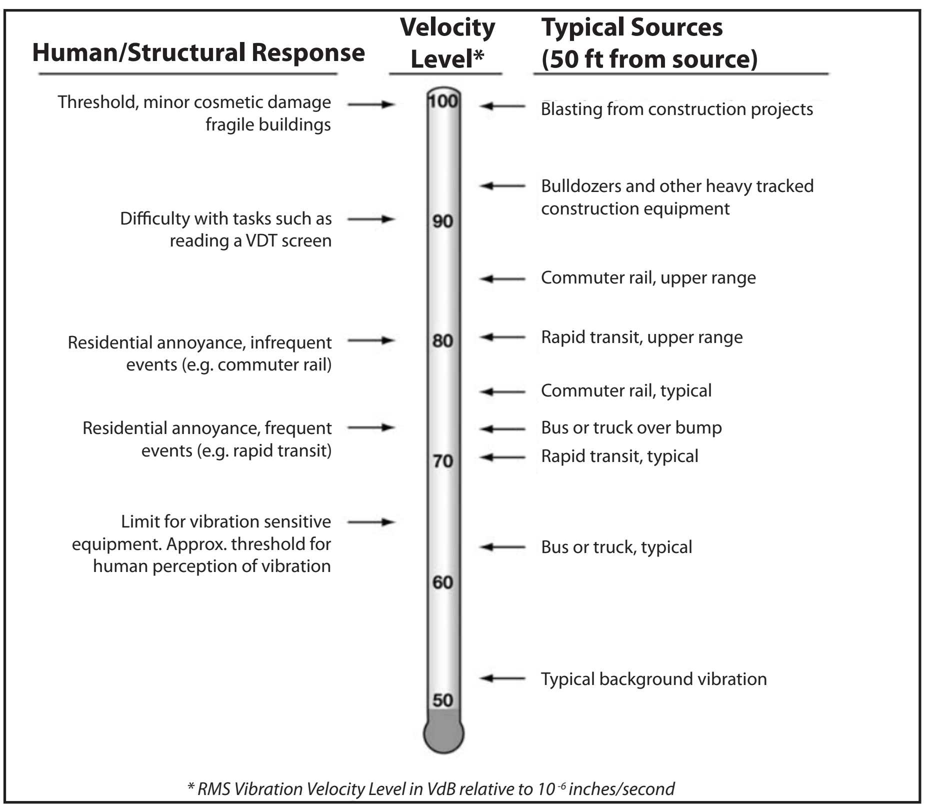
[4] Wilson Ihrig Associates (WIA), 2010. BART - Hayward Maintenance Complex Noise and Vibration Technical Report. May.

[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

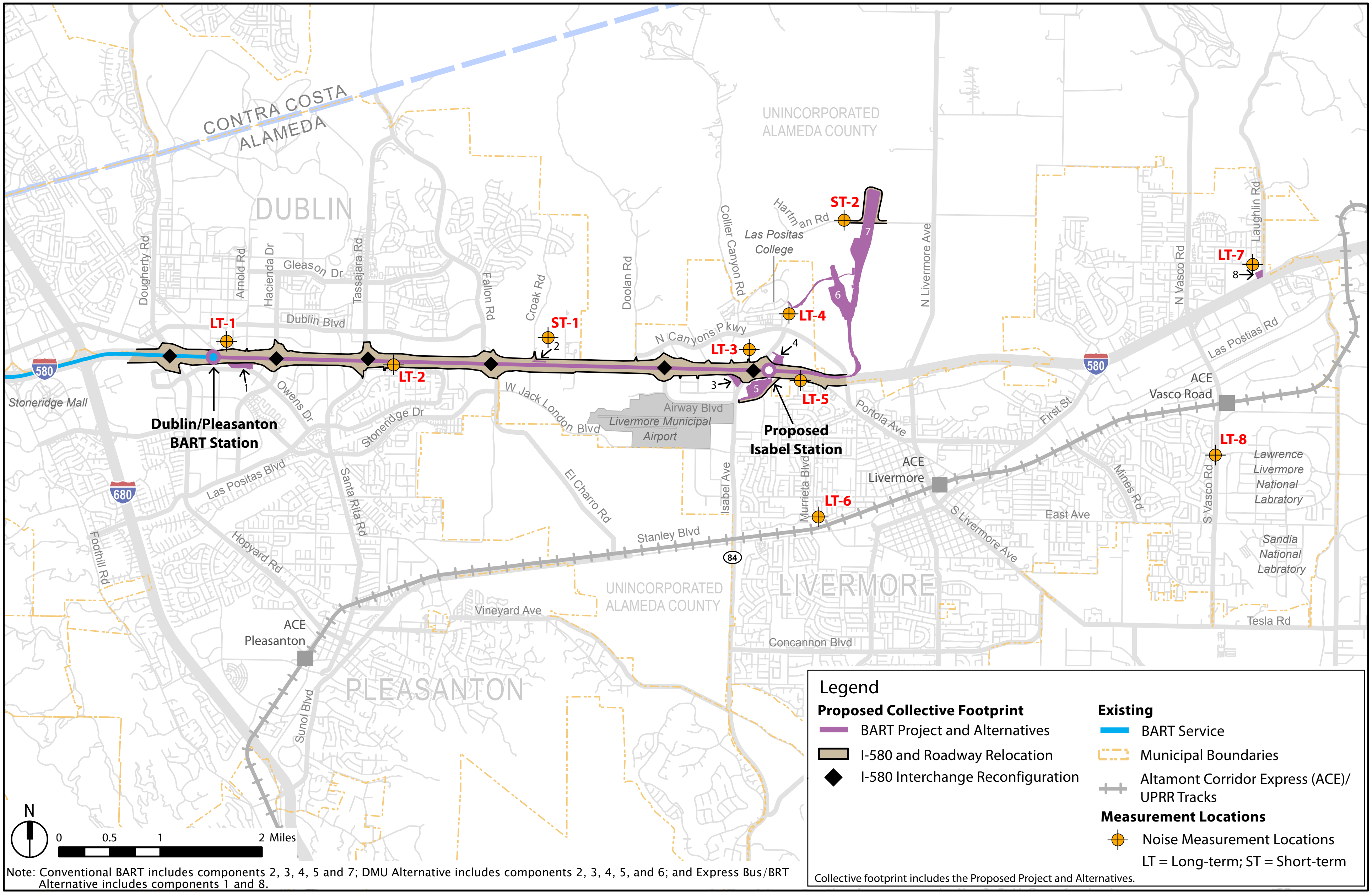
TABLE 3.J-1 SUMMARY OF AMBIENT NOISE MEASUREMENTS IN THE STUDY AREA

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).



Source: Arup, 2017.

BART to Livermore Extension Project EIR

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.

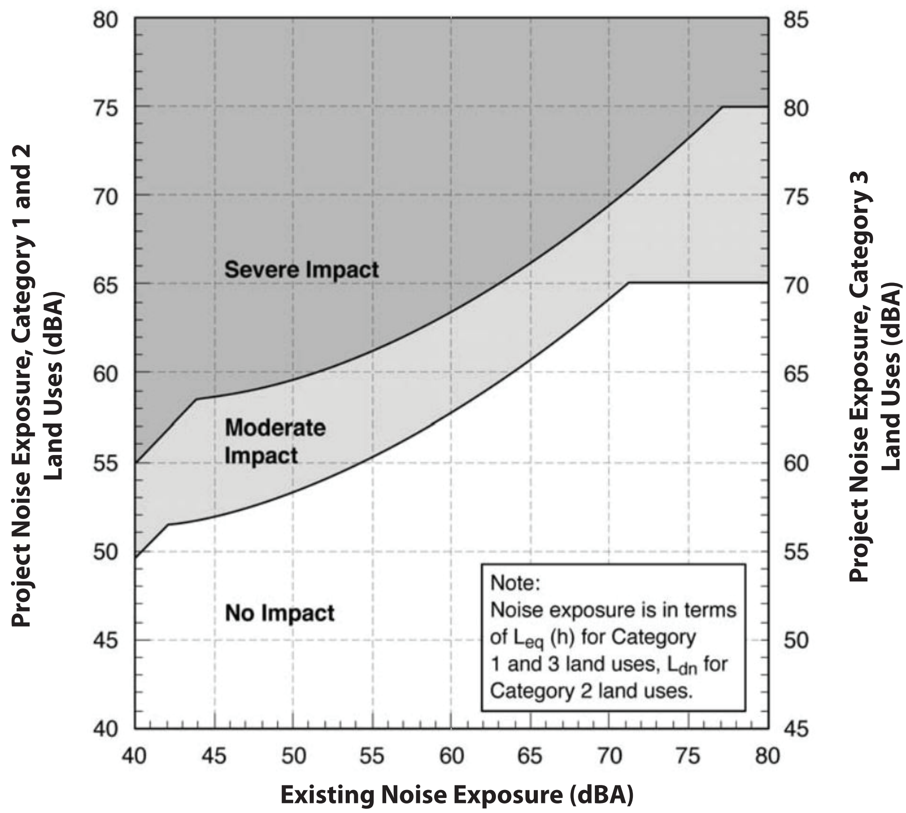
The methodology of both the FTA and the Federal Interagency Committee on Noise[7] uses more stringent thresholds for environments that are already noise impacted. Consequently, for noise environments where the ambient noise level is 65 dBA day-night average sound level or less, the significance threshold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

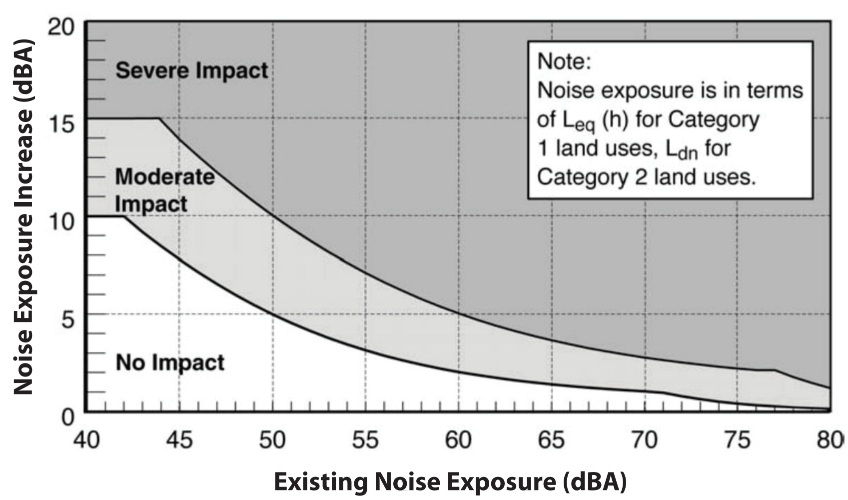
[6] Ibid.

[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.

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

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

	Groundborne Vibration Impact Levels (VdB)			
Land Use Category	**Frequent Events[a]**	**Occasional Events[b]**	**Infrequent Events[c]**	**Groundborne Noise (dBA)**
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.

K. AIR QUALITY

1. Introduction

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

Projects such as the BART to Livermore Extension Project that result in transit service improvements typically provide regional air quality benefits by reducing the amount of vehicles on the roads. However, transit projects can also result in elevated emissions and localized air pollutant concentrations due to increased local automobile congestion around stations and other project operations such as feeder bus service, emergency generators, architectural coating application, and cleaning and maintenance of transport vehicles.

This air quality analysis is conducted to (1) quantify the regional and localized air pollutant emission changes associated with the BART to Livermore Extension Project; and (2) compare those changes to air quality standards established by local, State of California (State), and federal air quality regulatory agencies as well as to significance thresholds recommended by those agencies. Where applicable, mitigation measures that would reduce impacts are also discussed. The assessment methods used in this section are consistent with the current recommendations of the Bay Area Air Quality Management District (BAAQMD) and the California Air Resources Board (CARB).

For the purpose of this air quality analysis, the study area is defined as the area within an approximately 3,280-foot radius (1,000 meters) around the collective footprint, which is the combined footprints of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative. Construction of the bus infrastructure improvements for the Enhanced Bus Alternative, as well as for the feeder buses for the Proposed Project and other Build Alternatives (which are anticipated to be within existing street rights-of-way) is addressed programmatically in this analysis, as described in Chapter 2, Project Description. For the bus service operations under the Enhanced Bus Alternative, as well as under the Proposed Project and other Build Alternatives, mass emissions are quantified based on anticipated routes (in and beyond the collective footprint).[1] The health risks and concentrations of particulate matter (PM) with an aerodynamic diameter of less than 2.5 microns ($PM_{2.5}$) from

[1] Arup, 2017a. BART to Livermore Extension Bus and Overall Operations and Maintenance Cost Technical Memorandum. July.

bus service are assessed for bus operations near the Dublin/Pleasanton BART Station (Dublin/Pleasanton Station) and the proposed Isabel BART Station (Isabel Station); these locations were chosen for the assessment because they are expected to have the highest occurrence of impacts due to the multiple bus lines accessing the stations for passenger pick-up and drop-off. Local concentrations of criteria pollutants are not estimated, as criteria pollutants (with the exception of $PM_{2.5}$) tend to have a potential impact on a regional rather than local level.

Comments pertaining to air quality were received in response to the Notice of Preparation for this EIR and during the public scoping meeting held for the EIR. These comments included a request for an analysis of the impacts on sensitive receptors in the city of Pleasanton near the Proposed Project and Alternatives and an analysis of the effects of ozone, particulates, and carbon monoxide (CO) on residents, particularly near the proposed Isabel Station.

2. Existing Conditions

The BART to Livermore Extension Project would be located in Alameda County, which is part of the nine-county San Francisco Bay Area Air Basin (SFBAAB). While overall air quality in the SFBAAB is generally good, it does not achieve either the State or federal standards for certain pollutants, as described in the analysis below.

This subsection describes the existing conditions for air quality in the SFBAAB, as well as local air quality conditions; the environmental setting; climate and meteorology; air pollutants and local air quality; existing sources of air pollution; and sensitive receptors.

a. Climate and Meteorology

Ambient concentrations of air pollutants are determined by the amount of emissions released by sources and the atmosphere's ability to transport and dilute those emissions. Natural factors that affect transport, pollutant transformation, and dilution include terrain, wind, atmospheric stability, and sunlight. Existing air quality conditions within the project corridor are determined by such natural factors as topography, meteorology, and climate, as well as the amount of emissions released by existing sources.

The environmental factors that affect ambient air pollutant concentrations are discussed below.

(1) Temperature Inversions

Temperature inversion layers, also called thermal inversions, are areas in which the normal decrease in air temperature with increasing altitude is reversed, i.e., air at higher altitudes is warmer than the air directly below it. The thickness of inversion layers varies considerably, from less than 100 feet to several thousands of feet. Thermal inversions limit the vertical dispersion of air pollutants and can trap pollutants close to the ground. These inversions occur most often when a warmer, less dense air mass flows over a colder, denser air mass close to the ground. The highest air pollutant concentrations in the San Francisco Bay Area (Bay Area) generally result from two types of such inversions:

- Subsidence inversions, a regional phenomenon that most commonly occurs in the Bay Area during summer and fall, when descending warmer air from the subtropical high-pressure cell centered over the Pacific Ocean caps the cooler marine air layer nearer the surface
- Radiation inversions, which are more localized and more typical of winter nights in interior parts of the Bay Area where air in contact with the ground cools more rapidly than the layer of air above it

(2) Topography and Its Effect on Wind Speeds and Patterns

Low-wind-speed conditions limit horizontal air dispersion and can result in the buildup of air pollutants. Poor air quality under low-wind-speed conditions can be especially pronounced in interior valleys, where the topography also contributes to the restriction of air movement and pollutant dispersion.

(3) Solar Radiation and Its Impact on Photochemical Pollutants

The higher intensity and longer duration of solar radiation during the Bay Area's summer months provide ultraviolet light and warm temperatures that promote the formation of secondary photochemical pollutants (e.g., ozone). Because sunlight intensity and summer temperatures are much higher in many of the Bay Area's inland valleys than in coastal areas, the inland areas are especially prone to photochemical air pollution. In contrast, photochemical pollutants do not usually reach significant levels anywhere in the Bay Area during the winter, when temperatures are lower and daylight hours are shorter.

Consequently, the inland areas of the Bay Area, which experience higher temperatures in the summer and lower temperatures in the winter, and which are sheltered from the higher winds and frequent fog that affect the coastal areas, tend to have the highest air pollution potential. Furthermore, because air pollutant levels depend on the amount of pollutants emitted locally or from upwind sources, ambient air pollution levels in inland areas tend to be higher where they are subject to emissions transported by the prevailing winds from populous upwind areas.

(4) Bay Area Climate

The Bay Area has a Mediterranean-type climate, which is influenced by a zone of high atmospheric pressure centered over the northeastern Pacific Ocean that lasts throughout much of the year. This high-pressure zone keeps storms from affecting the Bay Area in the summer, then weakens and shifts southward in the winter, allowing the passage of winter storm systems. For most of the year, prevailing winds in the Bay Area are from the west.

(5) Local Topography and Meteorology

The Livermore Valley is a sheltered inland valley near the eastern border of the SFBAAB. The western side is bordered by foothills (1,000 to 1,500 feet high) with two gaps—Hayward Pass and Niles Canyon—connecting the valley to the central SFBAAB. The eastern side of the valley is also bordered by foothills with one major passage to the San Joaquin Valley, Altamont Pass, and several secondary passages. The Black Hills and Mount Diablo lie to the north. A northwest-to-southeast channel connects the Diablo Valley to the Livermore Valley. The southern side of the Livermore Valley is bordered by mountains approximately 3,000 to 3,500 feet high.

As mentioned above, during the summer months, temperature inversions allow pollutants to become trapped and concentrated. Average summer temperatures in the Livermore Valley range from the high 80s to the low 90s, with extremes in the 100s. At other times in the summer, strong Pacific high-pressure cells from the west coupled with hot inland temperatures cause a strong onshore pressure gradient (a significant change in air pressure over a relatively short distance) that produces a strong afternoon wind. With a weak temperature inversion, air moves over the hills around Altamont Pass with ease, dispersing pollutants.

In the winter, with the exception of regional storms moving through the area, air movement is often dictated by local conditions. At night and early morning, especially under clear, calm, and cold conditions, gravity drives cold air downward. The cold air drains off the hills and moves into the gaps and passes. On the eastern side of the valley, the prevailing winds blow from north, northeast, and east out of Altamont Pass. Winds are light during the late night and early morning hours. Winter daytime winds sometimes flow from the south through Altamont Pass to the San Joaquin Valley. Average winter temperatures range from the high 50s to the low 60s, while lows are from the mid to high 30s, with extremes in the high teens and low 20s.

Air pollution potential is high in the Livermore Valley, especially for photochemical pollutants in the summer and fall, with high temperatures increasing the potential for the buildup of ozone The valley not only traps locally generated pollutants, but receives ozone and ozone precursors carried on winds from San Francisco, Alameda, Contra Costa, and Santa Clara counties. In early fall, winds commonly flow toward the northeast, carrying ozone west from the San Joaquin Valley to the Livermore Valley.

During the winter, the sheltering effect of the valley, its distance from moderating water bodies, and the presence of a strong high-pressure system contribute to the development of strong, surface-based temperature inversions. Pollutants such as CO and PM—

generated by motor vehicles, fireplaces, and agricultural burning—can become concentrated.[2]

Based on 2011 to 2015 meteorological data, prevailing winds at the Livermore Airport are westerly and west-north-westerly, with secondary winds (less than 15 percent) from the east-northeast.[3, 4] The Livermore Airport station is the closest station to the study area, and 2011 to 2015 is the most recent 5-year period for which meteorological data from that station are available.

b. Air Pollutants and Local Air Quality

(1) Federal and State Ambient Air Quality Standards

The United States Environmental Protection Agency (EPA) and the CARB have established health-based ambient air quality standards for several different pollutants. The EPA sets National Ambient Air Quality Standards (NAAQS) for the following seven pollutants, known as criteria pollutants: ozone, CO, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), PM with an aerodynamic diameter of less than 10 microns (PM_{10}), $PM_{2.5}$, and lead.

In addition, the CARB has established California Ambient Air Quality Standards (CAAQS) standards for the criteria pollutants, as well as for sulfate, visibility reducing particles, hydrogen sulfide, and vinyl chloride. The CAAQS are generally stricter than the NAAQS.

Areas can be designated as (1) attainment, where criteria pollutant concentrations are below the standards; (2) nonattainment, where criteria pollutant levels exceed the standards; (3) marginal nonattainment, where pollutant concentrations exceed the standards by a small amount; and (4) unclassified or unclassified/attainment, where insufficient data have been collected to determine classification. The attainment statuses of the SFBAAB are presented in Table 3.K-1 below.

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[2] Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en, accessed May 2017.

[3] National Climatic Data Center (NCDC), 2016a. TD-3505 Hourly Dataset. ASOS Station KLVK (Livermore Airport, WMO 724927, WBAN 23285). National Oceanic and Atmospheric Administration, National Centers for Environmental Information. Available at: ftp://ftp.ncdc.noaa.gov/pub/data/noaa/, accessed March 9, 2016. [Subset used: January 2011–December 2015.]

[4] National Climatic Data Center (NCDC), 2016b. DS-6405 1-Minute Dataset. ASOS Station KLVK (Livermore Airport, WBAN 23285). National Oceanic and Atmospheric Administration, National Centers for Environmental Information. Available at: ftp://ftp.ncdc.noaa.gov/pub/data/asos-onemin/, accessed March 9, 2016. [Subset used: January 2011–December 2015.]

TABLE 3.K-1 NATIONAL AND CALIFORNIA AMBIENT AIR QUALITY STANDARDS, EFFECTS, AND SOURCES

		State Standard[a]		National Standard[b]			
Pollutant	Averaging Time	Concen-tration	Attainment Status	Concen-tration	Attainment Status	Pollutant Health and Atmospheric Effects	Major Pollutant Sources
Ozone (O_3)	1-Hour 8-Hour	0.09 ppm 0.070 ppm	N N	[c] 0.070 ppm	[c] MN	High concentrations can directly affect lungs, causing irritation. Long-term exposure may cause damage to lung tissue.	Formed when ROGs and NO_X react in the presence of sunlight. Major sources include on-road motor vehicles, solvent evaporation, and commercial industrial mobile equipment.
Carbon Monoxide (CO)	1-Hour 8-Hour	20 ppm 9.0 ppm	A A	35 ppm 9 ppm	A A	Classified as a chemical asphyxiate, CO interferes with the transfer of fresh oxygen to the blood and deprives sensitive tissues of oxygen.	Internal combustion engines, primarily gasoline-powered motor vehicles.
Nitrogen Dioxide (NO_2)	1-Hour Annual	0.18 ppm 0.030 ppm	A -	0.10 ppm 0.053 ppm	U A	Irritating to eyes and respiratory tract. Colors atmosphere reddish-brown.	Motor vehicles, petroleum-refining operations, industrial sources, aircraft, ships, and railroads.
Sulfur Dioxide (SO_2)	1-Hour 3-Hour 24-Hour Annual	0.25 ppm – 0.04 ppm –	A - A -	0.075 ppm [d] 0.14 ppm [e] 0.030 ppm [e]	A - A [e] A [e]	Irritates upper respiratory tract; injurious to lung tissue. Can yellow the leaves of plants, destructive to marble, iron, and steel. Limits visibility and reduces sunlight.	Fuel combustion, chemical plants, sulfur recovery plants, and metal processing.
Respirable Particulate Matter (PM_{10})	24-Hour Annual	50 $\mu g/m^3$ 20 $\mu g/m^3$	N N	150 $\mu g/m^3$ [f]	U [f]	May irritate eyes and respiratory tract, and cause decreases in lung capacity, increases in certain cancers, and increased mortality. Produces haze and limits visibility.	Dust and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g., wind-raised dust and ocean sprays).

TABLE 3.K-1 NATIONAL AND CALIFORNIA AMBIENT AIR QUALITY STANDARDS, EFFECTS, AND SOURCES

		State Standard[a]		National Standard[b]			
Pollutant	**Averaging Time**	**Concen-tration**	**Attainment Status**	**Concen-tration**	**Attainment Status**	**Pollutant Health and Atmospheric Effects**	**Major Pollutant Sources**
Fine Particulate Matter ($PM_{2.5}$)	24-Hour Annual	– 12 μg/m³	– N	35 μg/m³ 12 μg/m³	N U/A	Increases respiratory disease, lung damage, cancer, and premature death. Reduces visibility and results in surface soiling.	Fuel combustion in motor vehicles, equipment, and industrial sources; residential and agricultural burning. Also formed from photochemical reactions of other pollutants, including NO_x, SO_2, and organics.
Lead	30-day Average Calendar Quarter Rolling 3-Month Average	1.5 μg/m³ – –	A – –	– 1.5 μg/m3 h 0.15 μg/m³	– A[h] U/A	Disturbs gastrointestinal system and causes anemia, kidney disease, and neuromuscular and neurological dysfunction.	Present source: lead smelters, battery manufacturing and recycling facilities. Past source: combustion of leaded gasoline.
Sulfates	24-Hour	25 μg/m³	A	–	–	Decrease in ventilator function, aggravation of asthmatic symptoms, and increased risk of cardio-pulmonary disease. Degrades visibility and can harm ecosystems and damage materials due to acidity.	Combustion of petroleum-derived fuels that contain sulfur.
Hydrogen Sulfide	1-Hour	0.03 ppm (42 μg/m³)	U	–	–	Disagreeable odor.	Bacterial decomposition of sulfur-containing organic substances.
Vinyl Chloride	24-Hour	0.010 ppm (26 μg/m³)	-	–	–	Central nervous system effects such as dizziness, drowsiness, and headaches. Long-term exposure to vinyl chloride through inhalation and oral exposure causes liver damage, can increase risk of cancer.	Used to make polyvinyl chloride plastic and vinyl products. Has been detected near landfills, sewage plants, and hazardous waste sites due to microbial breakdown of chlorinated solvents.

TABLE 3.K-1 NATIONAL AND CALIFORNIA AMBIENT AIR QUALITY STANDARDS, EFFECTS, AND SOURCES

		State Standard[a]		National Standard[b]			
Pollutant	**Averaging Time**	**Concen-tration**	**Attainment Status**	**Concen-tration**	**Attainment Status**	**Pollutant Health and Atmospheric Effects**	**Major Pollutant Sources**
Visibility Reducing Particles	8-Hour	[i]	U	–	–	Visibility impairment.	Consists of suspended PM, a complex mixture of tiny particles that consists of dry solid fragments, solid cores with liquid coatings, and small droplets of liquid.

Notes: -- = not applicable; ROG = reactive organic gas; NO_x = oxides of nitrogen; SOx = oxides of sulfur; ppm = parts per million; µg/m³ = micrograms per cubic meter. A = Attainment; N = Nonattainment; MN = Marginal Nonattainment; U = Unclassified; U/A = Unclassified/Attainment (insufficient data collected to determine classification; generally indicates low concern for the pollutant levels).

[a] California standards for ozone, CO (except Lake Tahoe), SO_2 (1-hour and 24-hour), NO_2, and PM_{10} are values not to be exceeded. The standards for Lake Tahoe CO and lead are not to be equaled or exceeded. If the standard is for a 1-hour, 8-hour, or 24-hour average (i.e., all standards except for lead and the PM_{10} annual standard), some measurements may be excluded; in particular, measurements determined by the CARB to occur less than once a year on average are excluded. The Lake Tahoe CO standard is 6.0 ppm, which is two-thirds of the national and State standard.

[b] National standards shown are the primary standards designed to protect public health. The national primary standards reflect the level of air quality necessary, with an adequate margin of safety, to protect the public health. National standards other than for ozone, particulates, and those based on annual averages are not to be exceeded more than once a year. The 1-hour ozone standard is attained if, during the most recent 3-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than 1. The 8-hour ozone standard is attained when the 3-year average of the fourth highest daily concentrations is 0.075 ppm or less. The 24-hour PM_{10} standard is attained when the 3-year average of the 99th percentile of monitored concentrations is less than 150 µg/m³. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of the 98th percentile is less than 35 µg/m³.

[c] The national 1-hour ozone standard was revoked on June 15, 2005.

[d] The national secondary 3-hour SO_2 standard is 0.5 ppm.

[e] On June 2, 2010, the 1971 national annual and 24-hr SO_2 standards were revoked. However, these standards remain in effect until 1 year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

[f] The national annual PM_{10} standard was revoked in 2006.

[g] The national secondary annual $PM_{2.5}$ standard is 15 µg/m³. On December 14, 2012, the national annual $PM_{2.5}$ primary standard was lowered from 15 µg/m³ to 12.0 µg/m³.

[h] On October 15, 2008, the national rolling 3-month average lead standard was established. The 1978 national quarterly lead standard remains in effect until 1 year after an area is designated for the 2008 standard, except in areas designated nonattainment for the 1978, where the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[i] In 1989, the CARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

Sources:
Bay Area Air Quality Management District (BAAQMD), 2016a; California Air Resources Board (CARB), 2016a; California Air Resources Board (CARB), 2016b; California Air Resources Board (CARB), 2016c; United States Environmental Protection Agency (EPA), 2016a; United States Environmental Protection Agency (EPA), 2016b.

(2) Ambient Air Quality

Existing air quality conditions in the study area are characterized by regional monitoring data. The BAAQMD maintains one pollutant monitoring station in Livermore as well as several additional monitoring stations throughout Alameda County—i.e., in Fremont, East Oakland, West Oakland, and Berkeley. Local ambient air quality data from the county for 2013 to 2015 are summarized in Table 3.K-2. The Livermore station is the closest station to the study area; however, recent data are not consistently available for the Livermore station.[5] Therefore, when data from the Livermore station were not available, data from the next closest station within the county are shown. Details of the data selected for each given year and pollutant are provided in the table footnotes. As seen from these data, some violations of the State ozone, $PM_{2.5}$, and PM_{10} and federal ozone and $PM_{2.5}$ standards in the study area occurred during the past 3 years.

(3) Criteria Air Pollutants of Concern and Health Effects

The pollutants of greatest concern in the study area are ozone, PM_{10}, $PM_{2.5}$, and CO. The SFBAAB does not meet the State ozone, PM_{10}, and $PM_{2.5}$ standards or the federal ozone and $PM_{2.5}$ standards.

[5] The Livermore Rincon station is not equipped with an SO_2 sensor; therefore, SO_2 data were taken from the next closest monitoring station with available data in Alameda County (West Oakland). Similarly, CO and PM_{10} were not monitored at the Livermore Rincon station in 2010–2012; therefore, CO and PM_{10} data were taken from the next closest monitoring station with available data in Alameda County (East Oakland and Berkeley, respectively).

TABLE 3.K-2 AMBIENT AIR QUALITY IN ALAMEDA COUNTY

	Alameda County[a]		
	2013	**2014**	**2015**
Ozone (O_3)			
Maximum 1-hour Concentration (ppm)	**0.096**	**0.093**	**0.105**
No. Days > CAAQS (1-hour) of 0.09 ppm	3	0	1
Maximum 8-hour Concentration (National/State)[b] (ppm)	**0.077/0.077**	**0.080/0.080**	**0.081/0.082**
No. Days > CAAQS (8-hour) of 0.07 ppm	2	7	7
No. Days > NAAQS (8-hour) of 0.070 ppm	1	4	1
Carbon Monoxide (CO)			
Maximum 1-hour Concentration (ppm)	3.6	2.8	2.4
No. Days > CAAQS (1-hour) of 20 ppm	0	0	0
Maximum 8-hour Concentration (ppm)	1.8	1.5	1.4
No. Days > NAAQS and CAAQS (8-hour) of 9.0 ppm	0	0	0
Nitrogen Dioxide (NO_2)			
Maximum 1-hour Concentration (ppm)	0.051	0.049	0.050
No. Days > CAAQS (1-hour) of 0.18 ppm	0	0	0
No. Days > NAAQS (1-hour) of 0.1 ppm	0	0	0
Annual Average Concentration (ppm)	0.012	0.010	0.010
Sulfur Dioxide (SO_2)			
Maximum 1-hour concentration (ppm)	0.050	0.016	0.022
No. Days > CAAQS (1-hour) of 0.25 ppm	0	0	0
No. Days > NAAQS (1-hour) of 0.075 ppm	0	0	0
Annual Average Concentration (ppm)	0.0004	0.0004	0.0007

TABLE 3.K-2 AMBIENT AIR QUALITY IN ALAMEDA COUNTY

	Alameda County[a]		
	2013	**2014**	**2015**
Respirable Particulate Matter (PM_{10})			
Maximum 24-hour Concentration (National/State)[b] (μg/m³)	(-)/(-)	(-)/(-)	(-)/(-)
No. Days > NAAQS (24-hour) of 150 μg/m³	(-)	(-)	(-)
No. Days > CAAQS (24-hour) of 50 μg/m³	(-)	(-)	(-)
Annual Average Concentration (National/State)[b] (μg/m³)	(-)/(-)	(-)/(-)	(-)/(-)
Fine Particulate Matter ($PM_{2.5}$)			
Maximum 24-hour Concentration (National/State)[b] (μg/m³)	40.1/40.1	42.9/42.9	31.1/31.1
No. Days > NAAQS (24-hour) of 35 μg/m³	4	1.2	0
Annual Average Concentration (National/State)[b] (μg/m³)	8.4/10.3	7.6/8.5	8.8/8.8

Notes: CAAQS = California Ambient Air Quality Standards; NAAQS = National Ambient Air Quality Standards; ppm = parts per million; μg/m³ = micrograms per cubic meter; – = data not available in Alameda County. **Bold**/gray shading indicates segments that operate at unacceptable levels.
[a] Data were taken from the Livermore air monitoring station (793 Rincon Avenue) when available. When data from the Livermore station were not available, data from the next closest Alameda County air monitoring station were used. 2013–2015 CO data are from the East Oakland station (9925 International Boulevard), and 2013–2015 SO_2 data are from the West Oakland station (1100 21st Street). PM_{10} data were not monitored at any stations within Alameda County in 2013–2015.
[b.] State and national statistics may differ for the following reasons: State statistics are based on California-approved samplers, whereas national statistics are based on samplers using federal reference or equivalent methods. State and national statistics may therefore be based on different samplers. State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.
Sources: California Air Resources Board (CARB), 2016d; Bay Area Air Quality Management District (BAAQMD), 2016b.

While the Bay Area has long met the NO_2 standards, oxides of nitrogen (NO_x) emissions are nevertheless a concern because they are precursors to ozone. Although reactive organic gases (ROGs) are not criteria pollutants, their emissions are consequential because they are also precursors to ozone.[6]

The SFBAAB is in attainment for both State and federal CO standards. CO can be a pollutant of concern if the number of motor vehicles and vehicle miles traveled (VMT) in the area continues to grow. However, due to substantial reductions in CO emissions from mobile sources since the introduction of catalytic converters in 1975, it is only under very unusual circumstances that the potential for elevated levels of CO remains.

SO_2 is no longer considered a pollutant of concern in the State because ambient levels are fairly low and the State has been in attainment for this standard for some time. SO_2 emissions have decreased substantially over the past 30 years due to improved industrial source controls and the use of natural gas instead of fuel oil for electricity generation. In addition, SO_2 emissions from mobile sources have decreased due to lower sulfur content in fuels.

(a) Oxides of Nitrogen

NO_x is a precursor to ozone and is primarily emitted through the combustion of fuel by mobile sources (e.g., passenger vehicles, buses, off-road equipment) and industrial sources (e.g., power plants). When inhaled at high concentrations, NO_2, one of the types of NO_x, can cause irritation in the respiratory system. Per the EPA, acute exposure can aggravate existing respiratory conditions (e.g., asthma) while long-term exposure may

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[6] To address organic chemicals that have photochemical reactivity, the BAAQMD has defined ROGs in its CEQA Air Quality Guidelines as "classes of organic compounds, especially olefins, substituted aromatics and aldehydes, that react rapidly in the atmosphere to form photochemical smog or ozone." The EPA and BAAQMD have also defined ozone precursor gases under the term volatile organic compounds (VOCs). The EPA formally defines VOCs in 40 CFR 51.100(s) as "any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions." The BAAQMD defines VOCs in Regulation 1 as "any organic compound, as described in Section 1-233, which would be emitted during use, processing, application, curing, or drying of a solvent, surface coating, or other material." Organic compound is defined in Section 1-233 of Regulation 1 as "any compound of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, or carbonates, and ammonium carbonate." Thus, the BAAQMD's definition of VOCs is more inclusive in that it does not require gases to participate in atmospheric photochemical reactions to be defined as a VOC.

In practical terms, the BAAQMD's definition of ROGs is almost equivalent to the EPA's definition of VOCs. For purposes of this section, with certain exceptions, ROGs will be referred to in the impact analysis because the BAAQMD CEQA thresholds are based on ROGs.

contribute to the development of asthma and potentially increase susceptibility to respiratory infections.[7]

(b) Reactive Organic Gases

ROGs are primarily emitted by industrial facilities, combustion of fuel by mobile and stationary sources, and use of chemical solvents and are a precursor to ozone formation. Per the EPA, exposure to ROG emissions can cause irritation of the eyes, nose, and throat; headaches; loss of coordination; nausea; and damage to the liver, kidney, and central nervous system. Some ROGs are known to cause cancer.[8]

(c) Ozone

Ozone, or smog, is not emitted directly; rather, it is formed in the atmosphere through complex chemical reactions between ROG and NO_x in the presence of sunlight. Ozone formation is greatest on warm, windless, sunny days. The main sources of NO_x and ROG, often referred to as ozone precursors, are (1) combustion processes (including motor vehicle engines); (2) the evaporation of solvents, paints, and fuels; and (3) biogenic sources. Automobiles are the single largest source of ozone precursors in the SFBAAB.

Ozone levels usually build up during the day and peak in the afternoon. Short-term exposure can cause eye irritation and airway constriction. In addition to causing shortness of breath, ozone can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema. Chronic exposure to high ozone levels can permanently damage lung tissue. Ozone can also damage plants, trees, and materials such as rubber and fabrics.

(d) Particulate Matter

PM encompasses a wide range of solid and liquid particles in the atmosphere, including smoke, dust, aerosols, and metallic oxides. In the SFBAAB, most PM stems from combustion, factories, construction, grading, demolition, agricultural activities, and motor vehicles. Motor vehicles are currently responsible for about half of all particulates in the SFBAAB. Wood burning in fireplaces and stoves is another large source of fine particulates. Some PM, such as pollen, is naturally occurring.

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[7] United States Environmental Protection Agency (EPA), 2017a. Basic Information about NO2. Available at: https://www.epa.gov/no2-pollution/basic-information-about-no2#What is NO2, accessed April 24, 2017.

[8] United States Environmental Protection Agency (EPA), 2017b. Volatile Organic Compounds' Impact on Indoor Air Quality. https://www.epa.gov/indoor-air-quality-iaq/volatile-organic-compounds-impact-indoor-air-quality, accessed April 24, 2017.

The EPA currently regulates two types of PM emissions: PM_{10} and $PM_{2.5}$. PM_{10} (with particles less than or equal to 10 microns in diameter) is also referred to as respirable particulate matter. $PM_{2.5}$ (with particles less than or equal to 2.5 microns in diameter) is also referred to as fine particulate matter.

PM_{10} is of concern because it bypasses the body's natural filtration system more easily than larger particles and can lodge deeply into the lungs. PM_{10} can be emitted directly or formed in the atmosphere through complex chemical reactions from precursor pollutants such as NO_x, oxides of sulfur (SO_x), ROGs, and ammonia. $PM_{2.5}$ poses an increased health risk relative to PM_{10} because the particles can deposit more deeply in the lungs and they contain substances that are particularly harmful to human health. Exposure to PM can increase the risk of chronic respiratory disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, and decreased lung function.

(e) Carbon Monoxide

CO is an odorless, colorless gas that is formed by the incomplete combustion of fuels. The single largest source of CO in the SFBAAB is motor vehicles. Emissions are highest during cold starts, hard acceleration, low speeds, and stop-and-go driving.

When inhaled at high concentrations, CO combines with hemoglobin in the blood and lowers its oxygen-carrying capacity, resulting in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease, or anemia, as well as for fetuses. Even healthy people exposed to high CO concentrations can experience headaches, dizziness, fatigue, unconsciousness, and even death.

(4) Criteria Pollutant Emissions in Alameda County

Table 3.K-3 summarizes the emissions inventory for criteria air pollutants within Alameda County and within the entire SFBAAB for various source categories. According to the emissions inventory for the county, total mobile sources (both on-road and off-road) are the largest contributor to the estimated annual average air pollutant levels of reactive organic gases (ROG),[9] CO, NO_x, and SO_x, accounting for approximately 40 percent, 90 percent, 87 percent, and 57 percent, respectively, of the total inventory. Areawide sources include solvent evaporation from equipment cleaning operations; on-site fuel combustion

[9] The California Air Resources Board (CARB) considers ROG to be a separate, distinct category from VOC. The definition of ROG can be found at: https://www.arb.ca.gov/ei/speciate/voc_rog_dfn_11_04.pdf

In practical terms, the CARB's definition of ROGs is almost equivalent to the EPA's definition of VOCs and the BAAQMD's definition of ROGs. The term ROG is used here because the Alameda County inventory is from the CARB.

for space and water heating (such as in boilers); and landscape maintenance equipment (such as lawnmowers and leaf blowers); they account for approximately 83 percent of the PM_{10} emissions and 64 percent of the $PM_{2.5}$ emissions within Alameda County.[10]

TABLE 3.K-3 2015 ESTIMATED CRITERIA POLLUTANT EMISSIONS INVENTORIES BY SOURCE (COUNTY AND AIR BASIN)

	Tons per Day Based on Annual Average					
Source	**ROG**	**CO**	**NO_X**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
Alameda County						
Mobile	26.3	238.0	62.5	2.1	3.9	3.0
Stationary	20.4	4.8	5.7	1.6	3.7	2.1
Area	18.5	21.9	3.4	0.1	37.8	9.1
TOTAL	65.2	264.7	71.6	3.7	45.3	14.2
San Francisco Bay Area Air Basin						
Mobile	129.0	1123.4	263.6	15.0	18.1	13.9
Stationary	109.7	47.5	53.4	50.2	17.4	13.0
Area	91.9	169.0	17.6	0.6	189.7	56.2
TOTAL	330.6	1339.9	334.6	65.8	225.2	83.1

Note: Table totals may not be exact due to rounding.
Source: California Air Resources Board (CARB), 2016e.

Although mobile source emissions constitute the majority of the 2015 ROG, CO, NO_x, and SO_x inventory, in both Alameda County and the SFBAAB as a whole, corresponding emissions from this category have decreased greatly since the 1970s due to more stringent federal and State emissions controls on mobile sources and fuels. Examples of vehicle emissions standards include the CARB's low-emission vehicle standards,[11] the CARB's heavy-duty engine standards,[12] and the EPA's corporate average fuel economy

[10] California Air Resources Board (CARB), 2016e. Almanac Emission Projection Data. Available at: http://www.arb.ca.gov/app/emsinv/emssumcat.php, accessed August 19 and September 2, 2016.

[11] California Air Resources Board (CARB), 2016f. Low-Emission Vehicle Program. Available at: http://www.arb.ca.gov/msprog/levprog/levprog.htm, accessed September 2, 2016.

[12] California Air Resources Board (CARB), 2016g. Truck and Bus Regulation: On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation. Available at: http://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm, accessed August 31 and September 2, 2016.

standards for passenger car and light duty trucks.[13] Examples of cleaner fuel standards include the elimination of lead from gasoline and the lowering of sulfur content in fuels.[14]

(5) Toxic Air Contaminants

In California, toxic air contaminants (TACs) are defined by the CARB as air pollutants that "may cause or contribute to an increase in deaths or in serious illness, or which may pose a present or potential hazard to human health."[15] To date, the CARB has identified more than 21 TACs and adopted the EPA's list of hazardous air pollutants (HAPs) as TACs.[16] The EPA defines HAPs as "pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects." Currently, there are 187 identified HAPs.[17]

The nature and magnitude of the potential health effects of TACs depends on the substance, concentration, and period of exposure. Some TACs cause effects in response to short-term (acute) exposure, while others cause effects only after sustained exposures over weeks, months, or years. The effects of acute exposure may be minor, such as watery eyes or respiratory irritation, or they may involve major damage, e.g., to the reproductive or nervous system. If exposure to a sufficient concentration occurs for a sufficient period, individuals may have an increased risk of developing cancer or a greater likelihood of experiencing non-carcinogenic chronic adverse effects. Chronic non-carcinogenic health effects may be minor, e.g., nasal rhinitis or respiratory irritation, or they may be serious, involving long-term damage to the immune, neurological, reproductive, respiratory, or other systems.[18]

Significant sources of TACs in the environment include industrial processes such as petroleum refining, chemical manufacturing, electric utilities, metal mining/refining, and chrome plating; commercial operations such as gasoline stations and dry cleaners; and transportation activities, particularly diesel-powered vehicles, including trains, buses, and trucks. In 1998, the CARB identified PM from diesel-powered engines as a TAC. Diesel particulate matter (DPM) emissions are estimated to be responsible for about 70 percent

[13] United States Environmental Protection Agency (EPA), 2016c. Fuel Economy and Emissions Program. Available at: http://www.epa.gov/fueleconomy/, accessed September 2, 2016.
[14] United States Environmental Protection Agency (EPA), 2016d. Fuel and Fuel Additives. Available at: http://www.epa.gov/otaq/fuels/index.htm, accessed September 2, 2016.
[15] California Air Resources Board (CARB), 2013. Glossary of Air Pollution Terms. Available at: http://www.arb.ca.gov/html/gloss.htm#T, accessed August 24, 2013.
[16] California Air Resources Board (CARB), 2011a. Toxic Air Contaminant Identification List. Available at: http://www.arb.ca.gov/toxics/id/taclist.htm, accessed August 24, 2013.
[17] United States Environmental Protection Agency (EPA), 2013. Toxic Air Pollutants. Available at: http://www.epa.gov/oar/toxicair/newtoxics.html, accessed August 24, 2013.
[18] Ibid.

of the total ambient air toxics risk. Statewide, the average potential cancer risk associated with these emissions is 500+ potential cases per million.[19]

Unlike criteria pollutants, the concentrations of individual TACs are not regulated directly; however, concentrations of TACs may be regulated indirectly based on results from a health risk assessment (HRA). An HRA is a scientifically based tool used to determine if exposure to chemical(s) pose a significant risk to human health. Table 3.K-4 summarizes the monitored concentrations of carcinogenic TACs at the BAAQMD Livermore monitoring station in 2010, the most recent year for which data are available. The concentration of TACs indicates the potential for adverse health impacts resulting from breathing ambient air and represents baseline conditions related to TACs.

According to the California Almanac of Emissions and Air Quality,[20] most of the estimated health risk from TACs in ambient air are attributed to relatively few compounds, predominantly PM exhaust from diesel-fueled engines.

DPM is a complex mixture of hydrocarbons, particulates, gases, and other compounds. DPM is emitted by diesel-fueled internal combustion engines, the composition of which varies depending on engine type, operating conditions, fuel composition, lubricating oil, and presence/absence of an emission control system. Both the California Office of Environmental Health Hazard Assessment (OEHHA) and the EPA consider DPM to be a carcinogen. The cancer potency factor derived by the California Environmental Protection Agency (Cal/EPA) for DPM is highly uncertain in both the estimation of response and the dose. In the past, due to inadequate animal test data and epidemiology data on diesel exhaust, the International Agency for Research on Cancer (IARC), a branch of the World Health Organization, had classified DPM as Probably Carcinogenic to Humans (Group 2); the EPA had also concluded that the existing data did not provide an adequate basis for

[19] California Air Resources Board (CARB), 2000. Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles. Stationary Source Division and Mobile Source Division. October.

[20] California Air Resources Board (CARB), 2009a. The California Almanac of Emissions and Air Quality, Chapter 4: Air Basin Trends and Forecasts – Criteria Air Pollutants. Available at: https://www.arb.ca.gov/aqd/almanac/almanac09/chap409.htm, accessed July 2017.

TABLE 3.K-4 ANNUAL AVERAGE AMBIENT CONCENTRATIONS OF VOLATILE ORGANIC COMPOUND CARCINOGENIC TACS IN LIVERMORE

	Concentration	
Compound	**(ppb)**	**(µg/m³)**
1,3-Butadiene	0.0363	0.0803
Benzene	0.212	0.677
Carbon Tetrachloride	0.113	0.710
Chloroform	0.0188	0.0919
Ethylbenzene	0.0757	0. 328
Ethylene Dibromide[a]	ND (0.005)	ND (0.04)
Ethylene Dichloride[a]	ND (0.05)	ND (0.2)
Methylene Chloride	0.142	0.493
Perchloroethylene	0.0143	0.0969
Trichloroethylene	0.00767	0.0412
Vinyl Chloride[a]	ND (0.05)	ND (0.1)

Notes:
ND = non-detect; ppb = parts per billion; µg/m³ = micrograms per cubic meter.
Data are taken from the BAAQMD Livermore monitoring station for 2010. Concentrations in µg/m³ are calculated assuming a temperature of 25°C. and a pressure of 1 atmosphere.
All data are based on averages of 30 samples. Samples with concentrations below the method detection limit were assigned a value equal to one-half of the detection limit.
[a] Ethylene dibromide, ethylene dichloride, and vinyl chloride were not detected above the method detection limit in any of the samples; they are therefore designated as ND with one-half the detection limit in parenthesis.
Source: Bay Area Air Quality Management District (BAAQMD), 2010a.

quantitative risk assessment.[21] However, based on two more recent scientific studies,[22, 23] the IARC has reclassified DPM as Carcinogenic to Humans, placing it in Group 1.[24] This classification means that the IARC has determined that there is "sufficient evidence of carcinogenicity" of a substance in humans; it represents the strongest weight-of-evidence rating in the IARC's carcinogen classification scheme. The EPA, OEHHA, and IARC also recognize that exposure to DPM may cause non-cancer effects such as changes in lung function and airway inflammation.[25, 26, 27] DPM is a component of PM, and recent scientific data have linked prolonged exposure to PM to premature mortality, respiratory effects, and cardiovascular disease.

In 2003, the BAAQMD estimated that the carcinogenic health risks from exposure to DPM in the Bay Area was about 500-in-1-million to 700-in-1-million.[28] More recently, as part of the effort to identify and update Community Air Risk Evaluation (CARE) communities, the BAAQMD prepared projected emissions and health risk estimates for 2015, which showed resulting cancer risks in the Dublin/Pleasanton/Livermore area of 150-in-1-million to 200-in-1-million,[29] with DPM contributing more than 85 percent of the total carcinogenic potential of emissions.

Diesel trucks and buses are sources of DPM emissions within the Bay Area. Specifically, the California Department of Transportation estimated that, in 2014, approximately 9 percent of the vehicles on Interstate Highway (I-) 580 in Livermore were trucks with two

[21] United States Environmental Protection Agency (EPA), 2002. Health Assessment Document for Diesel Engine Exhaust. National Center for Environmental Assessment, Office of Research and Development, Washington, DC. EPA/600/8-90/057F. May.

[22] Silverman D.T., C.M. Samanic, J.H. Lubin, A.E. Blair, P.A. Stewart, R. Vermeulen, J.B. Coble, N. Rothman, P.L. Schleiff, W.D. Travis, R.G. Ziegler, S. Wacholder, M.D. Attfield, 2012. The Diesel Exhaust in Miners Study: A Nested Case-Control Study of Lung Cancer and Diesel Exhaust. J Natl Cancer Inst. October.

[23] Attfield, M.D., P.L. Schleiff, J.H. Lubin, A. Blair, P.A. Stewart, R. Vermeulen, J.B. Coble, and D.T. Silverman, 2011. The Diesel Exhaust in Miners Study: A Cohort Mortality Study With Emphasis on Lung Cancer. J Natl Cancer Inst. October 21.

[24] International Agency for Research on Cancer (IARC), 2012. Press Release No. 213. IARC: Diesel Engine Exhaust Carcinogenic. June 12.

[25] Office of Environmental Health Hazard Assessment (OEHHA), 1998. Findings of the Scientific Review Panel on The Report on Diesel Exhaust, as adopted at the Panel's April 22, 1998, meeting. April 22.

[26] Office of Environmental Health Hazard Assessment (OEHHA), 2002. Air Toxics Hot Spots Program Risk Assessment Guidelines: Part II Technical Support Document for Describing Available Cancer Potency Factors. California Environmental Protection Agency. December.

[27] United States Environmental Protection Agency (EPA), 2011. Integrated Risk Information System (IRIS). Available at: http://www.epa.gov/iris/.

[28] Bay Area Air Quality Management District (BAAQMD), 2007. Toxic Air Contaminants 2003 Annual Report. August.

[29] Bay Area Air Quality Management District (BAAQMD), 2014. Improving Air Quality and Health in Bay Area Communities. Community Air Risk Evaluation Program Retrospective & Path Forward (2004–2013). April.

or more axles.[30] Many of these trucks are diesel powered and thus contribute to DPM risks.

Based on available data, the other 10 TACs that pose the greatest risk from breathing ambient air in California are benzene, 1,3-butadiene, acetaldehyde, carbon tetrachloride, hexavalent chromium, ethylbenzene, chloroform, formaldehyde, methylene chloride, and perchloroethylene.[31]

(6) Odors

Odors are not generally regarded as a physical health risk. However, manifestations of a person's reaction to strong odors can range from irritation, anger, or anxiety to circulatory and respiratory system effects, nausea, vomiting, and headache.

The ability to detect odors varies considerably among the population. Some individuals are able to smell very minute quantities of specific substances; others may not have the same sensitivity, but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor; an odor that is offensive to one person may be acceptable to another (e.g., a fast food restaurant). It is important to also note that an unfamiliar odor is more easily detected and a transient odor is more likely to result in complaints than a constant one. This is caused by a phenomenon known as odor fatigue, in which a person can become desensitized to almost any odor and recognition only occurs with an alteration in the intensity.

Odor intensity depends on the odorant concentration in the air. When an odorous sample is progressively diluted, the odorant concentration decreases. As this occurs, the odor intensity weakens and eventually becomes so low that the detection or recognition of the odor is quite difficult. At some point during dilution, the concentration of the odorant reaches a detection threshold. An odorant concentration below the detection threshold means that the concentration in the air is not detectable by the average human.

Land uses that constitute odor sources include industrial facilities, such as asphalt batch plants, wastewater treatment facilities, and solid waste transfer facilities. Other examples of minor sources of odors include restaurants and auto body/paint shops. In general, odor dispersal occurs relatively quickly, with noticeable effects diminishing substantially with increasing distance from the source.

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[30] California Department of Transportation (Caltrans), 2014. Annual Average Daily Truck Traffic on the California State Highway System. Available at: http://www.dot.ca.gov/trafficops/census/, accessed August 31, 2016.

[31] California Air Resources Board (CARB), 2009a. The California Almanac of Emissions and Air Quality, Chapter 4: Air Basin Trends and Forecasts – Criteria Air Pollutants. Available at: https://www.arb.ca.gov/aqd/almanac/almanac09/chap409.htm, accessed July 2017.

c. Existing Sources

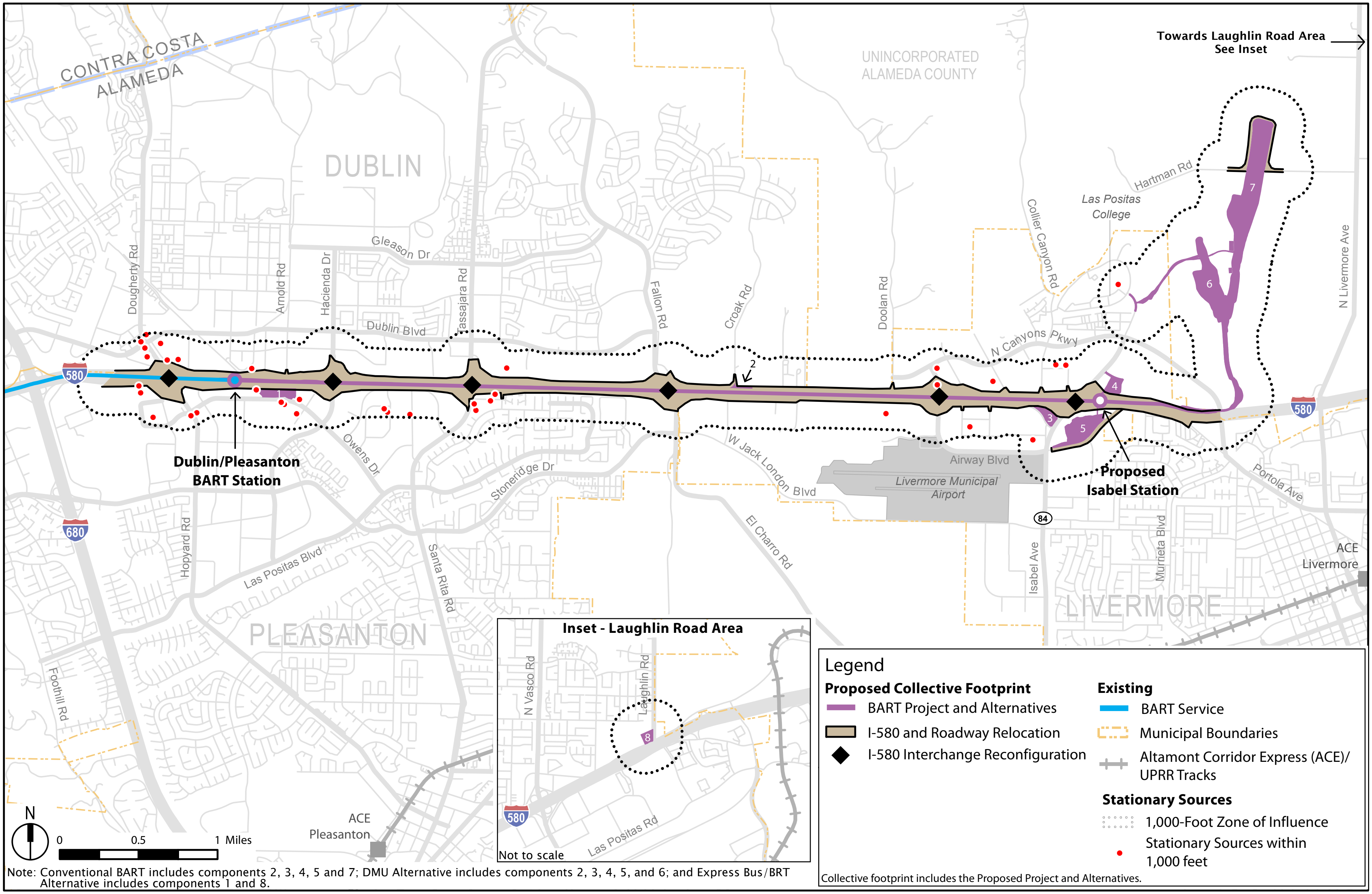
A number of existing air pollutant sources are located within and around the study area. Using the BAAQMD Stationary Source Screening Tool for Alameda County,[32] existing stationary sources within 1,000 feet of the collective footprint were identified, as shown in Figure 3.K-1. Per the BAAQMD Recommended Methods for Screening and Modeling Local Risks and Hazards, a 1,000-foot radius is generally recommended around the project property boundary to identify existing sources that may individually or cumulatively impact new receptors or contribute to the cumulative impact of new sources.[33] This 1,000-foot radius is referred to as the zone of influence, as sources located more than 1,000 feet from a receptor generally do not significantly influence the receptor. Existing stationary sources within 1,000 feet of the collective footprint include diesel-fired emergency generators, printing operations, gas stations, surface coating operations, and wipe cleaning operations.

d. Existing Sensitive Receptors

Sensitive receptors are locations where individuals with increased sensitivity to the health effects of air pollutants, such as children, hospital patients, and the elderly are usually present. Typical sensitive receptors include schools, daycare centers, parks, playgrounds, nursing homes, hospitals, and residential communities. Table 3.K-5 lists the daycare centers, hospitals, parks, playgrounds, and schools in the study area that are evaluated for health-related impacts. Other sensitive receptors also evaluated for health-related impacts include residential homes and small licensed daycare facilities operated out of private homes.

[32] Bay Area Air Quality Management District (BAAQMD), 2012a. Stationary Source Screening Tool. Available at: http://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/ceqa-tools, accessed August 31, 2016.

[33] Bay Area Air Quality Management District (BAAQMD), 2012b. Recommended Methods for Screening and Modeling Local Risks and Hazards. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/risk-modeling-approach-may-2012.pdf?la=en, accessed February 2017.



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, 2017b; BAAQMD, 2012a.

BART to Livermore Extension Project EIR

Figure 3.K-1
Air Quality
Stationary Air Pollutant Sources

TABLE 3.K-5 SENSITIVE RECEPTORS FOR HEALTH RISK ASSESSMENT

Name	Address
Daycare[a]	
Extended Day Child Care Center, Inc. - Dougherty	5301 Hibernia Street, Dublin
Kindercare Learning Center	3760 Brockton Drive, Pleasanton
La Petite Academy - Syber Kids	3 Sybase Drive, Dublin
Larpd Extended Student Service - Rancho	401 Jack London Boulevard, Livermore
New Horizons Preschool And Day Care	405 East Jack London Boulevard, Livermore
YMCA of the East Bay Y-Kids Fairlands	4151 West Las Positas, Pleasanton
YMCA of the East Bay Y-Kids Mohr	3300 Dennis Drive, Pleasanton
Hospital	
Hope Hospice Inc.	6500 Dublin Boulevard Suite. 100, Dublin
Las Positas College Student Health Center	3033 Collier Canyon Road, Livermore
Recreational	
Bray Commons	3300 Finninan Way, Dublin
Emerald Glen Park	4201 Central Parkway, Dublin
Fairlands Park	4100 Churchill Drive, Pleasanton
Las Positas Golf Course	917 Clubhouse Drive, Livermore
Los Positas College – Sports Fields	3000 Campus Hill Drive, Livermore
Meadows Park	3301 West Las Positas Boulevard, Pleasanton
Stoneridge Creek Neighborhood Park	3200 Stoneridge Creek Way, Pleasanton
Devany Square	4405 Chancery Lane, Dublin
Tri-Valley Golf Center	2600 Kitty Hawk Road 117, Livermore
YMCA	4151 West Las Positas, Pleasanton
School	
Fairlands Elementary	4151 West Las Positas Boulevard, Pleasanton
Hacienda Child Development Center	4671 Chabot Drive, Pleasanton
Hacienda School	3800 Stoneridge Drive, Pleasanton
Henry P. Mohr Elementary	3300 Dennis Drive, Pleasanton
James Dougherty Elementary	5301 Hibernia Drive, Dublin
Livermore Valley Charter School	543 Sonoma Avenue, Livermore
Rancho Las Positas Elementary	401 East Jack London Boulevard, Livermore
Tri-Valley Rop	2600 Kitty Hawk Road 117, Livermore

Note:
[a] Many licensed daycare facilities do not have formal names and may be operated out of private homes. These daycare facilities are not listed in this table for privacy reasons, but are evaluated as sensitive receptors for the health risk assessment.
Sources: Environmental Data Resources, 2017a; Environmental Data Resources, 2017b; Google Earth, 2017.

3. Regulatory Framework

This subsection describes the federal, State, and local environmental laws and policies relevant to the air quality.

a. Federal Clean Air Act

The federal Clean Air Act (CAA), as amended in 1990, establishes the framework for federal air pollution control. The CAA directed the EPA to establish the NAAQS described in Table 3.K-1. For federal nonattainment areas, the federal CAA requires the states to develop and adopt State Implementation Plans (SIPs) describing how the NAAQS will be attained. SIPs are prepared and adopted by the local or regional air districts (the BAAQMD for the Bay Area), and then reviewed and submitted to the EPA by the CARB and must be periodically modified to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies.

b. Federal Transportation Air Conformity

The federal CAA and EPA regulations ensure that federal transportation plans, programs, and projects conform to a SIP's purpose of eliminating or reducing the number/severity of violations of the NAAQS. Thus, transportation plans, programs, or projects cannot be approved unless projected emissions are within the limits allowed under the SIP and they do not violate local air quality standards. Regional Transportation Plans (RTPs) and Transportation Improvement Programs (TIPs) include highway or transit improvement projects that require funding or approval from the Federal Highway Administration or Federal Transit Administration. The emissions of nonattainment pollutants and precursors are calculated for all projects in RTPs and TIPs, and total emissions levels are compared to the transportation emissions limits in an SIP. The selected project must come from a conforming RTP and TIP, be included in the air quality analysis for the current conforming RTP and TIP even if not included in the RTP and TIP, or be included in a new air quality analysis showing that the current RTP and TIP would still conform if the project is implemented.

The BART to Livermore Extension Project is currently listed in both the Metropolitan Transportation Commission's RTP, known as Plan Bay Area, and its proposed updated version, the (final) draft Plan Bay Area 2040, issued in July 2017.[34] However, because BART

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[34] Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC), 2013. Plan Bay Area 2013. Available at: http://files.mtc.ca.gov/pdf/Plan_Bay_Area_FINAL/Plan_Bay_Area.pdf.

(continued)

has not yet adopted the Proposed Project or one of the alternatives, the BART to Livermore Extension Project was not included in the Plan Bay Area transportation conformity modeling.

The Federal Transit Administration or Federal Highway Administration must make a project-level conformity determination prior to project approval and/or funding. As discussed in Chapter 1, Introduction, the Proposed Project, the DMU Alternative, or Express Bus/BRT Alternative would be expected to require National Environmental Policy Act (NEPA) review subsequent to completion of the CEQA process. Conformity analysis and findings would be completed by the federal lead agency in conjunction with NEPA review.

c. California Clean Air Act

The California Clean Air Act of 1988 (California CAA) focuses on attainment of the CAAQS, which, for certain pollutants and averaging periods, are more stringent than the corresponding federal standards. The CARB and local air pollution control districts are responsible for achieving the CAAQS through district-level air quality management plans. The California CAA requires the designation of attainment and nonattainment areas with respect to the CAAQS. The California CAA also requires local and regional air districts to expeditiously prepare and adopt an air quality attainment plan if the district violates the CAAQS for CO, SO_2, NO_2, or ozone. No locally prepared attainment plans are in place for areas that violate the State PM_{10} standards because attainment plans are not required for those areas. This is discussed further below.

The California CAA requires the CAAQS to be met as expeditiously as practicable, but, unlike the federal CAA, does not set precise attainment deadlines. Instead, the California CAA establishes increasingly stringent requirements for areas that require more time to attain the standards. The CARB is primarily responsible for statewide pollution sources; as such, it develops and implements air pollution control plans to achieve and maintain the NAAQS, and produces a major part of the SIP for California, incorporating local air district strategies for reducing emissions from sources under their jurisdiction. Other CARB duties include monitoring air quality; determining and updating area designations and maps; and setting emissions standards for new mobile sources, consumer products, small utility engines, and off-road vehicles.

Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC), 2017. Draft Plan Bay Area 2040 Released; Public Invited to Comment Online or at Open Houses. Available: http://www.planbayarea.org/news/news-story/draft-plan-bay-area-2040-released-public-invited-comment-online-or-open-houses, accessed April 13, 2017.

d. Local Air Quality Management Programs

The BAAQMD has jurisdiction over air quality issues within the SFAAB. The BAAQMD's responsibilities include attaining and maintaining air quality standards in the SFBAAB through air quality planning, adoption of rules and regulations, enforcement, technical innovation, issuing permits for stationary sources of air pollution, and promoting the understanding of air quality issues.

The BAAQMD prepares air quality plans with control measures to attain the NAAQS in the SFBAAB. For example, the 1994 Carbon Monoxide Maintenance Plan was developed in coordination with the Association of Bay Area Governments to ensure continued attainment of the national CO standard.

The BAAQMD has prepared both federal and State air quality plans to bring the SFBAAB into attainment with the State and federal ozone standards; the Bay Area is currently nonattainment for ozone (both State and federal). Three air quality plans exist for the Bay Area, as follows:

- 2001 Ozone Attainment Plan, which describes the Bay Area's strategy for compliance with the federal 1-hour ozone standard. Although the EPA revoked the federal 1-hour ozone standard on June 15, 2005, the emissions reduction commitments in the plan are still being carried out by the BAAQMD.[35]
- 2005 Bay Area Ozone Strategy, which reviews the region's progress reducing ozone levels. This plan describes current conditions and charts a course for future actions to further reduce ozone and ozone precursor levels in the Bay Area and to achieve compliance with the State 1-hour ozone standard.[36]
- 2010 Clean Air Plan, which provides control strategies to reduce ozone, PM, air toxins, and greenhouse gases (GHGs) from stationary and mobile sources, specifically addresses nonattainment of the State ozone standards in the SFBAAB.[37]

On April 19, 2017 the BAAQMD adopted the 2017 Clean Air Plan, which provides control strategies for ozone, PM, TACs, and GHGs, and is aimed at reducing air pollution,

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[35] Bay Area Air Quality Management District (BAAQMD), 2001. Revised San Francisco Bay Area Ozone Attainment Plan for the 1-Hour National Ozone Standard. October 24. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/plans/2001-ozone-attainment-plan/oap_2001.pdf, accessed July 25, 2017.

[36] Bay Area Air Quality Management District (BAAQMD), 2006. Bay Area 2005 Ozone Strategy. January 4. Available at http://www.baaqmd.gov/~/media/files/planning-and-research/plans/2005-ozone-strategy/adoptedfinal_vol1.pdf, accessed July 24, 2017.

[37] Bay Area Air Quality Management District (BAAQMD), 2010b. Bay Area 2010 Clean Air Plan. Available at: http://www.baaqmd.gov/plans-and-climate/air-quality-plans/current-plans, accessed April 5, 2016.

protecting public health, and protecting the global climate. The 2017 Clean Air Plan includes the first ever Regional Climate Protection Strategy and has a total of 85 control measures, categorized among nine economic sectors.

In addition to the 2010 and 2017 Clean Air Plans, in 2004, the BAAQMD initiated the CARE program. This program has helped identify communities in the Bay Area that are disproportionately impacted by local emission sources. The CARE program serves as a foundation for the BAAQMD's efforts to reduce population exposure to TACs, including DPM, in communities that experience higher than average pollution levels. These communities are generally located near sources of pollution (e.g., freeways, industrial facilities), and thus have higher levels of risk from TAC exposure. The CARE program goals are as follows: (1) identify areas where air pollution contributes most to health impacts and where populations are most vulnerable to air pollution; (2) apply sound scientific methods and strategies to reduce health impacts in these areas; and (3) engage community groups and other agencies to develop additional actions to reduce local health impacts.[38]

e. Toxic Air Contaminants

Air quality regulations also focus on TACs. In general, air toxics that may cause cancer have no threshold concentration below which risks do not occur. However, standards for carcinogenic air toxics are established to reflect increased risks of 1-in-1-million to 1-in-10,000, which are the values identified as de minimis by regulatory agencies. Both the EPA's and CARB's regulation of HAPs and TACs typically reflect the de minimis risk levels noted above, while also generally requiring the use of either the maximum available control technology or best available control technology (BACT) to limit emissions. (Note: When BACT is applied to TACs, it is known as T-BACT.) These statutes and regulations, in conjunction with additional rules set forth by the BAAQMD, establish the regulatory framework for air toxics.[39]

(1) Federal

Title III of the CAA amendments requires the EPA to promulgate National Emissions Standards For Hazardous Air Pollutants (NESHAPs) for the regulation of HAPs from stationary sources. Currently, there are over 125 different types of stationary sources regulated under NESHAPs.

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[38] Bay Area Air Quality Management District (BAAQMD), 2014. Improving Air Quality and Health in Bay Area Communities. Community Air Risk Evaluation Program Retrospective & Path Forward (2004–2013). April.

[39] HAPs include 187 pollutants as defined by the EPA. TACs may include additional pollutants identified by Cal/EPA and the BAAQMD beyond those specifically defined as HAPs.

The CAA amendments also required the EPA to issue vehicle or fuel standards containing reasonable requirements to control HAP emissions, applying at a minimum to benzene and formaldehyde. Performance criteria were established to limit mobile source emissions of HAPs, including benzene, formaldehyde, and 1,3-butadiene. In addition, Section 219 of the CAA amendments also required the use of reformulated gasoline in selected U.S. cities (those with the most severe ozone nonattainment conditions) to further reduce mobile-source emissions, including the emissions of air toxics.[40]

(2) State

TACs in California are primarily regulated through the Tanner Air Toxics Act and the Air Toxics Hot Spots Information and Assessment Act of 1987, also known as the Hot Spots Act. The Tanner Act sets forth a formal procedure for CARB to designate substances as TACs. To date, the CARB has adopted the EPA's list of HAPs as TACs, as well as identified more than 21 additional TACs.[41]

Once a TAC is identified, the CARB adopts an Airborne Toxic Control Measure (ATCM) for sources that emit that particular TAC. If there is a concentration below which health effects are not likely to occur, the ATCM must reduce exposure below that threshold. If there is no safe concentration below which adverse health effects are not likely to occur, the measure must incorporate T-BACT to minimize emissions.

The Hot Spots Act requires existing facilities that emit toxic substances above a specified level to prepare a toxic emissions inventory; conduct a risk assessment if emissions are significant; notify the public of significant risk levels; and prepare and implement risk reduction measures.

The CARB adopted a comprehensive Risk Reduction Plan in 2000 after identifying DPM as a TAC.[42] Pursuant to this plan, the CARB adopted diesel-exhaust control measures and stringent emissions standards for various on-road and off-road sources of diesel emissions. Rules include the Public Transit Bus Fleet Rule and Emissions Standards for New Urban Buses, the California Diesel Fuel Regulations, On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation, and the In-Use Off-Road Diesel Vehicle Regulation.

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[40] United States Code. Title 42. Chapter 85. Section 7554. Urban Bus Standards.

[41] California Air Resources Board (CARB), 2011a. Toxic Air Contaminant Identification List. Available at: http://www.arb.ca.gov/toxics/id/taclist.htm, accessed August 24, 2013.

[42] California Air Resources Board (CARB), 2000. Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles. Stationary Source Division and Mobile Source Division. October.

(3) Local

At the local level, air pollution control or management districts may adopt and enforce the CARB's control measures and adopt their own TAC regulations. The BAAQMD limits emissions and public exposure to TACs primarily through Regulation 2-5 (New Source Review of Toxic Air Contaminants) and other rules, which are described by source category below.

(a) Planning Healthy Places

The purpose of the BAAQMD's Planning Healthy Places guidelines is to promote efficient and sustainable land use development while ensuring clean and healthy air for residents. Planning Healthy Places was developed on the premise that regional ambient air emissions and health risk control programs do not account for localized impacts to communities located near busy roadways, factories, airports, and other sources of air pollution.

The BAAQMD prepared these guidelines outside the CEQA context to assist developers and land use planners in addressing potential land use compatibility issues associated with locating people close to localized sources of air pollution, specifically PM and TACs. The BAAQMD identifies a list of best practices to reduce emissions or exposure to sensitive receptors located near development projects. Through Planning Healthy Places, the BAAQMD denotes regions in the Bay Area near highways and busy roadways where best practices are recommended to reduce exposure and emissions, as well as regions situated close to large and complex emissions sources (e.g., ports, refineries, and gas stations) where further study is required to assess air pollution levels.

Based on the interactive map for Planning Healthy Places, there are several discrete areas within the study area where BAAQMD recommends further study.[43] Additionally, best practices are recommended for areas adjacent to I-580 and other major roadways within the study area. These recommendations are intended for development projects that will place future residential receptors near existing sources of PM and TAC emissions.

f. Source-Specific Standards

The EPA, the CARB, and the BAAQMD administer regulations that limit criteria air pollutant, HAP, and TAC emissions (including DPM) from specific sources. The following

[43] Bay Area Air Quality Management District (BAAQMD), 2016c. Planning Healthy Places. Interactive Map of Location of Communities and Places Estimated to Have Elevated Levels of Fine Particulates and/or Toxic Air Contaminants. Available at: https://www.arcgis.com/home/webmap/viewer.html?webmap=9b240e706e6545e0996be9df227a5b8c&extent=-122.5158,37.5806,-122.0087,37.8427, accessed July 19, 2017.

subsections describe the regulations applicable to emissions sources for both the construction and operations activities of the Proposed Project and Alternatives.

(1) Mobile Off-Road Engines (Construction Phase)

Construction emissions generated from off-road construction equipment such as loaders, graders, and cranes are subject to federal and State regulations, as described below.

(a) Federal Emission Standards for Nonroad Diesel Engines

This program applies to nonroad diesel-powered engines, such as found in construction, general industrial, and port terminal equipment. The EPA established a series of emissions standards, called Tiers, for new nonroad diesel engines, culminating in the 2004 Nonroad Tier 4 Final Rule.[44, 45] The tiers require progressively more stringent emissions limits over time in which each tier is phased in over several years by engine power category—Tier 1: 1996-2005; Tier 2: 2001-2006; Tier 3: 2006-2008; Tier 4: 2008-2015.

(b) CARB Off-Road Emissions Regulation for Compression-Ignition Engines and Equipment

Similar to the EPA Nonroad Diesel Rule, the CARB Off-Road Emissions Regulation for Compression-Ignition Engines and Equipment applies to diesel engines such as those found in construction, general industrial, and port terminal equipment.[46, 47] Initially adopted in 2000 and amended in 2004, the regulation establishes Tier emissions standards, test procedures, and warranty and certification requirements. For some model years and engine sizes, the CARB Tier emissions standards are more stringent than the EPA standards.

[44] United States Environmental Protection Agency (EPA), 1998. Control of Emissions of Air Pollution from Nonroad Diesel Engines, Final Rule. Title 40 Code of Federal Regulations, Parts 9, 86, and 89. October.

[45] United States Environmental Protection Agency (EPA), 2004. Control of Emissions of Air Pollution from Nonroad Diesel Engines and Fuel, Final Rule. Title 40 Code of Federal Regulations, Parts 9, 69, 80, 86, 89, 94, 1039, 1048, 1051, 1065, and 1068. June.

[46] California Air Resources Board (CARB), 2004a. Off-Road Compression-Ignition Engines and Equipment. 13 CCR Section 2420 & Section 2425.1. December.

[47] California Air Resources Board (CARB), 2016h. New Off-Road Compression-Ignition (Diesel) Engines and Equipment. Available at: http://arb.ca.gov/msprog/offroad/orcomp/orcomp.htm, accessed August 29, 2016.

(c) State In-Use Off-Road Diesel Vehicle Regulation

In July 2007, the CARB adopted the In-Use Off-Road Diesel Vehicle Regulation and amended it in December 2011.[48, 49] The regulation requires owners of off-road mobile equipment powered by diesel engines 25 horsepower or larger to meet the fleet average or BACT requirements for NO_x and PM emissions by January 1 of each year. The regulation also establishes idling restrictions, limitations on buying/selling of older off-road diesel vehicles (Tier 0), reporting requirements, and retrofit and replacement requirements. The requirements and compliance dates vary by fleet size, with performance requirements for large fleets beginning in 2014, medium fleets in 2017, and small fleets in 2019.

(2) Mobile On-Road Engines

Construction can generate air emissions from on-road heavy-duty trucks such as haul trucks and vendor trucks. The operation of buses, maintenance trucks, and the shuttle van also generate air emissions. These sources are subject to federal and State regulations.

(a) Federal Emissions Standards for Heavy-Duty Engines and Vehicles

The EPA established a series of increasingly strict emissions standards for new engines, starting in 1988, culminating with the 2001 Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements Rule, more commonly known as the 2007 Highway Rule.[50] This rule integrated engine and fuel controls to gain emission reductions and established a PM emissions standard of 0.01 gram per horsepower-hour (g/hp-hr) for new vehicles beginning with model year 2007. NO_x and non-methane hydrocarbon standards of 0.20 g/hp-hr and 0.14 g/hp-hr, respectively, were phased in between 2007 and 2010 on a percent-of-sales basis: 50 percent from 2007 to 2009 and 100 percent in 2010.

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[48] California Air Resources Board (CARB), 2011b. Regulation for In-Use Off-Road Diesel-Fueled Fleets. Title 13, California Code of Regulations, Section 2449.

[49] California Air Resources Board (CARB), 2012. In-Use Off-Road Diesel Vehicle Regulation. Available at: http://www.arb.ca.gov/msprog/ordiesel/ordiesel.htm, accessed August 29, 2016.

[50] United States Environmental Protection Agency (EPA), 2001. Control of Air Pollution from New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements, Final Rule ("2007 Highway Rule"). Title 40 Code of Federal Regulations, Parts 80 and 86. January 18.

(b) State Heavy-Duty Diesel Truck Idling Regulation

The CARB adopted the in-use heavy-duty diesel truck idling ATCM in July 2004. The CARB approved the Heavy-Duty Diesel Truck Idling regulation in February 2005.[51, 52] The regulation requires in-state and out-of-state registered sleeper-berth-equipped trucks to shut down their engines if idling for longer than 5 minutes, except in the case of queuing (if the queue is located more than 100 feet from any homes or schools). Under the regulation, 2008 and newer model year heavy-duty diesel engines need to be equipped with a non-programmable engine shutdown system that automatically shuts down the engine after 5 minutes of idling or optionally meet a stringent oxides of nitrogen idling emission standard. Trucks with engines of model year 2006 or older may use any California or federally certified diesel-fueled auxiliary power system or fuel-fired heaters.

(c) Statewide Bus Truck and Bus Regulation

In addition to the 2007 Highway Rule described above, diesel buses are also subject to the CARB Statewide Truck and Bus Regulation adopted in December 2008 and amended in September 2011 and November 2014.[53, 54, 55] The regulation requires heavy-duty vehicles to be retrofitted with PM filters beginning on January 1, 2012, and requires older vehicles to be replaced starting on January 1, 2015. By January 1, 2023, nearly all trucks and buses are required to have 2010-model-year engines or the equivalent. The 2014 amendment extended the timeline to retrofit PM filters for certain categories.

(3) Emergency Generators

Diesel-fueled emergency generators are subject to a number of federal and State regulations applicable to stationary engines.

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[51] California Air Resources Board (CARB), 2004b. Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling. Title 13 California Code of Regulations, Chapter 10, Section 2485. July.

[52] California Air Resources Board (CARB), 2016i. Heavy-Duty Vehicle Idling Emission Reduction Program. Available at: http://www.arb.ca.gov/msprog/truck-idling/truck-idling.htm, accessed August 29, 2016.

[53] California Air Resources Board (CARB), 2016g. Truck and Bus Regulation: On-Road Heavy-Duty Diesel Vehicles (In-Use) Regulation. Available at: http://www.arb.ca.gov/msprog/onrdiesel/onrdiesel.htm, accessed August 31 and September 2, 2016.

[54] California Air Resources Board (CARB), 2011c. Amendments to the Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen and Other Criteria Pollutants from in-Use On-Road Diesel-Fueled Vehicles. Title 13 California Code of Regulations, Chapter 1, Section 2025. September.

[55] California Air Resources Board (CARB), 2014. Amendments to the Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen and Other Criteria Pollutants from in-Use On-Road Diesel-Fueled Vehicles. Title 13 California Code of Regulations, Chapter 1, Section 2025. November.

(a) New Source Performance Standards Subpart IIII (Stationary Compression Ignition Internal Combustion Engines)

The EPA promulgated New Source Performance Standards (NSPS) for major and minor sources on a category-by-category basis. The NSPS imposes uniform requirements on new and modified sources based on the best demonstrated technology, i.e., the best system of continuous emissions reduction that has been demonstrated to work in a given industry, considering economic costs and other factors, such as energy use. The NSPS program is implemented by the BAAQMD.

NSPS Subpart IIII applies to stationary compression ignition internal compression engines for which construction, modification, or reconstruction commenced after July 11, 2005. The requirements include emissions standards based on model year, maximum engine power, and emergency or non-emergency engine status; fuel requirements; monitoring requirements; compliance requirements; testing requirements; notification, reporting, and recordkeeping requirements; and emissions standards for special fuels.

(b) National Emission Standards for Hazardous Air Pollutants Subpart ZZZZ (Reciprocating Internal Combustion Engines)

Diesel-fueled emergency generators, as reciprocating internal combustion engines, are subject to NESHAPs Subpart ZZZZ. This regulation requires that new reciprocating internal combustion engines (defined as constructed or reconstructed on or after June 12, 2006) at an area source of HAPs meet the emission limits and work practices under NSPS Subpart IIII.[56] No other requirements under NESHAPs Subpart ZZZZ apply to new engines.

(c) State Airborne Toxic Control Measure for Stationary Internal Combustion Engines

The CARB ATCM for Stationary Compression Ignition Engines was adopted in 2004 and amended in May 2011 with the goal of reducing criteria pollutant and DPM emissions from diesel-fueled stationary compression ignition engines. The ATCM outlines emissions standards, fuel use requirements, and operational hour limitations for prime and emergency backup engines. The 2011 amendments harmonized many of the ATCM requirements with 2006 EPA Standards of Performance for Stationary Compression-Ignition Internal Combustion Engines (NSPS Subpart IIII); however, some ATCM emissions standards and other requirements are more stringent than the NSPS.

[56] An area source of HAPs is defined as a source that is not a major source. A major source emits 10 tons/yr or more of a single HAP or 25 tons/yr or more of a combination of HAPs. As HAP emissions from the BART facility will be much lower than the 10-tons/yr threshold, it is considered an area source.

(d) BAAQMD Regulation 2-5 (New Source Review of Toxic Air Contaminants)

BAAQMD regulates stationary sources of TACs through Regulation 2-5. Sources that have the potential to emit TACs greater than trigger levels defined in Regulation 2-5 are required to obtain permits from the BAAQMD, unless specifically exempted from permitting. Permits may be granted if the sources are constructed and operated in accordance with applicable regulations, including New Source Review Standards (BAAQMD Regulation 2-2) and ATCMs. The BAAQMD evaluates TAC-emitting stationary sources based on the quantity and toxicity of the TAC emissions, as well as the proximity of the facilities to sensitive receptors.

Emergency generators are a source of DPM, a TAC, and are therefore subject to Regulation 2-5. An exemption from the requirements of Regulation 2-5 exist for emergency generators smaller than 50 horsepower. However, the emergency generators proposed under the Proposed Project and the DMU Alternative are larger than 50 horsepower. If it is determined that the emergency generators will result in an increased cancer risk greater than 1-in-1-million and/or a chronic hazard index greater than 0.20, the emergency generators must implement T-BACT to reduce emissions.[57] If all sources subject to permitting, as part of the same project, cannot reduce the risk below the project threshold (cancer risk of 10-in-1-million, chronic hazard index of 1.0, or acute hazard index of 1.0) even after implementing T-BACT, the BAAQMD will deny the permit. The BAAQMD permit requirements help limit emissions from new sources and reduce emissions from existing sources by requiring them to apply new technology when retrofitting.

(e) BAAQMD Regulation 9-8 (Internal Combustion Engines)

Regulation 9-8 provides standards for the control of NO_x and CO from internal combustion engines. The regulation's emissions standards do not apply to emergency generators; however, emergency generators are limited to up to 50 hours of reliability-related activities within a calendar year. The regulation also requires recordkeeping.

(4) Diesel Multiple Units

(a) Federal Off-Road Diesel Engine Emissions Control Program (40 CFR Part 89)

This program applies to off-road diesel-powered engines, including passenger locomotives with total rated power equal to or less than 750 kilowatts. This is a tiered approach established by the EPA to lower the emissions standards for several categories

[57] T-BACT for emergency generators is being below the PM_{10} emission standard of 0.15 grams per brake horsepower-hour. This is achieved by all new emergency generators per the California ATCM for Stationary Internal Combustion Engines.

of off-road engines, such as diesel-powered trains, in which each tier is phased in over several years by engine power category—Tier 1: 1996–2005; Tier 2: 2001–2010; Tier 3: 2006–2010; and Tier 4: 2008–2015.

(b) State Heavy-Duty Off-Road Compression Ignition Engine Program (13 CCR 1956.1–1956.4; 13 CCR 1956.8)

This State rule established exhaust emissions standards for off-road heavy-duty diesel engines that have become increasingly more stringent based on the horsepower and model year, and complements the EPA program described above.

(c) State Diesel Requirements (13 CCR 2281, 13 CCR 2282, 13 CCR 2456[e]2)

All diesel fuel sold or supplied in California for motor vehicle use was required to meet or exceed formulation requirements, including a sulfur content no greater than 15 parts per million (ppm) by weight, as of September 1, 2006.

(5) Maintenance/Storage Facilities

(a) BAAQMD Regulation 8-1 (General Provisions)

Regulation 8-1 provides general requirements for organic compounds. The storage or disposal of cloth or paper impregnated with organic compounds used for surface preparation or cleanup, or for coating, ink, or paint removal, must be in closed containers.

(b) BAAQMD Regulation 8-16 (Solvent Cleaning Operations)

Regulation 8-16 requires monthly recordkeeping, indicating the type and quantity of solvent used in wipe cleaning. Records must be retained and available for inspection by the BAAQMD for the previous 24-month period.

(6) Diesel Fuel Requirements

In addition to the source-specific standards that are typically met through emissions control technologies, the EPA and the CARB also directly regulate the diesel fuel used in many project emission sources.

(a) Federal Highway Diesel Fuel Sulfur Requirements

The 2007 Highway Rule also required refineries to begin producing highway diesel fuel that meets a maximum sulfur standard of 15 ppm, known as ultra-low-sulfur diesel, by June 2006. All 2007 and later model year diesel-fueled vehicles must be refueled with ultra-low-sulfur diesel.

(b) Federal Nonroad Diesel Fuel Sulfur Requirements

This rule required low-sulfur (500 ppm) diesel fuel to be phased in starting in 2007, and required ultra-low-sulfur diesel (15 ppm) to be phased in over the 2010–2012 period for nonroad, locomotive, and marine engines.[58] The California Diesel Fuel Regulations (described below) generally preempt this rule for other sources such as construction equipment and require ultra-low-sulfur diesel at an earlier date.

(c) California Diesel Fuel Regulations

In 1988, the CARB proposed an initial diesel fuel regulation limiting the sulfur content and aromatic hydrocarbon content of diesel fuel for motor vehicles and identified particulate emissions from diesel-fueled engines as a TAC. The 1988 initial diesel fuel regulation was subsequently amended and additional regulations regarding diesel fuel were passed. Current standards for the sale of diesel fuel in California require a sulfur limit of 15 ppm,[59] an aromatic hydrocarbon limit of 10 percent by volume,[60] and a minimum lubricity level of a maximum wear scar diameter of 520 microns based on ASTM International test method D6079-02, Standard Test Method for Evaluating Lubricity of Diesel Fuels by the High Frequency Reciprocating Rig.[61, 62]

These State regulations establish the same fuel sulfur content limits as the federal diesel fuel regulations described above (15 ppm or 0.0015 percent); however, the State fuel regulations accelerate the effective dates of the requirements for non-highway applications within California by 3 to 5 years.

g. Odors

Because odors are typically considered a local air quality problem, the EPA has not established any odor regulations. Instead, the BAAQMD enforces rules that pertain to odors in the SFBAAB. Although offensive odors rarely cause physical harm, they can be unpleasant and generate citizen complaints. The BAAQMD's Regulation 7 (Odorous Substances) places general limitations on odorous substances and specific emission limitations on certain odorous compounds. This regulation does not apply until the air pollution control officer receives, within a 90-day period, 10 or more odor complaints

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[58] This applies only to diesel fuel, as opposed to marine residual fuel, which is more typically used for very large ocean-going vessels.

[59] California Air Resources Board (CARB), 2004c. Amendments to the California Diesel Fuel Regulations, Sulfur Content of Diesel Fuel. 13 CCR §2281. August.

[60] California Air Resources Board (CARB), 2004d. Amendments to the California Diesel Fuel Regulations, Aromatic Hydrocarbon Content of Diesel Fuel. 13 CCR Section 2282. August.

[61] California Air Resources Board (CARB), 2004e. Amendments to the California Diesel Fuel Regulations, Lubricity of Diesel Fuel. 13 CCR §2284. August.

[62] California Code of Regulations, Title 13, Sections 2281, 2282, and 2284.

alleging that a person or entity has caused odors, at or beyond the source's property line, that are perceived to be objectionable by the complainants in the normal course of their work, travel, or residence. At this point, the limits in the regulation become effective until such time as no complaints have been received by the air pollution control officer for 1 year. The limits in the regulation become applicable again if the air pollution control officer receives odor complaints from five or more complainants within a 90-day period.

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 on air quality are considered significant if the Proposed Project or one of the Alternatives would result in any of the following:

- Conflict with or obstruct implementation of the applicable air quality plan
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable NAAQS or CAAQS, specifically by exceeding quantitative thresholds for ozone precursors
- Expose sensitive receptors to substantial pollutant concentrations
- Create objectionable odors affecting a substantial number of people[63]

In 2017, the BAAQMD released the most recent update to its CEQA Air Quality Guidelines.[64] This is an advisory document that provides the lead agency, consultants, and project applicants with uniform procedures for addressing air quality in environmental documents. To assist in identifying projects with significant impact, the guidelines recommend CEQA numerical thresholds of significance for certain criteria air pollutants, TACs, and $PM_{2.5}$ for use by lead agencies.[65] These thresholds of significance are for

[63] BAAQMD thresholds list five confirmed complaints per year averaged over 3 years.
[64] Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en, accessed May 2017.
[65] Ibid.

individual project emission levels that would be cumulatively considerable. There are no separate cumulative thresholds of significance for criteria air pollutant emissions.

(1) Criteria Pollutants (Construction)

The following quantifiable criteria are used in this Draft EIR to define construction significance for criteria pollutants:

- Emissions of ROG, NO_x, or $PM_{2.5}$ (exhaust) exceeding 10 tons per year (tons/yr) or 54 pounds per day (lbs/day)
- Emissions of PM_{10} (exhaust) exceeding 15 tons/yr or 82 lbs/day
- Increase in the annual average $PM_{2.5}$ concentration greater than 0.3 microgram per cubic meter ($\mu g/m^3$)
- Cumulative annual average $PM_{2.5}$ concentration greater than 0.8 $\mu g/m^3$

(2) Criteria Pollutants (Operational)

The following quantifiable criteria are used in this Draft EIR to define operational significance:

- Emissions of ROG, NO_x, or $PM_{2.5}$ (exhaust) exceeding 10 tons/yr or 54 lbs/day
- Emissions of PM_{10} (exhaust) exceeding 15 tons/yr or 82 lbs/day
- Contribution to ambient CO concentration leading to an exceedance of the CAAQS of 9 ppm averaged over 8 hours or 20 ppm averaged over 1 hour, or the NAAQS of 9 ppm averaged over 8 hours or 35 ppm averaged over 1 hour
- Increase in the annual average $PM_{2.5}$ concentration greater than 0.3 $\mu g/m^3$
- Cumulative annual average $PM_{2.5}$ concentration greater than 0.8 $\mu g/m^3$

(3) Toxic Air Contaminants

To assist in identifying projects with significant impacts, the BAAQMD has recommended numerical significance criteria for TAC impacts for use by lead agencies.[66] If the project does not comply with a qualified Community Risk Reduction Plan, the following quantifiable criteria are used in this Draft EIR to define construction and operational significance:

- Expose the public to carcinogenic TACs that would increase the probability of contracting cancer for the maximally exposed individual that exceeds 10-in-1-million (100-in-1-million for cumulative impacts)

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[66] Ibid.

- Expose the public to non-carcinogenic TACs that would result in an acute or chronic hazard index greater than 1 (10 for cumulative impacts).

b. Impact Methodology

The methodology used to evaluate the significance of impacts is described below. The EMU Option would generally 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.

Emissions of criteria pollutants are compared with mass emissions thresholds. Local concentrations of these criteria pollutants are not estimated because their potential impacts, with the exception of $PM_{2.5}$, are at the regional rather than local level.

By contrast, emissions of TACs and $PM_{2.5}$ and their associated health impacts are evaluated at the local level because of their potential to impact individuals near project emission sources. In accordance with the BAAQMD's 2017 CEQA Air Quality Guidelines,[67] the zone of influence of an emissions source is 1,000 feet. Beyond this 1,000-foot radius, it is not expected that the non-project sources of TACs would have a cumulative health risk impact on sensitive receptors. As described in the Introduction subsection above, the study area for impacts of TACs and $PM_{2.5}$ is conservatively defined as the area within 3,280 feet (1,000 meters) of the collective footprint.

The impacts analysis for mass emission thresholds, $PM_{2.5}$ concentration thresholds, and health risk are evaluated for two separate years: 2025 (corresponding to the project opening year) and 2040 (corresponding to the horizon year). For each of these two years, the impacts are evaluated against the No Project Conditions. For example, the change between the 2025 No Project Conditions and the 2025 Project Conditions represents the net emissions increase or decrease attributed to the Proposed Project or an alternative in 2025. Similarly, the change between the 2025 No Project Conditions and the 2025 Cumulative Conditions represents the net emissions increase or decrease attributed to the Proposed Project or an alternative under Cumulative Conditions.

(1) Criteria Pollutants

Criteria pollutant emissions were calculated for the Proposed Project and Alternatives. The analysis is consistent with the California Emission Estimator Model version 2013.2.2

[67] Ibid.

(CalEEMod®).[68] The analysis is based on the CalEEMod® methodology described in Appendix A of the CalEEMod® User's Guide and the default data tables in Appendix D of the CalEEMod® User's Guide, with certain modifications to methodologies as described below for construction and operations. Tables 1 through 10 of Appendix H provide specific details on the calculation of construction emissions, and Tables 11 through 30 of Appendix H provide details on the calculation of operational emissions.

The subsections below describe calculation methodologies for operational emissions followed by construction-related emissions.

(a) Calculation Methodologies for Construction Emission Sources

Project construction would generate criteria air pollutant emissions through the use of heavy-duty construction equipment, off-gassing from architectural coatings and asphalt paving, and truck haul trips, and from construction workers and vendors traveling to and from the project site. Mobile source emissions would be generated from the use of construction equipment, including but not limited to excavators, bulldozers, compactors, forklifts, and cranes, and would include emissions of NO_x, ROG, PM_{10}, and $PM_{2.5}$. The assessment of construction air quality impacts considers each of these sources and recognizes that construction emissions can vary substantially from day to day, depending on the level of activity; the specific type of operation; and, for dust, the prevailing weather conditions.

Criteria pollutant emissions from on-road and off-road diesel vehicles were calculated using EMFAC2014 emissions factors.[69] Project-specific construction schedule, equipment lists, and vehicle trip data were used where known. In cases where project-specific data were not available, default data provided by CalEEMod® were used. Default data (such as emissions factors, trip lengths, and vehicle fleet mix) have been provided by the various air districts throughout California to account for local requirements and conditions.

Construction of the Proposed Project or the DMU Alternative was assumed to occur over an approximately 48-month period beginning in 2020.[70] Construction of the Express Bus/BRT Alternative was assumed to occur over a 52-month period beginning in 2020. Construction off-road equipment operating schedules were provided by BART. The model default fleet mix was used to compute construction equipment exhaust emissions rates.

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[68] California Air Pollution Control Officers Association (CAPCOA), 2013. California Emissions Estimator Model. Available at: http://www.caleemod.com, accessed February 2017.

[69] Emission factors for 2020 were conservatively used for all years of construction.

[70] As described in Chapter 2, Project Description, construction is expected to begin in 2021; however, this analysis assumes a construction start date of 2020. Because construction equipment fleets are expected to become cleaner over time due to fleet turnover and air quality regulations for diesel equipment, a conservative emissions estimate is provided.

In addition, ROG emissions from architectural coatings were calculated assuming 150 grams per liter for exterior coating and 100 grams per liter for interior coating to account for the BAAQMD's Regulation 8, Rule 3, which applies to the volatile organic compound (VOC) content of paints and solvents sold and used in the region.[71] ROG emissions from asphalt paving off-gassing were calculated using an emissions factor from the South Coast Air Quality Management District study as reported in Appendix A of the CalEEMod® User's Guide.

Construction activities for the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would occur along the project corridor. For the purpose of this analysis, the corridor was divided into segments. The equipment usage and construction schedule were provided by segment, and emissions were therefore calculated for each segment. Daily emissions (in lbs/day) were calculated based on the sum of construction emissions from all segments divided by the construction duration for each alternative, assuming 365 days of construction per year.

In addition to the bus-related facilities that would be installed for the proposed Isabel Station (included in the discussion of the methodology above), other bus infrastructure improvements, such as bus shelters, bus bulbs, and transit signal priority, would be installed under the Proposed Project and Build Alternatives. Because specific details on construction equipment and schedule for these activities are unknown at this time, the construction emissions from bus improvements were conservatively calculated by scaling the total construction emissions from the Proposed Project (not including the storage and maintenance facility) using the ratio of assumed construction duration for bus improvements (2 months) to the total construction duration for the Proposed Project (48 months). These emissions were then added to the construction emissions calculated for the Proposed Project and each alternative.

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[71] The BAAQMD regulations for paint are specifically for VOCs. However, the BAAQMD CEQA thresholds for mass emissions of ozone precursors addresses ROGs, not VOCs. BAAQMD Regulation 1 defines VOCs as "any organic compound, as described in Section 1-233, which would be emitted during use, processing, application, curing, or drying of a solvent, surface coating, or other material." Organic compound is defined in Section 1-233 of Regulation 1 as "any compound of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, or carbonates, and ammonium carbonate." (Note the difference between the BAAQMD and EPA definitions of VOCs. The EPA's definition requires that the organic compounds be photochemically reactive, while the BAAQMD's definition does not, and is therefore more encompassing.)

The BAAQMD CEQA Air Quality Guidelines define ROGs as "classes of organic compounds, especially olefins, substituted aromatics and aldehydes, that react rapidly in the atmosphere to form photochemical smog or ozone."

In practical terms, ROGs are a subset of VOCs (as defined by the BAAQMD) as not all organic compounds will react rapidly in the atmosphere to form photochemical smog or ozone. Depending on the source, the percentage of VOCs that are ROGs is typically very high (i.e., close to 100 percent). Thus, for purposes of this section, ROG emissions are conservatively assumed to be equivalent to VOC (as defined by BAAQMD) emissions.

(b) Calculation Methodologies for Operational Emission Sources

Operations of the Proposed Project and Alternatives would result in emissions of criteria air pollutants and ozone precursors, including ROG, NO_x, PM_{10}, and $PM_{2.5}$, from a variety of sources, including mobile on-road sources and sources on BART property. Operational emissions calculation methodologies address the following emission sources, for the Proposed Project or Build Alternatives, as indicated below.

- For on-road vehicles:
  - Net changes in passenger vehicle traffic (Proposed Project and Build Alternatives)
  - Net changes in bus miles (Proposed Project and Build Alternatives)
- For diesel combustion:
  - Emergency generators (Proposed Project and DMU Alternative)
  - Diesel combustion by DMU vehicles (DMU Alternative)
  - Diesel-fueled maintenance trucks at the DMU storage and maintenance facility (DMU Alternative)
  - Diesel-fueled shuttle van for transporting train operators between the BART storage and maintenance facility and the Isabel Station (Proposed Project)
- For area sources of emissions:
  - Architectural coatings (Proposed Project, DMU Alternative, and Express Bus/BRT Alternative)
  - Solvent usage at the BART and DMU maintenance facilities (Proposed Project and DMU Alternative)

Passenger Vehicle Traffic (Proposed Project and Build Alternatives)

The implementation of the Proposed Project or any of the alternatives would change passenger vehicle traffic as people could decide to use public transportation or otherwise change their transportation patterns due to the Proposed Project or Build Alternatives.

As described in Section 3.B, Transportation, the change in annual VMT and annual trips between the 2025 No Project Conditions and 2025 Project Conditions was used to quantify the change in emissions. In this analysis, the change is referred to as the Proposed Project in 2025 or 2025 Alternative (DMU Alternative, Express Bus/BRT Alternative, or Enhanced Bus Alternative). Similarly, the change between the 2040 No Project Conditions and 2040 Project Conditions was quantified and is referred to as the 2040 Proposed Project or 2040 Alternative (DMU Alternative, Express Bus/BRT Alternative, or Enhanced Bus Alternative).

The net change in overall VMT from the No Project Condition for each alternative is shown in Table 3.K-6. Emissions were calculated using EMFAC2014 emission factors for 2025 and 2040. Traffic activity was annualized by applying a conversion factor of 300 to average weekday VMT and trips, to account for lower weekend traffic activity, consistent with the methodology used in the Plan Bay Area 2040 Draft EIR.

TABLE 3.K-6 CHANGE IN ANNUAL NET PASSENGER VMT

	Net New Annual VMT	
	2025	**2040**
Project Conditions		
Conventional BART Project	-38,250,574	-73,770,403
DMU Alternative	-28,578,215	-42,745,966
Express Bus/BRT Alternative	-13,357,023	-28,586,697
Enhanced Bus Alternative	-75,668	-2,722,388
Cumulative Conditions		
Conventional BART Project	-32,649,225	-82,390,212
DMU Alternative	-21,858,079	-49,924,896
Express Bus/BRT Alternative	-19,509,613	-34,691,838
Enhanced Bus Alternative	-8,705,948	-8,834,264

Notes: VMT = vehicle miles traveled
Net new annual VMT is the net change in VMT between the Proposed Project (or Alternative) and No Project Condition for the specified year (2025 or 2040). A net negative VMT indicates that the Proposed Project or the Alternative would result in a net reduction in VMT.
Source: Cambridge Systematics, 2017.

Buses (Proposed Project and Build Alternatives)

Emissions from buses are calculated based on distance traveled (in miles) and emissions factors. The distance traveled is calculated based on the roundtrip distance (in miles) for each new and modified bus route. Emission factors for buses operated by Central Contra Costa Transit Authority, San Joaquin Regional Transit District, Modesto Area Express, and Amtrak California are from EMFAC2014 for 2025 and 2040 operational years. EMFAC2014 provides estimated county-specific average emissions factors for future years, and is a suitable source of data for when agency specific emissions factors are not available.

Emissions factors specific to buses operated by Livermore-Amador Valley Transit Authority (LAVTA) were available and are used in this analysis. Buses operated by LAVTA are subject to the Fleet Rule for Transit Agencies – Urban Bus Requirements, and are required to reduce DPM emissions to 0.01 grams per brake horsepower-hour (g/bhp-hr) and NO_x

emissions to 4.8 g/bhp-hr.[72] Therefore, PM and NO_x emissions from buses for 2025 and 2040 that would be operated on LAVTA routes were calculated based on emissions of 0.01 g/bhp-hr and 4.8 g/bhp-hr, respectively. Idling emissions for all buses are based on EMFAC2014 emissions factors. Anticipated schedules, including hours of operation and bus frequency, are described in Chapter 2, Project Description. Buses were assumed to idle at the proposed Isabel Station for the Proposed Project and DMU Alternative or at the Dublin/Pleasanton Station for the Express Bus/BRT Alternative and Enhanced Bus Alternative. The duration of idling was assumed to be 5 minutes (between each trip), as transit bus idling is limited to 5 minutes per the CARB's ATCM to Limit Diesel-Fueled Commercial Motor Vehicle Idling.

Maintenance Facility Vehicles and Equipment (Conventional BART Project and DMU Alternative)

Equipment at the BART and DMU maintenance facilities would consist of electric-powered forklifts and two diesel-fueled maintenance trucks. Because the forklifts would be electric, there would be no associated criteria air pollutant emissions. Additionally, the BART storage and maintenance facility would include a diesel-fueled shuttle van for transporting train operators between the storage and maintenance facility and the Isabel Station. Emissions from the maintenance trucks and shuttle van were calculated based on EMFAC2014 emissions factors for light heavy-duty trucks[73] for 2025 and 2040. Each truck was assumed to travel approximately 11 miles per day and idle for 10 minutes per day.[74] The shuttle van was assumed to travel 20 miles per day and idle for 40 minutes per day.

Emergency Generators (Conventional BART Project and DMU Alternative)

A single diesel-fired emergency generator would be installed at both the North Isabel touchdown structure and at the storage and maintenance facility to provide backup power during emergency situations. Because the make and model of the generator have not yet been determined, emissions for the generator at the North Isabel touchdown structure were calculated based on the size typical of diesel generators installed at other BART stations (2,500 kilowatts) and emissions factors for Tier 2 engines. Generator operation

[72] In accordance with Title 13 of the California Code of Regulations, Section 2023.1, transit agencies are required to comply with the Fleet Rule for Transit Agencies – Urban Bus Requirements by following one of two paths: alternative fuel or diesel. LAVTA elected to comply with the diesel path, which requires that DPM emissions be reduced to either 15 percent of the 2002 baseline or 0.01 g/bhp-hr, whichever is greater, by January 1, 2007. LAVTA was required to meet a reduction of target of 0.01 g/bhp-hr.

[73] EMFAC2014 vehicle class.

[74] Daily vehicle miles were provided by the project sponsor. Idling is assumed to occur for up to 10 minutes per day. Source: Dean, Donald, Environmental Coordinator, Bay Area Rapid Transit District, 2016. Email communication with Ramboll Environ, Inc. September 20.

would be limited to 2 hours of testing each month. Emissions for the storage and maintenance facility generator (500-kilowatt) were calculated based on Tier 3 emission factors and 50 hours per year for non-emergency maintenance and readiness testing.

DMU Vehicles (DMU Alternative)

DMU emissions were calculated based on annual rail car miles and trips, as described in Section 3.B, Transportation. Emissions factors for criteria air pollutants were obtained from the CARB and EPA Off-Road Compression-Ignition (Diesel) Engine standards for a Tier 4 Final diesel engine. As the exact make and model of the DMU have not been determined, emissions were determined based on the size and operating parameters typical of the DMU model planned for use in the East Contra Costa BART Extension (eBART) passenger rail service.[75]

Architectural Coating (Conventional BART Project, DMU Alternative, Express Bus/BRT Alternative)

ROG off-gassing emissions from architectural coating are calculated based on the square footage of the new buildings, an assumed VOC content of the paint based on BAAQMD regulations, and a reapplication rate of 10 percent, consistent with CalEEMod®.[76]

Solvent Use (Conventional BART Project and DMU Alternative)

Solvent and brake cleaner would be used at the BART and DMU maintenance facilities, although the specific materials have not yet been identified. For the purposes of evaluation, it is assumed that ROG emissions from use of solvent and brake cleaner would

[75] LTK Engineering Services, 2008. eBART Phase I Project to Hillcrest Terminal: DMU and LRV Comparison. May 14.

[76] The BAAQMD regulations for paint are specifically for VOCs. However, the BAAQMD CEQA thresholds for mass emissions of ozone precursors addresses ROGs, not VOCs. BAAQMD Regulation 1 defines VOCs as "any organic compound, as described in Section 1-233, which would be emitted during use, processing, application, curing, or drying of a solvent, surface coating, or other material." Organic compound is defined in Section 1-233 of Regulation 1 as "any compound of carbon, excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, or carbonates, and ammonium carbonate." (Note the difference between the BAAQMD and EPA definitions of VOCs. The EPA's definition requires that the organic compounds be photochemically reactive, while the BAAQMD's definition does not, and is therefore more encompassing.)

The BAAQMD CEQA Air Quality Guidelines define ROGs as "classes of organic compounds, especially olefins, substituted aromatics and aldehydes, that react rapidly in the atmosphere to form photochemical smog or ozone."

In practical terms, ROGs are a subset of VOCs (as defined by BAAQMD), as not all organic compounds will react rapidly in the atmosphere to form photochemical smog or ozone. Depending on the source, the percentage of VOCs that are ROGs is typically very high (i.e., close to 100 percent). Thus, for purposes of this section, ROG emissions are conservatively assumed to be equivalent to VOC (as defined by BAAQMD) emissions.

be less than the BAAQMD permitting exemption threshold of 150 pounds per year in BAAQMD Regulation 2-1-118-9.1.[77]

(2) Carbon Monoxide

CO impacts are evaluated by using the BAAQMD's screening thresholds for hotspots. The screening methodology is based on peak hourly traffic volumes at affected intersections. If a project would contribute 44,000 vehicles per hour to an intersection, or 24,000 vehicles per hour for intersections where vertical or horizontal air mixing would be limited (e.g., tunnel, parking garage, bridge underpass, natural or urban street canyon, or below-grade roadway), it could violate or contribute to a violation of NAAQS or CAAQS for CO.[78] Peak hourly traffic volumes from Section 3.B, Transportation are used to evaluate against screening thresholds.

The BAAQMD does not have separate cumulative thresholds of significance for local CO impacts; therefore, no separate cumulative analysis is performed for CO.

(3) Toxic Air Contaminants

TACs would be emitted during the operation and construction of the Proposed Project and Build Alternatives. The emissions and health risk calculation methodologies are described below.

(a) Construction

During construction of the BART to Livermore Extension Project, diesel-powered off-road construction equipment such as cranes, forklifts, and backhoes would generate TACs. The following three steps were performed for analysis of TACs: (1) an emissions estimation; (2) air dispersion modeling; and (3) an HRA.

For sources of diesel exhaust, such as construction equipment and haul trucks, the primary health impact is cancer risk. The DPM concentration at which the cancer risk significance threshold is exceeded is lower than the concentration for exceeding the chronic health index. Thus, non-cancer hazard indices from diesel exhaust were not explicitly estimated in this report.

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[77] The 150-pound threshold for BAAQMD Regulation 2-1-118-9.1 is specifically for VOCs. However, the BAAQMD CEQA thresholds for mass emissions of ozone precursors includes ROG, not VOC. Similarly, as for architectural costing, for purposes of this section, we conservatively assume the ROG emissions are equivalent to VOC (as defined by BAAQMD) emissions.

[78] Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en, accessed May 2017.

An HRA was conducted to assess both increased cancer risk and localized $PM_{2.5}$ concentrations from construction sources for sensitive receptors located within the study area. Based on a sensitive receptor search within the 3,280-foot (1,000-meter) study area, the following five sensitive receptor types were identified and evaluated in the HRA: residents, school children, daycare children, patients in hospitals, and recreational users. Known future developments with potential sensitive receptors were also considered in this analysis. Table 3.K-5 is a listing of the daycare centers, hospitals, parks, playgrounds, and schools in the study area and evaluated in the HRA. Other sensitive receptors also evaluated in the HRA include residential homes and small licensed daycare facilities operated out of private homes.

Localized $PM_{2.5}$ concentrations are assessed based on annual average concentrations. Conversely, cancer risk is assessed based on the probability of contracting cancer over a 30-year period. Sources considered in the HRA include unmitigated and mitigated emissions from construction equipment and trucks and from employee vehicle transport.

To evaluate DPM and $PM_{2.5}$ impacts from the construction of the Proposed Project and Build Alternatives, near-field air dispersion modeling of project operation emissions sources was conducted using the American Meteorological Society/EPA Regulatory Model (AERMOD), version 15181, as recommended by the 2017 BAAQMD CEQA Air Quality Guidelines (referred to herein as BAAQMD CEQA Guidelines).[79] Air dispersion modeling applications used surface meteorological data from the Livermore Airport (located 0.5 mile south of the project corridor near the proposed Isabel Station) and upper air data from the Metropolitan Oakland International Airport (closest upper air station to the project) to provide the most representative data set for this analysis.

The ambient concentrations obtained through dispersion modeling were subsequently used in the risk assessment to quantify cancer health risk impacts and to evaluate $PM_{2.5}$ impacts. Air dispersion models such as AERMOD require a variety of inputs such as source parameters, meteorological data, topographical information, and receptor parameters, which are discussed below.

Emissions

Emissions of DPM and $PM_{2.5}$ from construction activities were quantified using the emissions estimation methodologies previously described above for criteria pollutants. DPM emissions were conservatively assumed to be equal to PM_{10} emissions for all diesel combustion sources.

[79] Ibid.

Meteorological Data

Air dispersion modeling requires the use of meteorological data that, ideally, are spatially and temporally representative of conditions in the immediate vicinity of the site under consideration. For the HRA, National Weather Service surface meteorological data for 2011 through 2015 from the Livermore Airport meteorological station were used.[80, 81] Upper air data from the Metropolitan Oakland International Airport were used to complement the surface data.[82] Determination of surface moisture conditions for meteorological data processing were based on precipitation data from the Livermore Airport meteorological station.[83] As described above, the Livermore Airport meteorological station is located approximately 0.5 mile south of the project corridor.

Topographical Data

AERMOD uses a terrain preprocessor, AERMAP version 11103, to determine elevations of the surrounding landscape.[84] Data from the National Elevation Data set, available from the United States Geological Survey, were utilized to import the elevation information for sources and receptors.[85] AERMAP was used to extract elevations from the National Elevation Data set.

[80] National Climatic Data Center (NCDC), 2016a. TD-3505 Hourly Dataset. ASOS Station KLVK (Livermore Airport, WMO 724927, WBAN 23285). National Oceanic and Atmospheric Administration, National Centers for Environmental Information. Available at: ftp://ftp.ncdc.noaa.gov/pub/data/noaa/, accessed March 9, 2016. [Subset used: January 2011–December 2015.]

[81] National Climatic Data Center (NCDC), 2016b. DS-6405 1-Minute Dataset. ASOS Station KLVK (Livermore Airport, WBAN 23285). National Oceanic and Atmospheric Administration, National Centers for Environmental Information. Available at: ftp://ftp.ncdc.noaa.gov/pub/data/asos-onemin/, accessed March 9, 2016. [Subset used: January 2011–December 2015.]

[82] National Oceanic and Atmospheric Administration (NOAA) and Earth System Research Laboratory (ESRL), 2016. NOAA/ESRL Radiosonde Database. Forecast Systems Laboratory (FSL) data for Upper Air Station KOAK (Metropolitan Oakland International Airport, WMO 72493). Available at: https://ruc.noaa.gov/raobs/, accessed March 9, 2016. [Subset used: January 1, 2011–December 31, 2015.]

[83] National Climatic Data Center (NCDC), 2016c. Global Summary of the Month, Surface Station KLVK (Livermore Airport, WBAN 23285) for the period between January 1, 1986 and December 31, 2015. Available at: https://www.ncdc.noaa.gov/cdo-web/search?datasetid=ANNUAL, accessed March 9, 2016.

[84] United States Environmental Protection Agency (EPA), 2017c. Version 11103. Available at: https://www3.epa.gov/scram001/dispersion_related.htm, accessed February 2017.

[85] United States Geological Survey (USGS), 2016. National Elevation Dataset (NED) 1-arc second. Available at: https://www.mrlc.gov/viewerjs/, accessed March 9, 2016.

Source Configurations and Parameters

All emissions from construction, including off-site vehicle emissions from trucks and worker trips going to and from construction zones, were conservatively assumed to be included in the on-site emissions and were modeled as adjacent volume sources.

Construction would primarily occur Monday through Friday, with limited activities occurring on weekends. Although most construction activities would take place Monday through Friday, modeling was completed assuming activities would occur seven days a week, as cancer risk and $PM_{2.5}$ concentrations are based on annual averages of concentration. Construction activities were modeled between 5:00 a.m. and 7:00 p.m., seven days a week, to reflect the approximate duration of construction activities, even though some limited construction activity would take place between 7:00 p.m. and 5:00 a.m. Modeling during this timeframe is more conservative than during the typical construction hours of 7:00 a.m. to 7:00 p.m.

A summary of modeled source parameters is provided in Table 31 of Appendix H.

Risk Assessment

The purpose of the HRA analysis is to assess potential health impacts that would result from construction of the Proposed Project and Build Alternatives. Consistent with guidelines and methodologies from the BAAQMD[86] and OEHHA,[87] the HRA evaluates the estimated excess lifetime cancer risk and $PM_{2.5}$ concentrations associated with diesel exhaust that would be emitted by construction activities, and TACs associated with diesel exhaust emitted from vehicles associated with construction traffic to and from the site. The HRA evaluates the following three construction alternatives for the unmitigated and mitigated scenarios: Conventional BART Project, DMU Alternative, and Express Bus/BRT Alternative. An HRA is not conducted for construction of the Enhanced Bus Alternative because activity under that alternative would be limited to minor construction at widely separated locations for bus-related infrastructure improvements such as installing bus shelters and constructing bulb-outs. Therefore, the impacts to health risk and $PM_{2.5}$ concentration is considered de minimis.

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[86] Bay Area Air Quality Management District (BAAQMD), 2016d. Air Toxics NSR Program Health Risk Assessment (HRA) Guidelines. January Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/rules-and-regs/workshops/2016/reg-2-5/hra-guidelines_clean_jan_2016-pdf.pdf?la=en, accessed October 2016.

[87] Office of Environmental Health Hazard Assessment (OEHHA), 2015. Air Toxics Hot Spots Program Risk Assessment Guidelines. Guidance Manual for the Preparation of Health Risk Assessments. Available at: http://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-guidance-manual-preparation-health-risk-0, accessed October 2016.

The exposure parameters and methodology used to estimate excess lifetime cancer risks for all potentially exposed sensitive populations evaluated in the construction HRA are obtained using risk assessment guidelines from the OEHHA (2015) and the BAAQMD (2016), unless otherwise noted, and are presented in Table 33 of Appendix H.

The toxicity values and methodology used to estimate excess lifetime cancer risks are the same as those described for operational impacts. Specific details on the health risk and $PM_{2.5}$ calculations and methodology are provided in Tables 32, 33, 35, and 36 of Appendix H.

Cumulative Analysis

The construction cumulative analysis takes into account other construction activities occurring within the vicinity of the Proposed Project and Build Alternatives. As shown in Table 3.A-3 in Section 3.A, Introduction to Environmental Analysis and in Appendix E, several projects could be under construction concurrently with the Proposed Project or Build Alternatives. In addition, a portion of the INP would be undergoing construction concurrent with the Proposed Project or DMU Alternative. The cumulative impact of other construction activities on health risk is evaluated at the project construction maximally exposed individual sensitive receptor (MEISR). Impacts of other construction activities are first screened out based on distance. Per the BAAQMD CEQA Guidelines, a radius of 1,000 feet around the project property boundary should be used for assessing cumulative impacts. Any construction activities that are not screened out based on distance are modeled and then evaluated for additional health risk impacts to the MEISR. It is noted that there are no significance thresholds for construction-generated dust (i.e., PM) or criteria air pollutants. Construction-generated dust is addressed on a project-level basis with best management practices. BAAQMD considers project-level criteria air pollutant thresholds to also capture cumulative impacts; if project level thresholds are exceeded, then it would also be considered a cumulative impact.

(b) Operation

Health risks associated with operational activities such as a DMU rail line, increased bus service, increased mobile source activity (i.e., additional passenger VMT), use of the diesel-fueled emergency generators, and/or maintenance yard activities were evaluated through the following three steps: (1) an emissions estimation; (2) air dispersion modeling; and (3) an HRA.

BAAQMD modeling of roadways in the Bay Area showed that the thresholds for long-term and short-term hazard indices were never exceeded. Thus, for roadways, the non-cancer chronic and acute hazard indices were not estimated in this analysis. For sources of diesel exhaust, such as buses and DMUs, the primary health impact is cancer risk. The DPM concentration at which the cancer risk significance threshold is exceeded is lower than the concentration for exceeding the chronic health index. Thus, non-cancer hazard indices from diesel exhaust were not explicitly estimated in this report.

An HRA was conducted to assess both increased excess lifetime cancer risk and localized annual average $PM_{2.5}$ concentrations for sensitive receptors located within a 3,280-foot (1,000-meter) study area of the operational sources. Based on a sensitive receptor search within the 3,280-foot (1,000-meter) study area, the following five sensitive receptor types were identified and evaluated in the HRA: residents, school children, daycare children, patients in hospitals, and recreational users. Known future developments with potential sensitive receptors were also considered in this analysis. Sensitive receptors considered for the HRA are shown in Table 3.K-5.

Sources considered in the operational HRA include (1) traffic generated by full buildout of the BART to Livermore Extension Project (roadway segments with an increase in average daily traffic volume greater than 10,000 vehicles per day); (2) buses; (3) DMUs (DMU Alternative only); (4) maintenance trucks and solvents to be used for maintenance operations at the BART and DMU maintenance facilities (Proposed Project and DMU Alternative); and (5) maintenance operation of the diesel-fired emergency generators. Under State regulatory guidelines, DPM is used as a surrogate measure of carcinogen exposure for the mixture of chemicals that make up diesel exhaust.

To evaluate DPM and $PM_{2.5}$ impacts from the Proposed Project and Build Alternatives, near-field air dispersion modeling of project operation emissions sources was conducted using AERMOD version 15181, as recommended by the BAAQMD CEQA Guidelines.[88] Air dispersion modeling applications used surface meteorological data from the Livermore Airport (located 0.5 mile south of the project corridor near the proposed Isabel Station) and upper air data from the Metropolitan Oakland International Airport (closest upper air station to the project) to provide the most representative data set for this analysis.

The ambient concentrations obtained through dispersion modeling were subsequently used in the risk assessment to quantify cancer health risk impacts and to evaluate $PM_{2.5}$ impacts. Air dispersion models such as AERMOD require a variety of inputs such as source parameters, meteorological data, topographical information, and receptor parameters, which are discussed below.

[88] Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en, accessed May 2017.

Emissions

Emissions of DPM and $PM_{2.5}$ from off-road equipment and on-road vehicles were quantified using the emissions estimation methodologies described above for criteria pollutants. DPM emissions were conservatively assumed to be equal to PM_{10} exhaust emissions for all diesel combustion sources.

Meteorological Data

The same meteorological data used in the construction HRA described above are applied for the operational HRA.

Topographical Data

The same topographical data used in the construction HRA described above are applied for the operational HRA.

Source Configurations and Parameters

This subsection describes the source configurations and parameters used for dispersion modeling and the HRA. Modeling and the HRA for the Proposed Project and the DMU Alternative included passenger vehicles, buses, maintenance trucks, and two emergency generators. The Proposed Project also included the diesel-fueled shuttle van and the DMU Alternative included the DMU Vehicles. The Express Bus/BRT and the Enhanced Bus Alternatives only included passenger vehicle traffic and buses.

Passenger Vehicle Traffic (Conventional BART Project and Alternatives). To address the impacts of passenger vehicle traffic described in Section 3.B, Transportation, road segments with an increase in average daily traffic volume greater than 10,000 vehicles per day were identified. A screening-level risk assessment was completed for these segments using the BAAQMD Roadway Screening Analysis Calculator.[89] Cancer risk and $PM_{2.5}$ concentration were identified for the operational MEISR.

Buses (Conventional BART Project and Alternatives). Under the Proposed Project and DMU Alternative, the highest impacts associated with operation of buses are expected to occur at and around the proposed Isabel Station due to the number of buses accessing the station area and then idling briefly between trips. Bus routes near the proposed Isabel Station were modeled as line sources using AERMOD. This approach is expected to capture the highest impacts from DPM emissions, as other emissions sources included in

[89] Bay Area Air Quality Management District (BAAQMD), 2015. Roadway Screening Analysis Calculator. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/screeningcalculator_4_16_15-xlsx.xlsx?la=en, accessed April 16, 2015.

the operational HRA (emergency generator and traffic) are also at or near the Isabel Station. For the Express Bus/BRT Alternative and Enhanced Bus Alternative, modeling of bus emissions was performed around the Dublin/Pleasanton Station, as multiple bus lines would access the station for pick-up and drop-off of passengers; therefore, the highest impacts were expected in that area. The bus routes were modeled using the projected weekday hours of operation for each route.

DMU Vehicles (DMU Alternative). The DMU route between the Dublin/Pleasanton Station and the proposed Isabel Station was modeled as a line source in AERMOD. The operations were conservatively modeled for 24 hours of the day, although projected weekday hours of operation are expected to be approximately only 21 hours per day.

Maintenance Trucks (Conventional BART Project and DMU Alternative). Emissions from maintenance trucks at the BART and DMU maintenance facilities were modeled as a series of adjacent volume sources using AERMOD. It was conservatively assumed that these two diesel-fueled light-heavy-duty[90] maintenance trucks could operate throughout the day or night; therefore, no hour-of-day restrictions were applied in the modeling.

Shuttle Van (Conventional BART Project). Emissions from the shuttle van transporting train operators between the storage and maintenance facility and Isabel Station were modeled as a series of adjacent volume sources using AERMOD. It was assumed that the diesel-fueled light-heavy-duty[91] shuttle van could operate throughout the day or night; therefore, no hour-of-day restrictions were applied in the modeling.

Emergency Generators (Conventional BART Project and DMU Alternative). The diesel generators were modeled as point sources using AERMOD. Generator capacities of 2.5 megawatt (Isabel Station) and 500 kilowatt (storage and maintenance facility) was provided by BART.[92] It was conservatively assumed that testing of the generators could occur at any time throughout the day or night; therefore, no hour-of-day restrictions were applied in the modeling.

A summary of modeled source parameters is provided in Table 31 of Appendix H. Specific details on the health risk and $PM_{2.5}$ calculations and methodology are provided in Tables 32, 34, 35, and 36 of Appendix H.

[90] EMFAC2014 vehicle class
[91] Ibid.
[92] Dean, 2017. Emails communication from Donald Dean, Environmental Coordinator, San Francisco Bay Area Rapid Transit District with Ramboll Environ. Inc. (May 1 and May 2).

Risk Assessment

The purpose of the HRA analysis is to assess potential health impacts that would result from operation of the Proposed Project and Build Alternatives. Consistent with guidelines and methodologies from the BAAQMD and OEHHA, the HRA evaluates the estimated excess lifetime cancer risk and $PM_{2.5}$ concentrations associated with diesel exhaust that would be emitted by operational activities, and TACs associated with diesel exhaust emitted from vehicles.[93,] The HRA is conducted for the Proposed Project and each alternative for both 2025 and 2040.

The exposure parameters used to estimate excess lifetime cancer risks for all potentially exposed sensitive populations for the operational scenarios are obtained using risk assessment guidelines from the OEHHA and BAAQMD, unless otherwise noted, and are presented in Table 33 of Appendix H.

This analysis uses available toxicity values, including the inhalation cancer potency factor for DPM approved by Cal/EPA.[94, 95]

The annual average DPM concentrations are modeled at all identified sensitive receptor locations within the 3,280 foot (1,000-meter) study area for use in calculating the cancer risks associated with DPM emissions. The annual average $PM_{2.5}$ concentrations are also modeled at all sensitive receptor locations.

Excess lifetime cancer risks are estimated as the upper-bound incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to potential carcinogens following the methodology recommended by the BAAQMD and OEHHA. The cancer risk attributed to a chemical is calculated by multiplying the chemical intake or dose at the human exchange boundaries (such as lungs) by the chemical-specific cancer potency factor. Details of the intake calculation methodology, toxicity values, and risk characterization methodology are provided in Tables 32, 33, 35, and 36 in Appendix H.

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[93] Bay Area Air Quality Management District (BAAQMD), 2016d. Air Toxics NSR Program Health Risk Assessment (HRA) Guidelines. January Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/rules-and-regs/workshops/2016/reg-2-5/hra-guidelines_clean_jan_2016-pdf.pdf?la=en, accessed October 2016.

[94] Office of Environmental Health Hazard Assessment (OEHHA), 2011. Technical Support Document for Cancer Potency Factors. Appendix A: Lookup Table Containing Unit Risk and Cancer Potency Values. Available at: http://oehha.ca.gov/media/downloads/crnr/appendixa.pdf, accessed October 2016.

[95] Office of Environmental Health Hazard Assessment (OEHHA), 2008. Air Toxics Hot Spots Program Technical Support Document for the Derivation of Noncancer Reference Exposure Levels. Available at: http://oehha.ca.gov/air/crnr/notice-adoption-air-toxics-hot-spots-program-technical-support-document-derivation, accessed October 2016.

Quantification of excess lifetime cancer risk is based on a 30-year exposure duration per BAAQMD and OEHHA guidance. Thus, the exposure period for the 2025 analysis overlaps with the 2040 analysis (2025–2055). Operational DPM emissions from all sources either decrease or are conservatively assumed to stay the same between 2025 and 2040 with the exception of the DMU vehicles. Given that the total net new emissions in 2040 are lower than 2025, the 2025 analysis is still conservative because emissions will decrease over time rather than increase.

Cumulative Analysis

Projects considered under the cumulative conditions are described in Section 3.A, Introduction to Environmental Analysis and Appendix E.

Stationary sources and roadways within the 1,000-foot zone of influence were included in the cumulative analysis. Stationary sources were identified using the BAAQMD Stationary Source Screening Analysis Tool and additional information requested from the BAAQMD on these sources.[96] BAAQMD-provided tools were used to estimate impacts from the nearby stationary sources on the operational MEISR.[97]Impacts from total roadway traffic were analyzed using the BAAQMD Roadway Screening Analysis Calculator and the BAAQMD Highway Screening Analysis Tool.[98,99] The Stationary Source and Traffic Screening Analyses are provided in Tables 37 and 38 of Appendix H.

[96] Bay Area Air Quality Management District (BAAQMD), 2012a. Stationary Source Screening Tool. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/contra_costa_2012.kml?la=en, accessed August 31, 2016.

[97] For gas stations, the BAAQMD provides a screening tool to scale reported maximum impacts to those at other locations.

Bay Area Air Quality Management District (BAAQMD), 2012c. Gasoline Dispensing Facility (GDF) Distance Multiplier Tool. Available at: http://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/ceqa-tools, accessed June 2017.

[98] Bay Area Air Quality Management District (BAAQMD), 2015. Roadway Screening Analysis Calculator. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/screeningcalculator_4_16_15-xlsx.xlsx?la=en, accessed April 16, 2015.

[99] Bay Area Air Quality Management District (BAAQMD), 2011. Highway Screening Analysis Tool. Alameda County. 6ft. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/alameda-6ft.kmz?la=en, accessed July 2017.

(4) Odors

Odor impacts for diesel exhaust are evaluated by comparing concentrations of individual chemical species of exhaust to a compilation of odor thresholds.[100,101] Odor impacts for solvent use at the Conventional BART Project and DMU storage and maintenance facilities are expected to be de minimis because of the relatively low usage of solvents and the large distance between the storage and maintenance facility and the public (at least 1,000 feet between the BART storage and maintenance facility and the closest resident and at least 2,000 feet between the DMU storage and maintenance facility and the closest receptor). The odor analyses for construction and operations are provided in Tables 39 and 40, respectively, of Appendix H.

c. No Project Conditions

The 2025 No Project Conditions and 2040 No Project Conditions are described below. Under the 2025 and 2040 No Project Conditions, the Proposed Project and Build Alternatives would not be built. However, emissions of criteria pollutants, TACs, and odor-causing chemicals in the study area would result from new land use development and existing infrastructure. This would include the use of passenger vehicles and a continued

[100] Amoore, J.E. and E. Hautala, 1983. Odor as and Aid to Chemical Safety: Odor Thresholds Compared with Threshold Limit Values and Volatilities for 2014 Industrial Chemicals in Air and Water Dilution. Journal of Applied Toxicology, Vol 3, No 6, pg 272.

[101] Concentration of individual chemical species of diesel exhaust are derived by starting with maximum average annual modeled concentrations of DPM for each alternative and estimating the concentration of VOCs using the mass emission ratio of ROG to DPM. The mass emissions ratio can be calculated using the values in Appendix H Table 8 (for construction emissions) and Appendix H Table 27 (for operational emissions). While analyzed concentrations are annual average concentrations, odors are generally detected instantaneously or on a short time-average basis (i.e., less than one hour). Shorter time-average concentrations (i.e., 1-hour maximum concentrations) are typically 10 to 30 times higher than annual average concentrations. Rough estimates of the 1-hour maximum concentration of the odor-causing constituents are still much lower than odor thresholds.

For construction, there are two major contributors to diesel exhaust: off-road equipment and trucks & vehicles. As a conservative measure, the ratio of ROG to DPM for trucks & vehicles is used because it is higher compared to the ratio for off-road equipment. For operation, with the exception of the DMU Alternative, buses are the one major contributor to diesel exhaust. Under the DMU Alternative, the DMU is another major contributor to diesel exhaust. In evaluating the DMU Alternative, the ratio of ROG to DPM for DMU is used because it is higher compared to the ratio for buses.

Concentrations for individual chemical species are estimated by multiplying the ROG concentration by a speciation profile. Speciation profiles are from the EPA Speciate database:

United States Environmental Protection Agency (EPA), 2014. Speciate Database, Version 4.4. February. Profiles 3161, 4674, and 4741. Available at: http://www.epa.gov/ttnchie1/software/speciate/, accessed June 12, 2017.

EPA Speciation Profile 4674 is used for diesel trucks and vehicles. EPA Speciation Profile 4741 is used for buses. EPA Speciation Profile 3161 is used for off-road (construction) equipment.

increase in annual VMT in the study area and associated consumption of diesel fuel, gasoline, and electricity.

For 2025 and 2040, the project impacts are evaluated against the No Project Conditions. Thus, the 2025 Proposed Project and Build Alternatives are evaluated against the 2025 No Project Conditions and the 2040 Proposed Project and Build Alternatives are evaluated against the 2040 No Project Conditions.

(1) No Project 2025 Conditions

Under 2025 No Project Conditions, air quality is expected to improve compared to existing conditions. While traffic volumes are expected to increase, emissions from motor vehicles will become cleaner as emissions standards for motor vehicles become more stringent and older cars are taken out of circulation. The CARB estimates statewide reductions of NO_x (573 tons per day [tons/day]), ROG (214 tons/day), and $PM_{2.5}$ (5 tons/day) by 2031 from State measures that address on-road light-duty and on-road heavy-duty vehicles.

(2) No Project 2040 Conditions

Under 2040 No Project Conditions, air quality conditions would continue to improve compared to the 2025 No Project Conditions, for similar reasons to those described above. In addition, by 2040, a much higher percentage of the vehicle fleet in California is expected to be electric.

d. Summary of Impacts

Table 3.K-7 summarizes the impacts of the Proposed Project and Alternatives described in the analysis below.

TABLE 3.K-7 SUMMARY OF AIR QUALITY IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Construction					
		Project Analysis			
Impact AQ-1: Result in potentially significant, localized dust-related air quality impacts during construction	NI	LSM	LSM	LSM	LSM

TABLE 3.K-7 SUMMARY OF AIR QUALITY IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Impact AQ-2: Generate emissions of NO_x, PM, and ROGs exceeding BAAQMD significance thresholds during construction	NI	LSM	LSM	LS	LS
Impact AQ-3: Generate TAC and $PM_{2.5}$ emissions that result in health risks above the BAAQMD significance thresholds during construction	NI	LSM	LSM	LSM	LS
Impact AQ-4: Result in objectionable odors affecting a substantial number of people during construction	NI	LS	LS	LS	LS
Cumulative Analysis					
Impact AQ-5(CU): Result in potentially significant, localized dust-related air quality impacts during construction under Cumulative Conditions	NI	LS	LS	LS	LS
Impact AQ-6(CU): Result in potentially significant emissions of NO_x, PM, and ROGs during construction under Cumulative Conditions	NI	LS	LS	LS	LS
Impact AQ-7(CU): Generate TAC and $PM_{2.5}$ emissions that result in health risks above the BAAQMD significance thresholds during construction under Cumulative Conditions	NI	SU	SU	LS	LS

TABLE 3.K-7 SUMMARY OF AIR QUALITY IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Impact AQ-8(CU): Result in objectionable odors affecting a substantial number of people during construction under Cumulative Conditions	NI	LS	LS	LS	LS
Operational					
Project Analysis (2025 and 2040)					
Impact AQ-9: Result in increased emissions of NO_x, PM, and ROGs above BAAQMD significance thresholds under 2025 Project Conditions	NI	LS	LS	LS	LS
Impact AQ-10: Result in increased emissions of NO_x, PM, and ROGs above BAAQMD significance thresholds under 2040 Project Conditions	NI	LS	LS	LS	LS
Impact AQ-11: Result in increased emissions of TACs and $PM_{2.5}$, resulting in increased health risk above BAAQMD significance thresholds under 2025 Project Conditions	NI	LS	LS	LS	LS
Impact AQ-12: Result in increased emissions of TACs and $PM_{2.5}$, resulting in increased health risk above BAAQMD significance thresholds under 2040 Project Conditions	S	LS	LS	LS	LS

TABLE 3.K-7 SUMMARY OF AIR QUALITY IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Impact AQ-13: Result in local concentrations of CO above BAAQMD significance thresholds under 2025 Project Conditions	NI	LS	LS	LS	LS
Impact AQ-14: Result in local concentrations of CO above BAAQMD significance thresholds under 2040 Project Conditions	LS	LS	LS	LS	LS
Impact AQ-15: Result in objectionable odors affecting a substantial number of people in 2025 and 2040	LS	LS	LS	LS	LS
Impact AQ-16: Conflict or obstruct implementation of existing air quality plans in 2025 and 2040	LS	B	B	B	B
Cumulative Analysis (2025 and 2040)					
Impact AQ-17(CU): Result in increased emissions of NO_x, PM, and ROGs above BAAQMD significance thresholds under 2025 and 2040 Cumulative Conditions	NI	LS	LS	LS	LS
Impact AQ-18(CU): Result in increased emissions of TACs and $PM_{2.5}$, resulting in increased health risk above BAAQMD significance thresholds under 2025 Cumulative Conditions	NI	SU	SU	SU	LS

TABLE 3.K-7 SUMMARY OF AIR QUALITY IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Impact AQ-19(CU): Result in increased emissions of TACs and $PM_{2.5}$, resulting in increased health risk above BAAQMD significance thresholds under 2040 Cumulative Conditions	S	SU	SU	LS	LS
Impact AQ-20(CU): Result in local concentrations of CO above BAAQMD significance thresholds under 2025 Cumulative Conditions	NI	LS	LS	LS	LS
Impact AQ-21(CU): Result in local concentrations of CO above BAAQMD significance thresholds under 2040 Cumulative Conditions	LS	LS	LS	LS	LS
Impact AQ-22(CU): Result in objectionable odors affecting a substantial number of people under 2025 and 2040 Cumulative Conditions	LS	LS	LS	LS	LS
Impact AQ-23(CU): Conflict or obstruct implementation of existing air quality plans under 2025 and 2040 Cumulative Conditions	LS	B	B	B	B

Notes: NOx = nitrogen oxides; PM = particulate matter; ROG = reactive organic gas; BAAQMD = Bay Area Air Quality Management Disrict; TAC = toxic air contaminant; PM2.5 = fine particulate matter; CO = carbon monoxide; DMU = diesel multiple unit; EMU = electrical multiple unit; BRT = bus rapid transit.
NI=No impact; B=Beneficial impact; LS=Less-than-Significant impact, no mitigation required; LSM=Less-than-Significant impact with mitigation; S= Significant impact of No Project Alternative (mitigation is inapplicable); SU=Significant and unavoidable, even with mitigation or no feasible mitigation available.
[a] All significance determinations listed in the table assume incorporation of applicable mitigation measures.

e. Environmental Analysis

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

(1) Construction Impacts

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

(a) Construction – Project Analysis

Impact AQ-1: Result in potentially significant localized dust-related air quality impacts during construction.

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

Project-related demolition, excavation, soil stockpiling and handling, and other construction activities may generate wind-blown dust (including PM_{10} and $PM_{2.5}$). Construction-related dust emissions would vary from day to day, depending on the level and type of activity, silt content of the soil, and the weather.

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. Construction activities by other agencies under the No Project Alternative include minor structural improvements for the I-580 corridor and surface roadways, as well as construction of land use development projects, including residential and commercial uses. Construction of these improvements and development projects could result in localized dust emissions. 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 localized dust-related air quality impacts. **(NI)**

Conventional BART Project and Build Alternatives. Dust generated from construction activities may result in localized air quality impacts on a temporary and intermittent basis during the construction period. While the duration of construction would vary between the Proposed Project and Build Alternatives—approximately 48 months for the Proposed Project and DMU Alternative, approximately 52 months for the Express Bus/BRT Alternative, and approximately 2 months for the Enhanced Bus Alternative—the generation of wind-blown dust by the Proposed Project or any alternative during construction would have potentially significant impacts to air quality.[102]

The BAAQMD CEQA Guidelines note that individual best management practices have been shown to reduce fugitive dust by approximately 30 percent to more than 90 percent, and conclude that projects that implement construction best management practices will reduce fugitive dust emissions to a less-than-significant level. Therefore, with implementation of **Mitigation Measure AQ-1**, which requires application of the BAAQMD's best management practices to reduce fugitive dust, the Proposed Project and Build Alternatives would result in less-than-significant impacts related to fugitive dust. **(LSM)**

Mitigation Measures. As described above, the Proposed Project and Build Alternatives would have potentially significant impacts related to air quality due to localized dust. Based on BAAQMD significance thresholds, a project would not have a significant adverse air quality impact if applicable BAAQMD-recommended construction best management practices are implemented during construction activities. Therefore, with implementation of **Mitigation Measure AQ-1**, potential impacts would be reduced to a less-than-significant level.

Mitigation Measure AQ-1: BAAQMD Construction Best Management Practices (Conventional BART Project and Build Alternatives).

All construction activities for the Proposed Project and Build Alternatives shall comply with the following BAAQMD best management practices:

1. All exposed surfaces (such as parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
2. All haul trucks transporting soil, sand, or other loose material off site shall be covered.
3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
4. All vehicle speeds on unpaved roads shall be limited to 15 mph.

[102] While the entire construction duration would occur over approximately 5 years and include start-up and testing, the majority of the construction activities resulting in emissions would occur over approximately 4 years (48 months) for the Proposed Project and DMU Alternative, and over approximately 4.25 years (52 months) for the Express Bus/BRT Alternative. Construction of the Enhanced Bus Alternative, as well as bus infrastructure improvements under the Proposed Project and other Build Alternatives, is anticipated to occur over approximately 2 months.

5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California Airborne Toxics Control Measure – Title 13 of the California Code of Regulations, Section 2485). Clear signage shall be provided for construction workers at all access points.
7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator (persons who are certified to perform EPA Method 9 [Visual Opacity]).
8. Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The BAAQMD's phone number shall also be visible to ensure compliance with applicable regulations.

Impact AQ-2: Result in emissions of ROGs, NO_x, and PM exceeding BAAQMD significance thresholds during construction.

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

Construction activity results in emissions of ROGs, NO_x, and exhaust PM from off-road construction equipment, haul trucks, vendor trucks, employee vehicles, and architectural coating. The potential impacts from construction-related emissions of ROGs, NO_x, and PM are described here. Average daily construction emissions are shown in Table 3.K-8.

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. Construction activities under the No Build Alternative include only minor structural improvements for the I-580 corridor and surface roadways, as well as construction of land use development projects, including residential and commercial uses. Construction of these improvements and development projects could result in emissions of ROGs, NO_x, and PM. 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 ROG, NO_x, and PM emissions. **(NI)**

TABLE 3.K-8 AVERAGE DAILY CONSTRUCTION-RELATED EMISSIONS

	Average Daily Construction Emissions (lbs/day)			
	ROG	**NO_x**	**Exhaust PM_{10}/DPM[a]**	**Exhaust $PM_{2.5}$**
Significance Thresholds	**54**	**54**	**82**	**54**
Conventional BART Project				
Total Emissions	17	**80**	3.1	2.8
Above Threshold?	No	**Yes**	No	No
DMU Alternative				
Total Emissions	13	**56**	1.6	1.5
Above Threshold?	No	**Yes**	No	No
Express Bus/BRT Alternative				
Total Emissions	2.8	13	0.36	0.34
Above Threshold?	No	No	No	No
Enhanced Bus Alternative				
Total Emissions	13	40	1.3	1.2
Above Threshold?	No	No	No	No

Notes: lbs/day = pounds per day; ROG = reactive organic gas; NO_x = nitrogen oxides; PM_{10} = respirable particulate matter; $PM_{2.5}$ = fine particulate matter; DPM = diesel particulate matter.
[a] For purposes of this analysis, it is conservatively assumed that all PM_{10} is DPM.
Paving off-gas emissions from asphalt are calculated for the Laughlin Road Parking Lot under the Express Bus/BRT Alternative. It is assumed that new surface roads, I-580, and covered parking lots will not require asphalt paving.
Bold/gray values exceed thresholds.
The emissions shown in this table are average daily construction emissions (i.e., emissions divided by time). Therefore, the average daily construction emissions for the Enhanced Bus Alternative are similar to the emissions for the Proposed Project, even though total emissions will be substantially less.

Conventional BART Project. Primary sources of NO_x, PM_{10}, and $PM_{2.5}$ emissions would be from off-road equipment, trucks, and vehicles associated with construction activity, and the primary source of ROG emissions would be architectural coatings at the proposed Isabel Station and the storage and maintenance facility. As shown in Table 3.K-8, while total average daily emissions of ROGs, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds, average daily emissions of NO_x would be 80 lbs/day, which exceeds the 54-lbs/day threshold. As shown in Table 3.K-9, this impact would be reduced to 42 lbs/day, below the significance threshold, with implementation of **Mitigation Measure AQ-2** and this impact would be less than significant. **(LSM)**

DMU Alternative. Construction for the DMU Alternative would have lower levels of activity compared to the Proposed Project because the DMU Alternative has lower levels of excavation involved with the construction of the storage and maintenance facility. Thus, off-road equipment, truck, and vehicle emissions are lower. Also, there would be less surface area for architectural coating, and thus fewer ROG emissions. As shown in Table 3.K-8, while total average daily emissions of ROGs, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds, average daily emissions of NO_x would be 56 lbs/day, slightly over the 54-lbs/day threshold. As shown in Table 3.K-9, this impact would be reduced to 37 lbs/day, below the significance threshold, with implementation of **Mitigation Measure AQ-2** and this impact would be less than significant. **(LSM)**

TABLE 3.K-9 AVERAGE DAILY CONSTRUCTION-RELATED EMISSIONS AFTER MITIGATION-CONVENTIONAL BART PROJECT AND DMU ALTERNATIVE

	Average Daily Construction Emissions (lbs/day)			
	ROG	**NO_x**	**Exhaust PM_{10}/DPM[a]**	**Exhaust $PM_{2.5}$**
Significance Thresholds	**54**	**54**	**82**	**54**
Conventional BART Project				
Total Emissions	14	42	1.3	1.2
Above Threshold?	No	No	No	No
DMU Alternative				
Total Emissions	12	37	0.84	0.78
Above Threshold?	No	No	No	No

Notes: lbs/day = pounds per day; ROG = reactive organic gas; NO_x = nitrogen oxides; PM_{10} = respirable particulate matter; $PM_{2.5}$ = fine particulate matter; DPM = diesel particulate matter.
[a] For purposes of this analysis, it is conservatively assumed that all PM_{10} is DPM.

Express Bus/BRT Alternative. Construction activity for the Express Bus/BRT Alternative would be significantly less compared to the Proposed Project. Thus, off-road equipment, truck, and vehicle emissions would be significantly lower. There would also be fewer buildings/facilities, requiring less architectural coating and resulting in reduced ROG emissions. As shown in Table 3.K-8, total average daily emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts from emissions of ROGs, NO_x, and PM during construction. **(LS)**

Enhanced Bus Alternative. Construction activity under the Enhanced Bus Alternative would be limited to bus improvements such as excavation, paving, and construction of bus bulbs, bus shelters, and signage. As shown in Table 3.K-8, total average daily emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds. As described in the Approach to Analysis, construction emissions for this alternative were estimated from conservatively scaling from the Proposed Project emissions based on construction duration. Because construction emissions are shown on an average daily basis, the construction emissions for the Enhanced Bus Alternative are nearly as high as for the Proposed Project. This is a very conservative estimate and average daily construction emissions for the Enhanced Bus Alternative are expected to be much lower than shown in Table 3.K-8. Nevertheless, construction emissions, even when conservatively estimated, are below BAAQMD significance thresholds. Therefore, the Enhanced Bus Alternative would have less-than-significant impacts from emissions of ROGs, NO_x, and PM during construction. **(LS)**

Mitigation Measures. As described above, the Proposed Project and DMU Alternative would have potentially significant impacts from emissions of NO_x that would exceed BAAQMD significance thresholds. However, with implementation of **Mitigation Measure AQ-2**, which would require BART or its contractor to prepare and implement a construction emissions reduction plan to reduce NO_x emissions from off-road equipment, potential impacts would be reduced to a less-than-significant level. Table 3.K-9 quantifies emissions from construction of the Proposed Project and the DMU Alternative based on use of Tier 4 Final engines for the five highest-emitting construction equipment types for the Proposed Project (i.e., compactors, dozers, dump trucks, scrapers, and loaders) and the four highest-emitting equipment types (i.e., compactors, dozers, dump trucks, and scrapers) for the DMU Alternative. As demontstrated in Table 3.K-9, use of such equipement would reduce construction emissions below thresholds.

As described above, the Express Bus/BRT Alternative and Enhanced Bus Alternative would not have significant impacts related to construction mass emissions of ROGs, NO_x, and PM, and no mitigation measures are required for these alternatives.

Mitigation Measure AQ-2: Construction Emissions Reduction Plan – For Mitigating Mass Emissions of NO_x (Conventional BART Project and DMU Alternative/EMU Option).

The construction contractor shall use Tier 4 Final engines for all off-road construction equipment, which would result in average daily emissions being below the BAAQMD CEQA threshold of 54 lbs/day of NO_x. If the construction contractor proposes to use off-road construction equipment with engines other than Tier 4 engines, the construction contractor shall prepare and implement a construction emissions reduction plan for review and approval by BART that demonstrates that off-road construction equipment (including owned, leased, and subcontractor vehicles) would result in average daily emissions of NO_x below 54 lbs/day. The construction emissions reduction plan shall include an equipment inventory that lists equipment quantities, equipment types, Tier levels, horsepower, estimated daily hours of use, and any emissions abatement devices for each phase of construction. Construction emissions shall be calculated based on this equipment inventory to ensure that average daily emissions are below the BAAQMD CEQA threshold of 54 lbs/day of NO_x. If modifications to the construction emissions reduction plan are required, the contractor must demonstrate to BART that the emissions from the modified equipment inventory are below threshold levels. Acceptable methods for reducing average daily emissions to below 54 lbs/day of NO_x could include but are not limited to a reduction in operating hours and the use of low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, and add-on devices such as particulate filters. Other methods for reducing emissions, which may currently be unforeseen or in development, may also be implemented as they become available. The contractor shall implement the construction emissions reduction plan during all phases of construction where off-road construction equipment is used.

Impact AQ-3: Result in TAC and $PM_{2.5}$ emissions causing increased health risk above BAAQMD significance thresholds during construction.

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

The use of diesel-fueled construction equipment, haul trucks, and vendor trucks results in the emissions of DPM (a TAC) and $PM_{2.5}$ during construction. Emissions of DPM and $PM_{2.5}$ were estimated based on construction activity and were then used in a dispersion model to estimate ambient air concentrations. Concentrations of DPM were combined with exposure parameters for potentially exposed sensitive populations to calculate cancer risk, as discussed in detail in the Impact Methodology subsection above. Cancer risk and $PM_{2.5}$ concentrations are shown in Tables 3.K-10 and 3.K-11, respectively.

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. Construction activities under the No Build Alternative include only minor structural improvements for the I-580 corridor and surface roadways, as well as construction of land use development projects, including residential and commercial uses. Construction of these improvements and development projects could result in increased health risk associated with TAC and $PM_{2.5}$ emissions. 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 health risk associated with TAC and $PM_{2.5}$ emissions. **(NI)**

TABLE 3.K-10 MAXIMUM EXCESS CONSTRUCTION CANCER RISK AT OFF-SITE RECEPTORS

	Excess Cancer Risk (in 1 million)[a]			
Source	**Conventional BART Project**	**DMU Alternative**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Receptor Type	Resident	Resident	Resident	--[b]
Project Construction	24	20	10.2	De Minimis[b]
Total	**24**	**20**	**10.2**	De Minimis[b]
Significance Threshold	10	10	10	10
Above Threshold?	**Yes**	**Yes**	**Yes**	No

Notes: -- = not applicable; **bold**/gray values exceed thresholds.
[a] Maximum cancer risk shown for all sensitive receptor types.
[b] Construction for the Enhanced Bus Alternative would be limited to bus improvements such as paving, excavation, and construction of bulb outs. Bus infrastructure improvements are anticipated to be constructed within existing street rights-of-way. Given that construction activity is anticipated to be minimal for the installation of limited bus infrastructure improvements at dispersed locations, the contribution to excess cancer risk would be de minimis.

TABLE 3.K-11 MAXIMUM ANNUAL AVERAGE CONSTRUCTION $PM_{2.5}$ CONCENTRATIONS AT OFF-SITE RECEPTORS

	$PM_{2.5}$ Concentration (μg/m³)			
Source	**Conventional BART Project**	**DMU Alternative**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Project Construction	0.074	0.073	0.036	De Minimis[a]
Total	0.074	0.073	0.036	De Minimis[a]
Significance Threshold	0.3	0.3	0.3	0.3
Above Threshold?	No	No	No	No

Notes: -- = not applicable; μg/m³ = micrograms per cubic meter; $PM_{2.5}$ = fine particulate matter.
[a] Construction for the Enhanced Bus Alternative would be limited to bus improvements such as paving, excavation, and construction of bulb outs. Bus infrastructure improvements are anticipated to be constructed within existing street rights-of-way. Given that contraction activity is anticipated to be much lower compared to that of the Proposed Project and for the DMU Alternative (with EMU Option), the contribution to $PM_{2.5}$ concentration would be de minimis.

Conventional BART Project. As shown in Table 3.K-10, the maximum cancer risk for potentially exposed sensitive populations during construction of the Proposed Project (24-in-1-million) would exceed the significance threshold of 10-in-1-million. The MEISR is located to the west of the storage and maintenance facility near Hartman Road. Table 3.K-11 shows that the maximum concentration of $PM_{2.5}$ associated with construction of the

Proposed Project (0.074 μg/m^3) would be below the significance threshold of 0.3 μg/m^3. Therefore, construction under the Proposed Project would have potentially significant impacts resulting in emissions of TACs that could cause increased health risk above BAAQMD significance thresholds, but would have less-than-significant impacts for concentration of $PM_{2.5}$. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure AQ-3,** which would reduce emissions from construction activities to below BAAQMD thresholds through a reduction in operating hours and/or the use of low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, or add-on devices such as particulate filters. Other methods for reducing emissions, which may currently be unforeseen or in development, may also be implemented as they become available. Construction emissions after implementation of **Mitigation Measure AQ-3**, assuming the implementation of Tier 4 Final engines for the five highest-emitting equipment types, are shown in Table 3.K-9 and the mitigated cancer risk is shown in Table 3.K-13. **(LSM)**

DMU Alternative. As shown in Table 3.K-10, the maximum cancer risk for potentially exposed sensitive populations during construction of the DMU Alternative (20-in-1-million) would exceed the significance threshold of 10-in-1-million. The MEISR is located in the Shea Homes Sage Project residential development, which is expected to be fully completed by the time construction begins on the Proposed Project. Table 3.K-11 also shows that the maximum concentration of $PM_{2.5}$ associated with the DMU Alternative construction (0.073 μg/m^3) is below 0.3 μg/m^3. Therefore, construction under the DMU Alternative would have potentially significant impacts resulting in emissions of TACs that could cause increased health risk above BAAQMD significance thresholds, but would have a less-than-significant impact for concentration of $PM_{2.5}$. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure AQ-3,** which would reduce emissions from construction activities to below BAAQMD thresholds through a reduction in operating hours and/or the use of low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, or add-on devices such as particulate filters. Other methods for reducing emissions, which may currently be unforeseen or in development, may also be implemented as they become available. Construction emissions after implementation of **Mitigation Measure AQ-3**, assuming the implementation of Tier 4 Final engines for the four highest-emitting equipment types, are shown in Table 3.K-9 and the mitigated cancer risk is shown in Table 3.K-13. **(LSM)**

Express Bus/BRT Alternative. As shown in Table 3.K-10, the maximum cancer risk for potentially exposed sensitive populations during construction of the Express Bus/BRT Alternative (10.2-in-1-million) would exceed the significance threshold of 10-in-1-million. The MEISR is located at the southern corner of the Dublin Station – Avalon II development. Table 3.K-11 also shows that the maximum concentration of $PM_{2.5}$ associated with the Express Bus/BRT Alternative construction (0.036 μg/m^3) is below 0.3 μg/m^3. Therefore, construction under the Express Bus/BRT Alternative would have potentially significant impacts resulting in emissions of TACs that could cause increased health risk above BAAQMD significance thresholds, but would have a less-than-significant impact for concentration of $PM_{2.5}$. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure AQ-3,** which would reduce emissions from construction activities to below BAAQMD thresholds through a reduction in operating hours and/or the use of low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, or add-on devices such as particulate filters. Other methods for reducing emissions, which may currently be unforeseen or in development, may also be implemented as they become available. Construction emissions after implementation of **Mitigation Measure AQ-3**, assuming the implementation of Tier 4 Final engines for the highest-emitting equipment type, are shown in Table 3.K-12 and the mitigated cancer risk is shown in Table 3.K-13. **(LSM)**

Enhanced Bus Alternative. Construction of the Enhanced Bus Alternative would be limited to bus infrastructure improvements at dispersed locations such as the installation of bus shelters at approximately 29 locations, construction of bus bulbs at approximately 10 locations, and the installation of transit signal priority equipment at approximately six locations. The limited level of construction activity for this alternative would occur along existing street rights-of-way. The Express Bus/BRT Alternative, in comparison, requires much higher levels of construction—including a new bus transfer platform supporting direct BART-and-bus connections, new bus ramps from the I-580 HOV/HOT lanes, extended BART tail tracks, new parking areas, and the relocation of approximately 2.2 miles of I-580. The Enhanced Bus Alternative avoids these construction emissions as well as emissions associated with the relocation of I-580, which requires the reconfiguration of existing freeway interchanges, ramps, overcrossings, and surface frontage roads. The construction for the Enhanced Bus Alternative is assumed to occur over the course of 2 months compared to the approximately 52-month duration of the construction for the Express Bus/BRT Alternative. The lower level of construction activity and shorter duration for the Enhanced Bus Alternative results in much lower levels of DPM. Given that construction activity for the Enhanced Bus Alternative is expected to be much less than the Express Bus/BRT Alternative, which has a cancer risk of 10.2 in a million (slightly exceeding the threshold) and a $PM_{2.5}$ concentration of 0.036 $\mu g/m^3$, the Enhanced Bus Alternative's contribution to excess cancer risk and $PM_{2.5}$ concentration would be less than significant. Therefore, the Enhanced Bus Alternative would have less-than-significant impacts related to health risk. **(LS)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant impacts related to the exposure of sensitive populations to DPM emissions. However, with implementation of **Mitigation Measure AQ-3**, which would require a reduction in DPM emissions from construction activities to less than that shown in Tables 3.K-9 and 3.K-12, potential impacts would be reduced to a less-than-significant level. Table 3.K-12 quantifies emissions from construction of the Express Bus/BRT Alternative based on use of Tier 4 Final engines for the highest-emitting construction equipment type (i.e., compactors).

TABLE 3.K-12 MITIGATED AVERAGE DAILY CONSTRUCTION-RELATED EMISSIONS (EXPRESS BUS/BRT ALTERNATIVE)

	Average Daily Construction Emissions (lbs/day)			
	ROG	**NO_x**	**Exhaust PM_{10}/DPM[a]**	**Exhaust $PM_{2.5}$**
Significance Thresholds	**54**	**54**	**82**	**54**
Express Bus/BRT Alternative				
Total Emissions	2.7	12	0.32	0.30
Above Threshold?	No	No	No	No

Notes: lbs/day = pounds per day; ROG = reactive organic gas; NO_x = nitrogen oxides; PM_{10} = respirable particulate matter;
$PM_{2.5}$ = fine particulate matter; DPM = diesel particulate matter.
[a] For purposes of this analysis, it is conservatively assumed that all PM_{10} is DPM.

Tables 3.K-13 and 3.K-14 show cancer risk and $PM_{2.5}$, respectively, after the implementation of **Mitigation Measure AQ-3** assuming the following equipment:

- Conventional BART Project – Tier 4 Final engines for the five highest-emitting equipment types (compactors, dozers, dump trucks, scrapers, loaders)
- DMU Alternative (or EMU Option)– Tier 4 Final engines for the four highest-emitting equipment types (compactors, dozers, dump trucks, scrapers)
- Express Bus/BRT Alternative – Tier 4 Final engines for the highest-emitting equipment type (compactors)
- With implementation of **Mitigation Measure AQ-3**, impacts would be less than significant. Furthermore, implementation of **Mitigation Measure AQ-3** would achieve the BAAQMD thresholds indicated in **Mitigation Measure AQ-2** (54 lbs/day of NO_x), resulting in a less-than-signficant impact (under Impact AQ-2) for the Proposed Project and the DMU Alternative.

TABLE 3.K-13 MAXIMUM EXCESS CONSTRUCTION CANCER RISK AT OFF-SITE RECEPTORS AFTER MITIGATION

	Excess Cancer Risk (in 1 million)[a]		
Source	**Conventional BART Project**	**DMU Alternative**	**Express Bus/BRT Alternative**
Receptor Type	Resident	Resident	Resident
Project Construction	9.3	9.9	8.6
Total	9.3	9.9	8.6
Significance Threshold	10	10	10
Above Threshold?	No	No	No

Note:
[a] Maximum cancer risk shown for all sensitive receptor types.

TABLE 3.K-14 MAXIMUM ANNUAL AVERAGE CONSTRUCTION $PM_{2.5}$ AT OFF-SITE RECEPTORS AFTER MITIGATION

	$PM_{2.5}$ Concentration (µg/m³)		
Source	**Conventional BART Project**	**DMU Alternative**	**Express Bus/BRT Alternative**
Project Construction	0.037	0.044	0.032
Total	0.037	0.044	0.032
Significance Threshold	0.3	0.3	0.3
Above Threshold?	No	No	No

Notes: -- = not applicable; µg/m³ = micrograms per cubic meter.
[a] Maximum cancer risk shown for all sensitive receptor types.

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

Mitigation Measure AQ-3: Construction Emissions Reduction Plan – For Mitigating Cancer Risk (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

The construction contractor shall use Tier 4 Final engines for all off-road construction equipment, which would result in health risk being below BAAQMD CEQA thresholds. If the construction contractor proposes to use off-road construction equipment with engines other than Tier 4 engines, the construction contractor shall prepare and implement a construction emissions reduction plan for review and approval by BART that demonstrates that off-road construction equipment (including owned, leased, and subcontractor vehicles) would result in average daily emissions of DPM below 1.3

lbs/day (Proposed Project), 0.84 lbs/day (DMU Alternative), or 0.32 lbs/day (Express Bus/BRT Alternative). The construction emissions reduction plan should be prepared as decribed in **Mitigation Measures AQ-2**.

Impact AQ-4: Result in objectionable odors affecting a substantial number of people during construction.

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

The occurrence and severity of potential odor impacts depends on numerous factors. The nature, frequency, and intensity of the source, the wind speeds and direction, and the sensitivity of receiving location each contribute to the intensity of the impact. Although offensive odors seldom cause physical harm, they can be annoying and cause distress among the public, and generate citizen complaints.

Construction activities for the Proposed Project and Build Alternatives have the potential to generate objectionable odors, primarily as a result of diesel combustion. Diesel exhaust resulting from construction equipment and vehicles, while temporary, can be odorous and may have potential impacts. The BAAQMD CEQA Guidelines do not have thresholds of significance for construction-related odors.[103] Nevertheless, to evaluate significance for construction-related odors, a quantitative analysis was performed comparing concentrations of odorous constituents of diesel exhaust to published odor thresholds compliled by Amoore and Hautala.[104] The comparison analysis is shown in Table 39 of Appendix H.

The sources of odors identified for construction activities for the Proposed Project and Build Alternatives are described 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. Construction activities under the No Build Alternative include only minor structural improvements for the I-580 corridor and surface roadways, as well as construction of land use development projects, including residential and commercial uses.

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[103] Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en, accessed May 2017.

[104] Amoore, J.E. and E. Hautala, 1983. Odor as and Aid to Chemical Safety: Odor Thresholds Compared with Threshold Limit Values and Volatilities for 2014 Industrial Chemicals in Air and Water Dilution. Journal of Applied Toxicology, Vol 3, No 6, pg 272.

Construction of these improvements and development projects could result in odors. 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 odors. **(NI)**

Conventional BART Project. The Proposed Project has the potential to create odors from diesel combustion during construction activity (i.e., off-road construction equipment, off-road trucks, on-road trucks). Diesel odors from this equipment would be minor additions to the existing diesel and gasoline odors associated with vehicles on I-580 and nearby arterials. An analysis of the odor-causing constituents of diesel exhaust from the construction equipment indicates that concentrations of the odorous chemicals are well below the odor threshold; therefore, odor impacts are not expected.

Under the Proposed Project, potential sources of odor during construction would be typical of standard construction techniques, temporary in nature, and limited during operations; they are thus not designated by the BAAQMD as potential odor sources of particular concern. Therefore, impacts from odors under the Proposed Project would be less than significant. **(LS)**

DMU Alternative. The DMU Alternative has the potential to create odors from diesel combustion from construction activity (i.e., off-road construction equipment, off-road trucks, on-road trucks). However, diesel odors from this equipment would only incrementally increase the existing diesel and gasoline odors associated with vehicles on I-580 and nearby arterials. An analysis of the odor-causing constituents of diesel exhaust from the buses indicates that concentrations of the odorous chemicals are well below the odor threshold; therefore, odor impacts are not expected.

Under the DMU Alternative, potential sources of odor during construction would be typical of standard construction techniques, temporary in nature, and limited during operations; they are thus not designated by the BAAQMD as potential odor sources of particular concern. Therefore, impacts from odors under the DMU Alternative would be less than significant. **(LS)**

Express Bus/BRT Alternative. The Express Bus/BRT Alternative has the potential to create odors from diesel combustion from construction activity (i.e., off-road construction equipment, off-road trucks, on-road trucks). Diesel odors from this equipment would be minor additions to the existing diesel and gasoline odors associated with vehicles on I-580 and nearby arterials, and associated odors would not change noticeably. An analysis of the odor-causing constituents of diesel exhaust from the buses indicates that concentrations of the odorous chemicals are well below the odor threshold. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts related to odor. **(LS)**

Enhanced Bus Alternative. The Enhanced Bus Alternative has the potential to create odors from diesel combustion from construction activity (i.e., off-road construction equipment, off-road trucks, on-road trucks). However, the amount of construction associated with the Enhanced Bus Alternative is expected to be significantly lower compared to the other Alternatives. As the Proposed Project and other Alternatives have less-than-significant impacts, the Enhanced Bus Alternative would also have less-than-significant impacts related to odor. **(LS)**

Mitigation Measures. As described above, construction of the Proposed Project and Alternatives would not result in significant impacts related to objectionable odors, and no mitigation measures are required.

(b) Construction – Cumulative Analysis

The geographic study area for cumulative air quality analysis is the same as the study area described for the project in the Introduction subsection above.

The cumulative analysis for construction impacts evaluates the combined impact of construction of the Proposed Project or an alternative, along with other anticipated projects that may be under construction concurrently. Construction of the Proposed Project is anticipated to begin in 2021 and last approximately 5 years through 2026. As listed in Section 3.A, Introduction to Environmental Analysis and Appendix E, the following cumulative projects could be under construction concurrently with the Proposed Project: INP, Kaiser Dublin Medical Center, IKEA Retail Center/Project Clover, Dublin Crossing Specific Plan, Johnson Drive Economic Development Zone, Residences at California Center, ACEforward Program, Crosswinds Site, Hyatt Hotel, Las Positas College, Vasco Road/I-580 Interchange, and North Canyon Parkway/Dublin Boulevard Connection.

Impact AQ-5(CU): In combination with other projects within the vicinity, result in potentially significant localized dust-related air quality impacts during construction 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 AQ-1** above, the No Project Alternative would have no impacts associated with construction-generated dust during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. As discussed in **Impact AQ-1** above, the Proposed Project and Build Alternatives would generate construction-related dust, which would be mitigated to less than significant under **Mitigation Measure AQ-1**. These projects, along with potential cumulative projects, could result in construction-generated dust; however, cumulative projects would be required to undergo their own environmental review and approval process and would address any potential construction dust-related impacts through that process. Moreover, cumulative construction projects would be required to implement BAAQMD's best management practices to reduce dust-related impacts. The application of BAAQMD's best management practices will ensure that cumulative impacts from dust are less than significant. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future development would have less-than-significant cumulative impacts related to construction-generated dust that exceeds significance levels. **(LS)**

Mitigation Measures. As described above, the construction of the Proposed Project and Alternatives in combination with past, present, or probable future projects would not result in significant cumulative impacts related to related to air quality due to localized dust, and no additional mitigation measures, beyond those identified for the project impacts (Proposed Project and Build Alternatives) are required.

Impact AQ-6(CU): In combination with other projects within the vicinity, result in potentially significant emissions of ROGs, NO_x, and PM during construction under Cumulative Conditions.

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

As discussed in the Standards of Significance subsection above, the BAAQMD's thresholds of significance for criteria air pollutants and precursors represent levels at which a project's individual emissions would result in a cumulatively considerable contribution to the SFBAAB's existing air quality conditions. If a project's emissions do not exceed the BAAQMD's thresholds of significance for ROGs, NO_x, and PM, then the project's contribution is not cumulatively considerable.

No Project Alternative. As described in **Impact AQ-2** above, the No Project Alternative would have no impacts associated with emissions of ROGs, NO_x, and PM during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. As described in **Impact AQ-2**, the Conventional BART Project and the DMU Alternative would have less-than-significant impacts with the implementation of **Mitigation Measure AQ-2**. The Express Bus/BRT Alternative and Enhanced Bus Alternative have less-than-significant impacts and no mitigation measures are required. Thus, the construction emissions of ROGs, NO_x, and PM are below the BAAQMD's thresholds of significance, and are therefore not considered cumulatively considerable. Therefore, construction of the Proposed Project and Build Alternatives, in combination with past, present, and probable future development would have less-than-significant cumulative impacts related to ROGs, NO_x, and PM. **(LS)**

Mitigation Measures. As described above, the construction of the Proposed Project and Alternatives in combination with past, present, or probable future projects would not result in significant cumulative impacts related to related to ROGs, NO_x, and PM, and no additional mitigation measures, beyond those identified for the project impacts (Proposed Project and DMU Alternative) are required.

Impact AQ-7(CU): In combination with other projects within the vicinity, result in TAC and $PM_{2.5}$ emissions that cause increased health risks above BAAQMD significance thresholds during construction under Cumulative Conditions.

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

This analysis evaluates the combined health risk impacts from construction of the Proposed Project or an alternative and other cumulative projects. This cumulative analysis evaluates the contribution of TACs and $PM_{2.5}$ from construction of cumulative projects within the 1,000-foot zone of influence of the MEISR identified for the Proposed Project and each alternative under **Impact AQ-3**, as recommended by the BAAQMD CEQA guidance.[105] Projects that are not within 1,000 feet of the MEISR are not typically considered for cumulative impacts. Per the BAAQMD guidance, sources outside of the 1,000-foot zone of influence are not expected to have a significant adverse impact on health risks. A list of cumulative projects can be found in Section 3.A, Introduction to Environmental Analysis and Appendix E.

No Project Alternative. Under the project analysis for **Impact AQ-3** for construction impacts, the No Project Alternative does not result in new impacts related to health risk associated with construction TAC and $PM_{2.5}$ emissions. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project. Under the analysis for **Impact AQ-3**, the construction MEISR for the Proposed Project is located to the west of the storage and maintenance facility

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[105] Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en, accessed May 2017.

near Hartman Road and impacts to the MEISR would be reduced to less than significant with implementation of **Mitigation Measure AQ-3**. Two other construction projects within the vicinity of the MEISR—Las Positas College Improvements and the INP—are expected to be under construction concurrently with the Proposed Project. Because the construction activities at Las Positas College and related to the INP are well beyond the 1,000-foot zone of influence recommend by the BAAQMD CEQA guidance, construction activities at these locations would have de minimis impacts on cancer risk and $PM_{2.5}$ concentration at the MEISR for the Proposed Project. Thus, cumulative construction impacts to the construction MEISR for the Proposed Project would be less than the cumulative significance thresholds for cancer risk of 100-in-1-million and a $PM_{2.5}$ concentration of 0.8 $\mu g/m^3$, and impacts to this MEISR would be less than significant.

However, impacts of construction of the Proposed Project plus the INP could create health risk to a different MEISR closer to the INP development. The INP is a large project entailing the construction of transit-oriented development around the proposed Isabel Station area consisting of new residential units, office space, a business park, and commercial uses. The majority of the INP construction would occur north and west of the Isabel Station close to sensitive receptors. Based on the development levels in the INP, it is assumed that substantial construction activities for development projects under the plan would generate DPM that could expose sensitive receptors to significant health risks. It is also assumed that mitigation measures for the development of the INP will be identified to reduce construction health risk, but there may be instances where project-specific conditions cannot avoid health risks above cumulative significance thresholds of cancer risk of 100-in-1-million and a $PM_{2.5}$ concentration of 0.8 $\mu g/m^3$. While health risk impacts from mitigated Project construction would not exceed the project CEQA threshold, the cumulative impact of construction of the Proposed Project together with construction of one or more development projects under the INP may exceed the cumulative CEQA threshold at the locations of the MEISR for those development projects. Therefore, cumulative health impacts are considered potentially significant. Analysis of impacts would be incorporated in CEQA review for those projects. However, because such analysis cannot be performed at this time, the cumulative impact is conservatively considered significant and unavoidable. **(SU)**

DMU Alternative. Under the analysis for **Impact AQ-3**, the construction MEISR is located northeast of the Isabel Station at the Shea Homes Sage Project residential development for the DMU Alternative and impacts to the MEISR would be reduced to less than significant with implementation of **Mitigation Measure AQ-3**. Two other construction projects within the vicinity of the MEISR—Las Positas College Improvements and the INP—are expected to be under construction concurrently with the DMU Alternative.

Construction activities at Las Positas College are anticipated to include the demolition of existing buildings, construction of new buildings, and other site improvements. These construction activities would be approximately 2,900 feet from the MEISR and would be beyond the 1,000-foot zone of influence recommended by the BAAQMD CEQA guidance. Accordingly, the construction activity at Las Positas College would have de minimis impacts on cancer risk and $PM_{2.5}$ concentration at the MEISR.

The INP would include construction of transit-oriented development around the proposed Isabel Station area. Development would include new residential units, office space, a business park, and commercial uses. The majority of the INP construction would occur north and west of the Isabel Station, within the 1,000-foot zone of influence of the MEISR. Therefore, construction of the INP is considered in the cumulative construction impacts.

As described under **Impact AQ-3**, the DMU Alternative's construction impacts after mitigation would also be less than 10-in-1-million and $PM_{2.5}$ concentration would be less than 0.3 $\mu g/m^3$.

Based on the development levels in the INP, it is assumed that substantial construction activities for development projects under the plan would generate DPM that could expose sensitive receptors to significant health risks. It is also assumed that mitigation measures for the development of the INP will be identified to reduce construction health risk, but there may be instances where project-specific conditions cannot avoid health risks above cumulative significance thresholds of cancer risk of 100-in-1-million and a $PM_{2.5}$ concentration of 0.8 $\mu g/m^3$. While health risk impacts from the mitigated DMU Alternative's construction would not exceed the project CEQA threshold, the cumulative impact of construction of the DMU Alternative together with construction of one or more development projects under the INP may exceed the cumulative CEQA threshold at the locations of the MEISR for those development projects. Therefore, cumulative health impacts are considered potentially significant. Analysis of impacts would be incorporated in CEQA review for those projects. However, because such analysis cannot be performed at this time, the cumulative impact is conservatively considered significant and unavoidable. **(SU)**

Express Bus/BRT Alternative. Under the analysis for **Impact AQ-3**, the construction MEISR is located north of the Dublin/Pleasanton Station, at the southern corner of the Dublin Station – Avalon II development. Two other projects—IKEA Retail Center/Project Clover and Dublin Crossing Specific Plan—would be located within the vicinity of the MEISR and are anticipated to be under construction concurrently with the Express Bus/BRT Alternative.

The IKEA Retail Center/Project Clover and Dublin Crossing Specific Plan construction sites are approximately 1,542 feet and 1,285 feet, respectively, from the MEISR, and are therefore beyond the 1,000-foot zone of influence recommended by the BAAQMD for consideration in the cumulative health risk analysis. The construction activity associated with both of these projects would have de minimis impacts to cancer risk and $PM_{2.5}$ concentration at the MEISR and these projects are not further considered in this analysis.

As described under **Impact AQ-3**, the Express Bus/BRT Alternative's construction impacts would be less than 10-in-1-million and $PM_{2.5}$ concentration would be less than 0.3 μg/m^3 after mitigation. This would not exceed the cumulative risk thresholds of 100-in-1-million and $PM_{2.5}$ concentration of 0.8 μg/m^3. Therefore, the cumulative health risk from construction of the Express Bus/BRT Alternative and other cumulative projects would be less than significant. **(LS)**

Enhanced Bus Alternative. As described in **Impact AQ-3**, cancer risk and $PM_{2.5}$ are expected to be substantially lower under the Enhanced Bus Alternative than under the Proposed Project, given the relatively minor amount of construction activity associated with the Alternative. Construction activity is limited to installation of Rapid/Express route amenities at 29 locations (i.e., bus shelters, improved seating and surroundings near bus stops, ticket machines), and construction of bus bulbs at 10 locations. Given the very small impacts from construction activities of the Enhanced Bus Alternative, the cumulative health risk from construction of the Enhanced Bus Alternative and other cumulative projects would be less than significant. **(LS)**

Mitigation Measures. As described above, the Proposed Project and DMU Alternative, in combination with past, present, or probable future projects, could result in significant cumulative impacts related to emissions of TACs and $PM_{2.5}$. With implementation of **Mitigation Measure AQ-3**, the Proposed Project and DMU Alternative would not exceed the project significance threshold. Any additional mitigation for cumulative impacts related to emissions of TACs and $PM_{2.5}$ from construction of development projects under the INP would be considered in CEQA reviews of those projects. Because those mitigation measures and the MEISR locations for those projects, are not known at this time, it is not feasible to develop further mitigation for the contributions of the Proposed Project or DMU Alternative. Therefore, impacts under the Proposed Project and DMU Alternative, in combination with past, present, or probable future projects, would conservatively remain significant and unavoidable.

The Express Bus/BRT Alternative and Enhanced Bus Alternative, in combination with past, present, or probable future projects, would not result in significant cumulative impacts related to emissions of TACs and $PM_{2.5}$, and no mitigation measures are required.

Impact AQ-8(CU): In combination with other projects within the vicinity, result in objectionable odors affecting a substantial number of people during construction 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 AQ-4** above, the No Project Alternative would have no impacts associated with odors during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. As discussed in **Impact AQ-4** above, the Conventional BART Project and Build Alternatives would generate construction-related odors associated with diesel exhaust that would have less-than-significant impacts. The cumulative projects could result in additional construction-related odor; however, these projects would be required to undergo their own environmental review and approval process and would address any potential construction odor impacts through that process. Additionally, odor impacts are generally localized and not likely to result in cumulative impacts from multiple projects. Therefore, the Conventional BART Project and Build Alternatives, in combination with past, present, and probable future development would have less-than-significant cumulative impacts related to construction-related odors that exceeds significance levels. **(LS)**

Mitigation Measures. As described above, the construction of the Proposed Project and Alternatives, in combination with past, present, or probable future projects, would not result in significant cumulative impacts related to odors under Cumulative Conditions, 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 the opening year 2025 are described first, followed by impacts for the horizon year 2040.

Emissions of ROGs, NO_x, and PM

Impact AQ-9: Result in emissions of ROGs, NO_x, and PM above BAAQMD significance thresholds 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)

The operation of the Proposed Project and Build Alternatives would result in changes in emissions of ROGs, NO_x, and PM associated with both on-road and off-road sources, including mobile and stationary sources. Mobile sources include passenger vehicles, buses, DMUs (DMU Alternative only), shuttle van (Proposed Project) and maintenance trucks (Proposed Project and DMU Alternative only). The implementation of the Proposed Project or any Build Alternative would change passenger vehicle traffic as people may decide to use public transportation or otherwise change their transportation patterns due to the Proposed Project or Build Alternatives. Emissions related to operation of the BART trains and EMU vehicles are not included in this analysis because they are powered by electricity, which would not result in local emissions of ROGs, NO_x, and PM.[106]

Operational stationary sources include emergency generators (Proposed Project, DMU Alternative, and EMU Option only), architectural coatings applied to buildings for periodic upkeep (except Enhanced Bus Alternative), and solvent cleaner emissions (Proposed Project, DMU Alternative, and EMU Option only). The potential impacts from net new emissions of ROGs, NO_x, and PM are described below.

Under 2025 Project Conditions, net emissions for the Proposed Project and each alternative are calculated as the difference between the 2025 No Project Conditions and the 2025 Project Conditions. The 2025 operational emissions for the Proposed Project and Build Alternatives are shown in Table 3.K-15 (average net daily) and Table 3.K-16 (net annual).

No Project Alternative. The 2025 No Project Alternative is the same as baseline conditions (i.e., 2025 No Project Conditions). Therefore, the 2025 No Project Alternative would have no impacts. **(NI)**

Conventional BART Project. In 2025, the Proposed Project would result in a large net reduction in VMT for passenger vehicles compared to the 2025 No Project Conditions, resulting in a net reduction in emissions for ROGs, NO_x, PM_{10}, and $PM_{2.5}$ for passenger vehicles. The largest contributor to NO_x emissions would be the buses, due to their relatively high emissions rates. Other sources would release lower levels of emissions. The Proposed Project would also include maintenance trucks, a shuttle van, emergency generators, and solvent usage at the BART storage and maintenance facility, all expected to contribute minimally to ROG, NO_x, PM_{10} and $PM_{2.5}$ emissions. As shown in Tables 3.K-15 and 3.K-16, total average net daily and net annual emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds. Therefore, in 2025, the Proposed Project would have less-than-significant impacts related to emissions of ROGs, NO_x, and PM. **(LS)**

DMU Alternative. In 2025, there would be a smaller net reduction in VMT for passenger vehicles for the DMU Alternative compared to the Proposed Project, as the DMU

[106] While the generation of electricity results in criteria air pollutant and GHG emissions, such emissions occur locally at the power generator/plant, none of which are in the vicinity of the project; therefore, they are not considered under this impacts assessment, which focuses on impacts along the project corridor. See Sections 3.L, Greenhouse Gas Emissions and 3.M, Energy for discussions of impacts related to these topics.

Alternative would result in fewer drivers shifting from motor vehicles to the DMU. The net reduction in VMT results in a net reduction in emissions for ROGs, NO_x, PM_{10}, and $PM_{2.5}$ for passenger vehicles. Emissions associated with the buses, emergency generators, and architectural coating emissions would be similar to the Proposed Project, as activity levels for these sources are expected to be similar. The DMU Alternative would also include DMU trains, maintenance trucks and solvent usage at the DMU storage and maintenance facility. As shown in Tables 3.K-15 and 3.K-16, total average net daily and net annual emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds. Therefore, in 2025, the DMU Alternative would have less-than-significant impacts related to emissions of ROGs, NO_x, and PM. **(LS)**

EMU Option. Emissions for the EMU Option in 2025 would be similar to the DMU Alternative, except that there would be no emissions from DMU trains. EMU vehicles are electrically powered and have no local emissions impact. As shown in Tables 3.K-15 and 3.K-16, total average net daily and net annual emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds. Therefore, in 2025, the EMU Option would have less-than-significant impacts related to emissions of ROGs, NO_x, and PM. **(LS)**

TABLE 3.K-15 AVERAGE NET NEW DAILY OPERATIONAL EMISSIONS IN 2025

	Average Net New Daily Operational Emissions (lbs/day)			
	ROG	**NO_x**	**PM_{10}**	**$PM_{2.5}$**
Significance Thresholds	**54**	**54**	**82**	**54**
Conventional BART Project				
Total Emissions	0.75	15	-10	-4.0
Above Threshold?	No	No	No	No
DMU Alternative				
Total Emissions	5.8	26	-7.0	-2.5
Above Threshold?	No	No	No	No
EMU Option				
Total Emissions	1.6	18	-7.4	-2.9
Above Threshold?	No	No	No	No
Express Bus/BRT Alternative				
Total Emissions	2.0	19	-3.5	-1.3
Above Threshold?	No	No	No	No
Enhanced Bus Alternative				
Total Emissions	3.1	20	0.17	0.19
Above Threshold?	No	No	No	No

Note: lbs/day = pounds per day; ROG = reactive organic gas; NO_x = nitrogen oxides; PM_{10} = respirable particulate matter;
$PM_{2.5}$ = fine particulate matter.

TABLE 3.K-16 NET NEW ANNUAL OPERATIONAL EMISSIONS IN 2025

	Maximum Net New Annual Operational Emissions (short tons/yr)			
	ROG	**NO_x**	**PM_{10}**	**$PM_{2.5}$**
Significance Thresholds	**10**	**10**	**15**	**10**
Conventional BART Project				
Total Emissions	0.14	2.8	-1.8	-0.73
Above Threshold?	No	No	No	No
DMU Alternative				
Total Emissions	1.1	4.8	-1.3	-0.45
Above Threshold?	No	No	No	No
EMU Option				
Total Emissions	0.29	3.2	-1.4	-0.53
Above Threshold?	No	No	No	No
Express Bus/BRT Alternative				
Total Emissions	0.37	3.4	-0.65	-0.25
Above Threshold?	No	No	No	No
Enhanced Bus Alternative				
Total Emissions	0.57	3.7	0.032	0.034
Above Threshold?	No	No	No	No

Notes: tons/yr = tons per year; ROG = reactive organic gas; NO_x = nitrogen oxides; PM_{10} = respirable particulate matter; $PM_{2.5}$ = fine particulate matter.
A short ton is a unit of weight that is equivalent to 2,000 pounds. While typically referred to simply as a ton, it is it is distinguished here to clarify that it is not a metric ton, which is equivalent to 1,000 kilograms.

Express Bus/BRT Alternative. In 2025, the Express Bus/BRT Alternative would result in a smaller net reduction in VMT for passenger vehicles compared to the Proposed Project, and would result in fewer mode shifts from motor vehicles. Nevertheless, there would be a net reduction in VMT resulting in a net reduction in emissions for ROGs, NO_x, PM_{10}, and $PM_{2.5}$. Compared to the Proposed Project, bus emissions under the Express Bus/BRT Alternative would be reduced, as evidenced by the lower bus VMT shown in Table 14 of Appendix H. Architectural coating emissions would be lower compared to the Proposed Project, as there are fewer building structures requiring architectural coating. There would be no emissions generated by emergency generators under this alternative, as no generators are proposed under this alternative. As shown in Tables 3.K-15 and 3.K-16, total average net daily and net annual emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds. Therefore, in 2025, the Express Bus/BRT Alternative would have less-than-significant impacts related to emissions of ROGs, NO_x, and PM. **(LS)**

Enhanced Bus Alternative. In 2025, the Enhanced Bus Alternative would result in a smaller net reduction in VMT for passenger vehicles compared to the 2025 Express

Bus/BRT Alternative, as the Enhanced Bus Alternative would result in fewer drivers shifting to bus. Nevertheless, there would be a net reduction in VMT resulting in a net reduction in emissions for ROGs, NO_x, PM_{10}, and $PM_{2.5}$. Bus emissions would be lower under the Enhanced Bus Alternative compared to the Proposed Project, as the bus network would be smaller and involve fewer bus miles in operation, as evidenced by the lower bus VMT shown in Table 14 of Appendix H. There are no emissions from emergency generators or architectural coating under this alternative; thus, no emissions would be generated from these sources. As shown in Tables 3.K-15 and 3.K-16, total average net daily and net annual emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ are below BAAQMD significance thresholds. Therefore, in 2025, the Enhanced Bus Alternative would have less-than-significant impacts related to emissions of ROGs, NO_x, and PM. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to emissions of ROGs, NO_x, and PM in 2025, and no mitigation measures are required.

Impact AQ-10: Result in emissions of ROGs, NO_x, and PM above BAAQMD significance thresholds under 2040 Project Conditions

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

Under 2040 Project Conditions, net new emissions are calculated as the difference between the 2040 No Project Conditions and the 2040 Project Conditions. 2040 Project operational emissions for the Proposed Project and Build Alternatives are shown in Table 3.K-17 (average net daily emissions) and Table 3.K-18 (net annual emissions).

No Project Alternative. In 2040, the No Project Alternative would have higher passenger vehicle traffic compared to baseline conditions (the 2025 No Project Conditions). The number of bus trips, however, would be the same as in 2025. Emissions of PM and ROG are primarily driven by passenger vehicle traffic and are thus expected to be higher in 2040 compared to baseline conditions in 2025. NO_x emissions are primarily driven by bus traffic and are thus expected to be at least equivalent to 2025 conditions (due to same VMT) but more likely reduced over time as bus fleets are converted from diesel to hybrid electric or full electric.[107] The increase in daily passenger VMT for the No Project

[107] According to the LAVTA Short Range Transit Plan, LAVTA is looking into vehicles with alternative propulsion technologies such as all-electric for future vehicles purchases. The Short Range Transit Plan does not discuss a schedule for bus replacement to all-electric. Thus, at the very least, 2040 bus emissions would stay equivalent to 2025 emissions.
Livermore-Amador Valley Transit Authority (LAVTA), 2016. LAVTA Short Range Transit Plan. Available at: http://www.wheelsbus.com/wp-content/uploads/2015/08/FINAL-SRTP.pdf, accessed June 2017.

Alternative from 2025 to 2040 is 171,417 miles.[108] The increase in emissions of ROGs, NO_x, and PM is expected to be below BAAQMD significance thresholds.[109] **(LS)**

TABLE 3.K-17 AVERAGE NET NEW DAILY OPERATIONAL EMISSIONS IN 2040

	Average Net New Daily Operational Emissions (lbs/day)			
	ROG	**NO_x**	**PM_{10}**	**$PM_{2.5}$**
Significance Thresholds	**54**	**54**	**82**	**54**
Conventional BART Project				
Total Emissions	0.37	11	-20	-7.9
Above Threshold?	No	No	No	No
DMU Alternative				
Total Emissions	6.5	25	-11	-3.9
Above Threshold?	No	No	No	No
EMU Option				
Total Emissions	1.8	15	-11	-4.4
Above Threshold?	No	No	No	No
Express Bus/BRT Alternative				
Total Emissions	-0.68	18	-7.7	-3.0
Above Threshold?	No	No	No	No
Enhanced Bus Alternative				
Total Emissions	-3.0	19	-0.59	-0.15
Above Threshold?	No	No	No	No

Notes: lbs/day = pounds per day; ROG = reactive organic gas; NO_x = nitrogen oxides; PM_{10} = respirable particulate matter; $PM_{2.5}$ = fine particulate matter.

[108] 2040 No Project daily VMT is 928,428 miles. 2025 No Project daily VMT is 757,011 miles. The difference is: 928,428 miles – 757,011 miles = 171,417 miles.

[109] As shown in Table 3.K-6 (Change in Annual Net Passenger VMT), the reduction in annual VMT due to the 2040 Conventional BART Project is 73,770,403 miles. In comparison, the increase in annual VMT from 2025 No Project to 2040 No Project is 51,425,100 miles (daily VMT increase of 171,417 miles x 300 day per year conversion factor). The reduced emissions associated with the VMT changes in the 2040 Conventional BART Project (shown in Table 28 of Appendix H) are all well below the significance thresholds. Since the increase in annual VMT in the 2040 No Project is less than the decrease in annual VMT for the 2040 Conventional BART Project, and because bus emissions would be at most equivalent in 2040 under the No Project Alternative to 2040 Conventional BART Project, the increase in emissions of ROGs, NO_x, $PM_{2.5}$, and PM_{10} must be less than the BAAQMD significance thresholds.

TABLE 3.K-18 NET NEW ANNUAL OPERATIONAL EMISSIONS IN 2040

	Maximum Net New Annual Operational Emissions (short tons/yr)			
	ROG	**NO_x**	**PM_{10}**	**$PM_{2.5}$**
Significance Thresholds	**10**	**10**	**15**	**10**
Conventional BART Project				
Total Emissions	0.068	2.0	-3.6	-1.4
Above Threshold?	No	No	No	No
DMU Alternative				
Total Emissions	1.2	4.5	-2.0	-0.72
Above Threshold?	No	No	No	No
EMU Option				
Total Emissions	0.32	2.8	-2.1	-0.81
Above Threshold?	No	No	No	No
Express Bus/BRT Alternative				
Total Emissions	-0.12	3.3	-1.4	-0.55
Above Threshold?	No	No	No	No
Enhanced Bus Alternative				
Total Emissions	-0.54	3.5	-0.11	-0.027
Above Threshold?	No	No	No	No

Notes: tons/yr = tons per year; ROG = reactive organic gas; NO_x = nitrogen oxides; PM_{10} = respirable particulate matter; $PM_{2.5}$ = fine particulate matter.
A short ton is a unit of weight that is equivalent to 2,000 pounds. While typically referred to simply as a ton, it is it is distinguished here to clarify that it is not a metric ton, which is equivalent to 1,000 kilograms.

Conventional BART Project. In 2040 the Proposed Project would result in a net reduction in VMT for passenger vehicles compared to the 2040 No Project Conditions. While there would be a greater reduction in VMT associated with the Proposed Project, the passenger vehicles would have fewer emissions due to the CARB's requirements for cleaner vehicles in 2040. Thus, there would be a net reduction in emissions for ROGs, NO_x, PM_{10}, and $PM_{2.5}$ for passenger vehicles. Buses also would have lower emissions in 2040, consistent with regulatory requirements. The emergency generators, maintenance trucks, shuttle van, and the architectural coatings have the same levels of emissions as in the 2025 analysis. As shown in Tables 3.K-17 and 3.K-18, total average net daily and net annual emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds. Therefore, the Proposed Project would have less-than-significant impacts related to emissions of ROGs, NO_x, and PM. **(LS)**

DMU Alternative. In 2040, the DMU Alternative would result in a larger net reduction in VMT for passenger vehicles compared to 2040 No Project Conditions than in 2025, but the passenger vehicles would produce fewer emissions due to the CARB's requirements for cleaner vehicles in 2040. Nevertheless, there would be a net reduction in emissions for ROGs, NO_x, PM_{10}, and $PM_{2.5}$ for passenger vehicles in 2040. Bus emissions, emergency generators, maintenance trucks, and architectural coating emissions would be similar to the Proposed Project, as activity levels for these sources are expected to be similar. DMU emissions are higher compared to 2025 because of a greater number of DMU VMT. As shown in Tables 3.K-17 and 3.K-18, total average net daily and net annual emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds. Therefore, the DMU Alternative would have less-than-significant impacts related to emissions of ROGs, NO_x, and PM. **(LS)**

EMU Option. Emissions for the EMU Option would be similar to the DMU Alternative, except that there would be no emissions from DMU vehicles. As shown in Tables 3.K-17 and 3.K-18, total average net daily and net annual emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds. Therefore, the EMU Option would have less-than-significant impacts related to emissions of ROGs, NO_x, and PM. **(LS)**

Express Bus/BRT Alternative. In 2040, the Express Bus/BRT Alternative would result in a larger net reduction in VMT for passenger vehicles compared to 2040 No Project Conditions than in 2025. However, this is balanced by lower emission factors from cleaner vehicle fleets in 2040. Nevertheless, there would still be a net reduction in emissions for ROGs, NO_x, PM_{10}, and $PM_{2.5}$ for passenger vehicles. Buses would also have lower emissions in 2040, reflecting regulatory requirements for cleaner engines, and architectural coating emissions would be the same as in 2025. As shown in Tables 3.K-17 and 3.K-18, total average net daily and net annual emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts related to emissions of ROGs, NO_x, and PM. **(LS)**

Enhanced Bus Alternative. In 2040 the Enhanced Bus Alternative would result in a larger net reduction in VMT for passenger vehicles than in 2025. However, this is balanced by lower emission factors from cleaner vehicle fleets in 2040. Nevertheless, there would still be a net reduction in emissions for ROGs, NO_x, PM_{10}, and $PM_{2.5}$ for passenger vehicles. Buses would also have lower emissions in 2040, reflecting regulatory requirements for cleaner engines. As shown in Tables 3.K-17 and 3.K-18, total average net daily and net annual emissions of ROGs, NO_x, PM_{10}, and $PM_{2.5}$ would be below BAAQMD significance thresholds. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts related to emissions of ROGs, NO_x, and PM. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to emissions of ROGs, NO_x, and PM in 2040, and no mitigation measures are required.

Emissions of TACs and $PM_{2.5}$ Causing Increased Health Risk

Impact AQ-11: Result in emissions of TACs and $PM_{2.5}$ causing increased health risk above BAAQMD significance thresholds 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 sources of TACs and $PM_{2.5}$ include passenger vehicles associated with localized increases in traffic volumes on certain roadway segments, buses, DMUs (DMU Alternative), maintenance trucks (Proposed Project, DMU Alternative, and EMU Option), a shuttle van (Proposed Project), emergency generators (Proposed Project, DMU Alternative, and EMU Option), and solvent cleaning activities (Proposed Project, DMU Alternative, and EMU Option).

Health impacts associated with TACs contribute to increased cancer risk as well as chronic and/or acute impacts. As described under Approach to Analysis, the primary TAC analyzed for this project is DPM. The OEHHA recommends evaluating DPM as a surrogate for the combination of TACs for health impacts from diesel combustion sources. For sources of diesel exhaust, cancer risks tends to approach thresholds at lower concentrations of diesel exhaust than for non-cancer hazard (chronic and acute) indices due to the toxic profile of the exhaust. Therefore, only cancer risk is evaluated for TAC impacts. Apart from health impacts from TACs, the BAAQMD has a separate significance threshold for $PM_{2.5}$ concentrations. With the exception of solvent cleaning activities, all operational sources listed above emit DPM (a TAC) and $PM_{2.5}$.

Emissions of DPM and $PM_{2.5}$ were modeled to determine concentrations for the Proposed Project and Build Alternatives. TAC concentrations were further used to estimate impacts to cancer risk. Key assumptions for the analysis are noted below.

- It is assumed that solvent use would occur at a level that does not require permitting by the BAAQMD (less than 150 pounds of ROGs per year), and would therefore have negligible impacts to health risk (i.e., expected to contribute less than a 1-in-1-million increased cancer risk).
- To assess the localized increases in traffic volumes, the BAAQMD CEQA Guidelines recommend estimating health risk for roadways with net increase of 10,000 vehicles per day or more.[110] To evaluate project impacts, roadway segments with a net increase

[110] Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en, accessed May 2017.

of 10,000 vehicles per day or greater were evaluated using the BAAQMD Roadway Screening Analysis Calculator.

- This impact analysis conservatively does not account for the reduction in VMT that would result under the Proposed Project and Build Alternatives, which would reduce emissions of TACs and $PM_{2.5}$. Accounting for the reduction in VMT would result in a small-to-moderate reduction in the concentration of TACs and $PM_{2.5}$, depending on the Alternative. In an effort to simplify the analysis, this assessment conservatively does not incorporate complex modeling that would be required to account for the reduction in TACs and $PM_{2.5}$ associated with the reduction in VMT, resulting in relatively small reductions in concentration of TACs and $PM_{2.5}$.

The lifetime excess project cancer risk at the MEISR and maximum $PM_{2.5}$ concentrations for 2025 are shown in Tables 3.K-19 and 3.K-20, respectively, for the Proposed Project and Build Alternatives.

TABLE 3.K-19 MAXIMUM OPERATIONAL PROJECT CANCER RISK AT OFF-SITE RECEPTORS IN 2025

	Excess Cancer Risk (in 1 million)				
Source	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Receptor Type	Resident	Resident	Resident	Resident	Resident
Traffic	--[a]	--[a]	--[a]	--[a]	--[a]
Buses	6.1	6.1	6.1	4.1	6.3
DMU	--	1.6	--	--	--
Generator (Isabel Station)	0.44	0.44	0.44	--	--
Generator (Maintenance Facility)	0.025	0.043	0.043	--	--
Maintenance Trucks and Shuttle Van [c,d]	9.1E-06	2.1E-05	2.1E-05	--	--
Solvent Use	--[b]	--[b]	--[b]	--	--
Total	6.5	8.2	6.6	4.1	6.3
Significance Threshold	10	10	10	10	10
Above Threshold?	No	No	No	No	No

Notes: -- = not applicable.
[a] Incremental increase in traffic volume is less than 10,000 vehicles per day for all roadway segments. Cancer risk is not explicitly evaluated and is assumed to be negligible.
[b] Solvent use in the storage and maintenance facility for the Proposed Project, DMU Alternative, and EMU Option would be less than the BAAQMD permitting thresholds. Cancer risk is not explicitly evaluated and is assumed to be negligible.
[c] A numerical value with "E" denotes scientific notation; thus, 5.6E-06 is equivalent to 5.6×10^{-6}.
[d] A shuttle van is included for the Proposed Project only. Maintenance trucks are included for the Proposed Project, DMU Alternative, and EMU Option.

TABLE 3.K-20 MAXIMUM ANNUAL AVERAGE OPERATIONAL PROJECT $PM_{2.5}$ CONCENTRATIONS AT OFF-SITE RECEPTORS IN 2025

	$PM_{2.5}$ Concentration (µg/m³)				
Source	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Receptor Type	Resident	School	Resident	Resident	Resident
Traffic	--[a]	--[a]	--[a]	--[a]	--[a]
Buses	0.0087	0.00043	0.0087	0.0057	0.0085
DMU	--	0.022	--	--	--
Generator (Isabel Station)[b]	0.00059	4.2E-05	0.00059	--	--
Generator (Maintenance Facility)[c]	3.3E-05	0.00013	5.8E-05	--	--
Maintenance Trucks and Shuttle Van[c]	2.3E-08	6.4E-08	5.8E-08	--	--
Total	0.0093	0.023	0.0093	0.0057	0.0085
Significance Threshold	0.3	0.3	0.3	0.3	0.3
Above Threshold?	No	No	No	No	No

Notes: -- = not applicable; µg/m³ = micrograms per cubic meter; $PM_{2.5}$ = fine particulate matter.
[a] Incremental increase in traffic volume is less than 10,000 vehicles per day for all roadway segments. Cancer risk is not explicitly evaluated and is assumed to be negligible.
[b] A numerical value with "E" denotes scientific notation; thus, 3.7E-05 is equivalent to 3.7×10^{-5}.
[c] A shuttle van is included for the Proposed Project only. Maintenance trucks are included for the Proposed Project, DMU Alternative, and EMU Option.

No Project Alternative. The 2025 No Project Alternative is the same as baseline conditions (i.e., 2025 No Project Conditions). Therefore, the 2025 No Project Alternative would have no impacts. **(NI)**

Conventional BART Project. In 2025, the Proposed Project would result in potential impacts to health risk associated with TAC and $PM_{2.5}$ concentrations due to changes in passenger vehicle activity, new bus routes, activities at the storage and maintenance facility, and emergency generators. The key inputs to the analysis are described below.

- In 2025, the Proposed Project would have an overall net reduction in VMT of 38,250,574 miles compared to the 2025 No Project Conditions. However, as described above, this analysis conservatively does not quantify the reduction in TAC and $PM_{2.5}$ associated with the net reduction in VMT.
- No roadway segments were projected to have an increase of 10,000 vehicles per day. Thus, the contribution to incremental cancer risk and $PM_{2.5}$ concentration is not evaluated for changes in passenger vehicle.

- New and modified bus routes, as described in Chapter 2, Project Description, were also evaluated. The focus of the modeling analysis was at the Isabel Station north touchdown structure plaza where bus connections would be provided for BART riders.
- New emergency generators are assumed to be located at the Isabel North Station area and at the storage and maintenance facility.
- DPM emissions from maintenance vehicles at the storage and maintenance facility and a shuttle van were conservatively included in the modeling analysis, although the emissions are relatively low.

In 2025, the cancer risk MEISR and maximum $PM_{2.5}$ concentration for the Proposed Project are located at the Shea Homes Sage Project residential development currently under construction approximately 340 meters northeast of the proposed Isabel Station. This residential area is assumed to be fully constructed by the time the Proposed Project is in operation.

Table 3.K-19 shows that the increased cancer risk at the MEISR is 6.5-in-1-million and Table 3.K-20 shows that the maximum $PM_{2.5}$ concentration is 0.0093 $\mu g/m^3$, which are below the thresholds of 10-in-1-million and 0.3 $\mu g/m^3$, respectively. Therefore, the Proposed Project in 2025 would have less-than-significant impacts related to health risk. **(LS)**

DMU Alternative. In 2025, the DMU Alternative would result in similar emission sources as the Proposed Project, except that it would include DPM emissions from the DMU vehicles. The new and modified bus routes, emergency generators, and maintenance trucks at the storage and maintenance facility would be similar to the Proposed Project. Key inputs to the analysis that differ from the Proposed Project are described below as follows: passenger vehicle activity and DMU vehicle activity.

- In 2025, the DMU Alternative would have an overall net reduction in VMT of 28,578,215 miles compared to the 2025 No Project Conditions. However, as described above, this analysis conservatively does not quantify the reduction in TAC and $PM_{2.5}$ associated with the net reduction in VMT.
- No roadway segments under this alternative were projected to have an increase of 10,000 vehicles per day. Thus, the contribution to incremental cancer risk and $PM_{2.5}$ concentration is not evaluated for changes in passenger vehicle activity.
- Emissions for the DMU vehicle were modeled for its operational route along I-580 from the Dublin/Pleasanton Station to the Isabel Station. DMU vehicles would have approximately 776,400 vehicle miles per year in 2025.

In 2025, the cancer risk MEISR for the DMU Alternative is located in the Shea Homes Sage Project residential development (approximately 340 meters northeast of the proposed

Isabel Station), similar to the Proposed Project, and the maximum $PM_{2.5}$ concentration is located at the Tri-Valley Regional Occupational Program near the intersection of Kitty Hawk Road and Armstrong Street (approximately 235 meters southwest of the proposed Isabel Station).

Table 3.K-19 shows that the increased cancer risk at the MEISR is 8.2-in-1-million and Table 3.K-20 shows that the maximum $PM_{2.5}$ concentration is 0.023 $\mu g/m^3$, which are below the thresholds of 10-in-1-million and 0.3 $\mu g/m^3$, respectively. Therefore, the 2025 DMU Alternative would have less-than-significant impacts related to health risk. **(LS)**

EMU Option. In 2025, the EMU Option cancer risk and $PM_{2.5}$ concentrations would be similar to the DMU Alternative, except that the DMU vehicle would be replaced with an EMU vehicle, which does not emit TACs or $PM_{2.5}$ locally. The MEISR and maximum $PM_{2.5}$ concentration are located in the Shea Homes Sage Project residential development, similar to the Proposed Project. Table 3.K-19 shows that the increased cancer risk at the MEISR is 6.6-in-1-million and Table 3.K-20 shows that the maximum $PM_{2.5}$ concentration is 0.0093 $\mu g/m^3$, which are below the thresholds of 10-in-1-million and 0.3 $\mu g/m^3$ respectively. Therefore, the 2025 EMU Option would have less-than-significant impacts related to health risk. **(LS)**

Express Bus/BRT Alternative. In 2025, the Express Bus/BRT Alternative would result in a new bus transfer platform at the Dublin/Pleasanton Station to allow bus connections from I-580 HOV/HOT lanes to the station. Existing and new feeder bus service would run from the Dublin/Pleasanton Station on I-580 toward the east. Key inputs to the analysis are described below as follows: passenger vehicle activity and new bus routes.

- The 2025 Express Bus/BRT Alternative would have an overall net reduction in VMT of 13,357,023 miles compared to the 2025 No Project Conditions. However, as described above, this analysis conservatively does not quantify the reduction in TAC and $PM_{2.5}$ associated with the net reduction in VMT.
- No roadway segments would have an increase of 10,000 vehicles per day under this alternative; thus, the contribution to incremental cancer risk and $PM_{2.5}$ concentration is not evaluated for changes in passenger vehicle activity.
- New and modified bus routes, as described in Chapter 2, Project Description, were evaluated. The focus of the modeling analysis was at the Dublin/Pleasanton Station where bus connections would be provided to BART riders.

In 2025, the cancer risk MEISR and maximum $PM_{2.5}$ concentration for the Express Bus/BRT Alternative are located at the Dublin Station – Avalon II apartment complex, approximately 127 meters north of the Dublin/Pleasanton Station. Table 3.K-19 shows that the increased cancer risk at the MEISR is 4.1-in-1-million and Table 3.K-20 shows that the maximum $PM_{2.5}$ concentration is 0.0057 $\mu g/m^3$, which are below the thresholds of 10-in-1-million and

0.3 μg/m^3, respectively. Therefore, the 2025 Express Bus/BRT Alternative would have less-than-significant impacts related to health risk. **(LS)**

Enhanced Bus Alternative. In 2025, the Enhanced Bus Alternative would have new and modified bus routes, as described in Chapter 2, Project Description. Key inputs to the analysis are described below as follows: passenger vehicle activity and new bus routes.

- The 2025 Enhanced Bus Alternative would have an overall net reduction in VMT of 75,668 miles compared to the 2025 No Project Conditions. However, as described above, this analysis conservatively does not quantify the reduction in TAC and $PM_{2.5}$ associated with the net reduction in VMT.
- No roadway segments are projected to have an increase of 10,000 vehicles per day under this alternative. Thus, the contribution to incremental cancer risk and $PM_{2.5}$ concentration is not evaluated for changes in passenger vehicle activity.
- For the new and modified bus routes, the focus of the modeling analysis was at the Dublin/Pleasanton Station where bus connections would be provided to BART riders.

The MEISR and maximum $PM_{2.5}$ concentration are located at the DR Horton Espirit residential development, approximately 530 meters northeast of the Dublin/Pleasanton Station. Table 3.K-19 shows that the increased cancer risk at the MEISR is 6.3-in-1-million and Table 3.K-20 shows that the maximum $PM_{2.5}$ concentration is 0.0085 μg/m^3, which are below the thresholds of 10-in-1-million and 0.3 μg/m^3, respectively. Therefore, the 2025 Express Bus/BRT Alternative would have less-than-significant impacts related to health risk. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to increased health risk in 2025, and no mitigation measures are required.

Impact AQ-12: Result in emissions of TACs and $PM_{2.5}$ causing increased health risk above BAAQMD significance thresholds under 2040 Project Conditions.

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

The lifetime excess project cancer risk at the MEISR and maximum $PM_{2.5}$ concentrations for 2040 Project Conditions are shown in Tables 3.K-21 and 3.K-22, respectively, for the Proposed Project and Alternatives.

No Project Alternative. In 2040, health risk impacts from emissions of TACs and $PM_{2.5}$ would be driven by passenger vehicle and bus traffic because they would be the largest sources of operational diesel exhaust emissions. Bus routes and annual VMT will remain unchanged between the 2025 baseline (2025 No Project Conditions) and the 2040 No

Project Alternative, based on the analysis by Arup.[111] Bus emissions of TACs and $PM_{2.5}$ are thus expected to be at least equivalent to 2025 conditions (due to same VMT) but more likely reduced over time as bus fleets are converted from diesel to hybrid electric or full

Table 3.K-21 Maximum Operational Project Cancer Risk at Off-Site Receptors in 2040

	Excess Cancer Risk (in 1 million)				
Source	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Receptor Type	Resident	Resident	Resident	Resident	Resident
Traffic	1.3	--[a]	--[a]	--[a]	--[a]
Buses	2.7	2.7	2.7	3.9	6.1
DMU	--	1.8	--	--	--
Generator (Isabel Station)	0.44	0.44	0.44	--	--
Generator (Maintenance Facility)	0.025	0.043	0.043	--	--
Maintenance Trucks and Shuttle Van[c,d]	4.5E-06	9.9E-06	9.9E-06	--	--
Solvent Use	--[b]	--[b]	--[b]	--	--
Total	4.5	5.0	3.2	3.9	6.1
Significance Threshold	10	10	10	10	10
Above Threshold?	No	No	No	No	No

Notes: -- = not applicable.
[a] Incremental increase in traffic volume is less than 10,000 vehicles per day for all roadway segments. Cancer risk is not explicitly evaluated and is assumed to be negligible.
[b] Solvent use in the storage and maintenance facility under the Proposed Project, DMU Alternative, and EMU Option would be less than BAAQMD permitting thresholds. Cancer risk is not explicitly evaluated and is assumed to be negligible.
[c] A numerical value with "E" denotes scientific notation; thus, 2.7E-06 is equivalent to 2.7×10^{-6}.
[d] A shuttle van is included for the Proposed Project only. Maintenance trucks are included for the Proposed Project, DMU Alternative, and EMU Option.

[111] Arup, 2017a. BART to Livermore Extension Bus and Overall Operations and Maintenance Cost Technical Memorandum. July.

TABLE 3.K-22 MAXIMUM ANNUAL AVERAGE OPERATIONAL PROJECT $PM_{2.5}$ CONCENTRATIONS AT OFF-SITE RECEPTORS IN 2040

	$PM_{2.5}$ Concentration (µg/m³)				
Source	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Receptor Type	Resident	School	Resident	Resident	Resident
Traffic	0.016	--[a]	--[a]	--[a]	--[a]
Buses	0.0039	0.00021	0.0039	0.0053	0.0082
DMU	--	0.025	--	--	--
Generator (Isabel Station)[b]	0.00059	4.2E-05	0.00059	--	--
Generator (Maintenance Facility)	3.3E-05	0.00013	5.8E-05	--	--
Maintenance Trucks and Shuttle Van[c]	1.7E-08	4.7E-08	4.3E-08	--	--
Total	0.021	0.025	0.0046	0.0053	0.0082
Significance Threshold	0.3	0.3	0.3	0.3	0.3
Above Threshold?	No	No	No	No	No

Notes: -- = not applicable; PM_{10} = respirable particulate matter.
[a] Incremental increase in traffic volume is less than 10,000 vehicles per day for all roadway segments. Cancer risk is not explicitly evaluated and is assumed to be negligible.
[b] A numerical value with "E" denotes scientific notation; thus, 3.7E-05 is equivalent to 3.7×10^{-5}.
[c] A shuttle van is included for the Proposed Project only. Maintenance trucks are included for the Proposed Project, DMU Alternative, and EMU Option.

electric.[112] As described in **Impact AQ-7**, the increase in overall regional passenger VMT from 2025 No Project to 2040 No Project is 171,417 daily miles or 51,425,100 annual miles.[113] This is roughly 20 percent higher than the annual VMT decrease for passenger vehicles for the 2040 DMU Alternative (42,745,966 miles, Table 3.K-6). Table 30 of

[112] According to the LAVTA Short Range Transit Plan, LAVTA is looking into vehicles with alternative propulsion technologies such as all-electric for future vehicles purchases. The Short Range Transit Plan does not discuss a schedule for bus replacement to all-electric. Thus, at the very least, 2040 bus emissions would stay equivalent to 2025 emissions.

LAVTA, 2016. LAVTA Short Range Transit Plan. Available at: http://www.wheelsbus.com/wp-content/uploads/2015/08/FINAL-SRTP.pdf, accessed June 2017.

[113] 2040 No Project daily VMT is 928,428 miles. 2025 No Project daily VMT is 757,011 miles. The difference is as follows: 928,428 miles – 757,011 miles = 171,417 miles. To convert from daily VMT to annual VMT, the daily VMT is multiplied by 300 days/year. This is consistent with the Plan Bay Area 2040 Public Review Draft Environmental Impact Report.

Source: Cambridge Systematics, 2017. Personal communication with BART regarding BART to Livermore Extension Project VMT Projections. July 19.

Appendix H shows that the change in DPM and $PM_{2.5}$ emissions due to the decrease in passenger traffic in the DMU Alternative is 2.1 tons/yr and 0.87 tons/yr, respectively. Thus, the increase in emissions due to passenger traffic in the 2040 No Project Alternative compared to the 2025 No Project Alternative would be approximately 20 percent higher, or 2.5 tons/yr and 1.0 tons/yr for DPM and $PM_{2.5}$ emissions, respectively. While dispersion modeling and an HRA of these emissions has not been performed, it is conservatively assumed that the 2040 No Project Alternative would have a significant impact as a result of the increased emissions of DPM and $PM_{2.5}$. **(S)**

Conventional BART Project. In 2040, emissions of TACs and $PM_{2.5}$ would be similar to those in 2025, with differences described below.

- There is one segment of Airway Boulevard projected to have an increase of more than 10,000 vehicles per day. This segment is to the south of I-580 and east of the Isabel Station. All other roadway segments would have a net increase of less than 10,000 vehicles per day or a net decrease in roadway volume. Thus, this one roadway segment was evaluated for contribution to incremental health risk and $PM_{2.5}$ concentration.
- In 2040 the Proposed Project would result in a greater reduction in annual VMT (73,770,403 fewer miles annually) compared to the Proposed Project in 2025 (38,250,574 fewer miles annually). While this reduction in VMT is conservatively not quantified in this analysis, the reduced VMT would result in reduced emissions of TACs and $PM_{2.5}$. Bus activity in 2040 is expected to be similar to feeder bus service in 2025. However, DPM emissions associated with bus operations would be significantly lower as the transit agencies switch to cleaner fleets, consistent with requirements of the CARB Statewide Truck and Bus Regulation.[114]

The MEISR for cancer risk and maximum $PM_{2.5}$ concentration are at the same location as the Proposed Project in 2025 (Shea Homes Sage Project residential development). Tables 3.K-21 and 3.K-22, respectively, show that the increased cancer risk at the MEISR is 4.5-in-1-million and the maximum $PM_{2.5}$ concentration is 0.021 μg/m^3, which are below the thresholds of 10-in-1-million and 0.3 μg/m^3, respectively. Therefore, the 2040 Proposed Project would have less-than-significant impacts related to health risk. **(LS)**

DMU Alternative. The DMU Alternative emissions of TACs and $PM_{2.5}$ would be similar in 2040 to those in 2025, with differences noted below.

[114] California Code of Regulations, Title 13, Section 2025. Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen and Other Criteria Pollutants from In-Use Heavy-Duty Diesel-Fueled Vehicles. ("Truck and Bus Regulation"). Effective December 31, 2014.

- In 2040 there would be a greater reduction in annual VMT (42,745,966 fewer miles annually) compared to 2025 (28,578,215 fewer miles annually). While this reduction in VMT is conservatively not quantified in this analysis, the reduced VMT would result in reduced emissions of TACs and $PM_{2.5}$.
- No roadway segments are projected to have an increase of 10,000 vehicles per day under this alternative. Thus, the contribution to incremental cancer risk and $PM_{2.5}$ concentration is not evaluated for changes in passenger vehicle activity.
- DMU vehicle activity would increase from 776,400 car miles per year in 2025 to 864,100 car miles per year in 2040. This would result in increased emissions of DPM and $PM_{2.5}$.
- Truck activity at the storage and maintenance facility in 2040 is assumed to be similar to activity in 2025. However, emissions of DPM and $PM_{2.5}$ are expected to be lower, as truck emissions would be cleaner due to replacement of older fleet vehicles with newer vehicles, the emissions of which would be consistent with the CARB Tier Standards.
- As in the 2040 Proposed Project analysis, DPM emissions from buses would be lower compared to 2025, due to the CARB requirements for lower emissions.

The MEISR for cancer risk and maximum $PM_{2.5}$ concentration would be at the same locations as the DMU Alternative in 2025 noted above (Shea Homes Sage Project residential development and Tri-Valley Regional Occupational Program, respectively). Tables 3.K-21 and 3.K-22 show that the increased cancer risk at the MEISR is 5.0-in-1-million and the maximum $PM_{2.5}$ concentration is 0.025 μg/m^3, which are below the thresholds of 10-in-1-million and 0.3 μg/m^3, respectively. Therefore, the 2040 DMU Alternative would have less-than-significant impacts related to health risk. **(LS)**

EMU Option. The EMU Option conditions in 2040 would be similar to 2025, except that there would be no emissions associated with DMU vehicles, as EMU vehicles would be in use instead. The MEISR and maximum $PM_{2.5}$ concentration would be at the same location as in 2025 (Shea Homes Sage Project residential development). Tables 3.K-21 and 3.K-22 show that the increased cancer risk at the MEISR is 3.2-in-1-million and the maximum $PM_{2.5}$ concentration is 0.0046 μg/m^3, which are below the thresholds of 10-in-1-million and 0.3 μg/m^3, respectively. Therefore, the 2040 EMU Option would have less-than-significant impacts related to health risk. **(LS)**

Express Bus/BRT Alternative. The Express Bus/BRT Alternative emissions of TACs and $PM_{2.5}$ in 2040 would be similar to 2025, with differences described below.

- In 2040, there would be a greater reduction in annual VMT (28,586,697 fewer miles annually) compared to 2025 (13,357,023 fewer miles annually). While this reduction in

VMT is conservatively not quantified in this analysis, the reduced VMT would result in reduced emissions of TACs and $PM_{2.5}$.

- No roadway segments are projected to have an increase of 10,000 vehicles per day under this alternative. Thus, the contribution to incremental cancer risk and $PM_{2.5}$ concentration is not evaluated for changes in passenger vehicle activity.
- As in the 2040 Proposed Project analysis, DPM emissions from buses are lower compared to 2025 due to the CARB requirements for lower emissions.

The MEISR for cancer risk and maximum $PM_{2.5}$ concentration are located at the Elan at Dublin Station apartment complex. Tables 3.K-21 and 3.K-22 show that the increased cancer risk at the MEISR is 3.9-in-1-million and the maximum $PM_{2.5}$ concentration is 0.0053 $\mu g/m^3$, which are below the thresholds of 10-in-1-million and 0.3 $\mu g/m^3$, respectively. Therefore, the 2040 Express Bus/BRT Alternative would have less-than-significant impacts related to health risk. **(LS)**

Enhanced Bus Alternative. The Enhanced Bus Alternative emissions of TACs and $PM_{2.5}$ in 2040 would be similar to 2025, with differences noted below.

- In 2040, there would be a greater reduction in annual VMT (2,722,388 fewer miles annually) compared to 2025 (75,668 fewer miles annually). While this reduction in VMT is conservatively not quantified in this analysis, the reduced VMT would result in reduced emissions of TACs and $PM_{2.5}$.
- No roadway segments are projected to have an increase of 10,000 vehicles per day under this alternative. Thus, the contribution to incremental cancer risk and $PM_{2.5}$ concentration is not evaluated for changes in passenger vehicle activity.
- As in the 2040 Proposed Project analysis, DPM emissions from buses are lower compared to 2025 due to the CARB requirements for lower emissions.

The MEISR for cancer risk and maximum $PM_{2.5}$ concentration are located at the same residential area as under the 2025 Enhanced Bus Alternative (DR Horton Espirit residential development). Tables 3.K-21 and 3.K-22 show that the increased cancer risk at the MEISR is 6.1-in-1-million and the maximum $PM_{2.5}$ concentration is 0.0082 $\mu g/m^3$, which are below the thresholds of 10-in-1-million and 0.3 $\mu g/m^3$, respectively. Therefore, the 2040 Enhanced Bus Alternative would have less-than-significant impacts related to health risk. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Build Alternatives would not result in significant impacts related to health risk in 2040, and no mitigation measures are required.

Concentrations of Carbon Monoxide

Impact AQ-13: Result in local concentrations of CO above BAAQMD significance thresholds for 2025 Project Conditions.

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

CO concentration is a direct function of motor vehicle activity (particularly during peak commuting hours) and meteorological conditions. Under specific meteorological conditions combined with high motor vehicle activity, CO concentrations may reach unhealthy levels for local sensitive land uses, such as residential areas, schools, preschools, playgrounds, and hospitals. As a result, the BAAQMD recommends analysis of CO emissions at a local rather than a regional level.

BAAQMD provides a screening methodology based on peak hourly traffic volumes at affected intersections. If a project would contribute 44,000 vehicles per hour to an intersection or 24,000 vehicles per hour for intersections where vertical or horizontal air mixing would be limited (e.g., tunnel, parking garage, bridge underpass, natural or urban street canyon, or below-grade roadway), it could violate or contribute to a violation of NAAQS or CAAQS for CO.[115]

No Project Alternative. The 2025 No Project Alternative is the same as baseline conditions (i.e., 2025 No Project Conditions). Therefore, the 2025 No Project Alternative would have no impacts. **(NI)**

Conventional BART Project and Build Alternatives. Potential CO impacts from the Proposed Project and Build Alternatives were evaluated for intersections within the transportation study area, described in Section 3.B, Transportation. Traffic at intersections was approximated using the one-way PM peak traffic volumes for major roadway segments. Based on these volumes, none of the study area intersections would be expected to exceed either the 44,000-vehicles-per-hour threshold or the 24,000-vehicles-per-hour threshold for intersections where vertical or horizontal air mixing would be limited.

Intersection traffic volumes for 2025 Project Conditions are shown in Table 3.K-23 and listed below.

[115] Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en, accessed May 2017.

TABLE 3.K-23 PEAK HOURLY INTERSECTION TRAFFIC COUNTS IN 2025

Alternative	Peak Hourly Intersection Traffic Volume (vehicles per hour)
Conventional BART Project	9,010
DMU Alternative	9,026
Express Bus/BRT Alternative	8,982
Enhanced Bus Alternative	8,939

Note: Values shown represent the maximum PM peak hourly traffic volume at the worst-case intersection for the Proposed Project and each alternative.
Source: Arup, 2017c. Personal communication with BART regarding BART to Livermore Extension Project Intersection Turning Movements. July 19.

- **2025 Proposed Project.** The greatest intersection volumes would be 9,010 vehicles per hour at Intersection 2 (Hopyard Road/Dougherty Road and Dublin Boulevard).
- **2025 DMU Alternative.** The greatest intersection volumes would be 9,026 vehicles per hour at Intersection 2 (Hopyard Road/Dougherty Road and Dublin Boulevard).
- **2025 Express Bus/BRT Alternative**. The greatest intersection volumes would be 8,982 vehicles per hour at Intersection 2 (Hopyard Road/Dougherty Road and Dublin Boulevard).
- **2025 Enhanced Bus Alternative.** The greatest intersection volumes would be 8,939 vehicles per hour at Intersection 2 (Hopyard Road/Dougherty Road and Dublin Boulevard).

Each intersection would be below the most conservative screening threshold of 24,000 vehicles per hour.

Therefore, as described above, traffic vehicle volumes associated with the Proposed Project and Build Alternatives would be below BAAQMD screening thresholds for CO concentrations, and refined quantitative analysis is not required. Therefore, the Proposed Project and Build Alternatives would result in less-than-significant impacts related to CO concentrations. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to local concentrations of CO in 2025, and no mitigation measures are required.

Impact AQ-14: Result in local concentrations of CO above BAAQMD significance thresholds for 2040 Project Conditions.

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

No Project Alternative. Potential CO impacts from the 2040 No Project Alternative were evaluated for intersections within the transportation study area, described in Section 3.B, Transportation. Based on intersection volumes, none of the study area intersections would be expected to exceed either the 44,000-vehicles-per-hour threshold or the 24,000-vehicles-per-hour threshold for intersections where vertical or horizontal air mixing would be limited. The greatest intersection volume would be 9,870 vehicles per hour at Intersection 2 (Hopyard Road/Dougherty Road and Dublin Boulevard). Each intersection would be below the most conservative screening threshold of 24,000 vehicles per hour. Therefore, as described above, traffic vehicle volumes associated with the 2040 No Project Alternative would be below BAAQMD screening thresholds for CO concentrations, and refined quantitative analysis is not required. Therefore, the 2040 No Project Alternative would result in less-than-significant impacts related to CO concentrations. **(LS)**

Conventional BART Project and Build Alternatives. Potential CO impacts from the Proposed Project and Build Alternatives were evaluated for intersections within the transportation study area, described in Section 3.B, Transportation, similar to that for 2025. Based on intersection volumes, none of the study area intersections would be expected to exceed either the 44,000-vehicles-per-hour threshold or the 24,000-vehicles-per-hour threshold for intersections where vertical or horizontal air mixing would be limited.

Intersection traffic volumes for 2040 Project Conditions are shown in Table 3.K-24 and listed below.

- **2040 Proposed Project.** The greatest intersection volumes would be 10,166 vehicles per hour at Intersection 2 (Hopyard Road/Dougherty Road and Dublin Boulevard).
- **2040 DMU Alternative.** The greatest intersection volumes would be 10,059 vehicles per hour at Intersection 2 (Hopyard Road/Dougherty Road and Dublin Boulevard).
- **2040 Express Bus/BRT Alternative.** The greatest intersection volumes would be 9,903 vehicles per hour at Intersection 2 (Hopyard Road/Dougherty Road and Dublin Boulevard).2040 Enhanced Bus Alternative. The greatest intersection volumes would be 9,871 vehicles per hour at Intersection 2 (Hopyard Road/Dougherty Road and Dublin Boulevard).

TABLE 3.K-24 PEAK HOURLY INTERSECTION TRAFFIC COUNTS IN 2040

	Peak Hourly Intersection Traffic Volume (vehicles per hour)
Conventional BART Project	10,166
DMU Alternative	10,059
Express Bus/BRT Alternative	9,903
Enhanced Bus Alternative	9,871

Note: Values shown represent the maximum PM peak hourly traffic volume at the worst-case intersection for the Proposed Project and each alternative.
Source: Arup, 2017c. Personal communication with BART regarding BART to Livermore Extension Project Intersection Turning Movements. July 19.

Each intersection would be below the most conservative screening threshold of 24,000 vehicles per hour.

Therefore, as described above, traffic vehicle volumes associated with the Proposed Project and Build Alternatives would be below BAAQMD screening thresholds for CO concentrations, and refined quantitative analysis is not required. Therefore, the Proposed Project and Build Alternatives would result in less-than-significant impacts related to CO concentrations. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to local concentrations of CO in 2040, and no mitigation measures are required.

Impact AQ-15: Result in objectionable odors affecting a substantial number of people in 2025 and 2040.

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

The occurrence and severity of potential odor impacts depends on numerous factors. The nature, frequency, and intensity of the source, the wind speeds and direction, and the sensitivity of receiving location each contribute to the intensity of the impact. Although offensive odors seldom cause physical harm, they can be annoying and cause distress among the public, and generate citizen complaints.

Operational activities for the Proposed Project and Build Alternatives have the potential to generate objectionable odors, primarily as a result of diesel combustion. Operational sources of diesel exhaust include buses (all alternatives), DMU trains (DMU Alternative), the maintenance trucks (Proposed Project, DMU Alternative, and EMU Option), shuttle van (Proposed Project), and the emergency generators (Proposed Project, DMU Alternative, and EMU Option). Another potential source of odor is solvent use at the Proposed Project and DMU storage and maintenance facility.

The BAAQMD CEQA Guidelines specifically identify wastewater treatment plants, oil refineries, asphalt plants, chemical manufacturing, painting/coating operations, coffee roasters, food processing facilities, recycling operations, and metal smelters as operational odor sources of particular concern. For such uses, the BAAQMD recommends a buffer zone of 1 to 2 miles to avoid potential odor conflicts. The Proposed Project and Build Alternatives do not include any of these odor-producing sources. The BAAQMD CEQA Guidelines have a threshold of significance for operational-related odors of five confirmed complaints per year averaged over 3 years.[116] Given that the sources of odors are not yet in operation, this is not a useful threshold for determining significance. Thus, to evaluate significance for operational-related odors, a quantitative analysis was performed comparing concentrations of odorous constituents of diesel exhaust to published odor thresholds.[117] The comparison analysis is shown in Appendix H.

The sources of odors identified for operational activities for the Proposed Project and Alternatives are described below.

No Project Alternative. The No Project Alternative is not expected to result in objectionable odors. It does not include the Isabel Station or storage and maintenance facility (Proposed Project and DMU Alternative), and would therefore not include the associated activities in these areas with the potential to create odors, such as emergency generator use, maintenance trucks, shuttle van, solvent use, and area coating. The odor sources in both 2025 and 2040 would include diesel emissions from (non-BART) passenger vehicles and buses. From the 2025 No Project Conditions to the 2040 No Project Conditions, passenger vehicle emissions are expected to increase while bus emissions are expected to decrease. The increase in passenger vehicle emissions over the study area is not expected to contribute to a significant odor impact. **(LS)**

Conventional BART Project. The Proposed Project has the potential to create odors from diesel combustion during operational activity (i.e., emergency generator, shuttle van, and buses). With respect to the operation of buses, there would be an average of 217 net new

[116] Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en, accessed May 2017.

[117] Amoore, J.E. and E. Hautala, 1983. Odor as and Aid to Chemical Safety: Odor Thresholds Compared with Threshold Limit Values and Volatilities for 2014 Industrial Chemicals in Air and Water Dilution. Journal of Applied Toxicology, Vol 3, No 6, pg 272.

bus trips per day, and diesel odors from these operations would be minor additions to the existing diesel and gasoline odors associated with vehicles on I-580 and nearby arterials. An analysis of the odor-causing constituents of diesel exhaust from the buses indicates that concentrations of the odorous chemicals are roughly 1,000 times less than the odor threshold.[118]

It is estimated that the shuttle van used to transport train operators between the storage and maintenance facility and Isabel Station will only travel up to 20 miles per day; therefore, odor impacts from this source are expected to be negligible. There would also be odors associated with solvent usage at the storage and maintenance facility. However, given the distance between the storage and maintenance facility and the public, these odors would not noticeably change existing conditions. Based on the above, impacts from odors under the Proposed Project would be less than significant. **(LS)**

DMU Alternative. The DMU Alternative has the potential to create odors from diesel combustion from operational activity (i.e., emergency generators, DMU operation, solvent use, and buses). However, there would be a limited number of DMU-powered vehicles (six married pairs), and diesel odors from these operations would incrementally increase the existing diesel and gasoline odors associated with vehicles on I-580 and nearby arterials. In addition, the DMU Alternative would use trains with diesel engines that are compliant with the EPA's Tier 4 Final standards. Tier 4 Final standards require PM and NO_x emissions that are about 90 percent reduced from Tier 3 standards.[119] As a result, diesel emissions would have substantially reduced odors compared to engines from prior standards. With respect to the operation of buses, there would be an average of 217 net new bus trips per day, and diesel odors from these operations would be minor additions to the existing diesel and gasoline odors associated with vehicles on I-580 and nearby arterials. An analysis of the odor-causing constituents of diesel exhaust from the buses and DMU indicates that concentrations of the odorous chemicals are roughly 1,000 times less than the odor threshold.

There would be odors associated with solvent usage at the storage and maintenance facility. However, given the distance between the storage and maintenance facility and the public, these odors would not noticeably change existing conditions. Therefore, impacts from odors under the DMU Alternative would be less than significant. **(LS)**

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[118] The concentrations estimated are annual average concentrations. Odors are generally detected instantaneously or on a short time-average basis (i.e., 1 hour). Shorter time-average concentrations (i.e., 1-hour maximum concentrations) can be up to 10 times higher than annual average concentrations. Nevertheless, a rough estimate of a 1-hour maximum concentration of the odor-causing constituents would still be roughly 100 times lower than odor thresholds.

[119] United States Environmental Protection Agency (EPA), 2016e. Non-road emission standards. Available at: https://www3.epa.gov/otaq/nonroad-diesel.htm, accessed October 21.

EMU Option. The EMU Option would have fewer odor impacts compared to the DMU Alternative because EMU vehicles would be powered by electricity, and thus would not be a source of emissions of diesel exhaust. Therefore, the EMU Option would have reduced impacts associated with odors compared to the DMU Alternative. The EMU Option would have minor odors associated with the storage and maintenance facility, similar to those described above for the DMU Alternative. Overall, the EMU Option would result in less-than-significant impacts related to odors. **(LS)**

Express Bus/BRT Alternative. The Express Bus/BRT Alternative has the potential to create odors from diesel combustion from operational activity (i.e., buses). With respect to the operation of new buses, there would be an average of 212 net new bus trips per day; diesel odors from these operations would be minor additions to the existing diesel and gasoline odors associated with vehicles on I-580 and nearby arterials, and associated odors would not change noticeably. An analysis of the odor-causing constituents of diesel exhaust from the buses indicates that concentrations of the odorous chemicals are roughly 1,000 times less than the odor threshold. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts related to odor. **(LS)**

Enhanced Bus Alternative. The Enhanced Bus Alternative has the potential to create odors from diesel combustion from operational activity (i.e., buses). With respect to the operation of new buses, there would be an average of 200 net new bus trips per day; diesel odors from these operations would be minor additions to the existing diesel and gasoline odors associated with vehicles on I-580 and nearby arterials, and associated odors would not change noticeably. An analysis of the odor-causing constituents of diesel exhaust from the buses indicates that concentrations of the odorous chemicals are roughly 1,000 times less than the odor threshold. Therefore, the Enhanced Bus Alternative would have less-than-significant impacts related to odor. **(LS)**

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

Impact AQ-16: Conflict with or obstruct implementation of existing air quality plans in 2025 and 2040.

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

The most recently adopted air quality plan for the Bay Area is the 2017 Clean Air Plan (Spare the Air, Cool the Climate: A Blueprint for Clean Air and Climate Protection in the Bay Area), which is an update to the BAAQMD's 2010 Clean Air Plan. The 2017 Clean Air Plan serves as a multi-pollutant air quality plan to protect public health and the climate. The 2017 Clean Air Plan control strategy includes revised, updated, and new measures in the following control measure categories: stationary source measures, transportation measures, energy, buildings, agriculture, natural working lands, waste management, water, and "super-GHGs."

The California CEQA Guidelines Environmental Checklist Form (Appendix G) asks whether a project would "conflict with or obstruct implementation of the applicable air quality plan" in the determination of air quality impacts. The BAAQMD CEQA Guidelines recommend that, where an air quality plan consistency determination is required the Lead Agency consider the following three questions:

1. Does the project support the primary goals of the air quality plan?
2. Does the project include applicable control measures from the air quality plan?
3. Does the project disrupt or hinder implementation of any clean air plan control measures?

With regard to the first question, the BAAQMD CEQA Guidelines state that the primary goals of the Clean Air Plan are to:

- Attain air quality standards
- Reduce population exposure and protect public health in the Bay Area
- Reduce GHG emissions and protect the climate

Any project that is inconsistent with these goals is not considered consistent with the 2017 Clean Air Plan. If emissions and health impacts associated with a project are below the BAAQMD CEQA thresholds of significance, the project is considered to be consistent with the current Clean Air Plan.

As to the second question, the Clean Air Plan includes 85 control measures to reduce emissions of PM, PM precursors, and other air pollutants from a wide variety of emissions sources. The control measures can be classified into eight main categories, as follows: (1) transportation; (2) energy; (3) buildings; (4) agriculture; (5) natural and working lands; (6) waste management; (7) water; and (8) super-GHGs. The Proposed Project and Build Alternatives are evaluated for inclusion of applicable control measures.

The basis for evaluating consistency with the Clean Air Plan is whether the Proposed Project or Build Alternatives would disrupt or hinder implementation of any Clean Air Plan control measure.

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 the Proposed Project or any of the Build Alternatives. The benefits of the Proposed Project and Build Alternatives, including suppporting the Clean Air Plan's Transportation Control measures for Local and Regional Bus and Rail Service Improvements and Bicycle and Pedestrian Access, which would contribute to lowering vehicle usage and reducing emissions, would not be realized under the No Project Alterantive. Nevertheless, other projects would be expected to incorporate other measures to ensure consistency with the Clean Air Plan. In any case, any conflict with the Clean Air Plan woult not be a consequence of BART Board of Directors' decision not to adopt a project. Therefore, the No Project Alternative would have less-than-significant impacts related to consistency with the 2017 Clean Air Plan. **(LS)**

Conventional BART Project and Build Alternatives. Regarding the first question for consistency determination, **Impacts AQ-1** through **AQ-6** are all less than significant with mitigation. Therefore, the project can be considered to be consistent with the 2017 Clean Air Plan.

To address the second question for consistency determination, the control measures applicable to the Proposed Project and Build Alternatives, and how those measures would be achieved, are discussed below.

- Stationary Control Measure SS36: PM from Trackout. Under the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, construction best management practices (**Mitigation Measure AQ-1)** will be implemented, which includes a requirement that all visible mud or dirt track-out onto adjacent public roads be removed using wet power vacuum street sweepers at least once per day. Furthermore, the use of dry power sweeping will be prohibited.
- Transportation Control Measure TR3: Local and Regional Bus Service Improvements. New Express and Rapid routes would be added as a result of the Proposed Project and Build Alternatives.
- Transportation Control Measure TR4: Local and Regional Rail Service Improvements. An extension to the existing BART line from the Dublin/Pleasanton Station to Isabel Station would be added under the Proposed Project. Alternatively, an extension using DMU or EMU technology would be added under the DMU Alternative (or EMU Option) extending between the Dublin/Pleasanton Station to Isabel Station.
- Transportation Control Measures TR5: Transit Efficient and Use. Under the Proposed Project and Build Alternatives, bus-related infrastructure improvements will include real-time information via digital messaging boards and pre-paid ticketing with Clipper.
- Transportation Control Measure TR9: Bicycle and Pedestrian Access and Facilities. Under the Proposed Project and DMU Alternative, in the vicinity of the proposed Isabel Station, bicycle lanes would be constructed on East Airway Boulevard. The bicycle lanes would be 6 feet wide and would connect to the existing bicycle lanes on Isabel Avenue and Airway Boulevard to the west, to the existing multi-use trail along Stealth Street, and to the planned multi-use trail along Airway Boulevard east of the site. Additionally, a 5-foot-wide sidewalk would be constructed along the north side of East Airway Boulevard. The proposed Isabel Station would be accessible from both the

north and south side of I-580. Bicycle lockers and racks would be provided at each side of the station. Also, pedestrian and bicycle access to the Isabel Station would be provided from sidewalks and bicycle lanes along Isabel Avenue and East Airway Boulevard, as well as a proposed trail along Las Positas Creek that would extend under I-580, which is being developed by the City of Livermore.

- Transportation Control Measure TR22: Construction, Freight, and Farming Equipment. Under the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, a Construction Emissions Reduction Plan (**Mitigation Measures AQ-2 and 3**) would be required for DPM emission reductions for off-road construction equipment. This would be achieved by including the use of late-model engines, low-emission diesel products, alternative fuels, add-on devices such as particulate filters, and/or other options as they become available.

As described above, the Proposed Project and Build Alternatives are consistent with Clean Air Plan measures, including mobile source measures, transportation control measures, and energy and climate measures. Therefore, the Proposed Project and Build Alternatives meet the second criterion for consistency with the Clean Air Plan.

The Proposed Project and Build Alternatives would not affect any Clean Air Plan measures.

- Of the stationary source measures, three potentially apply to the project regarding stationary source permitting and the Air Toxics “Hot Spots” Program. Compliance with air permitting and potential Air Toxics “Hot Spots” Program requirements will ensure that the Proposed Project and Build Alternatives do not disrupt or hinder any Clean Air Plan control measures.
- Transportation control measures are strategies to reduce vehicles trips, vehicle use, VMT, vehicle idling, or traffic congestion. They also include measures to accelerate the replacement of older, dirtier vehicles and equipment largely through incentive programs. The project does not disrupt or hinder any of these measures.
- Energy and climate measures are focused on decreasing electricity demand and decarbonizing electricity production. The project does not disrupt or hinder any of these measures.
- Buildings control measures are focused on implementing the CAL-Green (Title 24) statewide building energy code, decarbonizing buildings, and reducing urban heat island effects. The project does not disrupt or hinder any of these measures.
- The project does not disrupt or hinder any agricultural activities.
- Natural and Working Lands control measures focus on carbon sequestration in rangeland and wetlands and urban tree planting. The project does not disrupt or hinder any of these measures.

- Waste Management control measures focus on landfill emissions, composting, recycling, and waste reduction. The project does not disrupt or hinder any of these measures.
- Water control measures focus on limiting emissions at treatment facilities and conserving water. The project does not disrupt or hinder any of these measures.
- Super-GHG control measures focus on reducing emissions of methane, black carbon, and fluorinated gases. The project does not disrupt or hinder any of these measures.

Therefore, the Proposed Project and Build Alternatives would be beneficial to the implementation of the Clean Air Plan. **(B)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to air quality plans, and no mitigation measures are required.

(b) Operations – Cumulative Analysis

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

The study area for cumulative impacts is the same as the study area identified in the Introduction subsection above.

Emissions of ROGs, NO_x, and PM

Impact AQ-17(CU): Result in emissions of ROGs, NO_x, and PM above BAAQMD significance thresholds under 2025 and 2040 Cumulative Conditions

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

As discussed in the Standards of Significance subsection above, the BAAQMD's thresholds of significance for criteria air pollutants and precursors represent levels at which a project's individual emissions would result in a cumulatively considerable contribution to the SFBAAB's existing air quality conditions. If a project's emissions do not exceed the BAAQMD's thresholds of significance for ROGs, NO_x, and PM, then the project's contribution is not cumulatively considerable.

No Project Alternative. As described in **Impacts AQ-9** and **AQ-10** above, the No Project Alternative would have no impacts associated with operational emissions of ROGs, NO_x, and PM for 2025 and 2040 Project Conditions. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. As discussed in **Impacts AQ-9** and **AQ-10** above, the Proposed Project and Build Alternatives would generate operational emissions of ROGs, NO_x, and PM that would be below the BAAQMD's thresholds of significance and not considered cumulatively considerable. Thus, the Proposed Project and Build Alternatives, in combination with past, present, and probable future development would have less-than-significant cumulative impacts related to operational emissions of ROGs, NO_x, and PM exceeding significance levels. **(LS)**

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 emissions of ROGs, NO_x, and PM under 2025 and 2040 Cumulative Conditions, and no mitigation measures are required.

Emissions of TACs and $PM_{2.5}$ Causing Increased Health Risk

Impact AQ-18(CU): Result in emissions of TACs and $PM_{2.5}$ causing increased health risk above BAAQMD significance thresholds under 2025 Cumulative Conditions.

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

Under the 2025 cumulative analysis, impacts from TAC and $PM_{2.5}$ emissions from overall roadway volumes and permitted sources are considered. Projects considered under the cumulative conditions are described in Section 3.A, Introduction to Environmental Analysis and Appendix E. This includes the INP (Proposed Project and DMU Alternatives only) and the Dublin/Pleasanton Station Parking Expansion. The effects of the INP and the Dublin/Pleasanton Station Parking Expansion projects on traffic are incorporated into the roadway volumes used in this cumulative analysis.

Per the BAAQMD Recommended Methods for Screening and Modeling Local Risks and Hazards, a 1,000-foot radius is generally recommended around the project property boundary to identify existing sources that may individually or cumulatively impact new receptors or contribute to the cumulative impact of new sources.[120] Existing stationary sources within 1,000 feet of the collective footprint include diesel-fired emergency generators, printing operations, gas stations, surface coating operations, and solvent wipe cleaning operations. No new stationary sources of TAC emissions were identified for cumulative projects.

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[120] Bay Area Air Quality Management District (BAAQMD), 2012b. Recommended Methods for Screening and Modeling Local Risks and Hazards. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/risk-modeling-approach-may-2012.pdf?la=en, accessed February 2017.

The reduction in VMT from the Proposed Project and Build Alternatives, compared to the No Project Conditions, is described for informational purposes. However, similar to the project analysis above, the cumulative analysis conservatively does not consider the reduction in VMT, which would further reduce emissions of TACs and $PM_{2.5}$, beyond the levels described herein.

The lifetime excess cumulative cancer risk at the MEISR and maximum $PM_{2.5}$ concentrations for 2025 are shown in Tables 3.K-25 and 3.K-26, respectively, for the Proposed Project and Build Alternatives under the 2025 Cumulative Conditions. These tables represent the impact attributed to the Proposed Project or an alternative under Cumulative Conditions, including all other sources of TAC and $PM_{2.5}$ emissions within 1,000 feet of the MEISR locations.

TABLE 3.K-25 MAXIMUM OPERATIONAL CANCER RISK AT OFF-SITE RECEPTORS, 2025 CUMULATIVE CONDITIONS

	Excess Cancer Risk (in 1 million)				
Source	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Receptor Type	Resident	Resident	Resident	Resident	Resident
Traffic[a]	126	124	124	127	67
Buses	6.1	6.1	6.1	4.1	6.3
DMU	--	1.6	--	--	--
Generator (Isabel Station)	0.44	0.44	0.44	--	--
Generator (Maintenance Facility)	0.025	0.043	0.043	--	--
Maintenance Trucks and Shuttle Van[b,d]	9.1E-06	2.1E-05	2.1E-05	--	--
Solvent Use	--[c]	--[c]	--[c]	--	--
Non-Project Sources	--	--	--	9.9	4.2
Total	**132**	**132**	**131**	**141**	77
Significance Threshold	100	100	100	100	100
Above Threshold?	**Yes**	**Yes**	**Yes**	**Yes**	No

Notes: -- = not applicable. **Bold**/gray values exceed thresholds.
[a] Includes traffic impact from INP and Dublin/Pleasanton Parking Expansion. The analysis considers roadway segments with an average of greater than 10,000 vehicles per day.
[b] A shuttle van is included for the Proposed Project only. Maintenance trucks are included for the Proposed Project, DMU Alternative, and EMU Option.
[c] Solvent use in the storage and maintenance facility under the Proposed Project, DMU Alternative, and EMU Option would be less than BAAQMD permitting thresholds. Cancer risk is not explicitly evaluated and is assumed to be negligible.
[d] A numerical value with "E" denotes scientific notation; thus, 5.6E-06 is equivalent to 5.6×10^{-6}.

TABLE 3.K-26 MAXIMUM ANNUAL AVERAGE OPERATIONAL $PM_{2.5}$ CONCENTRATIONS AT OFF-SITE RECEPTORS, 2025 CUMULATIVE CONDITIONS

	$PM_{2.5}$ Concentration (µg/m³)				
Source	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Receptor Type	Resident	School	Resident	Resident	Resident
Traffic[a]	0.82	1.15	0.80	0.86	0.58
Buses	0.0087	0.00043	0.0087	0.0057	0.0085
DMU	--	0.022	--	--	--
Generator (Isabel Station)	0.00059	4.2E-05	0.00059	--	--
Generator (Maintenance Facility)	3.3E-05	1.3E-04	5.8E-05	--	--
Maintenance Trucks and Shuttle Van[b,c]	2.3E-08	6.4E-08	5.8E-08	--	--
Non-Project Sources	--	--	--	0.0097	0.0050
Total	**0.83**	**1.17**	**0.81**	**0.87**	0.59
Significance Threshold	0.8	0.8	0.8	0.8	0.8
Above Threshold?	**Yes**	**Yes**	**Yes**	**Yes**	No

Notes: -- = not applicable; $PM_{2.5}$ = fine particulate matter. **Bold**/gray values exceed thresholds.
[a] Includes traffic impact from INP and Dublin/Pleasanton Parking Expansion. The analysis considers roadway segments with an average of greater than 10,000 vehicles per day.
[c] A shuttle van is included for the Proposed Project only.
[b] Maintenance trucks are included for the Proposed Project, DMU Alternative, and EMU Option.
[c] A numerical value with "E" denotes scientific notation; thus, 3.7E-05 is equivalent to 3.7×10^{-5}.

No Project Alternative. As described in **Impact AQ-11** above, the No Project Alternative would have no impacts associated with health risk during operations under 2025 Project Conditions. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project. Under the 2025 Cumulative Conditions, there would be potential impacts to health risk associated with TAC and $PM_{2.5}$ concentrations, as described under **Impact AQ-11** for the Proposed Project (including for bus routes, maintenance trucks, a shuttle van, and emergency generators), with the following key inputs noted for roadway segments, stationary sources, and VMT:

- There are five roadway segments projected to have greater than 10,000 vehicles per day within 1,000 feet of the MEISR. In addition, I-580 is within 1,000 feet of the MEISR. Both will impact the MEISR.
- Per the BAAQMD Stationary Source Screening Analysis Tool and additional information provided by the BAAQMD, there are no stationary sources within the 1,000-foot zone

of influence of the MEISR.[121, 122]As such, there are no existing stationary sources that are expected to impact the MEISR.

- The 2025 Cumulative Conditions would have an overall net reduction in VMT of 32,649,225 miles compared to the 2025 No Project Conditions. This net decrease in VMT would be less than the Proposed Project in 2025 by approximately 5,600,000 VMT.

The MEISR and maximum $PM_{2.5}$ concentration are the same locations described under **Impact AQ-11** for the Proposed Project in 2025 analysis (Shea Homes Sage Project residential development). Table 3.K-25 shows that the cumulative cancer risk at the MEISR is 132-in-1-million and Table 3.K-26 shows the maximum $PM_{2.5}$ concentration is 0.83 $\mu g/m^3$, which are above the thresholds of 100-in-1-million and 0.8 $\mu g/m^3$, respectively. It should be noted that the contribution of I-580 to the cancer risk exceeds the cumulative threshold, given its proximity to the MEISR. Thus, even without the Proposed Project, the cumulative cancer risk threshold would be exceeded. It should also be noted that emissions from vehicles are expected to decrease over time as more vehicles become electrified. As the rate of electrification of vehicles is unknown at this time, the anlaysis does not include elecrification. Thus, the cumulative cancer risk and $PM_{2.5}$ concentrations in Tables 3.K-25 and 3.K-26 are conservative. Therefore, under the 2025 Cumulative Conditions, the Proposed Project would contribute to significant and unavoidable cumulative impacts related to health risk. **(SU)**

DMU Alternative. Under the 2025 Cumulative Conditions, the DMU Alternative would have potential impacts to health risk associated with TAC and $PM_{2.5}$ concentrations, as described under **Impact AQ-11** (including for bus routes, DMU vehicles, maintenance vehicles, and emergency generators), with the following key inputs noted for roadway segments, stationary sources, and VMT:

- There are four roadway segments projected to have greater than 10,000 vehicles per day within 1,000 feet of the MEISR for cancer risk and two roadway segments projected to have greater than 10,000 vehicles per day within 1,000 feet of the MEISR for $PM_{2.5}$ concentration.[123] In addition, I-580 is within 1,000 feet of both the cancer risk and $PM_{2.5}$ concentration MEISR. Both will impact the MEISRs.

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[121] Bay Area Air Quality Management District (BAAQMD), 2015. Roadway Screening Analysis Calculator. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/screeningcalculator_4_16_15-xlsx.xlsx?la=en, accessed April 16.

[122] Kirk, 2016. Email communication from Alison Kirk, Senior Environmental Planner, Bay Area Air Quality Management District, with Ramboll Environ, Inc. September 28, 2016.

[123] Unless otherwise noted, the MEISR for cancer risk and $PM_{2.5}$ concentrations are generally in the same location. In some cases, such as in the DMU Alternative, the MEISR for cancer risk and $PM_{2.5}$ concentration are at different locations.

- Per the BAAQMD Stationary Source Screening Analysis Tool and additional information provided by the BAAQMD, there are no stationary sources within the 1,000-foot zone of influence of the MEISR.[124, 125] As such, there are no existing stationary sources that are expected to impact the MEISR.
- Under 2025 Cumulative Conditions, the DMU Alternative would have an overall net reduction in VMT of 21,858,079 miles compared to the 2025 No Project Conditions. This net decrease in VMT would be less than the 2025 DMU Alternative by approximately 6,720,000 VMT.

The MEISR and maximum $PM_{2.5}$ concentration are the same locations described under **Impact AQ-11** for the 2025 DMU Alternative analysis (Shea Homes Sage Project and Tri-Valley Regional Occupational Program, respectively). Table 3.K-25 shows that the cumulative cancer risk at the MEISR is 132-in-1-million and Table 3.K-26 shows the maximum $PM_{2.5}$ concentration is 1.17 $\mu g/m^3$, which are above the thresholds of 100-in-1-million and 0.8 $\mu g/m^3$, respectively. It should be noted that the contribution of I-580 to the cancer risk exceeds the cumulative threshold, given its proximity to the MEISR. Thus, even without the DMU Alternative the cumulative cancer risk threshold would be exceeded. This analysis does not include the electrification of vehicles for the reasons described above, and thus, the cumulative cancer risk and $PM_{2.5}$ concentrations in Tables 3.K-25 and 3.K-26 are conservative. Therefore, under the 2025 Cumulative Conditions, the DMU Alternative would contribute to significant and unavoidable cumulative impacts related to health risk. **(SU)**

EMU Option. Under the 2025 Cumulative Conditions, the EMU Option would have potential impacts to health risk associated with TAC and $PM_{2.5}$ concentrations, as described under **Impact AQ-11** (including for bus routes, maintenance vehicles, and emergency generators). Roadway segments, stationary sources, and VMT would be as described above for the DMU Alternative under 2025 Cumulative Conditions. The MEISR for cancer and MEISR for $PM_{2.5}$ concentration are the same locations described under **Impact AQ-11** for the 2025 EMU Option analysis (Shea Homes Sage Project residential development). Table 3.K-25 shows that the cumulative cancer risk at the MEISR is 131-in-1-million and Table 3.K-26 shows the maximum $PM_{2.5}$ concentration is 0.81 $\mu g/m^3$, which are above the thresholds of 100-in-1-million and 0.8 $\mu g/m^3$, respectively. It should be noted that the contribution of I-580 to the cancer risk exceeds the cumulative threshold, given its proximity to the MEISR. Thus, even without the EMU Option the

[124] Bay Area Air Quality Management District (BAAQMD), 2015. Roadway Screening Analysis Calculator. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/screeningcalculator_4_16_15-xlsx.xlsx?la=en, accessed April 16, 2015.

[125] Kirk, 2016. Email communication from Alison Kirk, Senior Environmental Planner, Bay Area Air Quality Management District, with Ramboll Environ, Inc. September 28, 2016.

cumulative cancer risk threshold would be exceeded. This analysis does not include the electrification of vehicles for the reasons described above, and thus, the cumulative cancer risk and $PM_{2.5}$ concentrations in Tables 3.K-25 and 3.K-26 are conservative. Therefore, under the 2025 Cumulative Conditions, the EMU Option would contribute to significant and unavoidable cumulative impacts related to health risk. **(SU)**

Express Bus/BRT Alternative. Under the 2025 Cumulative Conditions, the Express Bus/BRT Alternative would have potential impacts to health risk associated with TAC and $PM_{2.5}$ concentrations, as described under **Impact AQ-8** for bus routes, with the following key inputs noted for roadway segments, stationary sources, and VMT:

- There are six roadway segments projected to have greater than 10,000 vehicles per day within 1,000 feet of the MEISR. In addition, I-580 is within 1,000 feet of the MEISR. Both will impact the MEISR.
- Per the BAAQMD Stationary Source Screening Analysis Tool and additional information provided by the BAAQMD, there are two diesel generators located within 1,000 feet of the MEISR that were included in the cumulative analysis.[126, 127]
- Under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would have an overall net reduction in VMT of 19,509,613 miles compared to the 2025 No Project Conditions. This net decrease in VMT would be greater than the 2025 Express Bus/BRT Alternative by approximately 6,150,000 VMT.

The MEISR and maximum $PM_{2.5}$ concentration are the same locations described under **Impact AQ-11** for 2025 Express Bus/BRT Alternative (Dublin Station – Avalon II apartments located north of the Dublin/Pleasanton Station). Table 3.K-25 shows that the cumulative cancer risk at the MEISR is 141-in-1-million and Table 3.K-26 shows that the maximum $PM_{2.5}$ concentration is 0.87 μg/m^3, which are above the thresholds of 100-in-1-million and 0.8 μg/m^3, respectively. It should be noted that the contribution of I-580 to the cancer risk exceeds the cumulative threshold, given its proximity to the MEISR. Thus, even without the Express Bus/BRT Alternative the cumulative cancer risk threshold would be exceeded. This analysis does not include the electrification of vehicles for the reasons described above, and thus, the cumulative cancer risk and $PM_{2.5}$ concentrations in Tables 3.K-25 and 3.K-26 are conservative. Therefore, under the 2025 Cumulative Conditions, the Express Bus/BRT Alternative would contribute to significant and unavoidable cumulative impacts related to health risk. **(SU)**

[126] Bay Area Air Quality Management District (BAAQMD), 2015. Roadway Screening Analysis Calculator. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/screeningcalculator_4_16_15-xlsx.xlsx?la=en, accessed April 16, 2015.

[127] Kirk, 2016. Email communication from Alison Kirk, Senior Environmental Planner, Bay Area Air Quality Management District, with Ramboll Environ, Inc. September 28, 2016.

Enhanced Bus Alternative. Under the 2025 Cumulative Conditions, the Enhanced Bus Alternative would have potential impacts to health risk associated with TAC and $PM_{2.5}$ concentrations, as described under **Impact AQ-11** for bus routes, with the following key inputs noted for roadway segments, stationary sources, and VMT:

- There are three roadway segments projected to have greater than 10,000 vehicles per day within 1,000 feet of the MEISR. In addition, I-580 is within 1,000 feet of the MEISR. Both will impact the MEISR.
- Per the BAAQMD Stationary Source Screening Analysis Tool and additional information provided by the BAAQMD, there are two diesel generators located within 1,000 feet of the MEISR that were included in the cumulative analysis.[128, 129]
- Under the 2025 Cumulative Conditions, the Enhanced Bus Alternative would have an overall net reduction in VMT of 8,705,948 miles compared to the 2025 No Project Conditions. This net decrease in VMT would be greater than the 2025 Enhanced Bus Alternative by approximately 8,630,000 VMT.

The MEISR and maximum $PM_{2.5}$ concentration are the same locations described under **Impact AQ-11** for the 2025 Enhanced Bus Alternative (DR Horton Espirit residential development located northeast of the Dublin/Pleasanton Station). Tables 3.K-25 and 3.K-26, respectively, show that the cumulative cancer risk at the MEISR is 77-in-1-million and the maximum $PM_{2.5}$ concentration is 0.59 $\mu g/m^3$, which are below the thresholds of 100-in-1-million and 0.8 $\mu g/m^3$, respectively. It should be noted that while cancer risk and $PM_{2.5}$ would be below the thresholds at the MEISR for the Enhanced Bus Alterantive and thus, less than significant, the health risk impact at the location of the MEISRs for the Proposed Project and DMU Alternative (i.e., Shea Homes Sage Project and Tri-Valley Regional Occupational Program, respectively) would still exceed 100-in-1-million solely due to traffic from I-580 under the Enhanced Bus Alternative. The BAAQMD CEQA Guidelines Recommended Methods for Screening and Modeling Local Risks and Hazards recommends that the assessment of the cumulative impact be performed at the location of the MEISR for the project.[130] In this scenario, the MEISR is located far enough from I-580 to not have a significant contribution from the highway. Therefore, under the 2025

[128] Bay Area Air Quality Management District (BAAQMD), 2015. Roadway Screening Analysis Calculator. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/screeningcalculator_4_16_15-xlsx.xlsx?la=en, accessed April 16, 2015.

[129] Kirk, 2016. Email communication from Alison Kirk, Senior Environmental Planner, Bay Area Air Quality Management District, with Ramboll Environ, Inc. September 28, 2016.

[130] Bay Area Air Quality Management District (BAAQMD), 2012b. Recommended Methods for Screening and Modeling Local Risks and Hazards. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/risk-modeling-approach-may-2012.pdf?la=en, accessed February 2017.

Cumulative Conditions, the Enhanced Bus Alternative would not contribute to significant cumulative impacts related to health risk. **(LS)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would contribute to significant and unavoidable cumulative impacts related to emission of TACs and $PM_{2.5}$, together with past, present, and probable future projects under 2025 Cumulative Conditions. It should be noted that even without the Proposed Project or these Build Alterantives, the location of the MEISRs would still experience health risk impacts (from I-580) exceeding the cumulative significance threshold. For example, at the southwest corner of the Shea Homes Sage Project (the location of the Proposed Project MEISR), the cancer risk contribution from existing traffic on I-580 already exceeds 100-in-1-million without the Proposed Project. There are no feasible mitigation measures that could be applied that would reduce this to a less-than-significant level because the contribution to cancer risk from traffic on I-580 exceeds the significance level. Mitigating emissions from traffic on I-580 is not feasible. Therefore, cumulative impacts related to emissions of TACs and $PM_{2.5}$ would remain significant and unavoidable.

The Enhanced Bus Alternative, in combination with past, present, or probable future projects, would not contribute to significant cumulative impacts related to emissions of TACs and $PM_{2.5}$ under 2025 Cumulative Conditions, and no mitigation measures are required.

Impact AQ-19(CU): Result in emissions of TACs and $PM_{2.5}$ causing increased health risk above BAAQMD significance thresholds under 2040 Cumulative Conditions.

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

The approach to the 2040 cumulative analysis is similar to the 2025 cumulative analysis described above. The lifetime excess cumulative cancer risk at the MEISR and maximum $PM_{2.5}$ concentrations for 2040 are shown in Tables 3.K-27 and 3.K-28 respectively, for the Proposed Project and Build Alternatives in 2040. These tables represent the impact attributed to the Proposed Project or an alternative under 2040 Cumulative Conditions including all other sources of TAC and $PM_{2.5}$ emissions within 1,000 feet.

No Project Alternative. As described in **Impact AQ-12** the 2040 No Project Alternative would have a significant impact compared to the 2025 No Project Alternative due to an increase in DPM and $PM_{2.5}$ emissions from regional non-BART passenger vehicle traffic. Therefore, the increased emissions associated with the No Project Alternative would contribute to a significant cumulative impact together with those of other projects under 2040 Cumulative Conditions. **(S)**

TABLE 3.K-27 MAXIMUM OPERATIONAL CANCER RISK AT OFF-SITE RECEPTORS, UNDER 2040 CUMULATIVE CONDITIONS

	Excess Cancer Risk (in 1 million)				
Source	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Receptor Type	Resident	Resident	Resident	Resident	Resident
Traffic[a]	120	119	119	78	73
Buses	2.7	2.7	2.7	3.9	6.1
DMU	--	1.8	--	--	--
Generator (Isabel Station)	0.44	0.44	0.44	--	--
Generator (Maintenance Facility)	0.025	0.043	0.043	--	--
Maintenance Trucks and Shuttle Van[b,d]	4.5E-06	9.9E-06	9.9E-06	--	--
Solvent Use	--[c]	--[c]	--[c]	--	--
Non-Project Sources	--	--	--	9.9	4.2
Total	**123**	**124**	**122**	92	83
Significance Threshold	100	100	100	100	100
Above Threshold?	**Yes**	**Yes**	**Yes**	No	No

Notes: -- = not applicable. **Bold**/gray values exceed thresholds.
[a] Includes traffic impact from INP and Dublin/Pleasanton Parking Expansion. The analysis considers roadway segments with an average of greater than 10,000 vehicles per day.
[b] A shuttle van is included for the Proposed Project only. Maintenance trucks are included for the Proposed Project, DMU Alternative, and EMU Option.
[c] Solvent use in the storage and maintenance facility under the Proposed Project, DMU Alternative, and EMU Option would be less than BAAQMD permitting thresholds. Cancer risk is not explicitly evaluated and is assumed to be negligible.
[d] A numerical value with "E" denotes scientific notation; thus, 2.7E-05 is equivalent to 2.7×10^{-5}.

TABLE 3.K-28 MAXIMUM ANNUAL AVERAGE OPERATIONAL $PM_{2.5}$ CONCENTRATIONS AT OFF-SITE RECEPTORS, UNDER 2040 CUMULATIVE CONDITIONS

	$PM_{2.5}$ Concentration (μg/m³)				
Source	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Receptor Type	Resident	School	Resident	Resident	Resident
Traffic[a]	0.75	1.10	0.73	0.73	0.66
Buses	0.0039	0.00021	0.0039	0.0053	0.0082
DMU	--	0.025	--	--	--
Generator (Isabel Station)	0.00059	4.2E-05	0.00059	--	--
Generator (Maintenance Facility)	3.3E-05	1.3E-04	5.8E-05	--	--
Maintenance Trucks and Shuttle Van[b]	1.7E-08	4.7E-08	4.3E-08	--	--
Non-Project Sources	--	--	--	0.0097	0.0050
Total	0.75	**1.12**	0.74	0.75	0.67
Significance Threshold	0.8	0.8	0.8	0.8	0.8
Above Threshold?	No	**Yes**	No	No	No

Notes: -- = not applicable; μg/m³ = micrograms per cubic meter; $PM_{2.5}$ = fine particulate matter. **Bold**/gray values exceed thresholds.
[a] Includes traffic impact from INP and Dublin/Pleasanton Parking Expansion. The analysis considers roadway segments with an average of greater than 10,000 vehicles per day.
[c] A shuttle van is included for the Proposed Project only.
[b] Maintenance trucks are included for the Proposed Project, DMU Alternative, and EMU Option.
[c] A numerical value with "E" denotes scientific notation; thus, 3.7E-05 is equivalent to 3.7×10^{-5}.

Conventional BART Project. Under the 2040 Cumulative Conditions, sources of TACs and $PM_{2.5}$, as well as the MEISR and maximum $PM_{2.5}$ concentration locations, would be similar to those described under **Impact AQ-18(CU)** for the 2025 Cumulative Conditions with the following differences:

- There are four roadway segments projected to have greater than 10,000 vehicles per day within 1,000 feet of the MEISR. In addition, I-580 is within 1,000 feet of the MEISR. Both will impact the MEISR.
- There would be an overall net reduction in VMT of 82,390,212 miles compared to the 2040 No Project Conditions. This net decrease in VMT under Cumulative Conditions would be greater than the 2040 Proposed Project by approximately 8,600,000 more miles.

Tables 3.K-27 and 3.K-28 show that the cumulative cancer risk at the MEISR is 123-in-1-million and the maximum $PM_{2.5}$ concentration is 0.75 μg/m³. The cancer risk is above the threshold of 100-in-1-million and the $PM_{2.5}$ concentration is below the threshold of 0.8 μg/m^3. It should be noted that the contribution of I-580 to the cancer risk exceeds the cumulative threshold, given its proximity to the MEISR. Thus, even without the Proposed Project the cumulative cancer risk threshold would be exceeded. It should also be noted that emissions from vehicles are expected to decrease over time as more vehicles become electrified. As the rate of electrification of vehicles is unknown at this time, the anlaysis does not include elecrification. Thus, the cumulative cancer risk and $PM_{2.5}$ concentrations in Tables 3.K-27 and 3.K-28 are conservative. Therefore, under the 2040 Cumulative Conditions, the Proposed Project would contribute to significant and unavoidable cumulative impacts related to health risk. **(SU)**

DMU Alternative. Under the 2040 Cumulative Conditions, sources of TACs and $PM_{2.5}$, as well as the MEISR and maximum $PM_{2.5}$ concentration locations, would be similar to those described under **Impact AQ-18(CU)** for the 2025 Cumulative Conditions with the following differences:

- There are four roadway segments projected to have greater than 10,000 vehicles per day within 1,000 feet of the MEISR for cancer risk and one roadway segment projected to have greater than 10,000 vehicles per day within 1,000 feet of the MEISR for $PM_{2.5}$ concentration. In addition, I-580 is within 1,000 feet of both the cancer risk and $PM_{2.5}$ concentration MEISR. Both will impact the MEISRs.
- There would be an overall net reduction in VMT of 49,924,896 miles compared to the 2040 No Project Conditions. This net decrease in VMT would be greater than the 2040 DMU Alternative by approximately 7,178,000 VMT.

Tables 3.K-27 and 3.K-28 show that the cumulative cancer risk at the MEISR is 124-in-1-million and the maximum $PM_{2.5}$ concentration is 1.12 μg/m^3, respectively, which are above the thresholds of 100-in-1-million and 0.8 μg/m^3, respectively. It should be noted that the contribution of I-580 to the cancer risk exceeds the cumulative threshold, given its proximity to the MEISR. Thus, even without the DMU Alternative the cumulative cancer risk threshold would be exceeded. This analysis does not include the electrification of vehicles for the reasons described above, and thus, the cumulative cancer risk and $PM_{2.5}$ concentrations in Tables 3.K-27 and 3.K-28 are conservative. Therefore, under the 2040 Cumulative Conditions, the DMU Alternative would contribute to significant and unavoidable cumulative impacts related to health risk. **(SU)**

EMU Option. Under the 2040 Cumulative Conditions, sources of TACs and $PM_{2.5}$, as well as the MEISR and maximum $PM_{2.5}$ concentration locations, would be similar to those described under **Impact AQ-18(CU)** for the 2025 Cumulative Conditions with the following differences:

- There are four roadway segments projected to have greater than 10,000 vehicles per day within 1,000 feet of the MEISR. In addition, I-580 is within 1,000 feet of the MEISR. Both will impact the MEISR.
- There would be an overall net reduction in VMT of 49,924,896 miles compared to the 2040 No Project Conditions. This net decrease in VMT would be greater than the 2040 DMU Alternative by approximately 7,178,000 VMT.

Tables 3.K-27 and 3.K-28, respectively, show that the cumulative cancer risk at the MEISR is 122-in-1-million and the maximum $PM_{2.5}$ concentration is 0.74 $\mu g/m^3$. The cancer risk is above the threshold of 100-in-1-million and the $PM_{2.5}$ concentration is below the threshold of 0.8 $\mu g/m^3$. It should be noted that the contribution of I-580 to the cancer risk exceeds the cumulative threshold, given its proximity to the MEISR. Thus, even without the EMU Option the cumulative cancer risk threshold would be exceeded. This analysis does not include the electrification of vehicles for the reasons described above, and thus, the cumulative cancer risk and $PM_{2.5}$ concentrations in Tables 3.K-27 and 3.K-28 are conservative. Therefore, under the 2040 Cumulative Conditions, the EMU Option would contribute to significant and unavoidable cumulative impacts related to health risk. **(SU)**

Express Bus/BRT Alternative. Under the 2040 Cumulative Conditions, sources of TACs and $PM_{2.5}$ would be similar to those described under **Impact AQ-18(CU)** for the 2025 Cumulative Conditions with the following differences:

- There are three roadway segments projected to have greater than 10,000 vehicles per day within 1,000 feet of the MEISR. In addition, I-580 is within 1,000 feet of the MEISR. Both will impact the MEISR.
- There would be an overall net reduction in VMT of 34,691,838 miles compared to the 2040 No Project Conditions. This net decrease in VMT would be greater than the 2040 Express Bus/BRT Alternative by approximately 6,100,000 VMT.

Tables 3.K-27 and 3.K-28 show that the cumulative cancer risk at the MEISR is 92-in-1-million and the maximum $PM_{2.5}$ concentration is 0.75 $\mu g/m^3$, respectively, which are below the thresholds of 100-in-1-million and 0.8 $\mu g/m^3$, respectively. While the cumulative health risk impact is less than significant at the location of the MEISR for the Express Bus/BRT Alternative, the health risk impact at the location of the MEISRs for the Proposed Project and DMU Alternative (i.e., Shea Homes Sage Project and Tri-Valley Regional Occupational Program, respectively) would still exceed 100-in-1-million solely due to traffic from I-580 under the Express Bus/BRT Alternative. The BAAQMD CEQA Guidelines Recommended Methods for Screening and Modeling local Risks and Hazards recommends that the assessment of the cumulative impact be performed at the location of the MEISR for the project. Under the Express Bus/BRT Alterantive, the MEISR for is located far enough from I-580 to not have a significant contribution from the highway.

Therefore, under 2040 Cumulative Conditions, the Express Bus/BRT Alternative would not contribute to significant cumulative impacts related to health risk. **(LS)**

Enhanced Bus Alternative. Under the 2040 Cumulative Conditions, sources of TACs and $PM_{2.5}$, as well as the MEISR and maximum $PM_{2.5}$ concentration locations, would be similar to those described under **Impact AQ-18(CU)** for the 2025 Cumulative Conditions with the following differences:

- There are three roadway segments projected to have greater than 10,000 vehicles per day within 1,000 feet of the MEISR. In addition, I-580 is within 1,000 feet of the MEISR. Both will impact the MEISR.
- There would be an overall net reduction in VMT of 8,834,264 miles compared to the 2040 No Project Conditions. This net decrease in VMT would be greater than the 2040 Enhanced Bus Alternative by approximately 6,100,000 VMT.

Tables 3.K-27 and 3.K-28 show that the increased cancer risk at the MEISR is 83-in-1-million and the maximum $PM_{2.5}$ concentration is 0.67 μg/m^3, respectively, which are below the thresholds of 100-in-1-million and 0.8 μg/m^3, respectively. While the cumulative health risk impact is less than significant at the location of MEISR for the Enhanced Bus Alternative, the health risk impact at the location of the MEISRs for the Proposed Project and DMU Alternative (i.e., Shea Homes Sage Project and Tri-Valley Regional Occupational Program, respectively) would still exceed 100-in-1-million solely due to traffic from I-580 under the Enhanced Bus Alternative. The BAAQMD CEQA Guidelines Recommended Methods for Screening and Modeling Local Risks and Hazards recommends that the assessment of the cumulative impact be performed at the location of the MEISR for the project. Under the Enhanced Bus Alterantive, the MEISR for is located far enough from I-580 to not have a significant contribution from the highway. Therefore, under 2040 Cumulative Conditions, the Enhanced Bus Alternative would not contribute to significant cumulative impacts related to health risk. **(LS)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and EMU Option would contribute, in combination with past, present, or probable future projects, to significant and unavoidable cumulative impacts related to health risk under 2040 Cumulative Conditions. Similar to **Impact AQ-18(CU)**, it should be noted that even without the Proposed Project or these Build Alterantives, the location of the MEISRs would experience health risk impacts (from I-580) exceeding the cumulative significance threshold in absence of the project. For example, at the southwest corner of the Shea Homes Sage Project (the location of the Proposed Project MEISR), the cancer risk contribution from existing traffic on I-580 already exceeds 100-in-1-million without the Proposed Project. There are no feasible mitigation measures that could be applied that would reduce this to a less-than-significant level because the contribution to cancer risk from traffic on I-580 exceeds the significance level. Mitigating emissions from traffic on

I-580 is not feasible. Therefore, cumulative impacts related to emissions of TACs and $PM_{2.5}$ would remain significant and unavoidable.

The Express Bus/BRT Alterantive and Enhanced Bus Alternative, would not contribute to significant cumulative impacts related to emissions of TACs and $PM_{2.5}$ under 2040 Cumulative Conditions, and no mitigation measures are required.

Concentrations of Carbon Monoxide

Impact AQ-20(CU): Result in local concentrations of CO above BAAQMD significance thresholds under 2025 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 AQ-10** above, the No Project Alternative would have no impacts associated with local concentrations of CO for 2025 Project Conditions. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. As discussed in **Impact AQ-13** above, the Proposed Project and Build Alternatives would not result in significantly elevated concentrations of CO in 2025. The peak hourly intersection traffic counts would be below the screening threshold for CO impacts. The cumulative projects could result in additional traffic, and thus contribute to CO concentrations; however, these projects would be required to undergo their own environmental review and approval process and would address any potential CO concentration impacts through that process. Additionally, CO impacts are highly localized and are not likely to result in cumulative impacts from multiple projects. Therefore, the Conventional BART Project and Build Alternatives, in combination with past, present, and probable future development would have less-than-significant cumulative impacts related to local concentrations of CO. **(LS)**

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 emissions of CO under 2025 Cumulative Conditions, and no mitigation measures are required.

Impact AQ-21(CU): Result in local concentrations of CO above BAAQMD significance thresholds under 2040 Cumulative Conditions.

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

No Project Alternative. As discussed in **Impact AQ-14** above, the No Project Alternative would not result in significantly elevated concentrations of CO in 2040. The peak hourly intersection traffic counts would be below the screening threshold for CO impacts. Cumulative proejcts along with those under the No Project Alterantive, would be required to undergo their own environmental review and approval process and would address any potential CO concentration impacts through that process. Additionally, CO impacts are highly localized and are not likely to result in cumulative impacts from multiple projects. Therefore, under 2040 Cumulative Conditions, the No Project Alternative would not contribute to significant cumulative impacts related to local concentrations of CO. **(LS)**

Conventional BART Project and Build Alternatives. As discussed in **Impact AQ-14** above, the Proposed Project and Build Alternatives would not result in significantly elevated concentrations of CO in 2040 as the peak hourly intersection traffic counts would be below the screening threshold for CO impacts. Cumulative projects would be required to undergo their own environmental review and approval process and would address any potential CO concentration impacts through that process. Additionally, CO impacts are highly localized and are not likely to result in cumulative impacts from multiple projects. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future development, would have less-than-significant cumulative impacts related to local concentrations of CO. **(LS)**

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 emissions of CO under 2040 Cumulative Conditions, and no mitigation measures are required.

Impact AQ-22(CU): Result in objectionable odors affecting a substantial number of people in 2025 and 2040 Cumulative Conditions

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

No Project Alternative. As discussed in **Impact AQ-15** above, the No Project Alternative would not generate significant odors from operational activities. The cumulative projects could result in additional source of diesel exhaust or other odorous emissions, and thus contribute to odor impacts; however, these projects are required to undergo their own environmental review and approval process and would address any potential odor impacts through that process. Additionally, odor impacts are generally localized and not likely to result in cumulative impacts from multiple projects. Therefore, the No Project Alternative, in combination with past, present, and probable future development, would have less-than-significant cumulative impacts related to objectionable odors. **(LS)**

Conventional BART Project and Build Alternatives. As discussed in **Impact AQ-15** above, the Proposed Project and Build Alternatives would generate not significant odors from operational activities. The cumulative projects could result in additional source of diesel exhaust or other odorous emissions, and thus contribute to odor impacts; however, these projects are required to undergo their own environmental review and approval process and would address any potential odor impacts through that process. Additionally, odor impacts are generally localized and not likely to result in cumulative impacts from multiple projects. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future development, would have less-than-significant cumulative impacts related to objectionable odors. **(LS)**

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 odors under 2025 and 2040 Cumulative Conditions, and no mitigation measures are required.

Impact AQ-23(CU): Conflict with or obstruct implementation of existing air quality plans under 2025 and 2040 Cumulative Conditions.

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

No Project Alternative. As desrcibed in **Impact AQ-16** above, the BART to Livermore Extension Project would not be implemented under the No Project Alternative and there would be no physical changes in the environment associated with the Proposed Project or any of the Build Alternatives. The benefits of the Proposed Project and Build Alternatives, including suppporting the Clean Air Plan's Transportation Control measures for Local and Regional Bus and Rail Service Improvements and Bicycle and Pedestrian Access, which would contribute to lowering vehicle usage and reducing emissions, would not be realized under the No Project Alterantive. Nevertheless, other projects would be expected to incorporate other measures to ensure consistency with the Clean Air Plan. Any conflict with the Clean Air Plan would not be a consequence of BART Board of Directors' decision not to adopt a project. Therefore, the No Project Alternative would have less-than-significant cumulative impacts related to consistency with the 2017 Clean Air Plan. **(LS)**

Conventional BART Project and Build Alternatives. As discussed in **Impact AQ-16** above, the Proposed Project and Build Alternatives would be consistent with the 2017 Clean Air Plan and would incorporate five of the control measures identified in the plan. Cumulative projects are required to undergo their own environmental review and approval process and would address any potential impacts related to consistency with the Clean Air Plan through that process. Under the Proposed Project and the DMU Alternative, the INP would also be implemented, which incorporates transit oriented development. Placing residential and commercial developments oriented around transit, such as the proposed Isabel Station, is consistent with the Land Use Strategies control measure of the 2017 Clean Air Plan. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future development would have benefical cumulative impacts related to consistency with the 2017 Clean Air Plan. **(B)**

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 the implementation of existing air quality plans under 2025 and 2040 Cumulative Conditions, and no mitigation measures are required.

L. GREENHOUSE GAS EMISSIONS

1. Introduction

This section describes the setting and existing conditions for greenhouse gases (GHGs) as they relate to the BART to Livermore Extension Project; discusses the applicable federal, State of California (State), and local regulations; and assesses potential impacts from emissions of GHGs during construction and operation of the Proposed Project and Alternatives.

The study area for GHG impacts during construction includes all areas in which GHG emissions would occur due to construction of the Proposed Project or one of the Build Alternatives. This includes the collective footprint—the combined footprints of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative—as well as the construction staging areas and roads in the vicinity of the construction sites on which vehicle trips (by workers and vendors, and for hauling) would occur. Additionally, the construction of the bus infrastructure improvements 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 within existing street rights-of-way, are addressed programmatically in this analysis, as described in Chapter 2, Project Description.

The study area for GHG impacts during operation of the Proposed Project or one of the Build Alternatives includes all areas in which increases in or reduction of GHG emissions would occur due to project implementation. This includes (1) the area of transit operations, i.e., the proposed routes for the respective trains (BART, DMU, or EMU), and buses; (2) station and maintenance areas that would experience increases in emissions due to station and maintenance operations and offsetting reductions in emissions due to energy generation from solar voltaic panels at the Isabel Station; and (3) increases in or reduction of emissions from changes in passenger vehicle miles traveled (VMT), which are analyzed for the nine counties in the San Francisco Bay Area (Bay Area)—i.e., every county in which BART operates—as well as the adjacent San Joaquin County.

GHG emissions are inherently a cumulative concern. Although the geographic scope of cumulative impacts related to GHG emissions is global, this analysis focuses on the direct and indirect generation of, or reduction in, GHG emissions from the Proposed Project and Build Alternatives on both a statewide and regional level.

Comments pertaining to GHGs were received in response to the Notice of Preparation for this EIR or during the public scoping meeting held for the EIR. These comments focused on the following two issues: (1) the potential for additional traffic congestion to cause a net increase in GHGs despite the traffic reductions that would occur due to the Proposed Project and Alternatives; and (2) the amount of GHGs associated with new development occurring around the proposed Isabel BART Station (Isabel Station) versus development within already developed areas.

2. Existing Conditions

Constituent gases that trap heat in the atmosphere are called GHGs. Analogous to the way a greenhouse retains heat, GHGs allow sunlight to enter the atmosphere, but trap a portion of the outward-bound infrared radiation, which then warms the air. Both natural processes and human activities create GHGs. The accumulation of GHGs in the atmosphere regulates Earth's temperature; however, human activities such as fossil fuel-based electricity production and the use of motor vehicles have elevated GHG concentrations to the point of contributing to an increase in the atmospheric temperature of Earth (global warming) and to climate change. Climate change is a change in the average weather on earth that can be measured by wind patterns, storms, precipitation, and temperature, while global warming is a post-industrial age and ongoing trend of consistent rising global average temperatures that has been determined to be significantly influenced by human sources.

Although there is disagreement on the rate of global climate change and the extent of impacts attributable to human activities, there is widespread scientific consensus that a direct link exists between increased anthropogenic GHG emissions and long-term global temperature increases. If GHG emissions continue unabated, surface temperatures in California are expected to increase by 4.1–8.6 degrees Fahrenheit by the end of the century.[1] Some of the potential effects of global warming and climate change in California include loss of snow pack, sea level rise, greater risk of flooding, more extreme heat days per year, more high-ozone days, more large forest fires, and more drought years, all of which could contribute to changes in distribution of ecosystems throughout the state.[2]

The principal GHGs resulting from human activity that enter and accumulate in the atmosphere are carbon dioxide (CO_2), methane, nitrous oxide, and fluorinated gases such as sulfur hexafluoride, perfluorocarbons, and hydrofluorocarbons. In most cases, GHGs have both natural and anthropogenic (or human-based) sources. CO_2 is the most common reference gas regarding climate change. CO_2 enters the atmosphere through burning fossil fuels, solid waste, trees and wood products, and also as a result of certain chemical reactions (e.g., cement manufacturing). Methane is emitted during the production and

[1] California Climate Change Center, 2012. Our Changing Climate 2012, Vulnerability and Adaptation to the Increasing Risks from Climate Change in California. February 24. Available at: http://www.energy.ca.gov/2012publications/CEC-500-2012-007/CEC-500-2012-007.pdf, accessed October 25, 2016.

[2] California Energy Commission (CEC), 2006. Our Changing Climate Assessing the Risks to California: The 2006 Summary Report from the California Climate Change Center. July.

transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal waste landfills. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Fluorinated gases are synthetic, powerful GHGs that are emitted from a variety of industrial processes.

The magnitude of impact on global warming differs among the GHGs depending on factors such as the length of time the gas remains in the atmosphere and the gas's unique ability to absorb energy. For example, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride have a greater global warming potential—i.e., they make a greater contribution to global warming on a per-mass basis—than does CO_2. To account for the global warming potential of GHGs, emissions are often quantified and reported in terms of carbon dioxide equivalents (CO_2e), with large sources reported in million metric tons (MMT) of CO_2e. Sulfur hexafluoride (commonly used in the utility industry as an insulating gas in circuit breakers and other electronic equipment) in particular, while composing a small fraction of total GHGs emitted annually throughout the world, is a potent GHG with 22,800 times the global warming potential of CO_2. Table 3.L-1 presents the global warming potential for CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

TABLE 3.L-1 GLOBAL WARMING POTENTIALS OF PRINCIPAL GREENHOUSE GASES

Greenhouse Gas	Global Warming Potential
Carbon dioxide	1
Methane	25
Nitrous oxide	298
Hydrofluorocarbons	124 – 14,800
Perfluorocarbons	7,390 – 17,700
Sulfur hexafluoride	22,800

Source: IPCC, 2007.

CO_2 has the greatest impact on global warming and climate change because it is emitted into the atmosphere in relatively large quantities. For example, the Bay Area Air Quality Management District (BAAQMD) estimates that, in 2011 in the Bay Area, CO_2 accounted for approximately 90.3 percent of the total emissions of the six gases listed above.[3]

[3] Bay Area Air Quality Management District (BAAQMD), 2015. Bay Area Emissions Inventory Summary Report: Greenhouse Gases, Base Year 2011. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/emission-inventory/by2011_ghgsummary.pdf, accessed October 25, 2016.

Climate change, by its nature, is a cumulative impact resulting from innumerable GHG sources around the world. Thus, global solutions are required to truly address the impacts of climate change. Globally, CO_2 concentrations, which ranged from 265 parts per million (ppm) to 280 ppm over the past 10,000 years, only began rising in the past 200 years to the current levels of 407 ppm (a 45 percent increase).[4] According to the World Resources Institute, in 2012, total worldwide GHG emissions were estimated at 42,790 MMT CO_2e. This estimate excludes GHG emissions associated with land use changes (i.e. such as the alteration of land from natural vegetation to other uses) and forestry (including deforestation, reforestation, and afforestation) because of the uncertainties associated with these particular emissions. The World Resources Institute reports that, in 2012, GHG emissions in the United States (U.S.) totaled 6,193 MMT CO_2e, while GHG emissions in California totaled 444 million metric tons of CO_2e.[5]

a. Regional Overview

According to the Fifth U.S. Climate Action Report, total GHG emissions in the U.S. increased 17 percent from 1990 through 2007, with fossil fuel combustion as the largest source of CO_2.[6] This trend is largely due to significant growth in emissions from transportation activities and electricity generation. The U.S. Climate Action Report forecasts that total CO_2 emissions will increase by 4 percent from 2010 to 2020, and by 18 percent from 2010 to 2050.

According to the California Air Resources Board (CARB), as of 2014, California's gross GHG emissions totaled 441.5 MMT CO_2e, and 84.3 percent of the emissions were in the form of CO_2.[7] The transportation sector is 37 percent of that total, and industrial sources make up another 24 percent. Electrical generation sources provide 12 percent from in-state sources and 8 percent from imports. The current GHG emissions inventory for the state (2016 edition) covers the period from 2000 to 2014. The emissions estimates are statewide, relying on state, regional, or national data sources, and on aggregated facility-specific emissions reports.

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[4] National Oceanic and Atmospheric Administration (NOAA), 2017. Trends in Atmospheric Carbon Dioxide. Mauna Loa Observatory. Available at: http://www.esrl.noaa.gov/gmd/ccgg/trends/, accessed April 26, 2017.

[5] World Resources Institute, 2017. CAIT Climate Data Explorer. Available at: http://cait.wri.org/historical/, accessed April 17, 2017.

[6] United States Department of State, Office of Global Change, 2010. Fifth U.S Action Climate Report to the UN Framework Convention on Climate Change. Available at: https://2009-2017.state.gov/e/oes/rls/rpts/car5/index.htm, accessed April 26, 2017.

[7] California Air Resources Board (CARB), 2016. California Greenhouse Gas Emission Inventory – 2016 Edition. June 17. Available at: https://www.arb.ca.gov/cc/inventory/data/data.htm, accessed April 13, 2017.

b. Local Setting

In the Bay Area, GHG emissions are generated primarily from combustion of gasoline, diesel fuel, and natural gas used in mobile sources and by energy-generation activities. In particular, the BAAQMD has estimated that transportation, industrial/commercial activities, and power plants composed 39.7 percent, 35.7 percent, and 14.0 percent, respectively, of the total GHG emissions in the Bay Area (residential fuel usage, off-road equipment, and agriculture/farming constituted the remaining 11.6 percent). Of the total Bay Area GHG emissions, 15 percent originate in Alameda County.[8]

3. Regulatory Framework

This subsection describes the federal, State, and local environmental laws and policies relevant to GHG emissions.

a. Federal Clean Air Act

The federal Clean Air Act (CAA), enacted in 1970 and amended in 1977 and 1990, establishes the framework for federal air pollution control. The CAA does not identify GHGs as air pollutants subject to regulation. However, in April 2007, in Massachusetts v. U.S. Environmental Protection Agency, 549 U.S. 497 (2007), the U.S. Supreme Court held that CO_2 is an air pollutant as defined under the federal CAA, and that the U.S. Environmental Protection Agency (EPA) must follow the pertinent CAA criteria in determining whether to regulate emissions of CO_2 and other GHGs. In response to that decision, and as directed by the Supreme Court, in December 2009, the EPA issued an endangerment finding and cause or contribute findings under Section 202(a) of the CAA that GHGs from new motor vehicles contribute to air pollution and may endanger public health or welfare. The EPA found that the combined GHG emissions from new motor vehicles contribute to GHG pollution, which threatens public health and welfare. These findings became effective on January 14, 2010.

(1) Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards

The national program for GHG emissions and fuel economy standards for light-duty vehicles was developed jointly by the EPA and the National Highway Traffic Safety Administration. Phase 1 of the program covered passenger cars, light-duty trucks, and

[8] Bay Area Air Quality Management District (BAAQMD), 2015. Bay Area Emissions Inventory Summary Report: Greenhouse Gases, Base Year 2011. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/emission-inventory/by2011_ghgsummary.pdf, accessed October 25, 2016.

medium-duty passenger vehicles, in model years 2012 through 2016. Phase 2 of the program builds upon Phase 1, covering in model years 2017 through 2025. The final standards are projected to result in an average industry fleetwide level of 163 grams per mile of CO_2 in model year 2025, which is equivalent to 54.5 miles per gallon if achieved exclusively through fuel economy improvements. Light-duty vehicles are currently responsible for nearly 60 percent of U.S. transportation-related petroleum use and GHG emissions.

(2) Renewable Fuel Standard Program

The Renewable Fuel Standard program was created under the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007 to reduce GHG emissions and expand the nation's renewable fuels sector while reducing reliance on imported oil. The program requires a certain volume of renewable fuel to replace or reduce the quantity of petroleum-based transportation fuel, heating oil, or jet fuel.

b. State Regulations

Similar to the federal CAA, the California Clean Air Act of 1988 does not identify GHGs as pollutants subject to regulation. However, multiple State regulations and rules and several gubernatorial Executive Orders pertain to GHGs, which are presented below in chronological order.

(1) Assembly Bill 1493

California State Assembly Bill (AB) 1493, enacted in 2002, directs the CARB to develop and implement regulations that achieve the "maximum feasible reduction" of GHG emissions from passenger vehicles, light-duty trucks, and other noncommercial vehicles. Pursuant to AB 1493, in 2004, the CARB approved regulations limiting the amount of GHGs released from motor vehicles beginning with the 2009 model year. On March 6, 2008, the EPA published a Federal Register notice of its decision denying California's request for a CAA preemption waiver needed to allow the State to implement its motor vehicle GHG emissions standards. California sued the EPA, seeking reversal of that decision. On February 12, 2009, the EPA published a Federal Register notice proposing to approve the California waiver, and in March 2009, it held public hearings on the matter. On June 30, 2009, the EPA granted California's waiver request. On September 24, 2009, CARB adopted regulations that reduce GHG emissions in new passenger vehicles from 2009 through 2016. CARB, EPA, and the U.S. Department of Transportation's National Highway Traffic and Safety Administration have coordinated efforts to develop fuel economy and GHG standards for model 2017-2025 vehicles. The GHG standards are incorporated into the Low Emission Vehicle Regulations.

(2) Executive Order S-3-05

On June 1, 2005, Governor Schwarzenegger signed Executive Order S-3-05, which established the following GHG emissions reduction targets:

- By 2010, reduce GHG emissions to 2000 emissions levels
- By 2020, reduce GHG emissions to 1990 emissions levels
- By 2050, reduce GHG emissions to 80 percent below 1990 levels

A Climate Action Team was formed to implement GHG emissions reduction programs and report on progress made in meeting the emissions reduction targets. The Climate Action Team, which is led by the Secretary of the California Environmental Protection Agency, consists of representatives from several State agencies. A progress report on meeting the targets is issued every 2 years, starting with the report issued in March 2006. The most recent report was issued in 2010.[9]

(3) Assembly Bill 32

In 2006, the California Global Warming Solutions Act (AB 32) was signed into law by Governor Schwarzenegger. The law codified the State's goal of reducing statewide GHG emissions to 1990 levels by 2020. This reduction is being accomplished using several approaches, including a statewide cap on GHG emissions. AB 32 directs the CARB to develop GHG regulations and establish a mandatory reporting system to track and monitor global warming emissions.

Under AB 32, GHGs are defined as CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The regulatory steps established in AB 32 require the CARB to adopt premature action measures to reduce GHGs; adopt mandatory reporting rules for significant sources of GHGs; and adopt a scoping plan indicating how emissions reductions will be achieved via regulations, market mechanisms, and other actions.

AB 32 required that the CARB complete a GHG emissions inventory showing California's 1990 GHG emissions. On December 6, 2007, the CARB approved this inventory, which showed 1990 emissions of 427 MMT CO_2e. The CARB estimated that, without any reduction measures (business-as-usual scenario), 2020 emissions levels would be 596 MMT CO_2. Based on these estimates, the CARB concluded that California's GHG emissions should be reduced by 173 MMT CO_2e (a 28 percent reduction) to meet the

[9] California Environmental Protection Agency (Cal/EPA), 2010. Climate Action Team Reports. December. Available at: http://www.energy.ca.gov/2010publications/CAT-1000-2010-005/CAT-1000-2010-005.PDF, accessed October 27, 2016.

427-MMT cap. In 2014, the original 1990 calculation was revised to 431 MMT CO_2e, using the updated Intergovernmental Panel on Climate Change's 2007 fourth assessment report on global warming potentials.[10]

To help achieve these reductions, the CARB evaluated over 100 possible measures. On October 25, 2007, the CARB approved nine discrete early action measures and 35 additional measures. These measures are expected to reduce GHGs by 42 MMT CO_2e by 2020, which is a reduction of about 25 percent of the reduction needed to meet the AB 32 target.[11]

AB 32 also required that the CARB adopt a Scoping Plan by January 1, 2009. That plan must show how emissions reductions will be achieved using regulations, voluntary actions, monetary and nonmonetary incentives, market mechanisms, and other actions. The CARB adopted the final Scoping Plan in November 2008. The Scoping Plan identifies CO_2e reductions of 2 MMT from land use and transportation scenarios that meet the recommended targets while addressing housing needs and other goals.

In August 2011, the Scoping Plan was re-approved by the CARB board, and included a Final Supplement to the Scoping Plan Functional Equivalent Document. This document included an updated business-as-usual estimate of 507 MMT CO_2e by 2020. Consequently, a 16 percent reduction below the estimated business-as-usual levels would be necessary to return to 1990 levels by 2020.

The First Update to the Climate Change Scoping Plan was approved by the CARB board on May 22, 2014. This update identifies opportunities to leverage existing and new funds to further drive GHG emissions reductions through strategic planning and targeted low-carbon investments. A second update to the Climate Change Scoping Plan is planned to be adopted in 2018.

(4) Senate Bill 97

California State Senate Bill (SB) 97, signed in August 2007, acknowledges that climate change is an important environmental issue that requires analysis under the CEQA. This bill required the Governor's Office of Planning and Research to prepare and develop guidelines for the feasible mitigation of GHG emissions. The California Natural Resources

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[10] California Air Resources Board (CARB), 2015. California 1990 Greenhouse Gas Emissions Level and 2020 Limit. May 6. Available at: http://www.arb.ca.gov/cc/inventory/1990level/1990level.htm, accessed October 27, 2016.

[11] California Air Resources Board (CARB), 2007. Expanded List of Early Action Measures to Reduce Greenhouse Gas Emissions in California Recommended for Board Consideration. Available at: https://www.arb.ca.gov/cc/ccea/meetings/ea_final_report.pdf, accessed January 26, 2017.

Agency adopted these amendments on December 30, 2009, and they took effect on March 18, 2010.

Revisions to the CEQA Guidelines specifically address the potential significance of GHG emissions (Section 15064.4). Section 15064.4 calls for a good-faith effort to describe, calculate or estimate GHG emissions. Section 15064.4 further states that the significance of any GHG impacts should consider the extent to which the project would increase or reduce GHG emissions; exceed a locally applicable threshold of significance; and comply with "regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions." The CEQA Guidelines also state that a project may be found to have a less-than-significant impact on GHG emissions if it complies with an adopted plan that includes specific measures to sufficiently reduce GHG emissions (Section 15064(h)(3)). However, the CEQA Guidelines do not require or recommend a specific analytical methodology or provide quantitative criteria for determining the significance of GHG emissions.

(5) Senate Bill 375

On September 30, 2008, Governor Schwarzenegger signed SB 375. SB 375 melds regional transportation and local land use planning in an effort to achieve GHG emissions reductions from automobiles and light trucks by using transportation and land use planning to implement smart growth principles, thereby reducing vehicle trips and the resulting GHG emissions. Automobiles and light trucks contribute almost 30 percent of total GHG emissions in the Bay Area.[12] While substantial reductions to GHG emissions from automobiles and light trucks can be achieved through new vehicle technology and by the increased use of low-carbon fuel, the legislature determined that these reductions will not be enough to achieve the State's AB 32 GHG emissions reduction goals, and that it will therefore be necessary to achieve additional significant GHG reductions from changed land use patterns and improved transportation.

SB 375 creates a new regional planning mechanism, the Sustainable Communities Strategy, which promotes high-density, transit-oriented development and creates incentives for specifically defined, high-density development projects. SB 375 requires multiple State and regional agencies to work cooperatively to establish regional GHG emissions reduction targets for 2020 and 2035. The CARB approved the final targets on

[12] Bay Area Air Quality Management District (BAAQMD), 2015. Bay Area Emissions Inventory Summary Report: Greenhouse Gases, Base Year 2011. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/emission-inventory/by2011_ghgsummary.pdf, accessed October 25, 2016.

February 15, 2011.[13] The primary means by which the GHG reduction targets are to be met is through adoption of a Sustainable Communities Strategy to be presented in the regional transportation plans of each of the 18 metropolitan planning organizations throughout California. Each Sustainable Communities Strategy must analyze the existing land use conditions; forecast expected population and employment growth; identify sufficient areas to accommodate the region's housing needs; and identify a transportation network to service the transportation needs of the region. Most importantly, it must "set forth a forecasted development pattern for the region, which, when integrated with the transportation network and other transportation measures and policies, will reduce GHG emissions from automobile and light trucks to achieve, if there is a feasible way to do so, the GHG emissions reduction targets approved by" the CARB.[14]

(6) Plan Bay Area

On July 18, 2013, the Association of Bay Area Governments and the Metropolitan Transportation Commission adopted Plan Bay Area, an integrated transportation and land use strategy through 2040, which serves as the nine-county Bay Area region's first long-range plan in compliance with the requirements of SB 375.[15] The Bay Area's target is a 7 percent per capita reduction in GHGs by 2020 and a 15 percent per capita reduction by 2035. Plan Bay Area is the region's first regional transportation plan subject to SB 375. Plan Bay Area identified a potential BART extension from the Dublin/Pleasanton BART Station (Dublin/Pleasanton Station) to Livermore as a Transportation Projects/Program in its Final Plan Bay Area Project List.[16]

Plan Bay Area will be superseded by Plan Bay Area 2040. A (final) draft of Plan Bay Area 2040 was published in July 2017.[17] The BART to Livermore extension is also listed as a Transportation Project in the project database for Plan Bay Area 2040.[18]

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[13] California Air Resources Board (CARB), 2011. Executive Order No. G-11-024, Relating to Adoption of Regional Greenhouse Gas Emission Reduction Targets for Automobiles and Light Trucks Pursuant to Senate Bill 375. Available at: http://www.arb.ca.gov/cc/sb375/executive_order_g11024.pdf, accessed October 25, 2016.

[14] California Government Code, Section 65080(b)(2).

[15] Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC), 2013. Plan Bay Area 2013. Available at: http://files.mtc.ca.gov/pdf/Plan_Bay_Area_FINAL/Plan_Bay_Area.pdf, accessed January 26, 2017.

[16] Ibid.

[17] Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC), 2017. Draft Plan Bay Area 2040 Released; Public Invited to Comment Online or at Open Houses. Available: http://www.planbayarea.org/news/news-story/draft-plan-bay-area-2040-released-public-invited-comment-online-or-open-houses, accessed April 13, 2017.

[18] Ibid.

(7) Senate Bills 1078, 107, X1-2, and 350 / Executive Order S-14-08

SB 1078 (Chapter 516, Statutes of 2002) requires retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20 percent of their supply from renewable sources by 2017. SB 107 (Chapter 464, Statutes of 2006) changed the target date to 2010. In November 2008, Governor Schwarzenegger signed Executive Order S-14-08, which expands the State's Renewables Energy Standard to include 33 percent renewable power in the retail seller's portfolios by 2020. In April 2011, Governor Jerry Brown signed SB X1-2, which created a legislative mandate codifying the 33-percent Renewables Portfolio Standard into law. In October 2015, Governor Jerry Brown signed SB 350, which requires retail sellers and publicly owned utilities to procure 50 percent of their electricity from eligible renewable energy sources by 2030.

Electricity service is provided within the Bay Area by Pacific Gas and Electric Company. Approximately 30 percent of the company's 2015 energy mix came from renewable energy sources that included wind, solar, biomass, small hydropower, and geothermal sources.[19]

(8) Executive Order B-16-2012

Executive Order B-16-2012 was issued in March 2012 and specifically focuses on reducing emissions from California's vehicle fleet. It directs that California achieve a 2050 target for GHG emissions reductions from the transportation sector equaling 80 percent less than 1990 levels. This would be accomplished by achieving benchmarks by 2020 and 2025 for advancements of zero-emissions vehicle infrastructure and technology advancement.

(9) Executive Order B-30-15 and Senate Bill 32

In April 2015, Governor Jerry Brown issued Executive Order B-30-15 to establish a GHG reduction target of 40 percent below 1990 levels by 2030. SB 32, which was passed in August 2016, codified the target. The CARB is moving forward with a second update to the Scoping Plan to reflect the 2030 target set in Executive Order B-30-15 and SB 32.[20]

[19] Pacific Gas and Electric Company (PG&E), 2015. PG&E's 2015 Power Mix. Available at: https://www.pge.com/pge_global/common/pdfs/your-account/your-bill/understand-your-bill/bill-inserts/2016/11.16_PowerContent.pdf, accessed April 12, 2017.

[20] California Air Resources Board (CARB), 2017. AB 32 Scoping Plan. February 24. Available at: https://www.arb.ca.gov/cc/scopingplan/scopingplan.htm, accessed April 26, 2017.

(10) Assembly Bill 398

In July 2017, the California Legislature adopted AB 398, extending the AB 32 cap and trade program for GHG's to 2030. The Governor is expected to sign the bill.

(11) Other Mobile Source Reduction Requirements

Several other State provisions address the GHG emissions reduction targets set by the CARB for mobile sources, including trucks, passenger vehicles, trains, and ships. These measures include the following:

- Low Carbon Fuel Standard (Executive Order S-01-07)
- Advanced Clean Cars Program
- SmartWay Truck Efficiency Regulation
- AB 32 Cap-and-Trade Program as applicable to transportation fuel suppliers (17 California Code of Regulations, Sections 95800–96022)

c. Local Regulations

(1) Bay Area Air Quality Management District

For quantifying a project's GHG emissions, the BAAQMD recommends that all GHG emissions from a project be estimated, including a project's direct and indirect GHG emissions from operations. Emissions should be estimated in terms of CO_2e, a metric that accounts for the emissions of various GHGs based on their global warming potential. Expressing emissions in CO_2e considers the contributions of all GHG emissions to the greenhouse effect.

GHG emissions that would occur during construction should be quantified and disclosed, and an EIR should make a determination on the significance of these construction-generated GHG emissions impacts.

The BAAQMD's Clean Air Plan, adopted in September 2010, provides a comprehensive plan to improve Bay Area air quality and protect public health. The Clean Air Plan provides a control strategy to reduce ozone, particulate matter, air toxics, and GHGs. The 2017 Clean Air Plan was adopted by the BAAQMD Board on April 19, 2017. The 2017 Clean Air Plan includes a wide range of control measures, including improving fossil fuel combustion efficiency at oil refineries, power plants, and cement plants, reducing methane emissions from landfills and oil and gas production and distribution, advancing electrical vehicles, promoting clean fuels, supporting solar, and making new and existing buildings more energy efficient.

(2) BART's Wholesale Electricity Portfolio Policy

BART's Wholesale Electricity Portfolio Policy was adopted by the BART Board on April 27, 2017.[21] The goals of the policy are to support low and stable BART operating costs and maximum the use of low-carbon, zero-carbon, and renewable electricity. To maximize the use of this type of energy, BART would support state climate policies by prioritizing purchases from supply sources with very low or zero GHG emissions factors and support state renewable policies by prioritizing purchases from supplies that qualify as renewable under criteria set by state law. Performance measures include maintaining a long-term cost advantage compared to rates that BART would otherwise pay as a bundled utility customer, maintain per unit energy costs within BART's Short Range Transit Plan projections, and to achieve a portfolio that achieves the following:

- Has an average emissions factor no greater than 100 pounds of CO_2e per megawatt-hour during the period 2017 through 2024 (inclusive)
- Is from at least 50 percent eligible renewable sources and from at least 90 percent low- and zero-carbon sources by 2025
- Is 100 percent from zero-carbon sources by 2035
- Is 100 percent from eligible renewable sources by 2045

(3) BART's Sustainability Policy

BART updated its Sustainability Policy on April 27, 2017.[22] The goals of the Sustainability Policy are as follows:

1. Advance smart land use, livable neighborhoods, and sustainable access to transit
2. Choose sustainable materials, construction methods, and operations practices
3. Use energy, water, and other resources efficiently
4. Reduce harmful emissions and waste generation
5. Respond to risks from extreme weather, earthquakes, and other potential disruptions
6. Improve patron and employee health and experience

[21] San Francisco Bay Area Rapid Transit District (BART), 2017a. Wholesale Electricity Portfolio Policy. Available at: https://www.bart.gov/sites/default/files/docs/BART%20Wholesale%20Electricity%20Portfolio%20Policy%204.27.17.pdf, accessed June 15, 2017.

[22] San Francisco Bay Area Rapid Transit District (BART), 2017b. Sustainability Policy. Available at: https://www.bart.gov/sites/default/files/docs/BART%20Sustainability%20Policy%204.27.17.pdf, accessed June 15, 2017.

7. Serve as a leader in sustainability for transit agencies and the communities that BART serves by reducing BART's environmental footprint and encouraging other organizations and institutions to act similarly

BART plans to meet these goals by implementing the following GHG reduction and energy conservation methods: minimize ongoing maintenance and reduce waste; consider net embodied energy; incorporate efficient construction, deconstruction, and recycling practices; achieving 100 percent renewable energy; reducing energy use, water use, and consumption of other resources; designing new facilities to be resource efficient; powering non-electric facilities and vehicles with sources generating the lowest feasible greenhouse gas emissions and criteria air pollutants; reducing, reusing, and recycling materials; managing wastewater and stormwater comprehensively; and implementing programs for BART employees to decrease their environmental impact, among others.

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 on GHG emissions are considered significant if the Proposed Project or one of the Alternatives would result in any of the following:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions

The State has not identified significance thresholds for GHG emissions from projects. The CARB released its draft interim CEQA threshold concepts for industrial, commercial, and residential projects for public comment in October 2008. However, the CARB has taken no further action on these draft concepts. Pursuant to SB 97 (2007), the Office of Planning and Research amended the State CEQA Guidelines regarding GHG analysis in 2010. These guidelines, however, do not identify specific numeric thresholds, but instead encourage each agency to develop and publish identifiable thresholds of significance supported by substantial evidence.

On June 2, 2010, the BAAQMD's Board of Directors unanimously adopted updated thresholds of significance for GHG emissions to assist in the review of projects under CEQA as part of a general revision of all of BAAQMD's thresholds of significance. The thresholds for evaluating health impacts were challenged in court and partially rejected, but the GHG thresholds are now in effect and are utilized in this EIR.

This analysis uses the significance thresholds for operational impacts published in the May 2017 BAAQMD CEQA Guidelines.[23] BAAQMD's approach to developing thresholds of significance for GHG emissions is to identify the emissions level for which a project would not be expected to substantially conflict with an applicable plan, policy, or regulation adopted to reduce GHG emissions. Although there is an inherent amount of uncertainty in deriving significance thresholds, the thresholds are based on BAAQMD's expertise, the best available data, and use conservative assumptions for the amount of emissions reductions from legislation. This approach is intended to attribute an appropriate share of GHG emissions reductions necessary for projects that are evaluated pursuant to CEQA to conform with applicable plans, policies, and regulation. If a project would generate operational GHG emissions above the threshold, the BAAQMD CEQA Guidelines consider the project to contribute substantially to a cumulative impact that is considered cumulatively significant.

The BAAQMD has adopted thresholds of significance for the operation of stationary sources and for projects other than stationary sources. The GHG threshold of significance for stationary sources is 10,000 metric tons (MT) of CO_2e per year. For projects other than stationary sources (such as the Proposed Project and Build Alternatives), a project is considered by BAAQMD to have a less-than-significant GHG impact if it (1) complies with a qualified GHG reduction strategy; (2) emits less than 1,100 MT CO_2e per year; or (3) emits less than 4.6 MT CO_2e per service population (residents plus employees) per year.

The BAAQMD has not adopted GHG thresholds of significance for construction. Instead, the BAAQMD recommends quantifying and disclosing GHG emissions that would occur during construction, and making a determination on the significance of the emissions impacts based on the achievement of reduction goals.[24] To compare the potential significance of construction GHG emissions, a two-tier approach is used in this EIR. First, if GHG emissions from construction would be less than the BAAQMD significance threshold for operational-related GHG emissions, GHGs emitted during construction are considered less than significant. However, if construction GHG emissions exceed BAAQMD's operational GHG significance threshold, a second step is used. For this second step, construction GHG emissions for the project are compared to the project's annual operational GHG emissions. If the increase in construction GHG emissions would be offset

[23] Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en. accessed June 30, 2017.

[24] Ibid.

by a decrease in operational GHG emissions over the operational life of the project, then the project's construction GHG impacts are considered less than significant.

b. Impact Methodology

The methodology used to evaluate the significance of GHG emissions impacts is described below. The EMU Option would result in different energy requirements than the DMU Alternative, and is therefore discussed separately for each impact.

The Proposed Project and Build Alternatives would each have direct and indirect sources of GHG emissions. Direct GHG emissions changes (increases or decreases) would occur from sources that are included in the Proposed Project or a Build Alternative (i.e., emissions from DMU vehicles or bus vehicles, including feeder buses that are part of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative). Indirect GHG emissions changes would occur when GHG emissions are emitted by sources that are not themselves part of the Proposed Project or a Build Alternative (i.e., emissions from electricity used for train operations, reductions in emissions from passenger vehicles due to drivers and passengers switching to transit, or increases in emissions related to water and wastewater treatment).

GHG emissions estimates used in this analysis for the Proposed Project and Alternatives are based on data provided in Appendix H, Air Quality Technical Tables, and Appendix I.2, Energy and GHG Calculations.

As described in the Existing Conditions subsection above, units of CO_2e are commonly used to express emissions of GHGs and are used in the impacts discussion for ease of comparison between the Proposed Project and Build Alternatives. The assumptions and information used to estimate direct and indirect GHG emissions are described for construction and operations below.

(1) Construction

GHG emissions from construction include emissions from on-road vehicles and off-road equipment. On-road vehicle defaults from CalEEMod, version 2013.2.2, regarding trip lengths and project specific assumptions for vendor, hauling, and worker trip rates were used to calculate emissions. Worker trips were adjusted to account for carpool and public transportation rates. Diesel demand for on-road trucks is derived from EMFAC2014. Emissions of GHGs from off-road vehicles/equipment is calculated based on total horsepower-hours and EPA diesel fuel factors.[25]

[25] United States Environmental Protection Agency, 1996. AP-42, Fifth Edition, Volume 1, Chapter 3.4. Large Stationary Diesel and All Stationary Dual-fuel Engines. October.

(2) Operational Emissions

Under the Proposed Project and Build Alternatives, GHGs would be emitted during operation and maintenance of trains, stations, and associated infrastructure and support facilities. The sources of GHGs are described below for (1) transit operations, followed by (2) station and maintenance operations.

In addition, the Proposed Project and Build Alternatives would result in the reduction of GHG emissions from passenger vehicles due to decreased passenger VMT as more people take transit. Also, for the Proposed Project, DMU Alternative, and EMU Option, generation of renewable energy via a solar photovoltaic system at the proposed Isabel Station would help offset indirect GHG emissions that would otherwise be produced by electricity generation from off-site sources to meet project operational demand. These reductions are also described below.

(a) Transit Operations

Transit operations include BART trains, DMU vehicles, EMU vehicles, and bus operations as identified for the Proposed Project and Build Alternatives below.

- **BART Car Miles (Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative).** BART train use would result in indirect emissions of GHGs from off-site electricity generation due to the electricity used for train operations. BART traction power electricity demand is calculated from annual total BART car miles traveled and an electricity demand factor of 4.51 kilowatt-hours (kWh) per car mile, based on 2006 data.[26] However, the use of this electricity demand factor is conservative, as the current BART traction electricity demand factor is lower—4.30 kWh per car mile (as of 2015).[27] The annual total BART car miles traveled is the sum of the distance traveled for every BART car per year.

  The Proposed Project would result in additional BART car miles associated with the following: (1) the approximately 5.5-mile extension of BART service to the proposed Isabel Station; and (2) the increased BART car miles systemwide due to the increased ridership anticipated under the Proposed Project. On the other hand, the DMU Alternative, EMU Option, and Express Bus/BRT Alternative would only have increased BART car miles associated with increased systemwide ridership, due to the increased access to the BART system that these alternatives would provide. Under the Enhanced Bus Alternative, the number of BART car miles traveled for BART operations would be

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[26] The electricity demand factor for BART cars is based on the 2006 BART systemwide traction power electricity divided by annual BART car miles.

[27] Dean, Donald, Environmental Coordinator, San Francisco Bay Area Rapid Transit District, 2017. Email communication with Urban Planning Partners, Inc. April 12.

equivalent to the number of BART car miles for the No Project Conditions; therefore, there would be no change in BART car miles.

- **DMU Vehicle Miles (DMU Alternative).** Operation of the DMU vehicles would result in direct GHG emissions associated with diesel fuel combustion, and to a lesser degree, indirect GHG emissions from off-site electricity generation associated with electricity use during train idling. DMU diesel demand is calculated from annual revenue DMU car miles. A two-car DMU train would consume approximately 9 kWh per mile traveled (running) and 0.88 kWh per idle minute, plus approximately 0.725 gallons of diesel per mile traveled.[28] The DMU energy use rates were adjusted to account for the project-specific assumption of four DMU cars per train, 11.4 miles traveled per round-trip, and 12 minutes of idling per round-trip. Based on these project-specific parameters, the DMU energy use rates are estimated to be 0.478 gallons of diesel per car mile and 2.5 kWh per idle minute. The DMU is expected to use electricity for idling energy needs; the idling electricity intensity factors for CO_2e are 97 pounds per megawatt-hour (see Appendix H).
- **EMU Vehicle Miles (EMU Option).** Operation of the EMU vehicles would result in indirect GHG emissions from off-site electricity generation, associated with the electricity use for train operations. EMU vehicle traction power electricity is calculated from annual revenue miles of EMU car miles and round trips. The EMU vehicle would have an electricity demand factor of approximately 8.6 kWh per mile traveled (running) and 0.88 kWh per idle minute (see Appendix H). The EMU energy use rates were modified to account for the project-specific assumptions of four EMU cars per train, 11.4 miles traveled per round-trip, and 12 minutes of idling per round-trip. Based on these project-specific parameters, the EMU energy use rates are estimated to be 4.3 kWh per car mile and 1.8 kWh per idle minute. EMU operations electricity intensity factors for CO_2e are 97 pounds per megawatt-hour.
- **Bus Miles (Proposed Project and Build Alternatives).** Bus use would result in direct GHG emissions, associated with diesel fuel combustion. Operational bus emissions are calculated based on total bus trips and vehicle miles for service to the proposed Isabel Station. The analysis assumed that each bus trip includes 5 minutes of idling. Diesel demand for buses is derived from EMFAC2014 daily fuel use in Alameda County for 2025 and 2040. The buses operated by the Livermore-Amador Valley Transit Authority (LAVTA) are hybrid-diesel models and consume 15 percent less fuel than standard

[28] LTK Engineering Services, 2008. eBART Phase I Project to Hillcrest Terminal: DMU and LRV Comparison. May 14.

diesel buses (per manufacturer specifications).[29, 30] Therefore, the diesel demand for buses was reduced by 15 percent to account for the hybrid-diesel bus models operated by LAVTA.

Table 3.L-2 presents the net change in miles and/or trips from transit operations listed above.

(b) Station and Maintenance Operations

Station and maintenance area operational GHG emissions include station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, solid waste disposal, maintenance of BART vehicles and DMU/EMU vehicles, and other activities at the storage and maintenance facility, including use of maintenance trucks and forklifts and employee shuttle vans.

- **Proposed Isabel Station Electricity (Proposed Project, DMU Alternative, and EMU Option).** Electricity use at the proposed Isabel Station would result in indirect GHG emissions due to off-site electricity generation. Electricity consumption at the proposed Isabel Station was conservatively assumed to be similar to the electricity use at the Dublin/Pleasanton Station and station parking lot, an existing, comparable BART station.[31] This represents a conservative estimate of electricity use as the proposed Isabel Station and garage is anticipated to be more energy-efficient than the Dublin/Pleasanton Station due to the current building codes that require greater energy conservation (e.g., Title 24).[32]

[29] Peterson, Lee, 2017. Personal communication from Lee Peterson, Gillig, LLC with Aubrey Jones, Ramboll Environ. April 21.

[30] Approximately 90 percent of the buses in the model are assumed to be LAVTA buses under the Proposed Project and DMU Alternative and 100 percent are assumed to be LAVTA buses under the Express Bus/BRT Alternative and Enhanced Bus Alternative.

[31] Electricity use is based on a 3-year annual average (2012 to 2014) for the Dublin/Pleasanton Station.

[32] GHG emissions from electricity are conservatively calculated based on the gross electricity produced prior to electricity losses from the grid. Electricity transmission and distribution losses average about 5 percent of the electricity that is transmitted and distributed in the United States.

United States Energy Information Administration (USEIA), 2017. Frequently Asked Questions: How much electricity is lost in transmission and distribution in the United States? Available at: https://www.eia.gov/tools/faqs/faq.php?id=105&t=3, accessed June 15, 2017.

TABLE 3.L-2 NET CHANGE IN BART CAR MILES, DMU/EMU MILES, AND BUS MILES FOR 2025 AND 2040 PROJECT AND CUMULATIVE CONDITIONS

	BART Car Miles	DMU/EMU Miles	Bus Miles
2025			
Conventional BART Project	2,895,844	--	379,117
DMU Alternative (EMU Option is the same)	558,771	776,400	379,117
Express Bus/BRT Alternative	111,839	--	354,876
Enhanced Bus Alternative	--	--	235,016
2040			
Conventional BART Project	3,561,913	--	379,117
DMU Alternative (EMU Option is the same)	1,150,063	864,100	379,117
Express Bus/BRT Alternative	479,770	--	354,876
Enhanced Bus Alternative	--	--	235,016

Notes: -- = Not applicable or no change.
Change in BART car miles, DMU/EMU miles, and bus miles is the net change between the Proposed Project (or Alternative) and No Project Conditions for the specified year (2025 or 2040).
Source: Connetics Transportation Group, 2017.

- **Emergency Generators (Proposed Project, DMU Alternative, and EMU Option).** Combustion of diesel fuel for the emergency generators would result in direct GHG emissions. An approximately 2,500-kilowatt emergency generator would be located at the Isabel Station, and an approximately 500-kilowatt emergency generator would be located at the storage and maintenance facility. This analysis assumes that operation for routine maintenance and testing for the emergency generator at Isabel Station would not exceed 24 hours per year. For the emergency generator at the storage and maintenance facility, this analysis assumes that operation for routine maintenance and testing would not exceed 50 hours per year.
- **Water and Wastewater (Proposed Project and Build Alternatives).** Water use and wastewater generation would result in indirect GHG emissions from off-site electricity generation. Energy use related to water and wastewater consists of upstream electricity to supply, treat, and distribute water and downstream electricity to treat wastewater. Water use and wastewater generation would result from the stations (the Dublin/Pleasanton Station and the proposed Isabel Station), the storage and maintenance facility activities, and wayside facilities, as outlined in Section 3.P,

Utilities (see **Impact UTIL-5**).[33] For this analysis, water use and wastewater and solid waste generation are conservatively assumed to be the same in 2025 as 2040. GHG emissions from water use and wastewater generation are calculated consistent with CalEEMod, version 2013.2.2, for Alameda County.

- **Solid Waste (Proposed Project and Build Alternatives).** Solid waste disposal would be an indirect source of GHG emissions. Landfill emissions were conservatively estimated for the total disposed waste amount (i.e., even recyclable material was conservatively assumed to emit GHGs, although it would be recycled rather than sent to a landfill). Solid waste is assumed to be generated at the Dublin/Pleasanton Station and proposed Isabel Station and the storage and maintenance facility, as outlined in Section 3.P, Utilities (see **Impact UTIL-6**). Solid waste landfill GHG emissions are calculated consistent with CalEEMod, version 2013.2.2, for Alameda County.
- **Maintenance of BART cars and DMU/EMU vehicles (Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative).**[34] Electricity would be required for the maintenance of BART, DMU, and EMU vehicles, and the demand for electricity would result in indirect GHG emissions from off-site electricity generation. A maintenance factor of 7,060 British thermal units per car/vehicle mile was applied to the annual miles to determine total electricity usage for maintenance activities.[35] Maintenance of BART cars would occur at the storage and maintenance facility under the Proposed Project. For the other alternatives, maintenance of the BART cars associated with the increase in BART car miles traveled would occur at existing BART maintenance facilities.
- **Other Activities at the Storage and Maintenance Facility (Proposed Project, DMU Alternative, and EMU Option).** Activities associated with the storage and maintenance facility, specifically maintenance truck and forklift use, as well as shuttle vans for transporting BART employees to the proposed Isabel Station (under the Proposed Project only), would result in both direct and indirect GHG emissions (direct emissions from diesel fuel combustion and indirect emissions from off-site electricity generation

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[33] In addition to the water use described in Section 3.P, Utilities for water consumption in the study area, this analysis accounts for use of water outside the study area related to maintenance/cleaning of the additional BART cars required for the DMU Alternative and Express Bus/BRT Alternative that would be maintained at existing BART maintenance facilities, under these alternatives.

[34] Under the Enhanced Bus Alternative, the number of BART car miles traveled for BART operations are equivalent to the number of BART car miles for No Project Conditions (i.e., there would be no change in BART car miles).

[35] A British thermal unit is a traditional unit of heat. Maintenance factor from Table E-13, Caltrans Energy and Transportation Systems (1983).

California Department of Transportation (Caltrans), 1983. Energy and Transportation Systems. July. Available: http://www.dot.ca.gov/hq/env/air/documents/energytranssystems_ocr.pdf, accessed June 15, 2017.

for electricity use). Off-road maintenance trucks would also be used at the storage and maintenance facility. Project-specific assumptions for the trucks are as follows: approximately 8,030 annual VMT and 10 minutes of idling per day, per vehicle. Diesel demand for off-road trucks is derived from EMFAC2014 daily fuel use in Alameda County for 2025 and 2040. Two electric forklifts are assumed to be used at the storage and maintenance facility 365 days a year for 8 hours a day. Horsepower and load factors used are industrial averages and air quality model defaults from CalEEMod, respectively. In addition, one shuttle van will be used at the maintenance yard for the Proposed Project and is assumed to travel 20 miles per day and idle for 40 minutes per day.

(c) Emissions Reductions

Reductions in GHG emissions during operation would result from two activities. First, passenger VMT will be reduced due to the increased transit ridership from project implementation. Second, there will be a reduced demand for off-site electricity due to on-site electricity generation from a solar photovoltaic system at the proposed Isabel Station, as identified for the Proposed Project and Build Alternatives below. This will cause a reduction in GHG emissions for certain scenarios as a corresponding amount of GHG emissions from off-site electricity generation will no longer be occurring.

- **Reduced Passenger Vehicle VMT (Proposed Project and Build Alternatives).** Reductions in regional passenger VMT would occur as a result of the mode switch from passenger vehicles to transit thus causing reductions in GHG emissions, as shown in Table 3.L-3. Gasoline and diesel demand for passenger vehicles is derived from EMFAC2014 for daily fuel use in Alameda County for 2025 and 2040. A gallon-per-mile use factor was determined and applied to project specific VMT estimates. Electricity used in passenger vehicles was derived from the U.S. Department of Energy's 2016 Fuel Economy Guide.[36]
- **Solar Photovoltaic (Proposed Project, DMU Alternative, and EMU Option).** A solar photovoltaic system with a capacity of 1,000 kilowatts is assumed to be installed at the proposed Isabel Station. It is assumed to start operation in 2025, with a conservative 1 percent annual degradation in performance for every year thereafter. This system would provide on-site electricity to the Proposed Project, DMU Alternative, and EMU Option. This would reduce the demand for electricity generated at off-site power plants, and thus would reduce indirect GHG emissions from generating that electricity. Electricity generation was estimated using the National Renewable Energy

[36] Department of Energy (DOE), 2017. Model Year 2016 Fuel Economy Guide. April 25. Available at: https://www.fueleconomy.gov/feg/pdfs/guides/FEG2016.pdf, accessed April 26, 2017.

Laboratory's PVWatts Calculator.[37] Electricity generation is based on a roof-array using default assumptions and weather conditions typical of Livermore, California.

TABLE 3.L-3 NET CHANGE IN PASSENGER VEHICLE MILES TRAVELED

	Annual VMT		Average Daily VMT	
	2025	**2040**	**2025**	**2040**
Project Conditions				
Conventional BART Project	-38,250,574	-73,770,403	-128,000	-246,000
DMU Alternative (EMU Option is the same)	-28,578,215	-42,745,966	-95,000	-142,000
Express Bus/BRT Alternative	-13,357,023	-28,586,697	-45,000	-95,000
Enhanced Bus Alternative	-75,668	-2,722,388	-300	-9,000
Cumulative Conditions				
Conventional BART Project	-32,649,225	-82,390,212	-109,000	-275,000
DMU Alternative (EMU Option is the same)	-21,858,079	-49,924,896	-73,000	-166,000
Express Bus/BRT Alternative	-19,509,613	-34,691,838	-65,000	-116,000
Enhanced Bus Alternative	-8,705,948	-8,834,264	-29,000	-29,000

Notes: VMT = vehicle miles traveled
Change in annual VMT or average daily VMT is the difference between No Project Conditions and Project Conditions (or Cumulative Conditions). Negative values represent a decrease in VMT.
Source: Cambridge Systematics, 2017.

c. No Project Conditions

The 2025 No Project Conditions and 2040 No Project Conditions are described below. Under the 2025 and 2040 No Project Conditions, the Proposed Project and Build Alternatives would not be built. However, emissions of GHGs in the study area would result from new land use development and existing infrastructure. This would include the use of passenger vehicles and a continued increase in annual VMT in the study area and associated consumption of diesel fuel, gasoline, and electricity.

For 2025 and 2040, the project impacts are evaluated against No Project Conditions. Thus, the 2025 Proposed Project and Build Alternatives are evaluated against 2025 No Project Conditions and the 2040 Proposed Project and Build Alternatives are evaluated

[37] National Renewable Energy Laboratory (NREL), 2016. PVWatts Calculator. Available at: http://pvwatts.nrel.gov/, accessed November 7, 2016.

against 2040 No Project Conditions. See Section 3.B, Transportation, for additional details related to No Project Conditions.

(1) No Project 2025 Conditions

2025 No Project Conditions for GHGs and climate change assumes the growth-induced traffic volumes between the existing conditions and 2025 as determined in the transportation modeling.

(2) No Project 2040 Conditions

2040 No Project Conditions for GHGs and climate change assumes the growth-induced traffic volumes between the existing conditions and 2040 as determined in the transportation modeling.

d. Summary of Impacts

Table 3.L-4 summarizes the impacts of the Proposed Project and Alternatives described in the analysis below.

TABLE 3.L-4 SUMMARY OF GREENHOUSE GAS EMISSIONS IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Construction					
Project Analysis					
Impact GHG-1: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, during construction	NI	LS	LS	LS	LS
Cumulative Analysis					
Impact GHG-2(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds during construction under Cumulative Conditions	NI	NI	NI	NI	LS

TABLE 3.L-4 SUMMARY OF GREENHOUSE GAS EMISSIONS IMPACTS

Impacts	Significance Determinations[a]: No Project Alternative	Conventional BART Project	DMU Alternative (with EMU Option)	Express Bus/BRT Alternative	Enhanced Bus Alternative
Operational					
Project Analysis (2025 and 2040)					
Impact GHG-3: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions, under 2025 Project Conditions	NI	B	B	B	LSM
Impact GHG-4: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions, under 2040 Project Conditions	S	B	B	B	LS
Cumulative Analysis (2025 and 2040)					
Impact GHG-5(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions, under 2025 Cumulative Conditions	NI	B	B	B	B
Impact GHG-6(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions under 2040 Cumulative Conditions	S	B	B	B	B

Notes: BAAQMD = Bay Area Air Quality Management District; GHG = greenhouse gas.
NI=No impact; B=Beneficial impact; LS=Less-than-Significant impact, no mitigation required;
LSM=Less-than-Significant impact with mitigation; S= Significant impact of No Project Alternative (mitigation is inapplicable).
[a] All significance determinations listed in the table assume incorporation of applicable mitigation measures.

e. Environmental Analysis

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

(1) Construction Impacts

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

(a) Construction – Project Analysis

Impact GHG-1: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, during construction.

(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 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 Interstate Highway (I-) 580, local roadways and intersections, and core transit service improvements for BART, Altamont Corridor Express, and LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including both residential and commercial. Construction of these improvements and development projects could generate GHG emissions from construction. 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 GHG emissions during construction. **(NI)**

Conventional BART Project and Build Alternatives. Table 3.L-5 presents the GHG emissions from construction of the Proposed Project and Build Alternatives. Emissions of GHG during construction are categorized by off-road and on-road vehicle sources. Off-road equipment anticipated to be needed for the construction of the Proposed Project and Build Alternatives include excavators, dozers, compactors, loaders, dump trucks, scrapers, graders, pavers, vibrator compactors, pile drivers, forklifts, cranes, air compressors, and generators. Details regarding the estimated off-road equipment and usage hours are listed in Table 2 in Appendix H of this EIR. On-road vehicles include vendors, truck hauling, and worker vehicles. Estimated VMT from on-road construction vehicles are presented in Table 4 in Appendix H of this EIR.

TABLE 3.L-5 GHG EMISSIONS FROM CONSTRUCTION OF PROPOSED PROJECT AND BUILD ALTERNATIVES

	CO_2e (MT)			
	Conventional BART Project	**DMU Alternative (or EMU Option)**	**Express Bus/ BRT Alternative**	**Enhanced Bus Alternative**
Sources				
Off-Road Vehicles/Equipment	5,337	2,867	706	92
On-Road Vehicles	5,682	6,591	2,118	189
Total Construction Emissions	**11,019**	**9,458**	**2,824**	**281**
Summary				
Average Annual Construction Emissions	**2,755**	**2,365**	664	281
BAAQMD Operational GHG Significance Threshold	1,100	1,100	1,100	1,100
Exceed BAAQMD Significance Threshold	**Yes**	**Yes**	No	No

Notes: CO_2e = carbon dioxide equivalent; MT = metric tons. **Bold**/gray values exceed thresholds. Construction activities are annualized as follows: Proposed Project, DMU Alternative, and EMU Option over approximately 4 years; Express Bus/BRT Alternative over approximately 4.25 years; and Enhanced Bus Alternative over approximately 2 months.

As described in the Standards of Significance subsection above, BAAQMD has not adopted GHG thresholds of significance for construction. Therefore, this analysis uses a two-tier approach as follows: (1) construction GHG emissions are compared to the BAAQMD significance threshold for operational-related GHG emissions, and if emissions are less than the threshold, there is no impact; and (2) if emissions exceed BAAQMD's operational significance threshold, construction GHG emissions are then compared to the project's annual operational GHG emissions. Construction GHG emissions that are offset by a decrease in operational GHG emissions within only a few years of operation, are considered less than significant.

Due to the type of off-road construction equipment, duration of construction activities, and total VMT by on-road vehicles during construction, the Proposed Project would emit the greatest amount of CO_2e during the construction phase compared to the other alternatives (approximately 11,019 MT CO_2e). Of that total, 5,337 MT CO_2e would be from off-road vehicles and 5,682 MT CO_2e would be from on-road vehicles. While construction and start-up of the Proposed Project would occur over approximately 5 years, the majority of the construction activities resulting in emissions would occur over approximately 4 years. Therefore, the average annual CO_2e emissions during construction would be approximately 2,755 MT CO_2e (total emissions conservatively averaged over the 4-year construction period).

Construction of the DMU Alternative would emit approximately 9,458 MT CO_2e. Construction for the EMU Option would have the same emissions; therefore, it is not described separately here. Construction of the DMU Alternative would result in total emissions of 2,867 MT CO_2e from off-road vehicles and 6,591 MT CO_2e from on-road vehicles. Similar to the Proposed Project, construction emissions are conservatively averaged over the approximately 4-year construction period. Therefore, average annual CO_2e emissions would be approximately 2,365 MT CO_2e per year.

The Express Bus/BRT Alternative would emit approximately 2,824 MT CO_2e during construction. For the Express Bus/BRT Alternative, 706 MT CO_2e would be released from off-road vehicles and 2,118 MT CO_2e from on-road vehicles. While construction and start-up of the Express Bus/BRT Alternative would occur over approximately 5 years, the majority of the construction activities resulting in emissions would occur over approximately 4.25 years. Therefore, the average annual CO_2e emissions for construction of the Express Bus/BRT Alternative (over 4.25 years) would be 664 MT CO_2e per year.

The Enhanced Bus Alternative would emit approximately 281 MT CO_2e during construction, with 92 MT CO_2e from off-road vehicles and 189 MT CO_2e from on-road vehicles. The Enhanced Bus Alternative would involve limited construction activities over approximately 2 months.

As shown in Table 3.L-5, construction-related GHG emissions from the Express Bus/BRT Alternative and Enhanced Bus Alternative would be less than the BAAQMD operational GHG significance threshold. However, construction-related GHG emissions from the Proposed Project, the DMU Alternative, and the EMU Option would be above the BAAQMD operational GHG significance threshold. Therefore, these emissions are compared to the net decrease in GHG emissions during operations to determine significance.

As shown in Table 3.L-6, GHG emissions from construction of the Proposed Project, the DMU Alternative, and the EMU Option, would be offset within a few years of operation of the Proposed Project, DMU Alternative, or EMU Option. Starting from the opening year (2025), GHG emissions from construction of the Proposed Project would be offset by the reduction in GHG emissions from operations in approximately 1.5 years (in 2026), GHG emissions from construction activities for the DMU Alternative would be offset in approximately 3.1 years (in 2028), GHG emissions from construction of the EMU Option would be offset in approximately 1.8 years (in 2026), and GHG emissions from construction of the Express Bus/BRT Alternative would be offset in approximately 1.7 years (in 2026). The duration to offset the GHG emissions is within only a few years of operation of the Proposed Project, DMU Alternative, the EMU Option, and Express Bus/BRT Alternative. Construction GHG emissions from the Enhanced Bus Alternative would not be offset during operations as there is no net reduction in operational GHG emissions from the Enhanced Bus Alternative in 2025 or in 2040; however, emissions from the Enhanced Bus Alterative are below the BAAQMD operational GHG significance threshold.

TABLE 3.L-6 TIME TO OFFSET CONSTRUCTION GHG EMISSIONS DUE TO OPERATIONAL EMISSION REDUCTIONS

	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
Total Construction Emissions (MT CO_2e)	11,019	9,458	9,458	2,824	281
Annual Operational Emissions starting in 2025 (MT CO_2e)	-7,115	-3,021	-5,254	-1,696	1,398
Time to Offset Construction Emissions (Years)	1.5	3.1	1.8	1.7	-- [a]

Notes: -- = not applicable; CO_2e = carbon dioxide equivalent; MT = metric tons.
Time to offset construction emissions is calculated by dividing the quantity of construction emissions by the absolute value of the reduction in operational emissions for the Proposed Project or alternative in 2025.
[a] Construction GHG emissions from the Enhanced Bus Alternative would not be offset from a reduction in operational emissions.

Therefore, because construction-related GHG emissions would either be below the BAAQMD operational GHG significance threshold (for the Express Bus/BRT Alternative and Enhanced Bus Alternative) and/or would be offset within a few years of operation due to reduced total operational GHG emissions (for the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative), the GHG emissions associated with the construction of the Proposed Project and Build Alternatives would be considered less than significant. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant construction impacts related to GHG emissions, and no mitigation measures are required.

(b) Construction – Cumulative Analysis

The geographic study area for the cumulative construction analysis is the same as the study area for the project analysis, described in the Introduction subsection above.

Consistent with CEQA requirements, this Draft EIR considers the direct impact of GHG emissions from the Proposed Project and Build Alternatives, together with the effects of past, present, and probable future projects that cause or contribute cumulatively to GHG emissions. For purposes of the GHG emissions analysis, as described in Section 3.A, Introduction to Environmental Analysis and Appendix E, these cumulative projects include the Isabel Neighborhood Plan (INP) and the Dublin/Pleasanton Station Parking Expansion project (for the Proposed Project and DMU Alternative), or the Dublin/Pleasanton Station Parking Expansion alone (for the Express Bus/BRT and Enhanced Bus Alternatives), in addition to the projections provided in Plan Bay Area.[38]

Impact GHG-2(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, during construction under Cumulative Conditions.

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

No Project Alternative. As described in **Impact GHG-1** above, the No Project Alternative would have no impacts related to GHG emissions during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. The effects of climate change and GHG emissions are generally considered at a global scale. Each of the cumulative projects would be required to undergo their own CEQA analysis and assess and disclose their GHG emissions from construction. Furthermore, while construction of the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would result in GHG emissions, as presented in Table 3.L-6, these emissions would be offset by the decrease in operational emissions over time, and would result in a net zero contribution to GHG emissions within approximately 3.1 years or less of commencement of project operation. Thus, over the life of the project, the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would result in a net decrease in GHG emissions and a net zero contribution to cumulative impacts related to GHG emissions during construction. **(NI)**

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[38] Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC), 2017. Draft Plan Bay Area 2040 Released; Public Invited to Comment Online or at Open Houses. Available: http://www.planbayarea.org/news/news-story/draft-plan-bay-area-2040-released-public-invited-comment-online-or-open-houses, accessed April 13, 2017.

Enhanced Bus Alternative. As described above, construction of the Enhanced Bus Alternative would result in emissions of 281 MT CO_2e. These emissions would not be offset by operation of the Enhanced Bus Alternative because the bus operations also would result in increased GHG emissions. However, emissions from the construction of the Enhanced Bus Alternative would be less than the BAAQMD operational significance threshold. According to BAAQMD's CEQA Guidelines, if annual emissions of operational-related GHG emissions do not exceed the operational threshold levels, the proposed project does not result in a cumulatively considerable contribution of GHG emissions. If that is the case for ongoing annual operational emissions over the lifetime of a project then short-term construction emissions below the same threshold can be similarly treated as less than cumulatively considerable. Therefore, the Enhanced Bus Alternative would not contribute to cumulative impacts related to GHG emissions during construction, and in combination with past, present, or probable future projects, would result in significant cumulative construction impacts related to GHG emissions. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Build Alternatives, in combination with past, present, or probable future projects, would not result in significant cumulative construction impacts related to GHG emissions, 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 impacts related to project operations for opening year 2025 are described first, followed by impacts for the horizon year 2040.

Impact GHG-3: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions, under 2025 Project Conditions.

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

The change between 2025 No Project Conditions and the 2025 Project Conditions represents the net emissions increase or decrease attributed to the Proposed Project or an alternative. Table 3.L-7 shows the annual change in GHG emissions from the operation of the Proposed Project and Build Alternatives in 2025.

TABLE 3.L-7 CHANGE IN ANNUAL GHG EMISSIONS UNDER 2025 PROJECT CONDITIONS

	Metric Tons of CO_2e Per Year				
Emission Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	576	111	111	22	--
DMU Operations	--	2,404	--	--	--
EMU Operations	--	--	171	--	--
Bus Operations	1,251	1,251	1,251	1,528	1,369
Station and Maintenance Operations					
Station Electricity	126	126	126	--	--
Emergency Generator	60	60	60	--	--
Water and Wastewater	9	7	7	3	1
Solid Waste	447	231	231	103	52
BART Car Maintenance	87	17	17	3	--
DMU/EMU Car Maintenance	--	23	23	--	--
Employee Shuttle Vans	5	--	--	--	--
Maintenance Trucks	5	5	5	--	--
Electric Forklifts	4	4	4	--	--
Subtotal Sources	*2,570*	*4,239*	*2,006*	*1,659*	*1,422*
Reductions					
Passenger Vehicles (Reduced VMT)	-9,616	-7,191	-7,191	-3,355	-24
Solar Photovoltaic Electricity Generation	-69	-69	-69	--	--
Subtotal Reductions	*-9,685*	*-7,260*	*-7,260*	*-3,355*	*-24*
Summary					
Total Emissions	**–7,115**	**–3,021**	**–5,254**	**–1,696**	**1,398**
BAAQMD Significance Threshold	**1,100**	**1,100**	**1,100**	**1,100**	**1,100**
Exceed Threshold?	**No**	**No**	**No**	**No**	**Yes**

Notes: CO_2e = carbon dioxide equivalent; VMT = vehicle miles traveled.
Emissions are shown as the change between 2025 No Project Conditions and 2025 Project Conditions. Positive values represent an increase in GHG emissions and negative values represent a decrease in GHG emissions.
[a] GHG emissions for BART Operations are from the additional BART cars needed to support the ridership for each alternative.

No Project Alternative. The 2025 No Project Alternative is the same as baseline conditions (i.e., 2025 No Project Conditions). Therefore, the 2025 No Project Alternative would have no impacts related to GHGs. **(NI)**

Conventional BART Project. In 2025, the Proposed Project would result in a net decrease of 7,115 MT CO_2e annually compared to 2025 No Project Conditions. While the Proposed Project would increase emissions by 2,570 MT CO_2e annually, this would be offset by a reduction in emissions of 9,685 MT CO_2e associated with the reduced passenger VMT associated with increased BART ridership and the energy produced by the solar photovoltaic cells installed at the Isabel Station. Therefore, overall GHG emissions would be reduced. Table 3.L-7 shows the GHG emissions from the operation of the Proposed Project in 2025. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the Proposed Project include BART operations, bus operations, station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, solid waste disposal, BART car maintenance, employee shuttle vans, maintenance truck use, and electric forklift use. Sources are described below in the order presented in Table 3.L-6. For additional information related to transit operations or passenger VMT, see Section 3.B, Transportation.

- **BART Car Miles.** Annually, net new BART car miles from operation of BART would increase by 2,895,844 miles in 2025 due to implementation of the Proposed Project. This increase in BART car miles occurs due to the increase in the number of cars and distance that BART cars travel with the extended line. GHG emissions due to electricity demand for operation of BART would increase by 576 MT CO_2e per year.
- **Bus Miles.** Annually, net new bus VMT would increase by 379,117 miles per year in 2025. Due to this increase, emissions of GHGs from bus operations would be 1,251 MT CO_2e annually.
- **Proposed Isabel Station Electricity.** Annual electricity use at Isabel Station would be 2,847,609 kWh annually, resulting in indirect emissions of 126 MT CO_2e annually.
- **Emergency Generators.** During testing and maintenance, the emergency generator at Isabel Station would emit approximately 42 MT CO_2e per year and the emergency generator at the Maintenance Station would emit approximately 18 MT CO_2e per year. Combined, the generators would emit 60 MT CO_2e per year.
- **Water, Wastewater and Solid Waste.** Water use and wastewater and solid waste generation would result from the stations (Dublin/Pleasanton Station and proposed Isabel Station), the storage and maintenance facility activities, and wayside facilities. Water consumption is expected to be 5,488,117 gallons per year and GHG emissions from water use and wastewater treatment would be 9 MT CO_2e per year in 2025

annually. Disposal of solid waste is expected to be 888 tons per year and indirect GHG emissions would be 447 MT CO_2e per year.

- **Maintenance of BART Cars.** Maintenance of BART cars would occur at the storage and maintenance facility under the Proposed Project and the amount of maintenance is based on the number of miles traveled. GHG emissions from the maintenance of BART cars would be 87 MT CO_2e annually in 2025.
- **Other Activities at the Storage and Maintenance Facility.** Other activities at the storage and maintenance facility would include the following: (1) employee shuttle vans that would use 401 gallons of diesel annually and emit 5 MT CO_2e per year; (2) maintenance trucks, which would use 442 gallons of diesel per year, emitting 5 MT CO_2e annually; and (3) energy use from electric forklifts, which would use 65,650 kWh per year, emitting 4 MT CO_2e annually.

In 2025, the Proposed Project would also result in a reduction in GHG emissions as described below.

- **Reduced Passenger Vehicle VMT.** The Proposed Project would reduce passenger VMT by approximately 38,250,574 miles annually, or 128,000 miles on an average weekday. The Proposed Project would result in the greatest reduction in VMT of all alternatives. Due to these reductions in passenger vehicle use, emissions of GHGs from passenger vehicles would be reduced by 9,616 MT CO_2e.
- **Solar Photovoltaic.** Solar photovoltaic electricity generation would offset the demand for off-site electricity at the Isabel Station and decrease indirect GHG emissions associated with generation of this off-site electricity by 69 MT CO_2e annually.

As described above, in 2025, the Proposed Project would reduce GHG emissions by approximately 7,115 MT CO_2e annually compared to 2025 No Project Conditions. The Proposed Project would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2025, the DMU Alternative would result in a net decrease of 3,021 MT CO_2e annually compared to 2025 No Project Conditions. While the DMU Alternative would increase emissions by 4,239 MT CO_2e annually, this would be offset by a reduction in emissions of 7,260 MT CO_2e associated with the reduced passenger VMT due to increased BART ridership and the production of energy by solar photovoltaic cells installed at the Isabel Station; therefore, the overall GHG emissions would be reduced. Table 3.L-7 shows the GHG emissions from the operation of the DMU Alternative in 2025. The emissions and emissions reductions are explained below.

Sources of GHG emissions would be generally similar to those described above for the Proposed Project, with the following differences: (1) emissions would result from operation of the DMU train; (2) emissions from DMU vehicle maintenance (in addition to BART car maintenance); and (3) an employee shuttle van would not be used at the storage and maintenance facility. Sources are described below in the order presented in Table 3.L-6.

- **BART Car Miles.** Annually, net new BART car miles from operation of BART would increase by 558,771 due to implementation of the DMU Alternative. BART car miles would increase to accommodate riders transferring from the DMU train to BART. In 2025, GHG emissions from the electricity demand for BART operations would be 111 MT CO_2e per year.
- **DMU Vehicle Miles.** Annually, net new DMU car miles in 2025 would be 776,400. These new DMU car miles would increase GHG emissions by 2,404 MT CO_2e in 2025.
- **Bus Miles.** GHGs from buses and net new bus miles traveled under the DMU Alternative are expected to be the same as for the Proposed Project in 2025 (1,251 MT CO_2e annually).
- **Proposed Isabel Station Electricity and Emergency Generators.** Annual emissions of GHGs from electricity use at the proposed Isabel Station and emergency generator testing and maintenance would be the same as described above for the Proposed Project in 2025 (126 MT CO_2e and 60 MT CO_2e annually, respectively).
- **Water, Wastewater and Solid Waste.** Water use and wastewater and solid waste generation would result from the stations (Dublin/Pleasanton Station and proposed Isabel Station), the storage and maintenance facility activities, and wayside facilities. Also, the additional BART cars required to serve the increased ridership would require washing, which would be done at BART's existing maintenance facilities. Water consumption is expected to be 3,636,758 gallons per year and GHG emissions from water use and wastewater treatment would be 7 MT CO_2e per year in 2025 annually. Disposal of solid waste is expected to be 378 tons per year and indirect GHG emissions from that disposal would be 231 MT CO_2e per year.
- **Maintenance of BART Cars and DMU Vehicles and Other Maintenance Activities**. Maintenance of BART cars would occur under the DMU Alternative due to the increase in BART ridership and car miles traveled. Maintenance would occur at existing BART maintenance facilities. GHG emissions from the maintenance of BART cars would be 17 MT CO_2e annually in 2025. Under the DMU Alternative, the DMU vehicles would be maintained at the storage and maintenance facility. Emissions of GHGs due to DMU car maintenance would be 23 MT CO_2e annually. Maintenance of DMU cars would also require the use of electric forklifts/maintenance trucks, as follows: (1) GHG emissions from the use of maintenance trucks would be 5 MT CO_2e annually, and (2) emissions from electric forklifts would be 4 MT CO_2e annually.

In 2025, the DMU Alternative would also result in a reduction in GHG emissions described below.

- **Reduced Passenger Vehicle VMT.** The DMU Alternative would reduce passenger VMT by approximately 28,578,215 miles in 2025 annually, or 95,000 miles on an average weekday. The DMU Alternative would result in the second-greatest reduction in VMT of all alternatives. Due to these reductions in passenger vehicle use, emissions of GHGs from passenger vehicles would be reduced by 7,191 MT CO_2e.
- **Solar Photovoltaic.** Similar to the Proposed Project, solar photovoltaic electricity generation would offset the electrical demand at Isabel Station and decrease indirect GHG emissions (from off-site electricity generation) in 2025 by 69 MT CO_2e.

As described above, in 2025, the DMU Alternative would reduce GHG emissions by approximately 3,021 MT CO_2e annually compared to 2025 No Project Conditions. The DMU Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2025, the EMU Option would result in a net decrease of 5,254 MT CO_2e annually compared to 2025 No Project Conditions, the second-largest decrease in GHG emissions out of the Proposed Project and Build Alternatives. While GHG emissions sources would increase by 2,006 MT CO_2e annually, this would be offset by a reduction of 7,260 MT CO_2e associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the Isabel Station. Therefore, overall GHG emissions would be reduced. Table 3.L-7 shows the GHG emissions from the operation of the EMU Option in 2025.

The sources of GHG emissions and the amount of GHG emissions are the same as described above for the DMU Alternative, except that the EMU Option includes indirect emissions from electricity generation for EMU vehicle operation rather than direct emissions from DMU vehicle operation.

- **EMU Vehicle Miles.** Annually, EMU vehicle miles would result in emissions of 171 MT CO_2e in 2025, compared to 2,404 MT CO_2e for DMU vehicle miles, therefore resulting in a reduction in GHG emissions compared to the DMU Alternative.
- **Maintenance of EMU Vehicles.** The EMU vehicles would be maintained at the storage and maintenance facility. Emissions of GHG due to EMU car maintenance would be 23 MT CO_2e annually, the same as under the DMU Alternative.

In 2025, the EMU Option would also result in a reduction in GHG emissions due to reduced passenger vehicle miles and solar photovoltaic electricity generation, as described above for the DMU Alternative.

As described above, in 2025, the EMU Option would reduce GHG emissions by approximately 5,254 MT CO_2e annually compared to 2025 No Project Conditions. The EMU Option would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2025, the Express Bus/BRT Alternative would result in a net decrease of 1,696 MT CO_2e annually compared to 2025 No Project Conditions. While the Express Bus/BRT Alternative would increase emissions by 1,659 MT CO_2e annually in 2025, this would be offset by a reduction in emissions of 3,355 MT CO_2e associated with the reduced passenger VMT due to increased BART ridership; therefore, the overall GHG emissions would be reduced. Table 3.L-7 shows the GHG emissions from the operation of the Express Bus/BRT Alternative in 2025. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the Express Bus/BRT Alternative include increased BART operations due to increases in ridership, bus operations, water use, wastewater treatment, solid waste disposal, and BART car maintenance. Sources are described below in the order presented in Table 3.L-6.

- **BART Car Miles.** Annually, net new BART car miles would increase by 111,839 miles due to an increase in the ridership as a result of transfers from buses to BART. In 2025, GHG emissions from operation of BART under the Express Bus/BRT Alternative would be 22 MT CO_2e per year.
- **Bus Miles.** Annual net new bus miles traveled under the Express Bus/BRT Alternative are expected to increase by 354,876 per year in 2025. GHG emissions from bus operation for the Express Bus/BRT Alternative in 2025 would be 1,528 MT CO_2e per year.
- **Water, Wastewater and Solid Waste.** Increased ridership at the Dublin/Pleasanton Station would result in increased water use and wastewater and solid waste generation under the Express Bus/BRT Alternative in 2025. Also, the additional BART cars required to serve the increased ridership, would require washing, which would be done at BART's existing maintenance facilities. Water use increase is expected to be 1,326,426 gallons per year and GHG emissions from water use and wastewater treatment would be 3 MT CO_2e in 2025 annually. Disposal of solid waste would be 165 tons per year and this disposal would emit 103 MT CO_2e annually.

- **Maintenance of BART Cars.** Maintenance of BART cars would be required due to increased BART ridership under the Express Bus/BRT Alternative. GHG emissions from the maintenance of BART cars would be 3 MT CO_2e annually in 2025, as a result of the number of BART car miles traveled under the Express Bus/BRT Alternative.

In 2025, the Express Bus/BRT Alternative would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** The Express Bus/BRT Alternative would reduce passenger VMT by approximately 13,357,023 miles in 2025 annually, or 45,000 miles on an average weekday. Due to these reductions in passenger vehicle use, emissions of GHGs from passenger vehicles would be reduced by 3,355 MT CO_2e in 2025.

As described above, in 2025, the Express Bus/BRT Alternative would reduce GHG emissions by approximately 1,696 MT CO_2e annually compared to 2025 No Project Conditions. The Express Bus/BRT Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2025, the Enhanced Bus Alternative would result in a net increase of 1,398 MT CO_2e annually compared to 2025 No Project Conditions. The Enhanced Bus Alternative would increase emissions by 1,422 MT CO_2e annually, and would reduce emissions by 24 MT CO_2e annually associated with reduced passenger VMT due to increased BART ridership. The reduction in GHG emissions from the reduced passenger VMT would not be enough to fully offset the increase in GHGs from operations. Table 3.L-7 shows the GHG emissions from the operation of the Enhanced Bus Alternative in 2025. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the Enhanced Bus Alternative include bus operations, water use, wastewater treatment, and solid waste disposal.

- **Bus Miles.** Annual bus miles traveled under the Enhanced Bus Alternative are expected to increase by 235,016 per year in 2025. GHG emissions from bus operation for the Enhanced Bus Alternative would be 1,369 MT CO_2e per year.
- **Water, Wastewater and Solid Waste.** Increased ridership at the Dublin/Pleasanton Station would result in increased water use and wastewater and solid waste generation under the Enhanced Bus Alternative. Water use is expected to be 688,715 gallons per year and GHG emissions due to water usage and wastewater treatment would be 1 MT CO_2e annually. Disposal of solid waste would be 103 tons per year and would emit 52 MT CO_2e annually.

In 2025, the Enhanced Bus Alternative would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** The Enhanced Bus Alternative would reduce passenger VMT in 2025 by approximately 75,668 miles annually, or 300 miles on an average weekday. Due to these reductions in passenger vehicle use, emissions of GHGs from passenger vehicles would be reduced by 24 MT CO_2e in 2025.

As described above, in 2025, the Enhanced Bus Alternative would increase GHG emissions by approximately 1,398 MT CO_2e annually compared to 2025 No Project Conditions, exceeding BAAQMD's significance threshold of 1,100 MT CO_2e by 299 MT CO_2e annually. Thus, the Enhanced Bus Alternative would conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. Therefore, in 2025, the Enhanced Bus Alternative would have significant impacts related to GHG emissions during operations.

This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure GHG-3**, which would require BART to purchase carbon offsets equivalent to the amount of GHG emissions that exceed BAAQMD's significance threshold. **(LSM)**

Mitigation Measures. As described above, in 2025, the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would not result in significant operational impacts related to GHG emissions, and no mitigation measures are required. However, the Enhanced Bus Alternative would result in a significant impact. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure GHG-3**, which would require BART to purchase carbon offsets equivalent to the amount of GHG emissions that exceed BAAQMD's significance threshold. Various offset project registries provide these carbon offset credits for sale and the registries use approved compliance offset protocols to allow projects that have reduced their GHG emissions to make their reductions available for purchase to projects that emit GHGs to offset their GHG emissions.

<u>Mitigation Measure GHG-3: Obtain Carbon Offsets For Bus Emissions (Enhanced Bus Alternative).</u>

BART shall obtain offsets from a CARB-approved carbon offset project registry. Examples of approved carbon registries include the American Carbon Registry, the Climate Action Reserve, and the Verified Carbon Standard. BART shall obtain offsets in the amount of 300 MT CO_2e per year until 2040, or shall obtain offsets in a different amount that is sufficient to reduce GHG emissions from the Enhanced Bus Alternative to below BAAQMD's significance threshold of 1,100 MT CO_2e, as determined by a detailed GHG emissions analysis of the Enhanced Bus Alternative once it is in operation.

Impact GHG-4: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions, under 2040 Project Conditions.

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

The change between 2040 No Project Conditions and 2040 Project Conditions represents the net emissions increase or decrease attributed to the Proposed Project or an alternative. Table 3.L-8 shows the annual change in GHG emissions from the operation of the Proposed Project and Build Alternatives in 2040.

No Project Alternative. Under the 2040 No Project Alternative, the BART to Livermore Extension Project would not be implemented. The purpose of the No Project Alternative analysis under CEQA is to enable decision-makers and the public understand the consequences of not adopting a project. CEQA Guidelines 15126.6(e)(2) provides that the No Project Alternative must include "what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." VMT and associated GHG emissions are reasonably expected to increase in 2040 under No Project conditions, consistent with projections-based continued regional land use development and planned and programmed transportation improvements.

Operation of the planned and programmed transportation improvements and continued land use development under the No Project Alternative could generate GHG emissions above BAAQMD significance thresholds. At the same time, if the BART Board of Directors selects the No Project Alternative, the reductions in GHG emissions due to the reduced passenger VMT anticipated under the Proposed Project, DMU Alternative, EMU Option, or Express Bus/BRT Alternative (associated with increased transit ridership) would not occur. The No Project Alternative is anticipated to result in significant impacts in 2040 related to GHG emissions, without the benefit of VMT reductions attributable to Proposed Project or Build Alternatives off-setting a portion of the VMT growth, as a consequence of BART Board of Directors' decision not to adopt a project. Therefore, the No Project Alternative is considered to have a significant impact related to the GHG emissions. **(S)**

TABLE 3.L-8 CHANGE IN ANNUAL GHG EMISSIONS UNDER 2040 PROJECT CONDITIONS

	Metric Tons of CO_2e Per Year				
Emission Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	709	229	229	95	--
DMU Operations	--	2,675	--	--	--
EMU Operations	--	--	190	--	--
Bus Operations	1,103	1,103	1,103	1,347	1,207
Station and Maintenance Operations					
Station Electricity	126	126	126	--	--
Emergency Generator	60	60	60	--	--
Water and Wastewater	9	7	7	3	1
Solid Waste	447	231	231	103	52
BART Car Maintenance	107	35	35	14	--
DMU/EMU Car Maintenance	--	26	26	--	--
Employee Shuttle Vans	5	--	--	--	--
Maintenance Trucks	5	5	5	--	--
Electric Forklifts	4	4	4	--	--
Subtotal Sources	*2,575*	*4,501*	*2,016*	*1,562*	*1,260*
Reductions					
Passenger Vehicles (Reduced VMT)	-13,669	-7,922	-7,922	-5,302	-614
Solar Photovoltaic Electricity Generation	-59	-59	-59	--	--
Subtotal Reductions	*-13,728*	*-7,981*	*-7,981*	*-5,302*	*-614*
Summary					
Total Emissions	**–11,154**	**–3,482**	**–5,967**	**–3,739**	**646**
BAAQMD Significance Threshold	**1,100**	**1,100**	**1,100**	**1,100**	**1,100**
Exceed Threshold?	**No**	**No**	**No**	**No**	**No**

Notes: CO_2e = carbon dioxide equivalent; VMT = vehicle miles traveled.
Emissions are shown as the change between 2040 No Project Conditions and 2040 Project Conditions. Positive values represent an increase in GHG emissions and negative values represent a decrease in GHG emissions.
[a] GHG emissions for BART Operations are from the additional BART cars needed to support the ridership for each alternative.

Conventional BART Project. In 2040, the Proposed Project would result in a net decrease of 11,154 MT CO_2e annually compared to 2040 No Project Conditions. While sources of GHGs from the Proposed Project would increase by 2,575 MT CO_2e annually in 2040, this would be offset by a reduction of 13,728 MT CO_2e annually due to the reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed for the proposed Isabel Station; therefore, the overall GHG emissions would be reduced. Table 3.L-8 shows the GHG emissions from the operation of the Proposed Project in 2040. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the Proposed Project in 2040 would be the same as in 2025. However, overall GHG emissions would decrease in 2040 compared to 2025 due to cleaner electricity sources, a cleaner bus fleet, and increased BART ridership. Emissions of GHGs from station electricity use, emergency generators, water use and wastewater treatment, and solid waste would be the same for the Proposed Project in 2040 as in 2025. The differences in GHG emissions in 2040 compared to 2025 are described below in the order presented in Table 3.L-7.

- **BART Car Miles.** Annual net new BART car miles for BART operation would be 3,561,913, which is a slight increase in annual BART car miles compared to the Proposed Project in 2025 (2,895,844 net new annual BART car miles). The increase in net new annual BART car miles traveled in 2040 compared to 2025 would be offset some by cleaner electricity sources; however, overall GHG emissions would increase by 709 MT CO_2e per year. This is an increase of 133 MT CO_2e annually compared to the Proposed Project in 2025.
- **Bus Miles.** Net new annual bus VMT are expected to remain the same for the Proposed Project in 2025 and 2040; however, a cleaner and more fuel-efficient bus fleet coming into service over time would cause a decrease in GHG emissions in 2040. Bus operations would emit 1,103 MT CO_2e annually in 2040, which would be a decrease of 148 MT CO_2e compared to the Proposed Project in 2025.
- **Maintenance of BART Cars.** Under the Proposed Project, emissions of GHGs from BART car maintenance would be 107 MT CO_2e annually in 2040. Due to the increase in the number of BART car miles traveled, GHG emissions from the maintenance of BART cars would increase by 20 MT CO_2e annually in 2040 compared to 2025.

In 2040, the Proposed Project would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** Net new annual passenger VMT would be reduced even further for the Proposed Project in 2040 compared to 2025, due to increased transit ridership over time. The Proposed Project would result in the greatest reduction in VMT of all alternatives in 2040, approximately 73,770,403 VMT annually or

246,000 VMT on an average weekday. This would result in an annual reduction of GHG by 13,669 MT CO_2e compared to 2040 No Project Conditions, which is a reduction of 4,053 MT CO_2e compared to the Proposed Project in 2025.

- **Solar Photovoltaic.** Solar photovoltaic electricity generation would offset GHG emissions by 59 MT CO_2e. This reduction would be 10 MT CO_2e less than the Proposed Project in 2025 annually, due to the expected degradation of the solar panels and less efficient electrical generation capability.

As described above, in 2040, the Proposed Project would reduce GHG emissions by approximately 11,154 MT CO_2e annually compared to 2040 No Project Conditions. The Proposed Project would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2040, the DMU Alternative would result in a net decrease of 3,482 MT CO_2e annually compared to 2040 No Project Conditions. While sources of GHGs from the DMU Alternative would increase emissions by 4,501 MT CO_2e annually in 2040, this would be offset by a reduction in emissions of 7,981 MT CO_2e due to the reduced passenger VMT associated with increased attraction of new riders and the energy produced by solar photovoltaic cells installed at the Isabel Station; therefore, overall GHG emissions would be reduced. Table 3.L-8 shows the GHG emissions from the operation of the DMU Alternative in 2040. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the DMU Alternative in 2040 would be the same as in 2025. However, similar to the Proposed Project, overall GHG emissions would decrease in 2040 compared to 2025 due to cleaner electricity sources, a cleaner bus fleet, and increased BART ridership. Emissions of GHGs from station electricity use, emergency generators, water use and wastewater treatment, and solid waste would be the same for the DMU Alternative in 2040 as in 2025. The differences in GHG emissions in 2040 compared to 2025 are described below in the order presented in Table 3.L-7.

- **BART Car Miles.** For the DMU Alternative in 2040, net new annual BART car miles for BART operation would be 1,150,063 miles compared to 2040 No Project Conditions—more than double the ridership for the DMU Alternative in 2025. This increase in net new annual BART car miles would increase GHG emissions to 229 MT CO_2e per year over 2040 No Project Conditions (an increase of 118 MT CO_2e per year over the DMU Alternative in 2025).
- **DMU Vehicle Miles.** Annually, net new DMU car miles in 2040 for the DMU Alternative would be 864,100 miles. This increase in net new annual DMU car miles would

increase GHG emissions by 2,675 MT CO_2e per year over 2040 No Project Conditions (an increase of 271 MT CO_2e per year over the DMU Alternative in 2025).

- **Bus Miles.** While net new annual VMT are expected to remain the same for the DMU Alternative between 2025 and 2040 (379,117 miles), the implementation over time of a cleaner and more fuel-efficient bus fleet would cause a decrease in GHG emissions in 2040. Bus operations would emit 1,103 MT CO_2e annually over 2040 No Project Conditions (a decrease of 148 MT CO_2e compared to the DMU Alternative in 2025).
- **Maintenance of BART Cars.** Emissions of GHG from BART car maintenance would be 35 MT CO_2e annually in 2040. Due to the increase in the number of BART car miles traveled, as described above, GHG emissions from the maintenance of BART cars would be 35 MT CO_2e annually in 2040 (an increase of 18 MT CO_2e annually above 2025). DMU car maintenance would also increase to 26 MT CO_2e annually (an increase of 3 MT CO_2e over the DMU Alternative in 2025).

In 2040, the DMU Alternative would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** In 2040, the DMU Alternative would reduce passenger VMT by approximately 42,745,966 miles annually, or 142,000 miles on an average weekday—the second-greatest reduction in VMT of all alternatives. Emissions of GHGs for the 2040 DMU Alternative would be reduced by 7,922 MT CO_2e annually compared to 2040 No Project Conditions (a reduction of 731 MT CO_2e compared to the DMU Alternative in 2025).
- **Solar Photovoltaic.** Solar photovoltaic electricity generation would be reduced by 59 MT CO_2e, the same amount as the Proposed Project in 2040. This reduction would be 10 MT CO_2e less than the DMU Alternative in 2025 annually, due to the expected degradation of the solar panels and less efficient electrical generation capability.

As described above, in 2040, the DMU Alternative would reduce GHG emissions by approximately 3,482 MT CO_2e annually compared to 2040 No Project Conditions. Therefore, in 2040, the DMU Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2040, the EMU Option would result in a net decrease of 5,967 MT CO_2e annually compared to 2040 No Project Conditions. While sources of GHGs from the EMU Option would increase emissions by 2,016 MT CO_2e annually in 2040, this would be offset by a reduction in emissions of 7,981 MT CO_2e associated with the reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed for the Isabel Station; therefore, overall GHG emissions would be reduced.

Table 3.L-8 shows the GHG emissions from the operation of the EMU Option in 2040. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the EMU Option in 2040 would be the same as in 2025. However, similar to the DMU Alterative in 2040, total GHG emissions would decrease in 2040 compared to 2025 due to cleaner electricity sources, a cleaner bus fleet, and increased BART ridership. See the discussion for the DMU Alternative above for changes from 2025 to 2040 for categories other than those outlined below. Differences from the DMU Alternative in 2040 are described below.

- **EMU Vehicle Miles.** Annually, net new EMU car miles in 2040 for the EMU Option would be the same as net new DMU car miles for the DMU Alternative in 2040. However, due to the different fuels used, the EMU Option would only increase GHG emissions by 190 MT CO_2e per year over 2040 No Project Conditions and 19 MT CO_2e per year over the EMU Option in 2025, a smaller increase compared to the DMU Alternative.
- **Maintenance of EMU Vehicles.** The EMU vehicles would be maintained at the storage and maintenance facility. Emissions of GHG due to EMU car maintenance would be 26 MT CO_2e annually, the same as for DMU car maintenance under the DMU Alternative.

In 2040, the EMU Option would also result in a reduction in GHG emissions due to reduced passenger vehicle miles and solar photovoltaic electricity generation, as described above for the DMU Alternative in 2040.

As described above, in 2040, the EMU Option would reduce GHG emissions by approximately 5,967 MT CO_2e annually compared to 2040 No Project Conditions. Therefore, in 2040, the EMU Option would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2040, the Express Bus/BRT Alternative would result in a net decrease of 3,739 MT CO_2e annually compared to 2040 No Project Conditions. While sources of GHGs from the Express Bus/BRT Alternative would increase emissions by 1,562 MT CO_2e annually in 2040, this would be offset by a reduction in emissions of 5,302 MT CO_2e associated with reduced passenger VMT due to increased BART ridership, thus resulting in an overall net decrease in GHG emissions. Table 3.L-8 shows the GHG emissions from the operation of the Express Bus/BRT Alternative in 2040. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the Express Bus/BRT Alternative in 2040 would be the same as in 2025. However, total GHG emissions would decrease in 2040 compared to 2025 due to cleaner electricity sources, a cleaner bus fleet, and increased BART ridership. GHG emissions from water use, wastewater treatment, and solid waste would remain the same as in 2025 under the Express Bus/BRT Alternative. The differences in GHG emissions in 2040 compared to 2025 are described below in the order presented in Table 3.L-7.

- **BART Car Miles.** For the Express Bus/BRT Alternative in 2040, net new annual BART car miles for BART operation would be 479,770 compared to 2040 No Project Conditions—more than four times the ridership for the Express Bus/BRT Alternative in 2025. This increase in net new annual BART car miles would increase GHG emissions by 95 MT CO_2e per year over 2040 No Project Conditions (an increase of 73 MT CO_2e per year over the Express Bus/BRT Alternative in 2025).
- **Bus Miles.** Net new annual VMT are expected to remain the same for 2025 and 2040 (354,876 miles); however, a cleaner and more fuel-efficient bus fleet being implemented over time would decrease GHG emissions in 2040. Bus operations for the Express Bus/BRT Alternative in 2040 would emit 1,347 MT CO_2e annually, a decrease of 181 MT CO_2e compared to the Express Bus/BRT Alternative in 2025.
- **Maintenance of BART Cars.** Emissions of GHG from BART car maintenance would be 14 MT CO_2e annually in 2040. Due to the increase in the number of BART car miles traveled in 2040 compared to 2025, GHG emissions from the maintenance of BART cars would increase by 11 MT CO_2e annually in 2040 under the Express Bus/BRT Alternative.

In 2040, the Express Bus/BRT Alternative would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** The Express Bus/BRT Alternative would reduce passenger VMT by approximately 28,586,697 miles annually, or 95,000 miles on an average weekday. In 2040, the Express Bus/BRT Alternative would reduce emissions of GHG from passenger vehicles by 5,302 MT CO_2e annually compared to 2040 No Project Conditions (a reduction of 1,947 MT CO_2e compared to the Express Bus/BRT Alternative in 2025).

As described above, in 2040, the Express Bus/BRT Alternative would reduce GHG emissions by approximately 3,739 MT CO_2e annually compared to 2040 No Project Conditions. Therefore, the Express Bus/BRT Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2040, the Enhanced Bus Alternative would result in a net increase of 646 MT CO_2e annually compared to 2040 No Project Conditions. The Enhanced

Bus Alternative would increase GHGs by 1,260 MT CO_2e annually in 2040, and would reduce GHGs by 614 MT CO_2e annually associated with reduced passenger VMT due to increased BART ridership. The reduction in GHG emissions from the reduced passenger VMT would not be enough to fully offset the increase in GHGs from operations. Table 3.L-8 shows the GHG emissions from the operation of the Enhanced Bus Alternative in 2040, which are explained below.

Sources of GHG emissions for the Enhanced Bus Alternative in 2040 would be the same as in 2025. GHG emissions from water use, wastewater treatment, and solid waste would remain the same as in 2025 under the Enhanced Bus Alternative. The differences in GHG emissions in 2040 compared to 2025 are described below in the order presented in Table 3.L-7.

- **Bus Miles.** Net new annual VMT are expected to remain the same between the 2025 and 2040 (235,016 miles); however, a cleaner and more fuel-efficient bus fleet would decrease GHG emissions in 2040. Bus operations for the Enhanced Bus Alternative in 2040 would emit 1,207 MT CO_2e annually (a decrease of 162 MT CO_2e compared to the Enhanced Bus Alternative in 2025).

In 2040, the Enhanced Bus Alternative would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** The Enhanced Bus Alternative would reduce passenger VMT by approximately 2,722,388 miles annually, or 9,000 miles per average weekday. Emissions of GHG from passenger vehicles would be reduced by 614 MT CO_2e annually compared to 2040 No Project Conditions (a reduction of 590 MT CO_2e compared to the Enhanced Bus Alternative in 2025).

As described above, in 2040, the Enhanced Bus Alternative would increase GHG emissions by approximately 646 MT CO_2e annually compared to 2040 No Project Conditions. However, the quantity of GHG emissions generated under the Enhanced Bus Alternative in 2040 would be less than BAAQMD's significance threshold (1,100 MT CO_2e annually). Therefore, in 2040, the Enhanced Bus Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040, the Enhanced Bus Alternative would result in a less-than-significant impact, and mitigation measures are not required. **(LS)**

Mitigation Measures. As described above, in 2040, the Proposed Project and Build Alternatives would not result in significant operational impacts related to GHG emissions, and no mitigation measures are required. However, without the benefit of the Proposed Project, DMU Alternative, EMU Option, or Express Bus/BRT Alternative, the 2040 No Project Alternative would result in significant impacts related to GHG emissions.

(b) Operations – Cumulative Analysis

The geographic study area for the cumulative operations analysis is the same as the study area for the project analysis, described in the Introduction subsection above.

Impact GHG-5(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions, under 2025 Cumulative Conditions.

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

The change between 2025 No Project Conditions and 2025 Cumulative Conditions represents the net emissions increase or decrease attributed to the Proposed Project or an alternative under Cumulative Conditions. Table 3.L-9 shows the annual change in GHG emissions from the operation of the Cumulative Conditions in 2025.

No Project Alternative. As described in **Impact GHG-3** above, the No Project Alternative would have no impacts associated with GHG emissions during operations under 2025 Project Conditions. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project. In 2025 under Cumulative Conditions, the Proposed Project would result in a net decrease of 5,731 MT CO_2e annually compared to 2025 No Project Conditions. While GHG emissions would increase by 2,570 MT CO_2e annually in 2025 under Cumulative Conditions, this would be offset by a reduction of 8,301 MT CO_2e, thus resulting in an overall net decrease in GHG emissions. Table 3.L-9 shows the GHG emissions under 2025 Cumulative Conditions.

All sources of GHG emissions and GHG emissions reductions would be the same under 2025 Cumulative Conditions as for the Proposed Project in 2025, except that GHG emissions associated with passenger VMT would change compared to the Proposed Project in 2025, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2025 under Cumulative Conditions, the Proposed Project would reduce passenger VMT by approximately 32,649,225 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 8,232 MT CO_2e. This represents an increase in GHG emissions compared to the Proposed Project in 2025 (which would have a reduction of 9,616 MT CO_2e per year).

TABLE 3.L-9 CHANGE IN ANNUAL GHG EMISSIONS UNDER 2025 CUMULATIVE CONDITIONS

	Metric Tons of CO_2e Per Year				
Emission Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	576	111	111	22	--
DMU Operations	--	2,404	--	--	--
EMU Operations	--	--	171	--	--
Bus Operations	1,251	1,251	1,251	1,528	1,369
Station and Maintenance Operations					
Station Electricity	126	126	126	--	--
Emergency Generator	60	60	60	--	--
Water and Wastewater	9	7	7	3	1
Solid Waste	447	231	231	103	52
Employee Shuttle Vans	5	--	--	--	--
BART Car Maintenance	87	17	17	3	--
DMU/EMU Car Maintenance	--	23	23	--	--
Maintenance Trucks	5	5	5	--	--
Electric Forklifts	4	4	4	--	--
Subtotal Sources	*2,570*	*4,239*	*2,006*	*1,659*	*1,422*
Reductions					
Passenger Vehicles (Reduced VMT)	-8,232	-5,521	-5,521	-4,901	-2,187
Solar Photovoltaic Electricity Generation	-69	-69	-69	--	--
Subtotal Reductions	*-8,301*	*-5,590*	*-5,590*	*-4,901*	*-2,187*
Summary					
Total Emissions	**−5,731**	**−1,351**	**−3,584**	**−3,242**	**−765**
BAAQMD Significance Threshold	**1,100**	**1,100**	**1,100**	**1,100**	**1,100**
Exceed Threshold?	**No**	**No**	**No**	**No**	**No**

Notes: CO_2e = carbon dioxide equivalent; VMT = vehicle miles traveled.
Emissions are shown as the change between the 2025 No Project Condition and 2025 Cumulative Conditions. Positive values represent an increase in GHG emissions and negative values represent a decrease in GHG emissions.
[a] GHG emissions for BART Operations are from the additional BART cars needed to support the ridership for each alternative.

As described above, in 2025 under Cumulative Conditions, the Proposed Project would reduce GHG emissions by approximately 5,731 MT CO_2e annually compared to 2025 No Project Conditions. The Proposed Project in 2025 under Cumulative Conditions would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025 under Cumulative Conditions, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2025, under Cumulative Conditions, the DMU Alternative would result in a net decrease of 1,351 MT CO_2e annually compared to 2025 No Project Conditions. While GHGs would increase by 4,239 MT CO_2e, this would be offset by a reduction of 5,590 MT CO_2e, thus resulting in an overall net decrease in GHG emissions. Table 3.L-9 shows the GHG emissions under 2025 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2025 Cumulative Conditions as for the DMU Alternative in 2025, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2025 under Cumulative Conditions, the DMU Alternative would reduce passenger VMT by approximately 21,858,079 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 5,521 MT CO_2e. This represents an increase in GHG emissions compared to the DMU Alternative in 2025 (which would have a reduction of 7,191 MT CO_2e per year).

As described above, in 2025 under Cumulative Conditions, the DMU Alternative would reduce GHG emissions by approximately 1,351 MT CO_2e annually compared to 2025 No Project Conditions. In 2025 under Cumulative Conditions, the DMU Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025 under Cumulative Conditions, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2025, under Cumulative Conditions, the EMU Option would result in a net decrease of 3,584 MT CO_2e annually compared to 2025 No Project Conditions. While GHG emissions would increase by 2,006 MT CO_2e, this would be offset by a reduction in GHG emissions of 5,590 MT CO_2e, resulting in an overall net decrease in GHG emissions. Table 3.L-8 shows the GHG emissions in MT CO_2e per year under 2025 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2025 Cumulative Conditions as for the EMU Option in 2025, except for GHG emissions associated with passenger VMT. As described above for the DMU Alternative under Cumulative Conditions, passenger VMT reductions would be less for 2025 Cumulative Conditions than under 2025 Project Conditions.

As described above, in 2025 under Cumulative Conditions, the EMU Option would reduce GHG emissions by approximately 3,584 MT CO_2e annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the EMU Option would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025 under Cumulative Conditions, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2025 under Cumulative Conditions, the Express Bus/BRT Alternative would result in a net decrease of 3,242 MT CO_2e annually compared to 2025 No Project Conditions. While GHGs would increase by 1,659 MT CO_2e, this would be offset by a reduction of 4,901 MT CO_2e, thus resulting in an overall net decrease in GHG emissions. Table 3.L-9 shows the GHG emissions under 2025 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2025 Cumulative Conditions as for the Express Bus/BRT Alternative in 2025, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** In 2025, under Cumulative Conditions, the Express Bus/BRT Alternative would reduce passenger VMT by approximately 19,509,613 miles. Due to the reduction in passenger vehicle VMT, emissions of GHGs from passenger vehicles would be reduced by 4,901 MT CO_2e. This represents a further reduction in GHG emissions compared to the Express Bus/BRT Alternative in 2025 (which would have a reduction of 3,355 MT CO_2e per year).

As described above, in 2025 under Cumulative Conditions, the Express Bus/BRT Alternative would reduce GHG emissions by approximately 3,242 MT CO_2e annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025 under Cumulative Conditions, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2025 under Cumulative Conditions, the Enhanced Bus Alternative would result in a net decrease of 765 MT CO_2e annually compared to 2025 No Project Conditions. While GHGs would increase by 1,422 MT CO_2e, this would be offset from a reduction in emissions of 2,187 MT CO_2e, resulting in an overall decrease in GHG emissions. Table 3.L-9 shows the GHG emissions under 2025 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2025 Cumulative Conditions as for the Enhanced Bus Alternative in 2025, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2025 under Cumulative Conditions, the Enhanced Bus Alternative would reduce passenger VMT by approximately 8,705,948 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 2,187 MT CO_2e. This represents a further reduction in GHG emissions compared to the Enhanced Bus Alternative in 2025 (which would have a reduction of 24 MT CO_2e per year).

As described above, in 2025 under Cumulative Conditions, the Enhanced Bus Alternative would reduce GHG emissions by approximately 765 MT CO_2e annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the Enhanced Bus Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025 under Cumulative Conditions, the Enhanced Bus Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Mitigation Measures. As described above, in 2025 under Cumulative Conditions, the Proposed Project and Alternatives would not result in significant operational impacts related to GHG emissions, and no mitigation measures are required.

Impact GHG-6(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions, under 2040 Cumulative Conditions.

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

The change between 2040 No Project Conditions and 2040 Cumulative Conditions represents the net emissions increase or decrease attributed to the Proposed Project or an alternative under Cumulative Conditions. Table 3.L-10 shows the annual change in GHG emissions from the operation of the Cumulative Conditions in 2040.

No Project Alternative. As described in **Impact GHG-4** above, the 2040 No Project Alternative would have significant impacts associated with GHG emissions during operations because the reductions in GHG emissions due to the reduced passenger VMT anticipated under the Proposed Project, DMU Alternative, EMU Option, or Express Bus/BRT Alternative (associated with increased transit ridership) would not occur. Under 2040 Cumulative Conditions, without the benefit of the Proposed Project or these alternatives, cumulative GHG emissions would be significant and the No Project Alternative would result in a cumulatively considerable contribution to impacts related to GHG emissions. **(S)**

Conventional BART Project. In 2040 under Cumulative Conditions, the Proposed Project would result in a net decrease of 12,760 MT CO_2e annually compared to 2040 No Project Conditions. While GHG emissions would increase by 2,575 MT CO_2e annually under the 2040 Cumulative with Proposed Project, this would be offset by a reduction of 15,334 MT CO_2e, resulting in an overall net decrease in GHG emissions. Table 3.L-10 shows the GHG emissions in MT CO_2e per year for the Proposed Project under 2040 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2040 Cumulative Conditions as for the Proposed Project in 2025, except that GHG emissions associated with passenger VMT would change compared to the Proposed Project in 2040, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2040 under Cumulative Conditions, the Proposed Project would reduce passenger VMT by approximately 82,390,212. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 15,275 MT CO_2e. This represents a greater reduction in GHG emissions compared to the 2025 Proposed Project under Cumulative Conditions (which would have a reduction of 8,232 MT CO_2e per year).

As described above, in 2040 under Cumulative Conditions, the Proposed Project would reduce GHG emissions by approximately 12,760 MT CO_2e annually compared to 2040 No Project Conditions. In 2040 under Cumulative Conditions, the Proposed Project would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040 under Cumulative Conditions, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2040, under Cumulative Conditions, the DMU Alternative would result in a net decrease of 4,814 MT CO_2e annually compared to 2040 No Project Conditions. While GHG emissions would increase by 4,501 MT CO_2e, this would be offset by a reduction in GHG emissions of 9,314 MT CO_2e, thus resulting in an overall net decrease in GHG emissions. Table 3.L-10 shows the GHG emissions under 2040 Cumulative Conditions.

TABLE 3.L-10 CHANGE IN ANNUAL GHG EMISSIONS UNDER 2040 CUMULATIVE CONDITIONS

Emission Component	Metric Tons of CO_2e Per Year: Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
Sources					
Transit Operations					
BART Operations[a]	709	229	229	95	--
DMU Operations	--	2,675	--	--	--
EMU Operations	--	--	190	--	--
Bus Operations	1,103	1,103	1,103	1,347	1,207
Station and Maintenance Operations					
Station Electricity	126	126	126	--	--
Emergency Generator	60	60	60	--	--
Water and Wastewater	9	7	7	3	1
Solid Waste	447	231	231	103	52
BART Car Maintenance	107	35	35	14	--
DMU/EMU Car Maintenance	--	26	26	--	--
Employee Shuttle Vans	5	--	--	--	--
Maintenance Trucks	5	5	5	--	--
Electric Forklifts	4	4	4	--	--
Subtotal Sources	*2,575*	*4,501*	*2,016*	*1,562*	*1,260*
Reductions					
Passenger Vehicles (Reduced VMT)	-15,275	-9,255	-9,255	-6,425	-1,634
Solar Photovoltaic Electricity Generation	-59	-59	-59	--	--
Subtotal Reductions	*-15,334*	*-9,314*	*-9,314*	*-6,425*	*-1,634*
Summary					
Total Emissions	**−12,760**	**−4,814**	**−7,300**	**−4,862**	**−374**
BAAQMD Significance Threshold	**1,100**	**1,100**	**1,100**	**1,100**	**1,100**
Exceed Threshold?	**No**	**No**	**No**	**No**	**No**

Notes: CO_2e = carbon dioxide equivalent; VMT = vehicle miles traveled.
Emissions are shown as the change between 2040 No Project Conditions and 2040 Cumulative Conditions. Positive values represent an increase in GHG emissions and negative values represent a decrease in GHG emissions.
[a] GHG emissions for BART Operations are from the additional BART cars needed to support the ridership for each alternative.

All sources of GHG emissions and GHG reductions would be the same under 2040 Cumulative Conditions as for the DMU Alternative in 2025, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2040 under Cumulative Conditions, the DMU Alternative would reduce passenger VMT by approximately 49,924,896 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 9,255 MT CO_2e. This represents a further reduction in GHG compared to the 2025 DMU Alternative under Cumulative Conditions (which would have a reduction of 5,521 MT CO_2e per year).

As described above, in 2040 under Cumulative Conditions, the DMU Alternative would reduce GHG emissions by approximately 4,814 MT CO_2e annually compared to 2040 No Project Conditions. Under 2040 Cumulative Conditions, the DMU Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040 under Cumulative Conditions, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2040, under Cumulative Conditions, the EMU Option would result in a net decrease of 7,300 MT CO_2e annually compared to 2040 No Project Conditions. While GHG emissions would increase by 2,016 MT CO_2e, this would be offset by a reduction of 9,314 MT CO_2e, resulting in an overall net decrease in GHG emissions. Table 3.L-10 shows the GHG emissions in MT CO_2e per year under 2040 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2040 Cumulative Conditions as for the EMU Option in 2040, except for GHG emissions associated with passenger VMT. As described above for the DMU Alternative under 2040 Cumulative Conditions, passenger VMT reductions would be less than under 2040 Project Conditions.

As described above, in 2040 under Cumulative Conditions, the EMU Option would reduce GHG emissions by approximately 7,300 MT CO_2e annually compared to 2040 No Project Conditions. Under 2040 Cumulative Conditions, the EMU Option would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040 under Cumulative Conditions, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would result in a net decrease of 4,862 MT CO_2e annually compared to 2040 No Project Conditions. While GHGs would increase by 1,562 MT CO_2e, this would be offset by a reduction in GHGs of 6,425 MT CO_2e, thus resulting in an overall net decrease in GHG emissions. Table 3.L-10 shows the GHG emissions under 2040 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2040 Cumulative Conditions as for the Express Bus/BRT Alternative in 2040, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, under 2040 Cumulative Conditions, the Express Bus/BRT Alternative would reduce passenger VMT by approximately 34,691,838 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 6,425 MT CO_2e. This represents a further reduction in GHG emissions compared to the 2025 DMU Alternative under Cumulative Conditions (which would have a reduction of 4,901 MT CO_2e per year).

As described above, in 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would reduce GHG emissions by approximately 4,862 MT CO_2e annually compared to 2040 No Project Conditions. Under 2040 Cumulative Conditions, the Express Bus/BRT Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2040 under Cumulative Conditions, the Enhanced Bus Alternative would result in a net decrease of 374 MT CO_2e annually compared to 2040 No Project Conditions. While GHG emissions would increase by 1,260 MT CO_2e, this would be offset by a reduction in GHG emissions of 1,634 MT CO_2e, resulting in an overall net decrease in GHG emissions. Table 3.L-10 shows the GHG emissions under 2040 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2040 Cumulative Conditions as for the Enhanced Bus Alternative in 2025, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2040 under Cumulative Conditions, the Enhanced Bus Alternative would reduce passenger VMT by approximately 8,834,264 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 1,634 MT CO_2e. This represents an increase in GHG emissions compared to the 2025 Enhanced Bus Alternative under Cumulative Conditions (which would have a reduction of 2,187 MT CO_2e per year).

As described above, in 2040 under Cumulative Conditions, the Enhanced Bus Alternative would reduce GHG emissions by approximately 374 MT CO_2e annually compared to 2040 No Project Conditions. Under 2040 Cumulative Conditions, the Enhanced Bus Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040 under Cumulative Conditions, the Enhanced Bus Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Mitigation Measures. As described above, in 2040 under Cumulative Conditions, the Proposed Project and Build Alternatives would not result in significant operational impacts related to GHG emissions, and no mitigation measures are required. However, in 2040 under Cumulative Conditions, without the benefit of the Proposed Project or the Build Alternatives, the No Project Alternative would result in significant impacts related to GHG emissions.

M. ENERGY

1. Introduction

This section describes the energy consumption setting and existing conditions as they relate to the BART to Livermore Extension Project; discusses the applicable federal, State of California (State), and local regulations; and assesses the potential impacts to energy from construction and operation of the Proposed Project and Alternatives.

Energy use includes energy consumption associated with construction and operation of the Proposed Project and Alternatives. Energy consumption can be categorized as either direct or indirect. For the purposes of this analysis, direct energy consumption includes energy consumed for activities such as the propulsion of BART trains, buses, DMU trains, or EMU trains, and for powering facilities. Indirect energy consumption includes energy use by passenger vehicles and treatment of water and wastewater.

While energy resources are defined at the state and regional levels, impacts are evaluated at the project level. The study area for energy impacts during construction includes the collective footprint—the combined footprints of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative—as well as the construction staging areas and roads in the vicinity of the construction sites on which vehicle trips (by workers and vendors and for hauling) would occur. Additionally, construction of the bus infrastructure improvements 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 within existing street rights-of-way, are addressed programmatically in this analysis, as described in Chapter 2, Project Description.

The study area for energy impacts during operation of the Proposed Project or one of the Build Alternatives is the area of transit operations for the respective trains (BART, DMU, or EMU) and buses. Energy use from station and maintenance area operations, taking into account the reduction in energy demand from off-site sources of energy due to on-site solar photovoltaic electricity generation, is analyzed at each facility's respective location. Changes in energy use by passenger vehicles are analyzed for the nine San Francisco Bay Area (Bay Area) counties as well as for San Joaquin County.

No comments related to energy were received in response to the Notice of Preparation for this EIR or during the public scoping meeting held for the EIR.

2. Existing Conditions

This subsection describes the existing conditions for energy consumption, including statewide energy sources and consumption, regional energy consumption, and BART's energy consumption.

a. Overview

This analysis describes energy consumption for electricity, gasoline, diesel, and total energy (the sum of all sources used). The units of measurement used in this analysis are as follows:

- Electricity: kilowatt-hours (kWh)
- Gasoline and diesel: gallons
- Total energy: British thermal unit (BTU)

For this analysis, the approximate content of energy forms are assumed to be as follows: electricity at 3,414 BTU per kWh; gasoline at 124,240 BTU per gallon; and diesel at 138,490 BTU per gallon.[1]

b. Statewide Energy Sources and Consumption

California's energy sources includes electric power, natural gas, hydroelectric, nuclear, and petroleum. Although California is the second largest energy consumer in the United States (U.S.) overall—with 7,620 trillion BTU consumed in 2014—the state has one of the lowest energy consumption rates per capita in the nation (196 million BTU [MMBTU] in 2014). This is due in part to the mild climate and the widespread implementation of energy efficiency programs.[2]

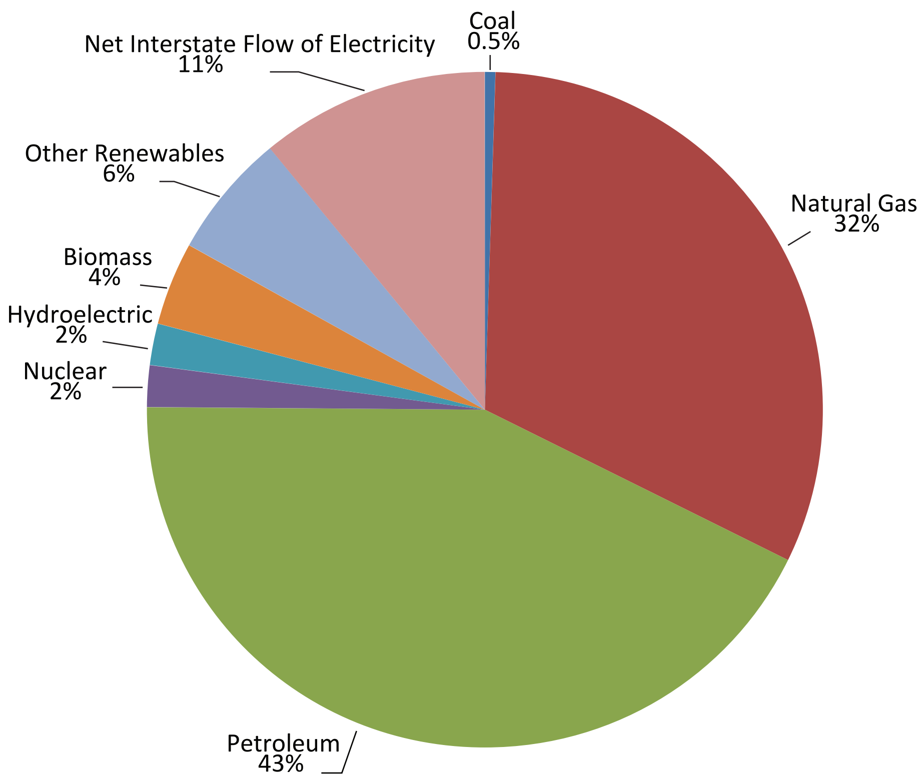
Figure 3.M-1 presents California's energy consumption by source and sector. The leading energy source in the state is petroleum, providing approximately 43 percent of the energy consumed and mostly supplying the transportation sector. Natural gas use constitutes 32 percent of the energy consumed in California. Nuclear makes up 2 percent, and solar, hydroelectric, biomass, and other renewables account for approximately 12 percent of the energy consumed on an annual basis. Energy consumed from the net interstate flow of electricity is approximately 11 percent of the total.[3] Coal accounts for 0.5 percent of the energy consumed in California.

[1] United States Department of Energy (DOE), 2014. Fuel Properties Comparison. Available at: http://www.afdc.energy.gov/fuels/fuel_comparison_chart.pdf, accessed March 27, 2017.

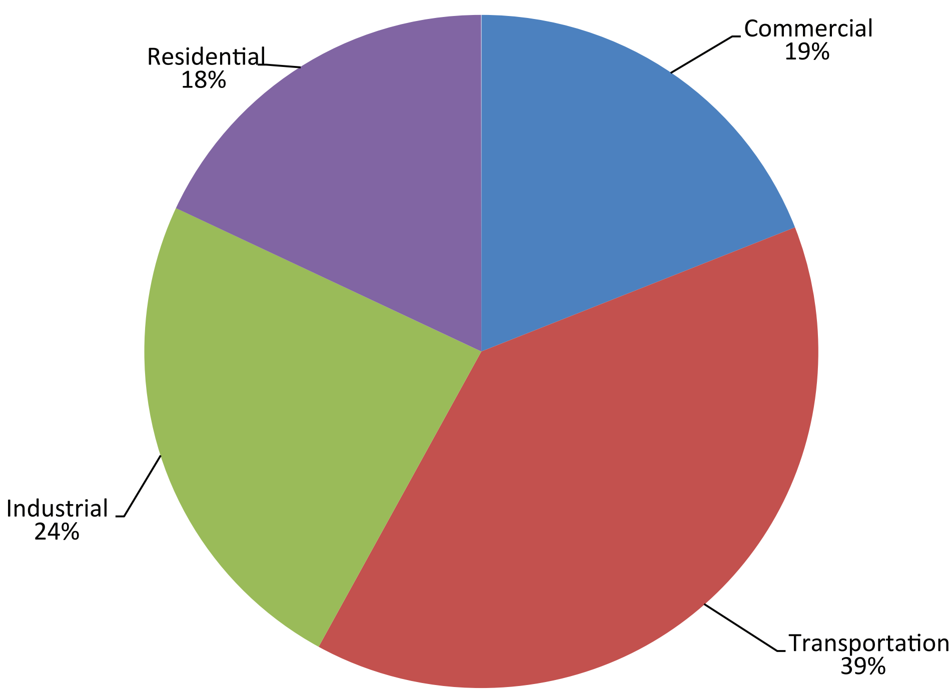
[2] United States Energy Information Administration (USEIA), 2016a. California State Energy Profile. Available at: https://www.eia.gov/state/print.cfm?sid=CA, accessed January 27, 2017.

[3] Net interstate flow of electricity is the difference between the amount of electricity generated within that the state and the sum of electricity sales and losses at the state level.

Production By Source in 2014



Consumption By Sector in 2014



Source: USEIA, 2016a,b.

Figure 3.M-1
Energy
Energy Sources and Uses in California

The transportation sector uses the greatest amount of energy in California compared to other sectors of the economy, consuming over one-third of the total energy demand (approximately 39 percent). Consumption by other sections is as follows: industry uses approximately 24 percent; commercial uses 19 percent; and residential uses approximately 18 percent.

Energy originates from both in-state and out-of-state sources. As shown in Table 3.M-1, the state depends on imports of petroleum, natural gas, and electricity. Approximately 91 percent of natural gas, 64 percent of petroleum, and 34 percent of electricity are from out-of-state sources. Approximately 66 percent of electricity, 36 percent of petroleum, and 9 percent of natural gas are provided from in-state sources.

TABLE 3.M-1 ORIGIN OF CALIFORNIA ENERGY SUPPLY

	Percentage of Total Energy		
Origin	**Petroleum**	**Natural Gas**	**Electricity**
In-State	36	9	66
Out-of-State	64	91	34
Total	**100**	**100**	**100**

Notes: Petroleum and electricity numbers for calendar year 2015. Natural gas values for calendar year 2012.
Sources: CEC, 2016a; CEC, 2016b; CPUC 2016.

(1) Petroleum and Natural Gas Supply and Demand

California is the second largest state consumer of natural gas, consuming 2,352 billion cubic feet in 2014. As shown in Table 3.M-2, approximately 37 percent of the natural gas consumed in California is used for heat and power in manufacturing, mining, or agriculture. Approximately 32 percent is used in electricity generation. Residential consumption of natural gas (i.e., for direct use in cooking and heating, not including natural gas used for electricity generation) is approximately 19 percent of the total used in California. The commercial sector (e.g., hotels, restaurants, etc.) consumes approximately 11 percent, and natural gas for vehicle fuel use is approximately 1 percent of the total used in California.[4]

[4] United States Energy Information Administration (USEIA), 2016a. California State Energy Profile. Available at: https://www.eia.gov/state/print.cfm?sid=CA, accessed January 27, 2017.

TABLE 3.M-2 NATURAL GAS USE IN CALIFORNIA BY SECTOR

Sector	2016 (Percent of Total)
Industrial	37
Electric power generation	32
Residential	19
Commercial	11
Vehicle fuel	1
Total	**100**

Source: United States Energy Information Administration (USEIA), 2017a.

Table 3.M-3 shows that 52.3 percent of California's petroleum is consumed as gasoline, followed by distillate (16.6 percent), jet fuel (17.7 percent), other petroleum fuels (10.9 percent), and residual fuel (2.5 percent).

TABLE 3.M-3 PETROLEUM USE IN CALIFORNIA BY END USE FUEL TYPE

Fuel Type	2014 (Percent of Total)
Motor Gasoline	52.3
Distillate	16.6
Jet Fuel	17.7
Liquid Petroleum Gas	1.5
Residual Fuel	2.5
Other Petroleum	9.4
Total	**100.0**

Source: United States Energy Information Administration (USEIA), 2016c.

As shown in Figure 3.M-1, the transportation sector consumes 39 percent of all energy used in the state, primarily from gasoline and diesel fuel. However, due to fuel efficiency standards and displacement by alternative fuels, the California Energy Commission (CEC) predicts that total demand for gasoline in California will decline by up to 3.7 percent annually through 2025. The CEC also predicts that total California transportation electricity demand will increase from approximately 11 percent in 2015 to 59 percent in

2026.[5] This increase is anticipated due to the rising use of plug-in electric vehicles and the anticipated operation of high-speed rail.

Annual gasoline use for transportation in California in 2016 is estimated at 15.2 billion gallons and annual diesel use is estimated at 3.6 billion gallons.[6]

(2) Electricity Supply and Demand

California is the second-largest user of electricity among all of the states, using approximately 282,173 million kWh in 2014, but the 49th on a per capita basis—just 7,273 kWh per person in 2014.[7, 8, 9] Electricity consumption is expected to increase 1.22 percent annually, driven mostly by the anticipated increase in population.[10]

In California, electricity is generated from a variety of sources, with natural gas being the largest source, providing approximately 44 percent of the state's electricity, as shown in Figure 3.M-2. Renewables such as small hydroelectric, solar, wind, geothermal, and biomass make up 22 percent of California's electricity mix, while large hydroelectric sources provide 5 percent. Nuclear power provides 9 percent of the state's electricity. Coal and oil account for 6 percent of the state's electricity mix, combined. Unspecified sources of power provide 14 percent of the state's power.

Table 3.M-4 shows California electricity consumption by end-use sector in 2015. Electrical use by commercial buildings and residential constitutes 69.8 percent of California's total annual electricity use. Industry, agricultural and water pumping, mining and construction, and street lighting combined account for the remaining 30.2 percent of California's electricity demand.

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[5] California Energy Commission (CEC), 2015. 2015 Integrated Energy Policy Report. Publication Number: CEC-100-2015-001-CMF. Available at: http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-01/TN212018_20160629T154356_2015_Integrated_Energy_Policy_Report_Full_File_Size.pdf, accessed January 30, 2017.

[6] California Air Resources Board (CARB), 2016. EMFAC2014 Mobile Source Emissions Model. February 3.

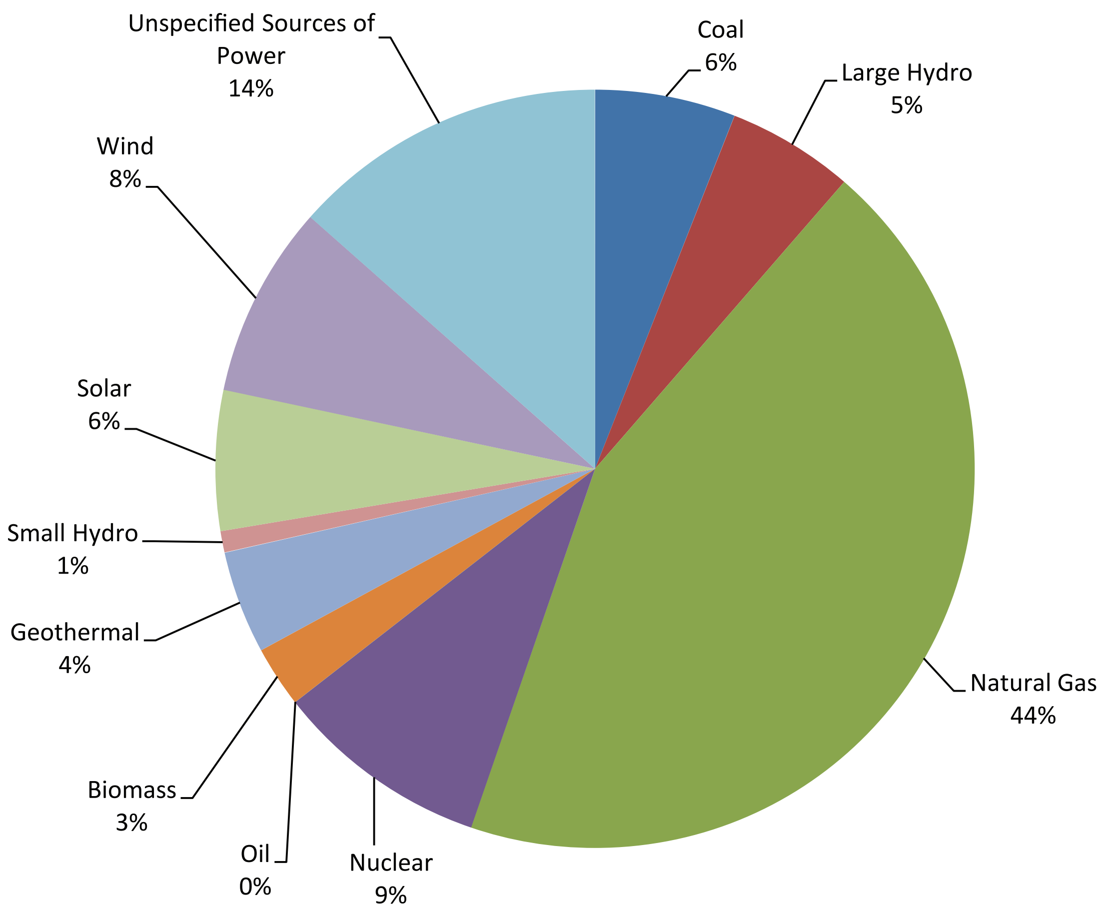
[7] California Energy Commission (CEC), 2016b. Electricity Consumption by County. Available at: http://www.ecdms.energy.ca.gov/elecbycounty.aspx, accessed October 25, 2016.

[8] United States Energy Information Administration (USEIA), 2016d. Rankings: Total Energy Consumed per Capita, 2014 (million BTU). Available at: http://www.eia.gov/state/rankings/?sid=CA#series/12, accessed October 25, 2016.

[9] United States Census Bureau, 2016. American FactFinder. Available at: http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk, accessed October 25, 2016.

[10] California Energy Commission (CEC), 2009. California Energy Demand 2010-2020 Adopted Forecast. CEC-200-2009-012-CMF. Available at: http://www.energy.ca.gov/2009publications/CEC-200-2009-012/CEC-200-2009-012-CMF.PDF, accessed April 26, 2017.

Production By Source in 2015



Source: CEC, 2016a.

Figure 3.M-2
Energy
Electricity Generation by Source in California

TABLE 3.M-4 ELECTRICITY END USE IN CALIFORNIA BY SECTOR

Sector	2015 (Percent)
Commercial Buildings	38.0
Residential	31.8
Industry	14.4
Agriculture and Water Pumping	6.7
Commercial Other	5.4
Mining and Construction	3.2
Streetlights	0.5
Total	**100.0**

Note: Construction energy use for the above categories are accounted for in the Mining and Construction sector.
Source: California Energy Commission (CEC), 2017.

Within the Bay Area, Pacific Gas and Electric Company (PG&E) provides electricity to consumers. In 2015, 29.5 percent of PG&E's energy mix came from renewable energy sources that include wind, solar, biomass, small hydropower, and geothermal.[11] The remaining 70.5 percent of PG&E's energy mix came from non-renewable energy sources.

Electricity demand is described as both electricity consumed over time (measured in gigawatt hours) and peak electricity supply and demand (measured in gigawatts or megawatts [MW]). The energy consumed over time must be met by the generating capacity of the regional energy supply. In addition, during hours of peak operation, the transmission capacity and reliability must be sufficient to carry the electricity from generator to consumer. Transmission capacity and reliability can limit the supply of electricity even if the generating capacity is sufficient.

Peak demand statewide typically occurs in the late afternoon during hot summer months when air conditioning units are in greatest use. In 2015, peak load was 47,358 megawatts.[12] In California, peak electricity demand is anticipated to increase by 0.54 to

[11] California Public Utilities Commission (CPUC), 2017. California Renewables Portfolio Standard (RPS) Homepage. Available at: http://www.cpuc.ca.gov/RPS_Homepage/, accessed April 13, 2017.
[12] California Independent System Operator (Cal-ISO), 2016. California ISO Peak Load History 1998 through 2015. Available at: https://www.caiso.com/Documents/CaliforniaISOPeakLoadHistory.pdf, accessed October 18, 2016.

1.27 percent annually.[13] Concerns about the long-term ability to meet this demand exist partly because of the uncertainty in the peak demand during the summer when air conditioning use is driven by high temperatures, which vary from year to year. There are also concerns about the aging transmission infrastructure and its ability to accommodate high electricity demands. To reduce the likelihood of demand exceeding supply, investor-owned utilities, such as PG&E, are required to maintain a 15 to 17 percent planning reserve margin (in excess of peak load obligations). Furthermore, the continuing addition of renewables in energy portfolios is predicted to increase the need for planning reserve margin to as much as 27 percent by 2020.[14]

c. Regional Energy Consumption

Sources of energy consumption considered in the region include electricity use, diesel fuel use, and gasoline fuel use. In 2015, Alameda County consumed a total of 10,245.7 million kWh of electricity, accounting for approximately 3.6 percent of the total electricity consumed in California (282,896.3 million kWh).[15]

Gasoline and diesel fuel are used primarily in transportation. The primary means of transportation in Alameda County are cars and trucks on roadways and highways. Approximately 75 percent of workers in Alameda County commute using a private car or truck, while about 13 percent use public transit.[16] In 2016, the estimated annual vehicle fuel usage for gasoline was 633,831,226 gallons, and the estimated annual fuel usage for diesel-fueled vehicles was 168,071,882 gallons.[17]

Therefore, based on the energy content conversion factors for electricity, gasoline, and diesel, the total annual energy consumed in Alameda County annually would be

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[13] California Energy Commission (CEC), 2016c. Tracking Progress. Available at: http://www.energy.ca.gov/renewables/tracking_progress/documents/statewide_energy_demand.pdf, accessed October 18, 2016.

[14] Haringa, G.E., 2010. Final Report to California Independent System Operator for Planning Reserve Margin (PRM) Study—2010-2020. General Electric Energy Applications & Systems Engineering. April 13. Available at: http://www.caiso.com/279d/279ded0337f20.pdf, accessed August 27, 2013.

[15] California Energy Commission (CEC), 2016b. Electricity Consumption by County. Available at: http://www.ecdms.energy.ca.gov/elecbycounty.aspx, accessed October 25, 2016.

[16] United States Census Bureau, 2015. 2010-2014 American Community Survey 5-Year Estimates. Available at: http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_5YR_B08301&prodType=table, accessed October 18, 2016.

[17] California Air Resources Board (CARB), 2016. EMFAC2014 Mobile Source Emissions Model. February 3.

approximately 137,002,286 MMBTU. This represents approximately 1.8 percent of the total energy used in California.[18]

d. BART Energy Consumption

Energy is required for the operation and maintenance of the existing BART system, as the trains and facilities are powered by electricity. BART's annual electric energy requirement is approximately 400,000 MWh (approximately 1.4 billion BTU). Approximately 79 percent of this is for train traction power, including on-board lighting; heating, ventilation, and air conditioning; and other needs. The remainder of BART's consumption (approximately 21 percent) is for stations, parking lots, maintenance facilities, track-side electronics, and other miscellaneous sources.

BART's systemwide peak electric load is approximately 80 MW. Typically, peak load for BART occurs in the late afternoon around 5:00 p.m. to 6:00 p.m. Peak load, and overall traction power consumption, is reduced due to the regenerative braking systems on each car, which feeds electricity back into the system when BART cars are slowing down, as described below.

Train cars are powered by four 150-horsepower, air-cooled, electric traction motors—one per axle. Energy for the electric traction power (referred to as tractive energy) is furnished via the third rail operating at 1,000 volts direct current. As stated above, the train cars are designed with a regenerative braking system that generates energy that is fed back to the third rail when the electric brakes are applied. Mechanical brakes operated via a hydraulic disc brake system operating on each axle operate together with the electric brake system.[19]

Approximately 90 percent of BART's electricity portfolio needs are met from low- and zero-carbon sources imported from the Pacific Northwest. Approximately 5 percent of BART's needs are met through long-term federal hydroelectric power purchases from the Western Area Power Administration. The remaining 5 percent of BART's needs are primarily met with long-term renewable power contracts, as follows:

- 2.5-MW Gridley solar farm in the city of Gridley, California
- 4.3-MW Lake Nacimiento hydroelectric project in Central California

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[18] Unites States Energy Information Administration, 2016b. Total Energy Consumption, Price, and Expenditure Estimates, 2014. Available at: http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_te.html&sid=US, accessed October 20, 2016.

[19] BASE Energy, Inc. 2007. Energy Efficiency Assessment of BART Train Cars, San Francisco Bay Area. November. Available at: http://www.bart.gov/sites/default/files/docs/BARTenergyreport.pdf, accessed October 18, 2016.

- Several on-site solar projects on BART property—at the Richmond and Hayward maintenance facilities, the Union City and Warm Springs BART Stations, and two new solar projects scheduled for completion in 2017 at the Lafayette and Antioch (eBART) Stations.

Due to the variable production that renewable resources provide, between 0 percent and 3 percent of BART's supply comes from unspecified system power to ensure a daily balanced power schedule.

Currently, BART is seeking to purchase renewable energy to meet a significant portion of its electric energy needs. BART seeks to purchase between 15,000 megawatt hours (MWh) and 350,000 MWh of off-site power per year, with deliveries beginning between 2019 and 2024. This off-site power would equal 3.8 to 87.5 percent of BART's current annual electric energy requirement.[20]

3. Regulatory Framework

This subsection describes the federal, State, and local environmental laws and policies relevant to energy.

a. Federal Regulations

(1) Corporate Average Fuel Economy Standards

At the federal level, the Energy Policy and Conservation Act of 1975 established a program to regulate fuel economy of passenger automobiles and light-duty trucks, including the development of the Corporate Average Fuel Economy Standards (CAFE) by the National Highway Traffic Safety Administration. The National Highway Traffic Safety Administration regulates the CAFE standards, and the U.S. Environmental Protection Agency (EPA) measures vehicle fuel efficiency. The U.S. Congress specifies that CAFE standards must be set at the "maximum feasible level" with consideration to the following:

- Technological feasibility
- Economic practicality
- Effect of other standards on fuel economy
- Need of the nation to conserve energy

The CAFE standards require that manufacturers maintain a fleet average fuel economy standard for their passenger automobiles and light-duty trucks with a gross vehicle weight

[20] San Francisco Bay Area Rapid Transit District (BART), 2017a. BART 2017 Renewable Energy Request for Proposals. Available at: https://www.bart.gov/sustainability/renewable-RFP/2017, accessed June 16, 2017.

rating of less than 8,500 pounds. The CAFE standard for passenger automobiles and light-duty trucks in the first phase (model years 2011 through 2016) is 35.5 miles per gallon. On August 28, 2012, the Obama Administration finalized the second phase of CAFE standards that increase fuel economy to the equivalent of 54.5 miles per gallon for cars and light-duty trucks by model year 2025. When combined with previous standards, this action will nearly double the fuel efficiency of model year 2025 vehicles compared to current vehicles. In March 2017, the Trump Administration ordered the EPA to review the CAFE standard.

(2) Federal Transportation Planning and Energy Conservation

MAP-21, the Moving Ahead for Progress in the 21st Century Act (P.L. 112-141), was signed into law by President Obama on July 6, 2012. MAP-21 funded surface transportation programs at over $105 billion for fiscal years 2013 and 2014. MAP-21 created a performance-based surface transportation program and builds on many of the highway, transit, bicycle, and pedestrian programs and policies first established in 1991 under the Intermodal Surface Transportation Efficiency Act (ISTEA).

On December 4, 2015, President Obama signed the Fixing America's Surface Transportation Act (FAST Act) into law. The 5-year, $305-billion bill replaced MAP-21. The FAST Act builds upon the changes made by MAP-21 in improving safety, maintaining infrastructure condition, reducing traffic congestion, improving efficiency of the system, improving freight movement, protecting the environment, and reducing delays in project delivery. These laws require that energy conservation be considered during the planning of transportation systems, such as the BART to Livermore Extension Project.

b. State Regulations

The State regulations pertaining to energy consumption and conservation are presented in chronological order below.

(1) California Energy Planning and Efficiency Standards

The CEC is the primary state agency responsible for developing energy policy. The five major responsibilities of the agency are as follows:

- Forecasting future energy needs and maintaining historical energy data
- Licensing thermal power plants that are 50 MW or larger
- Promoting energy efficiency through appliance and building standards
- Developing energy technologies and supporting renewable energy
- Planning for and directing State response to any energy emergency

In 1978, the CEC established the Building Energy Efficiency standards (Title 24, Part 6 of the California Code of Regulations) to help reduce the State's energy consumption. The

CEC updates these standards on approximately a 3-year cycle. The current standards are the 2016 standards, which went into effect on January 1, 2017. The 2016 standards continue to improve upon the 2013 standards for construction of, and additions and alterations to, residential and nonresidential buildings.[21]

(2) Renewables Portfolio Standard

To reduce dependence on fossil fuels, Governor Arnold Schwarzenegger signed California Executive Order S-21-09 requiring an increase in the share of renewable resources (not including large hydroelectric resources) to 33 percent by 2020. In April 2011, Governor Jerry Brown signed SB X1-2, which created a legislative mandate codifying the 33 percent Renewables Portfolio Standard into law.

The Clean Energy and Pollution Reduction Act of 2015 (Senate Bill 350) put into law a requirement to serve 50 percent of California's electricity use with renewable resources by 2030. Retail sellers and publicly owned utilities must procure half of the state's electricity from renewable sources by 2030. While it is not subject to the California's Renewables Portfolio Standard, BART prioritizes maintaining a supply portfolio that is nearly 100 percent low- and zero-carbon, and increasing its renewable content in line with state climate and renewables policies.[22]

(3) California Public Utilities Code 701.8 and Senate Bill 502

Originally created through Senate Bill 184 (passed in 1995), and most recently amended by Senate Bill 502, (passed in 2015), California Public Utilities Code 701.8 gives BART wide latitude to design its electricity portfolio. With this legislation, BART has the option to purchase wholesale electricity directly from an approved list of sources, including federal power marketing agencies, electricity supplied by one or more direct transactions, electricity supplied by any electric utility regulated by the commission that owns or operates transmission, and distribution facilities that deliver electricity at one or more locations to the BART system. Eligible renewable resources were added to the approved list of sources since the signing of Senate Bill 502.

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[21] California Energy Commission (CEC), 2016d. 2016 Building Energy Efficiency Standards. Available at: http://www.energy.ca.gov/title24/2016standards/, accessed October 18, 2016.

[22] San Francisco Bay Area Rapid Transit District (BART), 2017b. Wholesale Electricity Portfolio Policy. Available at: https://www.bart.gov/sites/default/files/docs/BART%20Wholesale%20Electricity%20Portfolio%20Policy%204.27.17.pdf, accessed May 30, 2017.

c. Local

(1) BART's Strategic Plan Framework

Although not a regulation per se, BART's Strategic Plan Framework (adopted October 2015) identifies goals and strategies related to energy conservation and sustainability. Consistent with its goal to advance regional sustainability, BART is committed to continuously improving its operating practices to preserve the environment of the Bay Area. This includes adopting feasible practices to conserve energy, such as the following:

- Prevent pollution and preserve natural resources
- Build partnerships to sustain and enhance our environment
- Meet or exceed environmental, health, and safety requirements
- Address and responsibly correct conditions that hinder a sustainable environment
- Create and achieve environmental objectives and targets that are measurable and meaningful
- Communicate this policy to all employees and to the communities BART serves

(2) Wholesale Electricity Portfolio Policy

BART's Wholesale Electricity Portfolio Policy was adopted by the BART Board on April 27, 2017.[23] The policy goals are to support low and stable BART operating costs and maximize the use of low-carbon, zero-carbon, and renewable electricity. To maximize the use of this type of energy, BART will support State climate policies by prioritizing purchases from supply sources with very low or zero greenhouse gas (GHG) emissions factors and support state renewable policies by prioritizing purchases from supplies that qualify as renewable under criteria set by state law. Performance measures include maintaining a long-term cost advantage compared to rates that BART would otherwise pay as a bundled utility customer, maintain per unit energy costs within BART's Short Range Transit Plan projections, and achieve the following portfolio:

- Average emission factor no greater than 100 pounds of carbon dioxide equivalent per MWh from 2017 through 2024 (inclusive)
- From at least 50 percent eligible renewable sources and from at least 90 percent low- and zero-carbon sources by 2025
- 100 percent from zero-carbon sources by 2035
- 100 percent from eligible renewable sources by 2045

[23] Ibid.

(3) Sustainability Policy

BART updated its Sustainability Policy on April 27, 2017.[24] The goals of the Sustainability Policy are as follows:

1. Advance smart land use, livable neighborhoods, and sustainable access to transit
2. Choose sustainable materials, construction methods, and operations practices
3. Use energy, water, and other resources efficiently
4. Reduce harmful emissions and waste generation
5. Respond to risks from extreme weather, earthquakes, and other potential disruptions
6. Improve patron and employee health and experience
7. Serve as a leader in sustainability for transit agencies and the communities that BART serves by reducing BART's environmental footprint and encouraging other organizations and institutions to act similarly

BART plans to meet these goals by implementing these energy consumption and conservation methods: (1) minimize ongoing maintenance and reduce waste; (2) consider net embodied energy; (3) incorporate efficient construction, deconstruction, and recycling practices; (4) achieve 100 percent renewable energy; (5) reduce energy use, water use, and consumption of other resources; (6) design new facilities to be resource efficient; (7) power non-electric facilities and vehicles with sources generating the lowest feasible greenhouse gas emissions and criteria air pollutants; (8) reduce, reuse, and recycle materials; (9) manage wastewater and stormwater comprehensively; and (10) implement programs for BART employees to decrease their environmental impact, among others.

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

CEQA requires that EIRs include a discussion of the potential energy impacts of proposed projects, with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy (see Public Resources Code section 21100(b)(3)).

[24] San Francisco Bay Area Rapid Transit District (BART), 2017c. Sustainability Policy. Available at: https://www.bart.gov/sites/default/files/docs/BART%20Sustainability%20Policy%204.27.17.pdf, accessed June 15, 2017.

Appendix F of the CEQA Guidelines provides guidance for assessing energy impacts of projects with the following three goals:

- Decreasing overall per capita energy consumption
- Decreasing reliance on fossil fuels such as coal, natural gas, and oil
- Increasing reliance on renewable energy sources

The Governor's Office of Planning and Research has proposed a new Energy section for the CEQA Guidelines Appendix G checklist, to better integrate the checklist with Appendix F.[25] For the purpose of this EIR, impacts on energy consumption are considered significant if the Proposed Project or one of the Alternatives would result in the following:

- Wasteful, inefficient, or unnecessary consumption of energy during project construction or operation

However, if the Proposed Project or one of the Alternatives would result in wasteful, inefficient, or unnecessary consumption, the Proposed Project or one of the Alternatives would have a less-than-significant impact on energy if it would involve the following:

- Incorporate renewable energy or energy efficiency measures into building design, equipment use, transportation, or other project features

Consistent with Appendix F of the CEQA Guidelines, elements evaluated in this analysis are as follows:

a) The energy requirements by amount and fuel type for each stage of the project, including construction, operation, and maintenance

b) The effects of the project on local and regional energy supplies and on requirements for additional capacity

c) The effects of the project on peak and base-period demands for electricity and other forms of energy

d) The degree to which the project complies with existing energy standards

e) The effects of the project on energy resources

f) The project's projected transportation energy use requirements and its overall use of efficient transportation alternatives

[25] Office of Planning and Research, 2015. Proposed Updates to the CEQA Guidelines, Preliminary Discussion Draft. August 11. Available at: https://www.opr.ca.gov/docs/Preliminary_Discussion_Draft_Package_of_Amendments_to_the_CEQA_Guidelines_Aug_11_2015.pdf, accessed April 26, 2017.

b. Impact Methodology

The methodology used to evaluate the significance of energy resources impacts is described below. The EMU Option would result in different energy requirements than the DMU Alternative and is therefore discussed separately for each impact.

The Proposed Project and Build Alternatives would consume energy both directly and indirectly. Direct energy consumption would occur from sources that are included in the Proposed Project or a Build Alternative (i.e., consumption by BART, DMU/EMU, or buses, including feeder buses that are part of the Proposed Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative). Indirect changes in energy consumption would occur when energy is consumed by sources that are not themselves part of the Proposed Project or a Build Alternative (i.e., reductions in energy use by passenger vehicles due to drivers and passengers switching to transit or increases in energy use related to water and wastewater treatment).

This energy analysis addresses the changes in energy consumption and the incorporation of renewable energy or energy efficiency measures that would result from the construction and operation of the Proposed Project and the Build Alternatives. Energy consumed during construction and operation is estimated for electricity, gasoline, and diesel. Natural gas used for electricity generation is accounted for under electricity use. To provide a comparison of energy use between the Proposed Project and the Build Alternatives, total energy use (which includes electricity, gasoline, and diesel) is quantified in terms of millions of BTU (MMBTU).

GHG emissions estimates used in this analysis for the Proposed Project and Alternatives are based on data provided in Appendix H, Air Quality Technical Tables, and Appendix I.2, Energy and GHG Calculations.

Assumptions used in estimating energy use and reductions are described below.

(a) Construction

Energy consumption from construction includes on-road vehicles and off-road equipment. Defaults from the California Emissions Estimator Model (CalEEMod) for trip lengths and project-specific assumptions for vendor, hauling, and worker trips were used to estimate on-road vehicle energy consumption. Worker trips were adjusted to account for a percentage of workers that would use carpools and public transportation. Energy consumption from off-road equipment was calculated using anticipated equipment usage hours. Diesel demand for off-road trucks is derived from EMFAC2014.

(b) Operation

Under the Proposed Project and Build Alternatives, energy would be consumed during the operation and maintenance of trains, stations, and associated infrastructure and support facilities. Operation energy use includes both transit operations and station and maintenance operations. Energy use is described below.

In addition, the Proposed Project and Build Alternatives would result in the reduction of energy use from passenger vehicles due to decreased passenger vehicle miles traveled (VMT) as more people take transit. Also, for the Proposed Project, DMU Alternative, and EMU Option, generation of renewable energy via a solar photovoltaic system at the proposed Isabel BART Station (Isabel Station) would help offset energy use from electricity generation from off-site sources to meet project operational demand. These reductions are also described below.

Transit Operations

Transit operations include BART trains, DMU vehicles, EMU vehicles, and bus operations as identified for the Proposed Project and Build Alternatives below.

- **BART Car Miles (Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative).** BART train use would result in direct energy use, associated with the electricity use for train operations. BART traction power electricity demand is calculated from annual total BART car miles traveled and an electricity demand factor of 4.51 kWh per car mile, based on 2006 data.[26] The use of this electricity demand factor is conservative, as the current BART traction electricity demand factor is lower—4.30 kWh per car mile (as of 2015). The annual total BART car miles traveled is the sum of the distance traveled for every BART car per year.

  The Proposed Project would result in additional BART car miles associated with (1) the approximately 5.5-mile extension of BART service to the proposed Isabel Station; and (2) the increased BART car miles systemwide due to the increased ridership anticipated under the Proposed Project. The DMU Alternative, EMU Option, and Express Bus/BRT Alternative would only have increased BART car miles associated with increased systemwide ridership due to implementation of the alternatives. Under the Enhanced Bus Alternative, the number of BART car miles traveled for BART operations would be equivalent to the number of BART car miles for No Project Conditions; therefore, there would be no change in BART car miles.

[26] San Francisco Bay Area Rapid Transit District (BART), 2010. BART to Livermore Extension Final Program Environmental Impact Report. Available at: https://bart.gov/sites/default/files/docs/Bart-to-Livermore-EIR-WEB_0.pdf, accessed April 26, 2017.

- **DMU Vehicle Miles (DMU Alternative).** Operation of the DMU vehicles would be a direct source of energy use. DMU diesel demand was calculated from annual revenue DMU car miles. A two-car DMU train would consume 9 kWh per mile traveled (running) and 1.25 kWh per idle minute, plus approximately 0.725 gallons of diesel per mile traveled.[27] The DMU energy use rates were modified to account for the project-specific assumption of four rail cars per train, 11.4 miles traveled per round-trip, and 12 minutes of idling per round-trip. Based on these project-specific parameters, the DMU energy use rates are estimated to be 0.478 gallon of diesel per car mile and 2.5 kWh per idle minute. The DMU is expected to utilize electricity for idling energy needs.
- **EMU Vehicle Miles (EMU Option).** Operation of the EMU vehicles would be a direct source of energy use. EMU vehicle traction power electricity is calculated from annual revenue EMU car miles and round trips. The EMU vehicle would have an electricity demand factor of 8.6 kWh per mile traveled (running) and 0.88 kWh per idle minute.[28] The EMU energy use rates were modified to account for the project-specific assumptions of four EMU cars per train, 11.4 miles traveled per round-trip, and 12 minutes of idling per round-trip. EMU energy use rates are estimated to be 4.3 kWh per car mile and 1.8 kWh per idle minute.
- **Bus Miles (Proposed Project and Build Alternatives).** Bus use would be a direct source of energy use, associated with diesel fuel use. Operational bus energy use is calculated based on total bus trips and vehicle miles for service to the proposed Isabel Station. The analysis assumed that each bus trip includes 5 minutes of idling. Diesel demand for buses is derived from EMFAC2014 daily fuel use in Alameda County for 2025 and 2040. The portion of the buses operated by the Livermore-Amador Valley Transit Authority (LAVTA) are hybrid-diesel models and consume 15 percent less fuel than standard diesel buses (per manufacturer specifications).[29, 30] Therefore, the diesel demand for buses were reduced by 15 percent to account for the hybrid-diesel bus models operated by LAVTA.

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[27] LTK Engineering Services, 2008. eBART Phase I Project to Hillcrest Terminal: DMU and LRV Comparison. May 14.

[28] Ibid.

[29] Peterson, Lee, Gillig, LLC, 2017. Personal communication with Aubrey Jones of Ramboll Environ. April 21.

[30] Approximately 90 percent of the buses in the model are assumed to be LAVTA buses under the Proposed Project and DMU Alternative, and 100 percent are assumed to be LAVTA buses under the Express Bus/BRT Alternative and Enhanced Bus Alternative.

Table 3.M-5 presents the net change in miles from transit operations listed above.

TABLE 3.M-5 NET CHANGE IN BART CAR MILES, DMU/EMU MILES, AND BUS MILES FOR 2025 AND 2040 PROJECT AND CUMULATIVE CONDITIONS

	BART Car Miles	DMU/EMU Miles	Bus Miles
2025			
Conventional BART Project	2,895,844	--	379,117
DMU Alternative (EMU Option is the same)	558,771	776,400	379,117
Express Bus/BRT Alternative	111,839	--	354,876
Enhanced Bus Alternative	--	--	235,016
2040			
Conventional BART Project	3,561,913	--	379,117
DMU Alternative (EMU Option is the same)	1,150,063	864,100	379,117
Express Bus/BRT Alternative	479,770	--	354,876
Enhanced Bus Alternative	--	--	235,016

Notes: -- = Not applicable or no change.
Change in BART car miles, DMU/EMU miles, and bus miles is the net change between the Proposed Project (or Alternative) and No Project Conditions for the specified year (2025 or 2040).
Source: Connetics Transportation Group, 2017.

Station and Maintenance Operations

Station and maintenance area operational energy use includes station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, maintenance of BART vehicles and DMU/EMU vehicles, and other activities at the storage and maintenance facility (including the use of maintenance trucks and forklifts and employee shuttle vans).

- **Proposed Isabel Station Electricity (Proposed Project, DMU Alternative, and EMU Option).** Electricity use at the proposed Isabel Station would be a direct source of energy use. Electricity consumption at the proposed Isabel Station was conservatively assumed to be similar to the electricity use at the Dublin/Pleasanton BART Station (Dublin/Pleasanton Station) and station parking lot, an existing and comparable BART station.[31] This represents a conservative estimate of electricity use as the proposed Isabel Station is anticipated to be more energy efficient than the Dublin/Pleasanton Station due to current building codes that require greater energy conservation (e.g.,

[31] Electricity use is based on a 3-year annual average (2012 to 2014) for the Dublin/Pleasanton Station (Ramboll Environ, 2017).

Title 24). Energy use is calculated based on the gross electricity produced prior to electricity losses from the grid. Specifically, the U.S. Energy Information Administration estimates that electricity transmission and distribution losses average about 5 percent of the electricity that is transmitted and distributed in the U.S.[32]

- **Emergency generators (Proposed Project, DMU Alternative, and EMU Option).** Use of diesel fuel for the emergency generators would be a direct source of energy use. An approximately 2,500-kilowatt emergency generator would be located at the Isabel Station, and an approximately 500-kilowatt emergency generator would be located at the storage and maintenance facility. This analysis assumes that operation for routine maintenance and testing for the emergency generator at Isabel Station would not exceed 24 hours per year. For the emergency generator at the storage and maintenance facility, this analysis assumes that operation for routine maintenance and testing for the emergency generator would not exceed 50 hours per year.
- **Water and Wastewater (Proposed Project and Build Alternatives).** Water use and wastewater generation are an indirect source of energy use. Energy use related to water and wastewater consists of upstream electricity to supply, treat, and distribute water and downstream electricity to treat wastewater. Water use and wastewater generation would result from the stations (Dublin/Pleasanton Station and proposed Isabel Station), the storage and maintenance facility activities, and wayside facilities, as outlined in Section 3.P, Utilities (see **Impact UTIL-5**).[33] For this analysis, water use and wastewater generation are conservatively assumed to be the same in 2025 as 2040.
- **Maintenance of BART Cars and DMU/EMU Vehicles (Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative).** Electricity use is anticipated from the maintenance of BART, DMU, and EMU vehicles, and would be a direct energy use. A maintenance factor of 7,060 BTU per car/vehicle mile was applied to the annual miles to determine total electricity usage for maintenance activities.[34] Maintenance of BART cars would occur at the storage and maintenance facility under the Proposed Project. For the other alternatives, maintenance of the BART cars

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[32] United States Energy Information Administration (USEIA), 2017a. Frequently Asked Questions: How much electricity is lost in transmission and distribution in the United States? Available: https://www.eia.gov/tools/faqs/faq.php?id=105&t=3, accessed June 15, 2017.

[33] In addition to the water use described in Section 3.P, Utilities for water consumption in the study area, this analysis accounts for use of water outside the study area related to maintenance/cleaning of the additional BART cars required for the DMU Alternative and Express Bus/BRT Alternative that would be maintained at existing BART maintenance facilities, under these alternatives.

[34] California Department of Transportation (Caltrans), 1983. Energy and Transportation Systems. July. Available at: http://www.dot.ca.gov/hq/env/air/documents/energytranssystems_ocr.pdf, accessed June 15, 2017.

associated with the increase in BART car miles traveled would occur at existing BART maintenance facilities.

- **Other Activities at the Storage and Maintenance Facility (Proposed Project, DMU Alternative, and EMU Option.** Activities associated with the storage and maintenance facility, specifically maintenance truck and forklift use, as well as shuttle vans for transporting BART employees to the proposed Isabel Station (under the Proposed Project only), would result in both direct and indirect sources of energy use (direct energy use from diesel fuel and electricity use). Off-road maintenance trucks would be used at the storage and maintenance facility. Project-specific assumptions for the trucks are as follows: approximately 8,030 annual VMT and 10 minutes of idling per day, per vehicle. Diesel demand for off-road trucks is derived from EMFAC2014 daily fuel use in Alameda County for 2025 and 2040. Two electric forklifts are assumed to be used at the storage and maintenance facility 365 days a year for 8 hours a day. Horsepower and load factors used are industrial averages and air quality model defaults from CalEEMod, respectively. In addition, one shuttle van would be used at the maintenance yard for the Proposed Project and is assumed to travel 20 miles per day and idle for 40 minutes per day.

Energy Reductions

Reductions in energy use during operation would result from reduced passenger VMT associated with increased transit ridership, as well as on-site electricity generation from a solar photovoltaic system at the proposed Isabel Station, as identified for the Proposed Project and Build Alternative below.

- **Reduced Passenger VMT (Proposed Project and Build Alternatives).** Reductions in regional passenger VMT would occur as a result of the mode switch from passenger vehicles to transit, as shown in Table 3.M-5. Gasoline and diesel demand for passenger vehicles is derived from EMFAC2014 for daily fuel use in Alameda County for 2025 and 2040. A gallon-per-mile use factor was determined and applied to project-specific VMT estimates. Electricity used in passenger vehicles was derived from the U.S. Department of Energy's 2016 Fuel Economy Guide.[35] The net change in passenger VMT is presented in Table 3.M-6.

[35] Department of Energy (DOE), 2017. Model Year 2016 Fuel Economy Guide. April 25. Available at: https://www.fueleconomy.gov/feg/pdfs/guides/FEG2016.pdf, accessed April 26, 2017.

TABLE 3.M-6 NET CHANGE IN PASSENGER VEHICLE MILES TRAVELED

	Annual VMT		Average Daily VMT	
	2025	**2040**	**2025**	**2040**
Project Conditions				
Conventional BART Project	-38,250,574	-73,770,403	-128,000	-246,000
DMU Alternative (EMU Option is the same)	-28,578,215	-42,745,966	-95,000	-142,000
Express Bus/BRT Alternative	-13,357,023	-28,586,697	-45,000	-95,000
Enhanced Bus Alternative	-75,668	-2,722,388	-300	-9,000
Cumulative Conditions				
Conventional BART Project	-32,649,225	-82,390,212	-109,000	-275,000
DMU Alternative (EMU Option is the same)	-21,858,079	-49,924,896	-73,000	-166,000
Express Bus/BRT Alternative	-19,509,613	-34,691,838	-65,000	-116,000
Enhanced Bus Alternative	-8,705,948	-8,834,264	-29,000	-29,000

Notes: VMT = vehicle miles traveled
Change in annual VMT or average daily VMT is the difference between No Project Conditions and Project Conditions (or Cumulative Conditions). Negative values represent a decrease in VMT.
Source: Cambridge Systematics, 2017.

- **Solar Photovoltaic (Proposed Project, DMU Alternative, and EMU Option).** A solar photovoltaic system with a capacity of 1,000 kilowatts is assumed for the Isabel Station; it is assumed to start operation in 2025, with a 1 percent annual degradation in performance for every year thereafter. Solar photovoltaic power generated on site would reduce demand for electricity generated at off-site power plants. Electricity generation was estimated using the National Renewable Energy Laboratory's PVWatts calculator.[36] Electricity generation is based on a rooftop array using default assumption and weather conditions typical of Livermore, California.

c. No Project Conditions

2025 No Project Conditions and 2040 No Project Conditions are described below. Under 2025 and 2040 No Project Conditions, the Proposed Project and Build Alternatives would not be built. Energy consumption in the study area would continue to result from new development and existing infrastructure. This would include the use of passenger vehicles

[36] National Renewable Energy Laboratory (NREL), 2016. PVWatts Calculator. Available at: http://pvwatts.nrel.gov/, accessed November 7, 2016.

and a continued increase in annual VMT in the study area and associated consumption of diesel fuel, gasoline, and electricity.

For 2025 and 2040, the project impacts are evaluated against No Project Conditions. Thus, the 2025 Proposed Project and Build Alternatives are evaluated against 2025 No Project Conditions, and the 2040 Proposed Project and Build Alternatives are evaluated against 2040 No Project Conditions. See Section 3.B, Transportation, for additional details related to No Project Conditions.

(1) 2025 No Project Conditions

2025 No Project Conditions for energy assume the growth-induced traffic volumes between existing conditions and 2025 as determined in the transportation modeling.

(2) 2040 No Project Conditions

2040 No Project Conditions for energy assume the growth-induced traffic volumes between existing conditions and 2040 as determined in the transportation modeling.

d. Summary of Impacts

Table 3.M-7 summarizes the impacts of the Proposed Project and Alternatives described in the analysis below.

Table 3.M-7 Summary of Energy Impacts

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Construction					
Project Analysis					
Impact EN-1: Result in wasteful, inefficient, or unnecessary consumption of energy, during construction	NI	LS	LS	LS	LS
Cumulative Analysis					
Impact EN-2(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, during construction under Cumulative Conditions	NI	LS	LS	LS	LS

TABLE 3.M-7 SUMMARY OF ENERGY IMPACTS

Impacts	No Project Alternative	Conventional BART Project	DMU Alternative (with EMU Option)	Express Bus/BRT Alternative	Enhanced Bus Alternative
	Significance Determinations[a]				
Operational					
Project Analysis (2025 and 2040)					
Impact EN-3: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Project Conditions	NI	B	B	B	SU
Impact EN-4: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Project Conditions	S	B	B	B	SU
Cumulative Analysis (2025 and 2040)					
Impact EN-5(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Cumulative Conditions	NI	B	B	B	B
Impact EN-6(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Cumulative Conditions	S	B	B	B	B

Notes: NI=No impact; B=Beneficial impact; LS=Less-than-Significant impact, no mitigation required; S= Significant impact of No Project Alternative (mitigation is inapplicable); SU=Significant and unavoidable, even with mitigation or no feasible mitigation available.
DMU = diesel multiple unit; EMU = electrical multiple unit; BRT = bus rapid transit.
[a] All significance determinations listed in the table assume incorporation of applicable mitigation measures.

e. Environmental Analysis

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

(1) Construction Impacts

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

(a) Construction – Project Analysis

Impact EN-1: Result in wasteful, inefficient, or unnecessary consumption of energy, during construction.

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

Although construction-related energy consumption would represent the irreversible consumption of finite fossil fuel energy resources, the consumption of energy would be short-term in duration, ranging from approximately 2 months (for the Enhanced Bus Alternative) to approximately 5 years (for the Proposed Project and other alternatives). In addition, as described further below, the amount of energy required would represent a very limited amount of the total energy consumed annually in Alameda County. Furthermore, for the Proposed Project and several of the alternatives, the reduction in energy consumption during operations (described in **Impact EN-3** below) would offset consumption of energy during construction.

Construction-related energy use would include the consumption of electricity, diesel, and gasoline. Petroleum fuels would be used for operation of construction vehicles and electricity would power other construction equipment, such as welding machines and power tools. Energy consumed by power equipment used during construction would be relatively minimal, as would the energy necessary for any required lighting and operation of ancillary electrical equipment. Gasoline and electricity would be used for on-road vehicles, while diesel would be used during construction by either off-road or on-road vehicles. Off-road vehicles are used on construction sites (such as bulldozers) and on-road vehicles are all vehicles that travel over roads. Energy use during construction of the Proposed Project and Build Alternatives are presented in Table 3.M-8.

TABLE 3.M-8 ENERGY USE DURING CONSTRUCTION

	Electricity (kWh)	Diesel (Gallons)	Gasoline (Gallons)	Total Energy Use (MMBTU)
Conventional BART Project	10,293	1,050,849	107,641	159,023
DMU Alternative (same for EMU Option)	10,293	877,046	109,991	135,245
Express Bus/BRT Alternative	10,913	221,151	102,552	43,491
Enhanced Bus Alternative	383	25,464	3,979	4,025

Notes: kWh = kilowatt hours; MMBTU = million British thermal units.

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, and LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including both residential and commercial. Construction of these improvements and development projects could result in wasteful, inefficient, or unnecessary consumption of energy from construction. 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 energy use during construction. **(NI)**

Conventional BART Project. As presented in Table 3.M-8, construction of the Proposed Project would consume approximately 159,023 MMBTU in the form of 10,293 kWh of electricity, 1,050,849 gallons of diesel (of which 482,395 gallons would be for use in on-road vehicles and 568,454 gallons for off-road vehicles), and 107,641 gallons of gasoline. For purposes of comparison, total energy use for construction of the Proposed Project would represent approximately 0.12 percent of Alameda County's annual energy use (137,002,286 MMBTU annually). Therefore, the anticipated amount of energy that would be consumed during construction of the Proposed Project would not result in wasteful, inefficient, or unnecessary consumption of energy. In addition, construction activities would not reduce existing electrical or natural gas services due to insufficient supply. Further, the energy consumed to construct the Proposed Project would be offset from the energy reductions that would occur during operation of the Proposed Project, described in **Impact EN-3** below. Therefore, construction of the Proposed Project would result in a less-than-significant impact on energy resources. **(LS)**

DMU Alternative (same for EMU Option). As Table 3.M-8 shows, construction of the DMU Alternative would consume approximately 135,245 MMBTU, which is less energy than required for construction of the Proposed Project. The EMU Option would require the same amount of energy and same sources of energy as the DMU Alternative. Of the total energy consumed, construction of the DMU Alternative would require 10,293 kWh of electricity, 877,046 gallons of diesel (of which 572,498 gallons would be for use in on-road vehicles and 304,547 gallons for off-road vehicles), and 109,991 gallons of gasoline. Therefore, the anticipated amount of energy that would be consumed during construction of the DMU Alternative would not result in wasteful, inefficient, or unnecessary consumption of energy. Construction of the DMU Alternative would represent

0.10 percent of Alameda County's annual energy use. In addition, construction activities would not reduce existing electrical or natural gas services due to insufficient supply. Further, the energy consumed to construct the DMU Alternative would be offset from the energy reductions that would occur during operation of the DMU Alternative, described in **Impact EN-3** below. Therefore, construction of the DMU Alternative (or EMU Option) would result in a less-than-significant impact on energy resources. **(LS)**

Express Bus/BRT Alternative. As Table 3.M-8 shows, construction of the Express Bus/BRT Alternative would consume approximately 43,491 MMBTU, which is less energy than required for construction of the Proposed Project. Of the total energy consumed, construction of the Express Bus/BRT Alternative would require 10,913 kWh of electricity, 221,151 gallons of diesel (of which 145,425 gallons would be for use in on-road vehicles and 75,726 gallons for off-road vehicles), and 102,552 gallons of gasoline. Construction of the Express Bus/BRT Alternative would represent 0.03 percent of Alameda County's annual energy use. Therefore, the anticipated amount of energy that would be consumed during construction of the Express Bus/BRT Alternative would not result in wasteful, inefficient, or unnecessary consumption of energy. Further, the energy consumed to construct the Express Bus/BRT Alternative would be offset from the energy reductions that would occur during operation of the Express Bus/BRT Alternative, described in **Impact EN-3** below. Therefore, construction of the Express Bus/BRT Alternative would have a less-than-significant impact on energy consumption. **(LS)**

Enhanced Bus Alternative. As Table 3.M-8 shows, construction of the Enhanced Bus Alternative would require approximately 4,025 MMBTU. Of the total energy consumed, construction of the Enhanced Bus Alternative would require 383 kWh of electricity; 25,464 gallons of diesel (of which 15,652 gallons would be for use in on-road vehicles and 9,811 gallons for off-road vehicles); and 3,979 gallons of gasoline. Construction of the Enhanced Bus Alternative would represent 0.003 percent of Alameda County's annual energy use. Thus, anticipated amount of energy that would be consumed during construction of the Enhanced Bus Alternative would not result in wasteful, inefficient, or unnecessary consumption of energy. Therefore, construction of the Enhanced Bus Alternative would have a less-than-significant impact on energy consumption. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant construction impacts related to consumption of energy, and no mitigation measures are required.

(b) Construction – Cumulative Analysis

Impact EN-2(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, during construction under Cumulative 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. As described in **Impact EN-1** above, the No Project Alternative would have no impacts related to energy consumption during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. The Proposed Project and Build Alternatives, in combination with past, present, or probable future projects, would result in a temporary increase in energy consumption over the respective construction periods of the various projects. If undertaken within the same time period, construction energy impacts from other transportation, residential, and commercial projects undertaken in the study area could combine with those associated with the Proposed Project and Build Alternatives. However, it is expected that construction would be implemented in conjunction with numerous measures to maximize energy efficiency and conservation, which include minimizing the number of material deliveries required, maintaining equipment in good condition, and minimizing equipment idling. Thus, construction of the Proposed Project or any Alternative, in combination with past, present, or probable future projects, would not contribute to significant cumulative impacts related to energy use. Therefore, cumulative energy impacts during construction would be less than significant. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Build Alternatives, in combination with past, present, or probable future projects, would not result in significant cumulative construction impacts related to consumption of energy, and no mitigation measures are required.

(2) Operational Impacts

Potential impacts pertaining to the opening year of 2025 are described first, followed by impacts pertaining to the horizon year of 2040.

(a) Operations – Project Analysis

Impact EN-3: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Project Conditions.

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

The change between 2025 No Project Conditions and 2025 Project Conditions represents the net energy increase or decrease attributed to the Proposed Project or Alternative. Table 3.M-9 provides a summary of the energy use from the operation of the Proposed Project and Build Alternatives in 2025. Tables 1 through 5 in Appendix I.1 provide detailed estimates for change in energy use from the operation of the Proposed Project and Build Alternatives in 2025, in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

No Project Alternative. The 2025 No Project Alternative is the same as baseline conditions (i.e., 2025 No Project Conditions). Therefore, the 2025 No Project Alternative would have no impacts related to energy use. **(NI)**

Conventional BART Project. In 2025, the Proposed Project would result in a net decrease of 73,163 MMBTU annually compared to 2025 No Project Conditions. While energy use from the Proposed Project would increase by 78,998 MMBTU annually in 2025, this would be offset from reductions in annual energy use of 152,161 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

Sources of energy use for the Proposed Project include BART operations, bus operations (for feeder bus service to the Isabel Station), station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, BART car maintenance, employee shuttle vans, maintenance truck use, and electric forklift use. Sources are described below in the order presented in Table 3.M-9. Table 1 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **BART Car Miles.** Annually, net new BART car miles would increase by 2,895,844 in 2025 due to implementation of the Proposed Project. This increase in BART car miles comes from the increase in the number and distance that BART cars travel with the extended line. As a result of this increase, energy use due to electricity demand for operation of BART would be 13,060,256 kWh annually (equivalent to 44,588 MMBTU per year).

TABLE 3.M-9 CHANGE IN ANNUAL ENERGY USE UNDER 2025 PROJECT CONDITIONS

	MMBTU				
Energy Use Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	44,588	8,603	8,603	1,722	--
DMU Operations	--	41,565	--	--	--
EMU Operations	--	--	13,219	--	--
Bus Operations	16,689	16,689	16,689	20,453	18,309
Station and Maintenance Operations					
Station Electricity	9,722	9,722	9,722	--	--
Emergency Generators	806	806	806	--	--
Water and Wastewater	101	67	67	25	13
BART Car Maintenance	6,751	1,303	1,303	261	--
DMU/EMU Car Maintenance	--	1,810	1,810	--	--
Employee Shuttle Vans	56	--	--	--	--
Maintenance Trucks	61	61	61	--	--
Electric Forklifts	224	224	224	--	--
Subtotal Sources	*78,998*	*80,850*	*52,504*	*22,461*	*18,322*
Reductions					
Passenger Vehicles (Reduced VMT)	-146,843	-109,711	-109,711	-51,277	-291
Solar Photovoltaic Electricity Generation	-5,318	-5,318	-5,318	--	--
Subtotal Reductions	*-152,161*	*-115,029*	*-115,029*	*-51,277*	*-291*
Total	**-73,163**	**-34,179**	**-62,525**	**-28,816**	**18,031**

Notes: -- = not applicable; VMT = vehicle miles traveled; MMBTU = million British thermal units.
Energy use is shown as the change between 2025 No Project Conditions and 2025 Project Conditions. Positive values represent an increase in energy use and negative values represent a decrease in energy use.
[a] Energy use due to BART Operations is from the additional BART cars needed to support the ridership for each alternative.

- **Bus Miles.** Annually, net new bus VMT would increase by 379,117 in 2025. Due to this increase, energy use from bus operations would increase by 120,505 gallons of diesel per year (16,689 MMBTU annually).
- **Proposed Isabel Station Electricity.** Annual electricity use at Isabel Station would be 2,847,609 kWh annually (9,722 MMBTU).
- **Emergency Generators.** During testing and maintenance, the emergency generator at Isabel Station would consume approximately 4,109 gallons of diesel per year (equal to 569 MMBTU) and the emergency generator at the maintenance station would consume approximately 1,712 gallons of diesel per year (equal to 237 MMBTU). Combined, the generators would use 5,821 gallons of diesel per year (806 MMBTU).
- **Water and Wastewater.** Water consumption is expected to be 5,488,117 gallons per year and energy use from water use and wastewater treatment would be 29,696 kWh per year (101 MMBTU) in 2025 annually.
- **Maintenance of BART Cars.** Maintenance of BART cars is based on the number of miles traveled under the Proposed Project. Energy use from the maintenance of BART cars would be 1,977,431 kWh per year (6,751 MMBTU annually) in 2025.
- **Other Activities at the Storage and Maintenance Facility.** Other activities at the storage and maintenance facility would include (1) employee shuttle vans, which would use 401 gallons of diesel annually, equivalent to 56 MMBTU; (2) energy use from the use of maintenance trucks, which would use 442 gallons of diesel per year (61 MMBTU annually); (3) and energy use from electric forklifts, which would use 65,650 kWh per year (224 MMBTU annually).

In 2025, the Proposed Project would also result in a reduction in energy use as described below.

- **Reduced Passenger VMT.** Annually, the Proposed Project would replace 38,250,574 net new passenger VMT. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 146,843 MMBTU. Of that total energy use, electricity usage would be reduced by 699,054 kWh, diesel usage by 8,038 gallons, and gasoline usage by 1,152,834 gallons per year.
- **Solar Photovoltaic.** Solar photovoltaic electricity generation on site would reduce the electrical demand at Isabel Station from off-site sources by 1,557,588 kWh annually in 2025 (5,318 MMBTU).

As described above, in 2025 the Proposed Project would reduce energy consumption by approximately 73,163 MMBTU annually compared to 2025 No Project Conditions. However, while energy consumption would be reduced overall, the Proposed Project would increase the amount of electricity and diesel consumed in bus operations (while reducing gasoline consumption by automobiles). While electricity use would increase with the

Proposed Project, this increase represents 0.15 percent of current electricity use in Alameda County. Similarly, diesel use would increase; this increase represents 0.07 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and are not anticipated to require additional capacity. Overall, in 2025, the Proposed Project would decrease per capita energy consumption, decrease reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Thus, in 2025, the Proposed Project would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2025, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2025, the DMU Alternative would result in a net decrease of 34,179 MMBTU annually compared to 2025 No Project Conditions. While energy use from the DMU Alternative would increase by 80,850 MMBTU annually in 2025, this would be offset from reductions in annual energy use of 115,029 MMBTU associated with the reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall decrease in energy use. Table 2 in Appendix I.1 shows the annual estimated change in energy use from the operation of the DMU Alternative in 2025 in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

Sources of energy use for the DMU Alternative include BART operations, DMU operations, bus operations, station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, BART and DMU car maintenance, employee shuttle vans, maintenance truck use, and electric forklift use. Sources are described below in the order presented in Table 3.M-9.

- **BART Car Miles.** Annually, net new BART car miles from operation of BART would increase by 558,771 due to implementation of the DMU Alternative. BART car miles will increase to accommodate riders transferring from the DMU train. Due to this increase, energy use from electricity demand for the operation of BART would be 2,520,059 kWh per year (8,603 MMBTU total).
- **DMU Vehicle Miles.** Annually, net new DMU car miles in 2025 would be 776,400. These new DMU car miles would increase diesel usage by 281,445 gallons and electricity usage by 757,935 kWh per year (41,565 MMBTU annually) in 2025.
- **Bus Miles.** Energy use by buses and net new bus miles traveled under the DMU Alternative are expected to be the same as under the Proposed Project in 2025 (120,505 gallons of diesel annually, or 16,689 MMBTU).

- **Proposed Isabel Station Electricity and Emergency Generators.** Annual energy use from electricity use at the proposed Isabel Station and emergency generator testing and maintenance would be the same as in 2025 for the Proposed Project.
- **Water and Wastewater.** Water use and wastewater treatment would be 3,636,758 gallons per year under the DMU Alternative in 2025. Energy use from water use and wastewater treatment would be 19,678 kWh per year (67 MMBTU annually).
- **Maintenance of BART Cars and DMU Vehicles and Other Maintenance Activities.** Maintenance of BART cars would occur under the DMU Alternative. Due to the number of BART car miles traveled under the DMU Alternative, energy use from the maintenance of BART cars would be 381,558 kWh per year (1,303 MMBTU annually) in 2025. Energy use due to DMU car maintenance would be 530,166 kWh per year (1,810 MMBTU annually). In addition, maintenance of DMU cars would require the use of electric forklifts/maintenance trucks; energy use from maintenance trucks would be 442 gallons of diesel per year (61 MMBTU annually), and energy use from electric forklifts would be 65,650 kWh per year (224 MMBTU annually).

In 2025, the DMU Alternative would also result in a reduction in energy use as described below.

- **Reduced Passenger VMT.** Annually, the DMU Alternative in 2025 would replace 28,578,215 net new passenger VMT. Furthermore, the DMU Alternative would result in reductions of 95,000 VMT per average weekday. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 109,711 MMBTU in 2025. Of that total energy use, electricity usage would be reduced by 522,286 kWh, diesel usage by 6,005 gallons, and gasoline usage by 861,318 gallons per year due to the DMU Alternative in 2025.
- **Solar Photovoltaic.** Solar photovoltaic electricity generation on site would offset the electrical demand at Isabel Station from off-site sources by 1,557,588 kWh annually in 2025 (5,318 MMBTU).

As described above, in 2025, the DMU Alternative would reduce energy consumption by approximately 34,179 MMBTU annually compared to 2025 No Project Conditions. However, while energy consumption would be reduced overall, in 2025, the DMU Alternative would increase the amount of electricity and diesel consumed in DMU and bus operation (while reducing gasoline consumption by automobiles). While electricity use would increase under the DMU Alternative in 2025, this increase represents 0.05 percent of current electricity use in Alameda County. Similarly, diesel use would increase under the DMU Alternative; however, this increase represents 0.24 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and are not anticipated to require additional capacity. In 2025, the DMU Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, the DMU Alternative in 2025 would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2025, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2025, the EMU Option would result in a net decrease of 62,525 MMBTU annually compared to 2025 No Project Conditions. While energy use from the EMU Option would increase by 52,504 MMBTU annually, this would be offset by reductions in annual energy use of 115,029 MMBTU associated with the reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed at the Isabel Station, thus resulting in an overall net decrease in energy use.

Sources of energy use for the EMU Option include BART operations, EMU operations, bus operations, station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, BART and EMU car maintenance, employee shuttle vans, maintenance truck use, and electric forklift use. Sources would be similar to those described above for the DMU Alternative, with the following differences described below in the order presented in Table 3.M-9. Table 3 in Appendix I.1 presents the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **EMU Vehicle Miles.** Annually, new net EMU car miles in 2025 for the EMU Option would be the same amount as the increase in net new DMU car miles for the 2025 DMU Alternative. These new EMU car miles would increase electricity usage by 3,872,106 kWh per year (13,219 MMBTU annually) in 2025.
- **Maintenance of EMU Vehicles.** Energy use due to EMU car maintenance would be 530,166 kWh per year (1,810 MMBTU annually).

In 2025, the EMU Option would also result in a reduction in energy use. The reduction in energy use due to passenger vehicles and solar photovoltaic electricity generation would be the same as for the DMU Alternative described above.

As described above, in 2025, the EMU Option would reduce energy consumption by approximately 62,525 MMBTU annually compared to 2025 No Project Conditions. However, while energy consumption would be reduced overall, in 2025 the EMU Option would increase the amount of electricity and diesel consumed in bus operation (while reducing gasoline consumption by automobiles). While electricity use would increase under the EMU Option, this increase represents 0.08 percent of current electricity use in Alameda County. Similarly, diesel use would increase; however, this increase represents

0.07 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and are not anticipated to require additional capacity. In 2025, the EMU Option would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2025, the EMU Option would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2025, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2025, the Express Bus/BRT Alternative would result in a net decrease of 28,816 MMBTU annually compared to 2025 No Project Conditions. While energy use from the Express Bus/BRT Alternative would increase by 22,461 MMBTU annually, this would be offset by a reduction in annual energy use of 51,277 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall net decrease in energy use.

Sources of energy use for the Express Bus/BRT Alternative include increased BART operations due to increases in ridership, bus operations, water use, wastewater treatment, and BART car maintenance. Sources are described below in the order presented in Table 3.M-9. Table 4 in Appendix I.1 presents the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **BART Car Miles.** Annually, net new BART car miles would increase by 111,839 miles due to implementation of the Express Bus/BRT Alternative in 2025 (BART car miles will increase to accommodate riders transferring from buses). Due to this increase, energy use due to operation of BART would be 504,396 kWh per year (equivalent to 1,722 MMBTU annually).
- **Bus Miles.** Annual net new bus miles traveled under the Express Bus/BRT Alternative are expected to increase by 354,876 per year in 2025. Energy use from bus operation for the 2025 Express Bus/BRT Alternative would be 147,684 gallons of diesel per year (20,453 MMBTU annually).
- **Water and Wastewater.** Water usage under the Express Bus/BRT Alternative in 2025 would be 1,326,426 gallons per year. Energy use related to water use and wastewater treatment would be 7,177 kWh per year (equal to 25 MMBTU).
- **Maintenance of BART Cars.** Maintenance of BART cars would occur under the Express Bus/BRT Alternative. Based on the number of BART car miles traveled under the Express Bus/BRT Alternative, energy use from the maintenance of BART cars would be 76,370 kWh per year (261 MMBTU annually) in 2025.

In 2025, the Express Bus/BRT Alternative would also result in a reduction in energy use, as described below.

- **Reduced Passenger VMT.** Annually, the Express Bus/BRT Alternative would replace 13,357,023 net new passenger VMT. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 51,277 MMBTU per year in 2025. Of that total energy use, electricity usage would be reduced by 244,108 kWh, diesel usage by 2,807 gallons, and gasoline usage by 402,567 gallons per year due to the Express Bus/BRT Alternative in 2025.

As described above, in 2025, the Express Bus/BRT Alternative would reduce energy consumption by approximately 28,816 MMBTU annually compared to 2025 No Project Conditions. However, while energy consumption would be reduced overall, the Express Bus/BRT Alternative would increase the amount of electricity and diesel consumed in bus operation (while reducing gasoline consumption by automobiles). While electricity use would increase in 2025 under the Express Bus/BRT Alternative, this increase represents 0.003 percent of current electricity use in Alameda County. Similarly, diesel use would increase; however, this increase represents 0.09 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and is not anticipated to require additional capacity. In 2025, the Express Bus/BRT Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2025, the Express Bus/BRT Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2025, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2025, the Enhanced Bus Alternative would result in a net increase of 18,031 MMBTU annually compared to 2025 No Project Conditions. Energy use from the Enhanced Bus Alternative would increase by 18,322 MMBTU annually. While there would be a reduction of 291 MMBTU per year associated with the reduced passenger VMT associated with increased BART ridership, this reduction is not enough to completely offset the increase in energy use (18,322 MMBTU) under the Enhanced Bus Alternative, thus resulting in an overall net increase in energy use.

Sources of energy use for the Enhanced Bus Alternative include bus operations and water use and wastewater treatment, as shown in Table 3.M-9. Table 5 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Bus Miles.** Net new bus miles traveled under the Enhanced Bus Alternative are expected to increase by 235,016 per year in 2025. Energy use from bus operation for the Enhanced Bus Alternative would be 132,202 gallons of diesel per year (equivalent to 18,309 MMBTU annually).
- **Water and Wastewater.** Water usage under the Enhanced Bus Alternative in 2025 would be 688,715 gallons per year. Energy use related to water use and wastewater treatment would be 3,727 kWh per year (equal to 13 MMBTU).

In 2025, the Enhanced Bus Alternative would also result in a reduction in energy use.

- **Reduced Passenger VMT.** Annually, the Enhanced Bus Alternative would replace 75,668 net new passenger VMT. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 291 MMBTU per year in 2025. Of that total energy use, electricity usage would be reduced by 1,383 kWh, diesel usage by 16 gallons, and gasoline usage by 2,281 gallons per year due to the Enhanced Bus Alternative in 2025.

As described above, in 2025, the Enhanced Bus Alternative would increase energy consumption by approximately 18,031 MMBTU annually compared to 2025 No Project Conditions. The Enhanced Bus Alternative would increase the amount of diesel consumed in bus operation (while reducing electricity and gasoline consumption by automobiles). While diesel use would increase under the Enhanced Bus Alternative in 2025, this increase represents 0.07 percent of current diesel use in Alameda County. This increase in diesel use would not have an effect on peak and base-period demand for diesel and is not anticipated to require additional capacity.

However, total energy use for the Enhanced Bus Alternative in 2025 would increase. While it would not result in wasteful, inefficient, or unnecessary consumption of energy, the Enhanced Bus Alternative does not incorporate renewable energy and would potentially result in a significant impact with regard to energy conservation. This impact would be reduced with implementation of **Mitigation Measure EN-3,** which requires renewable energy or energy efficiency measures. However, **Mitigation Measure EN-3** would be required to be implemented by bus operators and is not under BART's control. Given the uncertainty of the type of vehicles LAVTA or other bus operators may deploy in the future, the effectiveness of mitigation is uncertain. Accordingly, this impact is conservatively assumed to remain significant and unavoidable. **(SU)**

Mitigation Measures. As described above, in 2025, the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would not result in significant operational impacts related to consumption of energy, and no mitigation measures are required. However, the Enhanced Bus Alternative in 2025 would have potentially significant impacts with regard to energy conservation because total energy use would be increased and this alternative does not incorporate renewable energy measures. **Mitigation Measure EN-3**, which would incorporate renewable energy measures, would reduce impacts. As described above, given the uncertainty of the type of vehicles LAVTA or other bus operators would use in the future, this impact is conservatively assumed to remain significant and unavoidable.

Mitigation Measure EN-3: Incorporate Renewable Energy Features (Enhanced Bus Alternative).

Renewable energy or energy efficiency measures shall be incorporated into building design, equipment use, transportation, and/or other project features. Diesel buses shall be converted to biodiesel-electric or all-electric buses. Solar photovoltaic panels shall be incorporated to the extent feasible.

Impact EN-4: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Project Conditions.

(No Project Alternative: S; Conventional BART Project: B; DMU Alternative: B; Express Bus/BRT Alternative: B; Enhanced Bus Alternative: SU)

The change between 2040 No Project Conditions and 2040 Project Conditions represents the net energy increase or decrease attributed to the Proposed Project or an Alternative. Table 3.M-10 provides a summary of the energy use from the operation of the Proposed Project and Build Alternatives in 2040. Tables 6 through 10 in Appendix I.1 provide detailed estimates for change in energy use from the operation of the Proposed Project and Build Alternatives in 2025, in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

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 in the environment associated with construction of the Proposed Project or any of the Build Alternatives. The purpose of the No Project Alternative analysis under CEQA is to enable decision-makers and the public understand the consequences of not adopting a project. CEQA Guidelines 15126.6(e)(2) provides that the No Project Alternative must include "what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." VMT and associated energy consumption are reasonably expected to increase in 2040 under No Project conditions, consistent with projections based continued regional land use development and planned and programmed transportation improvements.

TABLE 3.M-10 CHANGE IN ANNUAL ENERGY USE UNDER 2040 PROJECT CONDITIONS

	MMBTU				
Energy Use Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	54,843	17,708	17,708	7,387	--
DMU Operations	--	46,190	--	--	--
EMU Operations	--	--	14,664	--	--
Bus Operations	14,671	14,671	14,671	17,980	16,095
Station and Maintenance Operations					
Station Electricity	9,722	9,722	9,722	--	--
Emergency Generators	806	806	806	--	--
Water and Wastewater	101	67	67	25	13
BART Car Maintenance	8,304	2,681	2,681	1,118	--
DMU/EMU Car Maintenance	--	2,014	2,014	--	--
Employee Shuttle Vans	52	--	--	--	--
Maintenance Trucks	58	58	58	--	--
Electric Forklifts	224	224	224	--	--
Subtotal Sources	*88,781*	*94,141*	*62,615*	*26,510*	*16,108*
Reductions					
Passenger Vehicles (Reduced VMT)	-214,996	-124,579	-124,579	-83,313	-7,934
Solar Photovoltaic Electricity Generation	-4,573	-4,573	-4,573	--	--
Subtotal Reductions	*-219,569*	*-129,152*	*-129,152*	*-83,313*	*-7,934*
Total	**-130,788**	**-35,011**	**-66,538**	**-56,803**	**8,174**

Notes: -- = not applicable; VMT = vehicle miles traveled; MMBTU = million British thermal units.
Energy use is shown as the change between 2025 No Project Conditions and 2025 Project Conditions. Positive values represent an increase in energy use and negative values represent a decrease in energy use.
[a] Energy use due to BART Operations is from the additional BART cars needed to support the ridership for each alternative.

Operation of the planned and programmed transportation improvements and continued land use development under the No Project Alternative would consume energy from various sources. At the same time, if the BART Board of Directors selects the No Project Alternative, the reductions in energy use due to the reduced passenger VMT anticipated under the Proposed Project, DMU Alternative, EMU Option, or Express Bus/BRT Alternative (associated with increased transit ridership) would not occur. Therefore, the No Project Alternative is anticipated to result in significant impacts in 2040 related to energy use, without the benefit of VMT reductions attributable to Proposed Project or Build Alternatives off-setting a portion of the VMT growth, as a consequence of BART Board of Directors' decision not to adopt a project. Therefore, the No Project Alternative is considered to have a significant impact related to energy use. **(S)**

Conventional BART Project. In 2040, the Proposed Project would result in a net decrease of 130,788 MMBTU annually compared to 2040 No Project Conditions. While the Proposed Project would increase energy use by 88,781 MMBTU annually, this would be offset by a reduction in annual energy use of 219,569 MMBTU associated with the reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station (reducing the need for off-site energy), thus resulting in an overall net decrease in energy use.

Sources of energy use for the Proposed Project in 2040 would be the same as in 2025. Energy use for the station, emergency generators, and water use and wastewater treatment would be the same for the Proposed Project in 2040 as in 2025. The differences in energy use in 2040 compared to 2025 are described below in the order presented in Table 3.M-10. Table 6 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **BART Car Miles.** For the Proposed Project in 2040, energy use from BART operation and BART car maintenance would increase compared to 2025 due to an increase in net new annual BART car miles. Net new annual BART car miles would be 3,561,913, which is a slight increase compared to 2025 (2,895,844 net new annual BART car miles). This would increase energy use from 44,588 MMBTU in 2025 to 54,843 MMBTU in 2040.
- **Bus Miles.** Bus operations for the Proposed Project would use 105,934 gallons of diesel annually over 2040 No Project Conditions (equivalent to 14,671 MMBTU), which is a decrease of 14,571 gallons of diesel compared to the Proposed Project in 2025. Net new annual VMT are expected to remain the same from 2025 and 2040 for the Proposed Project; however, a more fuel-efficient bus fleet would decrease energy use over time.
- **Maintenance of BART Cars and Other Activities at the Storage and Maintenance Facility.** Energy use from maintenance of BART cars would increase due to more

annual BART car miles traveled. For BART car maintenance, energy use in 2040 would be 8,304 MMBTU annually, an increase from 2025 (6,751 MMBTU). Energy from the use of maintenance trucks would reduce to 416 gallons of diesel per year (58 MMBTU annually). Employee shuttle vans would use 378 gallons of diesel annually, equivalent to 52 MMBTU, which is a reduction from the Proposed Project in 2025 (401 gallons of diesel per year, equivalent to 56 MMBTU).

In 2040, the Proposed Project would also result in a reduction in energy use, as described below.

- **Reduced Passenger VMT.** Net new annual passenger VMT would be reduced even further for the Proposed Project in 2040 compared to 2025 due to increased transit ridership. Energy use for the Proposed Project in 2040 would be reduced by 214,996 MMBTU annually compared to 2040 No Project Conditions, which is an additional reduction of 68,153 MMBTU compared to the Proposed Project in 2025. Of the total energy use, electricity usage would be reduced by 2,621,456 kWh, diesel usage by 12,537 gallons, and gasoline usage by 1,643,157 gallons per year.
- **Solar Photovoltaic.** Solar photovoltaic electricity generation would offset the electrical demand at Isabel Station and decrease the need for off-site electricity by 1,339,617 kWh annually in 2040 (4,573 MMBTU). This is a decrease from 2025 (1,557,588 kWh annually) due to degradation of the solar panels and less efficient electrical generation capability.

As described above, in 2040, the Proposed Project would reduce energy consumption by approximately 130,788 MMBTU annually compared to 2040 No Project Conditions. However, while energy consumption would be reduced overall, the Proposed Project would increase the amount of electricity and diesel consumed in bus operation (while reducing gasoline consumption by automobiles). While electricity use would increase, this increase represents 0.17 percent of current electricity use in Alameda County. Similarly, diesel use would increase under the 2040 Proposed Project; this increase represents 0.06 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and is not anticipated to require additional capacity.

In 2040, the Proposed Project would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040, the Proposed Project would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2040, the DMU Alternative would result in a net decrease of 35,011 MMBTU annually compared to 2040 No Project Conditions. While energy use from the DMU Alternative would increase by 94,141 MMBTU annually, this would be offset by reductions in annual energy use of 129,152 MMBTU associated with reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall decrease in energy use.

Sources of energy use for the DMU Alternative in 2040 would be the same as in 2025. Sources are described below in the order presented in Table 3.M-10. Table 7 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **BART Car Miles.** Annually, net new BART car miles would increase by 1,150,063 due to implementation of the DMU Alternative. BART car miles would increase to accommodate riders transferring from the DMU train. Due to this increase, energy use from electricity demand for the operation of BART would be 5,186,786 kWh per year (17,708 MMBTU total).
- **DMU Vehicle Miles.** Annually, net new DMU car miles in 2040 for the DMU Alternative would be 864,100. These new DMU car miles would increase diesel usage by 313,236 gallons and electricity usage by 823,155 kWh per year (46,190 MMBTU annually) in 2040.
- **Bus Miles.** Energy use by buses and net new bus miles traveled under the DMU Alternative are expected to be the same as under the Proposed Project in 2040 (105,934 gallons of diesel annually, or 14,671 MMBTU).
- **Proposed Isabel Station Electricity, Emergency Generators.** Annual energy use from electricity use at the proposed Isabel Station and emergency generator testing and maintenance would be the same as the Proposed Project in 2040.
- **Water and Wastewater.** Annual energy use from water use and wastewater treatment would be the same as the DMU Alternative in 2025.
- **Maintenance of BART Cars and DMU Vehicles and Other Maintenance Activities.** Due to the number of BART car miles traveled under the DMU Alternative, energy use from the maintenance of BART cars would be 785,322 kWh per year (2,681 MMBTU annually) in 2040. Energy use due to DMU car maintenance would be 590,052 kWh per year (2,014 MMBTU annually). In addition, maintenance of DMU cars would require use of electric forklifts/maintenance trucks; energy use from maintenance trucks would be 416 gallons of diesel per year (58 MMBTU annually), and energy use from electric forklifts would be 65,650 kWh per year (224 MMBTU annually).

In 2040, the DMU Alternative would also result in a reduction in energy use as described below.

- **Reduced Passenger VMT.** Annually, the DMU Alternative in 2040 would replace 42,745,966 net new passenger VMT. Furthermore, the DMU Alternative in 2040 would result in VMT reductions of 142,000 VMT per average weekday. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 124,579 MMBTU in 2040. Of that total energy use, electricity usage would be reduced by 1,518,992 kWh, diesel usage by 7,265 gallons, and gasoline usage by 952,121 gallons per year due to the DMU Alternative in 2040.
- **Solar Photovoltaic.** Solar photovoltaic electricity generation on site would offset the need for electricity from off-site at Isabel Station by 1,339,617 kWh annually in 2040 (4,573 MMBTU).

As described above, the DMU Alternative in 2040 would reduce energy consumption by approximately 35,011 MMBTU annually compared to 2040 No Project Conditions. However, while energy consumption would be reduced overall, the DMU Alternative in 2040 would increase the amount of electricity and diesel consumed in DMU and bus operation (while reducing gasoline consumption by automobiles). While electricity use increases for the DMU Alternative in 2040, this increase represents 0.07 percent of current electricity use in Alameda County. Similarly, diesel use would increase in 2040 under the DMU Alternative; however, this increase represents 0.25 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and is not anticipated to require additional capacity. In 2040, the DMU Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, the DMU Alternative in 2040 would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2040, the EMU Option would result in a net decrease of 66,538 MMBTU annually compared to 2040 No Project Conditions. While energy use from the EMU Option would increase by 62,615 MMBTU annually, this would be offset by reductions in annual energy use of 129,152 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed on the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

Sources of energy use for the EMU Option include BART operations, EMU operations, bus operations, station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, BART and EMU car maintenance, employee shuttle vans, maintenance truck use, and electric forklift use. Sources would be similar to those described above for the DMU Alternative, with the following differences described below in the order presented in Table 3.M-10. Table 8 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **EMU Vehicle Miles.** Annually, net new EMU car miles in 2040 for the EMU Option would be the same as the net new DMU car miles for the DMU Alternative. These new EMU car miles would increase electricity usage by 4,295,131 kWh per year (14,664 MMBTU annually) in 2040.
- **Maintenance of EMU Vehicles.** Energy use due to EMU car maintenance for the EMU Option in 2040 would be 590,052 kWh per year (2,014 MMBTU annually).

In 2040, the EMU Option would also result in a reduction in energy use. The reduction in energy use due to the decrease in VMT for passenger vehicles due to increased BART ridership and the increased solar photovoltaic electricity generation from the Isabel Station installation would be the same as for the DMU Alternative described above.

Net new annual passenger VMT for the EMU Option in 2040 would be the same as under the DMU Alternative in 2040. Associated energy use from passenger vehicles would be the same for the EMU Option in 2040 as for the DMU Alternative in 2040.

As described above, in 2040, the EMU Option would reduce energy consumption by approximately 66,538 MMBTU annually compared to 2040 No Project Conditions. However, while energy consumption would be reduced overall, the EMU Option in 2040 would increase the amount of electricity and diesel consumed in bus operation (while reducing gasoline consumption by automobiles). While electricity use increases in 2040 under the EMU Option, this increase represents 0.11 percent of current electricity use in Alameda County. Similarly, diesel use would increase under the EMU Option in 2040; however, this increase represents 0.06 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and is not anticipated to require additional capacity. In 2040, the EMU Option would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040, the EMU Option would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2040, the Express Bus/BRT Alternative would result in a decrease of 56,803 MMBTU annually compared to 2040 No Project Conditions. While energy use from the Express Bus/BRT Alternative would increase by 26,510 MMBTU annually, this would be offset by a reduction in energy use of 83,313 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall decrease in energy use.

Sources of energy use for the Express Bus/BRT Alternative in 2040 would remain the same as in 2025. Sources are described below in the order presented in Table 3.M-10. Table 9 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **BART Car Miles**. Annually, net new BART car miles would increase by 479,770 due to implementation of the Express Bus/BRT Alternative in 2040. Due to this increase, energy use due to operation of BART in 2040 under the Express Bus/BRT Alternative would be 2,163,762 kWh per year (7,387 MMBTU annually).
- **Bus Miles.** Net new annual bus VMT is expected to remain the same from 2025 and 2040 for the Express Bus/BRT Alternative (354,876 and 16,432, respectively). However, a cleaner and more fuel-efficient bus fleet would decrease energy use.
- **Water and Wastewater.** Energy use due to water usage and wastewater treatment under the Express Bus/BRT Alternative in 2040 would be the same as in 2025 for the Express Bus/BRT Alternative.
- **Maintenance of BART Cars.** Maintenance of BART cars would occur under the Express Bus/BRT Alternative. Based on the number of BAR car miles traveled under the Express Bus/BRT Alternative, energy use from the maintenance of BART cars would be 327,612 kWh per year (1,118 MMBTU annually) in 2040.

In 2040, the Express Bus/BRT Alternative would also result in a reduction in energy use, as described below.

- **Reduced Passenger VMT.** Annually, the Express Bus/BRT Alternative in 2040 would replace 28,586,697 net new passenger VMT. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 83,313 MMBTU per year in 2040. Of that total energy use, electricity usage would be reduced by 1,015,838 kWh, diesel usage by 4,858 gallons, and gasoline usage by 636,738 gallons per year.

As described above, in 2040, the Express Bus/BRT Alternative would reduce energy consumption by approximately 56,803 MMBTU annually compared to 2040 No Project Conditions. However, while energy consumption would be reduced overall, in 2040 the Express Bus/BRT Alternative would increase the amount of electricity and diesel consumed in bus operation (while reducing gasoline consumption by automobiles). While electricity use increases in 2040 under the Express Bus/BRT Alternative, this increase represents 0.01 percent of current electricity use in Alameda County. Similarly, diesel use would increase in 2040 under the Express Bus/BRT Alternative; however, this increase represents 0.07 percent of current diesel use in Alameda County. These increases in electricity and diesel use would not have an effect on peak and base-period demand for electricity or diesel and is not anticipated to require additional capacity. In 2040, the Express Bus/BRT Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040, the Express Bus/BRT Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2040, the Enhanced Bus Alternative would result in a net increase of 8,174 MMBTU annually compared to 2040 No Project Conditions. While there would be a reduction of 7,934 MMBTU per year associated with the reduced passenger VMT associated with increased BART ridership, this reduction is not enough to completely offset the increase in energy use (16,108 MMBTU) under the Enhanced Bus Alternative, thus resulting in an overall net increase in energy use.

Sources of energy use for the Enhanced Bus Alternative in 2040 would be the same as in 2025. Sources are described below in the order presented in Table 3.M-10. Table 10 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Bus Miles.** Energy use from bus operation for the Enhanced Bus Alternative would be 116,216 gallons of diesel per year (equivalent to 16,095 MMBTU annually). Net new bus miles traveled under the Enhanced Bus Alternative are expected to remain the same as in 2025. However, a more fuel-efficient bus fleet would decrease energy use.
- **Water and Wastewater.** Energy use due to water usage and wastewater treatment under the Enhanced Bus Alternative in 2040 would be the same as in 2025.

In 2040, the Enhanced Bus Alternative would also result in a reduction in energy use.

- **Reduced Passenger VMT.** Annually, the Enhanced Bus Alternative would replace 2,722,388 net new passenger VMT. Due to these reductions in passenger vehicle use, energy use from passenger vehicles would be reduced by 7,934 MMBTU annually in 2040. Of that total energy use, electricity usage would be reduced by 96,741 kWh, diesel usage by 463 gallons, and gasoline usage by 60,638 gallons per year due to the Enhanced Bus Alternative in 2025.

As described above, in 2040, the Enhanced Bus Alternative would increase energy consumption by approximately 8,174 MMBTU annually compared to 2040 No Project Conditions. In 2040, the Enhanced Bus Alternative would increase the amount of diesel consumed in bus operation (while reducing electricity and gasoline consumption by automobiles). While diesel use increases in 2040 under the Enhanced Bus Alternative, this increase represents 0.07 percent of current diesel use in Alameda County. This increase in diesel use would not have an effect on peak and base-period demand for diesel and is not anticipated to require additional capacity.

However, total energy use under the Enhanced Bus Alternative in 2040 would increase. While it would not result in wasteful, inefficient, or unnecessary consumption of energy, the Enhanced Bus Alternative does not incorporate renewable energy and would potentially result in a significant impact with regard to energy conservation. This impact would be reduced with implementation of **Mitigation Measure EN-3** above, which requires renewable energy or energy efficiency measures. However, **Mitigation Measure EN-3** would be required to be implemented by bus operators and is not under BART's control. Given the uncertainty of the type of vehicles LAVTA or other bus operators may deploy in the future, the effectiveness of this mitigation measure is uncertain. Accordingly, this impact is conservatively assumed to remain significant and unavoidable. **(SU)**

Mitigation Measures. As described above, in 2040, the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would not result in significant operational impacts related to consumption of energy, and no mitigation measures are required. However, the Enhanced Bus Alternative in 2040 would have potentially significant impacts with regard to energy conservation because total energy use would be increased and this alternative does not incorporate renewable energy measures. **Mitigation Measure EN-3** above, which would incorporate renewable energy measures, would reduce impacts. As described above, given the uncertainty of the type of vehicles LAVTA or other bus operators would use in the future, this impact is conservatively assumed to remain significant and unavoidable.

(b) Operations – Cumulative Analysis

Consistent with CEQA requirements, this Draft EIR considers the direct impacts on energy use of the Proposed Project and Alternatives, together with the effects of past, present, and probable future projects that cause or contribute cumulatively to energy use. For the purposes of the energy conservation analysis, as described in Section 3.A, Introduction to Environmental Analysis, these cumulative projects include both the Isabel Neighborhood Plan and the Dublin/Pleasanton Station Parking Expansion (for the Proposed Project and DMU Alternative) or the Dublin/Pleasanton Station Parking Expansion alone (for the

Express Bus/BRT and Enhanced Bus Alternatives), in addition to the projections provided in Plan Bay Area.[37]

Impact EN-5(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Cumulative Conditions.

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

The change between 2025 No Project Conditions and 2025 Cumulative Conditions represents the net energy increase or decrease attributed to the Proposed Project or an alternative. Table 3.M-11 provides a summary of the energy use from the operation of the Proposed Project and Build Alternatives under 2025 Cumulative Conditions. Tables 11 through 15 in Appendix I.1 provide detailed estimates for change in energy use from the operation of the Proposed Project and Build Alternatives under 2025 Cumulative Conditions, in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

No Project Alternative. As described in **Impact EN-3** above, the No Project Alternative would have no impacts associated with energy use during operations under 2025 Project Conditions. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project. Under 2025 Cumulative Conditions, the Proposed Project would result in a net decrease of 51,659 MMBTU annually compared to 2025 No Project Conditions. While energy use would increase by 78,998 MMBTU annually under Cumulative With Proposed Project, this would be offset by a reduction in annual energy use of 130,657 MMBTU, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under 2025 Cumulative Conditions as for the Proposed Project in 2025, except that energy use associated with passenger VMT would change compared to the Proposed Project in 2025, as described below (see Table 3.M-11). Table 11 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

[37] Association of Bay Area Governments (ABAG), 2013. Plan Bay Area Projections 2013.

TABLE 3.M-11 CHANGE IN ANNUAL ENERGY USE UNDER 2025 CUMULATIVE CONDITIONS

Energy Use Component	MMBTU Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
Sources					
Transit Operations					
BART Operations[a]	44,588	8,603	8,603	1,722	--
DMU Operations	-	41,565	--	--	--
EMU Operations	-	--	13,219	--	--
Bus Operations	16,689	16,689	16,689	20,453	18,309
Station and Maintenance Operations					
Station Electricity	9,722	9,722	9,722	--	--
Emergency Generators	806	806	806	--	--
Water and Wastewater	101	67	67	25	13
BART Car Maintenance	6,751	1,303	1,303	261	--
DMU/EMU Car Maintenance	-	1,810	1,810	--	--
Employee Shuttle Vans	56	--	--	--	--
Maintenance Trucks	61	61	61	--	--
Electric Forklifts	224	224	224	--	--
Subtotal Sources	*78,998*	*80,850*	*52,504*	*22,461*	*18,322*
Reductions					
Passenger Vehicles (Reduced VMT)	-125,339	-83,913	-83,913	-74,897	-33,421
Solar Photovoltaic Electricity Generation	-5,318	-5,318	-5,318	--	--
Subtotal Reductions	*-130,657*	*-89,231*	*-89,231*	*-74,897*	*-33,421*
Total	**-51,659**	**-8,381**	**-36,727**	**-52,436**	**-15,099**

Notes: -- = not applicable; VMT = vehicle miles traveled; MMBTU = million British thermal units.
Energy use is shown as the change between 2025 No Project Conditions and 2025 Project Conditions. Positive values represent an increase in energy use and negative values represent a decrease in energy use.
[a] Energy use due to BART Operations is from the additional BART cars needed to support the ridership for each alternative.

- **Reduced Passenger VMT.** Annually, under 2025 Cumulative Conditions, the Proposed Project would reduce passenger VMT by approximately 32,649,225 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 125,339 MMBTU. This represents an increase in energy use compared to the Proposed Project in 2025 (which would have a reduction of 143,343 MMBTU per year). Of that total energy use, electricity usage would be reduced by 596,686 kWh, diesel usage by 6,861 gallons, and gasoline usage by 984,015 gallons per year due to the Proposed Project in 2025.

As described above, under 2025 Cumulative Conditions, the Proposed Project would reduce energy consumption by approximately 51,659 MMBTU annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the Proposed Project would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, under 2025 Cumulative Conditions, the Proposed Project would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. Under 2025 Cumulative Conditions, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2025 under Cumulative Conditions, the DMU Alternative would result in a net decrease of 8,381 MMBTU annually compared to 2025 No Project Conditions. While energy use would increase by 80,850 MMBTU, this would be offset from a reduction in energy use of 89,231 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2025 Cumulative Conditions as for the DMU Alternative in 2025, except for energy use associated with passenger VMT, as described below (see Table 3.M-11). Table 12 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, under 2025 Cumulative Conditions, the DMU Alternative would reduce passenger VMT by approximately 21,858,079 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 83,913 MMBTU. This represents an increase in energy use from the DMU Alternative in 2025. Of that total energy use, electricity usage would be reduced by 399,471 kWh, diesel usage by 4,593 gallons, and gasoline usage by 658,780 gallons per year due to the DMU Alternative in 2025.

As described above, under 2025 Cumulative Conditions, the DMU Alternative would reduce total energy consumption by approximately 8,381 MMBTU annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the DMU Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, under 2025 Cumulative Conditions, the DMU Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. Under 2025 Cumulative Conditions, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. Under 2025 Cumulative Conditions, the EMU Option would result in a net decrease of 36,727 MMBTU annually compared to 2025 No Project Conditions. While energy use would increase by 52,504 MMBTU, this would be offset by a reduction in energy use of 89,231 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under 2025 Cumulative Conditions as for the EMU Option in 2025, except for energy use associated with passenger VMT. As described above for the DMU Alternative, passenger VMT reductions would be less than under 2025 Project Conditions (see Table 3.M-11). Table 13 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

As described above, under 2025 Cumulative Conditions, the EMU Option would reduce energy consumption by approximately 36,727 MMBTU annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the EMU Option would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, under 2025 Cumulative Conditions, the EMU Option would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. Under 2025 Cumulative Conditions, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. Under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would result in a net decrease of 52,436 MMBTU annually compared to 2025 No Project Conditions. While energy use would increase by 22,461 MMBTU, this would be offset by a reduction in energy use of 74,897 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall decrease in energy use.

All sources of energy use would be the same under 2025 Cumulative Conditions as for the Express Bus/BRT Alternative in 2025, except for energy use associated with passenger VMT, as described below (see Table 3.M-11). Table 14 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would reduce passenger VMT by approximately 19,509,613 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 74,897 MMBTU. This represents a decrease in energy use from the Express Bus/BRT Alternative in 2025. Of that total energy use, electricity usage would be reduced by 356,551 kWh, diesel usage by 4,100 gallons, and gasoline usage by 588,000 gallons per year due to the Express Bus/BRT Alternative in 2025.

As described above, under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would reduce total energy consumption by approximately 52,436 MMBTU. Under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. Under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. Under 2025 Cumulative Conditions, the Enhanced Bus Alternative would result in a net decrease of 15,099 MMBTU annually compared to 2025 No Project Conditions. While energy use would increase by 18,322 MMBTU annually, this would be offset by a reduction in annual energy use of 33,421 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2025 Cumulative Conditions as for the Enhanced Bus Alternative in 2025, except for energy use associated with passenger VMT, as described below (see Table 3.M-11). Table 15 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, under 2025 Cumulative Conditions, the Enhanced Bus Alternative would reduce passenger VMT by 8,705,948 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 33,421 MMBTU. This represents a decrease in energy use from the Enhanced Bus Alternative in 2025. Of that total energy use, electricity usage would be reduced by 159,107 kWh, diesel usage by 1,829 gallons, and gasoline usage by 262,388 gallons per year due to the Enhanced Bus Alternative in 2025.

As described above, under 2025 Cumulative Conditions, the Enhanced Bus Alternative would reduce energy consumption by approximately 15,099 MMBTU annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the Enhanced Bus Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, under 2025 Cumulative Conditions, the Enhanced Bus Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. Under 2025 Cumulative Conditions, the Enhanced Bus Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Mitigation Measures. As described above, under 2025 Cumulative Conditions, the Proposed Project and Alternatives would not result in significant operational impacts related to consumption of energy, and no mitigation measures are required.

Impact EN-6(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Cumulative Conditions.

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

The change between 2040 No Project Conditions and 2040 Cumulative Conditions represents the net energy increase or decrease attributed to the Proposed Project or an alternative. Table 3.M-12 provides a summary of the energy use from the operation of the Proposed Project and Build Alternatives under 2040 Cumulative Conditions. Tables 16 through 20 in Appendix I.1 provide detailed estimates for change in energy use from the operation of the Proposed Project and Build Alternatives in 2040 under Cumulative Conditions, in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

No Project Alternative. As described in **Impact EN-4** above, the 2040 No Project Alternative would have significant impacts associated with energy use during operations because the reductions in energy use due to the reduced passenger VMT anticipated under the Proposed Project or Build Alternatives (associated with increased transit ridership) would not occur. Under 2040 Cumulative Conditions, without the benefit of the Proposed Project or the Build Alternatives, cumulative energy use would be significant and the No Project Alternative would have a cumulatively considerable contribution to energy-related impacts. **(S)**

Conventional BART Project. In 2040 under Cumulative Conditions, the Proposed Project would result in a net decrease of 155,910 MMBTU annually compared to 2040 No Project Conditions. While energy use would increase by 88,781 MMBTU, this would be offset by a reduction in energy use of 244,690 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2040 Cumulative Conditions as for the Proposed Project in 2025, except that energy use associated with passenger VMT would change compared to the Proposed Project in 2040, as described below (see Table 3.M-12). Table 16 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, under the 2040 Cumulative Conditions, the Proposed Project would replace 82,390,212 net new passenger VMT. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 240,117 MMBTU. This represents a further reduction in energy use compared to the 2025 Proposed Project under Cumulative Conditions. Of that total energy use, electricity usage would be reduced by 2,927,763 kWh, diesel usage by 14,002 gallons, and gasoline usage by 1,835,154 gallons per year due to the Proposed Project in 2040.

As described above, in 2040 under Cumulative Conditions, the Proposed Project would reduce total energy consumption by approximately 155,910 MMBTU annually compared to 2040 No Project Conditions. In 2040 under Cumulative Conditions, the Proposed Project would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040 under Cumulative Conditions, the Proposed Project would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040 under Cumulative Conditions, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2040, under Cumulative Conditions, the DMU Alternative would result in a net decrease of 55,933 MMBTU annually compared to 2040 No Project Conditions. While energy use would increase by 94,141 MMBTU, this would be offset by a reduction in energy use of 150,074 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

TABLE 3.M-12 CHANGE IN ANNUAL ENERGY USE UNDER 2040 CUMULATIVE CONDITIONS

	MMBTU				
Energy Use Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	54,843	17,708	17,708	7,387	--
DMU Operations	--	46,190	--	--	--
EMU Operations	--	--	14,664	--	--
Bus Operations	14,671	14,671	14,671	17,980	16,095
Station and Maintenance Operations					
Station Electricity	9,722	9,722	9,722	--	--
Emergency Generators	806	806	806	--	--
Water and Wastewater	101	67	67	25	13
BART Car Maintenance	8,304	2,681	2,681	1,118	--
DMU/EMU Car Maintenance	--	2,014	2,014	--	--
Employee Shuttle Vans	52	--	--	--	--
Maintenance Trucks	58	58	58	--	--
Electric Forklifts	224	224	224	--	--
Subtotal Sources	*88,781*	*94,141*	*62,615*	*26,510*	*16,108*
Reductions					
Passenger Vehicles (Reduced VMT)	-240,117	-145,501	-145,501	-101,106	-25,747
Solar Photovoltaic Electricity Generation	-4,573	-4,573	-4,573	--	--
Subtotal Reductions	*-244,690*	*-150,074*	*-150,074*	*-101,106*	*-25,747*
Total	**-155,910**	**-55,933**	**-87,460**	**-74,596**	**-9,639**

Notes: -- = not applicable; VMT = vehicle miles traveled; MMBTU = million British thermal units.
Energy use is shown as the change between 2025 No Project Conditions and 2025 Project Conditions. Positive values represent an increase in energy use and negative values represent a decrease in energy use.
[a] Energy use due to BART Operations is from the additional BART cars needed to support the ridership for each alternative.

All sources of energy use would be the same under the 2040 Cumulative Conditions as for the DMU Alternative in 2025, except for energy use associated with passenger VMT, as described below (see Table 3.M-12). Table 17 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, in 2040 under Cumulative Conditions, the DMU Alternative would reduce passenger VMT by approximately 49,924,896 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 145,501 MMBTU. This represents decreases in energy use from the 2025 DMU Alternative under Cumulative Conditions. Of that total energy use, electricity usage would be reduced by 1,774,098 kWh, diesel usage by 8,485 gallons, and gasoline usage by 1,112,024 gallons per year due to the DMU Alternative in 2040.

As described above, in 2040 under Cumulative Conditions, the DMU Alternative would reduce total energy consumption by approximately 55,933 MMBTU annually compared to 2040 No Project Conditions.

In 2040 under Cumulative Conditions, the DMU Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040 under Cumulative Conditions, the DMU Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040 under Cumulative Conditions, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2040, under Cumulative Conditions, the EMU Option would result in a net decrease of 87,460 MMBTU annually compared to 2040 No Project Conditions. While energy use would increase by 62,615 MMBTU, this would be offset by a reduction in energy use of 150,074 MMBTU associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the proposed Isabel Station, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2040 Cumulative Conditions as for the EMU Option in 2025, except for energy use associated with passenger VMT. Energy use associated with passenger VMT would be the same as in 2040 under Cumulative Conditions for the DMU Alternative (see Table 3.M-12). Table 18 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

As described above, in 2040 under Cumulative Conditions, the EMU Option would reduce total energy consumption by approximately 87,460 MMBTU annually compared to 2040 No Project Conditions. In 2040 under Cumulative Conditions, the EMU Option would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040 under Cumulative Conditions, the EMU Option would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040, under Cumulative Conditions, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2040, under Cumulative Conditions, the Express Bus/BRT Alternative would result in a net decrease of 74,596 MMBTU annually compared to 2040 No Project Conditions. While energy use would increase by 26,510 MMBTU, this would be offset by a reduction in energy use of 101,106 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2040 Cumulative Conditions as for the Express Bus/BRT Alternative in 2040, except for energy use associated with passenger VMT, as described below (see Table 3.M-12). Table 19 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, under 2040 Cumulative Conditions, the Express Bus/BRT Alternative would reduce passenger VMT by approximately 34,691,838 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 101,106 MMBTU. This represents decreases in energy use compared to the 2025 Express Bus/BRT Alternative under Cumulative Conditions. Of that total energy use, electricity usage would be reduced by 1,232,786 kWh, diesel usage by 5,896 gallons, and gasoline usage by 772,724 gallons per year due to the Express Bus/BRT Alternative in 2040.

As described above, in 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would reduce energy consumption by approximately 74,596 MMBTU annually compared to 2040 No Project Conditions. In 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In

2040 under Cumulative Conditions, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2040 under Cumulative Conditions, the Enhanced Bus Alternative would result in a net decrease of 9,639 MMBTU annually compared to 2040 No Project Conditions. While energy use would increase by 16,108 MMBTU, this would be offset by a reduction in energy use of 25,747 MMBTU associated with the reduced passenger VMT due to increased BART ridership, thus resulting in an overall net decrease in energy use.

All sources of energy use would be the same under the 2040 Cumulative Conditions as for the Enhanced Bus Alternative in 2025, except for energy use associated with passenger VMT, as described below (see Table 3.M-12). Table 20 in Appendix I.1 shows the annual estimated change in energy use in kWh of electricity, gallons of diesel, gallons of gasoline, and total energy (in MMBTU).

- **Reduced Passenger VMT.** Annually, in 2040 under Cumulative Conditions, the Enhanced Bus Alternative would reduce passenger VMT by approximately 8,834,264 miles. Due to the reduction in passenger VMT, energy use from passenger vehicles would be reduced by 25,747 MMBTU. This represents decreases in energy use compared to the 2025 Enhanced Bus Alternative under Cumulative Conditions. Of that total energy use, electricity usage would be reduced by 313,929 kWh, diesel usage by 1,501 gallons, and gasoline usage by 196,774 gallons per year due to the Enhanced Bus Alternative in 2040.

As described above, in 2040 under Cumulative Conditions, the Enhanced Bus Alternative would reduce energy consumption by approximately 9,639 MMBTU annually compared to 2040 No Project Conditions. In 2040 under Cumulative Conditions, the Enhanced Bus Alternative would decrease overall per capita energy consumption, decrease overall reliance on fossil fuels such as coal, natural gas, and oil, and increase reliance on renewable energy sources by incorporating renewable energy and energy efficiency standards and measures. Therefore, in 2040 under Cumulative Conditions, the Enhanced Bus Alternative would not result in a significant adverse impact due to wasteful, inefficient, or unnecessary consumption of energy during project operation. In 2040 under Cumulative Conditions, the Enhanced Bus Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Mitigation Measures. As described above, in 2040 under Cumulative Conditions, the Proposed Project and Build Alternatives would not result in significant operational impacts related to consumption of energy, and no mitigation measures are required. However, in 2040 under Cumulative Conditions, without the benefit of the Proposed Project or the Build Alternatives the No Project Alternative would result in significant impacts related to energy use.

N. PUBLIC HEALTH AND SAFETY

1. Introduction

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

The study area for public health and safety varies in this section as follows:

- An area within a 0.5-mile radius of the collective footprint—the combined footprints of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative was used to identify hazardous materials sites in the vicinity. The 0.5-mile radius is a conservative search for nearby hazardous material sites.
- An area within a 0.25-mile radius of the collective footprint was used to assess potential impacts related to hazardous materials, substances, or waste to schools, consistent with CEQA Guidelines Appendix G.
- An area within a 2-mile radius of the collective footprint was used to assess potential impacts related to public and private airports, consistent with CEQA Guidelines Appendix G;
- The direct collective footprint was used to assess potential impacts related to wildfire, as any potential fires generated at BART-related facilities would occur within the direct footprint;
- An area within 1,000 feet of the collective footprint was used to assess potential impacts from electromagnetic fields (EMFs). An 1,000-foot radius is a conservative study area for EMF impacts related to electrified railways.[1, 2]

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[1] The California High Speed Rail (CHSR) uses a study area of 200 feet from the right-of-way (ROW) for health impacts from EMF and 500 feet from the ROW for electromagnetic interference impacts. A 1,000-foot study area is thus conservative as it captures a greater distance from the ROW than that employed in the CHSR Environmental Impact Report, which is for a train system running on much higher voltage.

[2] California High-Speed Rail Authority, 2014. California High-Speed Train Project Environmental Impact Report/Environmental Impact Statement, Fresno to Bakersfield Section. Chapter 3.5 Electromagnetic Fields and Electromagnetic Interference. April. Available at: http://www.hsr.ca.gov/docs/programs/fresno-baker-eir/final_ERIS_FresBaker_Vol_I_CH3_5_EMI_and_EMF.pdf, accessed May 2017.

This section describes the potential hazards within the study areas for the following topics:

- **Hazardous Materials and Public Health** – Hazardous materials have previously been released into the soil and groundwater at sites near the study area. The potential for exposure to hazardous materials from these past releases during construction and operation could pose a public health and safety risk. In addition, the accidental release of hazardous materials during construction and operation could pose a potential health and safety risk. Both impacts are analyzed in this section. This section also addresses potential historical releases of hazardous materials and current handling of hazardous materials near existing or proposed schools within 0.25-mile of the collective footprint of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative.
- **Airport Safety** – Interference with operational safety of the Livermore Municipal Airport
- **Wildland Fires** – Exposure of people or structures to wildland fire
- **Electromagnetic Fields** – Exposure of people or sensitive equipment to EMFs from train operations
- **BART System Safety** – System safety refers to the prevention of harmful incidents to riders, employees, or other members of the public near proposed operations, structures, or facilities. Potential incidents analyzed in this section include: (1) interference with existing evacuation routes/plans or routes/plans that would be established under the Proposed Project and Build Alternatives; and (2) terrorist activities.

The public health impacts related to air quality are discussed in Section 3.K, Air Quality. An analysis of traffic (automobile, bicycle, and pedestrian) safety can be found in Section 3.B, Transportation.

No comments pertaining to public health and safety were received in response to the Notice of Preparation for this EIR or during the public scoping meeting held for this EIR.

2. Existing Conditions

This subsection describes the existing conditions for public health and safety, including hazardous materials and public health, airport safety, wildland fires, EMF, and BART system safety.

a. Hazardous Materials and Public Health

A hazardous material is any substance that, because of its quantity, concentration, or physical or chemical properties, may pose a hazard to human health and the environment. The California Health and Safety Code (HSC) sets forth some of the California regulations related to hazardous materials management and disposal and defines hazardous materials as follows:

> …a material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. Hazardous materials include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment. (HSC, Division 20, Chapter 6.95, Section 25501(n)).

Under Title 22 of the California Code of Regulations (CCR), the term "hazardous substance" refers to both hazardous materials and hazardous wastes. Hazardous wastes are classified according to the properties of (1) toxicity; (2) ignitability; (3) corrosiveness; and (4) reactivity (CCR Title 22, Chapter 11, and Article 3). Title 22 Sections 66261.1 through 66261.126 identify regulatory requirements for the classification of hazardous wastes. A hazardous material is defined in CCR, Title 22 as:

> A substance or combination of substances which, because of its quantity, concentration, or physical, chemical or infectious characteristics, may either (1) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (2) pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported or disposed of or otherwise managed (CCR, Title 22, Section 66260.10).

California regulations and the HSC define hazardous waste as a waste with properties that make it potentially dangerous or harmful to human health or the environment. They can be the by-products of manufacturing processes, discarded used materials, or discarded unused commercial products, such as cleaning fluids (solvents) or pesticides. Materials can be hazardous waste even if they are not specifically listed or do not exhibit any of the four characteristic of a hazardous waste. For example, "used oil," products and contaminated soil generated from a "clean up" can be hazardous wastes. Common hazardous materials include petroleum hydrocarbons, pesticides, volatile organic compounds, semi-volatile organic compounds, and metals.

The Proposed Project and Build Alternatives would be located adjacent to industrial, commercial, residential, and agricultural areas within Alameda County, and the cities of Dublin, Pleasanton, and Livermore. Industrial facilities, research laboratories, medical centers, dry cleaners, and agricultural uses are located within the study area, and are among the uses that may have resulted in potential soil and groundwater contamination in the vicinity of the collective footprint due to past accidental spills or leaks, intentional dumping, and use of pesticides.

The only hazardous material currently transported for BART within the collective footprint is diesel fuel, which is associated with a diesel-powered emergency generator located at the Dublin/Pleasanton Station. The emergency generator is run periodically for testing and as a backup power supply, and thus, the use of diesel fuel is limited. BART does not currently operate any other hazardous material handling or hazardous waste generating equipment/activities within the collective footprint.

However, the routine transport of hazardous materials and hazardous wastes by other public and private entities occurs along Interstate (I-) 580 and other public and private roadways within the collective footprint.

(1) Environmental Database Search

Searches of various environmental databases were conducted in August 2016, February 2017, and May 2017, pursuant to CEQA Guidelines Appendix G and Government Code Section 65962.5. To be conservative in the impact assessment, these searches also included environmental databases that are not required by law to be included in such searches, but are indicative of known or potential contamination concerns, hazardous material handling and transport, and hazardous waste management. The purpose of the searches was to identify sites within a 0.5-mile radius of the collective footprint (more conservative than solely searching for the collective footprint only) with potential contaminated soil or groundwater or which have been identified in federal, state, or local databases for environmental regulatory compliance (see Table 3.N-1 for a description of the databases).

These database searches included federal, state, and local regulatory databases for sites with potential or known contamination, hazardous materials storage, and hazardous waste generation, including: (1) the National Priorities List (NPL), also known as Superfund sites; (2) the Superfund Enterprise Management System (SEMS) database, formerly known as the Comprehensive Environmental Response, Compensation, and Liability Information System; and (3) lists maintained by the Department of Toxic Substance Control (DTSC), the California Department of Health Services, the State Water Resources Control Board, and the California Department of Resources Recycling and Recovery.

TABLE 3.N-1 ENVIRONMENTAL DATABASE SITES WITHIN THE STUDY AREA

	Number of Sites		
Database[a, b]	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**
Listings With Known or Potential Contamination			
Superfund Enterprise Management System (SEMS)[c]	0	0	0
Superfund Enterprise Management System-Archive (SEMS-Archive)[d]	0	0	1
National Priorities List (NPL)[e]	0	0	0
Corrective Action Report (CORRACTS)[f]	0	0	0
Department of Defense (DOD) Sites[g]	1	1	1
Formerly Used Defense Sites (FUDS) Properties[h]	2	2	1
Emergency Response Notification System (ERNS)[i]	23	23	15
Hazardous Materials Incident Reporting System (HMIRS)[j]	1	1	1
Unexploded Ordinance (UXO)[k]	1	1	1
HIST Cal-Sites (Calsites)[l]	1	1	1
Cortese Hazardous Waste and Substances Sites List (CORTESE)[m]	2	2	2
Hazardous Waste and Substance Site List (HIST CORTESE)[m]	30	32	19
Leaking Underground Storage Tank (LUST)[n]	42	44	23
Spills, Leaks, Investigations and Cleanup (SLIC)[o]	18	21	13
CHMIRS[p]	45	51	21
Military Cleanup Sites Listing (MCS)[q]	1	1	1
Proposition 65 Records (Notify 65)[r]	4	4	2
Deed Restriction Listing (DEED)[s]	1	1	1
State Response Sites (RESPONSE)[t]	2	2	2
EnviroStor Database (ENVIROSTOR)[l]	3	5	6
Listings With Hazardous Material Use and/or Hazardous Waste Generation or Treatment			
Resource Conservation and Recovery Act (RCRA)-Treatment Storage and Disposal Facility (RCRA-TSDF)[u]	0	0	0
RCRA-Large Quantity Generator (RCRA-LQG)[v]	10	10	5
RCRA-Small Quantity Generator (RCRA-SQG)[w]	71	74	39
RCRA–No Longer Regulated (RCRA-NLR)[x]	13	17	14
Toxic Chemical Release Inventory System (TRIS)[y]	1	1	0
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) / Toxic Substances Control Act (TSCA) Tracking System (FTTS)[z]	5	6	3
FIFRA / TSCA Tracking System Administrative Case Listing (HIST FTTS)[z]	3	3	1
Section 7 of FIFRA (SSTS)[aa]	3	5	2
Integrated Compliance Information System (ICIS)[ab]	2	2	2
Polychlorinated Biphenyl Activity Database (PADS)[ac]	1	1	0

TABLE 3.N-1 ENVIRONMENTAL DATABASE SITES WITHIN THE STUDY AREA

	Number of Sites		
Database[a, b]	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**
Material Licensing Tracking System (MLTS)[ad]	1	1	2
Risk Management Plans (RMP)[ae]	2	2	0
Aerometric Information Retrieval System (US AIRS)[af]	1	1	1
Solid Waste Facilities/Landfill Sites (SWF/LS)[ag]	1	1	0
National Pollutant Discharge Elimination System (NPDES)[ah]	55	57	26
Waste Discharge System (WDS)[ai]	10	10	5
Facility Inventory Database (FID UST)[aj]	18	18	6
Active UST Facilities (UST)[aj]	15	15	9
Hazardous Substance Storage Container Database (HIST UST)[aj]	25	26	15
Statewide Environmental Evaluation and Planning System UST Listing (SWEEPS UST)[aj]	35	35	21
Aboveground Petroleum Storage Tank Facilities (AST)[ak]	15	15	8
Drycleaner Facilities (DRYCLEANERS)[al]	5	7	1
Clandestine Drug Labs (CDL)[am]	7	7	4
Facility and Manifest Data (HAZNET)[an]	501	540	311
Emissions Inventory Data (EMI)[ao]	94	101	66
Mines Site Location Listing (MINES)[ap]	1	1	0

Notes:
[a] This table summarizes the results of a database search for facilities located on and within a 0.5-mile radius of the collective footprint; only listings on databases indicative of potential contamination concern, hazardous material use, and hazardous waste generation are included here. This EIR describes and analyzes the bus routes and bus infrastructure improvements, including the Enhanced Bus Alternative, at a programmatic level as described in Chapter 2, Project Description. Bus infrastructure improvements are anticipated to be constructed within existing street rights-of-way (ROW) and a search for listings for the Enhanced Bus Alternative was not conducted.
[b] Listings on databases indicative of certain regulatory compliance matters (e.g., compliance information, manifest records, pesticide application licensing), pointer databases, and Environmental Data Resources proprietary records are not summarized herein.
[c] Known and potentially hazardous waste sites, including those under consideration for inclusion in the NPL.
[d] SEMS-Archive was formerly known as CERCLIS No Further Remedial Action Planned. Archived status indicates the site assessment was completed and the EPA determined the site is not a potential NPL site.
[e] Sites with known or potential releases of hazardous materials and prioritized by the EPA as warranting investigation and/or remediation.
[f] Sites subject to corrective action due to mismanagement of Resource Conservation and Recovery Act (RCRA) hazardous waste.
[g] Federally owned or administered lands administered by the United States Department of Defense that are 640 acres or larger.
[h] Sites where the United States Army Corps of Engineers has conducted or plans to conduct clean up actions.
[i] Releases of oil and other hazardous materials reported to the National Response Center.
[j] Spills of hazardous materials reported to the United States Department of Transportation.
[k] Sites containing unexploded ordnance.
[l] Sites in California with known or potential contamination. ENVIROSTOR replaced the Calsites database. ENVIROSTOR also identifies sites where contamination was identified, but a deed restriction was recorded, allowing the site to be authorized for reuse.
[m] Pointers to sites in California included on the LUST, SWF/LS, and Calsites lists. HIST CORTESE is not updated;

TABLE 3.N-1 ENVIRONMENTAL DATABASE SITES WITHIN THE STUDY AREA

	Number of Sites		
Database[a, b]	Conventional BART Project	DMU Alternative (with EMU Option)	Express Bus/BRT Alternative

current listings are included in the CORTESE database.
[n] Reported releases from underground storage tanks in California.
[o] Sites in California with known or potential contamination due to unauthorized releases.
[p] Spills of hazardous materials reported to the California Governor's Office of Emergency Services.
[q] Military facilities in California where investigation and cleanup is overseen by the State Water Resources Control Board and the United States Department of Defense.
[r] Reported releases in California that could impact drinking water.
[s] Sites in California where a recorded land use restriction was placed to protect the public from unsafe exposure to hazardous materials and waste.
[t] Sites in California with confirmed contamination. Remediation of the listed sites is under DTSC oversight.
[u] Sites authorized to treat, store, or dispose of hazardous waste.
[v] Sites registered for the generation of over 1,000 kilograms of hazardous waste or over 1 kilogram of acutely hazardous waste per month.
[w] Sites registered for the generation of 100 to 1,000 kilograms of hazardous waste per month
[x] Sites formerly registered as RCRA hazardous waste generators, but that do not currently generate RCRA hazardous waste in quantities requiring registration as either a small- or large-quantity generator.
[y] Facilities in certain industry sectors that report releases of toxic chemicals in reportable quantities (where "release" means the chemical is emitted to air, discharged to water, or managed through recycling, energy recovery, and/or treatment).
[z] FTTS and HIST FTTS track administrative cases and enforcement actions related to FIFRA, TSCA, and EPCRA. FTTS includes the past 5 years of records; the HIST FTTS is no longer updated and its records are not generally included in the FTTS.
[aa] Pesticide-producing establishments that submit compliance reports to the EPA.
[ab] Facilities that have been subject to regulatory compliance enforcement and facilities that maintain a National Pollutant Discharge Elimination System permit.
[ac] Registered generators, transporters, commercial stores, and/or brokers and disposers of polychlorinated biphenyls.
[ad] Nuclear Regulatory Commission-licensed sites that maintain or use radioactive materials.
[ae] Facilities that maintain a Risk Management Plan pursuant to federal requirements due to the storage of listed toxic or flammable substances above threshold quantities.
[af] Air emissions compliance data for certain point sources.
[ag] Solid waste disposal facilities and/or landfills in California.
[ah] Sites issued National Pollutant Discharge Elimination System permits for process wastewater and/or stormwater discharges.
[ai] Sites in California authorized to discharge wastes/wastewater to land or surface water (e.g., domestic/municipal wastewater, animal waste solids, industrial process wastewater, stormwater).
[aj] FID UST, UST, HIST UST, and SWEEPS UST list active and/or inactive underground storage tank locations in California. Only the UST database continues to be updated with new information.
[ak] Sites in California registered with aboveground petroleum storage exceeding 1,320 gallons.
[al] Sites registered with the EPA as hazardous waste generators with standard industrial classification codes corresponding to activities that could involve dry cleaning (e.g., power laundries, garment pressing and cleaner's agents, linen supply, industrial launderers).
[am] Illegal drug lab locations in California.
[an] Sites currently or formerly generated hazardous waste in California. Information is extracted from hazardous waste manifests submitted to the DTSC, and thus includes hazardous waste generators that are registered with both the EPA (e.g., RCRA-LQG, RCRA-SQG) and the State of California.
[ao] Sites that report air emissions data to the California Air Resources Board and/or local air pollution control districts.
[ap] Mining locations in California.
Sources: Environmental Data Resources, 2016; Environmental Data Resources, 2017a; Environmental Data Resources, 2017b.

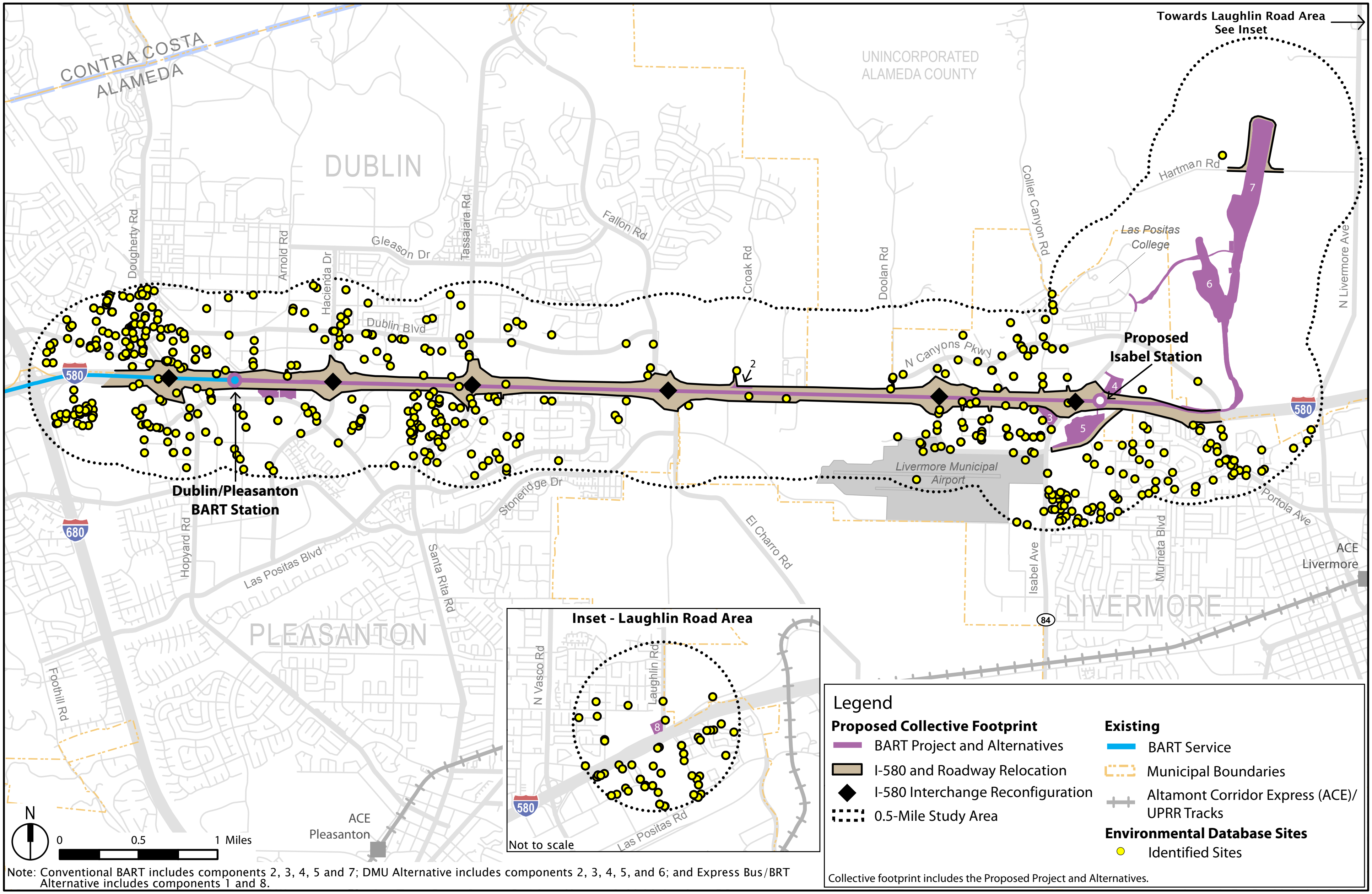
Table 3.N-1 lists the sites identified on environmental databases (both those required pursuant to CEQA Appendix G and others). Table 3.N-1 also distinguishes between those databases related to known or potential contamination (Listings Indicative of Known or Potential Contamination Concerns), such as known contamination as a result of the operation of hazardous waste treatment or solid waste management operations, and those databases related to regulatory compliance (Listings Indicative of Hazardous Material Use and/or Hazardous Waste Generation or Treatment), such as sites registered with the United States Environmental Protection Agency or DTSC for hazardous waste generation or treatment or sites that maintain underground storage tanks. These sites are also shown on Figure 3.N-1.

Only six of the sites listed in Table 3.N-1 are located within the footprints of the Proposed Project or DMU Alternative and five sites are within the Express Bus/BRT Alternative. These sites are summarized in Table 3.N-2 and described below.

TABLE 3.N-2 ENVIRONMENTAL DATABASE SITES WITHIN THE COLLECTIVE FOOTPRINT

	Number of Sites		
Database[a, b]	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**
Listings With Potential or Known Contamination			
Hazardous Materials Incident Reporting System (HMIRS)[c]	5	5	5
Listings With Hazardous Material Use and/or Hazardous Waste Generation or Treatment			
Facility and Manifest Data (HAZNET)[d]	1	1	0

Notes:
[a] This table summarizes the results of a database search for facilities located on and within a 0.5-mile radius of the collective footprint; only listings on databases indicative of potential contamination concern, hazardous material use, and hazardous waste generation are included here. This EIR describes and analyzes the bus routes and bus infrastructure improvements, including the Enhanced Bus Alternative, at a programmatic level as described in Chapter 2, Project Description. Bus infrastructure improvements are anticipated to be constructed within existing street rights-of-way (ROW) and a search for listings for the Enhanced Bus Alternative was not conducted.
[b] Listings on databases indicative of certain regulatory compliance matters (e.g., compliance information, manifest records, pesticide application licensing), pointer databases, and Environmental Data Resources proprietary records are not summarized herein.
[c] Spills of hazardous materials reported to the United States Department of Transportation.
[d] Sites currently or formerly generated hazardous waste in California. Information is extracted from hazardous waste manifests submitted to the DTSC, and thus includes hazardous waste generators that are registered with both the EPA (e.g., RCRA-LQG, RCRA-SQG) and the State of California.
Sources: Environmental Data Resources, 2016. Environmental Data Resources, 2017a. Environmental Data Resources, 2017b.



Source: Arup, 2017; Environmental Data Resources, Inc., 2016, 2017a,b.

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Figure 3.N-1
Public Health and Safety
Sites Identified in Environmental Databases in the Study Area

- Four of the six sites within the collective footprint are listed on the California Hazardous Material Incident Reporting System (CHMIRS) for incidents involving freight vehicles. No additional details are available in the CHMIRS listings regarding the type or volume of material released, but each incident is marked with a completed status, indicating that the incident was cleaned up to the satisfaction of the regulatory authority at that time. Therefore, these four CHMIRS listings are unlikely to present a current contamination concern to the Proposed Project and Build Alternatives. The location of these incidents are as follows:
  - (1) October 13, 1988 – two incidents at westbound I-580 at Hopyard Road, Pleasanton, CA
  - (2) October 13, 1988 – eastbound I-580, 0.25 miles east of Santa Rita Road, Pleasanton, CA
  - (3) September 25, 1990 – westbound I-580 at Hopyard Road, Pleasanton, CA
  - (4) October 14, 1991– eastbound I-580, 0.5 miles East Airway Boulevard, Livermore, CA.
- A fifth site within the collective footprint is listed on the CHMIRS due to a 30-gallon diesel spill on January 19, 2012 from a damaged fuel line on a vehicle (located at I-580 at Santa Rita Road). A date of incident completion is not identified in the CHMIRS. However, because the listing indicates that the spill was contained and cleaned up by a contractor, this spill is unlikely to present a current contamination concern.
- A sixth site is a listing for past hazardous waste generation activity at the BART Park & Ride Lot at 200 East Airway Boulevard in Livermore, within the Isabel South Area(within the Proposed Project and DMU Alternative footprints). A temporary hazardous waste identification number was obtained for off-site management of asbestos containing waste (one shipment each in 1995 and 1996).
- No sites within the collective footprint are identified on databases indicative of current hazardous material use (e.g., underground storage tank registration, wastewater discharges) or hazardous waste generation.

(2) Aerially Deposited Lead

Aerially deposited lead exists along many highways due to emissions from vehicles powered by leaded gasoline. The California Department of Transportation (Caltrans) has identified lead within 30 feet of pavement and within 6 inches to 3 feet below the ground surface. Caltrans reports that aerially deposited lead is generally present in soils above an unrestricted use level (unspecified) and is in the process of entering into an agreement with the DTSC for reuse of soil with total lead concentrations up to 3,200 milligrams per kilogram under certain conditions. Based on the presence of I-580 highway and roads within and adjacent to the Proposed Project and Build Alternatives, it is possible that aerially deposited lead is present.[3]

(3) Sensitive Receptors for Hazardous Materials

For the purposes of the hazardous materials analysis, sensitive receptors are individuals such as children, who are especially vulnerable to exposure to hazardous emissions or handling of hazardous or acutely hazardous materials, substances, or wastes (e.g., in the event of a hazardous material release). One school was identified within 0.25-mile of the collective footprint, as listed in Table 3.N-3. In addition to the school, other sensitive receptors (e.g., residences, daycare facilities, hospitals, recreation areas) are present within 0.25-mile of the collective footprint. For more information about land uses near the project corridor, see Section 3.C, Land Use and Agricultural Resources.

TABLE 3.N-3 SCHOOLS WITHIN 0.25-MILE OF THE COLLECTIVE FOOTPRINT

School Name	Address	Project Component within 0.25-Mile
Livermore Valley Charter (Public School)	3142 Constitution Drive, Livermore, CA 94551	▪ North Canyons Parkway Staging Area (south of the intersection of Airway Boulevard) approximately 460 feet southwest at its nearest point to the school ▪ I-580 relocation at Airway Boulevard (portions of the westbound on-ramps)

Notes:
This table summarizes the results of a database search for schools within 0.25-mile of the collective footprint. This EIR describes and analyzes the bus routes and bus infrastructure improvements, including the Enhanced Bus Alternative, at a programmatic level as described in Chapter 2, Project Description. Bus infrastructure improvements are anticipated to be constructed within existing street rights-of-way (ROW) and a search for listings for the Enhanced Bus Alternative was not conducted.
The information in the table is based on the EDR Offsite Receptor Report which includes a search of information from the National Center for Education Statistics, specifically for public elementary and secondary schools and private schools.
Sources: Environmental Data Resources, 2017c; Environmental Data Resources, 2017d.

b. Airport Safety

The Livermore Municipal Airport is located within approximately 0.35-mile south of I-580 and the collective footprint. The airport is between the Las Positas Golf Course and the Water Reclamation Plant on the west and Isabel Avenue on the east. It is at an elevation of 397 feet above mean sea level.

[3] California Department of Toxic Substances Control, 2016. California Environmental Quality Act Initial Study, Agreement with Caltrans for reuse of aerially deposited lead-contaminated soils. March 21.

The airport has 392 hangars and over 200 tie-down spots that house approximately 505 based aircraft. The airport's tenants consist of 33 percent Livermore residents and 18 percent Pleasanton residents. In 2015, the airport was the 20th busiest airport in California with 117,698 operations. The airport sold 662,262 gallons of fuel in 2015, of which 330,543 gallons were jet fuel. Livermore Municipal Airport serves a large number of corporate clients, including Costco, Safeway, Coca Cola, Chevron, Home Depot, Target, Les Schwab, Dollar General, and Verizon.[4]

The airport is available to pilots 365 days a year and 24 hours a day. However, aircraft operators, especially those operating jet aircraft, are requested by the city of Livermore to adhere to the Livermore Airport Voluntary Restraint from Night Flying Time Period, and refrain from flying between the hours of 10:00 p.m. and 6:00 a.m. to preserve quiet time for its neighbors. A total of 594 noise complaints were registered in 2015 (75.6 percent of which originated from Pleasanton households, 23.7 percent from Livermore households, and less than 1 percent by Dublin, San Ramon, or Danville residents).[5]

The Livermore Municipal Airport Land Use Compatibility Plan (ALUCP) identifies a number of different zones around the Livermore Municipal Airport that are defined to ensure that surrounding land uses are compatible with airport activities. The zones include, but are not limited to, the Airport Safety Zone, which encompasses an airport clear zone; an approach zone; and the Airport Protection Area (APA), wherein increased residential development is prohibited. The Livermore Municipal Airport is also currently designated an APA by the city of Livermore to encourage noise-compatible land uses around the airport. As shown in Figure 3.N-2, the APA is rectangular in shape and extends from the airport runways 5,000 feet to the north, south, and east towards Livermore and 7,100 feet to the west towards Pleasanton. The APA policy prohibits new residential uses within the APA boundary.[6] The ALUCP, the Airport Safety Zone, and APA of the Livermore Municipal Airport are described in more detail under Regulatory Framework below.

c. Wildland Fires

The San Francisco Bay Area experiences extended, dry summers with high wildland fire hazards. The risk of wildfire hazard depends on a combination of factors including winds, temperatures, humidity levels, rainfall quantity, and fuel moisture content. Steep slopes also contribute to fire hazard by intensifying the effects of wind and making fire suppression difficult.

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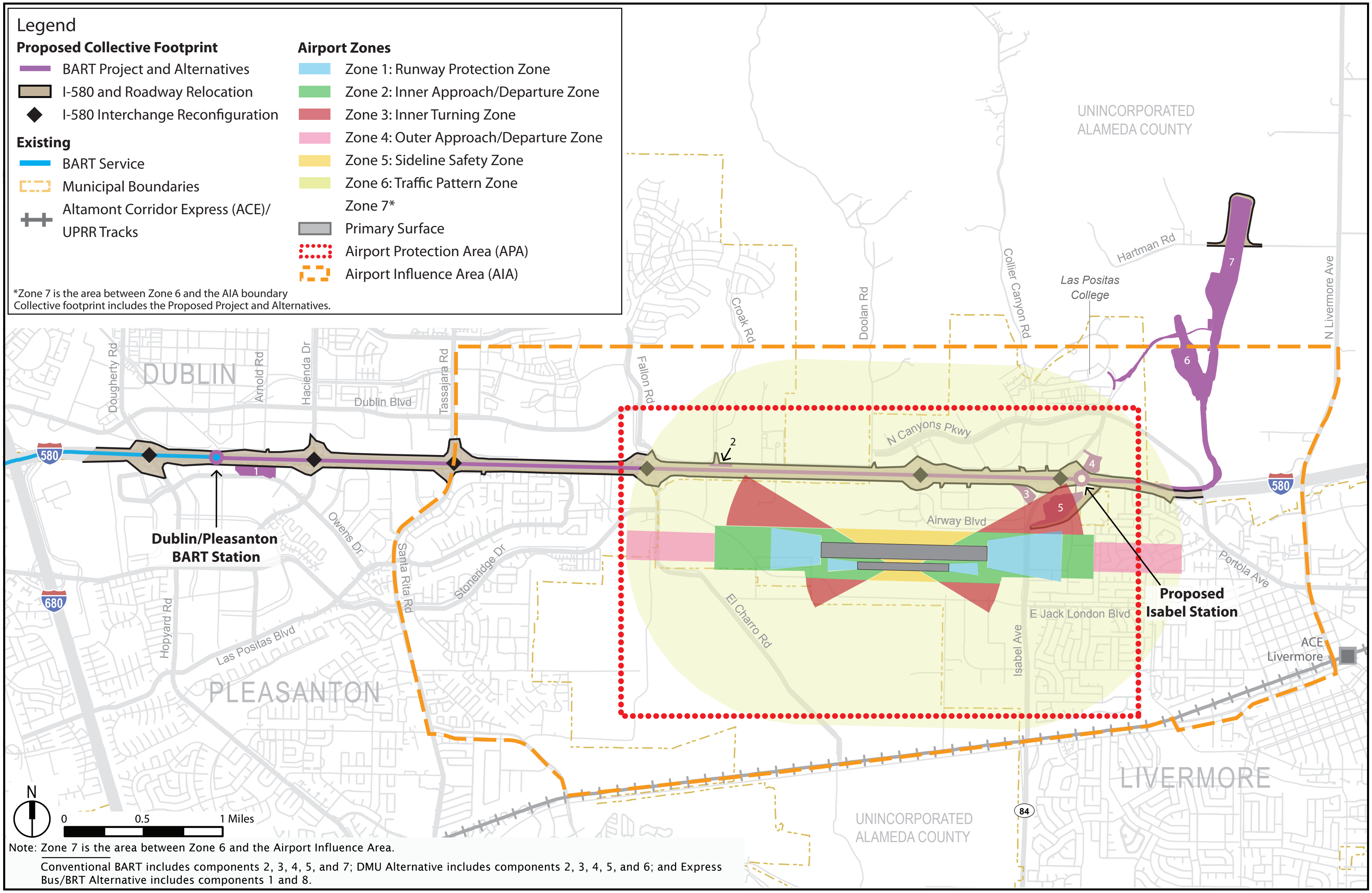
[4] City of Livermore, 2015. Livermore Airport Synopsis. Available at: http://www.cityoflivermore.net/civicax/filebank/documents/14368.

[5] Ibid.

[6] City of Livermore. 2004. City of Livermore General Plan: 2003–2025.



Source: Arup, 2017; Alameda County Airport Land Use Commission, 2012.

BART to Livermore Extension Project EIR

Figure 3.N-2
Public Health and Safety
Livermore Municipal Airport Zones

To quantify this potential risk, the California Department of Forestry and Fire Protection (CAL FIRE) has developed a fire hazard severity scale that uses three criteria to evaluate and designate potential fire hazards in wildland areas. These criteria include the following: 1) fuel loading from vegetation; 2) fire weather from winds, temperatures, humidity levels and fuel moisture contents; and 3) topography. The designations for fire hazard severity are moderate, high, and very high. CAL FIRE's designations are limited to areas of state or federal responsibility. Within the study area, the state responsibility areas are generally located in unincorporated Alameda County.

Areas of local responsibility are not designated by CAL FIRE. These areas within the local responsibility area have been analyzed for fire hazard by the United States Forest Service (USFS), which has also developed a wildland fire map.[7] The USFS designations range from water, non-burnable, very low, low, moderate, high, and very high. Areas designated as non-burnable are those areas that are heavily urbanized and do not pose a wildland fire potential. Areas with higher fire severity have fuels, such as continuous brush, downed vegetation or small trees, with high probability of experiencing torching, crowning, and other forms of extreme fire behavior under conductive weather conditions.[8]

Areas along the project corridor that are within CAL FIRE's state responsibility area are as follows and shown in Figure 3.N-3:

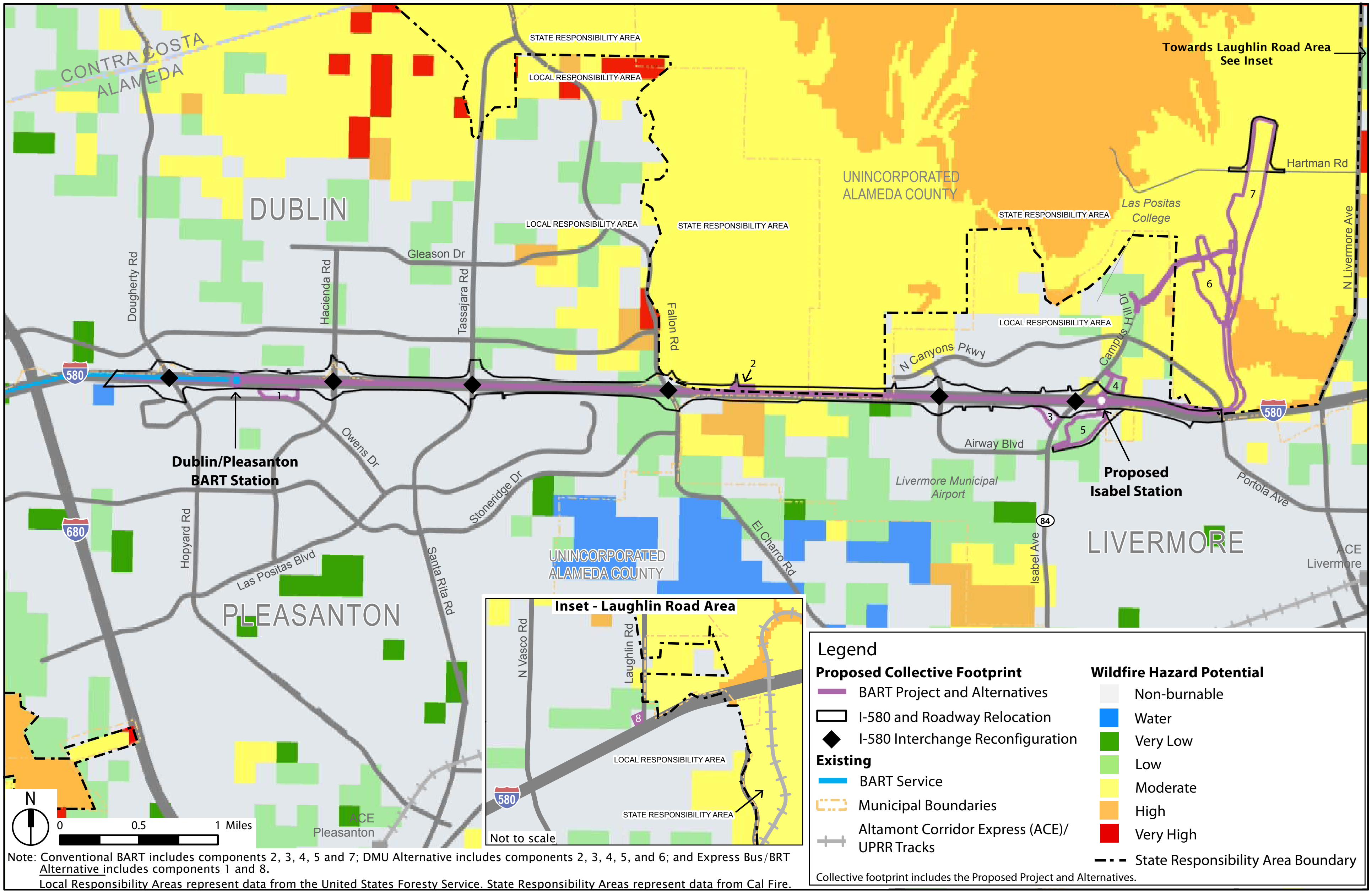
- I-580 Corridor Area – the northern portion of I-580 from Fallon Road/El Charro Road to Doolan Road is designated moderate fire severity
- Cayetano Creek Area – primarily located within a moderate designation with some areas of high severity

The majority of the collective footprint is not within CAL FIRE's designated state responsibility zone. These areas are designated with wildfire hazard potential as follows:

- Dublin/Pleasanton Station Area – generally designated as non-burnable with a few areas of low wildfire hazard potential
- I-580 Corridor Area – the western portion of the corridor is generally designated as non-burnable, while areas along the eastern portion are designated as low, moderate, and high wildfire hazard potential

[7] United States Forest Service, 2014. Wildfire Hazard Potential. December, Available at: https://www.arcgis.com/home/item.html?id=fc0ccb504be142b59eb16a7ef44669a3, accessed January 30, 2017.

[8] Crowning consists of fires which burn through the top layer of foliage on a tree, known as the canopy or crown fires. Conductive weather conditions are those conditions that could potentially start wildfire, such as warm and dry weather.



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.
Local Responsibility Areas represent data from the United States Foresty Service. State Responsibility Areas represent data from Cal Fire.

Source: Arup, 2017; USFS, 2014; CAL FIRE, 2008.

BART to Livermore Extension Project EIR

Figure 3.N-3
Public Health and Safety
Wildfire Hazard Potential

- Isabel North Area – primarily designated as low and moderate potential
- Isabel South Area – primarily designated as low potential
- Laughlin Road Area – primarily non-burnable with areas of low wildfire hazard potential

d. Electromagnetic Radiation and Electromagnetic Fields

This subsection defines electromagnetic radiation (EMR) and EMF and identifies typical sources for it, and describes the characteristics of EMF, sources of background EMF, and types of sensitive receptors.

(1) Definition and Sources of EMF

EMR is the electric and magnetic field that results from the motion of an electric charge (i.e., electricity). EMF is the electric and magnetic field that is measured as the sum of all EMR contributed from different sources at a specific frequency at a particular location. The terms EMF and EMR are often used interchangeably. If there is only one EMR source, then the EMF is equal to the EMR.

In general, anything that generates, transports, or uses electricity will emit EMF. The higher the voltage and power, the more powerful the electric and magnetic fields that are created. The largest contributor to static magnetic field is the Earth itself, and this magnetic field is what is used by compasses to detect direction. The second largest contributor of EMF is the electric and magnetic fields from power lines. Other major contributors to EMF are radio and television stations, cell phone towers, and radar stations.

The values for magnetic fields are typically expressed in tesla (T) or Gauss (G) and electric fields are expressed in volts per meter (V/m). For both values, the prefixes milli (m), or 1 thousandth, and micro (µ), or 1 millionth, are typically used. Example magnetic field strengths for everyday electrical appliances and other environmental sources are shown in Table 3.N-4.

EMF can be categorized into two groups, non-ionizing and ionizing frequencies. As shown in Figure 3.N-4, ionizing frequencies (i.e., shorter wavelengths) include x-rays and gamma rays and are considered harmful because the radiation is so powerful that it can change (i.e., ionize) living cell structure. Non-ionizing frequencies are considered relatively harmless within certain power limits. If the power limits are exceeded, living cells can be heated and eventually change structure. The frequencies emitted by electric trains are extremely low frequency, and are therefore considered non-ionizing.

TABLE 3.N-4 EXAMPLE MAGNETIC FIELD STRENGTHS

	Magnetic Field Strength	
Electrical Appliance	**(mG)**	**(μT)**
Copy Machines	40	4
Hair Dryers	70	7
Electric Shavers	100	10
Can Openers	300	30
Coffee Makers	1	0.1
Food Processors	20	2
Microwave Ovens	200	20
Mixers	100	10
Refrigerators	20	2
Washing Machines	30	3
Vacuum Cleaners	200	20

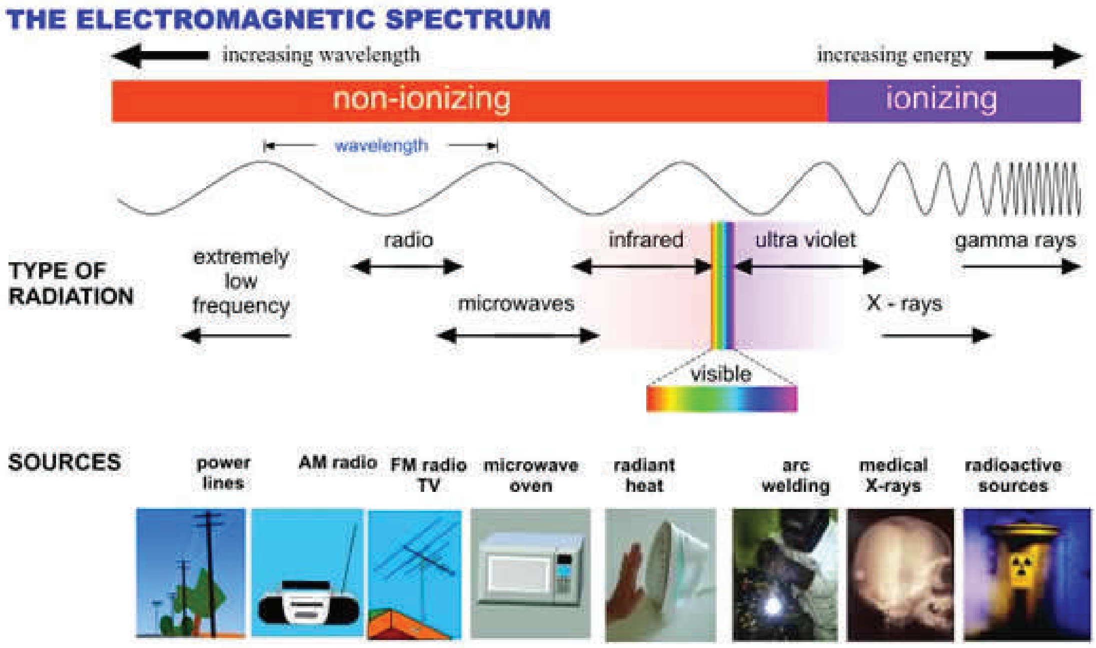
Notes: mG = milligauss; μT = microtesla. Magnetic field strength is provided at a distance of 1 foot from the source.
Source: National Institute of Environmental Health Sciences. National Institutes of Health, 2002.

(2) Characteristics of EMF

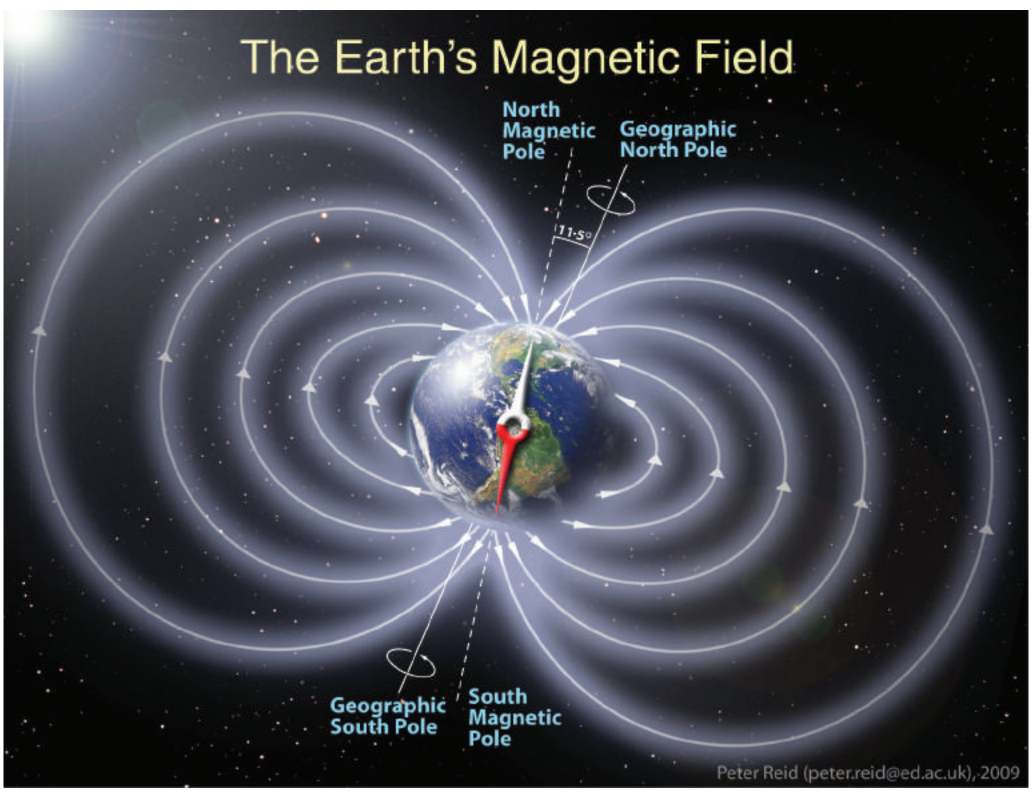
Electric current can either be direct current (DC) or alternating current (AC). In DC electricity, electrons flow in one direction. A common example of a source of DC electricity is a battery. BART trains receive their power through DC electricity. DC electricity emits EMF with magnetic and electric poles in a constant position.

In AC electricity, the flow of electrons reverses direction at a regular frequency. A common example of a source of AC electricity is electricity delivered to businesses and residences. In the U.S., electricity is delivered at 60 hertz (Hz) (i.e., the direction of the current switches back and forth 60 times per second). The traction motors on BART operate on AC power. AC also emits EMF; however, under AC, the magnetic or electric poles swap position according to the frequency.

Electromagnetic Spectrum



The Earth's Magnetic Field



Source: Peter Reid/NASA, 2009; ARPANSA, 2017.

In measuring any source's magnetic field, it is important to consider the Earth's static magnetic field. Figure 3.N-4 shows the Earth's static magnetic field, including the Magnetic North Pole and the Magnetic South Pole. Between the two magnetic poles are lines representing the Earth's magnetic fields. The magnetic field emitted by a source of EMF can be in any direction, compared to the Earth's magnetic direction and this direction affects the total EMF attributable to a source. For example, if a source's magnetic north pole aligns with the Earth's Magnetic North Pole, the strength of the magnetic fields will be additive. However, if the source's magnetic north pole matches the direction of the Earth's Magnetic South Pole, the source's magnetic field will be subtracted from the Earth's magnetic field. Because the strength of the Earth's magnetic field is relatively constant at a particular location, the relevant measurable EMF from a source for impact analysis is the change in magnetic field.

(3) Background EMF

Within the project corridor, the only source of background EMF at 0 Hz is the Earth itself. The magnetic field associated with Earth is approximately 50 microtesla (μT) in the San Francisco Bay Area.[9] The traction motors on the BART cars operate at frequencies between 35 to 700 Hz, depending on car type, and can potentially emit EMF from all frequencies in this span. Background sources of EMF in this frequency range can include power transmission lines and electrical appliances, both operating at 60 Hz. Other background sources of EMF include antennas associated with cellular telephone towers and broadcast towers for radio and television. However, these sources of EMF operate at higher frequencies than 700 Hz and are therefore not considered in this study.

(4) Sensitive Receptors for EMF

For the purposes of the EMF analysis, sensitive receptors are populations that may be exposed to EMF, including passengers waiting at the platform, passengers riding in BART or EMU cars, and the general population near the BART third rail or EMU catenary line. Individuals with cardiac pacemakers and similar electronic medical devices may be more sensitive to exposure to EMF. In addition to the potential impacts on people, certain sensitive equipment can be impacted by EMF. Sensitive equipment typically can be found at hospitals (e.g., MRI-scanners) and research universities (e.g., electron microscopes).

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[9] A magnetic field of 50 μT was measured in the San Jose area for the Silicon Valley Rapid Transit Corridor report. Given the relative proximity between the study areas for the Silicon Valley Rapid Transit Corridor and the BART to Livermore Extension Project, the magnetic field is assumed to have roughly equal values in both areas.

Valley Transportation Authority, 2004. Silicon Valley Rapid Transit Corridor Draft EIS/EIR. Available at: http://www.vta.org/sfc/servlet.shepherd/document/download/069A0000001EL1vIAG, accessed May 2017.

Within the study area for EMF (within 1,000 feet of the collective footprint) there is one medical facility—the John Muir Health Urgent Care Center (5860 Owens Drive, Pleasanton).[10] This facility is approximately 800 feet south of the proposed rail line for the Proposed Project and DMU Alternative. Although not within the study area, the Sutter Health Palo Alto Medical Foundation (4000 and 4050 Dublin Boulevard, Dublin) is approximately 1,100 feet north of the collective footprint.

e. BART System Safety

System safety refers to the prevention of harmful incidents to riders, employees, or other members of the public near proposed operations, structures, or facilities associated with the Proposed Project and Build Alternatives. BART is responsible for ensuring that emergency plans, described in the Regulatory Framework subsection below, are in place to respond to a terrorist event within the BART system and is responsible for law-enforcement within its system, as well as coordination with other law enforcement agencies. Emergency plans outline procedures to ensure coordination with local jurisdictions in evacuating areas and notifying BART and emergency response personnel.

3. Regulatory Framework

The following section describes the federal, state, and local environmental laws and policies relevant to public health and safety, organized by topic below.

a. Hazardous Materials and Public Health

Various federal, state, and local agencies exercise regulatory authority over the safe use, generation, transport, and disposal of hazardous substances. The primary federal regulatory agency is the United States Environmental Protection Agency (EPA). The primary state agency with similar authority and responsibility is the California Environmental Protection Agency (Cal EPA), which may delegate enforcement authority to other local agencies with which it has agreements. Construction activities are also subject to the regulations noted below for soil and groundwater contamination.

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[10] The EMF Study Area is defined as 1,000 feet from the collective footprint. The California High Speed Rail (CHSR) uses a study area of 200 feet from the right-of-way (ROW) for health impacts from EMF and 500 feet from the ROW for electromagnetic interference impacts. A 1,000-foot study area is thus conservative as it captures a greater distance from the ROW than that employed in the CHSR Environmental Impact Report.

Source: California High-Speed Rail Authority, 2014. California High-Speed Train Project Environmental Impact Report/Environmental Impact Statement, Fresno to Bakersfield Section. Chapter 3.5 Electromagnetic Fields and Electromagnetic Interference. April. Available at: http://www.hsr.ca.gov/docs/programs/fresno-baker-eir/final_ERIS_FresBaker_Vol_I_CH3_5_EMI_and_EMF.pdf, accessed May 2017.

(1) Federal Comprehensive Environmental Response, Compensation, and Liability Act/Superfund Amendments and Reauthorization Act

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also called the Superfund Act (42 United States Code Section 9601 et seq.), is intended to protect human health and the environment from sites contaminated with hazardous materials. Under CERCLA, the EPA has the authority to do the following: respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment; establish requirements concerning closed and abandoned hazardous waste sites; seek the parties responsible for hazardous materials releases; and ensure their cooperation in site remediation. CERCLA also provides federal funding (the Superfund) for the remediation of contaminated sites. The Superfund Amendments and Reauthorization Act of 1986 (SARA) amends some provisions of CERCLA and provides for a Community Right-to-Know Program, which is regulated in California under the more stringent Hazardous Materials Business Plan (HMBP) regulations.

Pursuant to CERCLA, the EPA maintains the NPL, which prioritizes sites warranting further investigation; such sites are identified for listing based on the EPA's hazard ranking system. As shown in Table 3.N-1, there are no active SEMS (formerly known as CERCLIS) or NPL sites within 0.5-mile of the Proposed Project and DMU Alternative footprints. However, there is a SEMS-Archive (formerly known as CERCLIS-No Further Remedial Action Planned) site located within 0.5-mile of the Express Bus/BRT Alternative footprint (Nuclepore Corp, located at 7035 Commerce Circle in Pleasanton) with no further remedial action planned status. A listing of an off-site location on the SEMS-Archive does not present a current contamination concern to the BART to Livermore Extension Project.

(2) Federal Resource Conservation and Recovery Act and California's Hazardous Waste Regulations

The Federal Toxic Substances Control Act (1976) and the Resource Conservation and Recovery Act (RCRA) of 1976 (40 Code of Federal Regulations [CFR] Parts 239 through 282) are the federal regulatory framework governing the generation, transportation, treatment, storage, and disposal of hazardous waste to ensure waste handling is controlled from the point of generation to its ultimate disposal. The EPA authorized the state to implement its more stringent hazardous waste regulations in lieu of RCRA. RCRA was amended in 1984 by the Hazardous and Solid Waste Amendments (40 CFR Part 260), which affirmed and extended the "cradle to grave" system of regulating hazardous wastes. A RCRA hazardous waste is a waste that appears on one of the four hazardous wastes lists (F-list, K-list, P-list, or U-list), or exhibits at least one of four characteristics—ignitability, corrosivity, reactivity, or toxicity.

Under RCRA, states may implement their own hazardous waste programs so long as they are at least as stringent as the federal RCRA requirements. California's DTSC administers and enforces the state's more stringent hazardous waste regulations under the Hazardous Waste Control Act of 1972 (HSC Division 20, Chapter 6.5). This law defines hazardous wastes and the procedures for the handling, transportation, and disposal of hazardous waste. The implementing regulations prescribe management practices for hazardous wastes; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous wastes that cannot be disposed of in landfills. Hazardous waste is tracked from the point of generation to the point of disposal or treatment using hazardous waste manifests. The hazardous waste control program is administered by DTSC and by local Certified Unified Program Agencies (CUPAs). California's Hazardous Waste Regulations (22 CCR Sections 66260.1 et seq.) provide the regulatory requirements for the implementation of the law. Numerous federally registered hazardous waste generators were identified within 0.5-mile of the collective footprint (see RCRA-LQG and RCRA-SGQ database listings in Table 3.N-1). Additionally, the HAZNET database identified hundreds of facilities that have generated and shipped hazardous waste under manifest (includes facilities that currently or formerly maintained state hazardous waste identification numbers) within 0.5-mile of the collective footprint. Of the listings related to registered hazardous waste generators, only one site was identified within the collective footprint—at the BART Park & Ride Lot (200 East Airway Boulevard, Livermore).

Operations of the Proposed Project and Build Alternatives that would entail use of hazardous waste (e.g., oily debris, equipment wash water, spent solvents) would be required to obtain a hazardous waste identification number and meet hazardous waste generator requirements.

(3) Federal Accidental Release Prevention Program and California Accidental Release Prevention Program

The Federal Risk Management Program (Clean Air Act Section 112(r)), the Federal Accidental Release Prevention Program (40 CFR 68) and the more stringent California Accidental Release Prevention Program (CalARP, 19 CCR Sections 2735 et seq.) require development of a Risk Management Plan if listed toxic or flammable substances (e.g., anhydrous ammonia, chlorine, ethane, formaldehyde, hydrogen, nitric acid, vinyl chloride) are stored in excess of substance-specific threshold quantities. The purpose of these programs is to prevent accidental releases of substances that could cause serious harm to the public and the environment and to minimize impacts from an accidental release. The EPA implements the federal Accidental Release Prevention program while local CUPAs, discussed below, implement the CalARP. Any business where the maximum quantity of a regulated substance exceeds the specified threshold must register with the county health department as a manager of regulated substances. Operations of the Proposed Project and Build Alternatives that would entail use of hazardous materials (e.g., cleaners, solvents) that are listed regulated substances under the federal or state regulations would be subject to these requirements.

(4) Federal Spill Prevention, Control, and Countermeasure Regulations and California's Aboveground Petroleum Storage Act

The Oil Pollution Act of 1990 (33 United States Code [U.S.C.] section 2701-2761) amended the Clean Water Act and established a single uniform federal system of liability and compensation for damages caused by oil spills in navigable waters, defined as waters of the United States. The Federal Spill Prevention, Control, and Countermeasure (40 CFR 112) (SPCC) regulations were first published in 1973 and were amended in 1990, 2002, and 2009. These regulations require that a SPCC plan must be prepared for facilities with a total aboveground oil storage capacity greater than 1,320 gallons (applies to containers that are 55-gallon and larger) or a total underground oil storage capacity greater than 42,000 gallons and if, due to its location, the facility could reasonably be expected to discharge oil into or upon the "navigable waters" of the United States. The purpose of an SPCC plan is to prevent release of oil and contain discharges.

The California Aboveground Petroleum Storage Act (APSA) (19 CCR section 2620-2734) regulates aboveground storage tanks (defined as containers that have a capacity to store 55 gallons or more of petroleum product and that are substantially or totally above the surface of the ground). The APSA requires reporting of any spill or leak in excess of one barrel. The state implements this program through the Unified Program administered by the CUPAs, discussed further below. BART would be required to prepare and implement a SPCC plan and meet APSA notification filing requirements to comply with the regulatory requirements for any operational activities that entail use of oils (e.g., diesel fuel) stored in aboveground containers in quantities exceeding the SPCC and APSA filing thresholds (each 1,320 gallons).

(5) Hazardous Materials Release Response Plans and Inventory Act of 1985/Business Plan Act

The Hazardous Material Release Response Plans and Inventory Act, also known as the Business Plan Act, (HSC Division 20, Chapter 6.95, Sections 25500 et seq. and 19 CCR Sections 2729, et seq.) requires any business that handles a hazardous material or mixture containing a hazardous material in reportable quantities to establish and implement a HMBP that describes their facilities, inventories, emergency response plans, and training programs. Specifically, the regulations require facilities that store hazardous materials in excess of 500 pounds for a solid, 55 gallons for a liquid, or 200 cubic feet for a gas at standard temperature and pressure to submit HMBPs to the CUPA. The HMBP includes general business information, a hazardous materials inventory, a training plan, and emergency/contingency response procedures.

BART would be required to establish and implement a HMBP for any operations that would entail use of hazardous materials (e.g., diesel fuel, cleaners, solvents) above reportable quantities.

(6) Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program)

Senate Bill 1082 of 1993 (HSC Chapter 6.11) required the Secretary of the Cal EPA to establish a "unified hazardous waste and hazardous materials management" regulatory program (Unified Program) by January 1, 1996. Currently, there are 83 Certified Unified Program Agencies in California. All counties have been certified by the Secretary.

The following Unified Programs are administered within each CUPA's geographic jurisdictional boundary: the Hazardous Materials Release Response Plan and Inventory Program (Business Plan), the CalARP, the hazardous waste generator and onsite hazardous waste treatment program (tiered permitting system), the Aboveground Storage Tank program (and its SPCCs), the underground storage tank program and the California Uniform Fire Code (UFC), and Hazardous Material Inventory Statement (HMIS). The Alameda County Department of Environmental Health coordinates and enforces the Unified Program within its jurisdiction, which includes the city of Dublin and unincorporated areas of Livermore and Pleasanton. In the cities of Livermore and Pleasanton, the Livermore-Pleasanton Fire Department is the CUPA, enforcing the Unified Program within its geographic boundary.

(7) Alameda County Water District

At sites where groundwater quality is threatened, the Alameda County Water District (ACWD) works with the San Francisco Bay Regional Water Quality Control Board (RWQCB) to oversee and provide guidelines for the investigation and cleanup of contaminated sites within the ACWD's jurisdiction. The ACWD provides technical oversight of cleanup sites within their jurisdiction, and submits closure recommendations to the RWQCB when regulatory closure is anticipated. The RWQCB and the ACWD sign off on regulatory closure.

(8) Federal Occupational Safety and Health Act and California Occupational Safety and Health Administration Standards

Under the authority of the Occupational Safety and Health Act of 1970 (29 U.S.C. 651-678), the Occupational Safety and Health Administration (OSHA), a division of the Department of Labor, established health and safety standards for the workplace, including the accidents and occupational injuries reporting requirements. Relevant regulations include those related to hazardous materials handling, communication of hazards to employers and employees, employee protection requirements, first aid, and fire protection, as well as material handling and storage.

The California Occupational Safety and Health Administration (Cal/OSHA) is the primary agency responsible for worker safety in the handling and use of chemicals in the workplace. Cal/OSHA standards are generally more stringent than federal regulations. Worker exposure to hazardous materials as well as contaminated soils, vapors, and groundwater may be subject to medical monitoring and personal protective equipment requirements that are established in Title 8 of the CCR. The employer is required to monitor worker exposure to listed hazardous substances and notify workers of exposure (8 CCR Sections 337-340). Workers must be provided with employee training and hazardous material exposure warnings, including safety data sheets for hazardous materials handled by the worker. The primary intent of these regulations is to protect workers, but compliance with some of these regulations also would reduce potential hazards to non-workers because required site monitoring, reporting, and other controls would be in place. Workers who are in direct contact with soil or groundwater containing hazardous levels of constituents are required to perform all activities in accordance with a site-specific health and safety plan.

b. Airport Safety

Portions of the Proposed Project and Build Alternatives would be located in the vicinity of the Livermore Municipal Airport, which is depicted in Figure 3.N-2. Applicable airport policies and regulations are described below.

(1) Federal Aviation Administration Regulations Part 77 – Safe, Efficient Use, and Preservation of the Navigable Airspace

The Federal Aviation Administration (FAA) regulates aviation at regional, public, private, and military airports. The FAA has established baseline standards for determining what projects are subject to review and what constitutes an obstruction for navigable airspace in 14 CFR Part 77 (Part 77).[11] Part 77 establishes the following:

- Requirements to provide notice to the FAA of certain proposed construction, or the alteration of existing structures
- The standards used to determine obstructions to air navigation, and navigational and communication facilities

[11] United States Government Publishing Office, 2016. Code of Federal Regulations: Part 77 - Safe, Efficient Use, and Preservation of the Navigable Airspace. December.

- The process for completing aeronautical studies of obstructions to air navigation or navigational facilities to determine the effect on the safe and efficient use of navigable airspace, air navigation facilities or equipment
- The process to petition the FAA for discretionary review of determinations, revisions, and extensions of determinations

Under Section 77.9 of Part 77, the FAA requires notice of construction or alteration for any of the following types of construction or alteration: (1) if a building is more than 200 feet above ground level; (2) any building penetrating an imaginary surface extending (a) outward and upward at 1 foot elevation for every 100 horizontal feet, over a horizontal distance of 20,000 feet, (b) at 1 foot of elevation for every 50 horizontal feet, over a horizontal distance of 10,000 feet, or (c) at 1 foot of elevation for every 25 horizontal feet, over a horizontal distance of 5,000 feet from the nearest point of a runway; or (3) vehicle clearances of roads (17 feet) and railroads (23 feet). Notification requirements under Section 77.9 include submittal of FAA Form 7460-1 (Notice of Proposed Construction or Alteration) to the FAA.

Based on the Form 7460-1 review, the FAA makes a determination whether or not a project would be an obstruction to navigation or navigational aids or facilities. Under Section 77.17 of Part 77, an object would be considered an obstruction or hazard to air navigation if: (1) it is greater than 499 above ground level; (2) it is 200 feet above ground level or above the established airport elevation, whichever is higher, within 3 nautical miles of the established reference point of an airport; (3) a height within a terminal obstacle clearance area, including an initial approach segment, a departure area, and a circling approach area, which would result in the vertical distance between any point on the object and an established minimum instrument flight altitude within that area or segment to be less than the required obstacle clearance; (4) a height within an en route obstacle clearance area, including turn and termination areas, of a Federal Airway or approved off-airway route, that would increase the minimum obstacle clearance altitude; or (5) the surface of a takeoff and landing area of an airport or any imaginary surface established under Section 77.19, 77.21, or 77.23 of Part 77.

Section 77.19 of Part 77 establishes thresholds for obstruction to air navigation—referred to as airport imaginary surfaces. Of these imaginary surfaces, Section 77.19(e), transitional surfaces are most relevant. Transitional surfaces extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 1 foot of elevation for every 7 feet horizontally from the sides of the primary surface and from the sides of the approach surfaces. Transitional surfaces extend a distance of 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the runway centerline, which roughly corresponds to the Airport Protection Area (APA) boundaries established by the Alameda County Airport Land Use Commission (ALUC) and explained below.

Through the Form 7460-1 review process, the FAA makes one of three determinations as follows:

- Determination of Hazard to Air Navigation, which concludes that the proposed construction or alteration will exceed an obstruction standard and would have a substantial aeronautical impact.
- Determination of No Hazard to Air Navigation, which is issued when the aeronautical study concludes that the proposed construction or alteration will exceed an obstruction standard, but would not have a substantial aeronautical impact to air navigation. A Determination of No Hazard of Air Navigation may include a project to include conditional provisions of a determination, limitations necessary to minimize potential problems, such as the use of temporary construction equipment, supplemental notice requirements, and/or marking and lighting recommendations.
- Determination of No Hazard to Air Navigation when a project does not exceed any of the construction standards and would not be a hazard to air navigation.

(2) Caltrans Airport Land Use Planning Handbook

The Caltrans Division of Aeronautics publishes the California Airport Land Use Planning Handbook (handbook) to provide compatibility planning guidance to ALUCs, their staffs and consultants, the counties and cities having jurisdiction over airport area land uses, and airport proprietors. The handbook includes guidance for ALUCs on establishing airport safety compatibility policies. The handbook is not binding, except as it may be adopted or incorporated by local governments. The handbook was most recently revised in October 2011. The Livermore ALUCP reflects the land use compatibility planning guidance set forth in the previous (2002) version of the Caltrans handbook.

The handbook provides examples of safety zones for different types of general aviation runways. As many as six safety zones are identified, depending on the size and activity level of the airport. The guidelines in the handbook are not intended to cover every type of scenario. Rather, they provide guidance for ALUCs as they adopt their own standards for the airports within their jurisdictions. The handbook quantifies the level of aviation risk within the zones ranging from a low likelihood of an accident in regular traffic patterns (Zone 6), to very high risk in the immediate runway protection area (Zone 1).[12]

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[12] California Department of Transportation, Division of Aeronautics, 2011. California Airport Land Use Planning Handbook. October. Available at: http://dot.ca.gov/hq/planning/aeronaut/documents/alucp/AirportLandUsePlanningHandbook.pdf.

(3) Alameda County Airport Land Use Commission

The State Aeronautics Act, Public Utilities Code Section 21670 et seq., provides for the establishment of airport land use commissions in counties with airports and requires that each ALUC develop a comprehensive ALUCP. The Livermore Municipal Airport ALUCP, adopted in August 2012 and discussed further below, contains policies that guide ALUC review of proposed local agency actions.

Once an ALUC has adopted an ALUCP, the authority and responsibility for enforcing its compatibility policies lie fully with the affected jurisdictions. For example, the city of Livermore is required to revise its general plan to be consistent with the Livermore Municipal Airport ALUCP (or adopt findings to override its requirements); the general plan is then subject to ALUC review (as are the other goals and policies established in the general plan). The ALUC also requests that project proponents for certain types of actions apply for review by the ALUC if action is planned within certain Airport Zones, as discussed further below.

Airspace protection policies rely upon regulation enacted by FAA and the state of California; ALUC policies are intended to help implement the federal and state regulations. The FAA has well-defined standards by which potential hazards to flight, especially airspace obstructions, can be assessed. However, the FAA has no authority to prevent the creation of such hazards; that authority rests with state and local officials. In addition, California airspace protection standards mostly mirror those of the FAA; the primary difference being that state law gives the California Department of Transportation, Division of Aeronautics and local agencies the authority to enforce the standards.

(4) Livermore Municipal Airport Land Use Compatibility Plan

(a) Airport Zones

The Livermore Municipal Airport ALUCP identifies a number of different zones around the Airport. These zones are identified to ensure that surrounding land uses are compatible with airport activities. The following zones are defined and described further below: Airport Influence Area, Airport Protection Area, and Airport Safety Zones. See Section 3.J, Noise and Vibration for a discussion of the noise impacts associated with the Livermore Municipal Airport.[13]

[13] Alameda County Airport Land Use Commission, 2012. Livermore Executive Airport: Airport Land Use Compatibility Plan. August.

Airport Influence Area

The Airport Influence Area (AIA) is the area in which current or future airport-related noise, overflight, safety, and/or airspace protection factors may significantly affect land uses or necessitate restrictions on those uses. In the AIA, the Alameda County ALUC is authorized to review local land use actions affecting the area, including adoption or amendments of general plans, specific plans, zoning ordinances, and building regulations. In addition, the ALUC asks project proponents for proposed residential developments (with five or more units), non-residential developments (of at least 20,000 square feet), utilities, and other uses to apply for review by the ALUC. To inform people about the potential for overflight annoyance the ALUCP also requires overflight notification or avigation easement and Buyer's Awareness Measures (i.e., sellers of land must disclose information regarding the property's proximity to the airport) to all residences within the AIA. For newly created residential properties within the AIA, the city of Livermore requires real estate disclosures to notify residents of the airport owner's right to use airspace (i.e., overflight notification), pursuant to the ALUCP and California law. The AIA for the Livermore Municipal Airport extends east from Tassajara Road/Santa Rita Road to North Livermore Avenue, and extends from Stanley Boulevard north past I-580. The AIA includes a large portion of the collective footprint (the majority of the I-580 Corridor Area, Isabel North Area, Isabel South Area, and much of the Cayetano Creek Area), as shown in Figure 3.N-2. The Dublin/Pleasanton Station Area and the Laughlin Road Area are not located within any airport zones.

State law provides that ALUCs, while required to be guided by the handbook, may develop height restrictions on buildings, specify use of land, and determine building standards, including soundproofing adjacent to airports within the AIA. The ALUC will also take into consideration the type of and location of proposed land uses apart from aircraft accident distribution patterns within the AIA, in order to minimize exposure to excessive noise and safety hazards within areas around the Livermore Municipal Airport to the extent that the areas are not already devoted to incompatible uses, and to safeguard against safety problems related to airport use.

Airport Protection Area

The city of Livermore established the Airport Protection Area (APA) in 1991 to prevent the encroachment of incompatible land uses near the airport. The APA extends 5,000 feet beyond the runways to the north, south, and east, and 7,000 feet to the west (typically the takeoff direction). As shown in Figure 3.N-2, the APA includes the I-580 corridor from just west of Fallon Road/El Charro Road to east of Isabel Avenue, which includes portions of the collective footprint (a portion of I-580 Corridor Area, Isabel North Area, and Isabel South Area).

New residential land use designations, or the intensification of existing residential land uses, are prohibited within the APA. Nonresidential land uses may be allowed as long as they are consistent with ALUCP criteria. The ALUC determines whether plans or proposed projects within the APA are consistent with the compatibility criteria set forth in the ALUCP.

Airport Safety Zones

The Airport Safety Zones, as established in the ALUCP, include seven safety zones identified by runway length and flight patterns, as shown in Figure 3.N-2. Where the risks associated with a particular land use are considered significant but tolerable, restrictions may be established to reduce the risk to an acceptable level. The zones represent the imaginary surfaces defined for the Airport in accordance with Federal Aviation Regulation (FAR) Part 77. Acceptable land uses generally require no limitations. Each of the zones also has acceptable open land requirements[14].

- Zone 1, Runway Protection, and Zone 2, Inner Approach/Departure, represent the higher risk areas immediately surrounding the runways. The collective footprint would not be located in Zone 1 or 2.
- Zone 3, Inner Turning Zone, extends northeast from the runways to acknowledge potential risk associated with turn movements on landing or departure. A portion of the I-580 Corridor Area and the Isabel South Area are located within Zone 3. The ALUCP recommends that 30 percent of the land area within Zone 3 be open land. Transit-oriented uses (train stations, bus stations, etc.), roads, automobile parking areas, and open parking garages are permitted uses in this Zone.
- Zones 4 through 6 are lower risk zones. Zone 6, Traffic Pattern Zone, roughly corresponds to the APA boundaries. As shown in Figure 3.N-2, the collective footprint is not located in Zone 4 or Zone 5; however, the I-580 Corridor Area from west of Fallon Road/El Charro Road to east of Isabel Avenue, Isabel North Area, and Isabel South Area are within Zone 6. Transit-oriented uses, roads, automobile parking areas, open parking garages, storage of hazardous materials, and repair garages are permitted uses in these zones and are recommended to have at least 20 percent open land for zones 4 and 5, with no minimum recommended percentage of open land in Zone 6.
- Zone 7, Other Airport Environ/Horizontal Surface/Outer Conical Surface, is the area between Zone 6 and the AIA boundaries, and prohibits hazards to flight, but allows residential uses, transit-oriented uses, roads, automobile parking areas, open parking garages, storage of hazardous materials, and repair garages are permitted uses in this Zone. There is no recommended minimum percent of open land in Zone 7.

[14] Roads and automobile parking areas are considered acceptable as open land areas.

Where the risks of a particular land use are considered significant but tolerable, establishment of restrictions may reduce the risk to an acceptable level. Uses which are basically acceptable generally require no limitations. In addition, land uses within safety zones 2 through 5 should be clustered, to the greatest extent practical, to preserve open space.

(b) ALUC Evaluation

A project must be evaluated for consistency with the ALUCP by the ALUC if it meets one of the following standards:

- Proposed redevelopment of a property which introduces a new land use within an AIA
- Increases the intensity or density of, or permitted by, an existing land use which the existing use is consistent with the local general plan and/or specific plan, but does not conform to the compatibility criteria set forth in this ALUCP
- Any obstruction reviewed by the FAA in accordance with FAR Part 77 that receives a finding other than "not a hazard to air navigation"
- Any other proposed land use action, as determined by the local planning agency, involving a question of compatibility with airport activities

FAA notification does not automatically trigger an airport compatibility review of a project by the ALUC, unless the general plan of the jurisdiction in which the project is located has not been deemed compatible with the ALUCP. Under most circumstances, when reviewing proposed structures that exceed the height criteria, the ALUC is expected to abide by the FAA's conclusions regarding marking and lighting requirements. However, situations may arise in which the ALUC, because of its particular knowledge of local airports and airspace, may reach a different conclusion than that of the FAA.

If a project meets one these standards, the ALUC would conduct a consistency review. This process primarily considers the land use associated a proposed project, in relation to its location within one of the respective safety zones listed above.

Upon determination that a consistency review must be completed, project sponsors are required to provide a number of items regarding including, but not limited to, the project's land use, relation to airport safety zones, component heights, general project description, and a copy of any environmental documents.

This consistency review examines if the proposed project does not contain characteristics likely to result in inconsistencies with the compatibility criteria set forth in the ALUCP, including airport safety zone compatibility. The ALUC Administrative Officer is authorized to make a finding of consistency, in writing, for such projects on behalf of the ALUC. However, if it is found that the proposed project may be inconsistent with the ALUCP, the ALUC Administrative Officer shall forward any such project to the ALUC for a consistency determination hearing.

The ALUC will make one of three determinations when reviewing a major land use project proposal:

- Find the project consistent with the ALUCP.
- Find the project consistent with the ALUCP, subject to compliance with such conditions as the ALUC may require. Any such conditions should be limited in scope and be described in a manner which allows compliance to be clearly assessed (e.g., the height of a structure).
- Find the project inconsistent with the ALUCP. In making a finding of inconsistency, the ALUC shall note the specific conflicts upon which its determination is based.

Once a project has been found consistent with the ALUCP, it need not be referred for review at subsequent stages of the planning process.

(c) City of Livermore

Local municipalities and the FAA work together to ensure that new structures do not degrade the safety and utility of navigable airspace surrounding airports. The local building department with jurisdictional authority to issue building permits is ultimately responsible for this task, but must coordinate with the FAA and Caltrans' aeronautical divisions as appropriate on aeronautical review and technical details.

The City of Livermore has a building height restriction of 40 feet, plus 15 feet for light poles for structures within the Livermore Municipal Airport APA and Zone 6, according to the Livermore Development Code 4.02.040 C.[15] This is independent of FAA evaluations for determining what constitutes an obstruction of navigable airspace in 14 CFR Part 77. To the extent that this restriction is applicable to BART through its incorporation in the APA, BART anticipates that it will be modified by the City of Livermore. While Livermore's height restriction is a relatively conservative restriction, depending on terrain differences and alignment with runway centerlines, it is possible that a proposed structure of 55 feet above ground level would constitute an obstruction and/or a hazard as defined by the FAA. Proposed construction that is lower than the civil airport imaginary surfaces shown in the ALUCP will likely not constitute an obstruction or hazard, but may constitute an obstruction or hazard depending on terrain differences and other factors. Deviation from the FAA's Part 77 standards does not necessarily mean that a safety hazard exists, only that encroaching objects must be evaluated by the FAA and that mitigation, such as marking or lighting, may be required if appropriate.

[15] City of Livermore Development Code, Section 4.02.040 C.

c. Wildland Fires

CCR Title 24, Part 9 (California Fire Code) sets forth building standards created by the California Building Standards Commission. These standards include fire service features, fire and smoke protection features, means of egress, and construction requirements that projects across the state must follow.

Within the California Fire Code, the Wildland-Urban Interface Code regulates the geographical areas identified by the State of California as fire hazard severity zones in accordance with the Public Resources Code, Sections 4201 through 4204, and the Government Code, Sections 51175 through 51189, or other areas designated by the enforcing agency to be at a significant risk from wildfires. The purpose of the code is to provide minimum standards to increase the ability of a building to resist the intrusion of flame or burning embers being projected by a vegetation fire and to contribute to a systematic reduction in conflagration losses through the use of performance and prescriptive requirements. Any BART facilities located within CAL FIRE's state or federal responsibility areas, and designated as moderate, high, or very high fire hazard severity zones would be subject to this code.

d. Electromagnetic Radiation and Electromagnetic Fields

The field of EMR and EMF is developing and thus standards for exposure tend to be guidelines promulgated by individual agencies relating to specific EMF sources (such as electric transmission lines) and/or specific receptors (such as schools). At present, the only available EMF guidelines that apply to the Proposed Project and Build Alternatives are the 1998 International Commission of Non-Ionizing Radiation Protection (ICNIRP) Guidelines discussed below. However, other EMF guidelines are discussed in this section for background purposes only.

(1) International Commission of Non-Ionizing Radiation Protection

The ICNIRP developed a guideline in 1998 (ICNIRP 1998) for limiting exposure to time-varying electric, magnetic, and EMFs, up to 300 GHz.[16] The ICNIRP 1998 recommendations were the result of years of research.[17, 18] The guideline contains limit values for workers and for the general public. Because impacts of EMF are evaluated in

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[16] International Commission of Non-Ionizing Radiation Protection (ICNIRP), 1998. ICNIRP Guidelines For Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz). Published in Health Physics 74 (4): 494-522, 1998. Available at: http://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf, accessed February 2017.

[17] References to studies that lead to the ICNIRP 1998 recommendation are embedded in the ICNIRP (1998) document.

[18] http://www.who.int/peh-emf/en/.

areas accessible to the public, or at distances from the train accessible to the general public, the ICNIRP 1998 limit values for the general public are used in this chapter.

For DC, there is only a reference value for magnetic fields and not for electric fields. This is because the only risk from an electric field at DC is electric shock, which is prevented by established electrical safety procedures. ICNIRP 1998 reference levels for magnetic fields and electric fields are shown in Figure 3.N-5, respectively. These reference levels are not to be exceeded at any time.

The reference levels for the general public are lower than the reference levels for workers as the limits account for special sensitivities of children, pregnant women, and people with medical implants.

(2) Federal Communications Commission

The Federal Communications Commission provides guidelines for exposure to EMF at frequencies in the range of 300 kHz to 100 GHz.[19] However, because BART trains run on DC, and the frequency emitted from the traction motor regulation is significantly below 300 kHz, the Federal Communications Commission guidelines are not applicable to the Proposed Project or Alternatives.

(3) California Energy Commission

The California Energy Commission makes recommendations for limiting the electric fields for electric transmission lines at the edge of ROW.[20] However, they do not make a recommendation for limiting magnetic fields. These recommendations are not applicable to the Proposed Project or Alternatives because they do not involve electric transmission lines.

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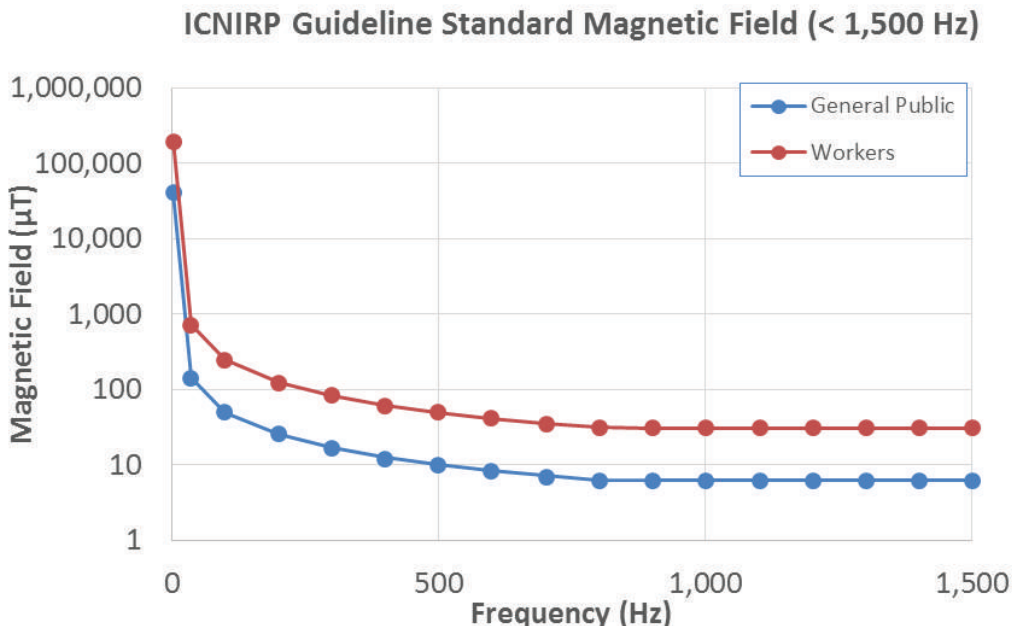
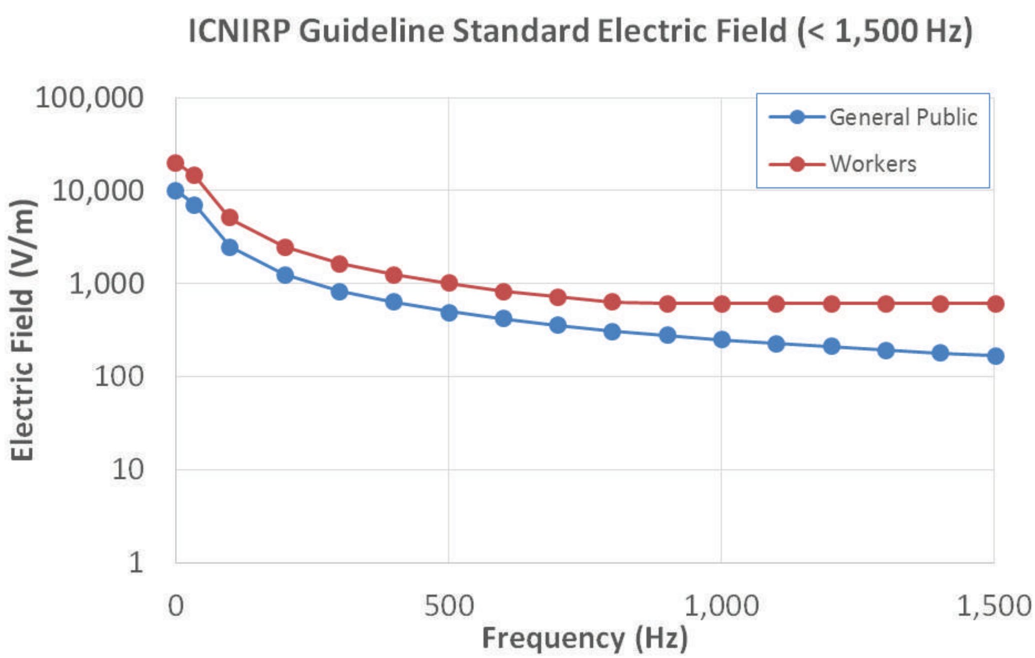
[19] Federal Communications Commission (FCC), 2017. Radio Frequency Safety. Available at: https://www.fcc.gov/general/radio-frequency-safety-0, accessed June 2017

[20] Peninsula Corridor Joint Powers Board, 2014. Peninsula Corridor Electrification Project EIR. Chapter 3.5: Electromagnetic Fields and Electromagnetic Interference. December. Available at: http://www.caltrain.com/Assets/Caltrain+Modernization+Program/FEIR/3.5+EMF+EMI.pdf, accessed: May 2017.

Reference Levels for Magnetic Fields Below 3 kHz



Reference Levels for Electric Fields



Source: International Commission of Non-Ionizing Radiation Protection (ICNIRP), 1998.

Figure 3.N-5
Public Health and Safety
ICNIRP Reference Levels

(4) American Conference of Governmental Industrial Hygienists

The American Conference of Governmental Industrial Hygienists (ACGIH) provides guidelines for worker exposure to EMF.[21] For normal healthy workers without special training the ceiling Threshold Limit Value (TLV-C) is 2 T (or 2,000,000 μT) for static magnetic fields.[22] For workers wearing medical devices the TLV-C is 0.5 mT (or 500 μT) for static magnetic fields. For magnetic fields in the range of 1 to 300 Hz, the TLV is 60,000/f μT, where f is the frequency expressed in hertz. For magnetic fields from 300 Hz to 30,000 Hz, the TLV is 200 μT. For workers wearing cardiac pacemakers at these low frequencies (1 to 30,000 Hz), it is recommended that exposure be maintained at or below 100 μT.

ACGIH also provides electric field TLVs for normal health workers. Up to 220 Hz, the TLV is 25,000 V/m. Between 220 Hz and 3,000 Hz, the TLV is given by $5.525 \times 10^6/f$, where f is the frequency expressed in hertz. For workers wearing cardiac pacemakers, it is recommended that exposure be maintained at or below 1,000 V/m. The TLVs for workers not wearing medical devices are higher than the ICNIRP reference levels. The recommended thresholds for workers wearing medical devices is more stringent than the ICNIRP reference levels and are considered in this analysis.

e. BART System Safety

(1) California Public Utilities Commission Regulations

The California Public Utilities Commission (PUC) has several regulations regarding rail transit. Most notable are 1) General Order (GO) 143-B Safety Rules Regulations Governing Light-Rail Transit, 2) GO 164-D Rules and Regulations Governing State Safety Oversight of Rail Fixed Guideway Systems, and 3) GO 175-A Rules and Regulations Governing Roadway Worker Protection Provided by Rail Transit Agencies and Rail Fixed Guideway Systems. These regulations are summarized below.

California PUC GO 143-B establishes requirements regarding equipment on light-rail vehicles, brakes, lighting, construction, operating speeds, ROW standards, traction power, fire protection, operating rules, inspections, maintenance, and reporting and investigating hazardous conditions.[23]

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[21] American Conference of Governmental Industrial Hygienists (ACGIH), 2017. Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Electromagnetic Fields 0-300 GHz. Pages 139-141.

[22] The Threshold Limit Value – Ceiling (TLV-C) indicates an exposure limit that should not be exceeded even instantaneously.

[23] California Public Utilities Commission (CPUC), 1991. General Order 143-B: Safety Rules and Regulations Governing Light Rail Transit. May, Amended 1991.

California PUC GO 164 establishes a number of safety regulations required by BART, including requirements for System Safety Program Plans (SSPP), System Security Plans, Internal Safety and Security Audits, Hazard Management Processes, reporting accidents, investigating accidents, corrective action plans, at grade rail crossings, Safety Certification Plans, and Safety Certification Verification Reports.[24]

California PUC GO 175-A establishes minimum controls and limitations for employees performing work on and off tracks, protections for emergency response personnel, roadway worker protections, and near-miss reporting programs.[25]

(2) Local Emergency Plans

Both Livermore and Pleasanton have local emergency plans adopted in 2005, titled Comprehensive Emergency Management Plans. These address the cities' respective responsibilities during emergencies associated with natural disasters, human-caused emergencies, and technological incidents. The plans provide a framework for coordination of response and recovery efforts within the cities in coordination with federal, state, and local agencies. In addition, the plans establish an emergency organization to direct and control operations during a period of emergency by assigning responsibilities to specific personnel. BART coordinates with these local jurisdictions in carrying out the plans and procedures outlined in their emergency plans.

(3) BART's Emergency Plan

BART responds to accidents based on procedures set forth in the BART Emergency Plan. This plan establishes standard operating policies and procedures that would be implemented by BART and other public safety agencies during an emergency that may occur within the BART system. The BART System Safety Department is responsible for managing accidents and hazardous materials cleanup, and ensuring that emergency plans are in place to respond appropriately. The plan applies to all BART personnel and is also used by outside public agencies such as local police and fire departments. The plan addresses specific response procedures for a full range of foreseeable types of emergencies, including procedures for train fires; derailments; injuries or deaths on the ROW; ROW intrusions; earthquakes; high winds; flooding; gas leaks and toxic spills; bomb threats; explosions; and hostage situations. When an emergency occurs, the plan is implemented through BART's Operations Control Center, and supersedes all other plans, rules, and procedures that conflict with the plan.

[24] California Public Utilities Commission (CPUC), 1996. Rules and Regulations Governing State Safety Oversight of Rail Fixed Guideway Systems. September, Amended 2007.

[25] California Public Utilities Commission (CPUC), 2016. Rules and Regulations Governing Roadway Worker Protection Provided By Rail Transit Agencies and Rail Fixed Guideway Systems. April.

BART also has a Terrorism Response Plan, which is maintained by the BART Police Department.

(4) BART System Safety Regulations

The BART System Safety Department is in charge of BART's safety program and ensures that safety procedures are implemented throughout the entire BART District. The BART System Safety Department developed the BART SSPP, which outlines safety goals and objectives and describes the procedures that BART follows to identify, reduce, and control hazards throughout the system. Potential hazards in the system can be caused by fires, broken equipment, and damaged software that could result in accidents to riders, employees, or other members of the public using or within the vicinity of the Proposed Project and Build Alternatives. BART's SSPP states that, "safety is the major consideration in all [BART] operations including planning, design, construction, testing, and maintenance of the rail transit system." The SSPP complies with the requirements of the California PUC General Order 164. The BART System Safety Department also evaluates the performance of the program and takes corrective measures to improve program implementation. In 2010 the PUC conducted a triennial review and confirmed that BART was in compliance with its SSPP.[26]

(5) BART Facilities Standards

The BART Facilities Standards set the standard specifications for construction of BART facilities. These specifications are the basic requirements governing the materials, equipment, and methods used in construction contracts administered by BART. These standards include 34 requirements ranging from building material requirements to required utilities for facilities. Of these standards, Division 21 – Fire Suppression and Division 28 – Electronic Safety and Security are the most relevant to BART system safety regulations. Division 21 sets forth requirements regarding the types of fire suppression devices and techniques that are required for the various BART facilities. Division 28 sets forth requirements for access-controlled doors and fire detection and alarm systems.

4. Impacts and Mitigation Measures

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

[26] California Public Utilities Commission (CPUC), 2010. Triennial Review of the San Francisco Bay Area Rapid Transit District (BART). August 19.

a. Standards of Significance

For the purposes of this EIR, impacts on public health and safety are considered significant if the Proposed Project or one of the Alternatives would result in any of the following:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment
- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and as a result, would create a significant hazard to the public or the environment
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25-mile of an existing or proposed school
- Impair implementation of or physically interfere with an adopted emergency response or emergency evacuation plan
- Be 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, and would result in a significant safety hazard for people residing or working in the project area
- Be located within the vicinity of a private airstrip, and result in a significant safety hazard for people residing or working in the project area
- Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands
- Result in EMF that exceeds significance levels for human health
- Result in EMF that causes interference with other electromagnetic systems
- Create a potential public or environmental health hazard; an undue potential risk for health-related accidents; or result in a safety hazard for people residing or working in the project area
- Physically interfere with an adopted emergency response or evacuation

b. Impact Methodology

The methodology used to evaluate the significance of public health and safety impacts is described below. The EMU Option would result in the same impacts as the DMU Alternative, and 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 independently.

The analysis of the Enhanced Bus Alternative, which addresses the potential impacts of construction of the bus infrastructure improvements and operation of the bus routes at a programmatic level, would also apply to the bus improvements and feeder bus service under the Proposed Project and other Build Alternatives. Therefore, the analyses and conclusions for the Enhanced Bus Alternative also apply to the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, and are not repeated in the analysis of the Proposed Project and other Build Alternatives.

(1) Hazardous Materials and Public Health

The hazardous materials and public health analysis focuses on a qualitative comparison of potential impacts to the public from hazardous materials or wastes. This analysis was based on searches of environmental databases on August 19, 2016; February 16, 2017; and May 2, 2017 for sites within a 0.5-mile radius of the collective footprint; general aerially deposited lead information obtained from website searches; sensitive receptor searches dated August 24 and 29, 2016 for sites within 1,000 feet of the collective footprint; and a field survey for sensitive receptors on August 25, 2016.

Property-specific environmental site assessments (e.g., Phase I environmental site assessment [ESA], Phase II ESA, site-specific historical review, targeted evaluation of migration of contamination from potential off-site sources) were not completed. Thus, the hazardous materials and public health analysis does not include other potential impacts (e.g., historical industrial site use, historical agricultural site use, migration of contamination from off-site sources).

(2) Electromagnetic Fields

Unlike the Proposed Project and the EMU Option, which use electricity to power the train, the DMU Alternative would use self-propelled rail cars that use a diesel engine to generate their own power. Therefore, they would have no impacts to EMF. The Express Bus/BRT Alternative and the Enhanced Bus Alternative would not extend the BART rail system and therefore, would have no impacts. Therefore, the EMF analysis focuses on the Proposed Project and EMU Option.

BART cars run on 1,000 volts (V) on a third rail and the EMUs are assumed to run on a 600-V catenary system. Both use DC creating DC electric and magnetic fields. Traction motors used to move the BART cars and EMUs operate on AC power, thus also creating AC electric and magnetic fields. By 2025 (opening year for the Proposed Project or Alternatives), two types of BART cars are expected to be in operation: (1) Type-A cars (existing BART cars); and (2) the new Bombardier cars anticipated to be put into service by

2017. Type-A train traction motors operate in the range of 35 to 450 Hz while Bombardier train traction motors operate in the range of 450 to 700 Hz.[27]

The 1998 ICNIRP Guidelines are used as the thresholds for EMF impacts for human health, as shown in Table 3.N-5. Threshold values generally decline with an increase in frequency. For DC electricity (i.e., frequency less than 1 Hz), the threshold for magnetic fields is 40,000 μT for the general public. Unlike other frequency ranges, for the frequency less than 1 Hz, there is no quantitative threshold value for the electric field for DC electricity. For AC electricity, the electric and magnetic field thresholds are functions of frequency as shown in Table 3.N-5.[28]

TABLE 3.N-5 ICNIRP ELECTRIC AND MAGNETIC FIELD THRESHOLDS FOR GENERAL PUBLIC EXPOSURE

Frequency Range	Electric Field Strength (V/m)	Magnetic Field Strength (μT)
Up to 1 Hz[a]	-	40,000
1 to 8 Hz	10,000	40,000/f[b]
8 to 25 Hz	10,000	5,000/f[b]
25 to 800 Hz	250,000/f[b]	5,000/f[b]
800 to 3,000 Hz	250,000/f[b]	6.25

Notes: Hz = hertz; V/m = volts per meter; μT = microtesla.
The thresholds shown here are for general public exposure. Adapted from Table 7 of ICNIRP 1998. Frequencies greater than 3,000 Hz are not shown here as they are not applicable to the BART to Livermore Extension Project.
[a] DC electricity corresponds to 0 Hz.
[b] *f* = frequency in Hz.
Source: ICNIRP, 1998.

The ACGIH recommendations for workers wearing medical devices are also used as thresholds, as shown in Table 3-N.6. ACGIH TLVs for workers not wearing medical devices are less stringent than ICNIRP reference levels, so the thresholds in Table 3.N-6 are conservative.

[27] Simply speaking, the DC electricity providing power to the train is converted to AC electricity for use by the traction motors.

[28] The ICNIRP Guidelines state that for electric fields for frequencies less than 1 Hz, spark discharges causing stress or annoyance should be avoided. This is not expected to occur at electric field strengths less than 25 kilovolt per meter.

Table 3.N-6 ACGIH Electric and Magnetic Field Thresholds for Workers Wearing Medical Devices

Frequency Range	Electric Field Strength (V/m)	Magnetic Field Strength (µT)
Up to 1 Hz[a]	-	500
1 to 30 kHz	1,000[b]	100

Notes: Hz = hertz; V/m = volts per meter; µT = microtesla.
The thresholds shown here are for exposure to workers wearing medical devices. Adapted from ACGIH (2017). Frequencies greater than 30 kHz are not shown here as they are not applicable to the BART to Livermore Extension Project.
[a] DC electricity and magnetic field corresponds to 0 Hz.
[b] Above 250 Hz, the ICNIRP limit values for the general public are more health protective compared to the ACGIH recommended value.
Source: ACGIH, 2017.

Measurements were made for both types of cars up to 1,500 Hz to cover these frequencies. The greatest EMF is expected when the cars are accelerating. Measurements on Type-A cars were conducted while the train was in service and loaded with passengers. Measurements on Bombardier cars were conducted while the train was fully loaded with sand bags to simulate a full passenger load. AC and DC electric and magnetic fields were measured at the locations described in Table 3.N-7 using an Aaronia NF-5035 spectrum analyzer (calibrated September 2016).

Table 3.N-7 BART Train Measurement Locations

Location	Type-A Train	Bombardier Train
Adjacent to Moving Train	At MacArthur Station Platform	At Hayward Yard
Inside Train	On moving train between El Cerrito Plaza Station and MacArthur Station	At Hayward Yard
Under Moving Train	Under MacArthur Station Platform on 40th Street	Not performed[a]

Note:
[a] The Bombardier trains are not in service currently, and thus a measurement from under a moving train was not possible.

Measurements were made where the public could be reasonably expected to be exposed to EMF from trains. These are conservative estimates as measurements were taken at publically accessible locations closest to sources of EMF. Measurements were also made inside the cars in motion. These measurements were taken from directly above the car's traction motors where EMF strength is the greatest. Traction motors control the acceleration and speed of the car as it regulates the amount of power taken on from the direct current from the third rail. Measurements were also taken below a BART overpass for the Type-A Trains only as the Bombardier Trains are not currently in service. Based on measurements at the platform and inside train (Table 3.N-10), it is expected that the electric and magnetic field for the Bombardier Trains would be less than that measured for the Type-A Trains below the BART overpass.

EMF occurs at specific frequencies and therefore measurements of EMF need to be at those same frequencies. Because the frequencies used by some common sources of EMF such as cellular telephone towers and broadcast towers are much higher than those used on electric train systems, they do not impact the measurements taken and are not further discussed in this report. Also, while electric power lines emit EMF at 60 Hz (within the span for the traction motors on BART trains), interference with the measurements is not expected as measurements were not made directly under or adjacent to 60-Hz power lines.

All magnetic fields at DC are measured as relative values, not including the magnetic field from Earth itself. The measured value is the change in the magnetic field, in either negative or positive direction, created by the train. For example, if the magnetic field of the Earth is 50 μT and a change in the magnetic field of 9 μT is measured outside a train, the total magnetic field strength can be somewhere between a minimum of 41 μT (50 μT minus 9 μT) and a maximum of 59 μT (50 μT plus 9 μT), depending on the polarity (i.e., direction) of the magnetic field from the train at any particular location.

For the EMU Option, San Francisco Muni Metro N-Judah trains at Duboce Park were measured. While the exact type of EMU to be employed in the EMU Option has not been selected, the San Francisco Muni Metro train is a reasonable proxy as it is likely to be in a similar weight class as the EMU. Measurement locations are described in Table 3.N-8.

TABLE 3.N-8 EMU TRAIN MEASUREMENT LOCATIONS

Location	EMU Train
Adjacent to Moving Train	At station platform
Public Space Near Moving Train	33 feet from moving train at a public space
Inside Train	Not performed
Under Moving Train	Not performed

The EMU cars measured in this study run on a 600 V DC catenary system. Two EMU units were coupled together. The measurements were made on a platform (adjacent to the train, at ground level) and in a public space approximately 33 feet from the EMU ROW.

Measurements were not made inside the EMU, as measurement values would be strongly dependent on the exact type of EMU in service (i.e., low-floor, mid-floor or high-floor EMU). It is anticipated that EMF inside the EMU would be lower than that measured inside conventional BART trains due to the lighter weight of the EMU trains as lighter cars require less power to move the trains.

Electromagnetic interference can occur to sensitive equipment, such as magnetic resonance imaging systems typically used in hospitals. Thus, the threshold for electromagnetic interference used in this assessment is a magnetic field of 2 mG. A recent study of worst-case magnetic fields for the California High Speed Rail uses 2 mG as significance threshold.[29, 30] Electric fields are not expected to result in electromagnetic interference to sensitive equipment and this impact is not discussed further.

c. Summary of Impacts

Table 3.N-9 summarizes the impacts of the Proposed Project and Alternatives described in the analysis below.

TABLE 3.N-9 SUMMARY OF PUBLIC HEALTH AND SAFETY IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project[b]**	**DMU Alternative (with EMU Option)[b, c]**	**Express Bus/BRT Alternative[b]**	**Enhanced Bus Alternative**
Construction					
Project Analysis					
Impact PHS-1: Create a potential public or environmental health hazard; an undue potential risk for health-related accidents; or result in a safety hazard for people residing or working in the project area during construction	NI	LSM	LSM	LSM	LSM

[29] The basis for setting the significance threshold at 2 mG is roughly equivalent to the susceptibility level of an unshielded magnetic resonance imaging (MRI) machine. 2 mG is also a typical level emitted from household appliances.

[30] Turner Engineering Corporation, 2012. California High-Speed Train Project. EIR/EIS Assessment of CHST Alignment EMF Footprint. Prepared for California High-Speed Rail Authority. Available at: www.hsr.ca.gov/docs/programs/eir_memos/Proj_Guidelines_TM300_07R00.pdf, accessed May 2017.

TABLE 3.N-9 SUMMARY OF PUBLIC HEALTH AND SAFETY IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project[b]**	**DMU Alternative (with EMU Option)[b, c]**	**Express Bus/BRT Alternative[b]**	**Enhanced Bus Alternative**
Impact PHS-2: Physically interfere with an adopted emergency response or evacuation plan during construction	NI	LSM	LSM	LSM	LS
Cumulative Analysis					
Impact PHS-3(CU): Create a potential public or environmental health hazard; an undue potential risk for health-related accidents; or result in a safety hazard for people residing or working in the project area during construction under Cumulative Conditions	NI	LS	LS	LS	LS
Impact PHS-4(CU): Physically interfere with an adopted emergency response or evacuation plan during construction under Cumulative Conditions	NI	LS	LS	LS	LS
Operational					
Project Analysis					
Impact PHS-5: Significant hazard created by routine transport, use, or disposal of hazardous materials or accidental release of hazardous materials	NI	LS	LS	LS	LS
Impact PHS-6: Located on a hazardous materials site pursuant to Government Code Section 35962.5	NI	LS	LS	LS	LS
Impact PHS-7: Emit hazardous emissions or handle hazardous materials within 0.25 miles of a school	NI	NI	NI	NI	NI

Table 3.N-9 Summary of Public Health and Safety Impacts

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project[b]**	**DMU Alternative (with EMU Option)[b, c]**	**Express Bus/BRT Alternative[b]**	**Enhanced Bus Alternative**
Impact PHS-8: Interfere with adopted emergency response and evacuation plans during operations	NI	LS	LS	LS	NI
Impact PHS-9: Located within an airport land use plan and result in a significant safety hazard	NI	LS	LS	NI	NI
Impact PHS-10: Located near a private airstrip and result in a significant safety hazard	NI	NI	NI	NI	NI
Impact PHS-11: Expose people or structures to wildland fires	NI	LS	LS	NI	NI
Impact PHS-12: Result in EMF that exceeds significant levels for human health	NI	LS	NI (LS)	NI	NI
Impact PHS-13: Result in EMF that can cause interference with existing electromagnetic systems	NI	LS	NI (LS)	NI	NI
Cumulative Analysis					
Impact PHS-14(CU): Significant hazard created by routine transport, use, or disposal of hazardous materials or accidental release of hazardous materials or be located on a hazardous materials site pursuant to Government Code Section 35962.5 under Cumulative Conditions	NI	LS	LS	LS	LS
Impact PHS-15(CU): Interfere with adopted emergency response and evacuation plans under Cumulative Conditions	NI	LS	LS	LS	LS

TABLE 3.N-9 SUMMARY OF PUBLIC HEALTH AND SAFETY IMPACTS

	Significance Determinations[a]				
Impacts	No Project Alternative	Conventional BART Project[b]	DMU Alternative (with EMU Option)[b, c]	Express Bus/BRT Alternative[b]	Enhanced Bus Alternative
Impact PHS-16(CU): Located within an airport land use plan and result in a significant safety hazard under Cumulative Conditions	NI	LS	LS	NI	NI
Impact PHS-17(CU): Expose people or structures to wildland fires under Cumulative Conditions	NI	LS	LS	NI	NI
Impact PHS-18(CU): Result in EMF that exceeds significant levels for human health or causes interference with existing electromagnetic systems	NI	LS	NI (LS)	NI	NI

Notes: NI=No impact; LS=Less-than-Significant impact, no mitigation required; LSM=Less-than-Significant impact with mitigation.
DMU = diesel multiple unit; EMU = electrical multiple unit; BRT = bus rapid transit.
[a] All significance determinations listed in the table assume incorporation of applicable mitigation measures.
[b] The analysis of the Enhanced Bus Alternative also applies to the feeder bus service and bus improvements under the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, as described in the Impact Methodology subsection above.
[c] If EMU Option impacts differ from those of the DMU Alternative, they are indicated in parentheses.

d. Environmental Analysis

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

(1) Construction Impacts

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

(a) Construction – Project Analysis

Impact PHS-1: Create a potential public or environmental health hazard; an undue potential risk for health-related accidents; or result in a safety hazard for people residing or working in the project area during construction.

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

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, and the Livermore Amador Valley Transit Authority would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including both residential and commercial. Construction of these improvements and development projects could create a potential health hazard during construction. 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 Director's decision not to adopt a project. Therefore, the No Project Alternative is considered to have no impacts related to public or environmental health hazards, health-related accidents, or safety hazards. **(NI)**

Conventional BART Project and Build Alternatives. During construction of the Proposed Project or an alternative, there would be a potential for exposure to the public and workers from hazardous materials due to pre-existing site contamination and accidental spills/releases.

Pre-existing Site Contamination. As noted in the Environmental Database Search subsection above, based on a search of environmental databases, there are no known contamination concerns in the footprints of the Proposed Project, DMU Alternative, or Express Bus/BRT Alternative. However, there are potential and known areas of contamination within the broader study area. In addition, the bus infrastructure improvements for the Enhanced Bus Alternative, as well as for the Proposed Project and other Build Alternatives, are anticipated be located within existing street ROWs (e.g., excavation limited in depth and extent) and the presence of contamination at these locations is unknown at this time; however, the likelihood of encountering hazardous materials is expected to be low given their general locations and limited area of each excavation.

Also, aerially deposited lead may present a concern along areas of the footprints of the Proposed Project and Build Alternatives that are within or adjacent to highways. Soil excavation and dewatering may result in identification of contaminated soil and/or groundwater requiring hazardous waste management. If contamination within the project area is identified (e.g., impacts from past operations, migration of contamination from off-site sources), investigation and remedial activities could be required to minimize hazards to construction workers and residents in the project area, the public, and the environment. Therefore, exposure of the public or workers to pre-existing site contamination could be a significant impact.

Accidental Spills or Releases during Construction. Construction activities for the Proposed Project and Build Alternatives would involve the use of hazardous materials (e.g., diesel fuel, oils, hydraulic fluid, vehicle maintenance fluids) associated with vehicles and heavy equipment. These materials would be typical of those used during construction for similar types of construction projects. The public health impacts related to air contamination are discussed in Section 3.K, Air Quality.

Construction activities could create a potential public health or environmental hazard, or result in a safety hazard for workers and residents in the project area if hazardous materials are not appropriately handled, stored, transported, or disposed. While there are regulatory requirements in place to minimize potential releases of hazardous materials and wastes from accidental spills/releases, described in **Impact PHS-5** below, construction operations may not be regulated under certain requirements (e.g., HMBP, SPCC) that would otherwise reduce potential impacts because activities would be transient and lacking a fixed location. Therefore, the Proposed Project and Build Alternatives could result in potentially significant impacts to the public, environment, and construction workers and residents during construction from accidental spills/releases.

These potential impacts related to pre-existing site contamination and accidental spills/releases during construction would be reduced to a less-than-significant level with implementation of the following mitigation measures: **Mitigation Measure PHS-1.A**, which requires preparation of a Phase I ESA and Phase II ESA (if necessary) to identify site-specific contamination; **Mitigation Measure PHS-1.B**, which requires preparation of a Soil Management Plan; **Mitigation Measure PHS-1.C**, which requires preparation of a hazardous materials and hazardous waste management plan; **Mitigation Measure PHS-1.D**, which provides procedures for construction equipment and vehicle fueling; and **Mitigation Measure PHS-1.E**, which requires an emergency response/contingency plan. **(LSM)**

Mitigation Measures. As described above, the Proposed Project and Build Alternatives would have potentially significant impacts to the public, the environment, and construction workers and residents in the project area. However, implementation of the

Mitigation Measures PHS-1.A and **PHS-1.B**, which address potential impacts due to pre-existing site contamination, and **Mitigation Measures PHS-1.C, PHS-1.D, and PHS-1.E**, which address accidental spills/releases, would reduce impacts to a less-than-significant level. Specifically, **Mitigation Measure PHS-1.A**, requires preparation of a Phase I ESA and Phase II ESA (if necessary) to identify site-specific contamination; **Mitigation Measure PHS-1.B**, requires preparation of a Soil Management Plan; **Mitigation Measure PHS-1.C**, requires preparation of a hazardous materials and hazardous waste management plan; **Mitigation Measure PHS-1.D**, provides procedures for construction equipment and vehicle fueling; and **Mitigation Measure PHS-1.E**, requires an emergency response/contingency plan.

Mitigation Measure PHS-1.A: Prepare Phase I ESA and Phase II ESA, as Necessary (Conventional BART Project and Build Alternatives).

BART shall prepare a site-specific Phase I ESA for the footprint of the adopted project. The Phase I ESA shall be prepared pursuant to the ASTM International's Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process E1527-13 (or the most current ASTM standard at the time the Phase I ESA is performed). Based on the results of the Phase I ESA, BART shall evaluate whether a Phase II ESA is necessary (i.e., subsurface investigation). As needed, BART shall prepare a Phase II ESA.

Mitigation Measure PHS-1.B: Soil Management Plan (Conventional BART Project and Build Alternatives).

Following implementation of **Mitigation Measure PHS-1.A** (preparation of a Phase I ESA and Phase II ESA, if necessary), and prior to construction, BART or its construction contractor shall develop a site-specific soil management plan based on the recommendations of the ESA(s). This plan shall include procedures for identification, investigation, excavation, characterization, and disposal of contaminated soil. The soil management plan shall outline handling, accumulation, and off-site disposal of contaminated soil that may be encountered during construction activities. The plan shall outline activities where appropriately trained workers are present (e.g., site preparation, grading, excavation) to monitor soil conditions. The soil management plan shall outline the professional qualifications of the appropriately trained workers to monitor and implement the plan.

During construction, BART or its contractor shall update the soil management plan, the documentation of locations where contaminated soil was encountered, sampling results, the extent of excavation and confirmatory sampling, and off-site disposal records. The soil management plan shall identify notification procedures to regulatory authorities for further assessment.

Mitigation Measure PHS-1.C: Hazardous Materials and Hazardous Waste Management Plan (Conventional BART Project and Build Alternatives).

BART or its construction contractor shall prepare and implement a hazardous materials and hazardous waste management plan prior to construction. Hazardous materials used and stored at staging areas and other construction areas shall be inventoried. Proper handling, storage, and disposal of the hazardous materials shall be documented, either through the maintenance of Safety Data Sheets or summaries of such information. Best management practices to prevent a release during storage shall be described (e.g., spill kits, secondary containment). This plan shall identify the types of hazardous wastes expected to be generated during routine construction activities and container management requirements. Workers shall receive training to implement this plan, including hazardous materials handling and waste management. Workers generating hazardous waste, their supervisors, and workers responsible for management of hazardous waste shall receive training appropriate for their role for hazardous waste container management (e.g., accumulation, labeling), spill prevention, and spill response. This plan shall include a procedure for off-site management of hazardous waste. BART shall be responsible for ensuring compliance with the above-described plan.

Mitigation Measure PHS-1.D: Fueling Procedures during Construction (Conventional BART Project and Build Alternatives).

BART or its construction contractor shall document procedures for fueling construction equipment and vehicles and ensure that BART employees and contractors are trained to implement these procedures. Procedures may require equipment to be refueled at a staging area, use of portable containers, fixed containers, or tanker trucks. The procedures shall require the use of fixed containment, where possible, and active containment (e.g., spill pans beneath fuel loading connections). Workers and their supervisors shall receive training to ensure that written procedures are understood and followed. A copy of the fueling procedure shall be affixed to portable and fixed fueling containers. BART shall be responsible for ensuring compliance with the above-described procedures.

Mitigation Measure PHS-1.E: Emergency Response Plan during Construction (Conventional BART Project and Build Alternatives).

BART or its construction contractor shall prepare an emergency response/contingency plan prior to construction. The plan shall be implemented by the construction contractor during construction and shall describe procedures to respond to releases of hazardous materials and waste. Similar to the hazardous materials and waste management plan, the emergency response/contingency plan shall describe hazardous materials and waste handling procedures to minimize spills. At a minimum, this plan shall include procedures to safely respond to a release, emergency contact information, identification of and directions to the nearest medical facility with emergency care, and notification procedures to regulatory authorities in the event of a spill or release. Workers and their supervisors shall receive emergency response training. Copies of the emergency response/contingency plan shall be maintained in hard copy at specified locations for use in the event of an emergency. BART shall be responsible for ensuring compliance with the above-described plan.

Impact PHS-2: Physically interfere with an adopted emergency response or evacuation plan during construction.

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

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, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could interfere with adopted emergency response or evacuation plan during construction. 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 emergency response or evacuation plans. **(NI)**

Conventional BART Project, DMU Alternative, and Express Bus/BRT Alternative. Potential public safety impacts could result from construction traffic and activities along local roads if these activities impede the movement of emergency response vehicles and/or the evacuation routes of emergency and evacuation plans. The Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would include construction along portions of I-580, relocating the westbound lanes to the north and eastbound lanes to the south. The Proposed Project and these alternatives would also require relocating some surface roads adjacent to I-580, as well as constructing BART and bus facilities. These construction operations would intermittently require lane and roadway closures, which could interrupt emergency response and affect evacuation routes. In addition, construction haul trips for moving excavated soils and construction materials could result in congestion to roadways, further affecting emergency vehicle response times.

Construction of the Proposed Project and these alternatives would be temporary and is anticipated to occur over approximately 5 years, in phases along the project corridor, as described in Chapter 2, Project Description.

Therefore, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant impacts on adopted emergency response and evacuation plans during construction. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure TRAN-1** (see Section 3.B, Transportation), which requires the preparation and implementation of a construction phasing and traffic management plan. **(LSM)**

Enhanced Bus Alternative. Construction of the Enhanced Bus Alternative would occur within the existing street ROW, and would be coordinated and reviewed by the applicable city agencies. These activities would entail limited construction to install bus infrastructure including bus bulbs, bus shelters, and signage. This construction would occur at various locations along the bus routes and would not be anticipated to significantly impact emergency response or evacuation plans. In addition, construction of this alternative is temporary in nature and anticipated to occur over approximately 2 months. Therefore, the Enhanced Bus Alternative would result in less-than-significant impacts to local emergency response and evacuation plans during construction. **(LS)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant impacts to emergency response and evacuation plans. With implementation of **Mitigation Measure TRAN-1** (see Section 3.B, Transportation), potential impacts would be reduced to a less-than-significant level. This measure requires BART or its contractor to prepare and implement a construction phasing and traffic management plan, which will identify traffic operations and circulation procedures for each phase of construction. The plan would provide information on road closures and detours and would be coordinated with the cities of Dublin, Pleasanton, and Livermore, and Caltrans. The plan would also specify measures to allow access and alternate transportation routes for maintenance and emergency response vehicles in the event of roadway closures.

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

(b) Construction – Cumulative Analysis

The geographic study area for the cumulative construction impacts related to public health and safety is defined as a 1-mile radius around the footprints of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative. Further, cumulative projects described in Section 3.A, Introduction to Environmental Analysis and Appendix E, that would have concurrent construction with the Proposed Project and Build Alternatives are considered in the analysis below.

Impact PHS-3(CU): Create a potential public or environmental health hazard; an undue potential risk for health-related accidents; or result in a safety hazard for people residing or working in the project area during construction 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 PHS-1** above, the No Project Alternative would have no impacts related to health hazards, health-related accidents, or safety hazards during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. Use of hazardous materials and wastes during construction activities associated with cumulative projects in combination with the Proposed Project and Build Alternatives could create a hazard to the public and the environment and a safety hazard for workers and residents in the project area if materials are not appropriately handled, stored, transported, or disposed.

However, as described in **Impact PHS-1** above, the Proposed Project and Build Alternatives would be required to implement **Mitigation Measures PHS-1.A** through **PHS-1.E**, which would require preparation of a Phase I ESA and Phase II ESA (as needed), a hazardous materials and hazardous waste management plan, require procedures for construction equipment and vehicle fueling, require an emergency response/contingency plan, and require the preparation of a soil management plan. With implementation of these measures and compliance with applicable federal, state, and local regulations, potential impacts of the Proposed Project and Build Alternatives due to hazardous materials would be minimized and/or avoided. Similarly, other cumulative projects would also be subject to compliance with federal, state, and local regulations and would prepare and implement plans to address risks. 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 health hazards, health-related accidents, or safety hazards during construction. **(LS)**

Mitigation Measures. As described above, the construction of the Proposed Project and Alternatives in combination with past, present, or probable future projects would not result in significant cumulative impacts related to health hazards, health-related accidents, or safety hazards during construction, and no additional mitigation measures, beyond those identified for the project impacts (Proposed Project and Build Alternatives) are required.

Impact PHS-4(CU): Physically interfere with an adopted emergency response or evacuation plan during construction 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 PHS-2** above, the No Project Alternative would have no impacts related to adopted emergency response or evacuation plans during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. Several of the cumulative projects could have concurrent construction schedules with the Proposed Project or alternatives including, the Dublin/Pleasanton Station BART Parking Expansion, Dublin Crossing Specific Plan, Kaiser Dublin Medical Center, Johnson Drive Economic Development Zone, Residences at California Center, ACEforward Program, Las Positas College, and the Recreation, and Trails Draft Master Plan. Specifically, under the Proposed Project and DMU Alternative, a portion of the Isabel Neighborhood Plan (INP) would be constructed concurrently.

Cumulative public safety impacts may result from construction traffic and activities of the Proposed Project or alternatives, and concurrent cumulative development along local roads. These impacts could impede the movement of emergency response vehicles and affect emergency and evacuation plans, routes, and access.

However, as described in **Impact PHS-2** above, the Proposed Project, DMU Alternative, and Express Bus Alternative would implement **Mitigation Measure TRAN-1**, which would require a construction phasing and traffic management plan that would reduce the potential for impacts by informing cities and emergency responders of road closures and detours. With the implementation of this mitigation measure, potential impacts to emergency response and evacuation plans from the Proposed Project and these alternatives would be minimized and/or avoided. On the other hand, the Enhanced Bus Alternative would have a very limited potential for interfering with emergency response and evacuation plans due to the minor amount of construction required and construction would be coordinated with local cities to ensure all local emergency response and evacuation plans are not impeded. In addition, it is anticipated that cumulative construction projects would be required to undergo their own environmental review and mitigate potential impacts to adopted emergency response or evacuation plans, if needed. Therefore, the Proposed Project and Build Alternatives, in combination with past, present, and probable future projects, would have a less-than-significant impact on adopted emergency response or evacuation plans during construction. **(LS)**

Mitigation Measures. As described above, the construction of the Proposed Project and Alternatives in combination with past, present, or probable future projects would not result in significant cumulative impacts related adopted emergency response and evacuation plans during construction, and no additional mitigation measures, beyond those identified for the project impacts (Proposed Project, DMU Alternative, and Express Bus/BRT Alternative) are required.

(2) Operational Impacts

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

(a) Operations – Project Analysis

Impact PHS-5: Create a significant hazard to the public or the environment through routine transport, use, or disposal of hazardous materials; or reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.

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

This section describes hazardous materials and wastes that may be handled or generated during operations.

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 the Proposed Project or any of the Build Alternatives. However, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could involve the transport, use, or disposal of hazardous materials. 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 is considered to have no impacts related to routine transport, use, disposal, or release of hazardous materials into the environment. **(NI)**

Conventional BART Project and DMU Alternative. Both the Conventional BART Project and DMU Alternative would result in an approximately 5.5-mile extension of rail service within the I-580 median, construct a new station near Isabel Avenue, and construct support facilities along the alignment and a storage and maintenance facility north of

I-580 in the Cayetano Creek Area. In addition, the DMU Alternative would also entail additional improvements at the Dublin/Pleasanton Station, including a DMU transfer platform.

For the majority of the operations-related activities such as maintenance and cleaning, small quantities of common hazardous materials (e.g., cleaning supplies and paint) would be routinely used. These materials would not be used in sufficient volumes to create risk to human or environmental health. However, some project components, such as the emergency generator at the proposed Isabel Station and at the storage and maintenance facility, as well as maintenance activities at the storage and maintenance facility would use hazardous materials and generate hazardous waste, typical of maintenance shops.

Hazardous material storage and use and generation of hazardous waste at the proposed storage and maintenance facility would be similar to existing BART maintenance shops. Typical hazardous materials that are anticipated to be used at the storage and maintenance facility are described below, for the various activities associated with the buildings in which they would occur. The type of container (e.g., UST, AST, drum, pail) and approximate maximum container size are listed in parentheses following each hazardous material and waste. The types of materials required for the operation of the Proposed Project and DMU Alternative would generally be similar; however, the Proposed Project would require greater volumes of materials due to the larger storage capacity at the storage and maintenance facility under the Proposed Project (172 BART cars) compared to the DMU Alternative (12 DMU cars).

- **Maintenance Building.** A variety of maintenance-related materials would be stored in or near the maintenance building, including hydraulic oils and lube/gear oils (55-gallon drums), propane (500 to 1,100-gallon cylinders or ASTs), and compressed welding gases (300-cubic foot cylinders) such as nitrogen, argon, acetylene, and oxygen. Minor quantities of solvents such as brake cleaners would be used (less than 20 gallons per year). Hazardous wastes routinely generated during maintenance activities include used oil, which would be collected in either an UST or an AST (approximately 1,000 to 2,200-gallon capacity), and oily rags/absorbent materials (collected in 55-gallon drums or smaller containers).
- **Train Operator Building/Yard Tower.** Lead-acid batteries (approximately three-gallon electrolyte volume in each battery) are stored in this area in association with backup power supply. Spent lead acid batteries may be occasionally generated.
- **Train Car Cleaning Building.** Washing activities would include the storage and use of a variety of hazardous materials: concentrated aluminum brightener (1,500 to 3,300-gallon AST), 20 percent sodium hydroxide solution (250 to 550-gallon AST), 40 percent sulfuric acid solution (200 to 440-gallon AST), carpet shampoo (55-gallon drum), aluminum sulfate (55-gallon drum), and heavy duty stripper (5-gallon pails).

- **Blowdown Building.** Heavy duty cleaner would be stored in 5-gallon or smaller containers in or near the blowdown build and blowdown sludge would be generated. The blowdown sludge would be pumped from the blowdown area for off-site management as hazardous waste. In addition, vehicle/equipment fueling would be conducted using two 12,000-gallon diesel fuel ASTs and additional lead acid batteries are associated with two electric-powered forklifts operated at the storage and maintenance facility.

Hazardous materials and wastes transported to and from the storage and maintenance facility would occur on public roads (Isabel Avenue and Campus Hill Drive, which pass through a residential area and Las Positas College) and on a new private access road from Campus Hill Drive to the facility.

BART will obtain required environmental permits and prepare and implement environmental plans, consistent with federal, state, and local requirements. At a minimum, the following will be obtained and implemented based on anticipated hazardous material storage and hazardous waste generation: 1) a Unified Program permit covering hazardous material handling, hazardous waste generation, APSA, and UST operation (if a UST is installed for used oil collection); 2) hazardous waste registration as either a small or large quantity generator to ensure cradle-to-grave tracking of hazardous waste shipments of hazardous waste generated at the storage and maintenance facility; 3) a HMBP, which includes a hazardous material inventory for all materials and wastes stored above regulatory thresholds, an employee training program, and an emergency/ contingency plan to respond to incidental spills and accidental releases; 4) a SPCC plan and APSA filing (latter typically performed through completion of the HMBP) for safe handling and storage of oils and petroleum products (including equipping SPCC-subject containers with appropriate secondary containment to contain potential spills and releases) and responses to releases; and 5) if a UST is installed/operated, a UST Monitoring Plan to ensure that the UST system, including associated monitoring equipment, are routinely checked and serviced to prevent leaks.

BART's compliance with existing regulatory requirements would ensure that no significant hazard to the public or the environment would result from storage and handling of hazardous materials or management of waste. Thus, the operation of the Conventional BART Project and DMU Alternative would not create a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials. Furthermore, a hazardous materials release resulting in a significant hazard to the public or the environment is not reasonably foreseeable. Therefore, the Conventional BART Project and DMU Alternative would have less-than-significant impacts related to the routine transport, use, disposal, or release of hazardous materials into the environment, and no mitigation measures are required. **(LS)**

Express Bus/BRT Alternative and Enhanced Bus Alternative. The Express Bus/BRT Alternative would construct new bus transfer platforms at the existing Dublin/Pleasanton Station within the I-580 median and new direct bus ramps from the I-580 express lanes to the platforms, parking at Dublin/Pleasanton Station and Laughlin Road, as well as some limited new bus infrastructure along new and proposed bus routes. The Enhanced Bus Alternative would only construct limited new bus infrastructure—such as bus bulbs, bus shelters, and signage—along new and proposed bus routes. Under these alternatives, large quantities of hazardous materials would not be permanently stored or used. While small quantities of common hazardous materials (e.g., paint and maintenance supplies) would be routinely used for maintenance and cleaning within the new facilities constructed under these alternatives, these materials would not be used in sufficient volumes to create a substantial risk of fire or explosion, or otherwise pose a substantial risk to human or environmental health. Thus, the operation of the Express Bus/BRT Alternative and Enhanced Bus Alternative would not create a significant hazard to the public or environment through the routine transport, use, or disposal of hazardous materials. Furthermore, a hazardous materials release resulting in a significant hazard to the public or the environment is not reasonably foreseeable. Therefore, the Express Bus/BRT Alternative and the Enhanced Bus Alternative would have less-than-significant impacts related to the routine transport, use, disposal, or release of hazardous materials into the environment, and no mitigation measures are required. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to the routine transport, use, disposal, or release of hazardous materials into the environment, and no mitigation measures are required.

Impact PHS-6: Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would create a significant hazard to the public or the environment.

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

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 the Proposed Project or any of the Build Alternatives. The potential impacts of the planned and programmed transportation improvements and continued land use development that would occur under the No Project Alternative has 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 consequence of the BART Board of Directors decisions not to adopt a project. Therefore, the No Project Alternative is considered to have no impacts related to creating a significant hazard to the public or the environment. **(NI)**

Conventional BART Project and Build Alternatives. As described in the Hazardous Materials and Public Health subsection above, the database search did not identify any open case listings indicative of a contamination concern within the footprints of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative. In addition, the bus improvements under the Enhanced Bus Alternative, as well as for the Proposed Project and other Build Alternatives, are anticipated be located within existing street ROWs and the likelihood of encountering hazardous materials is expected to be low. However, once the locations of the bus infrastructure improvements are determined, hazardous material sites lists would be reviewed to confirm that the physical locations are not identified on any open contamination-related listings, prior to construction (see **Mitigation Measure PHS-1.A** above). Therefore, the Proposed Project and Build Alternatives would result in less-than-significant impacts related to creating a hazard to the public or the environment. **(LS)**

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

Impact PHS-7: Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within 0.25-mile of an existing or proposed school.

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

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 the Proposed Project or any of the Build Alternatives. The potential impacts of the planned and programmed transportation improvements and continued land use development that would occur under the No Project Alternative has 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 emitting hazardous emissions or handling hazardous or acutely hazardous materials, substances, or waste within 0.25-mile of an existing or proposed school. **(NI)**

Conventional BART Project and Build Alternatives. As described in **Impact PHS-5** above, the Proposed Project and DMU Alternative would use and store limited supplies of hazardous materials and generate hazardous waste typical of a maintenance shop at the storage and maintenance facility. As described above, under the Proposed Project and DMU Alternative, the routine transport, use, disposal, or release of hazardous materials into the environment would have less-than-significant impacts. Furthermore, there are no existing or proposed schools within 0.25-mile of the proposed storage and maintenance facility. The Express Bus/BRT Alternative and the Enhanced Bus Alternative would use common cleaning supplies and maintenance materials and would not use or store hazardous materials or generate hazardous waste in sufficient volumes to create risk to human or environmental health. Therefore, the Proposed Project and Build Alternatives would result in no impacts related to emitting hazardous emissions or handling hazardous materials within 0.25-mile of existing or proposed schools. **(NI)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to emitting hazardous emissions or handling hazardous materials, and no mitigation measures are required.

Impact PHS-8: Impair implementation of or physically interfere with an adopted emergency response or emergency evacuation plan during operations.

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

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 the Proposed Project or any of the Build Alternatives. However, the planned and programmed transportation improvements and continued land use development, including residential and commercial uses under the No Project Alternative could impair implementation of or physically interfere with an adopted emergency response or emergency evacuation plan. 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 would not result in new impacts related to emergency response or emergency evacuation plans during operations. **(NI)**

Conventional BART Project and DMU Alternative. The BART System Safety Department would be responsible for implementing emergency plans for the Proposed Project and DMU Alternative and would coordinate emergency plans with local jurisdictions, including the Comprehensive Emergency Management Plans of local jurisdictions. The Comprehensive Emergency Management Plans for each municipality typically put in place standard procedures to assist cities in emergency situations, such as mass evacuation, disaster recovery, and shelter-in-place events. The BART SSPP lists procedures for interagency coordination and participation with local response agencies in BART disaster exercises. BART coordinates with local response agencies, including ambulance services, the fire department, the police department, and the California Highway Patrol.

The Proposed Project and DMU Alternative would be designed to provide access for emergency response vehicles. Specifically, the proposed Isabel Station would be designed to enhance access and parking for emergency response vehicles. In addition, the storage and maintenance facility would be accessible via a new access road from Campus Hill Drive for use by BART employees and local emergency responders. The proposed BART alignment and Isabel Station would be located in the median of I-580 completely separate from roadways and no at-grade crossings are proposed as part of the Proposed Project. Therefore, the Proposed Project and DMU Alterative would have less-than-significant impacts on local emergency response and evacuation plans. **(LS)**

Express Bus/BRT Alternative. The Express Bus/BRT Alternative would not include any new stations; however, modifications would occur at the Dublin/Pleasanton Station for the bus transfer platforms and bus ramps from I-580, as well as parking at the Dublin/ Pleasanton Station and Laughlin Road. These modifications would be designed to provide access for emergency response vehicles and would not impact emergency response vehicles or evacuation plans. Furthermore, the BART System Safety Department would coordinate with local jurisdictions in the development of its emergency plans. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts on local emergency response and evacuation plans. **(LS)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would only result in new bus infrastructure improvements and bus routes. These bus improvements would be constructed in existing street ROW and would not require new or modified emergency response or evacuation plans. Therefore, the Enhanced Bus Alternative would have no impacts on local emergency response and evacuation plans. **(NI)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to emergency response or emergency evacuation plans, and no mitigation measures are required.

Impact PHS-9: Be 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, and result in a significant safety hazard for people residing or working in the project area.

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

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 the Proposed Project or any of the Build Alternatives. However, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could be located within 2 miles of the Livermore

Municipal Airport and thus result in a significant safety hazard. 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 would not result in new impacts related to airports and airport safety. **(NI)**

Conventional BART Project and DMU Alternative. Under both the Proposed Project and DMU Alternative, the proposed Isabel Station would be located within the I-580 median and would be approximately 62 feet high; the pedestrian overcrossings (to the north and south of I-580) would be approximately 57 feet high; and the Isabel Station parking garage for the Proposed Project (south of I-580) would be approximately 87 feet high.[31]

According to Section 77.9 of Part 77, the FAA requires notice of construction or alteration if any building penetrating an imaginary surface extending outward and upward at 1 foot of elevation for every 100 horizontal feet, over a distance of 20,000 feet. Under this regulation, a number of project components, including the parking garage in the Isabel South Area, Isabel Station, and both pedestrian overcrossings would penetrate this imaginary surface. As such, BART would be required to submit a Form 7460-1 (Notice of Proposed Construction or Alteration) to the FAA for a determination of whether or not the project would be an obstruction to air navigation or navigational aids or facilities through an aeronautical study.

Based on initial review of these regulations (CFR Part 77, Section 77.17, and Section 77.79[e]), it appears that the Proposed Project and DMU Alternative would not exceed the thresholds for a Determination of Hazard to Air Navigation. All structures would be less than 200 feet high, would not be located in a terminal obstacle clearance area, and would not penetrate the defined transitional surface.[32] Thus, the FAA is anticipated to issue a Determination of No Hazard, which would approve the project as is, or a Determination of No Hazard with Conditions, which would require additional conditions, such as lighting and markings on structures, for the Proposed Project or DMU Alternative.

Under the ALUCP, the following project areas and corresponding components are located in airport zones and Airport Safety Zones, and are shown in Figure 3.N-2:

[31] The proposed parking structure for the DMU Alternative would be lower in height than the 87-foot high garage under the Proposed Project.

[32] Based on initial review, the transitional surface in the vicinity of the footprints of the Proposed Project and DMU Alternative at the Isabel Avenue area would range as follows: from a height of approximately 100 feet to 150 feet at the Isabel South Area (increasing in height from north to south) and from 120 to 90 feet at the Isabel North Area (decreasing in height from south to north).

- AIA: majority of I-580 Corridor Area from Tassajara Road to Portola Avenue, Isabel North Area, Isabel South Area, and Cayetano Creek Area, including the DMU Alternative's Storage and Maintenance Facility.
- APA: portions of the I-580 Corridor Area from Fallon Road to just past Isabel Avenue, Isabel North Area, and Isabel South Area.
- Zone 3: Isabel South Area.
- Zone 6: portions of the I-580 Corridor Area from Fallon Road to just past Isabel Avenue, Isabel North Area, and Isabel South Area.
- Zone 7: Cayetano Creek Area, including the DMU Alternative's storage and maintenance facility. (The storage and maintenance facility for the Proposed Project is located just outside of Zone 7.)

Because portions of the Proposed Project and DMU Alternative propose new land uses within the AIA, they would likely undergo a review of consistency by the ALUC. If such a review is required, BART will provide the following information to the ALUC including, but not limited to, the project's land use, relation to airport safety zones, component heights, general project description, and a copy of this EIR.

The ALUC would review the proposed land uses for compatibility with the Airport Safety Zones as noted below:

- The parking garage within the Isabel South Area would be reviewed for compliance with Zone 3's regulations. The garage located at the Isabel South Area would be a permitted use and would meet the 30 percent open land recommendation.
- The Isabel Station and pedestrian overcrossings would be reviewed for compliance with Zone 6 regulations. All proposed facilities under the Proposed Project and DMU Alternative within Zone 6 are permitted uses (train stations and transit-oriented development) and meet open land recommendations.
- The storage and maintenance facility under the DMU Alternative would be reviewed for compliance with Zone 7 regulations. All proposed facilities under the Proposed Project and DMU Alternative within Zone 7 are permitted uses (repair garages and storage facilities) and meet open land recommendations.

In addition, the ALUC would review compliance with Part 77. As stated above, both the Proposed Project and DMU Alternative are anticipated to receive a Determination of No Hazard or Determination of No Hazard, but subject to compliance with conditions, and thus are expected to be in compliance with Part 77.

Based on this criterion, it is anticipated that the Proposed Project and DMU Alternative would be found to be consistent with the ALUCP, or consistent with the ALUCP and subject to compliance with such conditions as the ALUC may require.

Based on this initial review of the proposed building heights and the building locations relative to the ALUCP and FAA regulations, the Proposed Project and DMU Alternative would not result in a safety hazard for people residing or working in the project area. Therefore, the Proposed Project and DMU Alternative would result in less-than-significant impacts related to airports and airport safety. **(LS)**

Express Bus/BRT Alternative. The majority of the proposed improvements under the Express Bus/BRT Alternative would be located within the Dublin/Pleasanton Station Area and the Laughlin Road Area, and the footprint of the Express Bus/BRT Alternative would not be located in areas subject to the Livermore Municipal Airport's ALUCP, with the exception of some bus infrastructure improvements (i.e., bus shelters, bus bulbs, and signage). In addition, none of the project components would be subject to review by the FAA under Part 77 and would not exceed the City of Livermore's 40 feet height limit. While minor bus improvements could be located within Livermore Municipal Airport zones, the improvements would be constructed within existing street ROW, and the heights of these improvements would not exceed the thresholds for review by the County ALUC. Therefore, the Express Bus/BRT Alternative would result in no impacts related to airports and airport safety. **(NI)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would construct improvements within existing street ROW and the heights of these improvements would not exceed the thresholds for review by the FAA, County ALUC, or City of Livermore. Therefore, the Enhanced Bus Alternative would have no impacts related to airports and airport safety. **(NI)**

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

Impact PHS-10: Be located within the vicinity of a private airstrip, and result in a significant safety hazard for people residing or working in the project area.

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

No Project Alternative. The potential impacts of the planned and programmed transportation improvements and continued land use development that would occur under the No Project Alternative has 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 would not result in new impacts related to private airstrip safety hazards. **(NI)**

Conventional BART Project and Build Alternatives. There are no privately owned airports or airstrips within a 2-mile radius of the Proposed Project and Build Alternatives. Therefore, the Proposed Project and Build Alternatives would result in no impacts related to private airstrip safety hazards. **(NI)**

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

Impact PHS-11: Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

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

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 the Proposed Project or any of the Build Alternatives. However, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could be located near areas of high fire severity. 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 would not result in new impacts related to wildland fires. **(NI)**

Conventional BART Project and DMU Alternative. While most of the project corridor is developed with commercial, industrial, and residential uses, segments of the project corridor extend through undeveloped areas that have the potential for wildland fire hazards. The Proposed Project would not be located within zones designated as very high wildfire hazard potential, as shown in Figure 3.N-3.

According to CAL FIRE, portions of the Proposed Project and DMU Alternative would be located in areas of state responsibility designated as moderate and high fire severity:

- I-580 Corridor Area – Portions of the eastern I-580 Corridor Area are within moderate and high fire hazard potential zones, particularly the areas between Fallon Road/El Charro Road and Dolan Road
- Cayetano Creek Area – The storage and maintenance facility and tail track would be located in areas with moderate and high fire hazard potential

According to the USFS, the portions of the Proposed Project and DMU Alternative within local responsibility areas would be located in zones ranging from non-burnable to high wildfire potential hazard:

- Dublin/Pleasanton Station Area – Generally designated as non-burnable with a few areas of low wildfire hazard potential
- I-580 Corridor Area – The western portion of the corridor is generally designated as non-burnable, while areas along the eastern portion are designated low, moderate, and high wildfire hazard potential
- Isabel North Area – Primarily designated as low and moderate potential
- Isabel South Area – Primarily designated as low potential

Because a portion of the Proposed Project and DMU Alternative would extend through areas with either moderate or high fire hazard severity according to CAL FIRE, the Proposed Project and DMU Alternative would be required to comply with Division 21, Fire Suppression, and Division 28, Electronic Safety and Security, of the BART Facilities Standards. These standards require facilities to include fire-suppression standpipes, wet-pipe sprinkler systems, clean agent fire extinguishing systems, and alarm detection systems.[33] Further, prior to construction, the Proposed Project and DMU Alternative would require review for conformity with the Wildland-Urban Interface Code, as amended, and would require the storage and maintenance facility to conform with applicable building requirements of Chapter 7A of the California Building Code.[34] As required in Chapter 7A of the California Building Code and Divisions 21 and 28 of the BART Facility Standards, all BART facilities in wildland-urban interface areas must use development and site design practices that would help to prevent wildfire exposure. These include, but are not limited to, vegetation management, building materials, construction methods, roofing, vents, sprinkler systems, and fire detection and alarm systems. Also, as stated in **Impact CS-6** in Section 3.O, Community Services, while the Proposed Project and DMU Alternative would increase demand for fire and emergency medical services, they would not trigger the need

[33] San Francisco Bay Area Rapid Transit District (BART), 2016. BART Facilities Standards, Standard Specifications, R3.0.3. January. Available at: https://webapps.bart.gov/BFS/BFS_3_1_Spec/BFS_3_1_index.html.

[34] California Building Standards Commission, 2013. 2013 Building Code. Available at: http://osfm.fire.ca.gov/codedevelopment/pdf/wildfire%20protection%20building%20construction/2013-Part-2-CBC-Ch7A.pdf.

for additional fire facilities within the project corridor to maintain acceptable service ratios, response times, or other performance standards.

Therefore, for the reasons stated above, the Proposed Project and DMU Alternative would result in less-than-significant impacts related to wildland fires. **(LS)**

Express Bus/BRT Alternative. Under the Express Bus/BRT Alternative, facilities would be constructed in Dublin/Pleasanton Station Area and Laughlin Road Area. None of the components proposed under the Express Bus/BRT Alternative would be located within a state responsibility area. According to the USFS wildfire designations, the Dublin/Pleasanton Station Area and Laughlin Road Area are both designated as predominately non-burnable or low wildfire hazard potential zones. For these reasons, the Express Bus/BRT Alternative would not be subject to the Wildland-Urban Interface Code and Chapter 7A of the California Building Code. Regardless of proximity to fire hazard zones, all BART developments, including the Express Bus/BRT Alternative, are required to use the best development and site design practices identified by local fire departments along with Divisions 21 and 28 of the BART Facility Standards as required by BART. Because of its location away from any fire hazard zones and compliance with the BART Facility Standards, it is not foreseen that the Express Bus/BRT Alternative would expose people or structures to potential wildfire. Therefore, the Express Bus/BRT Alternative would have no impacts related to wildland fires. **(NI)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would not include any additional BART facilities. The proposed bus infrastructure improvements under this alternative would be located within the existing street ROW, generally within local responsibility areas and non-burnable or low wildfire hazard potential zones according to both USFS and CAL FIRE. For this reason, the Enhanced Bus Alternative would not expose people or structures to a significant risk of loss, injury, or death involving wildland fires. Therefore, the Enhanced Bus Alternative would have no impacts related to wildland fires. **(NI)**

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

Impact PHS-12: Result in EMF that exceeds significance levels for human health.

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

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 the Proposed Project or any of the Build Alternatives.

However, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could potentially generate EMF. 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 would not result in new impacts related to EMF. **(NI)**

Conventional BART Project. Table 3.N-10 shows the measured EMF values inside the BART car, on the platform, and at the underpass for both the existing Type-A cars and new Bombardier cars as compared to the ICNIRP and ACGIH limits. The measured value inside the train is higher than the measured value on the platform or at the underpass; this value is 155 μT and 11 μT for the Type-A train and Bombardier train, respectively. Furthermore, as shown in Table 3.N-10, the new Bombardier train has a weaker magnetic field compared to the existing Type-A trains.

All the measured values, for both the Type-A train and the Bombardier train, are substantially lower than either the ICNIRP or ACGIH limits. For example, the Type-A train's highest measured value of 155 μT (inside train) is well below the ICNIRP and ACHIG magnetic field thresholds (40,000 μT and 500 μT, respectively). Therefore, the Proposed Project would not emit EMF that exceeds significance levels for human health and impacts would be less than significant. No mitigation measures are required. **(LS)**

DMU Alternative. The DMU Alternative would not emit EMF as described in the Impact Methodology subsection above. Therefore, the DMU Alternative would have no impact related to EMF that exceeds significance levels for human health, and no mitigation measures are required. **(NI)**

EMU Option. Table 3.N-11 shows the measured values for the EMU trains. Measurements were made at a platform next to an EMU car and at approximately 33 feet away from the train ROW in a public space. The only measureable field was the DC magnetic field from the platform.

As shown in Table 3.N-11, the EMF from the EMUs are substantially below the ICNIRP and ACGIH limits. The magnetic and electric fields for the non-detectable measurements are negligible compared to ICNIRP and ACGIH limits. Therefore, the EMU Option would not emit EMF that exceeds significance levels for human health, and impacts would be less than significant. No mitigation measures are required. **(LS)**

Express Bus/BRT Alternative and Enhanced Bus Alternative. The Express Bus/BRT Alternative and Enhanced Bus Alternative would not emit EMF as described in the Impact Methodology subsection above. Therefore, the Express Bus/BRT Alternative and Enhanced

Bus Alternative would have no impact related to EMF that exceeds significance levels for human health, and no mitigation measures are required. **(NI)**

TABLE 3.N-10 MEASURED EMF FOR BART TRAINS AND THRESHOLDS

	Measured Values		Thresholds	
Measurement	**Existing BART Train (Type-A Train)**	**New BART Train (Bombardier Train)**	**ICNIRP Limit Values**	**ACGIH Limit Values**
Inside Train				
DC Magnetic Field	155 µT*	11 µT	40,000 µT	500 µT
AC Electric Field	45 V/m	D	167 V/m @ 1.5 kHz[a]	1,000 V/m
AC Magnetic Field	D	D	-- [b]	100 µT
On Platform				
DC Magnetic Field	35 µT	9 µT	40,000 µT	500 µT
AC Electric Field	40 V/m	D	2,500 V/m @ 100 Hz[c]	1,000 V/m
AC Magnetic Field	D	D	-- [b]	100 µT
Underpass				
DC Magnetic Field	37 µT	NM	40,000 µT	500 µT
AC Electric Field	ND	NM	-- [b]	1,000 V/m
AC Magnetic Field	ND	NM	-- [b]	100 µT

Notes:
* = Very short peak value; -- =.threshold dependent on measured value which was not measureable; Hz = hertz; V/m = volts per meter; µT = microtesla.
D = Detectable but not measureable. Detected on the Aaronia spectrum analyzer, but the contribution so small that it cannot be quantified (generally below 0.5 µT or 10 V/m relative to the background noise).
ND = Not detectable. Detection limit on the Aaronia spectrum analyzer is approximately 0.3 µT or 8 V/m relative to the background noise.
NM = Not measured.
[a] The maximum AC electric field is measured at 1.5 kHz among the entire range of frequencies measured inside the train. All frequencies up to 1.5 kHz were measured. The highest peak during the acceleration was at 1.5 kHz. Due to the low voltage, even at the highest peak value, the total sum of all contributing frequencies, will not get close to the limit values.
[b] Measureable values were not obtained (see note D). Thus, an ICNIRP Limit Value is not shown because the peak frequency has not been identified. Values are less than 0.5 µT (magnetic field) and 10 V/m (electric field), well below thresholds for frequencies below 1.5 kHz.
[c] The maximum AC electric field is measured at 100 Hz among the entire range of frequencies measured on the platform. All frequencies up to 1.5 kHz were measured. The highest peak during the acceleration was at 100 Hz. Due to the low voltage, even at the highest peak value, the total sum of all contributing frequencies, will not be close to the limit values.
Source: ACGIH, 2017; ICNIRPP, 1998.

TABLE 3.N-11 MEASURED EMF FOR EMU TRAINS AND THRESHOLDS

	Measured Values		Thresholds	
Measurement	**EMU Platform**	**Public Space (at 33 Feet)**	**ICNIRP Limit Values**	**ACGIH Limit Values**
DC Magnetic Field	24 μT	ND	40,000 μT	500 μT
AC Electric Field	ND	ND	--[a]	1,000 V/m
AC Magnetic Field	ND	ND	--[a]	100 μT

Notes: -- = threshold dependent on measured value which was not measureable. V/m = volts per meter; μT = microtesla.
ND = Not detectable. Detection limit on the Aaronia spectrum analyzer is approximately 0.3 μT or 8 V/m relative to the background noise.
[a] Measureable values were not obtained (see note ND). Thus, an ICNIRP Limit Value is not shown because the peak frequency has not been identified. Values are less than 0.3 μT (magnetic field) and 8 V/m (electric field), well below thresholds for frequencies below 1.5 kHz.
Source: ACGIH, 2017; ICNIRPP, 1998.

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to EMF that exceed significance levels for human health, and no mitigation measures are required.

Impact PHS-13: Result in EMF that causes interference with other electromagnetic systems.

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

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 the Proposed Project or any of the Build Alternatives. However, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could potentially generate EMF. 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 would not result in new impacts related to EMF interference with other electromagnetic systems. **(NI)**

Conventional BART Project. For BART trains to influence sensitive equipment, such as at hospitals, the equipment must be in close proximity to the railway. A recent study of worst case magnetic fields from electrified train systems, completed for the California High-Speed Rail (CHSR), showed that the magnetic field from an electrified track decreases to 2 mG at approximately 226 feet from the centerline of the ROW.[35] This estimate is very conservative when applied to the BART system for the following reasons: (1) the CHSR would operate at a much higher voltage (25 kV) than BART (1 kV); (2) CHSR cars are heavier than BART cars and would travel at higher speeds, thus requiring more electrical power compared to BART and resulting in higher magnetic fields; and (3) the CHSR would use a catenary system, which would have higher magnetic fields compared to the third-rail system used by BART. Therefore, areas approximately 226 feet or greater from the centerline of the Proposed Project are expected to be exposed to a magnetic field much lower than the threshold level of 2mG.

As described in the Sensitive Receptor for EMF subsection above, the closest existing medical facility to the footprint of the Proposed Project is the John Muir Health Urgent Care Center (5860 Owens Drive, Pleasanton), located approximately 800 feet to the south. This facility is greater than 226 feet from the footprint and thus the magnetic field from the Proposed Project would be below the threshold level (2 mG) at the facility. Therefore, the Proposed Project would not produce EMF that causes interference with other electromagnetic systems and impacts would be less than significant. No mitigation measures are required. **(LS)**

DMU Alternative. The DMU Alternative would not emit EMF as described in the Impact Methodology subsection above. Therefore, the DMU Alternative would have no impact related to EMF interference with other electromagnetic systems, and no mitigation measures are required. **(NI)**

EMU Option. As described in **Impact PHS-12** above, measurements for the EMU Option that were made approximately 33 feet from the EMU ROW did not detect any change in the magnetic field. At a minimum, any sensitive equipment would be located beyond the Caltrans I-580 ROW, at least 80 feet from the EMU tracks in the I-580 median. [36] At this distance (at least 80 feet from the EMU tracks), the EMU Option would not emit EMF that causes interference with other electromagnetic systems. Therefore, the EMU Option would not produce EMF that causes interference with other electromagnetic systems and impacts would be less than significant. No mitigation measures are required. **(LS)**

[35] Turner Engineering Corporation, 2012. California High-Speed Train Project. EIR/EIS Assessment of CHST Alignment EMF Footprint. Prepared for California High-Speed Rail Authority. Available at: www.hsr.ca.gov/docs/programs/eir_memos/Proj_Guidelines_TM300_07R00.pdf, accessed May 2017.

[36] This estimate is based on five 12-foot travel lanes and two 10-foot shoulders. See Chapter 2, Project Description for existing and proposed lane configuration.

Express Bus/BRT Alternative and Enhanced Bus Alternative. The Express Bus/BRT Alternative and Enhanced Bus Alternative would not emit EMF as described in the Impact Methodology subsection above. Therefore, the Express Bus/BRT Alternative and Enhanced Bus Alternative would have no impact related to EMF interference with other electromagnetic systems, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to EMF that causes interference with other electromagnetic systems, and no mitigation measures are required.

(b) Operations – Cumulative Analysis

The geographic study area for the public health and safety cumulative analysis includes an area within an approximately 0.5-mile radius of the collective footprint.

As described in **Impacts PHS-6**, **PHS-7**, and **PHS-10** above, the Proposed Project and Build Alternatives would have no impacts related to hazardous material sites pursuant to Government Code Section 35962.5, emissions near schools, and safety hazards to private airstrips. Therefore, the Proposed Project and Build Alternatives would not contribute to these cumulative impacts during operations.

Impact PHS-14(CU): Create a significant hazard to the public or the environment through routine transport, use, or disposal of hazardous materials; or reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment; or be located on a hazardous materials site pursuant to Government Code Section 35962.5 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 PHS-5** above, the No Project Alternative would have no impacts associated with the routine transport, use, disposal, or release of hazardous materials into the environment during operations. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. Cumulative projects with industrial uses, such as the Johnson Drive Economic Development Zone, Five Rivers Aviation, Oaks Business Park, Trammel Crow, and Gillig Bus Manufacturing could result in increased transport, use, and disposal of hazardous materials. In addition, the Proposed Project and Build Alternatives, particularly the Proposed Project and DMU Alternative, which would use hazardous materials such as diesel fuel, paints, solvents, adhesives, caulks, and oils at the storage and maintenance facility, could also contribute to increased transport, use, and disposal of hazardous materials.

As described in the Regulatory Framework subsection above, use of hazardous materials is subject to existing regulatory requirements that ensure the safe handling of hazardous materials and waste and reduce potential risks from releases of such hazardous materials. Specifically, federal and state regulations require preparation of a SPCC plan and APSA filing for safe handling and storage of oils and responses to releases, hazardous waste management for handling of hazardous waste, and risk management planning/CalARP preparation for handling and release prevention of certain hazardous substances. In addition, State regulations require any business that handles a hazardous material or mixture containing a hazardous material in reportable quantities to establish and implement a HMBP (HSC Division 20, Chapter 6.95, Sections 25500 et seq. and 19 CCR Sections 2729, et seq.) for emergency response to a release or threatened release of a hazardous material. Each of the cumulative projects, as well as the Proposed Project and Build Alternatives, would be subject to these regulatory requirements related to hazards and hazardous materials. In addition, there are no open case listings indicative of a contamination concern within the footprints of the Proposed Project and Build Alternatives. If any cumulative projects are located on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5, they would be required to address the hazardous materials, if present. Therefore, the Proposed Project and Build Alternatives in combination with past, present, or probable future projects would result in less-than-significant cumulative impacts from routine transport, use, disposal, or release of hazardous materials into the environment, and no mitigation measures are required. **(LS)**

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 the routine transport, use, disposal, or release of hazardous materials into the environment, and no mitigation measures are required.

Impact PHS-15(CU): Impair implementation of or physically interfere with an adopted emergency response or emergency evacuation plan 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 PHS-8** above, the No Project Alternative would have no impacts associated with the implementation of or physical interference with an adopted emergency response or emergency evacuation plan during operations. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. The Proposed Project and Build Alternatives in combination with cumulative projects could interfere with emergency response or evacuation plans if designated emergency access routes or evacuation routes are obstructed. However, under the Proposed Project and Build Alternatives, BART would develop its emergency plans in coordination with local emergency response agencies and would incorporate access for emergency response vehicles. As described in **Impact PHS-8**, all new BART facilities would be constructed consistent with the BART Facility Standards and the BART System Safety Department would be responsible for implementing emergency plans. Further, the design of the Proposed Project and Build Alternatives would be consistent with requirements to allow emergency vehicle access at the facilities.

Furthermore, the cumulative projects, including the INP, would be subject to review by local jurisdictions. As part of the development approval process, the cumulative projects including the INP, have completed or will undergo their own environmental review and any potential impacts related to adopted local emergency and evacuation plans would be addressed before they are implemented. Therefore, the Proposed Project and Build Alternatives in combination with past, present, or probable future projects would result in less-than-significant cumulative impacts related to local emergency response and evacuation plans, and no mitigation measures are required. **(LS)**

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 emergency response or emergency evacuation plans, and no mitigation measures are required.

Impact PHS-16(CU): Be 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, and would result in a significant safety hazard for people residing or working in the project area under Cumulative Conditions.

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

No Project Alternative. As described in **Impact PHS-9** above, the No Project Alternative would have no impacts associated with the Livermore Municipal Airport during operations. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and DMU Alternative. The following proposed cumulative projects would be subject to FAA and ALUCP regulations: Fallon Gateway, The Shoppes, San Francisco Premium Outlets, Crosswinds Site, Sywest Site, Five Rivers Aviation, Chamberlin, Livermore Valley Charter School, Hyatt Hotel, Homes 2 Suites, Oaks Business Park, Trammel Crow, Gillig Bus Manufacturing, Las Positas College, Shea Homes – Sage Projects, and the INP. All listed cumulative projects within Livermore would also be subject to Livermore's 40 foot height requirement. These projects would cause a significant safety hazard if the Alameda County ALUC determined that they were inconsistent with the

ALUCP, if the FAA determined that they could disturb navigable airspace, or if they violated Livermore's 40 feet height requirement.

Each of these cumulative projects would be required to adhere to all applicable ALUCP, FAA, and local regulations, including height restrictions or incompatible land uses. Any projects deemed appropriate for review by the ALUC or FAA and found to cause a hazard would be required to make modifications to come into compliance with applicable regulations.

Elements of the INP would most likely exceed the City of Livermore's height limit of 40 feet for buildings within the APA according to the City of Livermore's Development Code, Section 4.02.040.C.[37] Therefore, the INP would require an amendment to Livermore Development Code 4.02.040.C to allow for the heights proposed in the plan. In addition, the APA currently restricts the encroachment of residential land uses into the area, which would conflict with the INP's plans to rezone a number of parcels for residential use. To address this, the City of Livermore proposes to revise the area of the INP located within the APA to allow the development of residential units by creating an overlay in the northeast corner of the APA. This overlay would allow for the development of residential uses with conditions aimed at increasing resident awareness, consistent with the ALUCP. The City of Livermore would also be required to comply with FAA Part 77 height criteria for all new development.[38]

As described in **Impact PHS-9** above, components of the Proposed Project and DMU Alternative would be required to be reviewed by both the ALUC and FAA. Based on an initial assessment described above, the Proposed Project and DMU Alternative would likely be consistent with the ALUCP and are not likely to result in a hazard to air navigation under the standards set forth in FAA Regulations Part 77.

As both the Proposed Project and DMU Alternative would not likely result in a hazard to navigable airspace, and each cumulative project would be required to follow applicable ALUCP and FAA regulations, potential for cumulative safety impacts would be reduced. Therefore, the Proposed Project and DMU Alternative, in combination with past, present, and probable future development would have less-than-significant cumulative impacts related to airports and airport safety. **(LS)**

Express Bus/BRT Alternative and Enhanced Bus Alternative. As described in **Impact PHS-9** above, the Express Bus/BRT Alternative and Enhanced Bus Alternative would have no impacts related to airports and airport safety, and therefore, would not contribute to potential cumulative impacts. **(NI)**

[37] City of Livermore, 2016. Isabel Neighborhood Plan.
[38] Ibid.

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 airport safety hazards, and no mitigation measures are required.

Impact PHS-17(CU): Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands under Cumulative Conditions.

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

No Project Alternative. As described in **Impact PHS-11** above, the No Project Alternative would have no impacts associated with wildland fires during operations. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and DMU Alternative. The majority of the cumulative projects would be located in areas of local responsibility and are therefore not subject to the Wildland-Urban Interface Code according to CAL FIRE. These projects would be located in non-burnable or low wildfire hazard potential zones. However, some cumulative projects are located within areas of State or federal responsibility and would be required to adhere to the Wildland-Urban Interface Code. Such projects include Fallon Gateway, San Francisco Premium Outlets, Crosswinds Site, and the Sywest Site; the area around these projects is designated as high wildfire hazard potential zones according to the USFS.

All cumulative projects would be subject to applicable state and local regulations, which would address potential wildland fire hazards by requiring fire extinguishers, creating fire lane markings, requiring fire protection system maintenance, fire hydrant maintenance, National Fire Protection Association placarding, and standby generator maintenance, and thus would reduce potential impacts.

As discussed above in **Impact PHS-11**, components of the Proposed Project and DMU Alternative would be located in areas of moderate and high wildfire hazard potential according to CAL FIRE and thus would be subject to BART Facilities Standards and the regulations set by the Wildland-Urban Interface Code. As stated in **Impact PHS-11**, no facilities under the Proposed Project and DMU Alternative would be located within very high wildfire hazard potential zones.

Each of the cumulative projects and the Proposed Project and DMU Alternative would address wildland fire risk as required by the State and local jurisdictions. Because of the localized nature of potential impacts, it is not anticipated that the impacts would combine with the potential impacts of the Proposed Project or Build Alternatives. Therefore, the

Proposed Project and DMU Alternative, in combination with past, present, and probable future development would have less-than-significant cumulative impacts related to exposing people or structures to a significant risk of loss, injury, or death involving wildfire. **(LS)**

Express Bus/BRT Alternative and Enhanced Bus Alternative. As stated in **Impact PHS-11**, the Express Bus/BRT Alternative and Enhanced Bus Alternative would have no impacts related to exposing people or structures to a significant risk of loss, injury, or death involving wildfire because all of their components are located within non-burnable and low wildfire hazard potential zones. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

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 wildland fire, and no mitigation measures are required.

Impact PHS-18(CU): Result in EMF that exceeds significance levels for human health or result in EMF that causes interference with other electromagnetic systems under Cumulative Conditions.

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

No Project Alternative. As described in **Impacts PHS-12 and PHS-13** above, the No Project Alternative would have no impacts associated with EMF. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and EMU Option. As discussed in **Impact PHS-12** above, the Proposed Project and EMU Option would emit EMF at levels substantially below the threshold limits for human health. Furthermore, it is unlikely that the cumulative projects would emit EMF; however, they are required to undergo their own environmental review and approval process and would address any potential EMF impacts through that process. It is possible for EMF impacts from the Proposed Project and cumulative projects to be additive if emitted at the same frequency. However, it is not anticipated that other cumulative projects listed in Section 3.A, Introduction to Environmental Analysis and Appendix E, will have significant sources of EMF.

The Kaiser Dublin Medical Center is currently under construction and the closest medical facility to the footprint of the Proposed Project (Medical Office Building 2) would be within approximately 250 feet.[39] As described in **Impact PHS-13** above, at a distance of approximately 226 feet from the Proposed Project, the magnetic field from the Proposed Project would be less than 2 mG, which is the threshold level for impacts to medical equipment. Therefore, the magnetic field from the Proposed Project at the closest Kaiser Dublin Medical Center building would be below the threshold level.

Also as described in **Impact PHS-13,** the EMU Option would not cause interference with other electromagnetic systems such as equipment within medical facilities because these facilities would be located beyond the Caltrans I-580 ROW. At this distance, at least 80 feet from the EMU tracks in the I-580 median, no EMF is detectable.

Therefore, the Proposed Project and EMU Option, in combination with past, present, and probable future development would have less-than-significant cumulative impacts related to EMF that exceeds significance levels for human health or causes interference with other electromagnetic systems. **(LS)**

DMU Alternative, Express Bus/BRT Alternative, and Enhanced Bus Alternative. As described in **Impacts PHS-12 and PHS-13** above, the DMU Alternative, Express Bus/BRT Alternative, and Enhanced Bus Alternative would have no impacts associated with EMF. Therefore, these alternatives would not contribute to cumulative impacts. **(NI)**

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 EMF that exceeds significance levels for human health or causes interference with other electromagnetic systems, and no mitigation measures are required.

[39] City of Dublin, 2016. Draft Environmental Impact Report for Kaiser Dublin Medical Center Project. January 28. Available at: http://dublinca.gov/DocumentCenter/View/12964, accessed May 2017.

O. COMMUNITY SERVICES

1. Introduction

This section describes the community services setting and existing conditions as they relate to the BART to Livermore Extension Project, discusses applicable regulations, and assesses the potential impacts to community services from construction and operation of the Proposed Project and Alternatives. Community services addressed in this section are: police, fire, emergency medical services, parks, and recreational facilities.

The study area for police, fire, and emergency medical services includes the service area of the respective service providers in the project corridor. The service boundaries of the various service providers generally conform to the city boundaries, and therefore, the study area is generally the cities of Dublin, Pleasanton, and Livermore, as well as a portion of unincorporated Alameda County. The study area for parks and recreational facilities includes the collective footprint—the combined footprints of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative. In addition, the bus routes and bus infrastructure improvements 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 and within the street right-of-ways (ROW), are addressed programmatically in this analysis, as described in Chapter 2, Project Description.

The police, fire, and emergency medical services analysis is based on published information from the respective service providers, the BART Facilities Standards, and local general plans.[1] In addition, police and fire service providers from each applicable agency were contacted for information on existing service levels and to ascertain the possible effects of the Proposed Project and Build Alternatives on the delivery of services within the study area.

Due to the nature of the Proposed Project and Build Alternatives, this analysis considers service ratios/times and performance standards for police protection, fire, and medical emergency services. This analysis does not consider performance standards for parks, schools, or other public services, or degradation of parks or recreational facilities due to their substantial use or demand for the facilities. Transportation projects, such as the Proposed Project and Build Alternatives, do not result in direct population, housing, or employment increases, and as such would not lead to increased demand for schools,

[1] San Francisco Bay Area Rapid Transit District (BART), 2016a. BART Facilities Standards. Available at: https://webapps.bart.gov/BFS/BFS_3_0_3_Spec/BFS_3_0_3_index.html, accessed September 29, 2016.

parks, or other public facilities. However, this analysis does consider potential impacts to parks and recreational facilities that are within the collective footprint and could be directly affected by construction of the Proposed Project and Build Alternatives.

Comments pertaining to community services 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: concerns regarding increased demands on police, fire, and medical services as a result of the Proposed Project and Build Alternatives (including concerns related to traffic and security); whether or not there would be increased demand for schools and parks; and potential impacts to the Shadow Cliffs to Morgan Territory Regional Trail and Brushy Peak Regional Preserve. See Section 3.B, Transportation, for further discussion of impacts related to traffic and access related to emergency vehicle, automobile, bicycle, and pedestrian access and see Section 3.E, Visual Quality, for impacts related to aesthetics at parks.

2. Existing Conditions

This subsection describes the existing conditions for community services, including police services, fire protection and emergency medical services, and parks and recreational facilities.

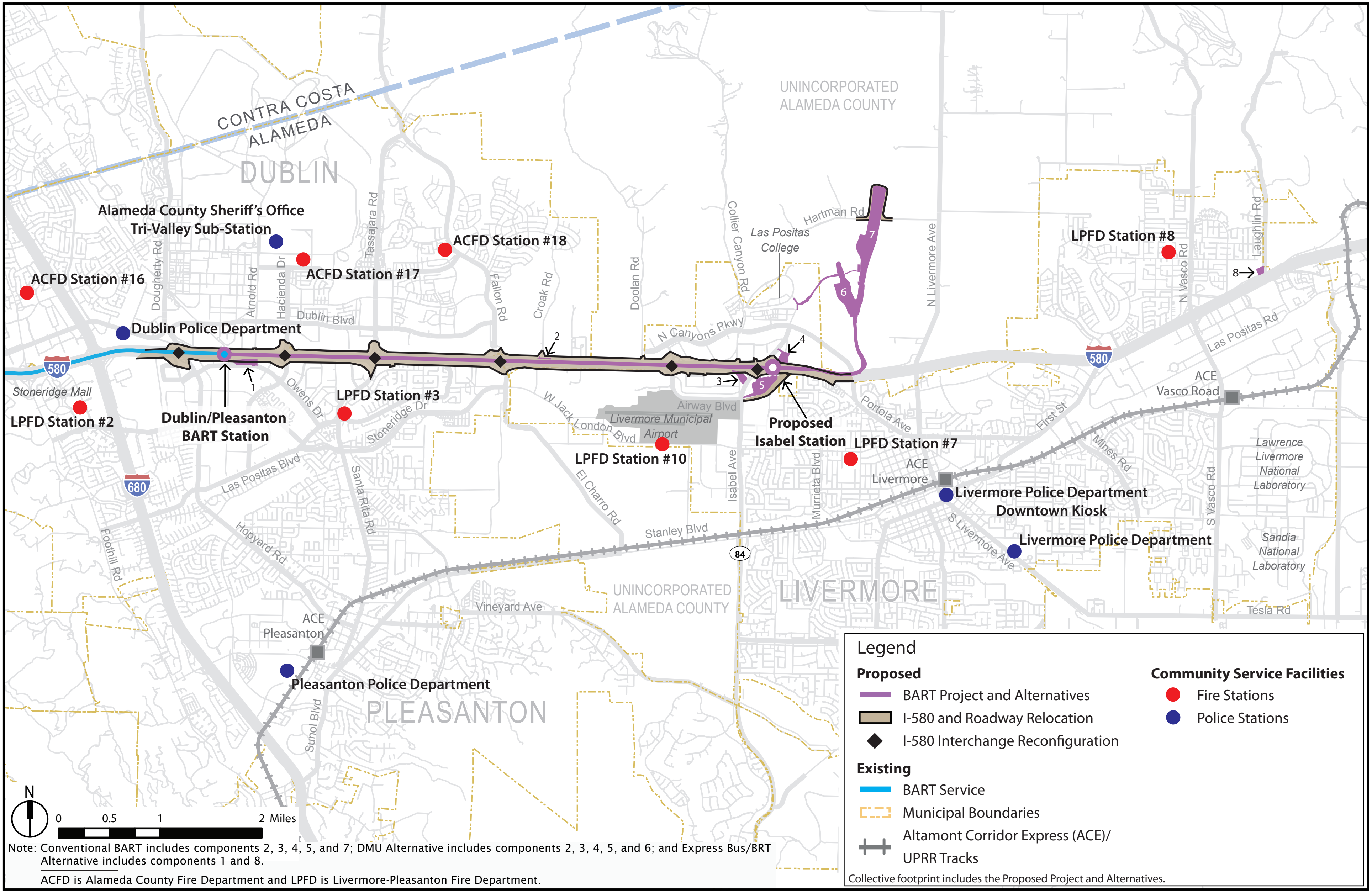
a. Police Services

Within the study area, police services are provided by the Alameda County Sheriff's Office, Dublin Police Department, Pleasanton Police Department, and Livermore Police Department. In addition, BART provides its own police services for its facilities. Police services for each agency are described below and police stations located within the study area are shown in Figure 3.O-1.

(1) Alameda County Sheriff's Office

Alameda County Sheriff's Office provides a wide range of services, including providing patrol and investigative services to the unincorporated areas of the county. Alameda County Sheriff's Office has over 1,500 authorized personnel, including more than 1,000 sworn officers.[2] Alameda County Sheriff's Office also operates emergency medical services, the Santa Rita Jail, and a regional training center in Dublin.

[2] Alameda County Sheriff's Office, 2016a. About Alameda County Sheriff's Office. Available at: https://www.alamedacountysheriff.org/about.php, accessed August 19, 2016.



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.

ACFD is Alameda County Fire Department and LPFD is Livermore-Pleasanton Fire Department.

Source: Arup, 2017.

BART to Livermore Extension Project EIR

Figure 3.O-1
Community Services
Police and Fire Stations

At any given time, four Alameda County Sheriff's Office officers are assigned to the area between Sunol and the eastern boundary of Alameda County that spans nearly 300 square miles. The city of Livermore and surrounding rural areas represent the core of this patrol area. Officers assigned to the Livermore area are based out of the Tri-Valley Substation at 5352 Broder Boulevard in Dublin, but spend most of their time in the field, primarily patrolling and responding to incidents in unincorporated portions of the county. Alameda County Sheriff's Office does not have a response time standard because its patrol officers do not respond from a specific office.[3]

(2) Dublin Police Department

The Dublin Police Department, located at 100 Civic Plaza is responsible for law enforcement in the city of Dublin. The city of Dublin contracts with Alameda County Sheriff's Office to staff the police department. There are 53 sworn officers and eight non-sworn employees, providing a ratio of approximately 1.2 sworn officers per 1,000 residents.[4] The Dublin Police Department strives to respond to calls as expeditiously as possible, but does not have a specific standard for response times. In 2015, the average response times for emergency calls were as follows: 5 minutes for priority one calls involving emergencies and incidents where someone is in harm's way or currently being harmed, or other urgent emergencies such as fire; 5.8 minutes for priority two calls which usually consists of emergencies such as in-progress theft; and 8 minutes for priority three calls which involve non-emergency situations.[5,6] While BART Police Department (BART Police) has primary jurisdiction over BART facilities, a portion of the existing Dublin/Pleasanton BART Station (Dublin/Pleasanton Station)—including train tracks and parking facilities—is located within the city of Dublin. For the 2015 calendar year, Dublin Police Department received four calls for service at the Dublin/Pleasanton Station at 5801 Owens Drive and some additional calls to the station that were not associated with a specific address.[7]

The Dublin Police Department reports that typical service calls related to BART are to cover or assist BART Police officers or to respond to suspicious persons or audible car alarms in the parking lot.[8]

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[3] Kelly, 2017. Phone interview with Ray Kelly, Public Information Officer, Alameda County Sheriff's Office, with Urban Planning Partners, Inc., January 18.

[4] Alameda County Sheriff's Office, 2016b. Alameda County Sheriff's Office Organizational Chart. Available at: https://www.alamedacountysheriff.org/orgchart.php, accessed April 25, 2016.

[5] Holmes, 2016. Email communication from Garrett Holmes, Captain, Dublin Police Department, with Urban Planning Partners, Inc., September 20.

[6] Monaghan, 2017. Phone interview with Kevin Monaghan, Sergeant, Dublin Police Department, with Urban Planning Partners, Inc., April 14.

[7] Holmes, 2016. Email communication from Garrett Holmes, Captain, Dublin Police Department, with Urban Planning Partners, Inc., September 20.

[8] Ibid.

(3) Pleasanton Police Department

The Pleasanton Police Department, located at 4833 Bernal Avenue, is responsible for law enforcement in the city of Pleasanton. The Pleasanton Police Department currently has 81 sworn officers and 35 non-sworn employees for a ratio of 1.1 sworn employees per 1,000 residents.[9] The Pleasanton General Plan establishes an average response time goal of 4 minutes for Pleasanton Police Department emergency calls.[10] In 2015, the average response time for emergency calls was 3.73 minutes.[11]

As noted previously, BART Police has primary jurisdiction over BART facilities. However, a portion of the Dublin/Pleasanton Station is located within the city of Pleasanton. Pleasanton Police Department does not track all calls for service to the Dublin/Pleasanton Station, but notes that the reporting district encompassing the Dublin/Pleasanton Station receives a limited number of calls for police services. As of 2016, the reporting district containing the Dublin/Pleasanton Station accounted for less than 3 percent of citywide calls for service/incidents.[12]

(4) Livermore Police Department

The Livermore Police Department is responsible for law enforcement in the city of Livermore. The Livermore Police Department operates one station, located in the Civic Center at 1110 South Livermore Avenue. In addition, Livermore Police Department has a kiosk office in Downtown Livermore that is staffed by police volunteers and Citizens-On-Patrol volunteers, as time and staffing allow. In addition, the officers use the kiosk on weekends and evenings, and patrol officers routinely use it to write reports and complete investigations. As of 2016, the Livermore Police Department has approximately 90 sworn officers and 46 non-sworn employees. This staffing level reflects a ratio of 1.1 sworn officers per 1,000 residents.[13]

The Livermore Police Department has different response time standards for calls for service, according to priority, as follows: priority one calls have a response standard of 2 minutes or less; priority two calls have a response standard of 10 minutes or less; and priority three calls have a response standard of 30 minutes. In 2015, the Livermore Police

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[9] Eicher, 2016. Email communication from Craig Eicher, Captain, Pleasanton Police Department, with Urban Planning Partners, Inc., October 3.

[10] City of Pleasanton, 2009. Pleasanton General Plan 2005-2025.

[11] City of Pleasanton Police Department, 2015. Pleasanton Police Department Annual Report. Available at: http://admin.cityofpleasantonca.gov/civicax/filebank/blobdload.aspx?BlobID=27416, accessed August 19, 2016.

[12] Eicher, 2016. Email communication from Craig Eicher, Captain, Pleasanton Police Department, with Urban Planning Partners, Inc., October 3.

[13] Sarsfield, 2016. Email communication from Matthew Sarsfield, Captain, Livermore Police Department, with Urban Planning Partners, Inc., September 9.

Department responded to approximately 56,712 calls for police service. Average response times were as follows: for priority one calls, the average time from dispatch to officer arrival on scene was 4 minutes; for priority two calls, the average time for officer arrival on scene was 5.5 minutes; and for priority three calls, the average time for officer arrival on scene was 9 minutes. The Livermore Police Department identifies a decrease in staffing, expanded city limits, and increases in population and traffic congestion as factors affecting its ability to meet the standard response time of 2 minutes for priority one calls.[14]

(5) BART Police Department

Within the BART system, law enforcement services are provided by the BART Police, which has 181 sworn peace officers. In addition, BART Police has 100 civilian staff who work as community service assistants, communications and 911 dispatchers, computer-aided dispatch/records management system administrators, revenue guards, and clerical staff. BART police officers are invested with the same powers of arrest as city police officers and county sheriff deputies, and are authorized to take enforcement action off BART property (e.g., within city limits, county jurisdictions, or on State highways) if there is immediate danger to persons or property.[15, 16]

To provide safety and security for BART riders and employees, BART Police seeks to maintain a highly visible presence in the enforcement of laws and regulations throughout the BART system by setting a service ratio of two officers per station at any time.[17] All reported crimes, felonies, misdemeanors, and infractions that occur on BART property are investigated by BART Police.

BART Police employs a number of law enforcement tools for patron safety. Pay phones and call boxes are available which connect to BART Police 911 services. Calls to the BART Police 911 number may also be made on personal cell phones. To protect BART's infrastructure against the threat of terrorism, BART Police officers participate in counterterrorism working groups at the local, state, and federal level, and also conduct training drills for first responders throughout the Bay Area. In addition, the "BART Watch" mobile app can be used by civilians to discreetly report disruptive behavior, robberies, unattended bags or packages, and incidents of vandalism.

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[14] Ibid.

[15] San Francisco Bay Area Rapid Transit District (BART), 2016b. BART Police Employment. Available at: http://www.bart.gov/about/police/employment, accessed August 16, 2016.

[16] Cromer, 2013. Written communication from Matthew Cromer, Administration Services, BART, with Urban Planning Partners, Inc., September 24.

[17] Hayes, 2017. Phone interview with Mike Hayes, Zone 1 and 3 Commander, BART Police, with Urban Planning Partners, Inc., April 20.

For crime prevention and investigation, the BART Police Patrol Bureau has instituted the Community Oriented Policing and Problem Solving program, which decentralizes the bureau into six geographical police zones. BART Police operates 22 beats across the six zones. Each zone has its own headquarters and field office. Zone lieutenants are assigned personnel, equipment, and resources to manage their respective police operations. This community-based deployment strategy enhances the ability of BART Police to work more closely with commuters and other community members to reduce crime and social disorder. The BART to Livermore Extension Project would fall into the jurisdiction of Zone 3, which currently has four police facilities: one at the Castro Valley BART Station, one at the Hayward BART Station, one at the West Dublin/Pleasanton BART Station, and one at the Dublin/Pleasanton BART Station.[18, 19]

BART system's performance is monitored every quarter, with performance indicators tracked on a quarterly and annual basis. BART Police has established crime and police responsiveness goals for the system, which are based on crimes against persons per million BART trips. Quality of life violations are based on automobile crimes per 1,000 parking spaces. Table 3.O-1 shows the number and types of crimes that occurred during the fourth quarter of fiscal year 2016 throughout the entire BART system. The existing crime rates are compared to BART security goals. As shown in Table 3.O-1, there were 2.28 crimes against persons per million trips, which exceeded BART's goal of 2.0 or fewer crimes per million trips. For automobile-related crimes, there were 5.9 crimes per 1,000 parking spaces, below BART's goal 8.0 or fewer automobile crimes per 1,000 parking spaces. The average response time to emergency service calls was 5.95 minutes, which exceed the goal of 5.0 or fewer minutes.[20] Short staffing has been a key factor affecting BART Police ability to meet particular service goals and response times. To help improve performance, BART Police is currently working on adding additional Police to its staff.[21]

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[18] San Francisco Bay Area Rapid Transit District (BART) Police Department. 2012. Training Bulletin No. 12-01. Community Oriented Policing and Problem Solving and Zone/Public Service Area. Available at: https://www.bart.gov/sites/default/files/docs/BART_PD_Community_Oriented_Policing_and_Problem_Solving_and.pdf, accessed January 6, 2017.

[19] Alvarez, 2016. Email communication from Ed Alvarez, Support Services Bureau, BART Police Department, with Urban Planning Partners, Inc., September 26.

[20] Ibid

[21] Hayes, 2017. Phone interview with Mike Hayes, Zone 1 and 3 Commander, BART Police, with Urban Planning Partners, Inc., April 20.

TABLE 3.O-1 BART POLICE DEPARTMENT CALLS AND CRIMES – FOURTH QUARTER FISCAL YEAR 2016

Category	Results	Goal (Not to Exceed)
Crimes Against Persons	74	
On Trains	5	
In Stations	37	
In Parking Lots	32	
Passenger Trips	32,433,952	
Crimes Per Million Trips	2.28	2.0
Automobile Crimes	282	
Automobile Burglary	115	
Automobile Theft	167	
Parking Spaces (1,000s)	47.58	
Crime per 1,000 spaces	5.9	8.0
Quality of Life Violations	1,319	
Quality Per Million Trips (see passenger trips above)	40.6	N/A
Calls for Service	16,305	
Average Emergency Response Time (minutes)	5.95	5.0
Bike Thefts	159	150

Notes: Crimes against persons are aggravated assaults, robberies, rape, and homicide. Quality of life violations include disturbing the peace, vagrancy, public urination, loud music/radios, expectoration, fare evasion, eating, drinking, or smoking on trains or station areas.
Source: Alvarez, 2016.

For emergency preparedness, the BART Office of Emergency Services (in cooperation with city and public protection agencies) is responsible for delineating evacuation routes and, where possible, alternate routes around points of congestion. BART's System Safety Program Plan outlines the technical and managerial safety activities, describing procedures for accident investigation and reporting and emergency management for the BART District, which includes Alameda, Contra Costa, San Francisco, and portions of San Mateo counties. In addition, BART contingency plans cover a full range of possible emergencies and integrate the support of local police, fire departments, and other emergency agencies, all of which practice emergency responses jointly with BART.

b. Fire Protection and Emergency Medical Services

Within the study area, the Alameda County Fire Department provides fire protection and emergency medical services for the unincorporated county areas as well as to the city of Dublin. The Livermore-Pleasanton Fire Department provides fire protection and emergency medical services to both the cities of Livermore and Pleasanton. These service providers are described below and the fire stations within 1 mile of the collective footprint are shown in Figure 3.O-1.

(1) Alameda County Fire Department

The Alameda County Fire Department has primary responsibility for fire and emergency medical services within the city of Dublin, at the Lawrence Livermore National Laboratory, and the unincorporated areas surrounding the cities of Dublin, Pleasanton, and Livermore.[22] The Alameda County Fire Department also cooperates with Livermore-Pleasanton Fire Department to provide mutual aid assistance within the cities of Livermore and Pleasanton when needed.[23] Alameda County Fire Department services include fire suppression, arson investigation, hazardous materials mitigation, paramedic services, urban search and rescue, fire prevention, and public education. Alameda County Fire Department has 30 fire stations that house 26 engine companies and seven ladder truck companies, one heavy rescue company, and four hazardous materials companies. Alameda County Fire Department has 432 authorized positions, 340 of which are sworn, and up to an additional 100 reserve firefighters.[24] Alameda County Fire Department follows National Fire Protection Association standards for response times and also has its own internal target of a 5-minute response time goal. In 2016, Alameda County Fire Department met these standards for the jurisdictions it serves, including the city of Dublin, the Lawrence Livermore National Laboratory, and unincorporated Alameda County.[25, 26]

Three fire stations are within a 1-mile radius of the collective footprint:

- Alameda County Fire Department Station #16, 7494 Donohue Drive, Dublin
- Alameda County Fire Department Station #17, 6200 Madigan Road, Dublin
- Alameda County Fire Department Station #18, 4800 Fallon Road, Dublin

The Alameda County Fire Department serves both the West Dublin/Pleasanton Station and Dublin/Pleasanton Station parking facilities north of Interstate Highway (I-) 580, in Dublin, and responded to a total of 25 calls at the West Dublin/Pleasanton BART Station and 28 calls at the Dublin/Pleasanton Station in 2016.[27]

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[22] Countywide Alameda County Fire Department also provides fire and paramedic services for the City of San Leandro, the Lawrence Berkeley National laboratory, and all unincorporated areas in Alameda County.

[23] Livermore Pleasanton Fire Department joined the Alameda County Automatic Aid Department in July 2012, allowing Livermore Pleasanton Fire Department to send units into Alameda County Fire Department response areas throughout the Livermore Valley and vice versa.

[24] Call, 2016. Email communication from Jim Call, Deputy Chief, Alameda County Fire Department, with Urban Planning Partners, Inc., September 29.

[25] National Fire Protection Association, 2009. NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public.

[26] Call, 2017. Email communication from Jim Call, Deputy Chief, Alameda County Fire Department, with Urban Planning Partners, Inc., June 6.

[27] Call, 2017. Email communication from Jim Call, Deputy Chief, Alameda County Fire Department, with Urban Planning Partners, Inc., June 2.

(2) Livermore–Pleasanton Fire Department

The Livermore-Pleasanton Fire Department has primary responsibility for fire suppression, emergency medical service, emergency hazardous materials response, and specialized rescue within the cities of Livermore and Pleasanton. In cooperation with Alameda County Fire Department, Livermore-Pleasanton Fire Department at times also provides mutual aid assistance beyond municipal boundaries in adjacent communities and portions of unincorporated Alameda County.

In 1996, the Livermore Fire Department and Pleasanton Fire Department consolidated through a joint powers authority to form the Livermore-Pleasanton Fire Department. Under this model, the two cities, as members of the joint powers authority, equally share responsibility and budget for the Livermore-Pleasanton Fire Department.[28]

The Livermore-Pleasanton Fire Department has eight engine companies and two truck companies that are located at 10 fire stations throughout the two cities. Livermore-Pleasanton Fire Department has a total of 210 staff (including firefighters and administrative). Livermore-Pleasanton Fire Department headquarters is located at 3560 Nevada Street in Pleasanton, which is also the site of one of its fire stations. This headquarters houses administrative and non-emergency safety services, including fire prevention and hazardous materials regulations, emergency medical services system management, emergency preparedness, training, information technology, finance, and public information.[29]

The following Livermore-Pleasanton Fire Department stations are within 1 mile of the collective footprint:

- Livermore-Pleasanton Fire Department Station #2, 6300 Stoneridge Mall Road, Pleasanton
- Livermore-Pleasanton Fire Department Station #3, 3200 Santa Rita Road, Pleasanton
- Livermore-Pleasanton Fire Department Station #7, 951 Rincon Avenue, Livermore
- Livermore-Pleasanton Fire Department Station #8, 5750 Scenic Avenue, Livermore
- Livermore-Pleasanton Fire Department Station #10, 330 Airway Boulevard, Livermore

Livermore-Pleasanton Fire Department follows National Fire Protection Association standards, which require the capability to deploy an initial full alarm assignment within a

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[28] Livermore-Pleasanton Fire Department, 2016. Livermore-Pleasanton Fire Department Administration. Available at: http://www.cityoflivermore.net/citygov/fire/about/administration.htm, accessed August 16, 2016.

[29] Basso, 2016. Phone interview with Sandy Basso, Office Manager, Livermore-Pleasanton Fire Department, with Urban Planning Partners, Inc., September 6.

7-minute response time to 90 percent of the medical and fire incidents.[30] Livermore-Pleasanton Fire Department has indicated that it is able to achieve this service standard based on current staffing levels and facilities.[31]

Livermore-Pleasanton Fire Department is the primary fire and emergency service provider for the portion of the Dublin/Pleasanton Station (station, BART tracks, and parking facilities) located in the city of Pleasanton (south of I-580). The Livermore-Pleasanton Fire Department also occasionally serves the West Dublin/Pleasanton BART Station as well. Table 3.O-2 provides the number service calls received by the Livermore-Pleasanton Fire Department between 2013 and 2016 related to these two BART stations. In 2016, there were 8 calls for service to the West Dublin/Pleasanton Station (6501 Golden Gate Drive in Dublin) and approximately 135 calls for service to the Dublin/Pleasanton Station (5801 Owens Drive, Pleasanton). These calls were primarily for emergency medical response, with no significant call activity related to fires at BART facilities.

TABLE 3.O-2 LIVERMORE-PLEASANTON FIRE DEPARTMENT CALLS FOR SERVICE HISTORY

Year	Calls to West Dublin/Pleasanton BART Station	Calls to Dublin/Pleasanton BART Station	Total Calls to Both Stations
2013	6	74	80
2014	18	128	146
2015	15	128	143
2016	8	135	143

Source: Espinoza, 2016; Call, 2017.

c. Parks and Recreational Facilities

Public parks and recreational facilities that are within the collective footprint, or for which EIR scoping comments were received, are described below.

(1) Dublin Sports Grounds

The Dublin Sports Grounds, partially within the footprint of the Express Bus/BRT Alternative, is located at 6700 Dublin Boulevard in the city of Dublin, just north of I-580

[30] National Fire Protection Association, 2009. NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public.

[31] Testa, 2016. Phone interview with Joe Testa, Deputy Chief, Livermore-Pleasanton Fire Department, with Urban Planning Partners, Inc., September 6.

and west of the Dougherty Road/Hopyard Road interchange. The city-owned park is approximately 23 acres and includes baseball and softball diamonds, soccer fields, play equipment, walkways and trails, picnic areas including barbecue grills, and restrooms.

(2) Las Positas Golf Course

The Las Positas Golf Course, partially within the footprint of both the Proposed Project and Diesel Multiple Unit (DMU) Alternative, is located at 917 Clubhouse Drive in the city of Livermore, immediately south of I-580 and just west of Airway Boulevard. The approximately 200-acre city-owned facility provides a 27-hole golf course, golf lessons, a clubhouse, and a sports bar.

(3) Shadow Cliffs to Morgan Territory Regional Trail

The Shadow Cliffs to Morgan Territory Regional Trail is a trail managed by the East Bay Regional Park District. The trail extends from Shadow Cliffs Regional Recreation Area in Pleasanton to Morgan Territory Regional Preserve in Antioch. A portion of the trail that extends along the sidewalk on Isabel Avenue/I-580 interchange is located within the collective footprint.

(4) Brushy Peak Regional Preserve

Brushy Peak Regional Preserve is a 1,833-acre preserve located in Livermore. The preserve is managed by the East Bay Regional Park District and is accessible by automobile via Laughlin Road and by trail via the Dyer Ranch Trail from Laughlin Road (approximately 0.75-mile) north of the collective footprint.

3. Regulatory Framework

This subsection describes the State and local environmental laws and policies relevant to community services.

Projects which modify a federal highway or require federal funding are also subject to requirements for evaluation of impacts to publicly owned recreational resources under the federal Department of Transportation Act Section 4(f), codified at 49 U.S.C. Section 303. Section 4(f) provides that agencies of the U.S. Department of Transportation can approve a project requiring use of publicly owned land in a public park or recreation area if there is no prudent and feasible alternative to using the land, and the project includes all possible planning to minimize harm to the site. Evaluations under Section 4(f) are commonly prepared in conjunction with an Environmental Impact Statement (EIS) under the National Environmental Policy Act. As discussed in Chapter 1, Introduction, the Proposed Project and two of the three build alternatives would likely require an EIS under the National Environmental Policy Act. Should an EIS be necessary, it would be prepared subsequent to completion of the CEQA process and a Section 4(f) analysis would be conducted with the EIS.

BART is exempt from local planning and development policies pursuant to California Government Code Sections 53090 and 53091. However, because BART supports and coordinates with local emergency response agencies, this subsection describes local policies and guidelines relevant to community services and desired service levels.

(1) Livermore General Plan

The City of Livermore General Plan includes policies related to police and fire department staffing standards and parks/recreational facilities. Policy INF-5.1.P3 states that “the City shall review annual Police Department staffing levels and development trends to determine whether additional police staffing or facilities are needed.” Likewise, Policy INF-6.1.P5 states that “the City shall review annual Livermore-Pleasanton Fire Department staffing levels and development trends to determine whether additional fire staffing or facilities are needed.” Policy LU-2.1.P3 states that “Future growth shall not exceed the community’s capability to provide services.” This includes public parks and recreation services.[32]

(2) Pleasanton General Plan

The Pleasanton General Plan 2005–2025 states that “the City will strive to respond to all emergency fire-related calls within 7 minutes of the time the call for service is received 90 percent of the time” (Goal 3, Policy 10) and “the City will evaluate the need for expanded services or facilities as the City grows” (Goal 3, Program 10.3). In addition, the Pleasanton General Plan calls for a Pleasanton Police Department response time averaging 4 minutes for emergency calls and 16 minutes for general service calls (Goal 8, Policy 27). One of the goals of the Pleasanton General Plan is to “Protect all large continuous areas of open space, as designated on the General Plan Map, from intrusion by urban development” (Goal 5, Policy 6).[33]

(3) City of Dublin Parks and Recreation Master Plan

The City of Dublin Parks and Recreation Master Plan includes polices related to parks and recreational facilities standards for the city of Dublin. Goal 1.1 states “Ensure a minimum standard of 5.0 acres of public park per 1,000 residents.”[34]

[32] City of Livermore, 2004. City of Livermore General Plan: 2003-2025.
[33] City of Pleasanton, 2009. Pleasanton General Plan 2005-2025.
[34] City of Dublin, 2015. Parks and Recreation Master Plan, May.

(4) East County Area Plan

The East County Area Plan serves as the guiding document for the future development and resource conservation within unincorporated areas of eastern Alameda County. The East County Area Plan includes several policies related to police, fire, and emergency medical services. Policy 241 states that "the County shall provide effective law enforcement, fire, and emergency medical services to unincorporated areas." In addition, it states that "the County shall reserve adequate sites for sheriff, fire, and emergency medical facilities in unincorporated locations within East County" (Policy 242).[35]

(5) BART Standards and Guidelines

BART has a number of procedures and guidelines regarding emergency response, crime prevention, design standards, and access within the BART system.

(a) BART Facilities Standards

BART Facilities Standards control the design and construction of BART facilities and contain standards applicable to emergency response, crime prevention, and fire suppression and prevention. To address public safety, these standards include requirements for the installation of public address systems, closed-circuit televisions, and emergency call boxes. To address fire suppression and prevention, different BART structures have different standards. Depending on the structure, the standards may require wet sprinkler systems, under car deluge systems, fire detection and alarm systems, and fire hose cabinets at specified locations. These standards are in addition to requirements for the use of various fire-resistant materials in construction.

(b) BART Station Access Guidelines

In addition to the BART Facilities Standards, the BART Station Access Guidelines provide a framework for BART staff and contractors in designing facilities at new and existing stations. An important component of the BART Station Access Guidelines is an endorsement of Crime Prevention through Environmental Design, which refers to the effective use of the built environment to reduce crime as well as the public's perception of crime, and to improve quality of life.[36] The BART Station Access Guidelines include the following Crime Prevention through Environmental Design recommendations:

- Provide enhanced lighting in parking lots, parking structures, walkways, bus stops, and stations

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[35] County of Alameda, 1994. East County Area Plan.

[36] San Francisco Bay Area Rapid Transit District (BART), 2003. BART Station Access Guidelines. Available at: https://www.bart.gov/sites/default/files/docs/access_guidelines.pdf, accessed August 16, 2016.

- Discourage the use of pedestrian tunnels
- Limit designs that require pedestrians to cross through bus zones or bus access points
- Locate passenger drop-off zones and taxi zones in areas that allow easy access to the stations and businesses
- Design parking lots, drop-off zones, and bus zones such that buses and cars do not mix

4. Impacts and Mitigation Measures

This subsection lists the standards of significant used to assess impacts, discusses the methodology used in the analysis, 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 on community services are considered significant if the Proposed Project or one of the Alternatives would result in any of the following:

- Result in substantial adverse physical impacts associated with the provision of or need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for police protection services and fire protection/emergency medical services
- Increase the use of existing recreational facilities causing substantial physical deterioration, include recreational facilities, or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment

b. Impact Methodology

The methodology used to evaluate the significance of community services impacts is described below under each respective impact analysis. The Electrical Multiple Unit (EMU) Option would result in the same impacts as the DMU Alternative, and therefore the analysis and conclusions for the DMU Alternative also apply to the EMU Option.

The analysis of the Enhanced Bus Alternative, which addresses the potential impacts of construction of the bus infrastructure improvements and operation of the bus routes at a programmatic level, would also apply to the bus improvements and feeder bus service under the Proposed Project and other Build Alternatives. Therefore, the analyses and conclusions for the Enhanced Bus Alternative also apply to the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, and are not repeated in the analysis of the Proposed Project and other Build Alternatives.

c. Summary of Impacts

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

TABLE 3.O–3 SUMMARY OF COMMUNITY SERVICES IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project[b]**	**DMU Alternative (With EMU Option)[b]**	**Express Bus/BRT Alternative[b]**	**Enhanced Bus Alternative**
Construction					
Project Analysis					
Impact CS-1: Need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for police, fire, and emergency response during construction	NI	LSM	LSM	LSM	LS
Impact CS-2: Cause substantial deterioration of recreational facilities or require construction or expansion of recreational facilities	NI	LS	LS	LS	NI
Cumulative Analysis					
Impact CU-3(CU): Need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for police, fire, and emergency response during construction under Cumulative Conditions	NI	LS	LS	LS	LS
Impact CS-4(CU): Construction or expansion of recreational facilities Cumulative Conditions	NI	LS	LS	LS	NI

TABLE 3.O-3 SUMMARY OF COMMUNITY SERVICES IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project[b]**	**DMU Alternative (With EMU Option)[b]**	**Express Bus/BRT Alternative[b]**	**Enhanced Bus Alternative**
Operational					
Project Analysis					
Impact CS-5: Need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for police services	NI	LS	LS	LS	LS
Impact CS-6: Need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for fire protection and emergency response	NI	LS	LS	LS	LS
Cumulative Analysis					
Impact CS-7(CU): Need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for police, fire, and emergency response under 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.
DMU = diesel multiple unit; EMU = electrical multiple unit; BRT = bus rapid transit
[a] All significance determinations listed in the table assume incorporation of applicable mitigation measures.
[b] The analysis of the Enhanced Bus Alternative also applies to the feeder bus service and bus improvements under the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, as described in the Impact Methodology subsection above.

d. Environmental Analysis

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

(1) Construction Impacts

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

(a) Construction – Project Analysis

Impact CS-1: Result in substantial adverse physical impacts associated with the provision of or need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for police, fire, and emergency response during construction.

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

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, 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, including both residential and commercial. Construction of these improvements and development projects could require temporary services to enforce safety, prevent fire, and provide emergency medical response during construction. 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 police, fire, or emergency medical services. **(NI)**

Conventional BART Project, DMU Alternative, and Express Bus/BRT Alternative. Construction of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative may require services to enforce safety, prevent fire, and provide emergency medical response. Any increase in demand for services during construction would be temporary and would not be expected to result in the need for new or expanded facilities.

Construction of the Proposed Project and these Alternatives would be temporary and is anticipated to occur over approximately 5 years. Construction activities would occur in phases at various locations along the project corridor. During peak construction periods, work could be underway at several locations, resulting in overlapping construction activities. The phasing and estimated duration of construction for each phase is described in Chapter 2, Project Description. Construction activities may result in temporary road or lane closures that could lead to increased response times for police, fire, and medical emergency services if not properly planned. Closures under the DMU Alternative and Express Bus/BRT Alternative could affect access to the Alameda County Fire Department's maintenance facility located at 5777 Scarlett Court in Dublin. In addition, construction haul trips for moving excavated soils and construction materials could result in congestion to roadways, further affecting emergency vehicle response times. Therefore, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant temporary impacts related to the provision of emergency police, fire, and medical services.

These impacts would be reduced to a less-than-significant level with implementation of **Mitigation Measure TRAN-1**, which would allow for access to affected properties at all times and would require a construction phasing and a traffic management plan that would inform cities and emergency responders to road closures and detours. **(LSM)**

Enhanced Bus Alternative. Construction of the Enhanced Bus Alternative may require services to enforce safety, prevent fire, and provide emergency medical response. Any increase in demand for services during construction would be temporary—occurring over the approximately 2-month construction period—and would not be expected to result in the need for new or expanded facilities. These construction activities would entail installation of bus infrastructure, including bus bulbs, bus shelters, and signage. Construction of the Enhanced Bus Alternative would occur within the existing street ROW and would be coordinated and reviewed by the applicable city agencies. This construction would be at various locations along the bus routes and would not be anticipated to significantly impact the provision of emergency police, fire, and medical services. Therefore, the Enhanced Bus Alternative would result in less-than-significant impacts related to provision of emergency police, fire, and medical services during construction. **(LS)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would have potentially significant impacts related to provision of emergency police, fire, and medical services during construction. However, with implementation of **Mitigation Measure TRAN-1**, described in Section 3.B, Transportation, which would develop and implement a construction phasing and traffic management plan, potential impacts would be reduced to a less-than-significant level. This measure requires BART or its contractor to prepare and implement a construction phasing and traffic management plan, which will identify traffic operations and circulation procedures for each phase of construction. The plan would provide information on road closures and detours and would be coordinated with the cities of Dublin, Pleasanton, and Livermore, and Caltrans. The plan would also allow for access to affected and adjacent properties at all times and specify measures to allow access and alternate transportation routes for maintenance and emergency response vehicles in the event of roadway closures.

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

Impact CS-2: Increase the use of existing recreational facilities causing substantial physical deterioration, include recreational facilities, or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment during construction.

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

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, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could adversely impact parks and recreational facilities. 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 parks and recreational facilities. **(NI)**

Conventional BART Project and DMU Alternative. As described in the Introduction subsection above, the Proposed Project and Build Alternatives would not increase demand for parks or recreational facilities nor would they accelerate the use of the parks such that they would have substantial physical deterioration. However, the footprint of the Proposed Project and DMU Alternative would encroach into recreational facilities. Specifically, construction-related activities would result in a permanent loss of recreational space at the city-owned Las Positas Golf Course at 917 Clubhouse Drive in the city of Livermore.

Approximately 17 feet of the northern-most area of Las Positas Golf Course would be required by the Proposed Project and DMU Alternative due to the relocation of the I-580 ROW. This area of the golf course is open space and generally consists of landscaping;

however, it is not part of the field of play. The preliminary engineering for the Proposed Project and DMU Alternative was designed to reduce the encroachment into the golf facility as much as feasible. BART would be required to purchase the necessary ROW and compensate the city. This reduction of open space within the golf course is not anticipated to affect the use of the golf course. Furthermore, potential construction-related impacts along the I-580 alignment are addressed throughout this EIR.

The portion of the Shadow Cliffs to Morgan Territory Regional Trail that extends along Isabel Avenue and crosses the Isabel Avenue/I-580 interchange is located in an area that would be affected by construction-related activities associated with the Proposed Project and DMU Alternative. However, as stated in **Impact TRAN-1**, construction of the Proposed Project and DMU Alternative would not result in significant impacts to pedestrian access, circulation, or safety with **Mitigation Measure TRAN-1**, which would provide safe access and circulation routes pedestrians along local roads. Therefore, the Proposed Project and DMU Alternative would have less-than-significant impacts on recreational facilities during construction, and no mitigation measures are required. **(LS)**

Express Bus/BRT Alternative. The footprint of the Express Bus/BRT Alternative would require ROW from the city-owned Dublin Sports Ground located at 6700 Dublin Boulevard in the city of Dublin. Approximately 10 feet of the Dublin Sports Ground would be required at the southeast corner of the facility. BART would be required to purchase the land and compensate the city. This reduction of landscaped area within the recreational facility is not anticipated to affect its use. Furthermore, potential construction-related impacts along the I-580 corridor are addressed throughout this EIR.

Construction of the Laughlin parking lot under the Express Bus/BRT Alternative would not affect access to Brushy Peak Regional Preserve. Construction-related activities would be located approximately 0.75-mile south from the Dyer Ranch Trail and 2 miles south of the preserve’s parking lot. In addition, construction activities would not obstruct access to Brush Peak Regional Preserve from Laughlin Road. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts on recreational facilities during construction, and no mitigation measures are required. **(LS)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would be constructed within existing street ROW. No parks or recreational facilities would be located within the footprint of the Enhanced Bus Alternative and it would not encroach on any recreational facilities. Therefore, the Enhanced Bus Alternative would have no impacts related to recreational facilities or the construction or expansion of recreational facilities, and no mitigation measures are required. **(NI)**

Mitigation Measures. As described above, the construction of the Proposed Project and Alternatives would not result in significant impacts related to recreational facilities or the construction or expansion of recreational facilities, and no additional mitigation measures are required.

(b) Construction – Cumulative Analysis

The geographic study area for cumulative impacts is as described in the Introduction subsection above, and includes the service area of the respective service providers in the project corridor.

Impact CS-3(CU): Result in substantial adverse physical impacts associated with the provision of or need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for police, fire, and emergency response during construction 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 CS-1** above, the No Project Alternative would have no impacts related to police, fire, or emergency medical services during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. Construction of the Proposed Project and the Alternatives in combination with other cumulative projects that would be under construction concurrently, including portions of the Isabel Neighborhood Plan (INP), may require services to enforce safety, prevent fire, and provide emergency medical response. Any increases in demand for services during construction would be temporary and would not be expected require the need for new or expanded facilities.

Construction activities from the cumulative projects, in combination with the Proposed Project and Build Alternatives, may result in temporary road or lane closures that could lead to increased response times for police, fire, and medical emergency services if not properly planned. These other cumulative projects would also be required to undergo their own environmental review and mitigate their potential impacts to police and emergency response services. **Mitigation Measure TRAN-1**, described in **Impact CS-1** above, would require a construction phasing and a traffic management plan for the Proposed Project and Build Alternatives, which would take into account cumulative projects whose construction schedules overlap with that of the Proposed Project or Build Alternatives, and would ensure emergency response times are not compromised. Therefore, the Proposed Project and Build Alternatives, in combination with other cumulative projects, would result in less-than-significant cumulative construction impacts to related to police, fire, or emergency response, and no mitigation measures are required. **(LS)**

Mitigation Measures. As described above, the construction of the Proposed Project and Alternatives in combination with past, present, or probable future projects would not result in significant cumulative impacts related to police, fire, or emergency response during construction, and no additional mitigation measures would be required.

Impact CS-4(CU): Increase the use of existing recreational facilities causing substantial physical deterioration, include recreational facilities, or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment under Cumulative Conditions.

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

No Project Alternative. As described in **Impact CS-2**, the No Project Alternative would have no impacts related to recreational facilities or the construction or expansion of recreational facilities during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project, DMU Alternative, and Express Bus/BRT Alternative. Cumulative projects described in Section 3.A, Introduction to Environmental Analysis and Appendix E, particularly projects located along the I-580 corridor and the INP, would involve construction or expansion of recreational facilities, resulting in potential impacts to such facilities, similar to the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative. The cumulative projects would also be required to undergo their own environmental review and mitigate potential impacts to parks. Any adverse physical effects on the environment during construction related to the recreational facilities would be addressed by each project and would not result in cumulative impacts. Therefore, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, in combination with other cumulative projects, would result in less-than-significant cumulative impacts related to recreation facilities or the construction or expansion of recreational facilities, and no mitigation measures are required. **(LS)**

Enhanced Bus Alternative. As described in **Impact CS-2**, the Enhanced Bus Alternative would have no impacts related to recreational facilities or the construction or expansion of recreational facilities during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Mitigation Measures. As described above, the construction of the Proposed Project and Alternatives in combination with past, present, or probable future projects would not result in significant cumulative impacts related to recreational facilities or the construction or expansion of recreational facilities during construction, and no additional 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

Impact CS-5: Result in substantial adverse physical impacts associated with the provision of or need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for police services.

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

Operation of the BART to Livermore Extension Project would result in transit activities in new locations, including in the cities of Dublin, Pleasanton, Livermore, and unincorporated Alameda County. Increased transit activity could cause increased demand on police services. As described in the Existing Conditions subsection above, providers of police service within the study area are: BART Police, Dublin Police Department, Pleasanton Police Department, Livermore Police Department, and Alameda County Sheriff's Office. Potential impacts to police services are discussed 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 the Proposed Project or any of the Build Alternatives. However, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could result in increased demand for police services. 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 police services. **(NI)**

Conventional BART Project. Under the Proposed Project, in addition to its existing responsibilities, including those at the Dublin/Pleasanton Station, BART Police would have primary responsibility for law enforcement services along the proposed 5.5-mile extension of BART service, at the proposed Isabel Station, Isabel Station parking garage, and storage and maintenance facility. BART Police would continue to provide patrol services on BART trains and facilities and respond to calls on BART property.

As described in Section 3.B, Transportation, under the Proposed Project, BART systemwide ridership for opening year (2025) is anticipated to increase by approximately 7,000 average daily trips compared to the No Project conditions for 2025, with approximately 3,600 new daily boardings at the Tri-Valley Area BART stations (West Dublin/Pleasanton, Dublin/Pleasanton, and proposed Isabel stations).[37] Approximately 4,700 of those boardings would be at the proposed Isabel Station. For horizon year (2040), BART systemwide ridership is anticipated to increase by approximately 12,000 average daily trips compared to the No Project conditions for 2040, with approximately 6,500 new daily boardings at the Tri-Valley Area BART stations. Approximately 8,100 of those boardings would be at the proposed Isabel Station. In addition, other transit services in the project vicinity would experience minor changes in ridership associated with the Proposed Project.

As part of the Proposed Project, BART Police plans to hire four additional officers and one community service officer, as well as establish a new beat to serve the extension. In addition, as part of the Proposed Project, new BART Police facilities would be constructed at the proposed Isabel Station. These facilities would include a field office with a holding cell, office space, and locker rooms.[38] BART Police anticipate that the Proposed Project would not adversely affect their ability to meet their performance goals, nor would it trigger the need for any new or physically altered governmental facilities beyond those that would be incorporated into the Proposed Project.[39]

While BART Police serve BART facilities, local police departments respond to calls in surrounding areas and support BART Police by responding to calls on BART property. Following the development of the Proposed Project, there would be an incremental increase in demand for police services at the proposed Isabel Station area and within the local bus systems.

Alameda County Sheriff's Office, Dublin Police Department, Pleasanton Police Department, and Livermore Police Department staff have advised that this slight increase in demand for service would not adversely affect response times, nor would it trigger a need for new or

[37] Ridership refers to the number of linked trips on the BART system; a passenger boarding the Dublin/Pleasanton-Daly City line at Dublin/Pleasanton Station and transferring at Bay Fair to the Richmond-Fremont line would count as one trip.

[38] Alvarez, 2016. Email communication from Ed Alvarez, Support Services Bureau, BART Police Department, with Urban Planning Partners, Inc., September 26.

[39] Ibid.

expanded facilities.[40, 41, 42, 43] Furthermore, the Proposed Project would include new BART Police facilities and additional police staffing to maintain BART's service performance goals, based on the increase in ridership projected under the Proposed Project.

The relationship between BART stations and surrounding crime levels was a topic raised during scoping comments. Some commenters have suggested that locating a new BART station in Livermore would increase criminal activity in surrounding areas. As noted on above, BART Facilities Standards contain public safety requirements, while BART Station Access Guidelines incorporate the principles of Crime Prevention through Environmental Design, which recommend security-oriented design elements such as enhanced lighting, station integration into the surrounding community and avoidance of pedestrian tunnels and other low-visibility areas. BART has studied stations for which personal security is indicated as an issue by the community, and found that these are generally older stations constructed before development of Crime Prevention through Environmental Design policies and located in historically low-profile, high-crime settings. This conclusion reinforces the findings of previous studies of crime and transit systems, which have found that crime levels vary throughout a given transit system and correlate to existing neighborhood crime.[44]

The City of Livermore has also concluded that criminal activity would not increase significantly as a result of a BART station in Livermore. In an assessment prepared for the BART to Livermore Program EIR, City staff and the Livermore Police Department studied State of California, Department of Justice Criminal Justice Statistics Center data for four cities, before and after the development of BART terminus stations. A memorandum from the Livermore Community Development Director and the Livermore Chief of Police to members of the Livermore City Council and Mayor reported that, "Given Livermore's current crime levels and assuming the station design and businesses are appropriate for the selected site…and that BART police staffing for this area is similar to its existing levels, any major increase in crime at or around BART stations in Livermore would not be anticipated."[45]

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[40] Sarsfield, 2016. Email communication from Matthew Sarsfield, Captain, Livermore Police Department, with Urban Planning Partners, Inc., September 9

[41] Holmes, 2016. Email communication from Garrett Holmes, Captain, Dublin Police Department, with Urban Planning Partners, Inc., September 20.

[42] Eicher, 2016. Email communication from Craig Eicher, Captain, Pleasanton Police Department, with Urban Planning Partners, Inc., October 3.

[43] Kelly, 2017. Phone interview with Ray Kelly, Public Information Officer, Alameda County Sheriff's Office, with Urban Planning Partners, Inc., January 18.

[44] DeGeneste and Sullivan, 1994. Policing Transportation Facilities.

[45] San Francisco Bay Area Rapid Transit District (BART), 2010. BART to Livermore Extension Final Program Environmental Impact Report. Available at: https://bart.gov/sites/default/files/docs/Bart-to-Livermore-EIR-WEB_0.pdf.

Therefore, for the reasons described above, the Proposed Project would have less-than-significant impacts related to provision of police services, and no mitigation measures are required. **(LS)**

DMU Alternative. The DMU Alternative would result in the construction of a DMU transfer platform at Dublin/Pleasanton Station and the extension of rail services to the proposed Isabel Station, as well as new parking facilities and a storage and maintenance facility. Similar to the Proposed Project, BART Police would have primary responsibility for law enforcement services at the new facilities. New BART Police facilities would be constructed at the proposed Isabel Station and additional BART Police staffing would be provided, similar to that outlined for the Proposed Project, above.

As described in Section 3.B, Transportation, under the DMU Alternative, BART systemwide ridership for opening year (2025) is anticipated to increase by approximately 5,000 average daily trips compared to the No Project conditions for 2025, with approximately 2,700 new daily boardings at the Tri-Valley Area BART stations.[46] Approximately 3,100 of those boardings would be at the proposed Isabel Station. For horizon year (2040), BART systemwide ridership is anticipated to increase by approximately 7,000 average daily trips compared to the No Project conditions for 2040, with approximately 3,900 daily boardings in the Tri-Valley Area. Approximately 4,800 of those boardings would be at the proposed Isabel Station. In addition, other transit services in the project vicinity would minor experience changes in ridership associated with the DMU Alternative.

The incremental increase in demand for police service on local police departments (Dublin Police Department, Pleasanton Police Department, Livermore Police Department, and Alameda County Sheriff's Office) would be similar to that under the Proposed Project, and therefore, for the same reasons, would not adversely affect police response times nor trigger a need for new or expanded facilities beyond those proposed as part of the DMU Alternative. Furthermore, the DMU Alternative would include new BART Police facilities and additional police staffing to maintain BART's service performance goals, based on the increase in ridership projected under the DMU Alternative. Therefore, the DMU Alternative would have less-than-significant impacts related to provision of police services, and no mitigation measures are required. **(LS)**

Express Bus/BRT Alternative. Under the Express Bus BRT Alternative, in addition to its existing responsibilities, including those at the Dublin/Pleasanton Station, BART Police would have primary responsibility for law enforcement services at the expanded parking lot south of I-580 (in Pleasanton) and the new Laughlin parking lot.

[46] Ridership refers to the number of linked trips on the BART system; a passenger boarding the Dublin/Pleasanton-Daly City line at Dublin/Pleasanton Station and transferring at Bay Fair to the Richmond-Fremont line would count as one trip.

As described in Section 3.B, Transportation, under the Express Bus/BRT Alternative, BART systemwide ridership for opening year (2025) is anticipated to increase by approximately 2,000 average daily trips compared to the No Project conditions for 2025 and 1,000 additional trips generated at the Dublin/Pleasanton Station. For horizon year (2040), BART systemwide ridership is anticipated to increase by approximately 4,000 average daily trips compared to the No Project conditions for 2040, with approximately 1,900 additional trips at the Dublin/Pleasanton Station. In addition, other transit services in the project vicinity would experience changes in ridership associated with the Express Bus/BRT Alternative. LAVTA bus ridership would increase by approximately 1,300 average daily trips per weekday compared to the No Project conditions for 2025, and would result in an increase of 2,200 average daily trips per weekday compared to the No Project conditions for 2040.

The Express Bus/BRT Alternative would result in an incremental increase in demand for police services at the proposed Dublin/Pleasanton Station area, Laughlin Road Area, and within the local bus systems from increased ridership levels. This increase in demand is anticipated to be less than demand under the Proposed Project, due to the lower ridership numbers. Under this alternative, there would be no new BART police facilities, and BART Police foresee a smaller increase in staffing required than under the Proposed Project.[47]

The Livermore Police Department and Pleasanton Police Department anticipate that the increase in ridership of local bus systems may require the addition of staff to maintain desired service levels, but would not require new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives.[48, 49] Furthermore, if required to maintain service levels, the Alameda County Sheriff's Office will work with the city of Dublin to hire additional officers.[50]

This slight increase in demand for service would be less than discussed above for the Proposed Project and DMU Alternative, and so would not adversely affect the Alameda County Sheriff's Office, Dublin Police Department, Pleasanton Police Department, Livermore Police Department, or BART Police response times, nor would it trigger a need for new or expanded facilities. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts related to provision of police services and no mitigation measures are required. **(LS)**

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[47] Alvarez, 2016. Email communication from Ed Alvarez, Support Services Bureau, BART Police Department, with Urban Planning Partners, Inc., September 26.

[48] Sarsfield, 2016. Email communication from Matthew Sarsfield, Captain, Livermore Police Department, with Urban Planning Partners, Inc., September 9

[49] Eicher, 2016. Email communication from Craig Eicher, Captain, Pleasanton Police Department, with Urban Planning Partners, Inc., October 3.

[50] Holmes, 2016. Email communication from Garrett Holmes, Captain, Dublin Police Department, with Urban Planning Partners, Inc., September 20.

Enhanced Bus Alternative. The Enhanced Bus Alternative is similar to the Express Bus/BRT Alternative, but would not include any capital improvements or add any additional BART infrastructure.

As described in Section 3.B, Transportation, under the Enhanced Bus Alternative, BART systemwide ridership for opening year (2025) as well as average daily boardings at the Dublin/Pleasanton Station are anticipated to remain the same compared to the No Project conditions for 2025. For horizon year (2040), BART systemwide ridership is anticipated to increase by 1,000 weekday trips compared to the No Project conditions for 2040 and increase the number of average daily trips at the Dublin/Pleasanton Station by 100. In addition, other transit services in the project vicinity would experience minor changes in ridership associated with the Enhanced Bus Alternative. LAVTA bus ridership would increase by approximately 300 average daily trips compared for the No Project conditions for 2025, and 500 average daily trips per weekday compared to the No Project conditions for 2040.

The Enhanced Bus Alternative would result in a slight incremental increase in demand for police services within local bus systems from increased ridership levels. Impacts under this Alternative would be less than those described above for the Express Bus/BRT Alternative, due to lower ridership numbers and so would not adversely affect the Alameda County Sheriff's Office, Dublin Police Department, Pleasanton Police Department, Livermore Police Department, or BART Police response times, nor would it trigger a need for new or expanded facilities, as described above. Therefore, the Enhanced Bus/BRT Alternative would have less-than-significant impacts related to provision of police services, and no mitigation measures are required. **(LS)**

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

Impact CS-6: Result in substantial adverse physical impacts associated with the provision of or need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for fire protection and emergency response.

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

Operation of the BART to Livermore Extension Project would result in transit activities in new or modified locations, including the Dublin/Pleasanton Station, the proposed Isabel Station, new parking facilities, and storage and maintenance facilities in the cities of Dublin, Pleasanton, Livermore, and unincorporated Alameda County. Increased activity could lead to increased demand for fire and emergency response services. Service providers in the study area are the Alameda County Fire Department and the Livermore-Pleasanton Fire Department. As shown in Figure 3.O-1, there are eight fire stations within a 1-mile radius of the Proposed Project and Build Alternatives footprints. Potential impacts to fire and emergency response services are discussed 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 the Proposed Project or any of the Build Alternatives. However, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could increase demand for fire and emergency services. 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 fire and emergency services. **(NI)**

Conventional BART Project. Under the Proposed Project, the extension of BART service by 5.5 miles, the proposed Isabel Station, Isabel Station parking garage, and storage and maintenance facility would result in additional transit-related activities that could result in increased demand for fire and emergency response service in the study area. The design and construction of these facilities would be consistent with the BART Facilities Standards, which require a number of fire safety measures, depending on the structure. Compliance with these standards would reduce the potential demand for fire and emergency services associated with these facilities.

Based on the proximity of Livermore-Pleasanton Fire Department Station #10 to the Isabel Station Area and the low number of calls for fire and emergency service that are anticipated from the BART facilities, the Livermore-Pleasanton Fire Department staff considers existing fire facilities and staffing levels to be adequate to serve the proposed Isabel Station and facilities, and no new or expanded facilities would be necessary.[51] Furthermore, based on current experience with the existing BART facilities located in the project corridor and elsewhere in the BART system, including stations and maintenance facilities, the Alameda County Fire Department staff have advised that existing staffing levels would be adequate to serve the Proposed Project.[52]

[51] Testa, 2016. Phone interview with Joe Testa, Deputy Chief, Livermore-Pleasanton Fire Department, with Urban Planning Partners, Inc., September 6.
[52] Call, 2016. Email communication from Jim Call, Deputy Chief, Alameda County Fire Department, with Urban Planning Partners, Inc., September 29.

While the Proposed Project would result in an incremental increase in demand for fire and emergency medical services associated with increased activities and ridership, the demand would not result in the need for additional fire or emergency facilities so that acceptable response times or other performance standards are maintained. Therefore, the Proposed Project would have less-than-significant impacts related to the provision of fire and emergency response services, and no mitigation measures are required. **(LS)**

DMU Alternative. The footprint and general design of facilities under the DMU Alternative would be similar to those under the Proposed Project, with the exception that there would be additional facilities at the Dublin/Pleasanton Station (the DMU transfer platform). In the Dublin/Pleasanton Station Area, the DMU Alternative would require the relocation of a portion of Scarlett Court in Dublin, which is adjacent to the Alameda County Fire Department's maintenance facility at 5777 Scarlett Court in Dublin. The Alameda County Fire Department uses Scarlett Court to access the maintenance facility which conducts repair and general service of fire vehicles. However, all vehicles being stored and on-site staff at the location do not respond to emergencies from the location.[53] In addition, the relocation of Scarlett Court would be designed using the same dimensions as the existing roadway. A preliminary assessment completed by BART has determined that adequate access from Scarlett Court to the Alameda County Fire Department maintenance facility would be maintained for vehicles of varying sizes. Thus, relocation of the Scarlett Court would not affect service for Alameda County Fire Department's emergency response.

Under the DMU Alternative, the incremental increase in demand for fire and emergency response services would be similar to demand under the Proposed Project and no additional fire or emergency facilities would be required to maintain acceptable service ratios, response times, or other performance standards are maintained. Therefore, the DMU Alternative would have less-than-significant impacts related to the provision of fire and emergency response services, and no mitigation measures are required. **(LS)**

Express Bus/BRT Alternative. Under the Express Bus/BRT Alternative, improvements would be constructed at the Dublin/Pleasanton Station Area and the Laughlin Road Area. New facilities would include the bus transfer platforms at the Dublin/Pleasanton Station, replacement parking facilities also at the station, and a new parking lot at Laughlin Road. In the Dublin/Pleasanton Station Area, the Express Bus/BRT Alternative would require the relocation of a portion of Scarlett Court in Dublin, which is adjacent to the Alameda County Fire Department's maintenance facility at 5777 Scarlett Court in Dublin. As described above, the relocation of Scarlett Court would be designed using the same dimensions as the existing roadway and a preliminary assessment completed by BART has

[53] Call, 2017. Email communication from Jim Call, Deputy Chief, Alameda County Fire Department, with Urban Planning Partners, Inc., June 6.

determined that adequate access from Scarlett Court to the Alameda County Fire Department maintenance facility would be maintained for vehicles of varying sizes.

The Express Bus/BRT Alternative would result in an incremental increase in demand for fire and emergency response services associated with the provision of additional transit services, although the demand would likely be less than demand under the Proposed Project. No additional fire or emergency facilities would be required to maintain acceptable service ratios, response times, or other performance standards. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts related to the provision of fire and emergency response services, and no mitigation measures are necessary. **(LS)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would not include any major capital improvements or additional BART facilities, but would include the provision of new bus routes and minor infrastructure improvements. Thus, impacts under this alternative would be similar to or less than those described above for the Express Bus/BRT Alternative. Therefore, the Enhanced Bus Alternative would have less-than-significant impacts related to the provision of fire and emergency response services, and no further mitigation measures are required. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to fire and emergency response, and no mitigation measures are required.

(b) Operations – Cumulative Analysis

The geographic study area for cumulative impacts is as described in the Introduction subsection above, and includes the service area of the respective service providers in the project corridor.

This cumulative analysis for community services considers population and employment growth projections through the year 2040 for the study area. As described in Section 3.A, Introduction to Environmental Analysis and Appendix E, these growth forecasts are contained in the general plans for various jurisdictions, the INP, and the Final Forecast of Jobs, Population, and Housing and Plan Bay Area Projections 2013[54, 55] and other reasonably foreseeable developments.

[54] Association of Bay Area Governments (ABAG), 2013. Plan Bay Area Projections 2013.
[55] Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC), 2013. Draft Plan Bay Area, Final Forecast of Jobs, Population and Housing, July.

Impact CS-7(CU): Result in substantial adverse physical impacts associated with the provision of or need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for police, fire, and emergency response 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 CS-5** and **Impact CS-6** above, the No Project Alternative would have no physical impacts associated with the provision of or need for new or physically altered governmental facilities during operations. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. Substantial population and employment growth are anticipated in the cities of Dublin, Pleasanton, and Livermore, even without implementation of the Proposed Project or Build Alternatives. As described in Section 3.D, Population and Housing, from 2010 to 2040, the population in Alameda County is anticipated to increase by approximately 27 percent.

Although the Proposed Project and Build Alternatives do not include residential uses and would not directly lead to population growth, additional growth is anticipated in association with the INP, which would be implemented under the Proposed Project or DMU Alternative. Population growth in the study area, including new residential and commercial uses, is anticipated within the cities' general plans. Furthermore, development of the INP and associated population increase in the area is consistent with the City of Livermore's general plan and would shift planned development from some areas of the city such that greater densities would be achieved in the INP area. As part of the development approval process, the cumulative projects, including the INP, have completed or will undergo their own environmental review and any potential impacts related to police, fire, and emergency response services will be addressed before they are implemented. Therefore, cumulative impacts related to the demand for police, fire, and emergency response services would be less-than-significant and would not result in substantial adverse physical impacts associated with the provision of or need for new or physically altered governmental facilities. **(LS)**

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 police, fire, or emergency response, and no mitigation measures are required.

P. UTILITIES

1. Introduction

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

The study area for utilities includes the service area of the utility providers within the project corridor and generally conforms to the Tri-Valley Area, including the cities of Dublin, Pleasanton, and Livermore. For specific affects related to the potential relocation of utility lines during construction, the study area is defined as the collective footprint—the combined footprints of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative. In addition, the bus routes and bus infrastructure improvements 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 and within the street right-of-ways, are addressed programmatically in this analysis, as described in Chapter 2, Project Description.

No comments pertaining to utilities were received in response to the Notice of Preparation for this EIR or during the public scoping meeting held for the EIR.

2. Existing Conditions

This subsection describes the utility providers and their facilities within the study area, followed by a description of the major utility lines within the collective footprint. Specific utilities discussed in this subsection are: electrical power and gas, water supply, wastewater, storm drainage, communications, and solid waste.

a. Utility Providers and Facilities

This subsection describes the applicable regional utility providers and associated facilities.

(1) Power and Gas

Pacific Gas & Electric (PG&E) provides electricity and gas service for Alameda County, including the cities of Dublin, Pleasanton, and Livermore.

PG&E's electrical transmission lines transport bulk electricity at high voltages ranging from 21 kilovolts (kV) to 500 kV across the region. These lines are usually supported on metal towers or wooden poles. Electrical distribution lines carry lower voltage and provide power to neighborhoods.

PG&E's gas transmission pipelines deliver natural gas across the region. These pipelines carry gas at higher pressures and are held to strict safety standards to ensure safe operations. PG&E's neighborhood distribution pipelines branch off from larger regional transmission lines to deliver natural gas to homes and businesses. Distribution pipes are smaller in diameter than transmission pipes and operate at lower pressures.

(2) Water Supply

The Zone 7 Water Agency (Zone 7) of the Alameda County Flood Control and Water Conservation District provides wholesale treated water to local water distributors, including Dublin San Ramon Services District, City of Pleasanton Water, Livermore Municipal Water, and California Water Service Company (Cal Water). It also sells untreated water directly to agricultural and other customers. Zone 7's water sources include both surface water and groundwater.

In 2015, water supply and use in Zone 7 was 35,000 acre-feet per year (afy).[1, 2] Future demand is predicted to increase to 77,300 afy by 2025 and to 92,800 afy by 2035.[3] Zone 7 anticipates that it will have a supply of 88,645 afy in 2025 and 99,500 afy in 2035 and Zone 7 reports that its supply is anticipated to satisfy projected demand.[4]

Zone 7 is the regional groundwater basin manager for the Tri-Valley Area and provides the entitlement of 250,000 acre-feet (af) groundwater, which is the estimated storage capacity of the groundwater basin.

The local water distributors provide retail water service to residential and commercial customers in the study area, as described below.

- Dublin San Ramon Services District provides retail water to the city of Dublin and portions of San Ramon. In 2015, Dublin San Ramon Services District provided 7,445 afy of water to its service area.
- City of Pleasanton Water Services provides retail water to the city of Pleasanton. In 2015, City of Pleasanton Water Services provided 11,355 af of water to its service area.
- Cal Water serves approximately 11.5 square miles of the downtown and western portions of the city of Livermore. The service area is generally defined by Isabel Avenue to the west, Interstate (I-) 580 to the north, First Street to the east, and Stanley

[1] Zone 7 Water Agency, 2016a. 2015 Annual Report.
[2] An acre-foot of water equals 325,851 gallons.
[3] Zone 7 Water Agency, 2016b. 2015 Urban Water Management Plan. March 31.
[4] Ibid.

Blvd to the south. Cal Water would be the main supplier of water for the Isabel South Area, which would include the proposed Isabel Station parking garage. In 2015, Cal Water provided 7,255 af of water to its service area.[5]

- Livermore Municipal Water, which is operated by the City of Livermore Public Works Department and Water Resources Division, serves approximately 23 square miles within the northwest, northeast, and east portions of the city of Livermore. Livermore Municipal Water would be the main supplier of water for the eastern portion of the Isabel Corridor Area, the Isabel North Area, Cayetano Creek Area, and Laughlin Road Area, which would include the proposed Isabel Station, storage and maintenance facility and Laughlin Road parking lot. In 2015, Livermore Municipal Water provided 4,554 af of water to its service area.[6]

As of 2015, the average water demand for the existing Dublin/Pleasanton Station is approximately 1,813,616 gallons per year (gpy) (4,369 gallons per day (gpd) [5.5 afy]).[7]

(3) Wastewater

Wastewater is primarily generated by residential, commercial, and industrial sources and wastewater treatment provides protection for human health and receiving water bodies, preserves the health of aquatic and riparian species, and improves supply reliability through the removal of harmful pollutants from discharges.

Wastewater treatment facilities in the study area are described below.

- Dublin San Ramon Services District provides wastewater collection and treatment services in the study area for the cities of Dublin and Pleasanton, including the Dublin/Pleasanton Station Area and western portion of the I-580 Corridor Area. Dublin San Ramon Services District has a maximum capacity of 17 million gallons per day (mgd) and the average demand is approximately 8.1 mgd.[8]
- The Livermore Water Reclamation Plant, owned by the City of Livermore, provides wastewater treatment facilities in the study area and serves the I-580 Corridor Area, Isabel North and South Areas, Cayetano Creek Area, and the Laughlin Road Area. The City of Livermore's Public Services Department owns, operates, and maintains approximately 294 miles of existing wastewater lines, ranging in diameter from 6 to 48 inches. These facility systems include pipelines, pipe stations, interceptor stations, and discharge stations. The Livermore Water Reclamation Plant currently has a

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[5] California Water Service, 2016. 2015 Urban Water Management Plan. June.

[6] Livermore Municipal Water, 2016. 2015 Urban Water Management Plan. June.

[7] Wong, 2016. Personal communication from Norman D. Wong, Environmental Engineer, Office of District Architect, San Francisco Bay Area Rapid Transit District (BART) with Donald Dean, Environmental Coordinator, BART. April 29.

[8] Dublin San Ramon Services District, 2016. 2015 Urban Water Management Plan. June.

maximum capacity of 8.5 mgd and average demand ranges from 4 to 7 mgd.[9, 10] Wastewater is collected and conveyed to the Livermore Water Reclamation Plant, which is located at 101 West Jack London Boulevard, less than 1 mile south of the proposed Isabel Station. Treated wastewater is then sent through the Livermore Amador Valley Water Management Agency pipeline for ultimate disposal by the East Bay Dischargers Authority in San Francisco Bay.[11]

(4) Storm Drainage

Zone 7 manages stormwater conveyances and flood channels within the region and requires that activities within these channels, including discharges of stormwater, obtain an encroachment permit. Zone 7 defers authority for floodplain and floodway encroachment review to the cities in some cases. Zone 7 owns and operates storm drainage systems for the eastern portions of unincorporated Alameda County while the cities of Dublin, Pleasanton, and Livermore own and operate their respective storm drainage systems. Typical components of storm drain systems include inlets and catch basins, open channels and ditches, underground pipelines, and detention ponds. The storm drains typically lead directly into local creeks and watercourses without passing through treatment facilities. Additional information on Zone 7 and storm drain facilities in the study area is provided in Section 3.H, Hydrology and Water Quality.

(5) Communications

A variety of communications lines surround the study area, including fiber optic and telecommunications (television, telephone, internet), which are owned and operated by private providers, including Comcast and AT&T.

(6) Solid Waste

This subsection describes the solid waste collection services, which are contracted by each individual city, followed by the landfills which serve the study area.

(a) Solid Waste Collection Services

Alameda County Waste Management Authority

Within the county, the Alameda County Waste Management Authority and local jurisdictions are responsible for the collection and disposal of solid waste. The Alameda

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[9] City of Livermore, 2014. Community Services and Infrastructure Report. Adopted June 23.

[10] City of Livermore, 2016. Water Reclamation Plant. Available at: http://www.cityoflivermore.net/citygov/pw/public_works_divisions/wrd/water_reclamation_plant/default.htm, accessed August 26, 2016.

[11] Ibid.

County Waste Management Authority operates under a joint exercise of powers agreement among each of the 14 cities within the county and two sanitary districts that also provide refuse collection services. Pursuant to State of California (State) law, the Alameda County Waste Management Authority is responsible for the preparation of the county's Integrated Waste Management Plan and Hazardous Waste Management Plan and provides support and assistance to its member agencies in implementing those plans.[12]

City of Dublin

The City of Dublin contracts with Amador Valley Industries for its solid waste collection services for all residents in the city of Dublin. This service area also includes the Dublin/Pleasanton Station.

City of Pleasanton

The City of Pleasanton contracts with Pleasanton Garbage Service for their residential and commercial solid waste collection.

City of Livermore

The City of Livermore contracts with Livermore Sanitation, Inc. for solid waste collection services (including garbage, recyclable materials, and green waste). The service area includes the city of Livermore and certain unincorporated parts of the county. The Isabel North and South Areas, Cayetano Creek Area, and Laughlin Road Area are within this service area. Refuse is hauled directly to Republic Services Vasco Road, LLC Landfill (Republic/Vasco Road Landfill) for disposal. Recyclable and compostable materials are taken to the company's direct transfer facility. In 2014, the City of Livermore disposed of 60,456 tons of solid waste and achieved a waste diversion rate of 76 percent.[13]

(b) Landfills

Two landfills primarily serve the study area—the Altamont Landfill and the Republic/Vasco Road Landfill, described below.

- The Republic/Vasco Road Landfill, at 4001 North Vasco Road in Livermore, is operated by Republic Services and is a Class III disposal site that permits the disposal of municipal solid waste, with separate disposal areas required for asbestos and automobile-shredder waste. The Republic/Vasco Road Landfill also has areas designated for recycling of construction and demolition debris, green waste, wood,

[12] Alameda County Waste Management Authority, 2003. Countywide Integrated Waste Management Plan. Adopted February 26, 2003, amended March 2015.

[13] Stop Waste, 2016. Waste Disposal Tonnages and Diversion Rates for Alameda County Jurisdictions.

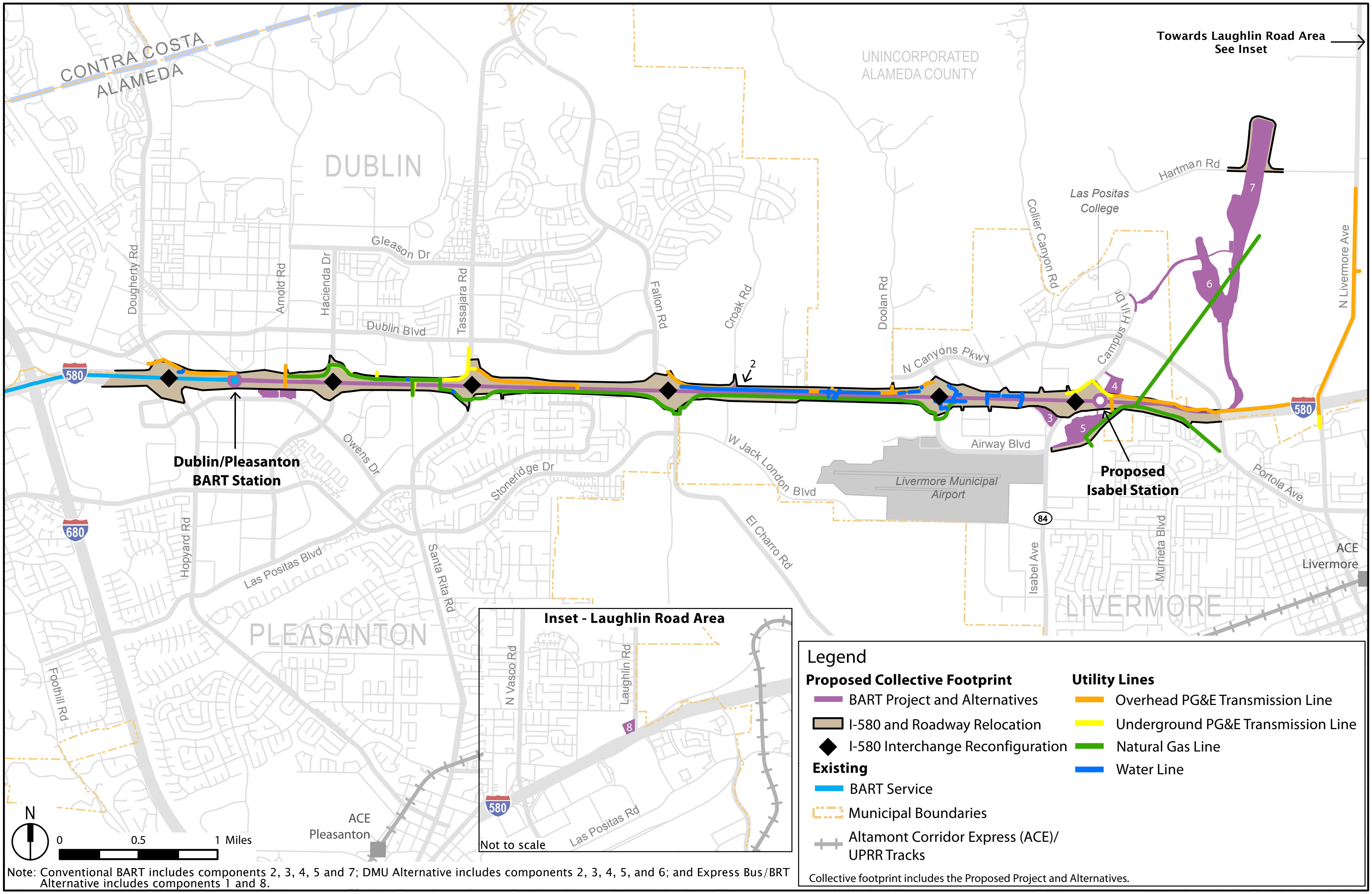
concrete, bricks, and residential recyclable materials. The landfill would serve the eastern portions of I-580 Corridor Area, Isabel North Area, Isabel South Area, Cayetano Creek Area, and the Laughlin Road Area. Currently, the Republic/Vasco Road Landfill receives an average of 885 tons per day (tpd), has a maximum capacity of 2,518 tpd, and is anticipated to reach capacity in 2022.[14]

- The Altamont Landfill, owned and operated by Waste Management Inc., is a Class II disposal site. It is located at 10840 Altamont Pass Road in Livermore on a 2,170-acre site with 472 acres permitted for landfill and currently serves the western portion of the I-580 Corridor Area and the Dublin/Pleasanton Station Area. The Altamont Landfill receives an average of 4,511 tpd, can accommodate 7,000 tpd, and has an expected closure date of 2049.[15]

(7) Utility Lines

There are a number of major utility lines that extend through the collective footprint, as shown in Figure 3.P-1 and listed in Table 3.P-1. These lines include electrical transmission power lines, underground gas lines, communication lines, and water lines.

[14] Alameda County Waste Management Authority, 2003. Countywide Integrated Waste Management Plan. Adopted February 26, 2003, amended March 2015.
[15] Ibid.



Source: Arup and Anil Verma Associates, Inc., 2017.

BART to Livermore Extension Project EIR

Figure 3.P-1
Utilities
Major Utility Lines in the Collective Footprint

TABLE 3.P-1 MAJOR UTILITY LINES IN THE COLLECTIVE FOOTPRINT

Geographic Subarea	City	Line Type
Dublin/Pleasanton Station Area	Dublin	PG&E 21 kV
	Dublin	PG&E 12-inch gas line
	Dublin	36-inch water line
I-580 Corridor Area	Dublin	PG&E 21 kV
	Dublin	PG&E 12-inch gas line
	Dublin	24-inch water line
	Dublin	36-inch water line
	Dublin	42-inch water line
	Pleasanton	PG&E 16-inch gas line
	Pleasanton	24-inch water line
	Livermore	36-inch water line
Isabel North Area	Livermore	PG&E 21 kV
Isabel South Area	Livermore	PG&E 21 kV
	Livermore	PG&E 16-inch gas line
	Livermore	Gas valve compound
Cayetano Creek Area	Livermore	PG&E 24-inch gas line
	Livermore	PG&E 21 kV

Source: Arup and Anil Verma Associates, Inc., 2017.

3. Regulatory Framework

This subsection describes the State and local environmental laws and policies relevant to utilities.

a. State Regulations

(1) California Integrated Waste Management Act

The California Integrated Waste Management Act of 1989 (Assembly Bill 939) required local cities and counties to adopt an Integrated Waste Management Plan to establish objectives, policies, and programs relative to waste disposal, management, source reduction, and recycling. Assembly Bill 939 mandated that each jurisdiction adopt a Source Reduction and Recycling Element to specify how the community will meet a 75-percent waste diversion goal by 2020. Each jurisdiction was also required to take measures to reduce solid waste generation and provide for the safe disposal of special and hazardous wastes.

(2) Per Capita Disposal Measurement System Act (Senate Bill 1016)

The Per Capita Disposal Measurement System Act (Senate Bill 1016) further specified the way State agencies measure their progress toward meeting the statutory waste diversion mandates. State agencies now have an individual disposal target (expressed as pounds per person per day) to represent their 75-percent diversion equivalent.

(3) California Government Code

California has established laws to protect infrastructure from damage caused by construction activities. According to the California Government Code (Sections 4216–4216.9), contractors are required to notify and coordinate with appropriate groups before beginning ground-disturbing construction activities. Contractors are required to paint the area to be disturbed and notify Underground Service Alert at least 2 days before starting any digging activities. Underground Service Alert then notifies its subscribing members of the proposed excavation.

b. BART Facilities Standards

BART has adopted requirements for environmental design and sustainability, described in the BART Facilities Standards. The objective of these requirements is to encourage the integration of sustainable design with facility development and maintenance by setting standards applicable to water conservation, energy efficiency, and other station improvements. Some of these requirements include using water efficient irrigation systems, utilizing water efficient plumbing fixtures, and minimizing vehicle washer water usage. See Chapter 2, Project Description, for additional discussion of sustainable project features.

4. Impacts and Mitigation Measures

This subsection lists the standards of significance used to assess impacts, discusses the methodology used in the analysis, 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 on utilities are considered significant if the Proposed Project or one of the alternatives would result in any of the following:

- Exceed wastewater treatment requirements of the San Francisco Bay Regional Water Quality Control Board

- Require or result in new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects
- Require or result in new stormwater drainage facilities, or expansion of existing facilities, the construction of which would cause significant environmental effects
- Exceed water supplies available to serve the project from existing entitlements and resources
- Result in a determination by the wastewater treatment provider that serves or may serve the project that it does not have adequate capacity to serve the projected demand in addition to existing commitments
- Be served by a landfill with insufficient permitted capacity to accommodate the solid waste disposal needs of the project
- Violate applicable federal, State, or local statutes and regulations related to solid waste
- Substantially disrupt utility services, including electrical power, natural gas, communications, drinking water supplies, wastewater transport, or stormwater transport during construction

b. Impact Methodology

The methodology used to evaluate the significance of utilities impacts is described below under each respective impact analysis. The Electrical Multiple Unit (EMU) Option would result in the same impacts as the Diesel Multiple Unit (DMU) Alternative, and therefore the analysis and conclusions for the DMU Alternative also apply to the EMU Option.

The analysis of the Enhanced Bus Alternative, which addresses the potential impacts of construction of the bus infrastructure improvements and operation of the bus routes at a programmatic level, would also apply to the bus improvements and feeder bus service under the Proposed Project and other Build Alternatives. Therefore, the analyses and conclusions for the Enhanced Bus Alternative also apply to the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, and are not repeated in the analysis of the Proposed Project and other Build Alternatives.

c. Summary of Impacts

Table 3.P-2 summarizes the impacts of the Proposed Project and Alternatives described in the analysis below.

TABLE 3.P-2 SUMMARY OF UTILITIES IMPACTS

	Significance Determinations[a]				
Impacts	No Project Alternative	Conventional BART Project[b]	DMU Alternative (with EMU Option)[b]	Express Bus/BRT Alternative[b]	Enhanced Bus Alternative
Construction					
Project Analysis					
Impact UTIL-1: Substantially disrupt utility services, including power, natural gas, communications, drinking water supplies, wastewater transport, or stormwater transport during construction	NI	LSM	LSM	LSM	LS
Impact UTIL-2: Result in the construction of new stormwater drainage facilities that would cause environmental effects	NI	LS	LS	LS	LS
Cumulative Analysis					
Impact UTIL-3(CU): Substantially disrupt utility services, including power, natural gas, communications, drinking water supplies, wastewater transport, or stormwater transport during construction under Cumulative Conditions	NI	LS	LS	LS	LS
Impact UTIL-4(CU): Result in the construction of new stormwater drainage facilities that would cause environmental effects under Cumulative Conditions	NI	LS	LS	LS	LS

TABLE 3.P-2 SUMMARY OF UTILITIES IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project[b]**	**DMU Alternative (with EMU Option)[b]**	**Express Bus/BRT Alternative[b]**	**Enhanced Bus Alternative**
Operational					
Project Analysis					
Impact UTIL-5: Exceed water supplies and wastewater capacity, or trigger the need for additional water or wastewater facilities	NI	LS	LS	LS	LS
Impact UTIL-6: Be served by a landfill with insufficient capacity or violate applicable solid waste regulations	NI	LS	LS	LS	LS
Cumulative Analysis					
Impact UTIL-7(CU): Exceed water supplies and wastewater capacity, or trigger the need for additional water or wastewater facilities under Cumulative Conditions	NI	LS	LS	LS	LS
Impact UTIL-8(CU): Be served by a landfill with insufficient capacity or violate applicable solid waste regulations under 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.
DMU = diesel multiple unit; EMU = electrical multiple unit; BRT = bus rapid transit
[a] All significance determinations listed in the table assume incorporation of applicable mitigation measures.
[b] The analysis of the Enhanced Bus Alternative also applies to the feeder bus service and bus improvements under the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, as described in the Impact Methodology subsection above.

d. Environmental Analysis

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

(1) Construction Impacts

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

(a) Construction – Project Analysis

Impact UTIL-1: Substantially disrupt utility services, including electrical power, natural gas, communications, drinking water supplies, wastewater transport, or stormwater transport during construction.

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

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, and the Livermore-Amador Valley Transit Authority would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including both residential and commercial. Construction of these improvements and development projects could potentially disturb utilities services in the study area. 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 is considered to have no impacts related to utility services during construction. **(NI)**

Conventional BART Project, DMU Alternative, and Express Bus/BRT Alternative. Construction of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative could entail several of the following activities that have potential to disturb utilities (depending on the alternative): (1) grading for the installation of tracks and associated horizontal infrastructure; and (2) excavation and grading for the construction of aerial and bridge structures, the proposed Isabel Station, including the pedestrian touchdown structures and parking facilities, transfer platforms at the Dublin/Pleasanton Station and parking garage, storage and maintenance facility, and Laughlin Road parking lot.

Many of these construction-related activities could require the relocation or temporary disruption of overhead and underground electric lines, water pipelines, and natural gas pipelines. As shown in Table 3.P-1, there are numerous utility lines within the collective footprint. These utilities would require relocation under the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative. Prior to starting construction, BART would be required to notify and coordinate with affected utility providers per California Government Code (Sections 4216–4216.9). However, services could be temporarily disrupted, which could result in a significant impact, depending on the duration of the interruption and the inconvenience to affected customers.

Implementation of the following mitigation measures would reduce potential impacts as follows: **Mitigation Measure UTIL-1.A** would restrict service interruptions to off-peak periods; **Mitigation Measure UTIL-1.B** would require temporary backup services for interruptions during peak periods; and **Mitigation Measure UTIL-1.C** would notify customers of scheduled service interruptions. With implementation of these measures, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative, would not substantially disrupt utility services, including electrical power, natural gas, communications, drinking water supplies, wastewater transport, or stormwater transport during construction and would have a less-than-significant impact. **(LSM)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would require limited excavation or grading for construction of bus shelters, bus bulbs, and installation of signage. Any potential utility service disruptions would be minor. Prior to the start of construction, BART would be required to notify and coordinate with affected utility providers per California Government Code (Sections 4216–4216.9). Thus, the Enhanced Bus Alternative would have less-than-significant construction-related impacts to utility services, and no mitigation measures are required. **(LS)**

Mitigation Measures. As described above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative could have potentially significant impacts by causing the temporary interruption of utilities. However, with implementation of **Mitigation Measure UTIL-1.A,** which would require service interruptions to off-peak periods, **Mitigation Measure UTIL-1.B,** which would require temporary backup service, and **Mitigation Measure UTIL-1.C,** which would notify customers of service interruptions, potential impacts would be reduced to a less-than-significant level.

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

Mitigation Measure UTIL-1.A: Restrict Service Interruptions to Off-Peak Periods (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

BART shall ensure that the contractor schedules utility work to be performed during periods of off-peak service demand. Low-demand periods typically occur during late evening and early morning hours.

Mitigation Measure UTIL-1.B: Arrange Temporary Backup Service (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

If it is not feasible to schedule service interruption to avoid inconveniencing customers and to avoid off-peak service hours, BART shall ensure that the contractor coordinates with the responsible utility provider to arrange alternate means of providing service.

Mitigation Measure UTIL-1.C: Notify Customers of Service Interruptions (Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative).

Notifications to commercial and residential customers shall be mailed at least two weeks in advance of service interruption and shall contain information on the selected BART extension alternative, expected schedule for service interruption, likely duration of service interruption, and individuals to contact regarding utility service or other construction-related issues.

Impact UTIL-2: Require or result in new stormwater drainage facilities or expansion of existing facilities, the construction of which would cause significant environmental effects.

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

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, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could result in new or altered stormwater drainage facilities. 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 stormwater drainage facilities. **(NI)**

Conventional BART Project and DMU Alternative. Several of the components of the Proposed Project and DMU Alternative would result in the relocation of existing or construction of new stormwater drainage facilities such as pipes, drains, manholes, and culverts. Under the Conventional BART Project and DMU Alternative, new impermeable surfaces would be constructed, including the relocated I-580 lanes, surface frontage roads, proposed Isabel Station and parking facilities, and the bus transfer facility at Isabel Station. Culverts would also be modified to accommodate the relocated I-580 right-of-way at a number of overcrossings. In addition, the tail tracks would be designed with culverts or drainage ways at regular intervals under the track to disperse stormwater runoff evenly along the trackway and maintain drainage to Cayetano Creek and vernal pools in the area.

The environmental impacts resulting from the relocation of existing storm drainage facilities and construction of new facilities for the Proposed Project and DMU Alternative are analyzed in **Impacts HYD-3, HYD-5,** and **HYD-6** as described in Section 3.H, Hydrology and Water Quality.

However, none of these proposed new stormwater drainage facilities would result in a significant environmental impact as stated in **Impact HYD-3**. For these reasons, impacts under the Proposed Project and the DMU Alternative to stormwater drainage facilities would be less than significant, and no mitigation is needed. **(LS)**

Express Bus/BRT Alternative. Under the Express Bus/BRT Alternative, existing stormwater drains would be required to be relocated and new drainages facilities such as pipes, drains, manholes would be constructed. These facilities would be at the Dublin/Pleasanton Station Area and the Laughlin Road Area. Components with new impermeable surfaces include the bus transfer platforms, replacement parking facility at the Dublin/Pleasanton Station, and the Laughlin Road parking lot. The environmental impacts resulting from the relocation of existing storm drainage facilities and construction of new facilities for the Express Bus/BRT Alternative are analyzed in **Impacts HYD-3, HYD-5,** and **HYD-6** as described in Section 3.H, Hydrology and Water Quality.

In addition, the Express Bus/BRT Alternative would involve modification (relocation) of Line G-2, to a tributary of Chabot Canal, as it extends along the south side of I-580 at the Dublin/Pleasanton Station. However, as stated in **Impact HYD-3**, this modification would not result in significant impacts to stormwater.

As described above, storm drainage facilities would be subject to Zone 7 and the City of Livermore's Flood Protection and Storm Water Drainage Development Impact Fee and would not result in significant environmental impacts. For these reasons, impacts under the Express Bus/BRT Alternative to stormwater drainage facilities would be less than significant, and no mitigation is needed. **(LS)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would include new bus infrastructure, such as bus shelters and bus bulbs that may require the relocation of existing storm drains or manholes. These improvements would be constructed within existing street rights-of-way and would not be anticipated to substantially increase impervious surfaces or require new drainage facilities, as described in **Impacts HYD-3, HYD-5,** and **HYD-6** (Section 3.H, Hydrology and Water Quality). Therefore, impacts under the Enhanced Bus Alternative to stormwater drainage facilities would be less than significant, and no mitigation is needed. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to construction of storm drainage facilities, and no mitigation measures are required.

(b) Construction – Cumulative Analysis

As described in Section 3.A, Introduction to Environmental Analysis and Appendix E, cumulative projects that may be under construction concurrently with the Proposed Project and Build Alternatives include: the Isabel Neighborhood Plan (INP); Dublin Crossing Specific Plan; Kaiser Dublin Medical Center; Ikea Retail Center; Hyatt Hotel; Johnson Drive Economic Development Zone; Residences at California Center; Crosswinds site; Los Positas College; and ACEforward.

Impact UTIL-3(CU): Substantially disrupt utility services, including electrical power, natural gas, communications, drinking water supplies, wastewater transport, or stormwater transport during construction 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 UTIL-1** above, the No Project Alternative would have no impacts related to utilities services during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. The concurrent construction of multiple cumulative projects, including the INP, as well as the Proposed Project and Build Alternatives, could result in overlapping needs for temporary relocation or disruption of utilities. However each of these projects, including the Proposed Project and Build Alternatives, would be required to notify and coordinate with affected utility providers per California Government Code (Sections 4216–4216.9). Furthermore, as described in **Impact UTIL-1** above, the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would implement **Mitigation Measure UTIL-1.A** (which would require service interruptions to off-peak periods), **Mitigation Measure UTIL-1.B** (which would require temporary backup service), and **Mitigation Measure UTIL-1.C** (which would notify customers of service interruptions), thereby minimizing any potential impacts on utilities during construction.

Overall, the Proposed Project and Build Alternatives, together with the cumulative projects, would not substantially disrupt utility services, including electrical power, natural gas, communications, drinking water supplies, wastewater transport, or stormwater transport during construction and would have less-than-significant cumulative impacts. **(LS)**

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 disruption of utilities during construction, and no mitigation measures are required.

Impact UTIL-4(CU): Require or result in new stormwater drainage facilities or expansion of existing facilities, the construction of which would cause significant environmental effects 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 UTIL-2** above, construction of the No Project Alternative would not have any new physical impacts associated with the provision of or need for new or physically altered stormwater drainage facilities. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART and Build Alternatives. Cumulative development within the study area would result in increases in impervious surface and likely require the construction of storm drainage facilities, including pipes, drains, manholes, and culverts. As described in **Impact UTIL-2** above, the Proposed Project and Build Alternatives would require the relocation of existing storm drainage facilities and construction and modification of stormwater drainage facilities. Further, the INP, which is assumed to be implemented in conjunction with the Proposed Project and DMU Alternative, would increase impervious surfaces and require the construction of stormwater drainage facilities.

As with the Proposed Project and Build Alternatives, cumulative development projects within the study area would be subject to water quality orders and regulations (see **Impacts HYD-3, HYD-5,** and **HYD-6**) that require the implementation of stormwater treatment and runoff volume control measures. The regulations typically require minimizing the introduction of new impervious surfaces and encouraging on-site infiltration. These features include low-impact development stormwater measures such as vegetated swales, pervious paving, and detention basins, which have proven effective in controlling stormwater pollutants and minimizing increases in runoff volumes.

While many of these cumulative projects would increase impermeable surfaces, they would be required to have adequate storm drainage facilities to accommodate stormwater runoff, and would be required to include treatment measures and design approaches measures for on-site infiltration of stormwater runoff such as vegetated swales, pervious paving, and landscaping. If any of the cumulative projects were to require the expansion of stormwater drainage facilities, the respective project would be required to address potential impacts associated with the construction of the facilities under its own environmental review.

Therefore, the Proposed Project and Build Alternatives, in combination with the cumulative projects, would have less-than-significant cumulative impacts related to construction of new stormwater drainage facilities or expansion of existing facilities. **(LS)**

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 relative to storm drainage, 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

Impact UTIL-5: Require or result in (1) new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects; (2) water demand that exceeds available water; (3) wastewater that exceeds treatment capacity; or (4) wastewater that exceeds treatment requirements.

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

Estimates of water consumption and wastewater generation from the Proposed Project and Build Alternatives are shown in Table 3.P-3 and Table 3.P-4, respectively. These

TABLE 3.P-3 WATER CONSUMPTION – CONVENTIONAL BART AND BUILD ALTERNATIVES

	Gallons per Year			
Project Component	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/ BRT Alternative**	**Enhanced Bus Alternative**
Existing Dublin/ Pleasanton Station (net increase)	252,529	436,186	1,101,944	688,715
Isabel Station	1,813,616	1,813,616	--	--
Storage and Maintenance Facility	3,217,572	733,593	--	--
Wayside Facilities (Croak Road and Kitty Hawk Road)	204,400	204,400	--	--
Total (Gallons per Year)	**5,488,117**	**3,187,795**	**1,101,944**	**688,715**
Total (Acre-Feet per Year)	**16.8**	**9.8**	**3.4**	**2.1**

Notes: -- = not applicable.
Source: Wong, 2016 and 2017.

TABLE 3.P-4 WASTEWATER GENERATION – CONVENTIONAL BART AND BUILD ALTERNATIVES

	Gallons per Day			
Wastewater Treatment Facility/Project Components	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/ BRT Alternative**	**Enhanced Bus Alternative**
Dublin San Ramon Services District				
Dublin/Pleasanton Station	692	1,195	3,019	1,887
Livermore Water Reclamation Plant				
Isabel Station, Storage and Maintenance Facility, Wayside Facilities	9,936	6,534	--	--
Total (Gallons per Day)	**10,628**	**7,729**	**3,019**	**1,887**

Notes: -- = not applicable; All water used (see Table 3.P-3) was conservatively assumed to be treated as wastewater, except approximately 50 percent of water used at the storage and maintenance facility, which would be recycled.
Source: Wong, 2016 and 2017.

estimates are for the horizon year 2040, as this would present the highest demand on service providers in comparison to opening year 2025.[16] All estimates are based on estimates of existing or proposed BART facilities.

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 the Proposed Project or any of the Build Alternatives. However, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could result in increased demand for water supply/treatment or wastewater treatment. 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 the provision or alternation of water or wastewater facilities, water demand, wastewater generation, or wastewater treatment requirements. **(NI)**

Conventional BART Project. Water use and wastewater generation for the Proposed Project would result from increased ridership at the existing Dublin/Pleasanton Station, operation of the proposed Isabel Station, operation of the storage and maintenance facility, and to a limited degree, wayside facilities.

- **Water Use.** Activities that would generate demand for water include facility cleaning, restrooms, drinking fountains, BART car maintenance activities, and landscaping. Water consumption estimates for the Proposed Project are shown in Table 3.P-3 and are described by facility below:
  - **Dublin/Pleasanton Station.** This analysis incorporates the net increase in water consumption above existing conditions for the Dublin/Pleasanton Station, associated with the increase in ridership at the station, above existing conditions. As stated in Section 3.B, Transportation, an average of 7,900 BART riders[17] exited at the Dublin/Pleasanton Station daily in 2016 and is anticipated to increase by approximately 14 percent, or 1,100 average daily riders, to a total of 9,000 in

[16] Water supply estimates from the Zone 7 2015 Urban Water Management Plan are through 2035. Because this information is only available until the year 2035, the analysis compares the horizon year (2040) to Zone 7's 2035 projections.

[17] Ridership refers to the number of linked trips on the BART system; a passenger boarding the Dublin/Pleasanton-Daly City line at Dublin/Pleasanton Station and transferring at Coliseum to the Richmond-Fremont line would count as one trip.

2040. As of 2015, the Dublin/Pleasanton Station used a total of 1,813,616 gpy.[18] With the projected increased number of riders at the station by 2040, water consumption is likely to increase by approximately 14 percent. Thus, the net increase in water usage at Dublin/Pleasanton Station would be 252,529 gpy (above existing water consumption at the station).

- **Isabel Station.** Demand for water supply at the proposed Isabel Station is estimated based on average water demand at the Dublin/Pleasanton Station (1,813,616 gpy), which is a comparable station.
- **Storage and Maintenance Facility.** Demand for water supply at the storage and maintenance facility under the Proposed Project is estimated based on the average water demand from BART's other comparable maintenance facilities. Under the Proposed Project, the storage and maintenance facility would include a BART car washing facility in addition to a number of water consuming activities such as showers and faucets. Estimates show that approximately 3,217,572 gpy will be used at the storage and maintenance facility for a fleet size of approximately 172 BART cars.
- **Wayside Facilities.** The wayside facilities at Croak Road and Kitty Hawk Road would generate limited demand for water associated with activities similar to those described above (i.e., restrooms, cleaning, and landscaping). Their combined water consumption would be comparable to one single-family household (approximately 204,400 gpy).[19]

In addition, the Proposed Project would include two new bus routes and four bus modified routes, as described in Chapter 2, Project Description. This would likely incrementally increase the number of buses in the regional bus system, resulting in an incremental increase in water consumption and wastewater generation in the study area. Overall, this additional feeder bus service would be anticipated to result in an incremental increase in water demand and wastewater generation.

It is conservatively estimated that the Proposed Project would generate increased demand for approximately 5,488,117 gpy of water (16.8 afy). By way of comparison,

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[18] Wong, 2017. Personal communication from Norman D. Wong, Environmental Engineer, Office of District Architect, San Francisco Bay Area Rapid Transit District with Don Dean, Environmental Coordinator, BART. April 29.

[19] East Bay Municipal Utility District, 2017. Save Like a Pro. Available at: http://www.ebmud.com/water-and-drought/conservation-and-rebates/residential/save-pro/, accessed May 4, 2017.

5,488,117 gpy is similar to the amount of water consumed by approximately 54 single-family homes.[20]

As described in the Existing Conditions subsection above, water use in Zone 7 is anticipated to increase to 92,800 afy and have a supply of 99,500 afy in 2035, resulting in a surplus available supply 6,700 afy in 2035.[21] The estimated increase in water demand by 16.8 afy from the Proposed Project would represent less than 0.3 percent of projected surplus available supply in 2035.

Furthermore, BART Facilities Standards require projects to implement water-reduction measures, as described in the Regulatory Framework subsection above, which would further reduce water demand at BART facilities. These measures include sustainable landscaping (using xeriscaping and drought-tolerant plants and irrigation design specifications that are low-water flow), and low flow toilets meeting the green building code. In addition, BART uses reclaimed water for washing sidewalks and plazas at stations.

- **Wastewater Generation.** For the purposes of the wastewater assessment, it is conservatively assumed that all water used by the Proposed Project would be treated at a wastewater treatment plant, with the exception that approximately 50 percent of water used at the storage and maintenance facility would be recycled back into the facility's return systems for reuse.[22]As shown in Table 3.P-4, the Proposed Project would generate approximately 10,628 gpd. Wastewater generation from the Proposed Project is described below for the respective wastewater treatment providers.
    - **Dublin San Ramon Services District.** Wastewater from the Dublin/Pleasanton Station is treated at the Dublin San Ramon Services District, which currently has a maximum capacity of 17 mgd, a current demand of 8.1 mgd, and remaining capacity of 8.9 mgd. The estimated additional wastewater generated at the station would be 692 gpd, which would be less than 0.05 percent of the remaining wastewater capacity for the Dublin San Ramon Services District.
    - **Livermore Water Reclamation Plant.** Wastewater generated by the proposed Isabel Station, wayside facilities, and storage and maintenance facility would be treated at the Livermore Water Reclamation Plant, which currently has a maximum

[20] A typical single-family home uses approximately 102,200 gallons per year. East Bay Municipal Utility District, 2017. Save Like a Pro. Available at: http://www.ebmud.com/water-and-drought/conservation-and-rebates/residential/save-pro/, accessed May 4, 2017.

[21] Zone 7 Water Agency, 2016b. 2015 Urban Water Management Plan. March 31.

[22] Typically, water used for landscaping would not flow to the wastewater treatment plant, but would be discharged through the storm drain system. However, because water demand has not been disaggregated among the various types of consumption, it is not possible to estimate how much of the water consumed would be conveyed to a wastewater treatment plant versus a storm drain.

capacity of 8.5 mgd, a current demand ranging from 4 to 7 mgd, and a remaining wastewater capacity of 1.5 mgd or greater.[23] The proposed Isabel Station, wayside facilities, and storage and maintenance facility would generate approximately 9,936 gallons of wastewater per day, which would be less than 0.2 percent of the available treatment capacity of the Livermore Water Reclamation Plant.

No new or additional water or wastewater facilities would be required to meet the estimated water and wastewater demand from the Proposed Project.

In summary, as described above, the Proposed Project would have a negligible contribution to the increase in water demand and wastewater generation and would not require: (1) new water or wastewater treatment facilities or the expansion of existing facilities, the construction of which could cause significant environmental effects; (2) water demand that exceeds available water; (3) wastewater that exceeds treatment capacity; or (4) wastewater that exceeds treatment requirements. Therefore, the Proposed Project would result in less-than-significant impacts to water demand and wastewater generation, and no mitigation is needed. **(LS)**

DMU Alternative. The DMU Alternative would use water and generate wastewater in ways similar to the Proposed Project. However, rather than an additional 172 BART cars, the DMU Alternative would have 12 DMU trains at the storage and maintenance facility.

- **Water Use.** Water consumption estimates for the DMU Alternative are shown in Table 3.P-3 and described below:
  - **Dublin/Pleasanton Station.** Under the DMU Alternative ridership is anticipated to increase by approximately 24 percent, or 1,900 average daily riders, to a total of 9,800 in 2040 under the DMU Alternative. With the projected increased number of riders at the station, water consumption is likely to increase by approximately 24 percent above existing conditions. Thus, the net increase in water usage at the Dublin/Pleasanton Station would be 436,186 gpy.
  - **Isabel Station.** Demand for water supply at the proposed Isabel Station would be similar to that of the Proposed Project (1,813,616 gpy).
  - **Storage and Maintenance Facility.** Demand for water supply at the storage and maintenance facility is estimated based on projected demand at the proposed eBART Hillcrest maintenance yard. Under the DMU Alternative, water consuming activities at the storage and maintenance facility would be similar to that of the Proposed Project's storage and maintenance facility. Estimates show that a total of

[23] City of Livermore, 2013. Livermore Water Reclamation Plant 2012 Master Plan Update, November.

733,593 gpy would be used at the storage and maintenance facility for a fleet size of 12 rail vehicles.[24]

- **Wayside Facilities.** Wayside facilities water consumption would be similar to that described above for the Proposed Project (204,400 gpy).

The new and modified bus routes under the DMU Alternative would be the same as under the Proposed Project and result in an incremental increase in water demand and wastewater generation.

It is conservatively estimated that the DMU Alternative would generate increased demand for approximately 3,187,795 gpy of water (9.8 afy). By way of comparison, this would be similar to the amount of water consumed by approximately 31 single-family homes.[25]

As described above, water use in Zone 7 is anticipated to increase to 92,800 afy and have a supply of 99,500 afy in 2035, resulting in a surplus available supply 6,700 afy in 2035. The estimated increase in water demand by 9.8 afy from the DMU Alternative would represent less than 0.2 percent of available supply in 2035.

- **Wastewater Generation.** Similar to the Proposed Project, it is conservatively assumed that all water used would flow to the wastewater treatment plant and that 50 percent of water used at the storage and maintenance facility would be recycled back into their return systems. As shown in Table 3.P-4, the DMU Alternative would generate approximately 7,729 gpd. Wastewater generation from the DMU Alternative is described below for the respective wastewater treatment providers.

  - **Dublin San Ramon Services District.** Wastewater from the Dublin/Pleasanton Station is treated at the Dublin San Ramon Services District, which currently has a maximum capacity of 17 mgd, a current demand of 8.1 mgd, and remaining capacity of 8.9 mgd. The estimated additional wastewater generated at the station would be 1,195 gpd, which would be less than 0.1 percent of the remaining wastewater capacity for the Dublin San Ramon Services District.

  - **Livermore Water Reclamation Plant.** Wastewater generated by the proposed Isabel Station, wayside facilities, and storage and maintenance facility would be treated at the Livermore Water Reclamation Plant, which currently has a maximum capacity of 8.5 mgd, a current demand ranging from 4 to 7 mgd, and a remaining wastewater capacity of 1.5 mgd or greater. The proposed Isabel Station, wayside facilities, and storage and maintenance facility would generate approximately

[24] San Francisco Bay Area Rapid Transit District (BART), 2011. eBART Hillcrest Maintenance Facility Sanitary Sewer Loads.

[25] A typical single-family home uses approximately 102,200 gallons per year. East Bay Municipal Utility District, 2017. Save Like a Pro. Available at: http://www.ebmud.com/water-and-drought/conservation-and-rebates/residential/save-pro/, accessed May 4, 2017.

6,534 gpd of wastewater, which would be less than 0.1 percent of the available treatment capacity of the Livermore Water Reclamation Plant.

No new or additional water or wastewater facilities would be required to meet the estimated water and wastewater demand from the DMU Alternative.

In summary, as described above, the DMU Alternative would have a negligible contribution to the increase in water demand and wastewater generation and would not require: (1) new water or wastewater treatment facilities or the expansion of existing facilities, the construction of which could cause significant environmental effects; (2) water demand that exceeds available water; (3) wastewater that exceeds treatment capacity; or (4) wastewater that exceeds treatment requirements. Therefore, the DMU Alternative would result in less-than-significant impacts to water demand and wastewater generation, and no mitigation is needed. **(LS)**

Express Bus/BRT Alternative. The Express Bus/BRT Alternative would not include a new station or other BART facilities. However, under this alternative ridership levels at the Dublin/Pleasanton Station would increase and would likely result in an increase in demand for water and wastewater generation at the station.

- **Water Use.** Activities that would generate demand for water include facility cleaning, restrooms, drinking fountains, and landscaping. Water consumption for the Express Bus/BRT Alternative are shown in Table 3.P-3 and described below:
  - **Dublin/Pleasanton Station.** Under the Express Bus/BRT Alternative, ridership is anticipated to increase by approximately 61 percent, or 4,800 average daily riders, to a total of 12,700 in 2040. With the projected increased number of riders at the station by 2040, water consumption is likely to increase by 61 percent above existing conditions. Thus, the net increase in water usage at the Dublin/Pleasanton Station would be 1,101,944 gpy.

  The new and modified bus routes under this alternative result in an incremental in water demand and wastewater generation, similar to the Proposed Project.

  It is conservatively estimated that the Express Bus/BRT Alternative would generate increased demand for approximately 1,101,944 gpy (3.4 afy). By way of comparison, 1,101,944 gpy is similar to the amount of water consumed by approximately 11 single-family homes.[26]

[26] A typical single-family home uses approximately 102,200 gallons per year. East Bay Municipal Utility District, 2017. Save Like a Pro. Available at: http://www.ebmud.com/water-and-drought/conservation-and-rebates/residential/save-pro/, accessed May 4, 2017.

As described above water usage in Zone 7 is anticipated to increase to 92,800 afy and have a supply of 99,500 afy in 2035, resulting in a surplus available supply 6,700 afy in 2035. The estimated increase in water demand by 3.4 afy from the Express Bus/BRT Alternative would represent less than 0.1 percent of projected available surplus available supply in 2035.

- **Wastewater Generation.** For the purposes of the wastewater assessment, it is conservatively assumed that all water used would flow to the wastewater treatment. Therefore, wastewater under the Express Bus/BRT Alternative is conservatively estimated to be the same as the water consumed.
  - **Dublin San Ramon Services District.** Wastewater from the Dublin/Pleasanton Station is treated at the Dublin San Ramon Services District, which currently has a maximum capacity of 17 mgd, a current demand of 8.1 mgd, and remaining capacity of 8.9 mgd. The estimated additional wastewater generated at the station would be approximately 3,019 gpd, which would be less than 0.1 percent of the remaining wastewater capacity for the Dublin San Ramon Services District.

No new or additional water or wastewater facilities would be required to meet the estimated water and wastewater demand from the Express Bus/BRT Alternative.

In summary, as described above, the Express Bus/BRT Alternative would have a negligible contribution to the increase in water demand and wastewater generation and would not require: (1) new water or wastewater treatment facilities or the expansion of existing facilities, the construction of which could cause significant environmental effects; (2) water demand that exceeds available water; (3) wastewater that exceeds treatment capacity; or (4) wastewater that exceeds treatment requirements. Therefore, the Express Bus/BRT Alternative would result in less-than-significant impacts to water demand and wastewater generation, and no mitigation is needed. **(LS)**

Enhanced Bus Alternative. Similarly to the Express Bus/BRT Alternative, the Enhanced Bus Alternative would not include any additional BART facilities that would create an increased demand in water consumption or wastewater generation. However, under this alternative ridership levels at the Dublin/Pleasanton Station would increase and would likely result in an increase in demand for water and wastewater generation.

- **Water Use.** Activities that would generate demand for water are similar to that of the Express Bus/BRT Alternative. Water consumption for the Enhanced Bus Alternative are shown in Table 3.P-3 and are described by facility below:
  - **Dublin/Pleasanton Station.** Under the Express Bus/BRT Alternative ridership is anticipated to increase by approximately 38 percent, or 3,000 average daily riders, to a total of 10,900 riders. With the projected increased number of riders at the station by 2040, water consumption is likely to increase by approximately 38

percent above existing conditions. Thus, the net increase in water usage at the Dublin/Pleasanton Station would be 688,715 gpy.

In addition, the new and modified bus routes under this alternative would result in an incremental increase in water demand and wastewater generation.

It is conservatively estimated that the Enhanced Bus Alternative would generate increased demand approximately 688,715 gpy of water (2.1 afy). By way of comparison, 688,715 gpy is similar to the amount of water consumed by approximately seven single-family homes.[27]

As described above, water use in Zone 7 is anticipated to increase to 92,800 afy and have a supply of 99,500 afy in 2035, resulting in a surplus available supply 6,700 afy in 2035. The estimated increase in water demand by 2.1 afy from the Enhanced Bus Alternative would represent approximately 0.1 percent of available supply in 2035.

- **Wastewater Generation.** As described above, for the purposes of the wastewater assessment, it is conservatively assumed that all water used would flow to the wastewater treatment. Wastewater under the Enhanced Bus Alternative is conservatively estimated to be the same as the water consumed.
  - **Dublin San Ramon Services District.** Wastewater from the Dublin/Pleasanton Station is treated at the Dublin San Ramon Services District, which currently has a maximum capacity of 17 mgd, a current demand of 8.1 mgd, and remaining capacity of 8.9 mgd. The estimated additional wastewater generated at the station would be approximately 1,887 gpd, which would be less than 0.1 percent of the remaining wastewater capacity for the Dublin San Ramon Services District.

No new or additional water or wastewater facilities would be required to meet the estimated water and wastewater demand from the Enhanced Bus Alternative.

In summary, as described above, the Enhanced Bus Alternative would have a negligible contribution to the increase in water demand and wastewater generation and would not require: (1) new water or wastewater treatment facilities or the expansion of existing facilities, the construction of which could cause significant environmental effects; (2) water demand that exceeds available water; (3) wastewater that exceeds treatment capacity; or (4) wastewater that exceeds treatment requirements. Therefore, the Enhanced Bus Alternative would result in less-than-significant impacts to water demand and wastewater generation, and no mitigation is needed. **(LS)**

[27] A typical single-family home uses approximately 102,200 gallons per year. East Bay Municipal Utility District, 2017. Save Like a Pro. Available at: http://www.ebmud.com/water-and-drought/conservation-and-rebates/residential/save-pro/, accessed May 4, 2017.

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to water demand and wastewater capacity or require additional water and wastewater facilities, and no mitigation measures are required.

Impact UTIL-6: Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs or violate applicable federal, State, and local statutes and regulations related to solid waste.

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

Solid waste generation estimates for the Proposed Project and Build Alternatives are shown in Table 3.P-5. These estimates are for the horizon year 2040, as this would present the highest demand on service providers in comparison to opening year 2025.

TABLE 3.P-5 SOLID WASTE GENERATION – CONVENTIONAL BART AND BUILD ALTERNATIVES

	Tons per Year			
Project Component	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/ BRT Alternative**	**Enhanced Bus Alternative**
Dublin/Pleasanton Station (net increase)	37.9	65.4	165.3	103.3
Isabel Station (new)	272.0	272.0	--	--
Storage and Maintenance Facility (new)	578.5	40.4	--	--
Total (Tons per Year)	**888.4**	**377.8**	**165.3**	**103.3**
Total (Tons per Day)	**2.4**	**1.0**	**0.5**	**0.3**

Notes: -- = not applicable.
Source: Wong, 2016 and 2017.

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 the Proposed Project or any of the Build Alternatives. However, construction of the planned and programmed transportation improvements and continued land use development, including construction of residential and commercial uses under the No Project Alternative could result in increased solid waste generation and increased demand on landfills. 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 solid waste or landfills. **(NI)**

Conventional BART Project. Solid waste generation from the Proposed Project would result from increased ridership at the existing Dublin/Pleasanton Station, operation of the proposed Isabel Station and operation of the storage and maintenance facility. Waste at the Isabel Station would be generated by both BART staff and patrons.

- **Solid Waste**. Solid waste generation estimates for the Proposed Project are shown in Table 3.P-5 and are described by facility below:
    - **Dublin/Pleasanton Station.** This analysis incorporates the net increase in solid waste generation above existing conditions for the Dublin/Pleasanton Station, associated with the increase in ridership at the station, above existing conditions. As stated in Section 3.B, Transportation, an average of 7,900 BART riders exited at the Dublin/Pleasanton Station daily in 2016 and is anticipated to increase by approximately 14 percent, or 1,100 average daily riders, to a total of 9,000 in 2040. As of 2015, the Dublin/Pleasanton Station generated a total of 22 tons of recycled materials and 272 tons of solid waste.[28] With the projected increased number of riders at the station by 2040, solid waste generation is likely to increase by approximately 14 percent. Thus, the net increase in solid waste generation at Dublin/Pleasanton Station would be 37.9 tpy (above existing solid waste generation at the station).
    - **Isabel Station.** Solid waste generation at the proposed Isabel Station is estimated based on existing solid waste generation at the Dublin/Pleasanton Station (272 tpy), which is a comparable station.
    - **Storage and Maintenance Facility.** Activities associated with BART employees, BART car cleaning, and other BART car maintenance would all generate solid waste. Solid waste generation at the storage and maintenance facility under the Proposed Project is estimated based on the average solid waste generated from BART's other comparable maintenance facilities—approximately 3.36 tons per BART car per year. Based on a fleet size of 172 BART cars, approximately 578 tpy would be generated at the storage and maintenance facility.

  It is conservatively estimated that the Proposed Project would generate increased demand on landfills by approximately 888.4 tpy (2.4 tpd).

[28] Wong, 2016. Personal communication from Norman D. Wong, Environmental Engineer, Office of District Architect, San Francisco Bay Area Rapid Transit District with Don Dean, Environmental Coordinator, BART. April 29.

- **Landfill Capacity.** The Altamont Landfill is the primary landfill serving the Dublin/Pleasanton Station and the Republic/Vasco Road Landfill is the primary landfill serving the area of the proposed Isabel Station, wayside facilities, and storage and maintenance facility.
  - **Altamont Landfill.** The Altamont Landfill has a maximum capacity of 7,000 tpd, a current demand of 4,511 tpd, and remaining available capacity of 2,489 tpd. The estimated increase of 37.9 tpy (0.1 tpd) in solid waste from the Dublin/Pleasanton Station would be less than 0.01 percent of the landfill's remaining available daily capacity.
  - **Republic/Vasco Road Landfill.** The Republic/Vasco Road Landfill has a current demand of 885 tpd and has a maximum capacity of 2,518 tpd, and a remaining available capacity of 1,633 tpd. The estimated increase 850.5 tpy (2.3 tpd) in solid waste from the proposed Isabel Station and storage and maintenance facility would be less than 0.2 percent of the landfill's remaining available daily capacity.

  However, the Republic/Vasco Road Landfill is anticipated to reach capacity in 2022, and would most likely be closed by 2025 when the Proposed Project is anticipated to be in operation.[29] Despite this, the county has a remaining landfill capacity of 45.6 million tons as of 2014. Furthermore, while the Republic/Vasco Road Landfill is anticipated to reach capacity in 2022, the Altamont Landfill is expected to have capacity through 2049. As stated in the Countywide Integrated Waste Management Plan, the county has sufficient landfill capacity until 2049.[30]

As described above, the Proposed Project would be served by a landfill with sufficient capacity. Furthermore, solid waste recycling and disposal for the Proposed Project would be contracted with the appropriate local service providers to ensure compliance with applicable regulations. Therefore, the Proposed Project would have less-than-significant impacts on local landfill capacity and would not violate applicable statutes and regulations. No mitigation is needed. **(LS)**

DMU Alternative. The DMU Alternative would generate solid waste similar to the Proposed Project. However, the DMU Alternative would have 12 DMU trains at the storage and maintenance facility.

- **Solid Waste.** Solid waste generation estimates for the DMU Alternative are shown in Table 3.P-5 and are described by facility below:
  - **Dublin/Pleasanton Station.** Under the DMU Alternative, ridership is anticipated to increase by approximately 24 percent, or 1,900 average daily riders, to a total of

[29] Alameda County Waste Management Authority, 2003. Countywide Integrated Waste Management Plan. Adopted February 26, 2003, amended March 2015.
[30] Ibid.

9,800 in 2040 under the DMU Alternative. With the projected increased number of riders at the station by 2040, solid waste generation is likely to increase by approximately 24 percent above existing conditions. Thus, the net increase in solid waste generation at the Dublin/Pleasanton Station would be 65.4 tpy or 0.2 tpd.

- **Isabel Station.** Solid waste generation at the proposed Isabel Station would be similar to that of the Proposed Project (272 tpy).
- **Storage and Maintenance Facility.** Similar to the BART cars, DMU vehicles would also generate waste at a rate of 3.36 tpy per vehicle. Thus, approximately 40.4 tpy would be generated at the storage and maintenance facility for a fleet size of 12 DMU trains.

It is conservatively estimated that the DMU Alternative would generate increased demand on landfills by approximately 377.8 tpy (1 tpd).

- **Landfill Capacity.** Landfills serving the facilities under the DMU Alternative would be the same as under the Proposed Project.
  - **Altamont Landfill.** The Altamont Landfill has a maximum capacity of 7,000 tpd, a current demand of 4,511 tpd, and remaining available capacity of 2,489 tpd. The estimated increase of 65.4 tpy (0.2 tpd) in solid waste from the Dublin/Pleasanton Station would be less than 0.01 percent of the landfill's remaining available daily capacity.
  - **Republic/Vasco Road Landfill.** The Republic/Vasco Road Landfill has a current demand of 885 tpd and has a maximum capacity of 2,518 tpd, and a remaining available capacity of 1,633 tpd. The estimated increase 312.4 tpy (0.9 tpd) in solid waste from the Isabel Station and storage and maintenance facility would be less than 0.1 percent of the landfill's remaining available daily capacity.

  As stated under the Proposed Project, the Republic/Vasco Road Landfill is anticipated to reach capacity in 2022; however, the county has sufficient landfill capacity through 2049.

As described above, the DMU Alternative would be adequately served by a landfill with sufficient capacity. Similar to the Proposed Project, solid waste recycling and disposal would be contracted with the appropriate local service providers to ensure compliance with applicable regulations. Therefore, the DMU Alternative would have less-than-significant impacts on local landfill capacity and would not violate applicable statutes and regulations. No mitigation is needed. **(LS)**

Express Bus/BRT Alternative. The Express Bus/BRT Alternative would provide increased access to the existing Dublin/Pleasanton Station via the proposed bus transfer platforms, but would not include a new BART stations or a storage and maintenance facility.

- **Solid Waste**. Under the Express Bus/BRT Alternative, solid waste would be generated at the Dublin/Pleasanton Station**.** Solid waste generation estimates are shown in Table 3.P-5. Under the Express Bus/BRT Alternative ridership is anticipated to increase by approximately 61 percent, or 4,800 average daily riders, to a total of 12,700 riders in 2040. With the projected increased number of riders at the station by 2040, solid waste generation is likely to increase by approximately 61 percent above existing conditions. Thus, the net increase in solid waste generation at Dublin/Pleasanton Station would be approximately 165.3 tpy (0.5 tpd).
- **Landfill Capacity.** The Altamont Landfill is the primary landfill serving the Dublin/Pleasanton Station. The Altamont Landfill has a maximum capacity of 7,000 tpd, a current demand of 4,511 tpd, and remaining available capacity of 2,489 tpd. The estimated increase of 165.3 tpy (0.5 tpd) in solid waste from the Dublin/Pleasanton Station would be less than 0.1 percent of the landfill's remaining available daily capacity.

As described above, the Express Bus/BRT Alternative would be adequately served by a landfill with sufficient capacity. Furthermore, solid waste recycling and disposal would be contracted with the appropriate local service providers to ensure compliance with applicable regulations. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts on local landfill capacity and would not violate applicable statutes and regulations. No mitigation is needed. **(LS)**

Enhanced Bus Alternative. The Enhanced Bus Alternative would result in minor bus infrastructure improvements and new/modified bus routes, with a limited increase in bus ridership.

- **Solid Waste**. Under the Enhanced Bus Alternative, solid waste would be generated at the Dublin/Pleasanton Station**.** Solid waste generation estimates are shown in Table 3.P-5. Ridership at the station is anticipated to increase by approximately 38 percent, or 3,000 average daily riders, to a total of 10,900 riders. With the projected increased number of riders at the station by 2040, solid waste generation is likely to increase by approximately 38 percent above existing conditions. Thus, the net increase in solid waste generation at Dublin/Pleasanton Station would be 103.3 tpy (0.3 tpd).
- **Landfill Capacity.** The Altamont Landfill is the primary landfill serving the Dublin/Pleasanton Station. The Altamont Landfill has a maximum capacity of 7,000 tpd, a current demand of 4,511 tpd, and remaining available capacity of 2,489 tpd. The estimated increase of 103.3 tpy (0.3 tpd) in solid waste from the Dublin/Pleasanton Station would be less than 0.1 percent of the landfill's remaining available daily capacity.

As described above, the Enhanced Bus Alternative would be adequately served by a landfill with sufficient capacity. Furthermore, solid waste recycling and disposal would be contracted with the appropriate local service providers to ensure compliance with applicable regulations. Therefore, the Express Bus/BRT Alternative would have less-than-significant impacts on local landfill capacity and would not violate applicable statutes and regulations. No mitigation is needed. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant impacts related to landfill capacity and would not violate any applicable solid waste regulations, and no mitigation measures are required.

(b) Operations – Cumulative Analysis

The geographic study area for the cumulative analysis of utility impacts includes the service area of the utility providers within the project corridor and generally conforms to the Tri-Valley Area, including the cities of Dublin, Pleasanton, and Livermore, as described in the Introduction subsection above.

The cumulative condition includes the population and employment growth projections assumed through 2040, which account for the growth forecasts provided in the general plans for the various jurisdictions in the study area and in Plan Bay Area. Specific projects and plans include those listed in Section 3.A, Introduction to Environmental Analysis and Appendix E.

Impact UTIL-7(CU): Require or result in (1) new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects; (2) water demand that exceeds available water; (3) wastewater that exceeds treatment capacity; or (4) wastewater that exceeds treatment requirements 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 CS-5** above, the No Project Alternative would have no new physical impacts associated with the provision of or need for new or physically altered water or wastewater treatment facilities, increased demand for water, increased generation of wastewater, and would not violate local wastewater treatment requirements. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. Development of the cumulative plans and projects listed in Section 3.A, Introduction to Environmental Analysis and Appendix E, could substantially increase demand for water and wastewater services in future years by increasing the population and employment in the study area. The Proposed Project and Build Alternatives would also increase demand on water and wastewater capacity, although the demand is anticipated to be minor relative to available supplies/treatment capacity, as described in **Impact UTIL-5** above. Further, the INP, which is assumed to be implemented in conjunction with the Proposed Project or DMU Alternative, would shift growth in the city of Livermore to the INP area, resulting in greater density in the area. However, it would not increase the city's projected water demand as the overall development would be consistent with the city's General Plan.

The 2015 Urban Water Management Plan estimates demand in 2035 will be 92,800 afy and available supply will be 99,500 afy, resulting in a remaining available supply of 6,700 afy.[31] Furthermore, demand for future water use on a per capita basis has been declining and is expected to continue to decline due to water conservation efforts. In addition, water conservation programs by local water supply retailers are anticipated to reduce demand and recycled water projects would increase supply in Zone 7's service area.[32] The projected water supply is anticipated to be adequate for the Proposed Project and Build Alternatives in conjunction with the INP and other cumulative projects.

The Dublin San Ramon Services District and the city of Livermore, through its Livermore Water Reclamation Plant, provide wastewater treatment services in the study area. The Dublin San Ramon Services District currently has a maximum capacity of 17 mgd, a current demand of 8.1 mgd, and remaining capacity of 8.9 mgd. The Livermore Water Reclamation Plant currently has a maximum capacity of 8.5 mgd, a current demand ranging from 4 to 7 mgd, and a remaining wastewater capacity of 1.5 mgd or greater. Therefore, the available capacity for wastewater treatment at these facilities is anticipated to be adequate for the projected future demand with the Proposed Project and Build Alternatives in conjunction with the INP and other cumulative projects.

The Proposed Project and Build Alternatives and cumulative projects would not trigger the need for the construction of new, or the expansion of existing, water or wastewater facilities, beyond that already accounted for in the respective water and wastewater provider's planning documents. Therefore, the Proposed Project and Build Alternatives in combination with the cumulative projects would have a less-than-significant cumulative impact on water supply and wastewater treatment capacity. **(LS)**

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 water demand and water capacity or require additional water and wastewater facilities, and no mitigation measures are required.

[31] Zone 7 Water Agency, 2016b. 2015 Urban Water Management Plan. March 31.
[32] Zone 7 Water Agency, 2016c. Water Supply Evaluation Update. February.

Impact UTIL-8(CU): Be served by a landfill with insufficient permitted capacity to accommodate the project's solid waste disposal needs or violate applicable federal, State, and local statutes and regulations related to solid waste 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 CS-5** above, the No Project Alternative would have no impacts associated with solid waste or landfills. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. Development of the cumulative plans and projects could substantially increase demand for solid waste disposal in the study area. In addition, the Proposed Project and Build Alternatives would also result in an incremental increase demand for solid waste disposal, as described in **Impact UTIL-6** above. Further, the INP, which is assumed to be implemented in conjunction with the Proposed Project and DMU Alternative, would also increase demand.

As described above, the Alameda County Waste Integrated Management Plan analyzes landfill capacity by examining the aggregate total for all landfills within the county. The county has a remaining landfill of 45.6 million tons, as of 2014. Furthermore, while the Republic/Vasco Road Landfill is anticipated to reach capacity in 2022, the Altamont Landfill is expected to have capacity through 2049. As stated in the Countywide Integrated Waste Management Plan, the county has sufficient landfill capacity until 2049.[33]

Development along the project corridor would be required to contract with proper service providers that continue to abide by and facilitate current and future laws for solid waste disposal. Therefore, the Proposed Project and Build Alternatives, together with cumulative developments, would have a less-than-significant impact on local landfill capacities and would not violate applicable statutes and regulations. **(LS)**

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 landfill capacity or solid waste regulations, and no mitigation measures are required.

[33] Alameda County Waste Management Authority, 2003. Countywide Integrated Waste Management Plan. Adopted February 26, 2003, amended March 2015.

CHAPTER 4
OTHER CEQA CONSIDERATIONS

A. INTRODUCTION

This section provides the additional analyses required under the CEQA, in accordance with Section 15126 of the CEQA Guidelines. These analyses include a summary of significant project-level and cumulative impacts resulting from implementation of the Proposed Project or Build Alternatives that cannot be mitigated to a less-than-significant level, irreversible and irretrievable commitment of resources, and growth-inducing impacts.

B. SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

Chapter 3, Environmental Analysis, of this EIR identifies impacts that are considered significant and mitigation measures to reduce those impacts to a less-than-significant level. In accordance with Sections 15126(b) and 15126.2(b) of the CEQA Guidelines, the purpose of this section is to identify project-related environmental impacts that could not be eliminated or reduced to a less-than-significant level with the implementation of all identified mitigation measures. The findings in this chapter are subject to final determination by the BART Board of Directors as part of its certification of this EIR. The significant impacts of the Proposed Project and/or Build Alternative(s) that cannot be mitigated to a less-than-significant level pertain to the following environmental resource topics:

- Transportation (Proposed Project, DMU Alternative/EMU Option, Express Bus/BRT Alternative)
- Land Use and Agricultural Resources (Proposed Project and DMU Alternative/EMU Option)
- Visual Quality (Proposed Project, DMU Alternative/EMU Option, Express Bus/BRT Alternative)
- Energy (Enhanced Bus Alternative)

C. SIGNIFICANT CUMULATIVE IMPACTS

Cumulative impacts are those effects resulting from future growth and other probable future projects in combination with the effects identified for the Proposed Project or an Alternative. Chapter 3, Environmental Analysis, provides a cumulative analysis for each environmental resource topic addressed in this EIR and Section 3.A, Introduction to Environmental Analysis, describes the cumulative projects and plans considered in this analysis.

The contribution of the Proposed Project and Build Alternatives to cumulative impacts would not be cumulatively considerable for the following resource topics: Population and Housing; Geology, Soils, Seismicity, Mineral and Paleontological Resources; Hydrology and Water Quality; Noise and Vibration; Greenhouse Gas Emissions; Energy; Public Health and Safety; Community Services; and Utilities.

No significant cumulative impacts that could be reduced to a less-than-significant level after the implementation of mitigation measures were identified in Chapter 3 of this EIR.

Significant cumulative impacts that would be significant and unavoidable, even with the implementation of mitigation measures, were identified in Chapter 3 of this EIR for the following resource topics:

- Transportation (Proposed Project, DMU Alternative/EMU Option, Express Bus/BRT Alternative, and Enhanced Bus Alternative)
- Land Use and Agricultural Resources (Proposed Project and DMU Alternative/EMU Option)
- Visual Quality (Proposed Project, DMU Alternative/EMU Option, Express Bus/BRT Alternative)
- Cultural Resources (Proposed Project, DMU Alternative/EMU Option, Express Bus/BRT Alternative, and Enhanced Bus Alternative)
- Biological Resources (Proposed Project and DMU Alternative/EMU Option)
- Air Quality (Proposed Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative)

D. SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

In accordance with CEQA Guidelines Section 15126.2(c), the purpose of this section is to identify significant irreversible environmental changes that would be caused by implementation of the Proposed Project or Build Alternatives. Irreversible commitment of resources must be evaluated to ensure that current consumption is justified. Changes that may be considered significant and irreversible include the following:

- Use of nonrenewable resources (e.g., land, energy, and construction materials) during the construction and operational phase of a proposed project (because a large commitment of such resources makes removal or non-use thereafter unlikely)

- Primary impacts, and particularly secondary impacts, that will commit future generations to similar use
- Irreversible damage due to environmental accidents

1. Commitment of Nonrenewable Resources

Construction and operation of the Proposed Project and Build Alternatives would require the one-time commitment of nonrenewable energy and materials for construction and the ongoing commitment of energy and materials for operation. This subsection describes the types of commitments related to construction, followed by the types of commitments related to operations.

a. Construction

Construction of infrastructure and transit facilities under the Proposed Project and Build Alternatives would require a substantial commitment of construction materials such as steel, cement, asphalt, and fabricated materials for various project components. The project components would include the following types of elements for the Proposed Project and Build Alternatives:

- Proposed Project – Extension of rail tracks, proposed Isabel BART Station (hereinafter referred to as the Isabel Station), other support structures, parking facility, a storage and maintenance facility, and limited infrastructure improvements for the feeder buses, including bus bulbs, bus shelters, signage
- DMU Alternative – Generally similar to the components described for the Proposed project above, with the addition of a DMU transfer platform at the existing Dublin/Pleasanton BART Station (hereinafter referred to as the Dublin/Pleasanton Station) and extension of BART storage track at the station, as well as a smaller parking structure at the proposed Isabel Station and a smaller storage and maintenance facility than the Proposed Project
- Express Bus/BRT Alternative – Improvements at the existing Dublin/Pleasanton Station, including bus transfer platforms, extension of BART storage track, and replacement parking lot or garage as well as a surface parking lot at Laughlin Road and limited improvements for the feeder buses similar to those described for the Proposed Project
- Enhanced Bus Alternative – Limited bus infrastructure improvements, including bus bulbs, bus shelters, and signage

In addition to the materials required for construction, the Proposed Project and Build Alternatives would require the one-time, short-term consumption of energy for construction—consisting of electricity, diesel, and gasoline. Total energy used during construction is estimated in Section 3.M, Energy, as follows:

- Proposed Project: 159,023 million British thermal units (MMBTU)
- DMU Alternative/EMU Option: 135,245 MMBTU
- Express Bus/BRT Alternative: 43,491 MMBTU
- Enhanced Bus Alternative: 4,025 MMBTU

The anticipated amount of energy that would be consumed during construction of the Proposed Project and Build Alternatives would not result in long-term depletion of non-renewable energy resources and would not permanently increase reliance on non-renewable energy resources. Furthermore, as described below, operation of the Proposed Project and Build Alternatives—with the exception of the Enhanced Bus Alternative—would result in a yearly decrease in energy consumption. Therefore, the one-time expenditure of energy during construction would be offset by the operational decrease in energy consumption for the Proposed Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative.

b. Operation

In addition to the commitment of non-renewable resources during construction, operation of the Proposed Project and Build Alternatives would require the consumption of energy sources (electricity, diesel, and gasoline). The types of activities requiring energy consumption would vary under the Proposed Project and Build Alternatives. The types of activities would include the following, as described in detail in Section 3.M, Energy:

- Transit operations (including BART, DMU/ EMU, and bus)
- Station and maintenance operations (including BART car maintenance, DMU/EMU car maintenance, station operations, emergency generators, water use and wastewater treatment, and other activities associated with the storage and maintenance facility such as trucks and forklifts)

To the extent that biodiesel or another biologically derived renewable diesel would be used as fuel, consumption of diesel would not be an irretrievable commitment of resources. However, if conventional petroleum-based diesel fuel were used to operate the DMU engines, emergency generators, maintenance trucks, storage and maintenance facility shuttle vans, and buses, this would constitute the use of a nonrenewable resource. The use of electricity for the Proposed Project and Build Alternatives would be an irretrievable commitment of resources to the extent that it would be supplied from nonrenewable sources such as natural gas. However, approximately 90 percent of BART's electricity portfolio needs are met from low-carbon and zero-carbon sources. Furthermore, by 2040, the Proposed Project and all of the Alternatives except for the Enhanced Bus Alternative would result in reductions in energy consumption when all energy sources (electricity, diesel, and gasoline) are taken into account. The reduction in fossil fuel consumption would primarily occur due to commuters taking the Proposed Project, DMU Alternative/ EMU Option, or Express Bus/BRT Alternative to arrive at their destination instead of driving. Total energy consumption from operation of the Proposed Project and DMU Alternative (as well as the EMU Option) would be offset by (1) a net reduction in passenger vehicle trips, as more people take transit; and (2) the generation of renewable energy via a solar photovoltaic system that would be installed at the proposed Isabel Station. Energy consumption from the Express Bus/BRT Alternative would be offset by a net reduction in passenger vehicle trips. Under the Enhanced Bus Alternative, however, energy consumption would increase both in 2025 and 2040.

Net annual energy use for the Proposed Project and Build Alternatives would be as shown below. The net reduction in passenger vehicle trips would be substantially greater for the Proposed Project than for any of the Build Alternatives, especially in 2040, thus resulting in a greater reduction in net annual energy use for the Proposed Project.

- Proposed Project
  - Decrease by 73,163 MMBTU in 2025
  - Decrease by 130,788 MMBTU in 2040
- DMU Alternative
  - Decrease by 34,179 MMBTU in 2025
  - Decrease by 35,011 MMBTU in 2040
- EMU Option
  - Decrease by 62,525 MMBTU in 2025
  - Decrease by 66,538 MMBTU in 2040
- Express Bus/BRT Alternative
  - Decrease by 28,816 MMBTU in 2025
  - Decrease by 56,803 MMBTU in 2040
- Enhanced Bus Alternative
  - Increase by 18,031 MMBTU in 2025
  - Increase by 8,173 MMBTU in 2040

2. Commitment of Land Resources and Land Uses

The Proposed Project and Build Alternatives would result in an irreversible commitment of land resources for the development of various project components. As shown in Table 2-1 in Chapter 2, Project Description, a large proportion of the collective footprint is already committed to transportation uses, namely the Interstate Highway (I-) 580 right-of-way (ROW) and other roadways. Furthermore, the bus routes and bus infrastructure improvements under the Enhanced Bus Alternative—similar to those included under the Proposed Project and other Build Alternatives—are anticipated to extend along existing streets and within the street ROWs, and would not affect any land resources or land uses that are not already committed to transportation. Therefore, the analysis below focuses on land uses that would be displaced by BART due to acquisition of land needed for the collective footprint.

As described in Section 3.C, Land Use and Agricultural Resources, the majority of the 147 acres affected under the Proposed Project would consist of agricultural uses (approximately 69 percent), with other uses (commercial/office, government/public property, industrial, residential, undeveloped, and other uses) each accounting for approximately 1 to 10 percent. For the DMU Alternative and EMU Option, approximately 54 percent of the 102 acres that would be affected are in agricultural use, 10 percent are government/public property; each of the remaining uses account for approximately 1 to 18 percent. Of the 10 acres that would be affected by the Express Bus/BRT Alternative, approximately 56 percent are government/public property and 42 percent are commercial and office.

Irreversible land use changes are generally considered to entail the conversion of open space, agricultural lands, or land having soil characteristics that qualify them to be suitable for agricultural activities, or containing valuable mineral resources. The Proposed Project and DMU Alternative would entail the conversion of such lands to transportation uses. As described in Section 3.C, Land Use and Agricultural Resources, the Proposed Project and DMU Alternative would directly convert approximately 6.3 acres of Prime Farmland and approximately 5.5 acres of Unique Farmland currently in agricultural uses, and approximately 0.2 acre of Prime Farmland currently used as a parking lot in the Isabel South Area.

Furthermore, the tail tracks and storage and maintenance facility would cover land zoned for agricultural use in the Cayetano Creek Area—approximately 104 acres under the Proposed Project and approximately 56 acres under the DMU Alternative. If BART is unable to acquire only the needed portions of the parcels within the footprint, and instead acquires the entire parcels, additional acreage could be removed from agricultural use.

In addition, the Proposed Project and DMU Alternative could indirectly accelerate the conversion of G&M Farms, a 20-acre parcel of Prime Farmland, to non-agricultural uses. This parcel could experience development pressure because the Proposed Project and DMU Alternative are intended to promote transit-oriented development; however, as detailed in Section 3.C, Land Use and Agricultural Resources, this land is already within the Urban Growth Boundary (UGB) and has been pre-zoned by the City of Livermore as Planned Development, a designation "applied to areas of the city appropriate for residential, commercial, and industrial planned development projects that require more flexible design standards."[1]

There are no known mineral resources that would be of value to the region and the residents of the state or a locally important mineral resource recovery site within the footprints of the Proposed Project or DMU Alternative. While the Cayetano Creek Area extends into an area underlain by Livermore Gravel, which could be a source of aggregate, it is not designated as an area with known mineral resources by the California Geological Survey. Additionally, as described in Section 3.C, Land Use and Agricultural Resources, this area is zoned for agricultural uses.

3. Environmental Accidents

Limited quantities of hazardous materials are normally required for the operation and maintenance of transit systems and vehicles. As described in Section 3.N, Public Health and Safety, the Proposed Project and DMU Alternative would entail the use of limited quantities of hazardous materials that are typical of maintenance shops. On the other hand, the Express Bus/BRT Alternative and Enhanced Bus Alternative would only use small quantities of common hazardous materials.

BART follows standard operating procedures for the transport, use, and disposal of hazardous materials and for emergency response activities in the event of an accidental release. These procedures include development of communication and response protocols with the local emergency response teams. Furthermore, compliance with existing federal, State of California (State), and local hazardous materials regulations for handling, disposal, and transport, as well as emergency response protocols, would ensure the containment of accidental releases and quick and coordinated responses in the event of environmental accidents. Environmental accidents stemming from the inadvertent release of these materials are not considered to be significant because of the minimal volumes and concentrations that would be used by the Proposed Project and DMU Alternative and the existing regulations that govern the use and accidental release of hazardous materials.

Furthermore, to minimize the possibility of a potential public health or environmental hazard during construction, mitigation measures have been identified that would require the following: preparation of a Phase I Environmental Site Assessment and, if necessary, a Phase II Environmental Site Assessment; preparation of a Soil Management Plan; a hazardous materials and waste management plan; procedures for fueling during construction; and an emergency response/contingency plan. Thus, the Proposed Project

[1] City of Livermore, 2010. Livermore Development Code § 3.04.030

and Build Alternatives would not result in irreversible damage to the public or the environment.

E. GROWTH-INDUCING IMPACTS

In accordance with CEQA Guidelines Section 15126.2(d), this section describes the potential for the BART to Livermore Extension Project to have growth-inducing impacts. A project is considered growth inducing if it has the potential to directly or indirectly foster economic or population growth or the construction of additional housing. For example, factors that contribute to growth inducement include the extension of public services or transportation facilities into previously unserved or underserved areas, or the removal of other obstacles to growth and development. Growth can occur as development of greenfields (i.e., previously undeveloped land) with housing, or as increased density (i.e., infill development) that results in a greater concentration of housing or jobs.

This analysis (1) evaluates whether the Proposed Project and Build Alternatives would directly or indirectly induce economic, population, or housing growth adjacent to the project corridor; and (2) describes the potential of the Proposed Project and Build Alternatives to redistribute regional population growth in a more efficient and compact manner, consistent with smart growth principles, described further below. See Section 3.D, Population and Housing, for additional discussion.

The study area for growth-inducing impacts encompasses the cities of Dublin, Pleasanton, and Livermore, as well as Alameda County as a whole. In addition, while outside of the study area, San Joaquin County is also examined due to its location directly east of Alameda County and the nature of the BART to Livermore Extension Project, which would extend transit access farther east.

The analysis below concludes that the Proposed Project and Build Alternatives would not result in the following:

- Directly cause population, housing, or economic growth
- Indirectly and adversely result in potential growth-related impacts in the project corridor
- Adversely affect overall growth in the San Francisco Bay Area (Bay Area)

The analysis has determined that the Proposed Project and Build Alternatives would result in the following:

- Indirectly and positively contribute to efficient land use development patterns in the project corridor

1. Relationship of Land Use and Transportation to Growth

Growth rates and patterns within an area are influenced by various local, regional, and nationwide forces that reflect ongoing social, economic, and technological changes. Ultimately, the amount and location of population growth and economic development that occurs within a specific area is regulated by city and county governments through zoning, land use plans and policies, and decisions regarding development applications. Local government and other regional, State, and federal agencies also make decisions regarding the provision of infrastructure—such as transportation facilities, water facilities, and sewage facilities—that may influence the location and rate of growth.

Transportation is one of several types of infrastructure that can have a wide range of growth-inducing effects. A transportation project may hasten growth in certain areas, slow it in others, intensify development in certain locations, or shift growth from one locality to another. However, generally, transportation improvements support or accommodate growth—in contrast to land use development projects, which generate new uses (i.e., growth) and increase travel demand, thereby contributing to the need for new transportation capacity.

Other factors, particularly local planning and community standards or environmental initiatives, may also direct the location and timing of transportation investments. An example of this is the UGB of the City of Livermore and of the East County Area of Alameda County that limits encroachment of urban development into open spaces and agricultural lands, as described in Section 3.C, Land Use and Agricultural Resources. The goal of the UGB is to focus urban development in or near existing cities, where it will be efficiently served by existing facilities.[2] Future modifications to the Livermore UGB require approval through a citywide vote; this requirement was established to ensure that future expansion of urban uses would be carefully considered to protect resources and growth management.

2. Analysis

a. Overview of Growth Trends

As described in the Program EIR for the BART to Livermore Extension Program, BART's original vision was to shape regional economic growth on a large-scale, areawide basis.[3] An explicit goal was to encourage and support large economic and redevelopment plans in the downtown areas of San Francisco and Oakland and in suburban centers along major

[2] Alameda County, 2000. East County Area Plan. November.

[3] San Francisco Bay Area Rapid Transit District (BART), 2009. BART to Livermore Extension Draft Program Environmental Impact Report. State Clearinghouse No. 2008062026. November.

corridors—effectively becoming an integrated transit system that the Bay Area needed. The original economic focus of Bay Area rail investment has largely succeeded; San Francisco and Oakland's central business districts added millions of square feet of office uses during the 1970s and 1980s and continue to grow. However, the expectation for growth in more-suburban areas did not occur until recently.

As development of mixed-use projects became standard practice in the mid-1980s, commercial and employment-oriented development occurred more frequently around several suburban centers, notably Concord, Hayward, and Walnut Creek. As the Bay Area's chronic housing shortage worsened, and given that many BART stations exist in redevelopment areas, more multi-family housing, especially affordable housing, began to be included near BART stations.

A large number of general plan updates and redevelopment plan amendments occurred in cities around the Bay Area during the mid-to-late 1990s, some of which had not been substantially revised for decades. With the refinement of smart growth principles in urban design and planning, the focus shifted to transit-oriented development with higher employment and housing densities within walking distance of rail stations. The late 1990s economic boom led to the creation of many transit-oriented development plans, which ultimately were adopted into updated general plans.

The BART to Livermore Extension Project is designed to serve the current and planned growth in population, housing, and employment in Alameda County over the next 25 years, as well as the travel demand between the Bay Area and the Central Valley through Altamont Pass. The BART to Livermore Extension Project would provide a key segment in the Bay Area's regional rail transportation network.

b. Regional Growth Inducement Outside Alameda County

Growth in San Joaquin County is anticipated to occur at a faster pace than in the Bay Area. Specifically, projections for San Joaquin County anticipate growth from about 742,781 residents in 2015 to 1,070,486 in 2040 (an increase of 44 percent).[4] This is substantially higher than the 27 percent population growth forecast through 2040 for the nine-county Bay Area and 26 percent growth forecast for Alameda County.[5, 6]

The growth would occur in part because of the relative affordability and greater supply of housing in San Joaquin County compared to the Bay Area. For example, in April 2017, the

[4] San Joaquin Council of Governments, 2014. Regional Transportation Plan, Sustainable Communities Strategy. Available at: http://www.sjcog.org/278/Adopted-2014-RTPSCS.
[5] United States Census Bureau, 2014. 2010-2014 American Community Survey 5-Year Estimates. Available at: https://factfinder.census.gov.
[6] Association of Bay Area Governments (ABAG), 2013. Plan Bay Area Projections 2013.

median sale price of a single-family home was $895,490 in the Bay Area as a whole, $875,000 in Alameda County, and $340,000 in San Joaquin County.[7] Further, according to the Association of Bay Area Governments, between 2007 and 2014, the regional housing needs assessment allocation for the Bay Area was 214,500 units and the housing production was 123,098 units, resulting in an unmet housing need of 91,402 units. During the same time period, Alameda County had a regional housing needs assessment allocation of 44,937, housing production of 19,615 units, and an unmet housing need of 25,322 units.[8]

Conversely, the Bay Area has a more abundant supply of jobs compared to San Joaquin County. Jobs-housing balance is often measured using an index based on the ratio of jobs to employed residents in the area, with an index of 1.0 indicating a jobs-housing balance.[9] As of 2010, this index was 1.04 for both the Bay Area and for Alameda County, and 0.89 for San Joaquin County, indicating that the Bay Area, including Alameda County is job-rich, whereas San Joaquin County is housing-rich.

Given the more abundant housing supply in San Joaquin County and greater availability of jobs in the Bay Area, many San Joaquin County residents travel long distances to the Bay Area for employment. According to the 2010 United States Census, at 31.5 miles one-way, the San Joaquin region is in the top 10 in the country for average work trip length.[10] Between 2006 and 2010, approximately 26 percent of the workers in San Joaquin County (68,401 workers) commuted out of San Joaquin County, and approximately 10 percent (26,121 workers) commuted to Alameda County.[11] More workers from San Joaquin County commuted to Alameda County than to any other county. As a result, commute travel over Altamont Pass has become even more congested. As of 2011, residents in San Joaquin County who commuted to the Bay Area spent an average of 1.37 hours one-way daily along the I-205/Altamont Pass and I-580 corridors.[12]

While housing in San Joaquin County may be less expensive than in the Bay Area, the job locations of the employed residents and the commute times affect the number of

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[7] California Association of Realtors, 2017. Current Sales & Price Statistics. April. Available at: http://www.car.org/marketdata/data/countysalesactivity/, accessed June 8, 2017.

[8] Association of Bay Area Governments (ABAG), 2015. San Francisco Bay Area Progress in Meeting 2007-2014 Regional Housing Need Allocation. September.

[9] An index above 1.0 indicates there are more jobs than employed residents and may suggest that many employees are commuting in from outside the community. An index below 1.0 indicates that there are more employed residents than jobs and may suggest that many residents are commuting to jobs located outside the community.

[10] San Joaquin Council of Governments, 2014. Regional Transportation Plan, Sustainable Communities Strategy. Available at: http://www.sjcog.org/278/Adopted-2014-RTPSCS

[11] California Employment Development Department (EDD), 2015. San Joaquin County to County Commuting Estimates. March.

[12] San Joaquin Council of Governments (SJCOG), 2011. Regional Transportation Plan. Available at www.sjcog-rcmp.org/_literature_158662/2011_Regional_Transportation_Plan.

households willing to relocate. A decrease in commute times or a positively perceived change in other subjective factors such as the quality of a commute (e.g., commuting by rail versus driving) could act as an incentive for relocation.

While an extension of BART service to Livermore could reduce the driving commute to and from San Joaquin County by approximately 5.5 miles, this would not substantially reduce commute times from San Joaquin County and would not be anticipated to induce growth beyond that already anticipated in regional plans. Any potential additional growth caused by the BART to Livermore Extension Project would be minor in the context of the substantial projected growth.

c. Direct Growth Inducement in Study Area

As described in detail in Section 3.D, Population and Housing, the BART to Livermore Extension Project would not directly induce substantial population, housing, or economic growth. Limited direct job growth could result from the Proposed Project and Build Alternatives—i.e., approximately 20 to 135 full-time-equivalent jobs, including train operators, maintenance personnel, and bus operators. In addition, the construction workforce for the Proposed Project and DMU Alternative would be several hundred workers per day over the course of approximately 5 years, with fewer workers for the Express Bus/BRT Alternative and Enhanced Bus Alternative. These jobs would likely be filled by persons within the study area or the greater Bay Area, and would not represent substantial population growth. Furthermore, even if all of these new employees required a housing unit within the study area, this demand could be accommodated within the existing housing stock (Alameda County has a vacancy rate of 6 percent, which represents approximately 35,224 vacant housing units). Therefore, the BART to Livermore Extension Project would not directly foster substantial direct population or housing growth.

d. Indirect Growth Inducement in Study Area

Association of Bay Area Governments projections for the next 20 years show substantial population, housing and employment growth in Dublin, Pleasanton, and Livermore even without implementation of the Proposed Project or Build Alternatives, as described in Section 3.D, Population and Housing. Population and housing growth is forecast to range between 24 to 49 percent over this time period.[13, 14] While the BART to Livermore Extension Project occurs in a corridor that is largely urbanized, there are areas that could accommodate new development, particularly north of I-580 and east of Isabel Avenue, the location of the Shea Homes – Sage Project (currently under construction). Furthermore, the

[13] United States Census Bureau, 2014. 2010-2014 American Community Survey 5-Year Estimates. Available at: https://factfinder.census.gov/.

[14] Association of Bay Area Governments (ABAG), 2013. Plan Bay Area Projections 2013.

Livermore General Plan anticipates new residential and retail development in the proposed Isabel Station area.

As described above, new travel demand and the need for new transportation capacity are generated by land use development, while transportation projects in a developed corridor (such as the Proposed Project and Build Alternatives) tend to respond to and accommodate, rather than induce, new growth. The Proposed Project would enhance the region's ability to accommodate the existing and projected population and employment growth and transportation demand described above.

While the BART to Livermore Extension Project would largely serve existing demand and support forecasted growth, it would also improve transit services, foster accessibility to BART's regional transit system, and provide a viable alternative to driving on I-580, which is forecast to become even more congested in the future. It is reasonable to assume that the Proposed Project or DMU Alternative would encourage new development, primarily around the proposed Isabel Station area. While population growth, economic growth, and new housing would occur regardless of the BART to Livermore Extension Project, the location and intensity of growth would likely shift to take advantage of increased transit services provided by the Proposed Project or DMU Alternative. Furthermore, there could also be growth in proximity to new or modified bus routes under the Express Bus/BRT Alternative and Enhanced Bus Alternative, although any such growth would be limited due to the considerably lower ridership increases forecast for the bus alternatives, compared to the Proposed Project and DMU Alternative.

This indirect growth effect is not considered adverse under CEQA definitions, because the principal effect is increased accessibility and density, reducing urban sprawl and associated environmental impacts, as discussed below. Projected growth that is redistributed in proximity to the Isabel Station, to take advantage of the regional accessibility afforded by BART, would be consistent with existing City of Livermore land use policies that anticipate a BART to Livermore extension. Additionally, changes in land use designations that are currently being initiated and proposed by the City of Livermore in the area around the Isabel Station would allow for more mixed-use development and would directly encourage denser growth.

Nevertheless, while the indirect growth caused by the BART to Livermore Extension Project would not be adverse in itself, it could cause indirect adverse growth-related impacts associated with the construction and implementation of new development projects in the vicinity (i.e., air and noise impacts from construction of new housing or other development). The Proposed Project or DMU Alternative could also indirectly encourage development on open space and agricultural land in the vicinity of the proposed Isabel Station. Development and densification of land within the UGB, particularly next to existing or proposed transit hubs, would satisfy Livermore General Plan objectives, even if some isolated pockets of agricultural or open space land could be developed in the process.

One of the requirements of BART's System Expansion Policy is for one or more ridership development plans to be developed for proposed projects that would expand the existing BART system. These plans seek to increase ridership to support the proposed BART extension through local measures such as transit-supportive land uses and investment in access programs and projects. This requirement would be fulfilled by the Isabel Neighborhood Plan (INP)—a specific plan under preparation by the City of Livermore. For the purpose of this EIR, it is assumed that the INP would be implemented under the Proposed Project or DMU Alternative, but not under the Express Bus/BRT Alternative or Enhanced Bus Alternative. While the amount of new growth surrounding the proposed Isabel Station could be substantial, it is being addressed through the INP planning process by the City of Livermore, which will increase the amount of allowable development around the proposed Isabel Station to accommodate growth in a more compact, transit-oriented configuration, which is considered smart growth. Furthermore, while the growth anticipated under the INP would account for greater densities at the Livermore Isabel Avenue BART Station PDA, the overall amount of growth anticipated in Livermore would be consistent with the General Plan.

e. Indirect Positive Contribution to Smart Growth Patterns in the Local Study Area

To the extent that improved transit systems encourage development by removing obstacles to mobility or improving access in the region, the Proposed Project and Build Alternatives could have an indirect growth-inducing effect by accelerating planned growth in a more compact, transit-oriented form, in and around the proposed station area. As described in Chapter 1, Introduction, a major objective of the BART to Livermore Extension Project is to provide an affordable and effective intermodal link of the existing BART system to the inter-regional rail network, as well as a series of priority development areas (PDAs)—including the Livermore Isabel Avenue BART Station PDA, Livermore Downtown PDA, and Livermore East Side PDA—identified by the City of Livermore and the Metropolitan Transportation Commission.

As described above, under the Proposed Project and DMU Alternative, new development around the Isabel Station Area would be guided by a ridership development plan—the INP in this instance—which would allow for more pedestrian-oriented, compact, mixed-use development. The access plans of the Proposed Project and Build Alternatives providing multi-modal access to regional rail emphasize public space and infrastructure improvements that are designed to encourage private-sector developers, who increasingly specialize in transit-oriented projects around BART and other rail stations. The Isabel Station would become a catalyst supporting local development plans promoted by the City of Livermore.

The Proposed Project and Build Alternatives would help to achieve goals set forth by the California Sustainable Communities and Climate Protection Act of 2008 (Senate Bill 375). This law requires many of California's metropolitan areas, including the Bay Area, to create Sustainable Communities Strategies that promote smart growth principles such as compact, mixed-use commercial and residential development and transit-oriented development to reduce greenhouse gas emissions, as further described in Section 3.C, Land Use and Agricultural Resources. Proximity to the Isabel Station could attract businesses, entertainment, commercial/retail, and other employment-generating land uses, and provide opportunities to achieve the local housing needs. While development may occur without the Proposed Project and Build Alternatives, it would most likely be automobile-oriented due to the lack of a connection to a large-scale transit system. Therefore, it would not be considered smart growth and would not help achieve the region's consistency with Plan Bay Area—the region's Sustainable Communities Strategy. The environmental benefits of smart growth, to which the Proposed Project and Build Alternatives contribute, will be assessed and facilitated through these separate planning efforts.

F. ENVIRONMENTALLY SUPERIOR ALTERNATIVE

The CEQA Guidelines (Section 15126.6(a) and 15126.6(e)(2)) require that an EIR's analysis of alternatives identify the environmentally superior alternative among all of those considered. In addition, if the No Project Alternative (or No Build Alternative) is identified as the environmentally superior alternative, the EIR must also identify the environmentally superior alternative among the other alternatives (CEQA Guidelines Section 15126.6(e)(2)). Under CEQA, the goal of identifying the environmentally superior alternative is to assist decision-makers in considering project approval. CEQA does not require an agency to select the environmentally superior alternative (CEQA Guidelines Section 15042-15043).

In general, the environmentally superior alternative is defined as the alternative with the least adverse impacts. Based on the evaluation presented in Chapter 3, Environmental Analysis, the No Project Alternative would be the environmentally superior 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 or operation of the Proposed Project or any of the Build Alternatives. Therefore, the No Project Alternative would avoid impacts associated with land acquisition, and changes to the viewshed as seen from I-580 and locally designated scenic routes.

Furthermore, the No Project Alternative would also avoid the following transportation-related impacts of the Proposed Project. The Proposed Project would cause traffic to be redistributed, as some of the existing BART passengers currently driving to the

Dublin/Pleasanton Station would instead drive to and park at the proposed Isabel Station. Parking facilities at the Dublin/Pleasanton Station have unmet demand for parking; with fewer drivers originating from the east, the freed station parking capacity would attract drivers from the north and south of the Dublin/Pleasanton Station. In addition, new auto trips would be generated east of the Isabel Station by people driving to the Isabel Station from San Joaquin County and from within Livermore. As a result, traffic volumes would decrease between the Dublin/Pleasanton Station and the Isabel Station within I-580 segments and parallel local roadways, while increasing within I-580 segments and local roadways east of the proposed Isabel Station, as well on local roadways north and south of the Dublin/Pleasanton Station (Dougherty Road and Hopyard Road).

However, the No Project Alternative would forego the benefits of the Proposed Project, DMU Alternative, Express Bus/BRT Alternative, and to a lesser extent, the Enhanced Bus Alternative. The No Project Alternative would not support SB 375's mandate to reduce GHG emissions through increasing density, reducing passenger vehicle miles traveled (VMT), or promoting transit-oriented development. Overall, the No Project Alternative would have six significant impacts, as shown in Table 4-1, and no beneficial impacts.

Pursuant to CEQA, this EIR also identifies an environmentally superior alternative from among the Build Alternatives. The Enhanced Bus Alternative is considered the environmentally superior alternative as it would avoid the majority of the adverse impacts of the Proposed Project. Overall, the Enhanced Bus Alternative would have four significant and unavoidable impacts and seven significant impacts that would be reduced to less than significant with mitigation, as shown in Table 4-1, as well as six beneficial impacts, as shown in Table 4-2.[15] The Enhanced Bus Alternative would have a much smaller area of ground disturbance during construction than the Proposed Project or other Build Alternatives, resulting in fewer impacts to archaeological resources, human remains, and paleontological resources. In addition, the storage and maintenance facility in the Cayetano Creek Area would not be constructed under this alternative, thereby avoiding impacts related to agricultural resources and biological resources. Similarly, this alternative would avoid impacts in the Isabel South Area related to visual quality and agricultural conversion, as no station or parking facility would be constructed there. In addition, the Enhanced Bus Alternative would also avoid the some construction-related air quality impacts as it would have a much shorter duration and substantially less intensity of activity (approximately 2 months instead of 5 years).

[15] Table 4-2 does not include the benefits of increased systemwide BART ridership and reduction in total vehicle miles traveled described in Section 3.B, Transportation, as these benefits are not associated with a particular impact statement. See Chapter 5, Project Merits, for additional discussion of these benefits, which would occur under the Proposed Project and each Build Alternative to varying degrees.

However, similar to the No Project Alternative, the Enhanced Bus Alternative would forego some of the benefits of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative—related to reduced GHG emissions and energy use. The Enhanced Bus Alternative would only result in GHG emissions and energy consumption reductions under cumulative conditions, and these would be significantly smaller than the equivalent reductions under the Proposed Project and other Build Alternatives. The Enhanced Bus Alternative would not support SB 375's mandate to reduce GHG emissions by increasing density, reducing passenger VMT, or promoting transit-oriented development.

After the Enhanced Bus Alternative, the Express Bus/BRT Alternative would have the second fewest adverse environmental impacts. The Express Bus/BRT Alternative would have 7 significant and unavoidable impacts and 28 significant impacts that would be reduced to less than significant with mitigation, as shown in Table 4-1, as well as 10 beneficial impacts, as shown in Table 4-2. While this alternative would have an approximately 5-year-long construction period—similar to the Proposed Project—there would be substantially less construction activity; in addition, construction would occur within a smaller footprint along the I-580 corridor (approximately 2.2 miles, compared with 5.6 miles for the Proposed Project and 7.1 miles for the DMU Alternative, respectively). No construction would occur at the Isabel South Area, the location of the proposed Isabel Station under the Proposed Project and DMU Alternative, or within the Cayetano Creek Area, the location of the proposed storage and maintenance facility under the Proposed Project and DMU Alternative. Overall, there would be more ground disturbance and ROW impacts under the Express Bus/BRT Alternative than under the Enhanced Bus Alternative, but significantly fewer than under the Proposed Project and DMU Alternative. Therefore, the Express Bus/BRT Alternative would avoid the following impacts of the Proposed Project and DMU Alternative: some of the impacts associated with increased traffic delays at local intersections and on I-580, all impacts associated with conversion of agricultural land, some visual and biological resources impacts, most noise impacts, and some impacts pertaining to air quality.

While the beneficial impacts of the Express Bus/BRT Alternative related to reduction of GHG emissions and energy consumption would be less than that those the Proposed Project, they would be comparable to the DMU Alternative and somewhat smaller than for the EMU Option. However, the Express Bus/BRT Alternative would result in lower additional BART ridership and a smaller reduction in VMT than the Proposed Project or the DMU Alternative. See Table 5-1 in Chapter 5, Project Merits, for further details.

The Proposed Project and DMU Alternative would have the highest number of significant adverse impacts. The Proposed Project would have 20 significant and unavoidable impacts and 33 significant impacts that would be reduced to less than significant with mitigation, as shown in Table 4-1, as well as 13 beneficial impacts, as shown in Table 4-2. The DMU Alternative would have 21 significant and unavoidable impacts, 33 significant impacts that would be reduced to less than significant with mitigation, and 13 beneficial impacts. The EMU Option would have 18 significant and unavoidable impacts, 34 significant impacts that would be reduced to less than significant with mitigation, and 13 beneficial impacts.

Overall, the number of significant impacts for the Proposed Project and DMU Alternative would be similar because the physical footprint as well as the duration and volume of construction would be similar. However, the storage and maintenance facility under the Proposed Project is larger than under the DMU Alternative; therefore, the agricultural, biological, and visual impacts of the storage and maintenance facility under the Proposed Project would be somewhat greater. The beneficial effects of the Proposed Project would be greater than for the DMU Alternative; these include much greater reductions in VMT, GHG emissions, and regional energy consumption.

For the reasons described above, among the Build Alternatives, the Enhanced Bus Alternative is considered to be the environmentally superior alternative for the purpose of CEQA. However, the Proposed Project has the greatest environmental benefits, followed by the EMU Option, the DMU Alternative, the Express Bus/BRT Alternative, and the Enhanced Bus Alternative.

TABLE 4-1 SUMMARY OF SIGNIFICANT IMPACTS

Impact Statement	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
3.B TRANSPORTATION						
Impact TRAN-1: Result in a significant delay, safety hazard, or diminished access during construction		LSM	LSM	LSM	LSM	
Impact TRAN-3: General-purpose lane freeway segments operating at unacceptable LOS, under 2025 Project Conditions		SU	SU	SU	SU	
Impact TRAN-4: General-purpose lane freeway segments operating at unacceptable LOS, under 2040 Project Conditions		SU	SU	SU		
Impact TRAN-5: HOV/express lane freeway segments operating at unacceptable LOS, under 2025 Project Conditions			SU	SU		
Impact TRAN-7: Intersections operating at unacceptable LOS, under 2025 Project Conditions		SU	SU	SU	LSM	

TABLE 4-1 SUMMARY OF SIGNIFICANT IMPACTS

Impact Statement	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
Impact TRAN-8: Intersections operating at unacceptable LOS, under 2040 Project Conditions		SU	SU	SU	SU	
Impact TRAN-16(CU): General-purpose lane freeway segments operating at unacceptable LOS, under 2040 Cumulative Conditions		SU	SU	SU		
Impact TRAN-19(CU): Intersections operating at unacceptable LOS, under 2025 Cumulative Conditions		SU	SU	SU	LSM	LSM
Impact TRAN-20(CU): Intersections operating at unacceptable LOS, under 2040 Cumulative Conditions		SU	SU	SU	SU	SU
3.C LAND USE AND AGRICULTURAL RESOURCES						
Impact AG-1: Directly convert Farmland		SU	SU	SU		
Impact AG-3: Conflict with zoning for agricultural use		SU	SU	SU		
Impact AG-5(CU): Convert or result in conversion of Farmland		SU	SU	SU		
3.D POPULATION AND HOUSING						
Impact PH-2: Displace substantial numbers of existing housing or people necessitating the construction of replacement housing elsewhere		LSM	LSM	LSM		
Impact PH-3: Displace substantial numbers of existing businesses during construction		LSM	LSM	LSM	LSM	
3.E VISUAL QUALITY						
Impact VQ-1: Substantially degrade the existing visual quality or create a new source of substantial light or glare during construction		LSM	LSM	LSM	LSM	
Impact VQ-3: Substantially degrade the existing visual quality		SU	SU	SU		
Impact VQ-4: Have a substantial adverse effect on a scenic vista		SU	SU	SU		
Impact VQ-5: Substantially damage scenic resources within State scenic highway		SU	SU	SU	SU	
Impact VQ-6: Create a new source of substantial light or glare		SU	SU	SU	LSM	
Impact VQ-7(CU): Have a substantial visual impact under Cumulative Conditions		SU	SU	SU	SU	

TABLE 4-1 SUMMARY OF SIGNIFICANT IMPACTS

Impact Statement	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
3.F CULTURAL RESOURCES						
Impact CUL-2: Cause a substantial adverse change in the significance of an archaeological resource		LSM	LSM	LSM	LSM	LSM
Impact CUL-3: Disturb any human remains		LSM	LSM	LSM	LSM	LSM
Impact CUL-4(CU): Cause a substantial adverse change in the significance of a historical resource, archaeological resources, or disturb human remains under Cumulative Conditions		SU	SU	SU	SU	SU
3.G GEOLOGY, SOILS, SEISMICITY, MINERAL, AND PALEONTOLOGICAL RESOURCES						
Impact PALEO-1: Loss of paleontological resources		LSM	LSM	LSM	LSM	
Impact GEO-5: Fault rupture		LSM				
3.H HYDROLOGY AND WATER QUALITY						
Impact HYD-5: Substantially alter drainage patterns – erosion, sedimentation, flooding		LSM	LSM	LSM	LSM	
Impact HYD-9: Impede or redirect flood flows within a 100-year flood hazard area		LSM	LSM	LSM	LSM	
3.I BIOLOGICAL RESOURCES						
Impact BIO-1: Adversely affect special-status plants, either directly or through habitat modifications		LSM	LSM	LSM	LSM	
Impact BIO-2: Adversely affect vernal pool fairy shrimp and longhorn fairy shrimp during construction		LSM	LSM	LSM		
Impact BIO-3: Adversely affect California tiger salamander and California red-legged frog		LSM	LSM	LSM	LSM	
Impact BIO-4: Adversely affect western spadefoot		LSM	LSM	LSM		
Impact BIO-5: Adversely affect western pond turtle		LSM	LSM	LSM	LSM	
Impact BIO-6: Adversely affect western burrowing owl		LSM	LSM	LSM	LSM	
Impact BIO-7: Adversely affect nesting raptors and other nesting birds		LSM	LSM	LSM	LSM	LSM
Impact BIO-8: Adversely affect special-status bats		LSM	LSM	LSM	LSM	

TABLE 4-1 SUMMARY OF SIGNIFICANT IMPACTS

Impact Statement	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
Impact BIO-9: Adversely affect American badger		LSM	LSM	LSM		
Impact BIO-10: Adversely affect San Joaquin kit fox		LSM	LSM	LSM	LSM	
Impact BIO-11: Have a substantial adverse effect on State or federally protected wetlands or waters		LSM	LSM	LSM	LSM	
Impact BIO-12: Have a substantial adverse effect on riparian habitat or sensitive natural communities		LSM	LSM	LSM	LSM	
Impact BIO-15: Result in loss of protected trees identified in local policies or ordinances		LSM	LSM	LSM	LSM	
Impact BIO-16(CU): Adversely affect, species identified as a candidate, sensitive, or special-status under cumulative conditions		SU	SU	SU		
3.J NOISE AND VIBRATION						
Impact NOI-1: Expose persons to or generate noise or vibration levels in excess of standards during construction		LSM	LSM	LSM	LSM	
Impact NOI-5: Result in a substantial permanent increase in ambient noise levels from roadway realignment and traffic distribution in the project vicinity under 2025 Project Conditions		LSM	LSM	LSM		
Impact NOI-6: Result in a substantial permanent increase in ambient noise levels from roadway realignment and traffic distribution in the project vicinity under 2040 Project Conditions		LSM	LSM	LSM		
Impact NOI-7: Expose persons to or generate excessive groundborne vibration or groundborne noise levels under 2025 and 2040 Project Conditions			LSM			
3.K AIR QUALITY						
Impact AQ-1: Result in potentially significant, localized dust-related air quality impacts during construction		LSM	LSM	LSM	LSM	LSM
Impact AQ-2: Generate emissions of NOx, PM, and ROGs exceeding BAAQMD significance thresholds during construction		LSM	LSM	LSM		
Impact AQ-3: Generate TAC and $PM_{2.5}$ emissions that result in health risks above		LSM	LSM	LSM	LSM	

TABLE 4-1 SUMMARY OF SIGNIFICANT IMPACTS

Impact Statement	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
the BAAQMD significance thresholds during construction						
Impact AQ-7(CU): Generate TAC and $PM_{2.5}$ emissions that result in health risks above the BAAQMD significance thresholds during construction under Cumulative Conditions		SU	SU	SU		
Impact AQ-12: Result in increased emissions of TACs and $PM_{2.5}$, resulting in increased health risk above BAAQMD significance thresholds under 2040 Project Conditions	S					
Impact AQ-18(CU): Result in increased emissions of TACs and $PM_{2.5}$, resulting in increased health risk above BAAQMD significance thresholds under 2025 Cumulative Conditions		SU	SU	SU	SU	
Impact AQ-19(CU): Result in increased emissions of TACs and $PM_{2.5}$, resulting in increased health risk above BAAQMD significance thresholds under 2040 Cumulative Conditions	S	SU	SU	SU		
3.L GREENHOUSE GAS EMISSIONS						
Impact GHG-3: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions, under 2025 Project Conditions						LSM
Impact GHG-4: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions, under 2040 Project Conditions	S					
Impact GHG-6(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions under 2040 Cumulative Conditions	S					
3.M ENERGY						
Impact EN-3: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Project Conditions						SU

TABLE 4-1 SUMMARY OF SIGNIFICANT IMPACTS

Impact Statement	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
Impact EN-4: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Project Conditions	S					SU
Impact EN-6(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Cumulative Conditions	S					
3.N PUBLIC HEALTH AND SAFETY						
Impact PHS-1: Create a potential public or environmental health hazard; an undue potential risk for health-related accidents; or result in a safety hazard for people residing or working in the project area during construction		LSM	LSM	LSM	LSM	LSM
Impact PHS-2: Physically interfere with an adopted emergency response or evacuation plan during construction		LSM	LSM	LSM	LSM	
3.O COMMUNITY RESOURCES						
Impact CS-1: Need for new or physically altered governmental facilities to maintain acceptable service ratios, response times, or other performance objectives for police, fire, and emergency response during construction		LSM	LSM	LSM	LSM	
3.P UTILITIES						
Impact UTIL-1: Substantially disrupt utility services, including power, natural gas, communications, drinking water supplies, wastewater transport, or stormwater transport during construction activities		LSM	LSM	LSM	LSM	

Notes: LOS = level of service; HOV = high-occupancy vehicle; NO_x = nitrogen oxides; PM = particulate matter; ROG = reactive organic gas; BAAQMD = Bay Area Air Quality Management District; TAC = toxic air contaminant; $PM_{2.5}$ = fine particulate matter; NI=No impact; LSM=Less-than-Significant impact with mitigation; S=Significant impact of No Project Alternative (mitigation is inapplicable); SU=Significant and unavoidable, even with mitigation or no feasible mitigation available.

TABLE 4-2 SUMMARY OF BENEFICIAL IMPACTS

Impact Statement	No Project Alternative	Conventional BART Project	DMU Alternative/ EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
3.B TRANSPORTATION [a]					
Impact TRAN-10: Worsen bicycle level of traffic stress, circulation and access, or safety hazards, under 2025 or 2040 Project Conditions		B	B		
Impact TRAN-11: Worsen pedestrian crossing distance or delay, circulation and access, or safety hazards, under 2025 or 2040 Project Conditions		B	B		
Impact TRAN-22(CU): Worsen bicycle level of traffic stress, circulation and access, or safety hazards, under 2025 or 2040 Cumulative Conditions		B	B		
3.K AIR QUALITY					
Impact AQ-16: Conflict or obstruct implementation of existing air quality plans in 2025 and 2040		B	B	B	B
Impact AQ-23(CU): Conflict or obstruct implementation of existing air quality plans under 2025 and 2040 Cumulative Conditions		B	B	B	B
3.L GREENHOUSE GAS EMISSIONS					
Impact GHG-3: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions, under 2025 Project Conditions		B	B	B	
Impact GHG-4: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions, under 2040 Project Conditions		B	B	B	
Impact GHG-5(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions, under 2025 Cumulative Conditions		B	B	B	B
Impact GHG-6(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions under 2040 Cumulative Conditions		B	B	B	B
3.M ENERGY					
Impact EN-3: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Project Conditions		B	B	B	

TABLE 4-2 SUMMARY OF BENEFICIAL IMPACTS

Impact Statement	No Project Alternative	Conventional BART Project	DMU Alternative/ EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
Impact EN-4: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Project Conditions		B	B	B	
Impact EN-5(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Cumulative Conditions		B	B	B	B
Impact EN-6(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Cumulative Conditions		B	B	B	B

Notes: BAAQMD = Bay Area Air Quality Management District; TAC = toxic air contaminant; $PM_{2.5}$ = fine particulate matter; B = Beneficial impact.
[a] Table does not include the benefits of increased systemwide BART ridership and reduction in total vehicle miles traveled described in Section 3.B, Transportation, as these benefits are not associated with a particular impact statement. See Chapter 5, Project Merits, for additional discussion of these benefits, which would occur under the Proposed Project and each Build Alternative to varying degrees.

CHAPTER 5
PROJECT MERITS

A. INTRODUCTION

EIRs are intended to provide information to the public and the decisionmakers about the project, its physical environmental effects, and mitigation measures or alternatives that can avoid or reduce these effects. More specifically, an EIR prepared pursuant to CEQA must address the significant adverse impacts on the environment (Public Resources Code Section 21068). Information on whether a project is desirable is usually regarded as a discussion of the project's merits. Such information is relevant to the process of project approval and may be included in a statement of overriding considerations, which balances the benefits of a proposed project against its unavoidable environmental risks. However, information on project merits is not required to be included in an EIR under CEQA.

Although not required in the EIR by CEQA, this chapter is intended to provide the public and decisionmakers, including the BART Board of Directors, with information regarding the benefits or merits of the BART to Livermore Extension Project to assist with its decision on whether to adopt the Proposed Project or one of the Build Alternatives, or not to adopt any project (the No Project Alternative). The following four topics are addressed in this chapter:

- The beneficial impacts of the Proposed Project and Build Alternatives, which are presented in detail in Chapter 3, Environmental Analysis
- The possibility of future service expansion eastward under the Proposed Project and each Build Alternative
- The Proposed Project and Build Alternatives in relation to BART's System Expansion Policy (SEP) and Metropolitan Transportation Commission's (MTC) Resolution #3434 Transit-Oriented Development (TOD) Policy
- How the Proposed Project and Build Alternatives satisfy Plan Bay Area 2013 (Plan Bay Area) performance targets

A discussion of how the Proposed Project and Alternatives satisfy project objectives will be added to this chapter in the Final EIR, after BART has the opportunity to review and consider public comments and incorporate any revisions into the Final EIR.

B. PROJECT BENEFITS

The beneficial effects of the BART to Livermore Extension Project are not environmental impacts under CEQA, and an EIR is not required to evaluate these relative benefits. However, this EIR presents the beneficial effects of the Proposed Project and Build Alternatives so the public and decisionmakers can understand the improvements that could be achieved with project implementation.

The Proposed Project and Build Alternatives would have beneficial effects as identified in Chapter 3, Environmental Analysis, and summarized below. The quantifiable benefits are shown in Table 5-1 (see also Table 4-2 in Chapter 4). Although benefits would also occur in 2025, this discussion focuses on benefits in 2040, when the BART to Livermore Extension Project would be in full operation and benefits would be greatest. This discussion includes both project-level beneficial effects from implementation of the Proposed Project or an alternative and cumulative beneficial effects from implementation of the Proposed Project or an alternative in combination with the effects of other projects.

- **Transportation**. As described in Section 3.B, Transportation, benefits would occur with regard to increased systemwide BART ridership and reduction in total vehicle miles traveled (VMT), as well as pedestrian and bicycle improvements.[1]
  - In 2040, the Proposed Project and Build Alternatives would achieve both an increase in BART systemwide ridership and a reduction in total VMT, as travelers switch from driving to transit, as follows:
    - The Proposed Project would result in the greatest increase in BART systemwide weekday ridership, by 11,900 riders, as well as the greatest reduction of weekday VMT, by 244,000.
    - The DMU Alternative or EMU Option would increase weekday ridership by 7,000 riders and reduce weekday VMT by 140,600.
    - The Express Bus/BRT Alternative would increase weekday ridership by 3,500 riders and reduce weekday VMT by 92,600.
    - The Enhanced Bus Alternative would result in the smallest increase in weekday ridership (400 riders) and the smallest reduction in weekday VMT (6,500).

    When considered together with other projects in the cumulative analysis, the increases in systemwide weekday ridership and reductions in weekday VMT would be greater for each of the Proposed Project and Build Alternatives.

[1] Total VMT is the combination of passenger VMT reductions and bus VMT increases (see Table 3.B-30 in Section 3.B, Transportation).

TABLE 5-1 SUMMARY OF QUANTITATIVE BENEFICIAL EFFECTS UNDER 2040 PROJECT AND CUMULATIVE CONDITIONS

Metric	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
Transportation					
Project – BART System Ridership (average weekday)	+11,900	+7,000	+7,000	+3,500	+400
Cumulative – BART System Ridership (average weekday)	+13,400	+8,300	+8,300	+4,800	+1,800
Project – Vehicle Miles Traveled (average weekday)	-244,000	-140,600	-140,600	-92,600	-6,500
Cumulative – Vehicle Miles Traveled (average weekday)	-272,700	-164,500	-164,500	-112,900	-26,800
Greenhouse Gas Emissions					
Project – Annual GHG Emissions (metric tons of CO_2e/year)	-11,200	-3,500	-6,000	-3,700	--
Cumulative – Annual GHG Emissions (metric tons of CO_2e/year)	-12,800	-4,800	-7,300	-4,900	-400
Energy					
Project – Regional Energy Consumption (millions British Thermal Units/year)	-130,800	-35,000	-66,500	-56,800	--
Cumulative – Regional Energy Consumption (millions British Thermal Units/year)	-155,900	-55,900	-87,500	-74,600	-9,600

Note: -- = No benefit; the Enhanced Bus Alternative would increase GHG emissions by 600 metric tons of CO_2e/year and energy use by 8,200 million British Thermal Units/year.
All numbers have been rounded to the nearest hundred.
Data presented represent the difference between 2040 No Project Conditions and 2040 Project Conditions (or 2040 Cumulative Conditions). Positive values represent an increase and negative values represent a decrease.

- Under **Impacts TRAN-10** and **TRAN-11**, the Proposed Project and DMU Alternative or EMU Option would have beneficial effects pertaining to bicycle and pedestrian access, circulation, and safety. Specifically, the Proposed Project and DMU Alternative (or EMU Option) would incorporate pedestrian and bicycle access improvements in the vicinity of the proposed Isabel Station, including: (1) a new sidewalk along the north side of East Airway Boulevard; and (2) a new I-580 pedestrian and bicycle overcrossing of I-580, which would connect to the Isabel Station from both the north and south sides of I-580, eliminating the need for pedestrians to cross the I-580 ramps. The Express Bus/BRT Alternative and Enhanced Bus Alternative would not have any beneficial effects for pedestrians and bicyclists.

  Similarly, under Cumulative Conditions, as described under **Impact TRAN-22(CU)**, the Proposed Project and DMU Alternative or EMU Option would also implement the above pedestrian and bicycle access improvements, in addition to the INP improvements, which include bicycle-supportive street design and the proposed Las Positas Trail.

- **Air Quality.** As described in Section 3.K, Air Quality, under **Impacts AQ-16** and **AQ-23(CU)**, the Proposed Project and Build Alternatives would be consistent with the 2017 Clean Air Plan—the most recently adopted air quality plan for the Bay Area—and support implementation of the plan. The Proposed Project and DMU Alternative or EMU Option would add a rail extension from the Dublin/Pleasanton Station to the Isabel Station. In addition, the Proposed Project and all Build Alternatives would add new Express and Rapid bus routes as well as bus-related infrastructure improvements.
- **Greenhouse Gas Emissions.** As described in Section 3.L, Greenhouse Gas Emissions, under **Impact GHG-4**, in 2040, the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would result in a reduction in greenhouse gas (GHG) emissions associated with reductions in VMT, as follows:
  - The Proposed Project would result in the greatest reduction in GHG emissions, at 11,200 metric tons per year.
  - The EMU Option would reduce GHG emissions by 6,000 metric tons per year.
  - The DMU Alternative would reduce GHG emissions by 3,500 metric tons per year.
  - The Express Bus/BRT Alternative would reduce GHG emissions by 3,700 metric tons per year.
  - However, the Enhanced Bus Alternative would result in an increase of 600 metric tons per year, as emission reductions associated with the small amount of additional riders that have been diverted from driving would not be enough to outweigh the emissions from the buses themselves. This would not represent a benefit.

When considered together with other projects in the cumulative analysis (**Impact GHG-6[CU])**, the Enhanced Bus Alternative would result in a larger VMT reduction, which would be sufficient to achieve a small GHG emissions reduction of 400 metric tons per year. Reductions in GHG emissions also would be greater for the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative under Cumulative Conditions.

- **Energy Consumption.** As described in Section 3.M, Energy, under **Impact EN-4**, in 2040, the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would result in a reduction in energy consumption associated with reductions in VMT, as follows:
  - The Proposed Project would result in the greatest reduction in energy consumption, at 130,800 million British thermal units (MMBTU) per year.
  - The EMU Option would reduce energy consumption by 66,500 MMBTU per year.
  - The Express Bus/BRT Alternative would reduce energy consumption by 56,800 MMBTU per year.
  - The DMU Alternative would reduce energy consumption by 35,000 MMBTU per year.
  - The Enhanced Bus Alternative would result in an increase in energy consumption by 8,200 MMBTU per year, as the energy consumption reduction associated with the small amount of additional riders that have been diverted from driving would not be enough to outweigh the energy consumption of the buses themselves. This would not represent a benefit.

  When considered together with other projects in the cumulative analysis (**Impact EN-6[CU]**), the Enhanced Bus would result in a larger VMT reduction, which would be sufficient to achieve a small reduction in energy consumption of 9,600 MMBTU per year. Reductions in energy consumption would also be greater for the Proposed Project, DMU Alternative, EMU Option and Express Bus/BRT Alternative under Cumulative Conditions.

C. FUTURE SERVICE EXPANSION

Comments received during the scoping process for this EIR, as well as comments on the BART to Livermore Program EIR, raised concerns regarding the prospect of further service expansion east of the Isabel Station. The adoption of the Proposed Project or one of the alternatives does not preclude future service expansions utilizing one or more of the technologies analyzed in this EIR, including conventional BART technology, DMU or EMU technology, or bus technology. Such an extension, as contemplated in the Program EIR, would be the subject of a separate project-level evaluation in a future environmental document. The analysis below describes which technologies could be used for a future extension under the Proposed Project and each Alternative.

1. Conventional BART Project

If the Proposed Project is adopted by the BART Board of Directors, a future extension of conventional BART could be implemented farther east of the Isabel Station, either within the Interstate Highway (I-) 580 median toward Vasco Road and Greenville Road, or southeast toward Downtown Livermore. Additionally, DMU or EMU technology could be implemented from the Isabel Station, either east within the I-580 median or southeast toward Downtown Livermore. The adoption of the Proposed Project would not preclude the use of any technologies evaluated in this EIR for a future extension.

2. DMU Alternative/EMU Option

If the DMU Alternative or EMU Option is adopted, a future extension of DMU or EMU technology could be implemented farther east of the Isabel Station, either east within the I-580 median or southeast toward Downtown Livermore. However, the adoption of the DMU Alternative or EMU Option would preclude the extension of the Proposed Project from the Isabel Station, either east within the I-580 median or southeast toward Downtown Livermore. The transition from conventional BART service at the Dublin/Pleasanton Station to DMU or EMU service for one stop to the Isabel Station and then back to conventional BART service east of Isabel Station would be highly ineffective.

3. Express Bus/BRT Alternative

If the Express Bus/BRT Alternative is adopted, a future extension of conventional BART could be implemented east from the Dublin/Pleasanton Station. No modification to the Express Bus/BRT infrastructure would be necessary under this scenario and both transit services could co-exist. However, the adoption of the Express Bus/BRT Alternative would preclude the extension of DMU or EMU technology east from the Dublin/Pleasanton Station because it would require reconstruction of the Express Bus/BRT infrastructure at the Dublin/Pleasanton Station to accommodate DMU or EMU technology, which would be cost prohibitive.

4. Enhanced Bus Alternative

If the Enhanced Bus Alternative is adopted, a future extension of conventional BART could be implemented east from the Dublin/Pleasanton Station. Similarly, DMU or EMU technology could be implemented from the Dublin/Pleasanton Station. The adoption of the Enhanced Bus Alternative would not preclude the use of any technologies evaluated in this EIR for a future extension.

D. BART AND METROPOLITAN TRANSPORTATION COMMISSION POLICIES

1. Introduction

Both BART and MTC have adopted policies to encourage TOD in locations that are proposed to be served by a transit system expansion project. These policies seek to ensure that new station areas will generate a sufficient amount of new passengers and provide an adequate amount of housing.

As part of its SEP, BART has established ridership ratings to evaluate a proposed extension's performance, and requires local jurisdictions to prepare a Ridership Development Plan (RDP) to increase BART ridership. As part of its Resolution #3434 TOD Policy, MTC has established corridor-level housing thresholds to identify whether or not proposed extension station areas contain adequate existing and planned housing units, as well as a process for identifying measures to increase the housing supply if the thresholds are not met.

2. BART System Expansion Policy

As further described in Chapter 1, Introduction, BART's SEP—adopted in parallel with its first Strategic Plan in 1999—is meant to provide a policy framework for system expansion. The policy encourages BART to seek partnerships with other transit agencies, local communities, and private entities to plan transit service expansion. In 2002, BART adopted the system expansion criteria and process. System expansion criteria consider potential ridership in the context of other factors such as project cost-effectiveness, surrounding land uses, accessibility, connectivity with other transit systems, effects on the existing BART system, and degree of inter-agency partnering and community support.

As a steward of public funding for transportation investments, the BART policy seeks to achieve the following:

- Ensure cost-effective transportation investment decisions
- Protect the taxpayers' investment in BART's physical infrastructure
- Ensure the financial health and sustainability of BART
- Enhance the Bay Area's environment and quality of life

One element of the SEP is an evaluation of forecasted ridership for proposed extension corridors through its corridor-wide ridership ratings system. This evaluation assesses whether new stations under a proposed extension would support increased ridership. Under the SEP, projected average daily trips for an extension (daily entries and exits associated with new stations) are categorized into five ratings from low to high, as follows:

- Low: less than 5,000 average daily entries and exits
- Low-Medium: 5,000 to 9,999 average daily entries and exits
- Medium: 10,000 to 13,999 average daily entries and exits
- Medium-High: 14,000 to 20,000 average daily entries and exits
- High: above 20,000 average daily entries and exits

a. BART System Expansion Policy Ridership Ratings

Per the SEP, only future ridership at the proposed Isabel Station needs to be assessed. See Section 3.B, Transportation for a discussion of projections for systemwide ridership as well as boardings at the Dublin/Pleasanton Station and the West Dublin/Pleasanton Station. The SEP ridership ratings are only applicable to new stations; because the Express Bus/BRT Alternative makes improvements to an existing station (i.e., the Dublin/Pleasanton Station) and does not include a new station, the ratings do not apply. These ratings also do not apply to the Enhanced Bus Alternative, which consists only of minor bus infrastructure improvements and would not expand the BART system.

Based on the 2040 BART ridership projections presented in Section 3.B, Transportation, the Proposed Project would have an average of 16,200 daily entries and exits at the Isabel Station, attaining a Medium-High rating per the SEP, and the DMU Alternative would have an average of 9,600 daily entries and exits at the Isabel Station, attaining a Low-Medium Rating.[2] Therefore, the Proposed Project would perform better respective to the SEP ridership ratings than the DMU Alternative.

b. Ridership Development Plan

One of the primary components of the system expansion criteria and process is the requirement for communities proposed to be served by a BART extension to prepare an RDP. RDPs seek to promote BART ridership by balancing community desires with enhanced access to proposed BART stations and TOD. The RDPs can be implemented as general plan amendments, specific plans, rezonings, access improvements, or other actions selected at the discretion of the local jurisdictions. By promoting additional TOD housing within station areas, growth would be redirected and redistributed into the station areas. In response to this requirement, the City of Livermore is preparing the Isabel Neighborhood Plan (INP), which would provide for increased development densities beyond those currently allowed under the City of Livermore General Plan in the vicinity of the proposed Isabel Station, within the Livermore Isabel Avenue BART Station Priority

[2] See Table 3.B-22 in Section 3.B, Transportation, for daily boardings (entries). The number of entries at the Isabel Station was doubled to determine the BART ridership numbers (entries and exits) consistent with the SEP.

Development Area. See Section 3.A, Introduction to Environmental Analysis, for a more detailed discussion of the INP.

3. Metropolitan Transportation Commission Resolution #3434 – Transit-Oriented Development Policy

As further described in Chapter 1, Introduction, MTC is responsible for financing and coordinating public transportation in the nine-county Bay Area. MTC Resolution #3434 was adopted in 2001 to set forth the Regional Transit Expansion Program of Projects, together with a comprehensive funding strategy of local, regional, State of California (State), and federal funding sources.[3] The resolution was amended in 2005 to include a TOD policy and amended again in 2007. The TOD policy applies only to those projects specified in the policy, which are a subset of the projects funded by Resolution #3434.[4]

While the BART to Livermore Extension Project is included in Resolution #3434, it is not listed as one of the transit extension projects subject to the TOD policy. Therefore, the housing thresholds listed in the TOD policy, further described below, are not applicable to the Proposed Project and Alternatives. However, this chapter includes a discussion of the consistency of the Proposed Project and DMU Alternative with these thresholds to provide information regarding the adequacy of housing supply in the extension corridor. Neither the Express Bus/BRT Alternative nor the Enhanced Bus Alternative would physically extend the transit system, and thus would not be subject to the TOD policy. Therefore, the Express Bus/BRT Alternative and Enhanced Bus Alternative are not further discussed below.

a. Housing Thresholds

Transit extension projects subject to the MTC Resolution #3434 TOD policy must plan for a minimum number of housing units along their respective corridors. These housing thresholds require that, within 0.5 mile of all stations served by a transit extension project, a combination of existing land uses and planned land uses meets or exceeds the corridor housing threshold. The thresholds vary by mode of transit, with more capital-intensive modes requiring higher numbers of housing units.

The corridor-level housing thresholds are as follows: 3,850 housing units for extensions utilizing BART technology; 3,300 housing units for light rail stations; 2,750 housing units

[3] Metropolitan Transportation Commission (MTC), 2001. Resolution No. 3434. December 19. Amended September 24, 2008.

[4] Metropolitan Transportation Commission (MTC), 2005. MTC Resolution 3434 Transit Oriented Development (TOD) Policy for Regional Transit Expansion Projects. July 27. Available at: https://todresources.org/app/uploads/sites/2/2016/06/2005MTCTODPolicy.pdf.

for bus rapid transit stations; and 2,200 housing units for commuter rail. An existing end-of-line station is included as part of the transit corridor for the purposes of calculating the housing thresholds. For example, a light rail extension with one new station would be required to meet a housing threshold of 6,600 housing units (3,300 units for the existing end-of-line station and 3,300 for the new light rail station). In addition, the housing threshold is an average of all the stations in the corridor; therefore, one station could have 2,200 units and the other station could have 4,400 units, as long as the average for both stations was a minimum of 3,300 units.

Furthermore, MTC Resolution #3434 TOD policy states that new below-market housing units receive a 50 percent bonus toward meeting the corridor threshold (i.e. one planned below-market housing unit counts as 1.5 housing units for the purposes of meeting the corridor threshold).

b. BART to Livermore Extension Project's Consistency with Housing Thresholds

Table 5-2 shows existing (2015) housing units and estimates of planned (2040) housing units for the existing Dublin/Pleasanton Station and the proposed Isabel Station, compared to the housing thresholds established by MTC methodology. There are approximately 5,003 existing and planned housing units within 0.5 mile of the Dublin/Pleasanton Station and approximately 4,831 existing and planned housing units within 0.5 mile of the Isabel Station, resulting in an average of approximately 4,917 housing units; this would exceed the respective MTC targets for the Proposed Project, DMU Alternative, and EMU Option. This analysis includes the anticipated housing units associated with the INP.

The methodology for developing the numbers presented in Table 5-2 is as follows: Existing and planned housing units within 0.5 mile of the Dublin/Pleasanton Station and existing housing units within 0.5 mile of the proposed Isabel Station were obtained from a memorandum prepared for MTC regarding existing and potential household capacity around those two stations.[5, 6] Planned housing units within 0.5 mile of the Isabel Station were obtained from an administrative draft version of the INP.[7] The estimates provided include the affordable housing bonus, and are therefore slightly larger than the actual amount of housing units in 2040.

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[5] CD+A, 2015. Memorandum to MTC regarding Project 1507: 580 MTC TOD Assessment.

[6] This memorandum provided two future buildout scenarios: Zoning/General Plans (fewer new housing units) and Long Term Redevelopment (more new housing units). In addition, each scenario had a low and a high estimate. The planned housing units presented here were conservatively taken from the Zoning/General Plans scenario, which projected fewer new housing units, by averaging the low estimate (4,759) and high estimate (5,247), which amounts to 5,003 housing units.

[7] Szydlik, Monica, Senior Associate, Dyett & Bhatia, 2017. Email communication with Urban Planning Partners, Inc. May 2.

TABLE 5-2 COMPARISON OF METROPOLITAN TRANSPORTATION COMMISSION RESOLUTION #3434 – THRESHOLDS WITH EXISTING AND PLANNED HOUSING UNITS IN 2040

	Dublin/ Pleasanton Station		Isabel Station		Average for both		
Project/ Alternative (MTC Project Type)	**Existing (2015)**	**Future (2040)**	**Existing (2015)**	**Future (2040)**	**Stations (2040)**	**MTC Target**	**Target Satisfied**
Conventional BART Project (BART)	924	5,003	565	4,831	**4,917**	3,850	Yes
DMU Alternative (Commuter Rail)	924	5,003	565	4,831	**4,917**	2,200	Yes
EMU Option (Light rail)	924	5,003	565	4,831	**4,917**	3,300	Yes

Note: MTC = Metropolitan Transportation Commission.
The Express Bus/BRT Alternative and Enhanced Bus Alternative are not shown because neither of those alternatives physically extends the transit system.
The DMU Alternative is classified as a Commuter Rail project type based on MTC's classification of the East Contra Costa County BART extension as Commuter Rail. The DMU Alternative is similar to the East Contra Costa County BART extension, as both entail the operation of DMU vehicles in the median of a freeway.
Sources:
Housing units within 0.5 mile of the Dublin/Pleasanton Station (Existing and planned): CD+A, 2015.
Housing units within 0.5 mile of the proposed Isabel Station (Existing): CD+A, 2015.
Housing units within 0.5 mile of the proposed Isabel Station (Proposed): Szydlik, 2017.

E. PLAN BAY AREA

Plan Bay Area is the San Francisco Bay Area's Regional Transportation Plan and Sustainable Communities Strategy, adopted in July 2013. A draft update of Plan Bay Area (Plan Bay Area 2040) was published in March 2017. Revisions to the draft Plan Bay Area 2040 and an accompanying Final EIR were published in July 2017; however, this update has not been adopted as of the preparation of this Draft EIR. See Section 3.C, Land Use and Agricultural Resources for additional information about Plan Bay Area.

This subsection briefly summarizes the consistency of the Proposed Project and Build Alternatives with the Plan Bay Area performance targets, which are shown in Table 5-3. Plan Bay Area identifies performance targets that are adopted by MTC and the Association of Bay Area Governments to outline preferred outcomes of the plan and measure the plan's performance. Performance targets 1 and 2 are required by State law, and the other eight are voluntary. The following discussion focuses on performance targets 1, 3, 6, and 9, which are applicable to the BART to Livermore Extension Project; other targets are not applicable.

TABLE 5-3 PLAN BAY AREA GOALS AND PERFORMANCE TARGETS

Goal/Outcome		Performance Target
State-required Targets		
Climate Protection	1	Reduce per-capita CO_2 emissions from cars and light-duty trucks by 15 percent (Statutory requirement is for 2035, per Senate Bill 375)
Adequate Housing	2	House 100 percent of the region's projected growth (from a 2010 baseline year) by income level (very-low, low, moderate, above-moderate) without displacing current low-income residents (Statutory requirement, per Senate Bill 375)
Voluntary Targets		
Healthy and Safe Communities	3	Reduce premature deaths from exposure to particulate emissions: ▪ Reduce premature deaths from exposure to fine particulates ($PM_{2.5}$) by 10 percent ▪ Reduce coarse particulate emissions (PM_{10}) by 30 percent ▪ Achieve greater reductions in highly impacted areas
Reduce Injuries and Fatalities	4	Reduce by 50 percent the number of injuries and fatalities from all collisions (including bike and pedestrian)
Encourage Active Transport	5	Increase the average daily time walking or biking per person for transportation by 70 percent (for an average of 15 minutes per person per day)
Open Space and Agricultural Land	6	Direct all non-agricultural development within the urban footprint (existing urban development and urban growth boundaries)
Equitable Access	7	Decrease by 10 percentage points (to 56 percent, from 66 percent) the share of low-income and lower-middle income residents' household income consumed by transportation and housing
Economic Vitality	8	Increase gross regional product by 110 percent — an average annual growth rate of approximately 2 percent (in current dollars)
Transportation System Effectiveness	9	▪ Increase non-auto mode share by 10 percentage points (to 26 percent of trips) ▪ Decrease automobile vehicle miles traveled per capita by 10 percent
	10	Maintain the transportation system in a state of good repair: ▪ Increase local road pavement condition index to 75 or better ▪ Decrease distressed lane-miles of state highways to less than 10 percent of total lane-miles ▪ Reduce share of transit assets past their useful life to 0 percent

Notes: CO_2 = carbon dioxide; PM_{10} = particulate matter, less than 10 microns in diameter; $PM_{2.5}$ = particulate matter, less than 2.5 microns in diameter.
Source: ABAG and MTC, 2013.

The Proposed Project, DMU Alternative, and Express Bus/BRT Alternative would be consistent with performance targets 1, 3, and 9, while the Enhanced Bus Alternative would have a negligible effect on these targets. The Proposed Project and DMU Alternative would have a minor inconsistency with performance target 6, while the Express Bus/BRT Alternative and Enhanced Bus Alternative would be consistent with this target. The No Project Alternative would not advance any performance targets, as existing transit conditions would be maintained, and VMT would increase with population growth without the benefit of public transit improvement or expansion.

Consistency with the applicable performance targets is described below.

- **Performance target 1: Reduce carbon dioxide emissions by 35 percent by 2035.** As described above in the Project Benefits subsection, the Proposed Project would provide the greatest reduction in GHGs—including carbon dioxide—contributing toward performance target 1, while the DMU Alternative, EMU Option, and Express Bus/BRT Alternative would also support this target to a lesser extent. The Enhanced Bus Alternative would provide a negligible contribution toward this target only when considered together with other projects under the cumulative scenario.
- **Performance target 3: Reduce premature deaths from exposure to $PM_{2.5}$ by 10 percent and reduce PM_{10} by 30 percent.** The Proposed Project, DMU Alternative (with EMU Option) and Express Bus/BRT Alternative would be consistent with this target by reducing both particulate matter less than 10 microns in diameter ($PM_{2.5}$) and particulate matter less than 2.5 microns in diameter (PM_{10}) annually by 2040. The Proposed Project would achieve the greatest reduction in both pollutants, with the DMU Alternative (with EMU Option) achieving a smaller reduction, and the Express Bus/BRT Alternative achieving a smaller reduction than either the Proposed Project or DMU Alternative. The Enhanced Bus Alternative would achieve a negligible reduction in $PM_{2.5}$ and PM_{10}. See Table 3.K-17 in Section 3.K, Air Quality for further detail.
- **Performance target 6: Direct all non-agricultural development within the urban footprint.** The Proposed Project and DMU Alternative would remove approximately 11.8 acres of Prime Farmland and Unique Farmland from agricultural use; however, these parcels are within the Livermore Urban Growth Boundary and are surrounded by urban and transportation uses. In addition, the storage and maintenance facility, which would be constructed under the Proposed Project and DMU Alternative, would be located on grazing land outside of the Urban Growth Boundary. However, this type of use is conditionally permitted by Alameda County in the Agricultural district as public use similar to a public utility. Therefore, the Proposed Project and DMU Alternative would have a minor inconsistency with this performance target. The Express Bus/BRT Alternative and Enhanced Bus Alternative would not have any components outside of the urban footprint and would be consistent with this performance target.
- **Performance target 9: Increase the non-auto mode share by 10 percent and decrease VMT per capita by 10 percent.** As shown in Table 5-1, the Proposed Project would result in the largest increase in BART average weekday ridership (11,900 daily riders) and the highest average weekday VMT reduction (244,000 miles). The DMU Alternative would increase BART weekday ridership by 7,000 riders and reduce average weekday VMT by 140,600 miles. The Express Bus/BRT Alternative would

increase BART weekday ridership by 3,500 riders and reduce average weekday VMT by 92,600 miles. The Enhanced Bus Alternative would result in the smallest increase in weekday ridership, by 400 additional riders, and smallest reduction in weekday VMT, by 6,500.

CHAPTER 6
LIST OF PREPARERS AND REFERENCES

A. LEAD AGENCY

San Francisco Bay Area Rapid Transit District (BART)

300 Lakeside Drive, 22nd Floor
Oakland, CA 94612

Andrew Tang, Principal Planner, Project Manager
Donald Dean, MCP, Environmental Coordinator
Scott Van Dussen, Project Manager – Engineering and Design
Nathanael Miksis, Energy Division
Sandford Stadtfeld, Operations Planning

B. CONSULTANTS

Urban Planning Partners, Inc., Prime CEQA Consultant

388 17th Street, Suite 230
Oakland, CA 94612

Land Use & Agricultural Resources, Population & Housing, Visual Quality, Safety, Community Services, and Utilities

Lynette Dias, AICP, Principal-in-Charge
Hannah Young, AICP, Principal Planner, Project Manager
Julian Bobilev, Associate Planner
Brandon Northart, Planner
Kelly Beggs, Associate Planner
Brianna Ceglia Bohonok, AICP, Associate Planner
Annelise Dohrer, Planner
Bo Dash, Technical Editing
Brian Vahey, Word Processing
Susan Smith, Word Processing

Arup North America, Ltd.

560 Mission Street, Suite 700
San Francisco, CA 94105

Transportation Planning Lead and Engineering Lead

William Baumgardner, Associate Principal
Chester Fung, Associate, Arup Planning Team Lead
David Hunt, Associate, Arup Engineering Team Lead
Nancy Mathison, Senior Transportation Planner
Geoff Walker, Senior Engineer
Ritu Garg, Transportation Planner
Justin Walker, Transportation Engineer
Jasmine Stitt, Transportation Planner
Jack Mong, Senior Engineer
Stephen Burges, Associate
Colm Tully, Associate
Cindy Do, Engineer
Eric Guerra, Analyst
Kyle McMillen, Senior BIM Designer

ESA (Environmental Science Associates)

1425 N. McDowell Boulevard, Suite 200
Petaluma, CA 94954

Biological Resources, Cultural Resources, Hydrology & Water Quality, Geology, Soils, Seismicity, Mineral & Paleontological Resources, Noise & Vibration, Energy, Greenhouse Gases

Julie Watson, AICP, LEED AP, Project Manager
Maria Hensel, Project Coordinator
Michael Burns, CHG, CEG, PG Geology, Soils and Seismicity Technical Lead
Sarah Dietler, Paleontological Resources Lead
Heidi Koenig, RPA Cultural Resources Technical Lead
Brian Pittman, CWB Biological Resources Technical Lead
Justin Gragg, Hydrology and Water Quality Technical Lead
Tim Rimpo, Energy and Greenhouse Gases and Climate Change Technical Lead
Daniel Sloat, Energy and Greenhouse Gases Analyst
Chris Sanchez, Noise and Vibration Technical Lead

Ramboll Environ

201California Street, Suite 1200
San Francisco, CA 94114

Air Quality, Public Health, Electromagnetic Fields, Greenhouse Gas Emissions and Energy Calculations

Shari Libicki, PhD, Ramboll Environ Team Lead
David Kim, PhD, Senior Manager and Project Manager
Taylor Vencill, MS, PE, Manager
Sharon Harichandran, MSc, Senior Manager
Biljana Cosic, PhD, Senior Manager
Kun Zhao, MS, Manager
Kimberly Dehuff, MS, Senior Associate
Aubrey Jones, CCM, Senior Associate
Sarah Manzano, MS, Senior Associate
Darren Wilton, PhD, Associate
Malini Nambiar, Associate
Erin Finestone, MPH, Associate
Frede Lillelund, Head of Department, Towers and Steel Structures
Flemming Sode, Senior Engineer

Urban Advantage

1404 Elm Street
El Cerrito, CA 94530

Visual Simulation

Steve Price, Illustrator, Photo-Simulations

Cambridge Systematics

555 12th Street, Suite 1600
Oakland, CA 94607

Travel Demand Forecasting

Ron West, Principal
Maria Martchouk, Senior Associate
Xuan Liu, Senior Professional
Moby Khan, Associate

Connetics Transportation Group

570 Colonial Park Drive, Suite 302
Roswell, GA 30075

Rail Operations Planning and Costing

Susan Rosales, President
Chris Adkins, Senior Associate

Danquah Group

4900 Hopyard Road, Suite 100
Pleasanton, CA 94588

Cost Estimating

Seth Danquah, Principal Cost Consultant

C. REFERENCES

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