BART to Livermore Extension

Proposed Project and Build Alternatives Evaluation Report

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Executive Summary

This Evaluation Report supplements the information provided in the Bay Area Rapid Transit (BART) to Livermore Extension Project Environmental Impact Report (EIR). While the purpose of the EIR is to disclose the environmental impacts of the Proposed Project and alternatives and propose mitigation measures to avoid or reduce adverse environmental impacts, the Evaluation Report provides a comparison of the benefits and costs of the Proposed Project and build alternatives.

This report is intended to provide an evaluation of the Proposed Project and build alternatives, primarily using two major evaluation frameworks: consistency with established project goals, and the BART System Expansion Policy (BSEP). Additional evaluations considered significant environmental impacts, an equity assessment, and application of the MTC's Resolution 3434 Transit-Oriented Development Policy.

Proposed Project and Build Alternatives

The Proposed Project and three build alternatives are as follows:

- **Proposed Project –** The Proposed Project is an extension of the BART system using conventional BART technology from the existing system terminus at the Dublin/Pleasanton Station to a new station located near the Isabel Avenue (State Route 84) / I-580 interchange in the city of Livermore.
- **DMU Alternative / EMU Option –** The Diesel Multiple Unit (DMU) Alternative uses a similar alignment as the Proposed Project but differs in vehicle technology. DMUs are self-propelled rail cars that use a diesel engine to generate power and run on a standard-gauge rail track. The Electric Multiple Unit (EMU) Option is generally the same as the DMU Alternative, except that it is electric-powered rather than diesel-powered.
- **Express Bus / Bus Rapid Transit (BRT) Alternative –** Under this alternative, new bus ramps from the I-580 express lanes to new bus transfer platforms would be constructed at the existing Dublin/Pleasanton Station to facilitate direct connections between BART and connecting buses. No rail extension would be included.
- **Enhanced Bus Alternative –** This alternative provides modest, lower-cost bus enhancements on local streets to improve access to the Dublin/Pleasanton Station, but no new bus transfer platforms or other infrastructure in the median of I-580.

Project Goals

The BART to Livermore Extension Project goals are as follows:

- Provide a cost-effective intermodal link of the existing BART system to the inter-regional rail network and to a series of Priority Development Areas (PDAs) identified by the City of Livermore, the MTC, and the Association of Bay Area Governments. These PDAs include the Livermore Isabel Avenue BART Station PDA, the Livermore Downtown PDA and the Livermore East Side PDA.
- Support the regional goals of integrating transit and land use policies to create opportunities for transit-oriented development (TOD) in the Livermore-area PDAs.
- Provide an effective alternative to traffic congestion on I-580.

- Improve air quality and reduce greenhouse gas (GHG) and other emissions associated with automobile use.

Project Goals Evaluation

The BART to Livermore Extension Program EIR, adopted in 2010, established the project's goals for improving transit mobility, increasing BART ridership and supporting TOD. These goals were further developed in the Notice of Preparation for the Project EIR (2012) and refined in the BART to Livermore Extension Project Draft EIR (DEIR). This Evaluation Report analyzes the extent to which the Proposed Project and build alternatives meet these goals.

Table ES-1 provides an overview of the performance of the Proposed Project and build alternatives in light of each of the project goals. The Proposed Project has medium or medium-high ratings for all five goals. The DMU Alternative and EMU Option rate medium or low-medium on all goals. The Express Bus / BRT Alternative rates medium-high under the first goal, to "provide a cost-effective link." However, the Express Bus / BRT Alternative rates as medium or low-medium for all other goals. The Enhanced Bus Alternative rates as medium for one goal, low-medium for one goal, and low for three of the goals.

Table ES-1 – Proposed Project and Alternatives Compared to Project Goals

Project Goals and Objectives	Proposed Project - Conventional BART	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
Provide a cost-effective intermodal link					
Link existing BART, inter-regional rail, Priority Development Areas (Isabel, downtown, East Side)					
Create transit-oriented development (TOD) opportunities					
Provide alternative to I-580 congestion					
Improve air quality, reduce greenhouse gases (GHG)					
 High  Medium-high  Medium  Medium-low  Low					

The BART System Expansion Policy (BSEP) is a BART Board-adopted policy for considering system expansions. This policy includes several criteria that must be considered: the potential for generating new ridership, cost effectiveness, surrounding land uses, accessibility, connectivity with other transit systems, effects on the existing BART system, and the degree of inter-agency partnering and community support. These criteria constitute the second framework used for evaluating the Proposed Project and build alternatives.

As shown in **Table ES-2**, neither the Proposed Project nor any of the build alternatives rate high across a majority of evaluation criteria. The Proposed Project rates high for only one criterion — the Operating Finance Plan. It rates medium or medium-high for most other criteria but rates low in the areas of Existing Land Use, Existing Intermodal Connections, Station Context, and Regional Transportation Gap Closure. The DMU Alternative / EMU Option rates high for Operating Finance Plan as well, and low under the same criteria as the Proposed Project, and rates medium or low-medium in other categories. The Express Bus / BRT Alternative rates high for two criteria, Capital Finance Plan and Operating Finance Plan, and medium-high for one criterion, Cost per New Rider: Base Case. It rates low or low-medium for all other criteria. The Enhanced Bus Alternative rates high for Capital Finance Plan, low for Existing Land Use and Regional Transportation Gap Closure, and medium or low-medium for all other categories.

Table ES-2 – Proposed Project and Alternatives Compared to BART System Expansion Policy Criteria

	Proposed Project	DMU Alternative / EMU Option	Express Bus / BRT Alternative	Enhanced Bus Alternative
Transit-Supportive Land Use and Access				
Existing Land Use: Residential and/or Employment				
Existing Intermodal Connections				
Land Use Plans and Policies				
Ridership Development Plan				
Ridership Threshold			N/A	N/A
Station Context			N/A	N/A
Cost-Effectiveness[1]				
Cost per New Rider: Base Case				
Cost per New Rider: with Transit-Oriented Development			N/A	N/A
Regional Network Connectivity				
Regional Transportation Gap Closure				
System and Financial Capacity				
Core System Improvements				
Capital Finance Plan				
Operating Finance Plan				
Partnerships				
Community and Stakeholder Support	See Section 4.8.	See Section 4.8.	See Section 4.8.	See Section 4.8.
 High Medium-High Medium Low-Medium Low				

[1] Cost/Transportation System User Benefit, a suggested BSEP metric, was not utilized as it is no longer employed by the Federal Transit Administration and was never phased into the BSEP by BART.

Community and stakeholder support was evaluated for the Proposed Project and build alternatives through a community and stakeholder outreach program. This included two public workshops, in Oakland and Livermore, as well as several meetings with stakeholders. In addition, BART received written and verbal comments from community members and stakeholders during the outreach process on this Evaluation Report. Responses to selected comments of general interest are provided in Appendix D. The *Project Alternatives Evaluation Outreach Report*, available as a separate document, summarizes the BART to Livermore Extension outreach program and results.

Providing a rating of low, medium, or high for community and stakeholder support does not fully capture the character of this support, as different community and stakeholder groups have disparate opinions of the Proposed Project and build alternatives. For this reason, no single rating is assigned to the Proposed Project and build alternatives, rather, the stakeholder feedback for each is summarized in Section 4.8 of this report.

Overall Results

The evaluation results of the Proposed Project and build alternatives are as follows:

- The Proposed Project (conventional BART) and the Express Bus / BRT Alternative perform better than the other alternatives. The Proposed Project, which has the highest ridership projections, would result in the greatest number of benefits, such as reductions in regional vehicle miles traveled and GHG emissions.
- The DMU Alternative / EMU Option has higher benefits, such as improved transit travel time, increased transit ridership, and reduced regional vehicle miles traveled, than the two bus alternatives, but less than the Proposed Project. Its costs are comparable to the Proposed Project.
- The Express Bus / BRT Alternative performs better than the Proposed Project for the cost-effectiveness and financial capacity measures, but generally worse for the other measures.
- The Enhanced Bus Alternative performs equal to or worse than the Express Bus / BRT Alternative under all frameworks.

Neither the Proposed Project nor any of the alternatives achieves a high rating for any of the goals. The BSEP ratings, meant to guide decisions about expansions, are highly variable for the Proposed Project and all the build alternatives.

1 Introduction

This report evaluates the proposed Bay Area Rapid Transit (BART) to Livermore Extension Project (Proposed Project) and three build alternatives to the Proposed Project. The Proposed Project, also referred to as the Conventional BART Project, was developed in partnership with the City of Livermore and consists of a proposed 5.5-mile BART extension along I-580 to a new station near the Isabel Avenue/I-580 interchange.

The purpose of this evaluation is to compare the Proposed Project and build alternatives and provide information to policymakers, stakeholders, and the general public.

1.1 Background and Project History

1.1.1 BART to Livermore Program EIR

In November 2009, BART released the Draft Program Environmental Impact Report (PEIR) for the BART to Livermore Extension Program. The Draft PEIR considered nine alignment alternatives for extending the existing BART service eastward from the Dublin/Pleasanton BART Station (Dublin/Pleasanton Station) to Livermore. The PEIR assumed use of conventional BART technology; its analysis focused on alignment alternatives and was not intended to evaluate alternative technologies. The evaluation of alternative technologies was deferred to a project-level EIR.

On July 1, 2010, the BART Board of Directors certified the Final PEIR and selected Alternative 2B (Portola-Vasco) as the preferred alternative. This alternative would originate at the existing Dublin/Pleasanton Station in the median of I-580, diverge from the I-580 corridor (just west of the existing Portola interchange), transition to a subway under Portola and Junction Avenues to an underground station adjacent to the existing Altamont Corridor Express (ACE) station in downtown Livermore, and extend at-grade parallel to the existing Union Pacific Railroad tracks to a terminus station and maintenance yard at Vasco Road.

Initially, the City of Livermore recommended the Alternative 2B (Portola-Vasco) alignment; however, following further public discussion, the City determined that it preferred an alignment along I-580 from Dublin/Pleasanton Station to Greenville Road, with stations at Isabel Avenue and Greenville Road. This alignment was then incorporated into the City of Livermore's General Plan.

As part of the continuing BART to Livermore planning process, BART released a project-level Draft EIR (DEIR) in July 2017 for a BART extension to a new station at Isabel Avenue. The Proposed Project in the project-level DEIR corresponds to the alignment of Alternative 4 (Isabel Avenue/I-580 interchange) in the PEIR. In addition, both the City's preferred I-580 alignment and BART's adopted Portola-Vasco alignment share the 5.5-mile segment from Dublin/Pleasanton Station to Isabel Avenue in the I-580 median.

1.1.2 BART to Livermore Project Draft EIR

The project-level DEIR evaluates a Proposed Project and three build alternatives. The Proposed Project would extend the existing BART system in the I-580 median to a proposed station east of the Isabel Avenue/I-580 interchange, together with tail track, a storage and maintenance facility, and other facilities such as wayside facilities and station parking.

The Proposed Project does not preclude extending transit service farther east in an alignment within or extending out of the I-580 median. From Isabel Avenue, a future expansion farther east beyond Isabel using conventional BART or another technology could extend to either Downtown Livermore or along I-580 to Greenville Road. Such an extension, as contemplated in the PEIR, would be the subject of a separate project-level evaluation in a future environmental document.

BART released the project-level DEIR for public review in July 2017. The DEIR informs public agency decision-makers and the public of the significant environmental impacts of the Proposed Project and its alternatives, and includes mitigation measures for significant impacts where feasible. Following a 77-day public review and comment period, BART is preparing the Final EIR (FEIR). The FEIR will contain all the comments received on the DEIR and a written response to each substantive comment. The FEIR is scheduled to be completed by late spring 2018.

1.1.3 Proposed Project and Alternatives

The Proposed Project and three build alternatives, as well as the No Project Alternative (or No Build Alternative), are evaluated in the DEIR in accordance with the California Environmental Quality Act (CEQA). The three build alternatives were identified in initial screening as alternatives with the potential to meet most of the project goals and be completed within a reasonable timeframe; therefore, they merited full evaluation in the DEIR.

The three build alternatives (shown with Proposed Project in the figures on the following pages) are as follows:

- Diesel Multiple Unit (DMU) Alternative, which includes a variant referred to as the Electrical Multiple Unit (EMU) Option;
- Express Bus / Bus Rapid Transit (BRT) Alternative; and
- Enhanced Bus Alternative.

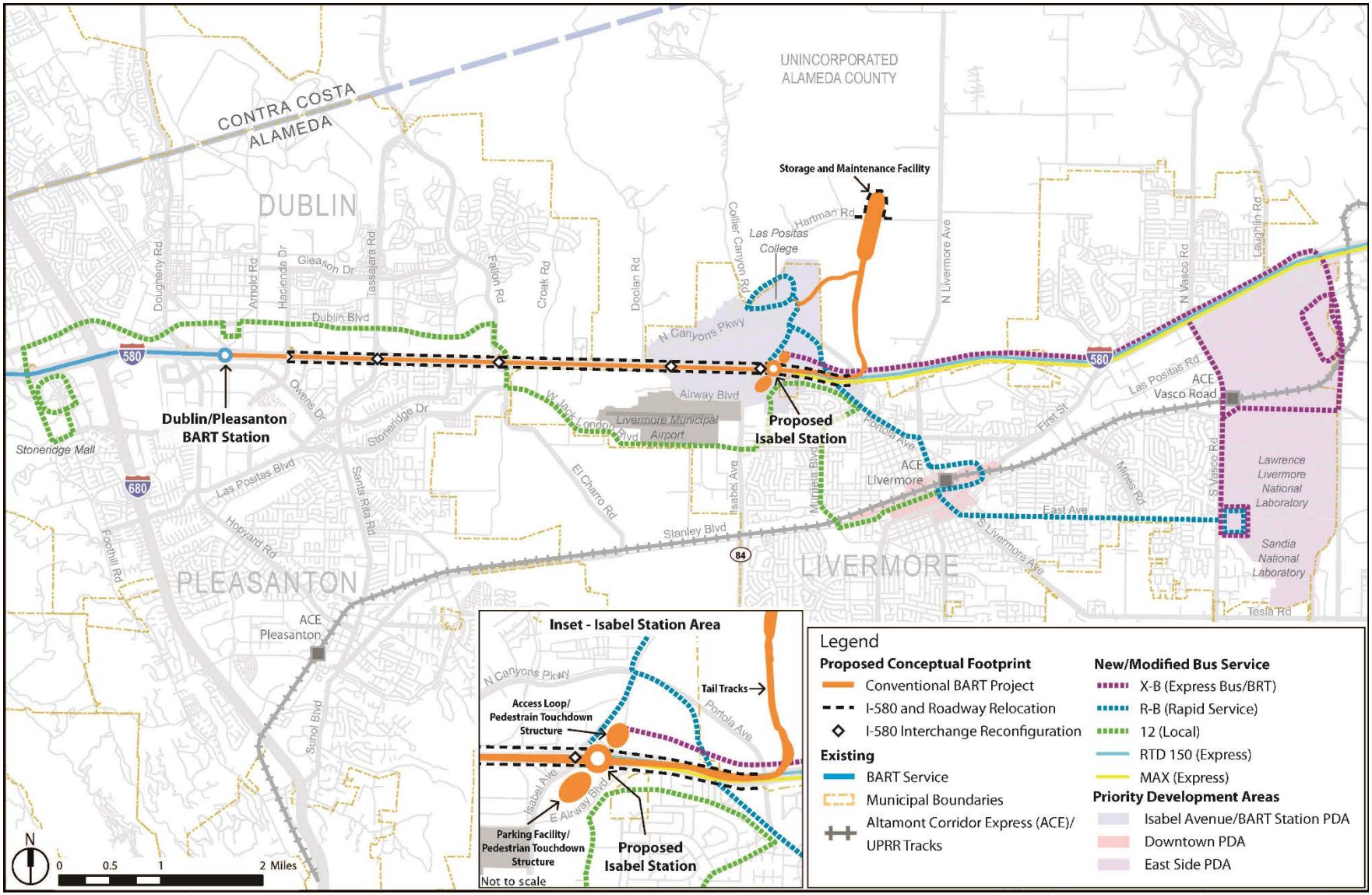
Proposed Project

The Proposed Project, shown in **Figure 1**, involves extending the BART system using conventional BART technology, from the existing terminus of the Dublin/Pleasanton–Daly City Line at the Dublin/Pleasanton Station to a new station located at the Isabel Avenue (State Route 84) / I-580 interchange in the city of Livermore. The new alignment and the new Isabel BART Station (Isabel Station) would be constructed in the I-580 median. New parking facilities — consisting of a parking structure and a surface lot containing approximately 3,412 spaces — would be constructed immediately south of I-580 along East Airway Boulevard. In addition, a new, approximately 68-acre BART storage and maintenance facility would be constructed north of I-580, beyond the Isabel Station near Hartman Road.

To accommodate the widening of the I-580 median for the new BART alignment and Isabel Station, the California Department of Transportation right-of-way would be widened along approximately 5.6 miles. The I-580 lanes would be relocated by a total of approximately 46 feet, from just east of the Hacienda Drive interchange to west of the Portola Avenue/I-580 overcrossing. At the proposed Isabel Station, I-580 would be relocated by approximately 67 feet to accommodate the new station within the median. The relocation of I-580 would require the modification of some interchanges and surface frontage roads.

The Proposed Project includes new and modified feeder bus routes that would connect the new Isabel Station to the Livermore Downtown Priority Development Area (PDA), the Livermore East Side PDA (which includes the Lawrence Livermore National Laboratory), and other areas east of the BART system, as well as to the ACE Stations in downtown Livermore and Vasco Road. The overall performance of these bus routes would be improved via the implementation of transit priority infrastructure enhancements, such as signal timing priority, bus shelters and bus bulbs.

Figure 1 – Proposed Project (Conventional BART) Overview



Source: Arup, 2017a,b.

BART to Livermore Extension Project EIR

Conventional BART Project Overview

DMU Alternative / EMU Option

The DMU Alternative, shown in **Figure 2**, differs from the Proposed Project in terms of vehicle technology. DMUs are self-propelled rail cars that use a diesel engine to generate their own power and run on a standard-gauge rail track, whereas BART trains use electricity and run on wide-gauge rail track.

The DMU Alternative would have a similar median alignment and station configuration as the Proposed Project, but would have a longer alignment and include a new transfer platform at the Dublin/Pleasanton Station. A passenger wishing to travel further on the BART system would need to transfer from DMU to BART at Dublin / Pleasanton Station. A BART-to-DMU or BART-to-EMU platform would provide a direct transfer across a platform. This transfer facility would require widening of the BART right-of-way at the existing Dublin/Pleasanton Station with corresponding relocation of I-580 and reconfiguration of adjacent roadways beyond that required for the Proposed Project. A new parking structure for the Isabel Station, with approximately 2,428 parking spaces, would be constructed immediately south of I-580 along East Airway Boulevard. In addition, a new, approximately 32-acre storage and maintenance facility would be constructed north of I-580, between the terminus of the alignment and Hartman Road.

To accommodate the median widening, approximately 7.1 miles of I-580 would be relocated by a total of approximately 46 feet, from west of Dougherty Road/Hopyard Road interchange to the Portola Avenue / I-580 overcrossing. Around the Dublin/Pleasanton Station, the north side of I-580 would be relocated to accommodate the new DMU transfer platform. At the proposed Isabel Station, I-580 would be relocated by a total of approximately 67 feet to accommodate the station in the median. The relocation of I-580 would require modification of some interchanges and surface frontage roads.

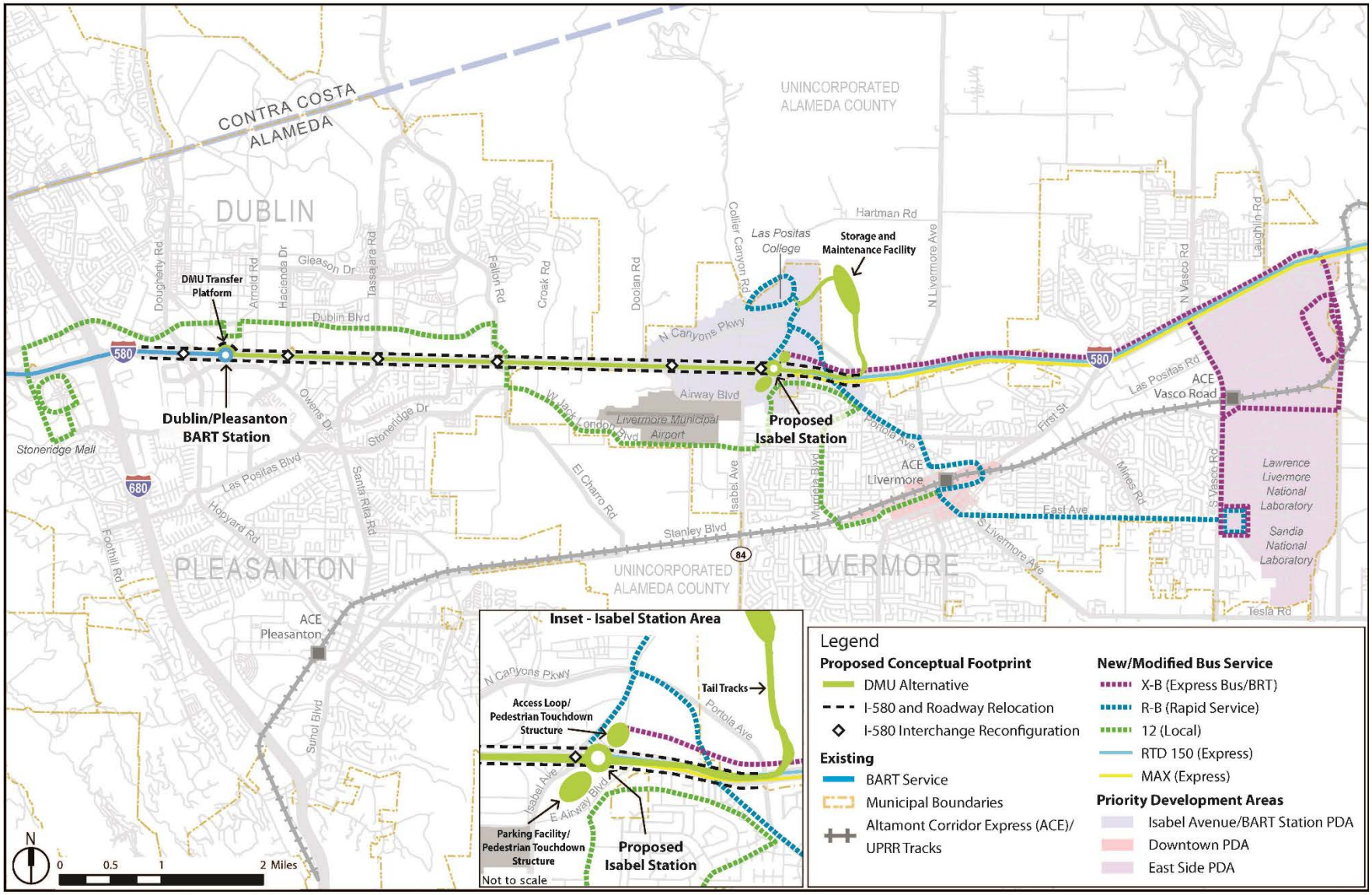
The DMU Alternative includes the same bus components as the Proposed Project, including new and modified feeder bus routes connecting the new station to areas east of the BART system.

A variant of the DMU Alternative — the EMU Option — is also being considered. The EMU Option is generally the same as the DMU Alternative, except that it uses electrical-powered vehicles rather than diesel-powered vehicles.

Express Bus / BRT Alternative

The Express Bus / BRT Alternative, shown in **Figure 3**, seeks to achieve the project goals using bus technology only. Under this alternative, new bus transfer platforms would be constructed at the existing Dublin/Pleasanton Station. The bus platforms would be located to the outside of the existing BART station platforms. New bus ramps from the I-580 express lanes would be constructed for buses to enter and connect directly to the bus transfer platforms, allowing passengers to transfer from bus to BART without leaving the station.

Figure 2 – DMU Alternative / EMU Option Overview

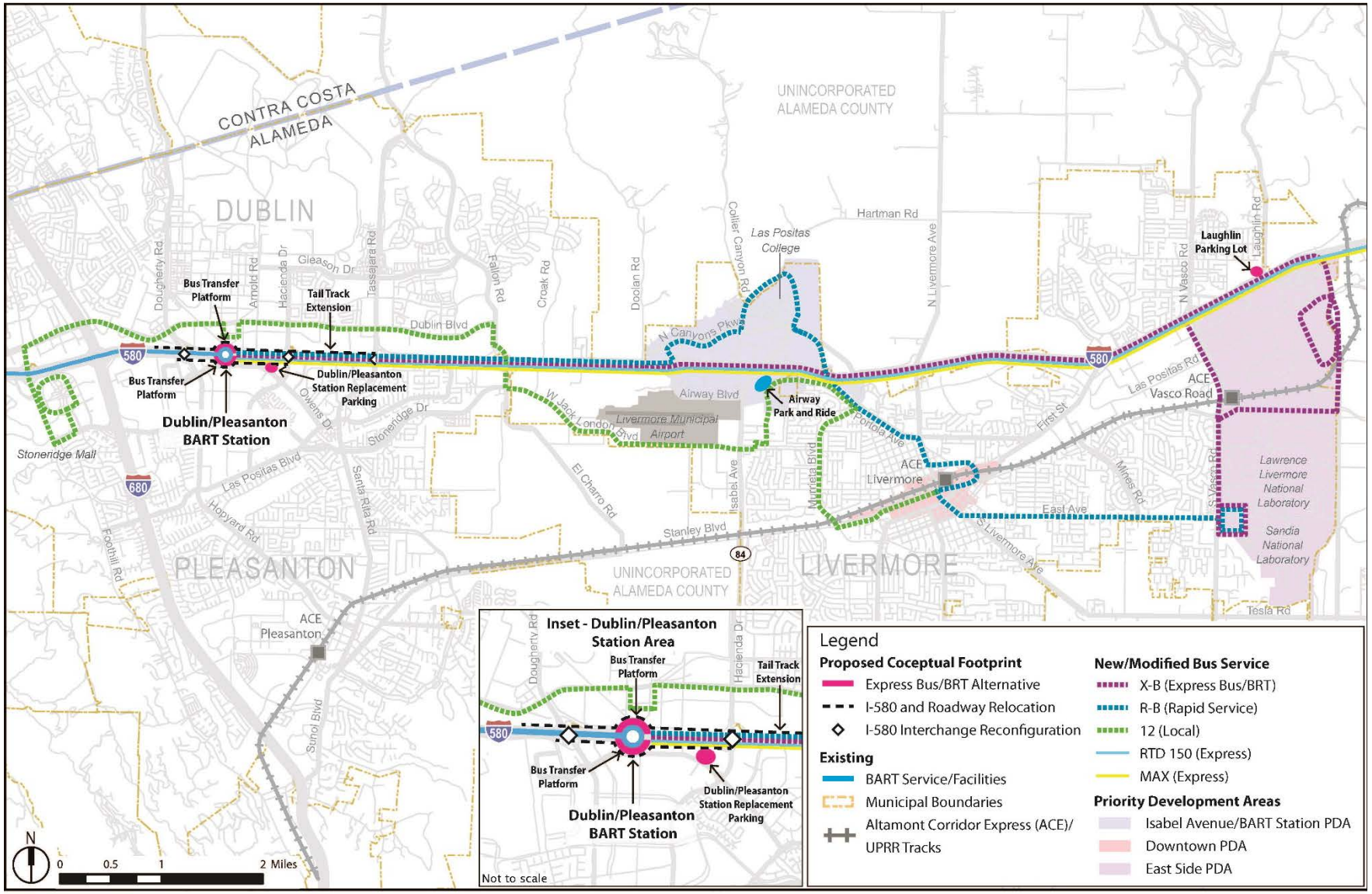


Source: Arup, 2017a,b.

BART to Livermore Extension Project EIR

DMU Alternative Overview

Figure 3 – Express Bus / BRT Alternative Overview



Source: Arup, 2017a,b.

BART to Livermore Extension Project EIR

Express Bus/BRT Alternative Overview

To accommodate the new bus transfer platforms and facilities under this alternative, approximately 2.2 miles of I-580, from west of the Dougherty Road/Hopyard Road interchange to the Tassajara Road/Santa Rita Road interchange, would be relocated by approximately 88 feet. The relocation of I-580 would require modification of some interchanges and surface frontage roads.

A new parking lot (or garage) with 210 parking spaces would be constructed at the Dublin/Pleasanton Station to replace the existing parking lost due to the I-580 relocation. In addition, a remote, approximately 230-space park-and-ride lot would be constructed at Laughlin Road, with regular bus service during peak hours from the lot to the Dublin/Pleasanton Station.

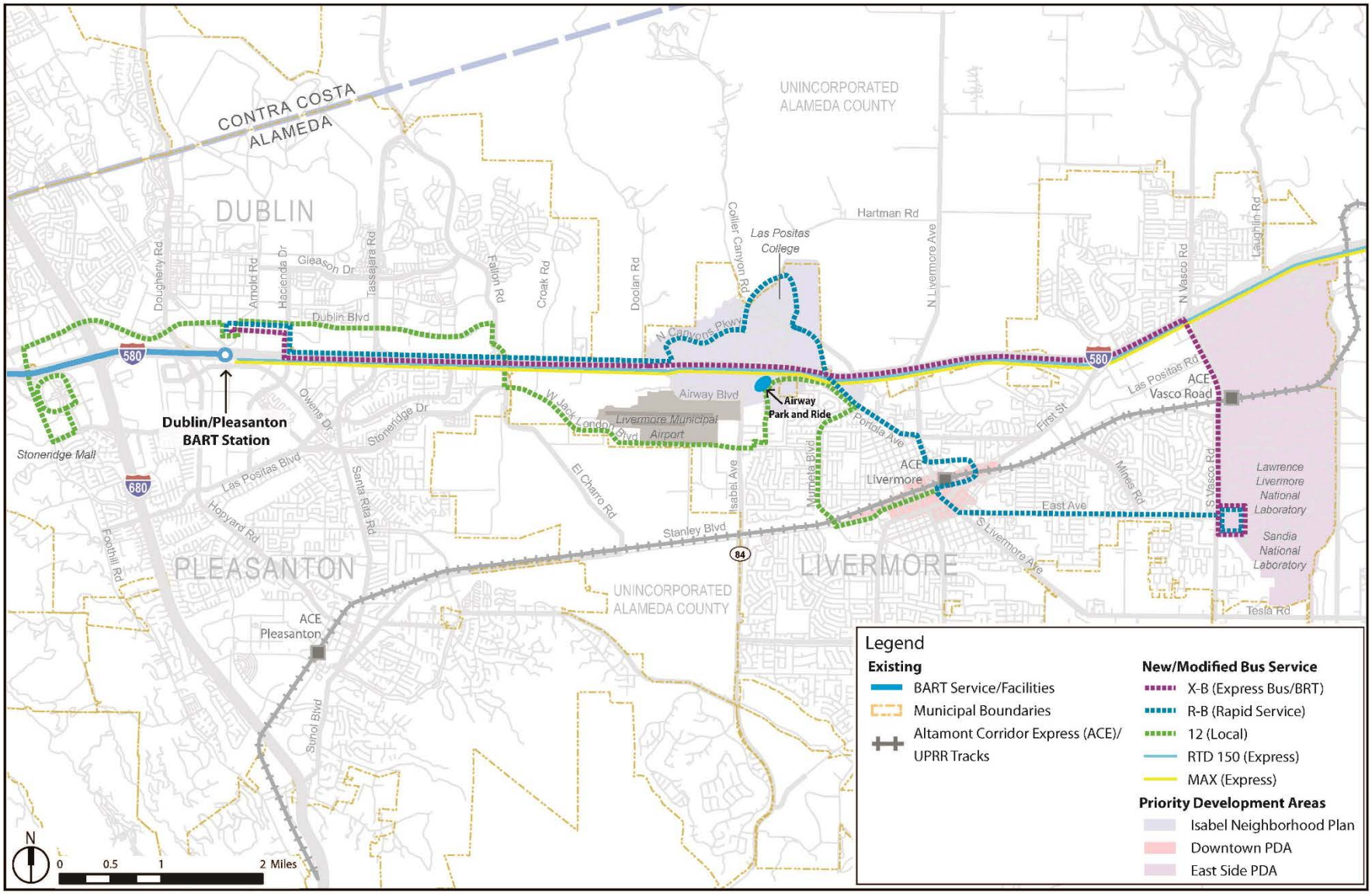
This alternative includes a feeder bus operation like that of the Proposed Project and DMU Alternative. It would be designed to enhance direct connections between the Dublin/Pleasanton Station, downtown Livermore, both the downtown Livermore and Vasco Road ACE stations, and Livermore-area PDAs, as well as to maximize use of the I-580 high-occupancy vehicle/high-occupancy toll lanes. Bus service improvements include, but are not limited to, two new express/rapid bus routes.

Enhanced Bus Alternative

Like the Express Bus / BRT Alternative, the Enhanced Bus Alternative, shown in **Figure 4**, uses bus-related technology only and does not include an extension of BART rail service or the development of a new rail station. Unlike the Express Bus / BRT Alternative, this alternative does not include any major capital improvements and would not include the development of bus transfer platforms or direct bus ramps. This alternative provides lower-cost bus service improvements to enhance access to the Dublin/Pleasanton Station.

The Enhanced Bus Alternative includes bus operation like those for the Proposed Project and other build alternatives, designed to enhance direct connections to the Dublin/Pleasanton Station from Las Positas College, downtown Livermore, and both the downtown Livermore and Vasco Road ACE stations, as well as to serve existing and future Livermore PDAs.

Figure 4 – Enhanced Bus Alternative Overview



Source: Arup, 2017a,b.

BART to Livermore Extension Project EIR

Enhanced Bus Alternative Overview

1.2 Report Purpose

This report is intended to provide an evaluation of the Proposed Project and build alternatives, primarily using two major evaluation frameworks — consistency with established project goals and the BART System Expansion Policy (BSEP). The report will be used in association with a public outreach process in early 2018 to inform stakeholders about the merits and demerits of the Proposed Project and build alternatives and to receive stakeholder input.

This report supplements the information provided in the EIR prepared for the BART Livermore Extension Project. While the purpose of the EIR is to disclose the environmental impacts of the Proposed Project and alternatives and to propose mitigation measures to avoid or reduce adverse environmental impacts, the Evaluation Report provides a comparison of the benefits and costs of the Proposed Project and build alternatives.

This report is included in the administrative record for the FEIR. However, this report is not a part of the EIR itself — the public comment period for the EIR has ended, and any stakeholder input received by BART in response to this report will not be considered as comments on the EIR.

The BART Board of Directors must certify that it has reviewed and considered the information in the FEIR and that the FEIR has been completed in conformity with CEQA requirements before any decision can be made regarding the project. The Board will also consider this Evaluation Report in weighing the potential project impacts against the benefits and any other economic, legal, social, technological and other considerations, and the feasibility of alternatives, to determine whether the Proposed Project or an alternative should be approved as proposed, approved with modifications, or not approved.

1.3 Report Organization

Section 2 provides an overview of the approach and methodology employed in this report, including a description of the two major evaluation frameworks.

Section 3 presents an evaluation of the Proposed Project and build alternatives based on the consistency with the established project goals evaluation framework.

Section 4 presents an evaluation of the Proposed Project and build alternatives based on the consistency with the BSEP evaluation framework.

Section 5 discusses other evaluation considerations.

Appendix A presents evaluation data assembled or generated for this report in a comprehensive form.

Appendix B provides a summary of significant impacts from the BART to Livermore Project EIR.

Appendix C provides details on the impact of the Proposed Alternatives and the build alternatives on air quality emissions.

1.4 Abbreviations

The following abbreviations are used throughout this report.

ACE	Altamont Corridor Express
BART	Bay Area Rapid Transit
BRT	bus rapid transit
BSEP	BART System Expansion Policy
CEQA	California Environmental Quality Act
DEIR	Draft Environmental Impact Report
DMU	Diesel Multiple Unit
EIR	Environmental Impact Report
EMU	Electric Multiple Unit
FEIR	Final Environmental Impact Report
GHG	greenhouse gas
INP	Isabel Neighborhood Plan
MTC	Metropolitan Transportation Commission
PDA	Priority Development Area
PEIR	Program Environmental Impact Report
TOD	transit-oriented development
VMT	vehicle miles traveled

2 Approach and Methodology

2.1 Evaluation Frameworks

In this report, the Proposed Project and build alternatives are evaluated based on a set of categories and metrics that provide a rational and comprehensive basis for comparison. The categories and metrics for this evaluation primarily come from two sources: 1) the stated goals for the project and 2) the adopted BART System Expansion Policy. Other considerations are also discussed below.

2.1.1 Consistency with Project Goals

The project goals to improve transit mobility, increase BART ridership, and support transit-oriented development (TOD) were expressed in the adopted 2010 BART to Livermore Extension PEIR. These goals were further developed in the Notice of Preparation for the Project EIR (2012) and refined in the BART to Livermore Extension Project DEIR. This report analyzes the extent to which the Proposed Project and build alternatives meet these goals.

The BART to Livermore Extension Project goals, as listed in the DEIR, are as follows:

- Provide a cost-effective intermodal link of the existing BART system to the inter-regional rail network and a series of Priority Development Areas (PDAs) identified by the City of Livermore, the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments. These PDAs include the Livermore Isabel Avenue BART Station PDA, the Livermore Downtown PDA and the Livermore East Side PDA.
- Support the regional goals of integrating transit and land use policies to create opportunities for TOD in the Livermore area PDAs.
- Provide an effective alternative to traffic congestion on I-580.
- Improve air quality and reduce GHG and other emissions associated with automobile use.

Specific metrics were selected for evaluating the Proposed Project and build alternatives under each of these goals. The metrics used for the analysis are detailed in **Section 3**.

2.1.2 BART System Expansion Policy

The BSEP is a BART Board-adopted policy for considering system expansions. This policy includes several criteria that must be considered. These criteria include the potential for generating new ridership, cost effectiveness, surrounding land uses, accessibility, connectivity with other transit systems, effects on the existing BART system, and the degree of inter-agency partnering and community support. These criteria constitute the second framework used for evaluating the Proposed Project and build alternatives. The metrics used for analyzing each of these criteria are specified in **Section 4**.

2.1.3 Other Considerations

The report also includes several other factors that are useful for comparing the Proposed Project and build alternatives, but which are not explicitly covered by the two evaluation frameworks discussed above.

Environmental impacts, disclosed in the EIR for this project, are relevant not only to meeting CEQA requirements, but also in alternatives evaluation. **Section 5** provides an overview of impacts and mitigation measures associated with the Proposed Project and build alternatives.

Equity is a category not explicitly addressed in the project BSEP or the project goals. Equity is nonetheless an important consideration and BART has a written environmental justice policy that outlines its commitment "to taking reasonable steps in order to ensure equitable public transportation service." Accordingly, a separate assessment of equity is included in **Section 5**.

Section 5 also includes a discussion of the MTC's process for assessing projects competing for discretionary regional funding, and a performance assessment of the Proposed Project and build alternatives under MTC's Resolution 3434 TOD policy.

2.2 Evaluation Methodology

For each goal/criterion of the two evaluation frameworks, one or more specific performance metrics were developed to assess how well the Proposed Project and build alternatives perform in comparison with each other. For the project goal framework, the evaluation identified performance metrics for each project goal, as detailed in **Section 3**. For the BSEP framework, quantitative and qualitative BSEP metrics for each criterion were used to assign a low to high evaluation rating, as detailed in **Section 4**.

Performance of the Proposed Project and build alternatives by evaluation categories are presented and allow for some overall conclusions about the merits and demerits of the Proposed Project and build alternatives. No weights were assigned to individual categories, nor was there an effort to total or average the category ratings to create a total or average score.

The DEIR has two different future analysis years — 2025 and 2040. This Evaluation Report uses 2040 as the evaluation year, as it represents a timeframe when the full impacts and benefits of the Proposed Project and the build alternatives will be realized.

The DEIR also has two different scenarios for future years — project scenarios and cumulative scenarios. The project scenarios include the Proposed Project or alternative, and assume only population and employment growth and transportation network improvements consistent with regional projections. The cumulative scenarios include, in addition to the growth and improvements assumed in the project scenario, (1) the build-out of the Isabel Neighborhood Plan (INP), which proposes a mixed-use TOD near the proposed Isabel station, and (2) the construction of additional parking at the Dublin/Pleasanton station. [2] Unless otherwise noted, the evaluations in this report utilize data from the project scenario. **Appendix A** provides more detail on the evaluation metrics using the project scenario and the cumulative scenario.

[2] BART has expanded its consideration to include a variety of parking strategies to increase parking near the Dublin/Pleasanton and West Dublin/Pleasanton station. The results in this report are not substantially affected by the use of alternative parking strategies.

3 Project Goals Evaluation Framework

An important consideration in comparing the Proposed Project and build alternatives is determining how well they meet the project goals established in the DEIR. For purposes of evaluation, these goals as worded in the DEIR and shown in 2.1.1 are abbreviated in **Table 1** below. In addition, the first DEIR goal is expressed in two parts to differentiate between cost effectiveness and intermodal connectivity. Metrics were selected to represent the project goals, as shown in **Table 1**. Some of these metrics were previously employed in the DEIR. In these cases, the results from the DEIR analyses were used here. A full set of analysis results is presented in **Appendix A**.

Table 1 – Project Goals and Key Metrics

Project Goals	Key Metrics
Provide a cost-effective link	New Net BART Systemwide Boardings
	Total Capital Cost
	Annual Operating and Maintenance (O&M) Cost
	Farebox Recovery Ratio[3]
	Lifecycle Cost[4] per New BART Boarding
Provide an intermodal link between BART, inter-regional rail and PDAs	Accessibility: Isabel Station to Downtown San Francisco travel time (measures link to Isabel PDA)
	Accessibility: Downtown Livermore to downtown San Francisco travel time (measures link to downtown Livermore PDA)
	Regional Transportation Gap Closure (measures link to regional rail)
Support integrating transit and land use policies to create transit-oriented development (TOD) opportunities	Land Use Plans and Policies
Provide alternative to I-580 congestion	Travel Time (downtown Livermore to downtown San Francisco)
	Reduction in Regional Vehicle Miles Traveled (VMT)
Improve air quality, reduce greenhouse gases (GHGs)	GHG Emission Reduction
	Reduction in Regional VMT
	EIR Emissions Thresholds

A performance matrix comparing the Proposed Project and build alternatives was developed for each project goal, using the selected metrics to provide a rating for each goal. The following section provides a summary of the overall performance assessment. Subsequent sections provide results for each individual goal.

[3] Farebox recovery ratio is the percentage of operating and maintenance costs covered by fares. Both bus and rail costs and revenues were considered in this analysis.
[4] Lifecycle costs add annualized rehabilitation and replacement costs over the course of the expected lifetime of a project to capital expenses and annual operating expenses.

3.1 Overall Performance

Table 2 provides an overview of the performance of the Proposed Project and build alternatives in light of each of the project goals. The Proposed Project has medium or medium-high ratings for all five goals. The DMU Alternative and EMU Option rate medium or low-medium on all goals. The Express Bus/ BRT Alternative rates medium-high under the first goal, to "provide a cost-effective link." However, the Express Bus / BRT Alternative rates as medium or low-medium for all other goals. The Enhanced Bus Alternative rates medium for one goal, low-medium for one goal, and low for three of the goals.

Table 2 – Consistency with Project Goal Comparison: Overall

Project Goals	Proposed Project - Conventional BART	DMU Alternative	EMU Option	Express Bus / BRT Alternative	Enhanced Bus Alternative
Goal 1A: Provide a cost-effective link					
Goal 1B: Provide an intermodal link between BART, inter-regional rail and PDAs					
Goal 2: Support integrating transit and land use policies to create transit-oriented development (TOD) opportunities					
Goal 3: Provide alternative to I-580 congestion					
Goal 4: Improve air quality, reduce greenhouse gases					
 High Medium-High Medium Low-Medium Low					

3.2 Goal 1A: Provide a Cost-Effective Link

Table 3 summarizes the evaluation of the Proposed Project and build alternatives for the goal of providing a cost-effective link. This goal is focused on the affordability and effectiveness for BART to provide new service. Systemwide boardings represent ridership, an important component of cost-effective service. To evaluate affordability, the total capital cost, operations and maintenance costs, farebox recovery, and lifecycle costs for the Proposed Project and build alternatives were analyzed and rated.

Capital costs are provided primarily in year of expenditure dollars (YOE$); that is, inflating current costs to the estimated midpoint of construction of each build alternative. Values in 2016 dollars are provided in parenthesis. Operating and maintenance (O&M) costs are provided in 2016 dollars.

- **Conventional BART Project: Medium.** The Proposed Project would have an estimated capital cost of YOE $1.635 billion (2016 $1.329 billion), annual O&M costs of $22.8 million, and would generate 11,900 net new BART boardings in 2040. The Proposed Project would thus be the most expensive option but also the one that attracts the greatest number of users. It would have a farebox recovery rate of 88% and a total cost per boarding of $20.56. The Proposed Project rates medium because its higher ridership is offset by high costs, making it less cost effective than the Express Bus/BRT Alternative.
- **DMU Alternative / EMU Option: Low-Medium.** The DMU Alternative would have an estimated capital cost of YOE $1.599 billion (2016 $1.353 billion) and would generate 7,000 net new weekday BART boardings in 2040. Its yearly O&M cost would be $16.8 million, 74% of the Proposed Project's O&M cost. The DMU Alternative would have a farebox recovery rate of 72% and a total cost per boarding of $30.60. The EMU Option for this alternative would have a slightly higher capital cost of YOE $1.665 billion (2016 $1.353 billion) due to the additional electrical infrastructure (catenary system and wayside facilities), but a slightly lower annual O&M cost of $16.6 million. It would have a farebox recovery rate of 73% and a total cost per boarding of $31.33. The DMU Alternative/EMU Option rates low-medium because it has similar costs as the Proposed Project, but would attract fewer users.
- **Express Bus / BRT Alternative: Medium-High.** The Express Bus/BRT Alternative would have 3,500 net new BART boardings in 2040, which is only 29% of the Proposed Project's net new boardings. However, it would also have a lower capital cost of YOE $367 million (2016 $305 million), which is 23% of the Proposed Project's capital cost, and a yearly O&M cost of $3 million or 13% of the Proposed Project's O&M cost. It would have an excellent farebox recovery of 196% and a total cost per boarding of $14.11. The Express Bus/BRT Alternative rates medium-high because it is the most affordable and effective option that would attract any significant number of passengers.
- **Enhanced Bus Alternative: Medium.** The Enhanced Bus Alternative would have 400 net new BART boardings in 2040, which is only 3% of the Proposed Project's boardings. The Enhanced Bus Alternative would have a low capital cost of YOE $25 million (2016 $21 million), which is 1.6% of the Proposed Project's capital cost, and a low yearly O&M cost of $1.7 million or 7% of the Proposed Project's O&M cost. It would have a comparatively low farebox recovery of 42% and a total cost per boarding of $21.24. The Enhanced Bus Alternative rates medium under this goal because it is the most affordable option, but would attract a low number of additional users to BART.

Table 3 – Consistency with Project Goal 1A Comparison: Provide a Cost-Effective Link

Project Goal	Provide a cost-effective link				
Metrics	**Proposed Project - Conventional BART**	**DMU Alternative**	**EMU Option**	**Express Bus / BRT Alternative**	**Enhanced Bus Alternative**
Net New BART Systemwide Boardings in 2040	11,900	7,000	7,000	3,500	400
Total Capital Cost (Millions of YOE$)	$1,635	$1,599	$1,665	$376	$25
Total O&M Cost in 2040 (2016$)	$22,800,000	$16,800,000	$16,600,000	$3,000,000	$1,700,000
Farebox Recovery Ratio	88%	72%	73%	193%	40%
Lifecycle Costs per New BART Boarding	$20.56	$30.60	$31.33	$14.11	$21.24
Overall Performance					

Notes: YOE$: Year of expenditure

3.3 Goal 1B: Provide an Intermodal Link Between BART, Inter-Regional Rail and PDAs

Table 4 summarizes the evaluation of the Proposed Project and build alternatives for this goal. To evaluate this goal, transit travel times[5] from key origins and destinations under the Proposed Project and build alternatives were calculated, and the regional gap closure was evaluated qualitatively.

The Proposed Project and all build alternatives make transit travel time improvements to PDAs in Livermore, but none provide a rail connection to ACE and therefore do not close this regional transportation gap. Livermore Amador Valley Transit Authority (LAVTA) express, Rapid and local routes currently connect ACE stations to the Dublin/Pleasanton and West Dublin/Pleasanton BART stations. The Proposed Project and all build alternatives improve marginally on these connections with more frequent express bus service. Only the Proposed Project was rated as medium for providing the best transit connections in terms of travel time to Livermore destinations.

- **Conventional BART Project: Medium**. The Proposed Project would link the existing BART system to the Livermore Isabel Avenue/BART Station PDA and improve travel times to this PDA and the downtown Livermore PDA more than any of the build alternatives. However, it does not provide a rail connection to ACE and therefore does not close this regional transportation gap. For this reason, the Proposed Project rates medium under this goal.

  DMU Alternative / EMU Option: Low-Medium. The DMU Alternative//EMU Option would link the existing BART system to the Livermore Isabel Avenue/BART Station PDA (with a transfer required) and improve travel times to this PDA and the downtown Livermore PDA, though travel times savings would be less than the Proposed Project. Like the Proposed Project, it does not provide a rail connection to ACE and therefore does not close this regional transportation gap. The DMU Alternative//EMU Option is rated low-medium under this goal.

  Express Bus / BRT Alternative: Low-Medium. It is unlikely that the Livermore Isabel Avenue/BART Station PDA would be implemented under the Express Bus / BRT alternative. However, this alternative would have improved travel times to this PDA as well as to the downtown Livermore PDA, but not as much as either the Proposed Project or the DMU Alternative//EMU Option. Like the Proposed Project and all the build alternatives, it does not provide a rail connection to ACE and therefore does not close this regional transportation gap. The Express Bus / BRT Alternative is rated low-medium under this goal.

- **Enhanced Bus Alternative: Low.** It is unlikely that the Livermore Isabel Avenue/BART Station PDA would be implemented under the Enhanced Bus Alternative. However, this alternative would have improved travel times to this PDA as well as to the downtown Livermore PDA, but not as much as either the Proposed Project or other build alternatives. Like the Proposed Project and all the build alternatives, it does not provide a rail connection to ACE and therefore does not close this regional transportation gap. The Express Bus / BRT Alternative is rated low under this goal.

[5]For travel time estimations, it was assumed that travelers used the fastest transit option (bus or train) for all legs of their total trip.

Table 4 – Consistency with Project Goal 1B Comparison: Provide an intermodal link between BART, inter-regional rail and PDAs

Project Goal	Provide an intermodal link between BART, inter-regional rail and PDAs				
Metrics	**Proposed Project - Conventional BART**	**DMU Alternative**	**EMU Option**	**Express Bus / BRT Alternative**	**Enhanced Bus Alternative**
Transit travel time Isabel to downtown San Francisco (minutes/minutes less than no project)*	57/23	60/20	60/20	66/14	71/9
Transit travel time downtown Livermore to downtown San Francisco (minutes/minutes less than no project)**	71/19	74/16	74/16	74/16	90/0
Regional Transportation Gap Closure***	Low	Low	Low	Low	Low
Overall Performance					
 High  Medium-High  Medium  Low-Medium  Low					

*Connection to Isabel PDA; **Connection to downtown Livermore PDA, ***Connection to inter-regional rail

3.4 Goal 2: Support integrating transit and land use policies to create transit-oriented development opportunities

Table 5 summarizes the evaluation of the Proposed Project and build alternatives against this goal. To measure how well each contributes to TOD opportunities, the single metric of land use policy and plans was employed. Plans that were reviewed included the following:

- Isabel Neighborhood Plan (draft);
- Livermore General Plan;
- Livermore Downtown Specific Plan; and
- Plan Bay Area.

There are three PDAs in Livermore: Isabel Avenue/BART Station Planning Area, Downtown and East Side (east of Vasco Road). PDAs are transit-accessible areas designated by municipalities for growth, and are used by the regional Plan Bay Area to allocate planned future growth. The first two are addressed in the proposed INP and Downtown Specific Plan, while there is no Specific Plan underway for the redevelopment of the East Side.

Land use plans and policies in the area were reviewed and rated for transit supporting land use and access. For the Proposed Project, land use plans and policies provide a medium-high level of transit supportive land use and access. The City of Livermore is in the process of creating the INP which, if implemented, would increase development density around the transit station. The City of Livermore expects to consider adopting the INP before the BART Board is expected to consider adopting the BART to Livermore Extension Project; however, the INP is being developed only for the Proposed Project. Should BART wish to adopt the DMU Alternative / EMU Option, the City of Livermore would need to reassess the INP and potentially undergo a new planning process. The INP does not apply to the Express Bus / BRT Alternative because it does not include a new Isabel station, nor for the Enhanced Bus Alternative, which consists of minor bus infrastructure improvements.

The INP proposes increasing development density around the station, encouraging mixed-use development and enhancing the transit-oriented character of the area. However, even with these plans implemented, the development will not result in the level of densities observable at many other BART stations (e.g., downtown Oakland and downtown Berkeley). A medium-high rating is given to the Proposed Project, recognizing that the INP is proposed specifically for a conventional BART extension. A medium rating is given to the DMU Alternative / EMU Option, with the understanding that a new INP process would be required to develop a transit oriented development plan for this alternative.

For the Express Bus / BRT Alternative and the Enhanced Bus Alternative, land use plans provide a low-medium level of transit supportive land use and access. The bus alternatives' bus stops are located throughout the City of Livermore. Some locations have land use plans and policies in place to support transit use, such as the Downtown Livermore PDA, while others do not. Downtown Livermore is zoned to concentrate development around existing ACE rail stations and established communities. A Downtown Livermore Plan encourages medium density housing and mixed-use development. Other bus stop locations have low opportunities that would likely not support TOD with zoning and parking requirements that do not encourage transit usage. Many bus stops are in built-out neighborhoods with

limited transit-oriented in-fill development potential, especially given that much of Livermore's existing neighborhoods are predominantly low density.

- **Proposed Project**: **Medium-High.** The plan that would most significantly create TOD opportunities in association with the Proposed Project is the INP. This plan, which is currently in draft form and has not yet been approved, proposes zoning the station area to increase development density, encourage mixed-use development and enhance the transit-oriented character of the area. However, even with these plans implemented, the development will not result in the level of densities observable at many other BART stations (e.g., downtown Oakland and downtown Berkeley). The Downtown Specific Plan encourages strengthening Livermore's Downtown through redevelopment as a mix of uses including housing. However, it is not particularly relevant to the Proposed Project, given that rail will not be extended to Downtown Livermore. A medium-high rating is given to the Proposed Project for land use plans and policies.
- **DMU Alternative / EMU Option**: **Medium.** It is likely but not certain that the INP would also be implemented in association with the DMU Alternative / EMU Option. The City of Livermore would need to reassess and potentially conduct a new planning process. For this reason, a medium rating is given to the DMU Alternative / EMU Option for the land use plans and policies.
- **Express Bus / BRT Alternative**: **Low-Medium.** It is not expected that the INP would be implemented in association with the Express Bus / BRT Alternative, as the INP builds around a future rail station. Therefore, the most relevant plan is the Downtown Specific Plan. The Downtown Specific Plan encourages strengthening Livermore's Downtown through redevelopment as a mix of uses including housing. It is debatable whether this alternative's improvements to bus routes accessing the Livermore Transit Center and ACE station will create TOD opportunities. The Express Bus / BRT Alternative is rated low-medium for this reason.
- **Enhanced Bus Alternative**: **Low-Medium.** It is not expected that the INP would be implemented in association with the Enhanced Bus Alternative, as the INP builds around a future rail station. Same as Express Bus / BRT Alternative.

Table 5 – Consistency with Project Goal 2 Comparison: Support Integrating Transit and Land Use Policies to Create Transit-Oriented Development (TOD) Opportunities

Project Goal	Support integrating transit and land use policies to create TOD opportunities				
Metrics	**Proposed Project - Conventional BART**	**DMU Alternative**	**EMU Option**	**Express Bus / BRT Alternative**	**Enhanced Bus Alternative**
Land Use Plans and Policies	Medium-High	Medium	Medium	Low-Medium	Low-Medium
Overall Performance					
 High  Medium-High  Medium  Low-Medium  Low					

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3.5 Goal 3: Provide Alternative to I-580 Congestion

Table 6 summarizes the evaluation of the Proposed Project and build alternatives against this goal. Metrics were chosen that represent the potential for each to provide a viable alternative to congestion. The metric "Transit Travel Time[6] - downtown Livermore to downtown San Francisco" is an important indication of how competitive the Proposed Project and build alternatives are, and the metric "Reduction in Regional Vehicle Miles Traveled (VMT)" directly indicates vehicles being taken off the road. This goal does not directly address the impact of the Proposed Project and build alternatives on I-580 congestion, but rather the degree to which they provide an alternative to that congestion. The EIR did evaluate level of service (LOS)[7] and volume-to-capacity (V/C)[8] ratios for freeway segments. This is presented in detail in the Transportation Chapter of the EIR.

- **Conventional BART Project: Medium-High.** The Proposed Project would offer the fastest transit travel times between downtown Livermore and downtown San Francisco (71 minutes), and reduce regional VMTs by 244,000 per weekday in 2040.
- **DMU Alternative / EMU Option: Medium.** The DMU Alternative / EMU Option would provide a transit travel time of 74 minutes between and Downtown Livermore and Downtown San Francisco. It would reduce regional VMTs by 140,600 per day in 2040. For all three metrics, the DMU Alternative / EMU Option performs worse than the Proposed Project but better than any other build alternative. For this reason, it rates as medium.
- **Express Bus / BRT Alternative: Low-Medium.** The Express Bus / BRT Alternative would provide a transit travel time of 74 minutes between and downtown Livermore and downtown San Francisco (identical to the DMU Alternative / EMU Option). It would reduce regional VMTs by 92,600 per day in 2040. It generally performs worse than the DMU Alternative / EMU Option and thus rates as low-medium.
- **Enhanced Bus Alternative: Low.** The Enhanced Bus Alternative performs significantly worse than the Proposed Project and other build alternatives with a travel time of 90 minutes between and downtown Livermore and downtown San Francisco, and a regional weekday VMT reduction of 6,500 per day in 2040. It rates as low.

[6]For travel time estimations, it was assumed that travelers used the fastest transit option (bus or train) for all legs of their total trip
[7] Level of Service (LOS) is a qualitative measure of operating conditions within a traffic stream, and their perception by motorists/passengers. A LOS definition generally describes these conditions in terms of such factors as speed, travel time, freedom to maneuver, comfort and convenience, and safety.
[8] Volume to capacity (V/C) is a ratio of vehicle volume to roadway capacity, with numbers greater than 1.0 indicating the roadway capacity is exceeded.

Table 6 – Consistency with Project Goal 3 Comparison: Provide Alternative to I-580 Congestion

Project Goal	Provide alternative to I-580 congestion				
Metrics	**Proposed Project - Conventional BART**	**DMU Alternative**	**EMU Option**	**Express Bus / BRT Alternative**	**Enhanced Bus Alternative**
Transit travel time downtown Livermore to downtown San Francisco (minutes/minutes less than no project)	71/19	74/16	74/16	74/16	90/0
Reduction in Regional Vehicle Miles Traveled (VMT) in 2040	244,000	140,600	140,600	92,600	6,500
Overall Performance					

3.6 Goal 4: Improve Air Quality, Reduce Greenhouse Gases

Table 7 summarizes the evaluation of the Proposed Project and build alternatives against this goal. As there is a strong correlation between VMT reduction and air quality, VMT reductions are used to measure this goal along with relevant emissions and GHG reductions.

- **Conventional BART Project: Medium-High.** In 2040, the Proposed Project would reduce GHG emissions by 11,200 metric tons of carbon dioxide equivalent (CO_2e) per year, and reduce regional VMT by 244,000 per day. The Proposed Project will also have net reduction in emissions for $PM_{2.5}$ and PM_{10}. ROG and NO_x emissions would increase but not exceed the threshold of significance. For these reasons, the Proposed Project is rated medium-high under this goal.
- **DMU Alternative: Medium.** In 2040, the DMU Alternative would reduce GHG emissions by 3,500 metric tons of carbon dioxide equivalent (CO_2e) per year, and reduce regional VMT by 140,600 per day. The EMU Option would remove an additional 2,500 metric tons of CO_2e per year because of cleaner vehicle technology. The DMU/EMU Alternative would also have reductions in $PM_{2.5}$ and PM_{10} compared to the No Project Alternative. ROG and NO_x emissions would increase but not exceed the threshold of significance. For these reasons, the DMU Alternative and EMU Option are rated medium.
- **Express Bus / BRT Alternative: Medium.** In 2040, the Express Bus / BRT Alternative would reduce GHG emissions by 3,700 metric tons of carbon dioxide equivalent (CO_2e) per year, and reduce regional VMT by 92,600 per day. This reduction is significantly less than those of the Proposed Project. The Express Bus / BRT Alternative would have lower ROG emissions compared to the Proposed Project, but higher NO_x, $PM_{2.5}$ and PM_{10}. For these reasons, the Express Bus / BRT Alternative is rated medium.
- **Enhanced Bus Alternative: Low.** The Enhanced Bus Alternative would not reduce GHG emissions. VMT reduction is also very low compared with the Proposed Project and the other build alternatives. The Enhanced Bus Alternative would have lower ROG emissions compared to the Proposed Project, but higher NO_x, $PM_{2.5}$ and PM_{10} emissions. For these reasons, the Enhanced Bus Alternative rates low.

Table 7 – Consistency with Project Goal 4 Comparison: Improve Air Quality, Reduce Greenhouse Gases (GHGs)

Project Goal	Improve air quality, reduce GHGs				
Metrics	**Proposed Project - Conventional BART**	**DMU Alternative**	**EMU Option**	**Express Bus / BRT Alternative**	**Enhanced Bus Alternative**
Annual GHG Emission Reduction in 2040 (Metric Tons CO_2e)	11,200	3,500	6,000	3,700	No Benefit
Reduction in Weekday Regional Vehicle Miles Traveled (VMT) in 2040	244,000	140,600	140,600	92,600	6,500
EIR Emissions Thresholds	Does not exceed thresholds	Does not exceed thresholds	Does not exceed thresholds	Does not exceed thresholds	Does not exceed thresholds
Overall Performance					
 High Medium-High Medium Low-Medium Low					

Notes: Emissions types include ROG = reactive organic gas; NO_x = nitrogen oxides; PM_{10} = respirable particulate matter; PM_{25} = fine particulate matter

More detail on the impact of the Proposed Project and the build alternatives on air quality emissions is provided in **Appendix C**.

4 BART System Expansion Policy Evaluation Framework

To guide BART in the extension and expansion of its system, its Board of Directors adopted a Policy Framework for System Expansion in 1999 and a System Expansion Project Advancement Criteria and Process in 2002 (together known as the BSEP).

The BSEP identifies criteria for project advancement to be applied when determining whether a new BART expansion project should be recommended for advancement. These criteria include:

- Transit Supportive Land Uses and Access – How well do existing residential and/or employment land uses, intermodal connections, and local land use plans and policies support transit use?
- Ridership Development Plan (RDP) – How well does the project support BART ridership goals, and have the local jurisdictions prepared plans to promote transit supportive land uses and improve access to proposed stations?
- Cost-Effectiveness – How much does it cost to increase ridership?
- Regional Network Connectivity – How well does the project close gaps in the regional transportation network?
- System and Financial Capacity – How does the project affect BART's existing system, and is there a viable capital financing plan and operating financing plan?
- Partnerships – How much community and stakeholder support exists for the project?

Among the chief elements of the BSEP is the requirement that one or more RDPs be undertaken for proposed expansion projects of the existing BART system. The RDP(s) seek to increase ridership to support the proposed BART extension and to support development of that ridership through local measures such as transit-supportive land uses and investment in access programs and projects.

As a steward of public funding for transportation investments, BART employs this policy to:

- Ensure cost-effective transportation investment decisions;
- Protect the taxpayers' investment in the District's physical infrastructure;
- Ensure the financial health and sustainability of the District; and
- Enhance the Bay Area's environment and quality of life.

4.1 Approach

The BSEP evaluation categories and the metrics used in each category are shown in **Table 8**. The rating scale for each criterion is from low to high.

For some metrics, the BSEP provides guidelines on how to conduct quantitative assessments, along with thresholds that correspond to the low to high rating scale. In certain cases, the provided guidelines are more applicable to a rail extension rather than a bus extension, particularly for the station-related evaluations. In those cases where the methodology for evaluating the bus alternatives was not clear, approaches that are rational and consistent with the perceived intentions of the BSEP were developed and employed.

4.2 Overall Results

Neither the Proposed Project nor any of the build alternatives rate high across a majority of evaluation criteria. The Proposed Project rates high for only one criterion — the Operating Finance Plan. It rates medium or medium-high for most other criteria but rates low in the areas of Existing Land Use, Existing Intermodal Connections, Station Context, and Regional Transportation Gap Closure. The DMU Alternative / EMU Option rates high for Operating Finance Plan as well, and low under the same criteria as the Proposed Project, and rates medium or low-medium in other categories. The Express Bus / BRT Alternative rates high for two criteria – Capital Finance Plan and Operating Finance Plan – and medium-high for one criterion – Cost per New Rider: Base Case. It rates low or low-medium for all other criteria. The Enhanced Bus Alternative rates high for Capital Finance Plan, low for Existing Land Use and Regional Transportation Gap Closure, and medium or low-medium for all other categories.

Table 8 – BART System Expansion Policy

	Proposed Project - Conventional BART	DMU Alternative / EMU Option	Express Bus / BRT Alternative	Enhanced Bus Alternative
Transit Supportive Land Use and Access				
Existing Land Use: Residential and/or Employment				
Existing Intermodal Connections				
Land Use Plans and Policies				
Ridership Development Plan				
Ridership Threshold			N/A	N/A
Station Context			N/A	N/A
Cost-Effectiveness[9]				
Cost per New Rider: Base Case				
Cost per New Rider: with TOD			N/A	N/A
Regional Network Connectivity				
Regional Transportation Gap Closure				
System and Financial Capacity				
Core System Improvements				
Capital Finance Plan				
Operating Finance Plan				
Partnerships				
Community and Stakeholder Support	See written description.	See written description.	See written description.	See written description.
 High  Medium-High Medium Low-Medium Low				

[9] Cost/Transportation System User Benefit, a suggested BSEP metric, was not utilized as it is no longer employed by the Federal Transit Administration and was never phased in to the BSEP by BART.

Notes: N/A: Not applicable

4.3 Transit Supportive Land Use and Access

The metrics used for evaluating transit supportive land use and access around the proposed new Isabel Station include the existing residential and employment densities, existing intermodal connections, and land use plans and policies. For the Express Bus / BRT Alternative and the Enhanced Bus Alternative, the quality of land use and access around areas served by bus routes was evaluated, as these alternatives do not include a major station.

Existing Land Use: Residential and/or Employment Densities

The staff-recommended BSEP metrics include density thresholds for this category. For the Proposed Project and the DMU Alternative / EMU Option, existing residential and employment densities within a ½ mile radius of the proposed Isabel Station were calculated using census data. Residential density is 0.85 households per acre, and employment density is 6.11 employees per acre. This results in a low Existing Land Use rating for the Proposed Project and the DMU Alternative / EMU Option.

For the Express Bus / BRT Alternative and the Enhanced Bus Alternative, no major stations are planned at Isabel or elsewhere. Thus, the existing residential and employment densities were measured within a ¼ mile buffer of major bus routes serving Dublin/Pleasanton Station. The result was a density of 1.99 households per acre, and 4.52 employees per acre, translating into a low Existing Land Use rating for the Express Bus / BRT Alternative and the Enhanced Bus Alternative.

Existing Intermodal Connections

Existing pedestrian, bicycle and transit connections to the Proposed Project and build alternatives are evaluated qualitatively. Overall, a low rating is assigned to the Proposed Project / DMU Alternative / EMU Option and a low-medium rating is assigned to the Express Bus / BRT Alternative and the Enhanced Bus Alternative.

Proposed Project and the DMU Alternative / EMU Option. Existing pedestrian conditions in the future Isabel station area provide low connectivity. The ½ mile area surrounding the station has sidewalks, but it lacks consistency and continuity. The roadways that surround the station area, including Isabel Avenue and Airway Boulevard, are wide, multi-lane arterials, and adjacent development is sporadic, with stretches of undeveloped land in between developed parcels. Crosswalks exist at most of the surrounding intersections, but on many major arterials, pedestrian crossings are only in place along one approach in the north-south or east-west directions, with long crossing distances that expose pedestrians to vehicle traffic and long signal cycles that cause pedestrian delay.

Existing bicycle conditions for the Proposed Project and the DMU Alternative / EMU Option provide similarly poor connectivity. While some roadways have bicycle lanes, these facilities are uncomfortable for bicyclists of all ages and ability and do not provide key connections. The bicycle lanes along Isabel Avenue are particularly stressful, requiring cyclists to ride adjacent to high-speed traffic that is merging on and off the I-580 freeway. There is one bike path within a ½ mile radius of the rail station along Stealth Street, but this path dead-ends at a four-lane arterial, providing no connection across for cyclists traveling south.

Existing transit connections for the Proposed Project and the DMU Alternative / EMU Option also provide low connectivity. The area around the potential Isabel Station currently has very limited transit

connections. The closest bus stop served by Wheels route 30R is at Las Positas College, which is about ¾ mile away.

Express Bus / BRT Alternative and the Enhanced Bus Alternative. Existing pedestrian conditions were rated low-medium. Areas in a quarter-mile buffer around proposed bus routes generally have completed sidewalks. Pedestrian facilities around downtown Livermore are well connected with high intersection density, pedestrian-oriented land uses and many pedestrian amenities such as benches, trees, blub outs and pedestrian-scale lighting. Other areas around bus stops have land uses that are not oriented towards pedestrians. These places appear uninviting towards pedestrians and are closed off from the activity of the street. Many streets are wide, high-speed arterial roadways that act as a barrier to pedestrians, such as Vasco Road, East Avenue, Portola Avenue, West Jack London Boulevard and North Canyon Parkway. These roadways have been built particularly wide to accommodate peak traffic levels, with large crossing distances and high vehicle speeds that are problematic for pedestrians by making them vulnerable to more severe collisions.

Existing bicycle connections for the Express Bus / BRT Alternative and the Enhanced Bus Alternative were also rated low-medium. Bicycle facilities exist, but many are adjacent to high volume streets, making them uncomfortable for most cyclists. There are some bike paths adjacent to bus routes, but these do not provide access to the majority of Livermore. The lack of high-quality and connected facilities is reflected in the existing bicycle usage for Livermore, which is 0.7% according to the US Census Journey-to-Work data, lower than the California average of 1.1%.

For the bus alternatives, existing transit connections are of low-medium quality. The areas within a ¼ mile buffer of proposed bus routes have multiple bus routes, including Wheels routes 11, 14, 15, 20X, 580X, 10R and 30R, and a rail station in downtown Livermore and Vasco road, served by ACE. While the bus alternatives are connected to many existing transit routes, only the 10R and the 15R have peak minute headways of 15 minutes.

Land Use Plans and Policies

Land use plans and policies in the area were reviewed and rated for transit supporting land use and access. For the Proposed Project, land use plans and policies provide a medium-high level of transit supportive land use and access. The City of Livermore is in the process of creating the INP which, if implemented, would increase development density around the transit station. The City of Livermore expects to consider adopting the INP before the BART Board is expected to consider adopting the BART to Livermore Extension Project; however, the INP is being developed only for the Proposed Project. Should BART wish to adopt the DMU Alternative / EMU Option, the City of Livermore would need to reassess the INP and potentially undergo a new planning process. The INP does not apply to the Express Bus / BRT Alternative because it does not include a new Isabel station, nor for the Enhanced Bus Alternative, which consists of minor bus infrastructure improvements.

The INP proposes increasing development density around the station, encouraging mixed-use development and enhancing the transit-oriented character of the area. However, even with these plans implemented, the development will not result in the level of densities observable at many other BART stations (e.g., downtown Oakland and downtown Berkeley). A medium-high rating is given to the Proposed Project, recognizing that the INP is proposed specifically for a conventional BART extension. A

medium rating is given to the DMU Alternative / EMU Option, with the understanding that a new INP process would be required to develop a transit oriented development plan for this alternative.

For the Express Bus / BRT Alternative and the Enhanced Bus Alternative, land use plans provide a low-medium level of transit supportive land use and access. The bus alternatives' bus stops are located throughout the City of Livermore. Some locations have land use plans and policies in place to support transit use, such as the Downtown Livermore PDA, while others do not. Downtown Livermore is zoned to concentrate development around existing ACE rail stations and established communities. A Downtown Livermore Plan encourages medium density housing and mixed-use development. Other bus stop locations have low opportunities that would likely not support TOD with zoning and parking requirements that do not encourage transit usage. Many bus stops are in built-out neighborhoods with limited transit-oriented in-fill development potential, especially given that much of Livermore's existing neighborhoods are predominantly low density.

4.4 Ridership Development Plan

BART's BSEP requires a Ridership Development Plan (RDP) be developed for each proposed new station to support increased ridership along with meeting the goals of the BSEP. Strategies for boosting ridership include planning and implementation of transit supportive land uses, improvements in local transportation programs and infrastructure, improvements to multi modal access including pedestrian and bicycle access, increases in transit feeder services, and development of additional automobile serving parking facilities (including parking in the station area).

To meet the requirement for a RDP, the City of Livermore is preparing the INP to guide future development around a potential Isabel Station. The draft plan consists of a mixed-use development with over 4,000 residential units, 1.6 million square feet of office space, and other commercial uses. The City of Livermore expects to consider adopting the INP before the BART Board is expected to consider adopting the BART to Livermore Extension Project; however, the INP is being developed only for the Proposed Project.

Should BART wish to adopt the DMU Alternative / EMU Option, the City of Livermore would need to reassess the INP. For the purposes of evaluation only, BART is assuming the INP would apply to the DMU Alternative / EMU Option. The City of Livermore has indicated this would reasonably characterize the maximum amount of development around the Isabel station under this alternative.

A RDP is not required for the Express Bus / BRT Alternative because it does not include a new station, nor for the Enhanced Bus Alternative, which consists of minor bus infrastructure improvements.

The effectiveness of the RDP is measured by assessing ridership thresholds and station context evaluation.

Ridership Threshold

The ridership assessment compares the ridership forecasted for proposed extensions with ridership thresholds. This assessment evaluates the effectiveness of extension projects in achieving adequate ridership.

The staff-recommended BSEP metric, projected average daily trips for an extension (daily entries and exits associated with new stations), is categorized into five grades from low to high:

- Low: less than 5,000 average daily trips
- Low-Medium: 5,000 to 9,999 average daily trips
- Medium: 10,000 to 13,999 average daily trips
- Medium-High: 14,000 to 20,000 average daily trips
- High: above 20,000 average daily trips

Based on year 2040 BART ridership projections, the Proposed Project would have an average of 15,800 daily boardings and alightings at Isabel Station, attaining a medium-high rating. The DMU Alternative / EMU Option would have an average of 9,400 daily boardings and alightings at Isabel Station, attaining a low-medium rating.[10] The BSEP ridership criterion is not used for the Express Bus / BRT Alternative because it does not include a new station, nor for the Enhanced Bus Alternative, which consists of minor bus infrastructure improvements.

The ridership projections cited above are from the cumulative scenario which include the INP. The analysis was also performed using the project scenario ridership projections and yielded the same ratings.[11]

Station Context

This is a qualitative assessment of how well a station location would support TOD and the station experience for patrons. The proposed Isabel station site has space to provide a mixed-use neighborhood with both employment and residential centers with high densities of uses for the Tri-Valley area. However, the station location in the median of I-580 will negatively affect patron experience. The freeway acts as a barrier between land uses to the south and the north of the station, and provides a poor environment for walking and biking. The BSEP guidelines indicate that a medium rating is only achieved with an acceptable station experience for patrons; thus, a low rating was selected for the Proposed Project and DMU Alternative / EMU Option.

Station context is not applicable to the bus alternatives since no new stations are provided as part of those alternatives.

[10] The number of projected entries at Isabel Station was doubled to determine the BART ridership numbers (entries and exists) consistent with the BSEP.
[11] Cumulative scenario projections for Isabel Station boardings and alightings are slightly lower than project scenario projections. This is because the additional parking capacity included at Dublin/Pleasanton attracts passengers from Isabel Station, despite the overall ridership increases generated by INP development.

4.5 Cost Effectiveness

This category evaluates cost effectiveness through a cost per rider measure with and without the inclusion of future TOD.

The annualized lifecycle costs per net new annual BART boarding for 2040 in 2016 dollars were calculated. To develop BESP ratings, the costs were adjusted to 2002 dollars based on historic inflation rates. The BESP cost per rider scale ranges from low (more than $40 per rider in 2002 dollars) to high (less than $10 per rider in 2002 dollars).

Table 9 shows the results of these calculations and the BSEP cost effectiveness ratings for the Proposed Project and the build alternatives.

Table 9 – Cost Effectiveness

	Proposed Project - Conventional BART	DMU Alternative	EMU Option	Express Bus / BRT Alternative	Enhanced Bus Alternative
Lifecycle Cost per BART Boarding – Base Case					
2016 Dollars	$20.56	$30.60	$31.33	$14.11	$21.24
2002 Dollars	$15.40	$22.94	$23.50	$10.60	$16.09
Cost per Rider - Base Case rating	Medium	Medium	Medium	Medium-High	Medium
Lifecycle Cost per BART Boarding – With TOD					
2016 Dollars	$18.26	$25.81	$26.43	N/A	N/A
2002 Dollars	$13.68	$19.34	$19.82	N/A	N/A
Cost per Rider - with TOD	Medium-High	Medium	Medium	N/A	N/A

Notes: N/A: Not applicable

Cost per New Rider: Base Case

The cost per new rider is first evaluated for the Proposed Project and build alternatives under base case land use assumptions that do not include future TOD. The base case corresponds to the EIR project scenario. As shown in **Table 9** the Proposed Project earns a medium rating. The DMU Alternative and EMU Option both also receive a medium rating. The Express Bus / BRT Alternative receives a medium-high rating. The Enhanced Bus Alternative, result is a medium rating.

Cost per New Rider: with TOD

The cost per new rider is also evaluated for the Proposed Project and DMU Alternative / EMU Option under future TOD conditions (see **Table 9**). The future TOD conditions correspond with the EIR cumulative scenario, which includes the INP. The Express Bus / BRT and Enhanced Bus alternatives were

not evaluated with TOD because development of the INP is not assumed to occur under these alternatives.

The Proposed Project receives a medium-high rating. The DMU Alternative and the EMU Option both earn a medium rating.

4.6 Regional Network Connectivity

Regional Transportation Gap Closure

The regional transportation gap closure measure is the only metric used to evaluate regional network connectivity. The evaluation of this metric qualitatively "assess[es] the interconnected relationship of the transit expansion project and the existing transportation network, identifying opportunities for major gap closures."

The Proposed Project and the DMU Alternative / EMU Option perform low in terms of regional transit gap closure since they do not establish any new rail connections. Most notably, no new ACE/BART rail connections are made with this project, though the project does not preclude a rail connection in the future. While no new rail connections are made, rail-bus connections to ACE, Amtrak, LAVTA and San Joaquin Regional Transit District (SJTRD) are made more convenient than current, with decreased travel times, and more frequent service.

The Express Bus / BRT Alternative and the Enhanced Bus Alternative also rate low in terms of regional transit gap closure since neither establishes any new rail connections, though they improve rail-bus connections with ACE, Amtrak, LAVTA and SJRTD with decreased travel times and more frequent service.

4.7 System and Financial Capacity

The system and financial capacity category is evaluated through a qualitative evaluation of the core system improvements, capital finance plan and operating finance plan.

Core System Improvements

The core system improvements evaluation is a qualitative assessment of how well the expansion project "enhances (at best) or minimizes demands on core system yard/support facilities, redundancy/recovery capabilities and station and line haul capacity."

Overall, the Proposed Project is rated as medium-high for core system improvements. The Proposed Project is rated high for yard and support facilities because it includes a new BART yard and shop facility at the start/end of line able to support the entire Blue Line. Its redundancy and recovery capabilities are medium, as the new yard and shop facility may provide some greater ability to respond to incidents on the Blue Line. The impact on station and line haul capacity is rated medium, since the impact on any individual station or car crowding is minimized by providing additional Blue Line peak period BART service included as part of the Proposed Project.

Overall, the DMU Alternative / EMU Option is rated as low-medium for core system improvements. The DMU Alternative / EMU Option is rated medium for yard and support facilities because it provides additional BART tail track capacity to support the increased load on the BART system generated by the DMU Alternative / EMU Option, but not additional BART yard or shop capacity to support the entire Blue

Line.[12] Its redundancy and recovery capabilities are rated low, as no new facilities that benefit the system as whole are constructed. The impact on station and line haul capacity is rated medium, since the impact on any individual station or car crowding would be minimal due to the new capacity proposed as part of the DMU Alternative / EMU Option and due to the increased headways assumed in 2040.

Overall, the Express Bus / BRT Alternative is rated as low-medium for core system improvements. The Express Bus / BRT Alternative is rated medium for yard and support because it provides additional BART tail track capacity to support the increased load on the BART system generated by the Express Bus / BRT Alternative, but not additional BART yard or shop capacity to support the entire Blue Line. Its redundancy and recovery capabilities are low, as no new facilities that benefit the system as whole are constructed. The impact on station and line haul capacity is rated as medium, since the impact on any individual station or car crowding is minimized by providing additional Blue Line peak period BART service included as part of the Express Bus / BRT Alternative.

Overall, the Enhanced Bus Alternative is rated as low-medium for core system improvements. The Enhanced Bus Alternative is rated medium for yard and support facilities because it generates minimal added load on the BART system and thus minimal added demand on support facilities. Its redundancy and recovery capabilities are rated low, as no new facilities that benefit the system as whole are constructed. The impact on station and line haul capacity is rated as medium, since it generates minimal added load on the BART system.

Capital Finance Plan

The capital finance plan assessment evaluates whether the system expansion is fully funded and considers the stability, reliability and availability of the proposed funding sources, and whether those sources are competing with renovation and core system capacity needs.

The Proposed Project is not fully funded; however, a significant amount, approximately $533 million in funding, has been committed to design and construction. The funding comes from Alameda County's sales tax funds (Measure BB), Livermore development impact fees and regional bridge tolls. This funding is dedicated, secure, and is not easily transferable to other BART projects. It also has the potential to be matched by state or federal sources. The Proposed Project is rated medium for Capital Finance Plan for these reasons.

The DMU Alternative / EMU Option has the same funding identified as the Proposed Project. The available funds do not fully cover the costs, but they are a dedicated and stable source of funding that could be used as a local match. This Alternative is rated medium.

The Express Bus / BRT Alternative and the Enhanced Bus Alternative are fully funded with available funding sources, and these sources are dedicated and stable. Thus, these build alternatives are rated high for Capital Finance Plan.

[12] The DMU Alternative and EMU Option do include a yard and shop.

Operating Finance Plan

The operating finance plan evaluation is an assessment of the estimated farebox recovery ratios and the stability, reliability and availability of the operating subsidy. The staff recommended BSEP metric includes ratings for farebox recovery with a high rating for over 50% farebox recovery, medium for 30-50%, and low for <30%. For the Proposed Project, the DMU Alternative/EMU Option, and the BRT/Express Bus Alternative, farebox recovery ratios are all higher than 50%. Therefore, they all receive a rating of high for this assessment. The Enhanced Bus Alternative has a farebox recovery ratio of 40%, and thus receives a medium rating.

4.8 Partnerships

The partnership assessment is based on community support and stakeholder support. Community and stakeholder support was evaluated for the Proposed Project and build alternatives primarily through a community and stakeholder outreach program. This included two public workshops, in Oakland and Livermore on February 26th, 2018 and February 27th, 2018, respectively, as well as several meetings with stakeholders. In addition, BART received written and verbal comments from community members and stakeholders during the outreach process on this Evaluation Report. Responses to selected comments of general interest are provided in **Appendix D**. The *Project Alternatives Evaluation Outreach Report*, available as a separate document, summarizes the BART to Livermore Extension outreach program, comments received, and survey results.

Providing a rating of low, medium, or high for community and stakeholder support does not fully capture the character of this support, as different community and stakeholder groups have disparate opinions of the Proposed Project and build alternatives. For example, to provide a medium rating for an alternative that is heavily favored by one group and highly disfavored by another would not seem to accurately represent the character of the support for that alternative, and the BSEP does not provide clear guidance in such an instance. For this reason, no single rating is assigned to the Proposed Project and build alternatives, rather, the stakeholder feedback for each is summarized below.

The Proposed Project received strong support from community members who participated in the public outreach process, the majority of whom were Livermore residents. At the February 26th and 27th public meetings, 86% of participants expressed a preference for conventional BART. However, many of these same individuals expressed opposition to the yard and shop in North Livermore. Many public meeting attendees also said or wrote that they would prefer to see conventional BART extended all the way to Greenville Road. This feedback is generally consistent with a 2013 City survey of Livermore residents who voted in the 2012 election, which found that 77% support or strongly support conventional BART in the I-580 median to Isabel Avenue with ample parking.

Similarly, stakeholders in the Tri-Valley that were presented with the Evaluation Report results expressed support for the Proposed Project. This included the following organizations:

- Cities of Livermore, Pleasanton, Dublin and Tracy;
- County of Alameda
- Lawrence Livermore National Laboratory
- IKEA Dublin (planned development)

- Chamberlin Associates
- Livermore Winegrowers Association
- Visit Tri-Valley
- East Bay Leadership Council
- BART2Livermore Coalition

Only one Tri-Valley stakeholder opposed the Proposed Project. This was Hamcor, Inc., the owner of various area car dealers. In addition, there were several regional stakeholders that expressed opposition to the Proposed Project:

- TransForm
- Sierra Club
- Bay Area Transportation Working Group
- TRANSDEF

The DMU alternative/EMU option was generally not favored by public meeting attendees or local and regional stakeholders. Only 6% of public meeting survey respondents indicated a preference for this alternative, though 62% made it their second choice. Some members of the public expressed direct opposition. None of the Tri-Valley or regional stakeholders expressed support for this alternative. One local stakeholder (Hamcor, Inc.) and one regional stakeholder (Sierra Club) directly expressed opposition.

The Express Bus/BRT alternative received a low level of support from the Tri-Valley community. There were few community comments expressing support for Express Bus/BRT; only 12% of public meeting survey respondents supported it. Several local stakeholders expressed opposition to this alternative:

- Cities of Livermore and Pleasanton
- East Bay Leadership Council
- Hamcor, Inc.

Two regional stakeholders (TransForm and Bay Area Transportation Working Group) support the Express Bus/BRT option.

BART received no direct expressions of support for the Enhanced Bus alternative from the local community, and only 2% of the public meeting survey respondents selected Enhanced Bus as their preferred alternative. The Cities of Livermore and Pleasanton oppose this alternative.

5 Additional Evaluations

In addition to the primary two frameworks described above for evaluating the Proposed Project and build alternatives, other assessments are also useful for evaluation. This section includes a reference to environmental impacts declared in the DEIR, an equity assessment, the MTC project performance assessment process and MTC Resolution 3434 TOD Policy.

5.1 Significant Environmental Impacts

This section, referencing the DEIR, was included in recognition that environmental impacts not only need to be disclosed and mitigated per CEQA, but also may play a role in evaluating the Proposed Project and build alternatives.

The Proposed Project and build alternatives would result in several potentially significant impacts. Most of the impacts identified would be mitigated to a less-than-significant level with implementation of the recommended mitigation measures. However, either project or cumulative impacts would be significant and unavoidable for the following areas:

- Transportation (permanent impacts for the Proposed Project, DMU Alternative / EMU Option, Express Bus / BRT Alternative, and Enhanced Bus Alternative);
- Land Use and Agricultural Resources (permanent impacts for the Proposed Project and DMU Alternative / EMU Option);
- Visual Quality (permanent impacts for the Proposed Project, DMU Alternative / EMU Option, and Express Bus / BRT Alternative);
- Cultural Resources (permanent impact for the Proposed Project, DMU Alternative / EMU Option, Express Bus / BRT Alternative, and Enhanced Bus Alternative);
- Biological Resources (permanent impact for the Proposed Project and DMU Alternative / EMU Option);
- Air Quality (temporary construction and permanent impacts for the Proposed Project, DMU Alternative / EMU Option, and Express Bus / BRT Alternative); and
- Energy (permanent impact for the Enhanced Bus Alternative only).

Appendix B provides details on individual impacts and mitigation measures. The BART to Livermore Project Extension EIR may also be consulted for further details on environmental impacts.

5.2 Equity Assessment

Although not an evaluation category in the BSEP nor mentioned in the BART to Livermore project goals, equity is nonetheless an important consideration, and BART has a written environmental justice policy that outlines its commitment "to taking reasonable steps in order to ensure equitable public transportation service." Accordingly, an assessment focused on equity was undertaken.

Equity is measured by impacts on environmental justice populations (minority, low-income, and limited English proficiency households). **Table 10** provides definitions of these populations.

Table 10 – Environmental Justice Populations

Environmental Justice Population	Description
Low-income households	Households with an income of less than $40,000 per year according to the 2015 Census, American Community Survey.
Minority population	Minority population, or a person who is black, Hispanic or Latino, Asian American, American Indian or Alaskan Native, Native Hawaiian and other Pacific Islander according to the 2015 Census, American Community Survey.
Limited English proficiency households	Households with limited English proficiency according to the 2015 Census, American Community Survey.

5.2.1 Impacts

An evaluation of the impacts of the Proposed Project and build alternatives on environmental justice populations is presented below. It uses a geographic information systems (GIS) platform to analyze project area populations within a ½-mile on either side of the Proposed Project and build alternatives, with the exception of the Enhanced Bus Alternative, which does not include major infrastructure that would substantially change the existing condition of the surrounding environment.

Figure 5 identifies Census block groups with a large low-income percentage and **Figure 6** identifies Census block groups with a large minority percentage. Six of 17 block groups within the ½-mile buffer have minority populations greater than the BART service area average. No block groups have low-income populations greater than the BART service area average. In addition, this analysis identifies Census tracts[13] in the study area with percentages of people with limited English proficiency greater than the BART Service Area average. As shown in **Figure 7**, one Census tract exceeded the BART service area average and one nearly equals but is slightly lower than the average.

The following impact categories were investigated, using the DEIR as the source:

- Transportation;
- Community;
- Visual and Aesthetic;
- Noise and Vibration;
- Relocations;
- Air Quality; and
- Construction Effects.

The Proposed Project and build alternatives, with the exception of the Enhanced Bus Alternative[14], are each expected to have some community, noise, visual, relocation, and air quality impacts on affected populations, which include minority and low-income individuals. Many of these are addressed through mitigations included in the DEIR. Importantly, it was found that with mitigations included, neither the Proposed Project nor the build alternatives would have environmental impacts with a high or disproportionate[15] effect on environmental justice populations.

Based on these conclusions, there is no practical difference between the Proposed Project and build alternatives in terms of impacts to environmental justice population

[13] Unlike for racial/ethnic and household economic data, the data concerning languages is not available at the block group level.
[14] The Enhanced Bus Alternative would implement only modest changes to existing conditions in the study area, such as bus bulbs and bus stop shelters, but would not involve construction of any major transit infrastructure. For these reasons, it would not have high or disproportionate impacts to environmental justice populations.
[15] A disproportionate effect would impact environmental justice groups more than other populations.

Figure 5 – Low-Income Population within ½ Mile Buffer of Proposed Project

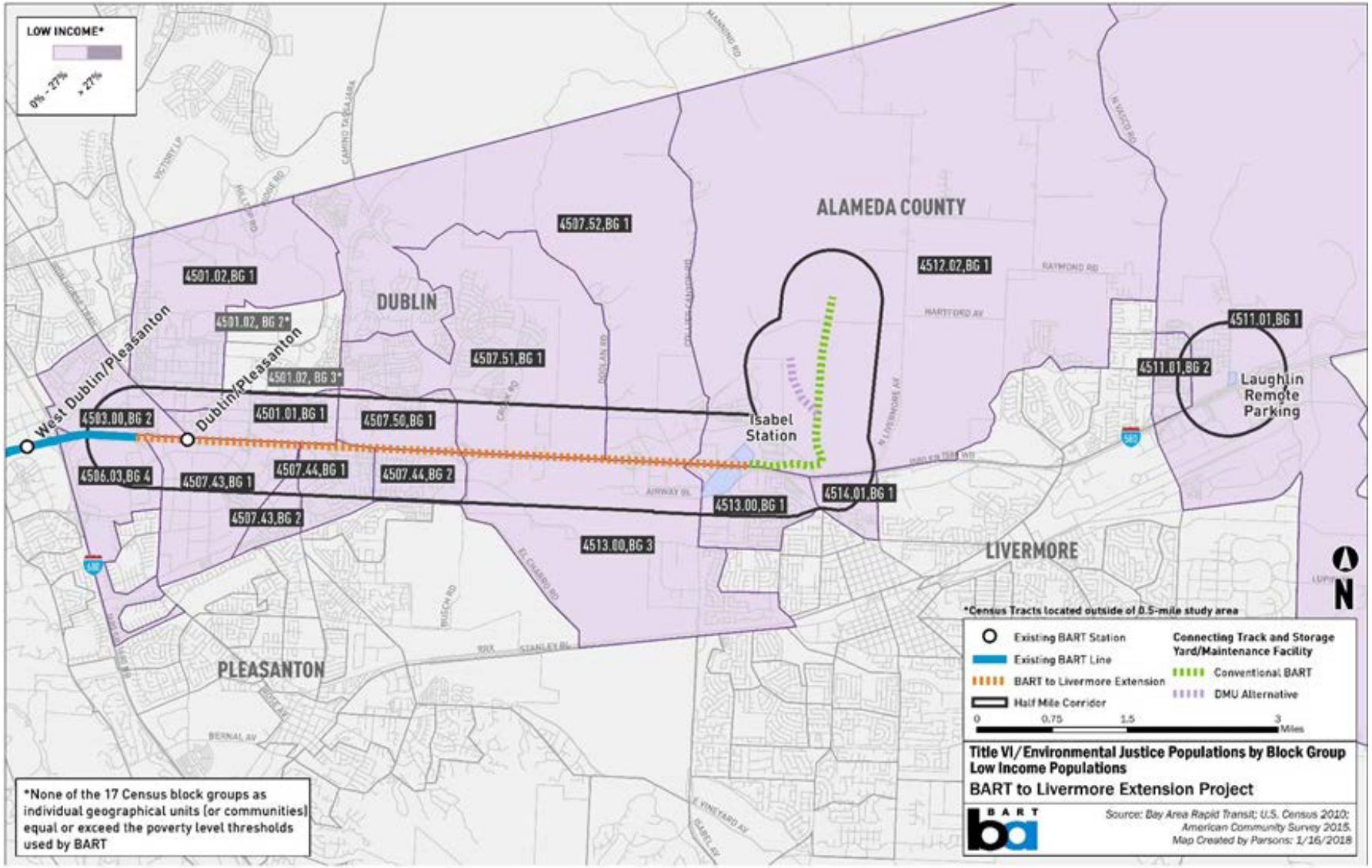


Figure 6 – Minority Population within ½ Mile Buffer of Proposed Project

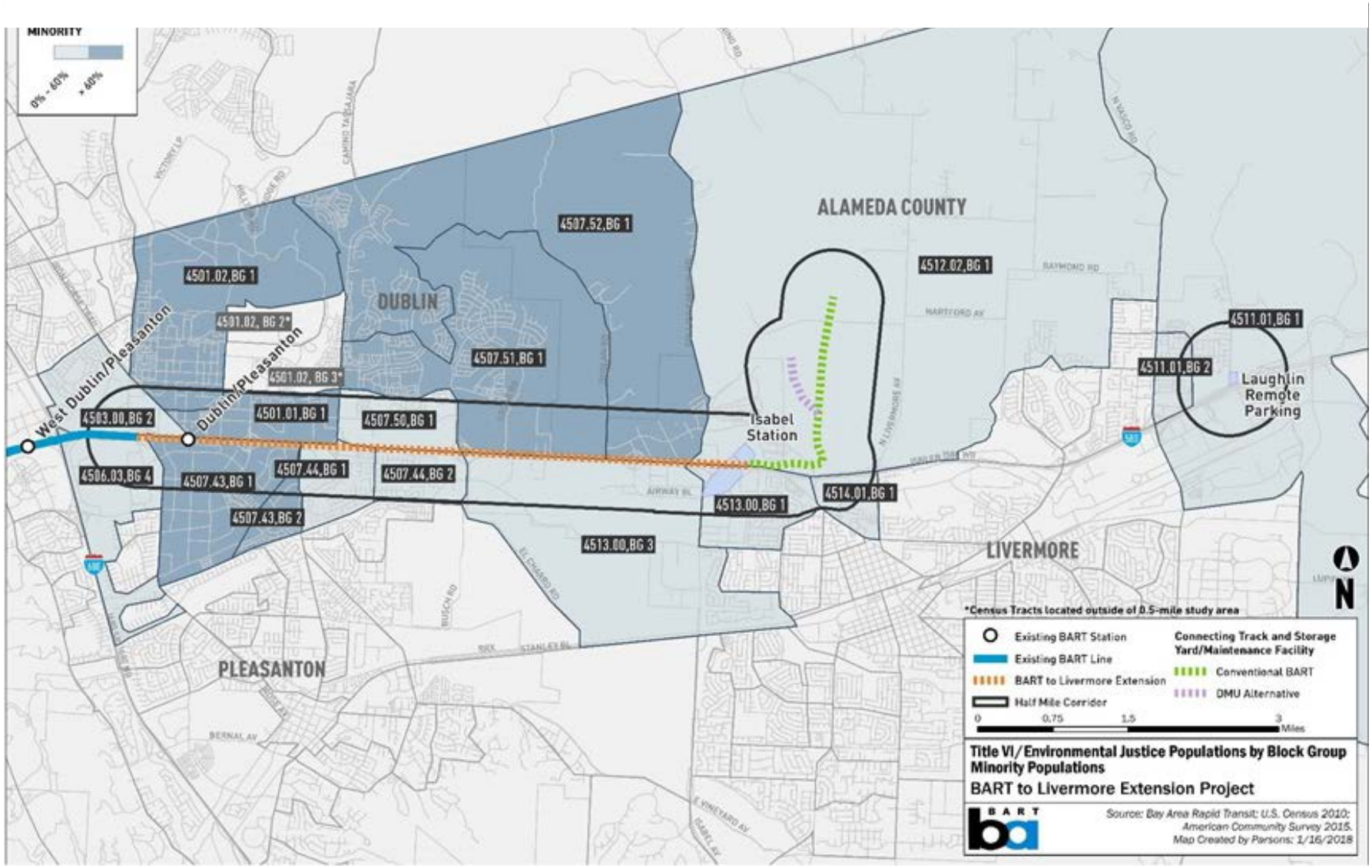
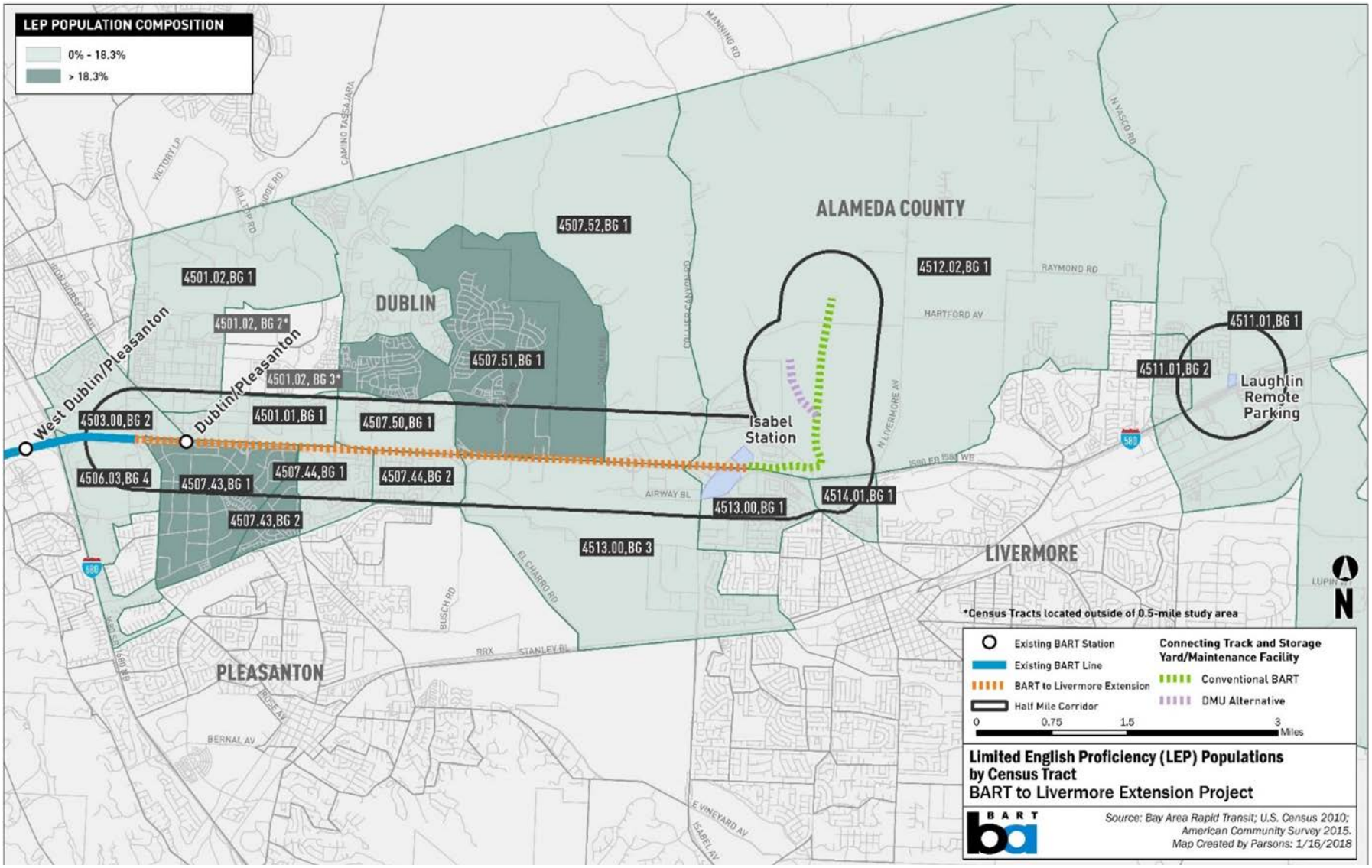


Figure 7 – Limited English Proficiency Population Within ½ Mile Buffer



5.3 MTC Performance Assessment

A full assessment per MTC's Plan Bay Area project performance assessment process was not conducted as part of this Evaluation Report. However, as it is a required step for accessing discretionary regional funding, possible outcomes in this process for the Proposed Project or build alternatives are discussed below.

Transportation projects in MTC's Plan Bay Area 2040 with total project costs greater than $100 million and desiring discretionary regional funding were subject to MTC's project performance assessment process. The BART to Livermore Extension Project is included in Plan Bay Area 2040. However, because BART has not yet adopted the Proposed Project or one of the alternatives, the Livermore Extension Project was not included in the Plan Bay Area 2040 project performance assessment. Should BART adopt the Proposed Project or the DMU Alternative / EMU Option and desire discretionary regional funding to design and construct it, the adopted project would be subject to MTC's project performance assessment project (assuming MTC continues to use this process to prioritize discretionary regional funding in future updates to Plan Bay Area). The Express Bus / BRT Alternative and the Enhanced Bus Alternative are fully funded and would not be subject to this project performance assessment, which is required only for projects seeking discretionary regional funding.

The Plan Bay Area 2040 project performance assessment was conducted using qualitative and quantitative metrics. The targets assessment (qualitative) evaluated the extent to which a project supports the region's ability to meet the targets in Plan Bay Area 2040. The benefit-cost assessment (quantitative) evaluated the cost-effectiveness of each project. Benefits included travel time, travel time reliability, travel cost, air pollution, collisions, noise and health. Relative to other projects seeking regional discretionary funding, high-performing projects would have both a high targets score and a high benefit-cost ratio. In addition, MTC used a qualitative approach to identify the project's level of support for communities of concern and confirmed that the process provides access to residents of the affected community. Some low-performing projects were included in Plan Bay Area 2040 under the compelling case process, which required project sponsors to document that either: 1) the travel model used to quantify benefits did not adequately capture project benefits; 2) the project was a cost-effective means of reducing CO_2, PM, ozone precursor emission; or 3) the project improved transportation mobility/reduces air toxics and PM emissions in communities of concern.

5.4 MTC Resolution 3434 TOD Policy

Although this policy does not apply to the BART to Livermore Extension project, it is an established regional method of assessing whether transit investments are occurring in corridors with existing and planned TOD. Therefore, it is instructive to assess how it would theoretically apply to a BART to Livermore extension.

Resolution 3434, adopted in 2001, set forth MTC's regional transit expansion program of projects. The resolution was amended in 2005 to condition these transit expansion projects on supportive land use policies and further amended in 2007 to reflect changes in the TOD policy.

This TOD policy includes three elements:

1. Corridor-level development thresholds around transit stations;
2. Local station area plans; and
3. Corridor working groups.

Corridor development thresholds are focused on existing and planned housing and shown in **Table 11**. The total number of existing and planned housing units within ½ mile of new stations and the existing end station must meet the appropriate threshold multiplied by the number of stations. As an example, the BART to Livermore Proposed Project would require 7,700 units, or the BART housing threshold multiplied by two stations (Dublin/Pleasanton and Isabel). New below-market housing counts as 1.5 units for this calculation. As indicated in **Table 11**, the Proposed Project and DMU Alternative / EMU Option would meet the housing target.

Table 11 – Resolution 3434 TOD Policy Housing Thresholds

	Dublin/Pleasanton Station		Isabel Station		Average for both Stations (2040)	MTC Target	Target Satisfied
	Existing (2015)	Future (2040)	Existing (2015)	Future (2040)			
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 ½ mile of the Dublin/Pleasanton Station (Existing and planned): CD+A, 2015.
Housing units within ½ mile of the proposed Isabel Station (Existing): CD+A, 2015.
Housing units within ½ mile of the proposed Isabel Station (Proposed): Szydlik, 2017.

Under Resolution 3434, station area plans must be initiated by the local jurisdiction according to guidelines established in MTC's Station Area Planning Manual. The INP is the station area plan that is associated with the Proposed Project; however, as stated earlier, compliance of the INP with Resolution 3434 TOD policy or MTC guidelines is not required because BART to Livermore is not a designated Resolution 3434 transit extension.

Similarly, a Resolution 3434 corridor working group is not required for the BART to Livermore project, but the City of Livermore and BART have been coordinating their respective transit expansion and TOD planning efforts.

Appendix A – Project and Cumulative Results for the Proposed Project and Build Alternatives

This appendix provides the results for a comprehensive set of metrics that were assessed under the project and cumulative scenarios for the Proposed Project and build alternatives.

The project scenario assumes only background growth consistent with regional growth projections.[16] The cumulative scenario also considers effects of probable future projects. Most significant of these are the Dublin/Pleasanton Station Parking Expansion, and the Isabel Neighborhood Plan (INP).

The Dublin/Pleasanton Station Parking Expansion would increase the total available parking spaces at that station from 2,890 to 3,430.[17]

The City of Livermore is preparing the INP to guide future development around a potential Isabel Station. The draft plan consists of a mixed-use development with over 4,000 residential units, 1.6 million square feet of office space, and other commercial uses. The INP is being developed by the City of Livermore only for the Proposed Project. For the purposes of evaluation only, BART is assuming the INP would apply to the DMU Alternative / EMU Option. The City of Livermore has indicated this would reasonably characterize the maximum amount of development around the Isabel station under this alternative. The INP does not apply to the Express Bus / BRT Alternative because it does not include a new station, nor for the Enhanced Bus Alternative, which consists of minor bus infrastructure improvements.

[16] From Plan Bay Area and SJCOG's Regional Transportation Plan/Sustainable Communities Strategy

[17] BART has expanded its consideration to include a variety of parking strategies to increase parking near the Dublin/Pleasanton and West Dublin/Pleasanton station. The results in this report are not substantially affected by the use of alternative parking strategies.

Project Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Ridership Development Plan/Market Demand					
Net New BART Systemwide Boardings					
BART Average Weekday Increase	N/A	11,900	7,000	3,500	400
					Source: EIR, Project Merits page 1495, Table 5-1
Net New Transit Trips (BART and all other transit)					
Transit Average Weekday Increase	N/A	10,100	6,200	3,400	600
					Source: BART to Livermore Ridership Projection, Cambridge Systematics, page 43, Table 18
Change in Systemwide Transit Boardings (other transit)					
Systemwide Average Weekday Boardings for ACE	N/A	(1,400)	(900)	(400)	(100)
Systemwide Average Weekday Boardings for LAVTA	N/A	(400)	200	2,200	500
Systemwide Average Weekday Boardings for SJRTD	N/A	(290)	(290)	(260)	-
					Source: BART to Livermore Ridership Projection, Cambridge Systematics, page 43, Table 18
Ridership Threshold					
Number Calculated Using Isabel Station Boardings and Alightings, ranking based on BART SE Policy	N/A	Medium-High	Low-Medium	N/A	N/A
					Source: BART to Livermore Ridership Projection, Cambridge Systematics, page 41, Figure 30, BART System Expansion Policy, page 18
Station Context (qualitative assessment)					
Transit-Orientated Development Potential and Patron Station Experience	N/A	Low	Low	N/A	N/A
					Source: BART System Expansion Policy, page 19
Tri-Valley BART Station Daily Boarding					
West Dublin Pleasanton Station Daily Boarding	3,400	3,600	3,500	3,400	3,500
Dublin Pleasanton Station Daily Boarding	10,800	9,000	9,800	12,700	10,900
Isabel Station Daily Boarding	N/A	8,100	4,800	N/A	N/A
All Stations Daily Boarding	14,200	20,700	18,100	16,100	14,400
					Source: EIR, transportation page 293, Figure 3.B-22

Project Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Regional Network Connectivity					
Regional transportation gap closure (qualitative assessment)					
Alternative closes a major regional transportation gap	N/A	Low	Low	Low	Low
					Note: Metric from BART System Expansion Policy, page 22
Cost					
Total capital					
Total capital (2016 dollars)	N/A	$1,329,000,000	$1,300,000,000 / $1,353,000,000	$305,000,000	$21,000,000
					Source: EIR, executive summary page 16, Table S-2
Total capital (YOE dollars)	N/A	$1,635,000,000	$1,599,000,000/ $1,665,000,000	$376,000,000	$25,000,000
					Source: EIR, executive summary page 16, Table S-2
Annual O&M					
2016 dollars	N/A	$22,800,000	$16,800,000/ $16,600,000	$3,000,000	$1,700,000
					Source: EIR, executive summary page 17, Table S-3
Annual O&M Net of Fares					
Annual Rail O&M Net of Rail Fares Cost 2016$	N/A	$410,000	$2,708,000 / $2,534,000	-$4,034,000	-$474,000
Annual Rail+Bus O&M Net of Rail + Bus Fares 2016$	N/A	$2,643,000	$4,716,000 / $4,542,000	-$2,822,000	$1,039,000
					Note: Annualization factor for revenue to daily X 290 days
Annualized Replace and Rehab Cost					
2016 dollars	N/A	$21,062,000	$18,817,000 / $19,395,000	$5,091,000	$330,000
					Source: Arup, Cost Team
					Note: This cost does not include capital cost
Annualized Lifecycle Costs					
2016 dollars	N/A	$70,963,000	$62,117,000 / $63,607,000	$14,318,000	$2,464,000
					Source: Arup, Cost Team
					Note: Lifecycle costs include capital cost + replace and rehab cost + operation and maintenance cost

Project Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Cost-Effectiveness					
Farebox Recovery Ratio					
Farebox Recovery Rail 2040 (2016 dollars)	N/A	98%	82% / 83%	379%	1857%
Farebox Recovery Rail+Bus 2040 (2016 dollars)	N/A	88%	72% / 73%	193%	40%
					Source: Arup, based on revenue and O&M costs
Lifecycle Costs per New BART Boarding in 2040					
Lifecycle Cost per net new Annual BART Boardings 2016 $	N/A	$20.56	$30.60 / $31.33	$14.11	$21.24
					*Note: Lifecycle cost /Average Weekday New BART Boardings * 290(Annualization factor)*
Costs Net of Fares per New BART Boarding in 2040					
Cost Net of Fares per net new Annual BART Boardings 2016 $	N/A	$14.56	$24.60 / $25.33	$8.11	$15.24
Cost per Rider: Base Case					
	N/A	Medium	Medium / Medium	Medium High	Medium
					Note: Metric from BART System Expansion Policy, page 20. Number adjusted from 2002 dollars to 2016 dollars
Annual O&M cost per Net New BART Boarding in 2040					
	N/A	$6.61	$8.28 / $8.18	$2.96	$14.66
System and Financial Capacity					
Enhances or minimizes demand on core system - Qualitative assessment:					
Yard/Support Facilities	N/A	High	Medium	Medium	Medium
Redundancy/Recovery Capabilities	N/A	Medium	Low	Low	Low
Station and Line Haul Capacity	N/A	Medium	Medium	Medium	Medium
Combined Summary Rating:	N/A	Medium High	Low Medium	Low Medium	Low Medium

Project Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Capital finance plan (qualitative)					
Fully Funded Project	N/A	Not Fully Funded	Not Fully Funded	Fully Funded	Fully Funded
Stability, Reliability and Availability of proposed Funding Sources	N/A	High	High	High	High
Sources not competing for BART System renovation and Core System Capacity needs	N/A	High	High	High	High
Combined Summary Rating:	N/A	Medium	Medium	High	High
Operating finance plan (qualitative) Special fleet/maintenance requirements					
	N/A	High	High	High	Medium
Transit Supportive Land Use and Access					
Existing Densities					
Residential	N/A	Low	Low	Low	Low
Employment	N/A	Low	Low	Low	Low
				Source: BLVX Model, Cambridge Systematics	
Existing Intermodal Connections					
Pedestrian	N/A	Low	Low	Low-Medium	Low-Medium
Bicycle	N/A	Low	Low	Low-Medium	Low-Medium
Transit	N/A	Low	Low	Medium	Medium
Land Use Plans and Policies					
	Low Medium	Medium-High	Medium	Low-Medium	Low-Medium
				Note: Metric from BART System Expansion Policy, page 26	
Parking Supply					
Net New Parking Spaces	N/A	3,412	2,428	230	0
				Source: EIR, project description page 80, Table 2-1	
Tri- Valley BART Station Average Access Mode Share					
Drive and Park	43%	50%	46%	38%	42%
Other	57%	50%	54%	62%	58%

Project Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Traveller Experience					
In Vehicle Crowding					
	Red line: 106 (116) Yellow line: 109 (103) Green line: 113 (112) Blue line: 112 (115) Orange line: 88 (96) Tube: 108 (108)	Red line: 106 (116) Yellow line: 109 (103) Green line: 113 (112) Blue line: 105 (109) Orange line: 90 (98) Tube: 107 (107)	Red line: 106 (116) Yellow line: 109 (103) Green line: 113 (112) Blue line: 101 (104) Orange line: 89 (97) Tube: 106 (106)	Red line: 106 (116) Yellow line: 109 (103) Green line: 113 (112) Blue line: 98 (100) Orange line: 88 (96) Tube: 106 (106)	Red line: 106 (116) Yellow line: 109 (103) Green line: 113 (112) Blue line: 113 (115) Orange line: 88 (96) Tube: 108 (108)
			Source: Appendix B BART BLVX Operstat - 2040 spreadsheet		
Service Reliability					
	N/A	High	High	Medium	Low
Environmental					
GHG Emission Reduction					
reduction in metric tons of CO2 equivalents/year	No Impact	11,200	3,500/ 6,000	3,700	No Benefit
				Source: EIR, project merits page 1495, Table 5-1	
Air Quality					
Construction Impacts	No	No	No	No	No
Operational Impacts	Yes	No	No	No	No
				Source: EIR, air quality, page 1128, Table 3.K-7 and Table 3.K-8	
Energy Usage Reduction					
Regional Energy Consumption (million British Thermal Units/ year)	No Impact	130,800	35,000/ 66,500	56,800	No Benefit
				Source: EIR, project merits page 1495, Table 5-1	
Permanent Impact to Sensitive Habitat					
acres	No Impact	approx. 400 acres mitigation required.	approx. 250 acres mitigation required.	Approx. 7 acres mitigation required.	No Impact
				Source: EIR, Biological resources page 881, Table 3.I-8	
Permanent Impact to Waters/Wetlands					
acres	No Impact	0.7 acres mitigation required	0.7 acres mitigation required	0.5 acres mitigation required	No Impact
				Source: EIR, Biological resources page 881, Table 3.I-8	

Project Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Construction Noise					
Exceeds one or more noise threshold during construction (after mitigation)	No Impact	No	No	No	No
					Source: EIR, Noise and Vibrations page 987, Table J-11
Operations Noise					
Exceeds one or more noise threshold during operations (after mitigation)	No Impact	No	No	No	No
					Source: EIR, Noise and Vibrations page 985, Table J-11
Impact to Viewsheds					
	No Impact	Significant and Unavoidable, Highest Impact Among Alternatives	Significant and Unavoidable, Highest Impact Among Alternatives	Significant and Unavoidable, Less of an Impact compared to BART and DMU Alternative	No Impact
					Source: EIR, Visual Quality page 582, Table 3.E-1
Community Impacts					
ROW impacts					
Acres (not including BART property)	No Impact	147	102	10	No Impact
					Source: EIR, executive summary page 7, Table S-1
Equity					
Number of Low Income Households within Transit Catchment					
	See Map	See Map	See Map	See Map	See Map
Minority Population within Transit Catchment					
	See Map	See Map	See Map	See Map	See Map
Number of Limited English Proficiency Households within Transit Catchment					
	See Map	See Map	See Map	See Map	See Map
Impacts on Protected Populations					
Potentially High and Disproportionate Impacts	None	None	None	None	None
					Source: Environmental Justice Technical Report BART to Livermore Extension Project, Parsons, 2017
Roadway					
Reduction in Regional Vehicle Miles Travelled (VMT)					
Average Weekday VMT Reduction	N/A	244,000	140,600	92,600	6,500
					Source: EIR, executive summary page 20, Table S-4

Project Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Congestion (Change in AM peak Hour Delay in Seconds)					
Traffic Delay at Isabel Ave & Airway Blvd (no mitigation proposed)	N/A	24	11	0	0
Traffic Delay at Dublin Blvd & Tassajara Dr (no mitigation proposed)	N/A	-10	-3	0	0
Traffic Delay at Dougherty Rd & Amador Valley Rd (Incl. mitigation)	N/A	See Note	See Note	See Note	See Note
Traffic Delay at Hopyard Rd & Owens Rd (no AM mitigation proposed)	N/A	3	1	0	0
Source: EIR, Transportation page 433, table 3.B-69, Arup Synchro Results Master Spreadsheet					
Note: Dougherty Road and Amador Valley Road Delay not calculated with mitigation, Mitigation = EBR overlap phase in AM; mitigated calculated for worst case only (Conventional BART alternative, cumulative scenario). Other alternatives will have no significant impact after mitigation.					
Traffic Volume (Change in AM peak Hour Volume)					
Dublin Blvd east of Fallon Rd	N/A	EB: - 10 WB: - 460	EB: - 10 WB: - 150	EB: - 10 WB: 50	EB: 0 WB: -20
Airway Blvd west of Isabel Ave	N/A	EB: 300 WB: 10	EB: 160 WB: 30	EB: 20 WB: 0	EB: -20 WB: 10
Airway Blvd east of Isabel Ave	N/A	EB: 980 WB: 140	EB: 760 WB: 140	EB: 0 WB: 0	EB: 0 WB: 0
Dougherty north of Dublin Blvd	N/A	NB: 70 SB: 280	NB: 40 SB: 200	NB: 10 SB: 20	NB: 0 SB: 10
Source: EIR Synchro Model					
Highway Volume (Change in AM Westbound peak hour volumes)					
I-580 East of Greenville Road at Livermore Border	N/A	173	122	36	32
I-580 at the Dublin-Livermore Border (between Fallon and Airway)	N/A	-254	-196	1	19
Source: EIR, Appendix F2 pages 1890 - 1905					

Project Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Screenline Volumes					
Screenline 1 (Livermore West Boarder)	N/A	-1017	-529	-47	-12
Screenline 2 (Livermore East Border)	N/A	311	234	-11	-5

Note: Screenline 1: Change in peak hour WB volumes at Livermore West Border (I-580, Dublin Blvd, Stanley, Jack London, Vineyard Ave, Route 84); Screenline 2: Change in peak hour WB volumes on Livermore East Border (I-580, Altamont Pass, Patterson Pass Rd, Tesla Rd) Source: BLVX Model, Cambridge Systematics

Cumulative Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Ridership Development Plan/ Market Demand					
Net New BART Systemwide Boardings					
BART Average Weekday Increase	N/A	13,400	8,300	4,800	1,800
					Source: EIR, Project Merits page 1495, Table 5-1
Net New Transit Trips					
Transit Average Weekday Increase	N/A	12,400	8,100	4,500	1,500
					Source: BART to Livermore Ridership Projection, Cambridge Systematics, page 43, Table 18
Change in Systemwide Transit Boardings – other transit					
Systemwide Average Weekday Systemwide Boardings for ACE	N/A	(1,400)	(1,000)	(500)	(200)
Systemwide Average Weekday Systemwide Boardings for LAVTA	N/A	700	1,000	2,000	(100)
Systemwide Average Weekday Systemwide Boardings for SJRTD	N/A	(290)	(290)	(270)	-
					Source: BART to Livermore Ridership Projection, Cambridge Systematics, page 43, Table 18
Ridership threshold					
Isabel Station Boardings and Alightings Threshold	N/A	Medium-High	Low-Medium	N/A	N/A
					Note: Ranking based on BART SE Policy
					Source: BART to Livermore Ridership Projection, Cambridge Systematics, page 41, Figure 30, BART System Expansion Policy, page 18
Station Context (qualitative assessment)					
Transit-Orientated Development Potential and Patron Station Experience	N/A	Low	Low	N/A	N/A
					Source: BART System Expansion Policy, page 19

Cumulative Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Tri-Valley BART Station Daily Boarding:					
West Dublin Pleasanton Station Daily Boarding	3,400	3,600	3,500	3,500	3,500
Dublin Pleasanton Station Daily Boarding	10,800	10,000	10,500	13,300	11,600
Isabel Station Daily Boarding	N/A	7,900	4,700	N/A	N/A
All Stations Daily Boarding	14,200	21,500	18,700	16,800	15,100
					Source: EIR, transportation page 293, Figure 3.B-22
Regional Network Connectivity					
Regional transportation gap closure (qualitative assessment)					
Alternative closes a major regional transportation gap	N/A	Low	Low	Low	Low
					Source: BART System Expansion Policy, page 22
Cost					
Total capital					
Total capital (2016 dollars)	N/A	$1,329,000,000	$1,300,000,000 / $1,353,000,000	$305,000,000	$21,000,000
Total capital (YOE dollars)	N/A	$1,635,000,000	$1,599,000,000 / $1,665,000,000	$376,000,000	$25,000,000
					Source: EIR, executive summary page 16, Table S-2
Annual O&M					
2016 dollars	N/A	$22,800,000	$16,800,000 / $16,600,000	$3,000,000	$1,700,000
					Source: EIR, executive summary page 17, Table S-3
Annual O&M Net of Fares					
Annual Rail O&M Net of Rail Fares Cost	N/A	-$2,151,000	$650,000 / $476,000	-$6,183,000	-$2,689,000
Annual Rail+Bus O&M Net of Rail + Bus Fares	N/A	-$329,000	$2,360,000 / $2,186,000	-$4,880,000	-$952,000
					Note: Annualization factor for revenue to daily X 290 days
Annualized Replacement and Rehabilitation Cost					
2016 dollars	N/A	$21,062,000	$18,817,000 / $19,395,000	$5,091,000	$330,000
					Note: cost does not include capital cost

Cumulative Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Annualized Lifecycle Costs					
2016 dollars	N/A	$70,963,000	$62,117,000 / $63,607,000	$14,318,000	$2,464,000
			Note: Lifecycle costs include capital cost + replace and rehab cost + operation and maintenance cost		
Cost-Effectiveness					
Farebox Recovery Ratio					
Farebox Recovery Rail 2040 (2016 dollars)	N/A	110%	96% / 97%	528%	10060%
Farebox Recovery Rail+Bus 2040 (2016 dollars)	N/A	101%	86% / 87%	260%	155%
			Source: Arup calculation based on revenue and O&M costs		
Lifecycle Costs per New BART Boarding in 2040					
Lifecycle Cost per net new Annual BART Boardings 2016 $	N/A	$18.26	$25.81 / $26.43	$10.29	$4.72
			*Note: Lifecycle cost /Average Weekday New BART Boardings * 290(Annualization factor)*		
Costs Net of Fares per New BART Boarding in 2040					
Cost Net of Fares per net new Annual BART Boardings 2016 $	N/A	$12.26	$19.81 / $20.43	$4.29	-$1.28
Cost per Rider: with TOD					
	N/A	Medium-High	Medium/ Medium	N/A	N/A
			Note: BART System Expansion Policy, page 20. Number adjusted from 2002 dollars to 2016 dollars		
Annual O&M cost per Net New BART Boarding in 2040					
	N/A	$5.87	$6.98 / $6.90	$2.16	$3.26
System and Financial Capacity					
Enhances or minimizes demand on core system - Qualitative assessment:					
Yard/Support Facilities	N/A	High	Medium	Medium	Medium
Redundancy/Recovery Capabilities	N/A	Medium	Low	Low	Low
Station and Line Haul Capacity	N/A	Medium	Medium	Medium	Medium
Combined Summary Rating:	N/A	Medium High	Low Medium	Low Medium	Low Medium

Cumulative Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Capital finance plan (qualitative)					
Fully Funded Project	N/A	Not Fully Funded	Not Fully Funded	Fully Funded	Fully Funded
Stability, Reliability and Availability of proposed Funding Sources	N/A	High	High	High	High
Sources not competing for BART System renovation and Core System Capacity needs	N/A	High	High	High	High
Combined Summary Rating:	N/A	Medium	Medium	High	High
Operating finance plan (qualitative) Special fleet/maintenance requirements					
	N/A	High	High	High	Medium
Transit Supportive Land Use and Access					
Existing Densities					
Residential	N/A	Low	Low	Low	Low
Employment	N/A	Low	Low	Low	Low
				Source: BLVX Model, Cambridge Systematics	
Existing Intermodal Connections					
Pedestrian	N/A	Low	Low	Low-Medium	Low-Medium
Bicycle	N/A	Low	Low	Low-Medium	Low-Medium
Transit	N/A	Low	Low	Medium	Medium
Land Use Plans and Policies					
	Low Medium	Medium-High	Medium	Low-Medium	Low-Medium
			Note: Metric from BART System Expansion Policy, page 26		
Parking Supply					
Net New Parking Spaces	N/A	3,952	2,968	770	540
				Source: EIR, project Description page 80, Table 2-1	
Tri- Valley BART Station Average Access Mode Share					
Drive and Park	43%	49%	46%	41%	46%
Other	57%	51%	54%	59%	54%

Cumulative Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Traveller Experience					
In Vehicle Crowding					
Peak Hour Load/car at max load point AM (PM)	Red line: 106 (116) Yellow line: 109 (103) Green line: 113 (112) Blue line: 112 (115) Orange line: 88 (96) Tube: 108 (108)	Red line: 106 (116) Yellow line: 109 (103) Green line: 113 (112) Blue line: 108 (112) Orange line: 90 (98) Tube: 108 (108)	NA	NA	NA
					Source: "Appendix B BART BLVX Operstat - 2040" spreadsheet
Service Reliability					
	N/A	High	High	Medium	Low
Environmental					
GHG Emission Reduction					
reduction in metric tons of CO2 equivalents/year	No Impact	12,800	4,800/ 7,300	4,900	400
					Source: EIR, project merits page 1495, Table 5-1
Air Quality					
Construction Impacts	No	Yes	Yes	No	No
Operational Impacts	Yes	Yes	Yes	No	No
					Source: EIR, air quality, page 1128, Table 3.K-7 and 3.K-8
Energy Usage Reduction					
Regional Energy Consumption (million British Thermal Units/ year)	No Impact	155,900	55,900 / 87,500	74,600	9,600
					Source: EIR, project merits page 1495, Table 5-1
Permanent Impact to Sensitive Habitat					
acres	No Impact	approx. 400 acres mitigation required.	approx. 250 acres mitigation required.	Approx. 7 acres mitigation required.	No Impact
					Source: EIR, Biological resources page 881, Table 3.1-8
Permanent Impact to Waters/Wetlands					
acres	No Impact	0.7 acres mitigation required	0.7 acres mitigation required	0.5 acres mitigation required	No Impact
					Source: EIR, Biological resources page 881, Table 3.I-8

Cumulative Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Construction Noise					
Exceeds one or more noise threshold during construction (after mitigation)	No Impact	No	No	No	No
					Source: EIR, Noise and Vibrations page 987, Table J-11
Operations Noise					
Exceeds one or more noise threshold during operations (after mitigation)	No Impact	No	No	No	No
					Source: EIR, Noise and Vibrations page 985, Table J-11
Impact to Viewsheds					
	No Impact	Significant and Unavoidable, Highest Impact Among Alternatives	Significant and Unavoidable, Highest Impact Among Alternatives	Significant and Unavoidable, Less of an Impact compared to BART and DMU Alternative	No Impact
					Source: EIR, Visual Quality page 582, Table 3.E-1
Community Impacts					
ROW Impacts					
acres (not including BART property)	No Impact	147	102	10	No Impact
					Source: EIR, executive summary page 7, Table S-1
Equity					
Number of Low Income Households within Transit Catchment					
	See Map	See Map	See Map	See Map	See Map
Minority Population with Transit Catchment					
	See Map	See Map	See Map	See Map	See Map
Number of Limited English Proficiency Households within Transit Catchment					
	See Map	See Map	See Map	See Map	See Map
Impacts on Protected Populations					
Potentially High and Disproportionate Impacts	None	None	None	None	None
					Source: Source: Environmental Justice Technical Report BART to Livermore Extension Project, Parsons, 2017
Roadway					
Reduction in Regional Vehicle Miles Travelled (VMT)					
Average Weekday VMT Reduction	N/A	272,700	164,500	112,900	26,800
					Source: EIR, executive summary page 20, Table S-4

Cumulative Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Congestion (Change in AM peak Hour Delay in Seconds)					
Traffic Delay at Isabel Ave & Airway Blvd (no mitigation proposed)	N/A	43	29	0	0
Traffic Delay at Dublin Blvd & Tassajara Dr (no mitigation proposed)	N/A	-5	-4	0	0
Traffic Delay at Dougherty Rd & Amador Valley Rd (Incl. mitigation)	N/A	-7	see note	see note	see note
Traffic Delay at Hopyard Rd & Owens Rd (no AM mitigation proposed)	N/A	-4	-4	-6	-7
Source: EIR, Transportation page 433, table 3.B-69, Arup Synchro Results Master Spreadsheet *Note: Dougherty Road and Amador Valley Road Delay not calculated with mitigation, Mitigation = EBR overlap phase in AM; mitigated calculated for worst case only (Conventional BART alternative, cumulative scenario). Other alternatives will have no significant impact after mitigation.*					
Traffic Volume (Change in AM peak Hour Volume)					
Dublin Blvd east of Fallon Rd	N/A	EB: 10 WB: -300	EB: 10 WB: -240	EB: 0 WB: -10	EB: 10 WB: -10
Airway Blvd west of Isabel Ave	N/A	EB: 380 WB: 70	EB: 280 WB: 70	EB: -10 WB: 10	EB: -20 WB: 10
Airway Blvd east of Isabel Ave	N/A	EB: 670 WB: 250	EB: 670 WB: 180	EB: 0 WB: 0	EB: 0 WB: 20
Dougherty north of Dublin Blvd	N/A	NB: 60 SB: 310	NB: 40 SB: 250	NB: 10 SB: 30	NB: 10 SB: 40
Source: EIR Synchro Model, Arup					
Highway Volume (Change in AM Westbound peak hour volumes)					
I-580 East of Greenville Road at Livermore Border	N/A	264	172	35	32
I-580 at the Dublin-Livermore Border (between Fallon and Airway)	N/A	-253	-139	24	19
Source: EIR, Appendix F2 pages 1890 - 1905					

Cumulative Scenario Results 2040

Metric	No Project	Proposed Project - Conventional BART	DMU/EMU Alternative	Express Bus/BRT Alternative	Enhanced Bus Alternative
Screenline Volumes					
Screenline 1 (Livermore West Boarder)	N/A	-556	-505	26	30
Screenline 2 (Livermore East Border)	N/A	474	405	19	16

Note: Screenline 1: Change in peak hour WB volumes at Livermore West Border (I-580, Dublin Blvd, Stanley, Jack London, Vineyard Ave, Route 84); Screenline 2: Change in peak hour WB volumes on Livermore East Border (I-580, Altamont Pass, Patterson Pass Rd, Tesla Rd)

Source: BLVX Model, Cambridge Systematics

Appendix B – Summary of Significant Impacts – BART to Livermore Extension Draft Project EIR

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
3.B TRANSPORTATION								
Impact TRAN-1: Result in a significant delay, safety hazard, or diminished access during construction		✓	✓	✓	✓		**Mitigation Measure TRAN-1:** Develop and Implement a Construction Phasing and Traffic Management Plan	LSM
Impact TRAN-3: General-purpose lane freeway segments operating at unacceptable LOS, under 2025 Project Conditions		✓	✓	✓	✓		No feasible mitigation measures	SU
Impact TRAN-4: General-purpose lane freeway segments operating at unacceptable LOS, under 2040 Project Conditions		✓	✓	✓			No feasible mitigation measures	SU
Impact TRAN-5: HOV/express lane freeway segments operating at unacceptable LOS, under 2025 Project Conditions			✓	✓			No feasible mitigation measures	SU

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
Impact TRAN-7: Intersections operating at unacceptable LOS, under 2025 Project Conditions		✓	✓	✓	✓		**Mitigation Measure TRAN-7a:** Improvements for Intersections #2, #5, #39, and #48 under 2025 Project Conditions (*Conventional BART Project*) **Mitigation Measure TRAN-7b:** Improvements for Intersections #2, #5, and #48 under 2025 Project Conditions (*DMU Alternative/EMU Option)* **Mitigation Measure TRAN-7c:** Improvements for Intersection #48 under 2025 Project Conditions (*Express Bus/BRT Alternative)*	LSM (Express Bus/BRT Alternative) SU (Conventional BART and DMU Alternative/EMU Option)
Impact TRAN-8: Intersections operating at unacceptable LOS, under 2040 Project Conditions		✓	✓	✓	✓		**Mitigation Measure TRAN-8a:** Improvements for Intersections #1, #2, #5, #35, #39, #45, #48, and #50 under 2040 Project Conditions (*Conventional BART Project*) **Mitigation Measure TRAN-8b:** Improvements for Intersections #1, #2, #5, and #48 under 2040 Project Conditions (*DMU Alternative/EMU Option*) **Mitigation Measure TRAN-8c:** Improvements for Intersection #5 under 2040 Project Conditions (*Express Bus/BRT Alternative*)	SU

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
Impact TRAN-16(CU): General-purpose lane freeway segments operating at unacceptable LOS, under 2040 Cumulative Conditions		✓	✓	✓			No feasible mitigation measures	SU
Impact TRAN-19(CU): Intersections operating at unacceptable LOS, under 2025 Cumulative Conditions		✓	✓	✓	✓	✓	**Mitigation Measure TRAN-19a:** Improvements for Intersections #5, #38, #39, and #48 under 2025 Cumulative Conditions (*Conventional BART Project*) **Mitigation Measure TRAN-19b:** Improvements for Intersections #2, #5, #48, and #50 under 2025 Cumulative Conditions (*DMU Alternative/EMU Option*) **Mitigation Measure TRAN-19c:** Improvements for Intersection #2 under 2025 Cumulative Conditions (*Express Bus/BRT Alternative*) **Mitigation Measure TRAN-19d:** Improvements for Intersection #48 and #50 under 2025 Cumulative Conditions (*Enhanced Bus Alternative*)	LSM (Express Bus/BRT Alternative and Enhanced Bus Alternative) SU (Conventional BART and DMU Alternative/EMU Option)

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
Impact TRAN-20(CU): Intersections operating at unacceptable LOS, under 2040 Cumulative Conditions		✓	✓	✓	✓	✓	**Mitigation Measure TRAN-20a:** Improvements for Intersections #1, #2, #17, #35, #38, #39, #45, #48, and #50 under 2040 Cumulative Conditions (*Conventional BART Project*) **Mitigation Measure TRAN-20b:** Improvements for Intersections #1, #2, #5, #17, #35, #39, #48, and #50 under 2040 Cumulative Conditions (*DMU Alternative/EMU Option*) **Mitigation Measure TRAN-20c:** Improvements for Intersections #1, #2, #5, and #50 under 2040 Cumulative Conditions (*Express Bus/BRT Alternative*) **Mitigation Measure TRAN-20d:** Improvements for Intersections #1, #2, #5, #17, and #50 under 2040 Cumulative Conditions (*Enhanced Bus Alternative*)	SU
3.C LAND USE AND AGRICULTURAL RESOURCES								
Impact AG-1: Directly convert Farmland		✓	✓	✓			**Mitigation Measure AG-1:** Provide Compensatory Farmland under Permanent Protection	SU
Impact AG-3: Conflict with zoning for agricultural use		✓	✓	✓			See **Mitigation Measure AG-1** (above)	SU
Impact AG-5(CU): Convert or result in conversion of Farmland		✓	✓	✓			No feasible mitigation measures	SU

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
3.D POPULATION AND HOUSING								
Impact PH-2: Displace substantial numbers of existing housing or people necessitating the construction of replacement housing elsewhere		✓	✓	✓			**Mitigation Measure PH-2:** Acquisition of Property and Relocation Assistance	LSM
Impact PH-3: Displace substantial numbers of existing businesses		✓	✓	✓	✓		See **Mitigation Measure PH-2** (above)	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		✓	✓	✓	✓		**Mitigation Measure VQ-1.A:** Visually Screen Staging Areas **Mitigation Measure VQ-1.B:** Minimize Light Spillover During Construction	LSM
Impact VQ-3: Substantially degrade the existing visual quality		✓	✓	✓			**Mitigation Measure VQ-3.A:** Design Sound Wall with Architectural Treatments **Mitigation Measure VQ-3.B:** Design Parking Garage with Architectural Treatments **Mitigation Measure VQ-3.C:** Screen Storage and Maintenance Facility	SU
Impact VQ-4: Have a substantial adverse effect on a scenic vista		✓	✓	✓			No feasible mitigation measures	SU
Impact VQ-5: Substantially damage scenic resources within State scenic highway		✓	✓	✓	✓		**Mitigation Measure VQ-5:** Revegetate Areas of Removed Landscaping	SU

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
Impact VQ-6: Create a new source of substantial light or glare		✓	✓	✓	✓		**Mitigation Measure VQ-6:** Design and Install Lighting Fixtures to Reduce Spillover	LSM (Express Bus/BRT Alternative) SU (Conventional BART and DMU Alternative/EMU Option)
Impact VQ-7(CU): Have a substantial visual impact under Cumulative Conditions		✓	✓	✓	✓		No feasible mitigation measures	SU
3.F CULTURAL RESOURCES								
Impact CUL-2: Cause a substantial adverse change in the significance of an archaeological resource		✓	✓	✓	✓	✓	**Mitigation Measure CUL-2.A:** Archaeological Resources Investigation for the Cayetano Creek Area (*Conventional BART Project and DMU Alternative/EMU Option*) **Mitigation Measure CUL-2.B:** Discovery of Previously Unknown Archaeological Resources (*Conventional BART Project, DMU Alternative/EMU Option, Express Bus/BRT Alternative, and Enhanced Bus Alternative*)	LSM
Impact CUL-3: Disturb any human remains		✓	✓	✓	✓	✓	**Mitigation Measure CUL-3:** Discovery of Previously Unknown Human Remains	LSM

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
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		✓	✓	✓	✓	✓	See **Mitigation Measure CUL-2.A**, **CUL-2.B**, and **CUL-3** (above)	SU
3.G GEOLOGY, SOILS, SEISMICITY, MINERAL, AND PALEONTOLOGICAL RESOURCES								
Impact PALEO-1: Loss of paleontological resources		✓	✓	✓	✓		**Mitigation Measure PALEO-1A:** Surface Paleontological Survey of the Cayetano Creek Area (*Conventional BART Project and DMU Alternative/EMU Option*) **Mitigation Measure PALEO-1B:** Paleontological Monitoring (*Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative*) **Mitigation Measure PALEO-1C:** Discovery of Previously Unknown Paleontological Resources (*Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative*)	LSM
Impact GEO-5: Fault rupture		✓					**Mitigation Measure GEO-5:** Geotechnical Investigation of the Cayetano Creek Area and Development of Project Design Features	LSM

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
3.H HYDROLOGY AND WATER QUALITY								
Impact HYD-5: Substantially alter drainage patterns – erosion, sedimentation, flooding		✓	✓	✓	✓		**Mitigation Measure HYD-5:** Hydraulic Capacity for Non-Flood Hazard Area Crossings	LSM
Impact HYD-9: Impede or redirect flood flows within a 100-year flood hazard area		✓	✓	✓	✓		**Mitigation Measure HYD-9:** Floodway Hydraulic Analysis	LSM
3.I BIOLOGICAL RESOURCES								
Impact BIO-1: Adversely affect special-status plants, either directly or through habitat modifications		✓	✓	✓	✓		**Mitigation Measure BIO-1.A:** Botanical Surveys for Areas Not Previously Surveyed and Refinement of Project Design **Mitigation Measure BIO-1.B:** Salvage and Relocation of Rare Plants that Cannot be Avoided	LSM
Impact BIO-2: Adversely affect vernal pool fairy shrimp and longhorn fairy shrimp		✓	✓	✓			**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	LSM

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
Impact BIO-3: Adversely affect California tiger salamander and California red-legged frog		✓	✓	✓	✓		**Mitigation Measure BIO-3.A:** Consult with USFWS, Survey Potential Habitat, and Reduce Impacts on Special-status Amphibians during Construction **Mitigation Measure BIO-3.B:** Provide Compensatory Habitat to Mitigate for the Loss and Disturbance of CTS and CRLF Habitat **Mitigation Measure BIO-3.C:** General Measures for Biological Resources Protection during Construction	LSM
Impact BIO-4: Adversely affect western spadefoot		✓	✓	✓			**Mitigation Measure BIO-4:** Preconstruction Survey and Avoidance Measures for the Western Spadefoot	LSM
Impact BIO-5: Adversely affect western pond turtle		✓	✓	✓	✓		**Mitigation Measure BIO-5:** Preconstruction Surveys and Relocation of Western Pond Turtle	LSM
Impact BIO-6: Adversely affect western burrowing owl		✓	✓	✓	✓		**Mitigation Measure BIO-6.A:** Preconstruction Surveys for Burrowing Owl (*Conventional BART Project, DMU Alternative/EMU Option, and Express Bus/BRT Alternative*) **Mitigation Measure BIO-6.B:** Off-site Compensatory Habitat for Burrowing Owl (*Conventional BART Project and DMU Alternative/EMU Option*)	LSM

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
Impact BIO-7: Adversely affect nesting raptors and other nesting birds		✓	✓	✓	✓	✓	**Mitigation Measure BIO-7:** Identify and Avoid Active Nesting Birds during Nesting Season	LSM
Impact BIO-8: Adversely affect special-status bats		✓	✓	✓	✓		**Mitigation Measure BIO-8:** Preconstruction Surveys and Avoidance Measures for Pallid Bat	LSM
Impact BIO-9: Adversely affect American badger		✓	✓	✓			**Mitigation Measure BIO-9:** Preconstruction Surveys and Avoidance Measures for American Badger	LSM
Impact BIO-10: Adversely affect San Joaquin kit fox		✓	✓	✓	✓		**Mitigation Measure BIO-10.A:** Preconstruction Surveys and Avoidance Measures for the San Joaquin Kit Fox (*Conventional BART Project and DMU Alternative/EMU Option*) **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*) See **Mitigation Measure BIO-3.C** above *(Express Bus/BRT Alternative)*	LSM
Impact BIO-11: Have a substantial adverse effect on State or federally protected wetlands or waters		✓	✓	✓	✓		**Mitigation Measure BIO-11.A:** Avoid and Minimize Impacts to Wetlands, Waters of the U.S. and/or Waters of the State **Mitigation Measure BIO-11.B:** Compensatory Mitigation for Wetlands, Waters of the U.S. and/or Waters of the State	LSM

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
Impact BIO-12: Have a substantial adverse effect on riparian habitat or sensitive natural communities		✓	✓	✓	✓		**Mitigation Measure BIO-12.A:** Identify and Avoid Sensitive Natural Communities **Mitigation Measure BIO-12.B:** Compensate for Impacts to CDFW-regulated Sensitive Upland Plant Communities	LSM
Impact BIO-15: Result in loss of protected tees identified in local policies or ordinances		✓	✓	✓	✓		**Mitigation Measure BIO-15:** Conduct an Inventory of Protected Trees, Protect Trees that Remain, and Plant Replacement Trees	LSM
Impact BIO-16(CU): Adversely affect species identified as a candidate, sensitive, or special-status under Cumulative Conditions		✓	✓	✓			No additional mitigation measures beyond those identified for project impacts	SU
3.J NOISE AND VIBRATION								
Impact NOI-1: Expose persons to or generate noise or vibration levels in excess of standards during construction		✓	✓	✓	✓		**Mitigation Measure NOI-1:** Limit Construction Hours and Methods for Pile Driving and Other Construction Activities	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		✓	✓	✓			**Mitigation Measure NOI-5:** Construct Noise Barrier along Airway Boulevard	LSM

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
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		✓	✓	✓			See **Mitigation Measure NOI-5** (above)	LSM
Impact NOI-7: Expose persons to or generate excessive groundborne vibration or groundborne noise levels under 2025 and 2040 Project Conditions			✓				**Mitigation Measure NOI-7:** Vibration-Reducing Design Elements	LSM
3.K AIR QUALITY								
Impact AQ-1: Result in potentially significant, localized dust-related air quality impacts during construction		✓	✓	✓	✓	✓	**Mitigation Measure AQ-1:** BAAQMD Construction Best Management Practices	LSM
Impact AQ-2: Generate emissions of NO_x, PM, and ROGs exceeding BAAQMD significance thresholds during construction		✓	✓	✓			**Mitigation Measure AQ-2:** Construction Emissions Reduction Plan – for Mitigating Mass Emissions for NO_x	LSM
Impact AQ-3: Generate TAC and $PM_{2.5}$ emissions that result in health risks above the BAAQMD significance thresholds during construction		✓	✓	✓	✓		**Mitigation Measure AQ-3:** Construction Emissions Reduction Plan – for Mitigating Cancer Risk	LSM

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
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		✓	✓	✓			See **Mitigation Measure AQ-3** (above)	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	✓						Not applicable	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		✓	✓	✓	✓		No feasible mitigation measures	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	✓	✓	✓	✓			No feasible mitigation measures	S (No Project Alternative) SU (Conventional BART and DMU Alternative/EMU Option)

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
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						✓	**Mitigation Measure GHG-3:** Obtain Carbon Offsets For Bus Emissions	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	✓						Not applicable	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	✓						Not applicable	S

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
3.M ENERGY								
Impact EN-3: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2025 Project Conditions						✓	**Mitigation Measure EN-3:** Incorporate Renewable Energy Features	SU
Impact EN-4: Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Project Conditions	✓					✓	See **Mitigation Measure EN-3** (above)	S (No Project Alternative) SU (Enhanced Bus Alternative)
Impact EN-6(CU): Result in wasteful, inefficient, or unnecessary consumption of energy, under 2040 Cumulative Conditions	✓						Not applicable	S
3.N PUBLIC HEALTH AND SAFETY								
Impact PHS-1: Create a potential public or environmental health hazard; undue potential risk for health-related accidents; or result in a safety hazard for people residing or working in the project area during construction		✓	✓	✓	✓	✓	**Mitigation Measure PHS-1.A:** Prepare Phase I ESA and Phase II ESA, as Necessary **Mitigation Measure PHS-1.B:** Soil Management Plan **Mitigation Measure PHS-1.C:** Hazardous Materials and Hazardous Waste Management Plan **Mitigation Measure PHS-1.D:** Fueling Procedures during Construction **Mitigation Measure PHS-1.E:** Emergency Response Plan during Construction	LSM

TABLE S-5 SUMMARY OF SIGNIFICANT IMPACTS

Impact Summary	No Project Alternative	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative	Mitigation Measure Title	Impact Significance after Mitigation
Impact PHS-2: Physically interfere with an adopted emergency response or evacuation plan during construction		✓	✓	✓	✓		See **Mitigation Measure TRAN-1** (above)	LSM
3.O COMMUNITY SERVICES								
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		✓	✓	✓	✓		See **Mitigation Measure TRAN-1** (above)	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		✓	✓	✓	✓		**UTIL-1.A:** Restrict Service Interruptions to Off-Peak Periods **UTIL-1.B:** Arrange Temporary Backup Service **UTIL-1.C:** Notify Customers of Service Interruptions	LSM

Notes: 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.
DMU = diesel multiple unit; EMU = electrical multiple unit; BRT = bus rapid transit; LOS = level of service; USFWS = United States Fish and Wildlife Service; CTS = California tiger salamander; CRLF = California red-legged frog; BUOW = burrowing owl; SJKF = San Joaquin kit fox; 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 less than 2.5 microns in diameter; GHG = greenhouse gas.

Appendix C – Air Quality Emissions

The operational emissions for the Proposed Project and build alternatives are shown in **Table C-1** (average net daily emissions) and **Table C-2** (net annual emissions). The Proposed Project and alternatives would not result in significant impacts related to emissions of Reactive Organic Gases (ROGs), Nitrogen Oxides (NO_x) and Particulate Matter (PM) in 2040, and no mitigation measures are required.

In 2040, the Proposed Project would result in a net reduction in VMT for passenger vehicles compared to the 2040 No Project Conditions. The passenger vehicles would also have fewer emissions due to the California Air Resource Board's (CARB's) requirements for cleaner vehicles in 2040. Thus, there would be a net reduction in emissions for PM_{10} and $PM_{2.5}$ for passenger vehicles. Buses also would have lower emissions in 2040, consistent with regulatory requirements.

The DMU Alternative would also have reductions in PM_{10} and $PM_{2.5}$ compared to the No Project Alternative, but these reductions would not be as great as the Proposed Project. The emissions for the EMU Option would be slightly lower than the DMU Alternative, as EMU vehicles have no direct emissions. The Express Bus / BRT Alternative would have lower ROG emissions compared to the Proposed Project, but higher NO_x and $PM_{2.5}$ emissions. Similarly, the Enhanced Bus Alternative would have lower ROG emissions compared to the Proposed Project, but higher NO_x and $PM_{2.5}$ emissions.

Table C-1 – 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_{25} = fine particulate matter
*Compared with 2040 No Project Conditions

Table C-2– 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_{25} = 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 distinguished here to clarify that it is not a metric ton, which is equivalent to 1,000 kilograms.
*Compared with 2040 No Project Conditions

Appendix D – Responses to Selected Comments Received

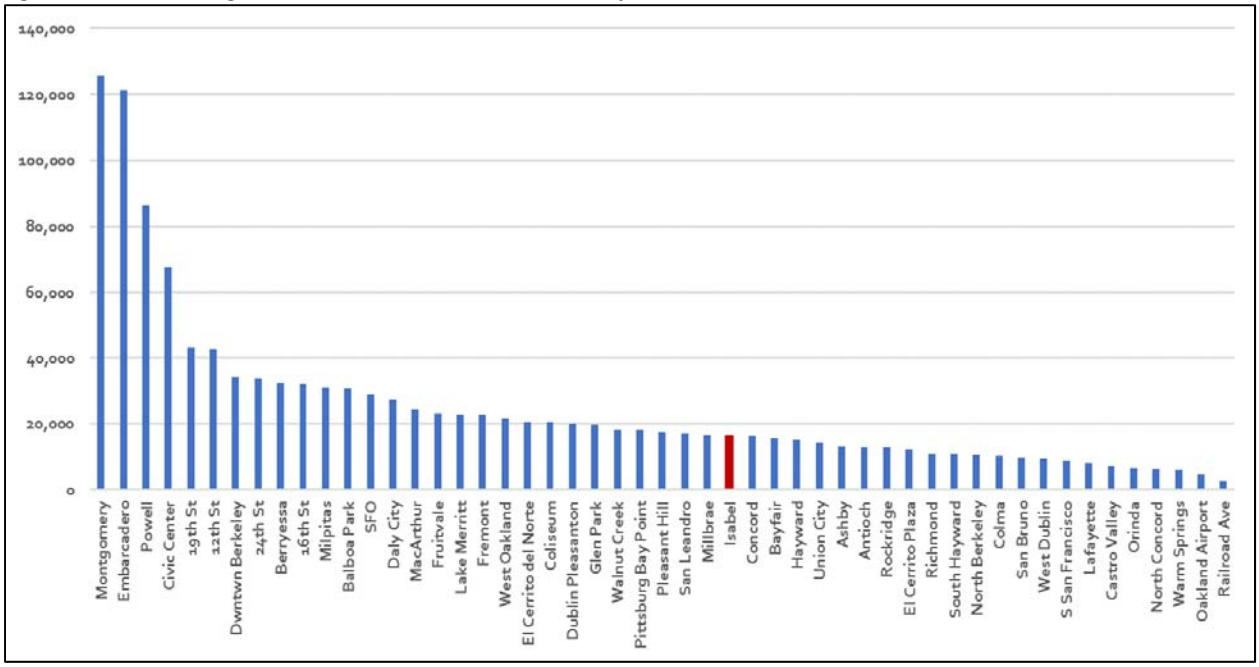
BART received several comments on the previous February 2018 version of the Evaluation Report. This Appendix responds to selected comments received that may be of general interest.

Projected Ridership of the Proposed Project Compared to Other BART Stations

Comment: Show how projected ridership at the Isabel BART station would compare to 2040 ridership for other BART stations.

Figure 1 shows projected 2040 ridership from the Isabel BART station under the Proposed Project. The chart shows Isabel BART station projected ridership in relation to projected ridership for all other BART stations. In 2040, the Isabel BART station is estimated to have 16,200 average weekday boardings and exits, which falls between the projected 2040 boardings and exits for the Millbrae BART station and Concord BART station.

Figure 1: 2040 Boardings and Exits at Isabel BART Station Compared to Other BART Stations



Source: BART Financial Planning, 2017

Vehicle Trips Reduced by Alternative

Comment: What is the number of daily trips that would be expected to be removed from the road network under the Proposed Project and Alternatives?

Vehicle trips are anticipated to be reduced under Conventional BART and the Alternatives compared to No Project. Table 2 shows the number of daily vehicle trips removed from the road network under the Proposed Project and Alternatives in the year 2040.

Table 2: Number of Daily Vehicle Trips Removed by the Proposed Project and Alternatives (2040)

	Conventional BART	DMU/EMU	Express Bus/BRT	Enhanced Bus
Daily Vehicle Trips Removed	8,800	5,400	3,000	500

Source: Cambridge Systematics, Arup, 2017

Freeway Traffic Conditions with Conventional BART

Comment: Show how much traffic would be reduced on I-580 at Isabel under Conventional BART compared to baseline conditions.

Compared with the projected vehicle volumes in 2040 with No Project, the number of daily vehicles would decrease by 3,000 on westbound I-580 west of the new Isabel BART station for the Conventional BART Alternative under project-only conditions, and increase by 2,000 east of the new Isabel BART station. Under the cumulative conditions (which are defined on page 20 of the Evaluation Report), the vehicles on westbound I-580 would also decrease by 3,000 compared with No Project, and would increase by 4,000 vehicles east of the new Isabel BART station. Table 1 shows the comparison of projected 2040 vehicle volumes on I-580 at Isabel BART station between No Project, Conventional BART under project-only conditions, and Conventional BART under cumulative conditions.

Table 3: I-580 Westbound Daily Vehicle Volumes

	2040 No Project Vehicle Volumes	2040 Conventional BART Project-Only Conditions Vehicle Volumes	2040 Conventional BART Cumulative Conditions Vehicle Volumes
Airway Boulevard to Isabel Avenue	115,000	112,000	112,000
Greenville Road to Flynn Road	101,000	103,000	105,000

Source: Cambridge Systematics, Arup, 2017

Timing and Funding of the Proposed Project in Relation to Other System Improvements

Comment: Consider the timing of the BART core system improvements with the timing of the Conventional BART project or Alternatives to understand whether or not the Proposed Project could be completed at the same time as other BART system improvements.

The Proposed Project and the DMU Alternative/EMU Option are not fully funded and additional funding sources would need to be identified to pay for their design and construction. Since many of the possible funding sources that could fund a BART to Livermore rail extension could also be used to fund BART core system improvements, funding a rail project may affect the timing for funding core system improvements. The Express Bus/BRT Alternative and Enhanced Bus Alternative are fully funded with dedicated sources and would therefore not impact core systems investments.