ROAD REPAIR AND ACCOUNTABILITY ACT OF 2017
PROJECT BASELINE AGREEMENT
Purchase Zero Emission Buses – Phase 2

Resolution LPP-P-1920-10B
(will be completed by CTC)

1. FUNDING PROGRAM

☐ Active Transportation Program

☒ Local Partnership Program (Competitive)

☐ Solutions for Congested Corridors Program

☐ State Highway Operation and Protection Program

☐ Trade Corridor Enhancement Program

2. PARTIES AND DATE

2.1 This Project Baseline Agreement (Agreement) for the *Purchase Zero Emission Buses – Phase 2 Project*, effective on, June 24, 2020 (will be completed by CTC), is made by and between the California Transportation Commission (Commission), the California Department of Transportation (Caltrans), the Project Applicant, *Alameda-Contra Costa Transit District*, and the Implementing Agency, *Alameda-Contra Costa Transit District*, sometimes collectively referred to as the "Party".

3. RECITAL

3.2 Whereas at its May 16, 2018 meeting the Commission approved the Local Partnership Program (Competitive) Program, and included in this program of projects the *Purchase Hybrid Buses Project*, the parties are entering into this Project Baseline Agreement to document the project cost, schedule, scope and benefits, as detailed on the Project Programming Request Form attached hereto as Exhibit A and the Project Report attached hereto as Exhibit B, as the baseline for project monitoring by the Commission.

3.3 Whereas at its June 24, 2020 meeting, the Commission approved this modification to the *Purchase Hybrid Buses Project*, the parties are entering into this Project Baseline Agreement to document the project cost, schedule, scope and benefits, as detailed on the Project Programming Request Form attached hereto as Exhibit A and the Supplemental Project Report attached hereto as Exhibit B, as the baseline for project monitoring by the Commission.

3.4 The undersigned Project Applicant certifies that the funding sources cited are committed and expected to be available; the estimated costs represent full project funding; and the scope and description of benefits is the best estimate possible.

4. GENERAL PROVISIONS

The Project Applicant, Implementing Agency, and Caltrans agree to abide by the following provisions:

4.1 To meet the requirements of the Road Repair and Accountability Act of 2017 (Senate Bill [SB] 1, Chapter 5, Statutes of 2017) which provides the first significant, stable, and on-going increase in state transportation funding in more than two decades.

4.2 To adhere, as applicable, to the provisions of the Commission:

☒ Resolution LPP-P-1920-06, amending resolution LPP-P-1718-01, "Adoption of Program of Projects for the Local Partnership Program", dated May 16, 2018.

4.3 All signatories agree to adhere to the Commission's Local Partnership Program Guidelines. Any conflict between the programs will be resolved at the discretion of the Commission.

4.4 All signatories agree to adhere to the Commission's SB 1 Accountability and Transparency Guidelines and policies, and program and project amendment processes.

4.5 The Alameda-Contra Costa Transit District agrees to secure funds for any additional costs of the project.

4.6 The Alameda-Contra Costa Transit District agrees to report to Caltrans on a quarterly basis on the progress made toward the implementation of the project, including scope, cost, schedule, outcomes, and anticipated benefits.

4.7 Caltrans agrees to prepare program progress reports on a quarterly basis; after July 2019, reports will be on a semi-annual basis and include information appropriate to assess the current state of the overall program and the current status of each project identified in the program report.

4.8 The Alameda-Contra Costa Transit District agrees to submit a timely Completion Report and Final Delivery Report as specified in the Commission's SB 1 Accountability and Transparency Guidelines.

4.9 All signatories agree to maintain and make available to the Commission and/or its designated representative, all work related documents, including without limitation engineering, financial and other data, and methodologies and assumptions used in the determination of project benefits during the course of the project, and retain those records for four years from the date of the final closeout of the project. Financial records will be maintained in accordance with Generally Accepted Accounting Principles.

4.10 The Transportation Inspector General of the Independent Office of Audits and Investigations has the right to audit the project records, including technical and financial data, of the Department of Transportation, the Project Applicant, the Implementing Agency, and any consultant or sub-consultants at any time during the course of the project and for four years from the date of the final closeout of the project, therefore all project records shall be maintained and made available at the time of request. Audits will be conducted in accordance with Generally Accepted Government Auditing Standards.

5. SPECIFIC PROVISIONS AND CONDITIONS

5.1 Project Schedule and Cost
See Project Programming Request Form, attached as Exhibit A.

5.2 Project Scope
See Supplemental Project Report or equivalent, attached as Exhibit B. At a minimum, the attachment shall include the cover page, evidence of approval, executive summary, and a link to or electronic copy of the full document.

5.3 Other Project Specific Provisions and Conditions

Attachments:

Exhibit A: Project Programming Request
Exhibit B: Supplemental Project Report

SIGNATURE PAGE
TO
PROJECT BASELINE AGREEMENT

Purchase Zero Emission Buses

Resolution LPP-P-1920-10B

Michael Hursh — Date: 11 May 2020

Alameda-Contra Costa Transit District, General Manager

Project Applicant

Michael Hursh — Date: 11 May 2020

Alameda-Contra Costa Transit District, City Manager

Implementing Agency

Tony Tavares — Date: 5/18/2020

Director, District 4

California Department of Transportation

Toks Omishakin — Date: 6.9.20

Director

California Department of Transportation

Mitch Weiss — Date: 08/18/21

Executive Director

California Transportation Commission

STATE OF CALIFORNIA ● DEPARTMENT OF TRANSPORTATION

PROJECT PROGRAMMING REQUEST

DTP-0001 (Revised Mar, 1 2018 v7.08) *General Instructions*

Amendment (Existing Project) Yes						**Date:**	03/10/20
District	**EA**	**Project ID**		**PPNO**	**MPO ID**		
04		0419000094		2320B			

County	**Route/Corridor**	**PM Bk**	**PM Ahd**	**Project Sponsor/Lead Agency**	
ALA				Alameda Contra Costa Transit District	
				MPO	**Element**
				MTC	MT

Project Manager/Contact	**Phone**	**E-mail Address**
Evelyn Ng	(510) 891-5405	eng@actransit.org

Project Title

Purchase Zero Emission Buses - Phase 2

Location (Project Limits), Description (Scope of Work)

In Alameda and Contra Costa counties across 13 densely populated cities and adjacent unincorporated areas. This project will procure 40 zero-emission replacement buses (20 fuel cell and 20 battery electric). All procured buses will be equipped with real-time bus dispatch and tracking systems, electronic and cash fare collection, traffic signal priority systems and bike racks.

Component	**Implementing Agency**
PA&ED	Alameda Contra Costa Transit District
PS&E	Alameda Contra Costa Transit District
Right of Way	Alameda Contra Costa Transit District
Construction	Alameda Contra Costa Transit District

Legislative Districts

Assembly:	15,17,18,20,25	**Senate:**	9,10,11	**Congressional:**	11,12,13,15

Project Benefits

The benefits of this project include 1. reducing greenhouse gases as all buses purchased will be zero emission buses 2. meet increasing demand for transit service 3. increase connections to other modes of travel including rail and ferry and 4. serve Disadvantaged Communities better by providing greater air and environmental quality with new zero emission buses.

Purpose and Need

Forty buses will replace diesel buses that are due for retirement. With buses retiring, there is a need to purchase new buses to replace them in order to maintain fleet size and service levels.

Category	**Outputs/Outcomes**	**Unit**	**Total**
Intercity Rail/Mass Trans	Rail car(s) / transit vehicle(s)	Each	40

ADA Improvements No	Bike/Ped Improvements No	Reversible Lane analysis	No
Inc. Sustainable Communities Strategy Goals	Yes	Reduces Greenhouse Gas Emissions	Yes

Project Milestone			**Existing**	**Proposed**
Project Study Report Approved				
Begin Environmental (PA&ED) Phase				06/01/19
Circulate Draft Environmental Document	**Document Type**	ND		12/01/19
Draft Project Report				
End Environmental Phase (PA&ED Milestone)				02/28/20
Begin Design (PS&E) Phase			10/01/2018	03/31/20
End Design Phase (Ready to List for Advertisement Milestone)			12/01/2018	07/01/20
Begin Right of Way Phase				
End Right of Way Phase (Right of Way Certification Milestone)				
Begin Construction Phase (Contract Award Milestone)			12/01/2018	12/31/20
End Construction Phase (Construction Contract Acceptance Milestone)			06/01/2020	12/31/22
Begin Closeout Phase			07/01/2020	03/01/23
End Closeout Phase (Closeout Report)				03/01/24

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PROJECT PROGRAMMING REQUEST

Additional Information

The project milestone schedule and funding info provided are for Phase 1 and Phase 2 of the project. The environmental benefits of replacing 40 diesel buses with 40 zero-emission buses are significant, estimated at an 97% reduction in particulate matter PM2.5, and 100% reduction in other greenhouse gases. In addition, 40 zero-emission buses also save much more in terms of greenhouse gas production, measured by grams of CO2e per mile. The 40 zero-emission buses would produce only 33% of what 59 diesel-hybrid buses would emit, based on 1,078 grams of CO2e per mile for a zero-emission bus, compared to 2,212 grams for a diesel-hybrid bus. Significant amounts of greenhouse gases will be reduced by purchasing 40 zero-emission buses instead of 59 diesel hybrids. The environmental benefits of purchasing 40 zero-emission buses instead of 59 diesel hybrid buses are compared in this table:

Greenhouse Gas Type	59 Diesel Hybrid Buses	40 Zero Emission Buses	Percentage reduction
PM 2.5 (metric tons)	0.1217	0.0024	97%
PM10 (metric tons)	0.1217	0	100%
CO2 (metric tons)	3624.9600	0	100%
CO (metric tons)	29.3156	0	100%
NOx (metric tons)	14.9344	0	100%
CO2e per mile	125,198	43,120	50%

STATE OF CALIFORNIA ● DEPARTMENT OF TRANSPORTATION

PROJECT PROGRAMMING REQUEST

DTP-0001 (Revised Mar, 1 2018 v7.08)

Date: 03/10/20

District	County	Route	EA	Project ID	PPNO	Alt. ID
04	ALA, ,	, ,		0419000094	2320B	
Project Title:	Purchase Zero Emission Buses - Phase 2					

Existing Total Project Cost ($1,000s)									
Component	Prior	18-19	19-20	20-21	21-22	22-23	23-24+	Total	**Implementing Agency**
E&P (PA&ED)		253						253	Alameda Contra Costa Transit
PS&E									Alameda Contra Costa Transit
R/W SUP (CT)									Alameda Contra Costa Transit
CON SUP (CT)									Alameda Contra Costa Transit
R/W									Alameda Contra Costa Transit
CON		61,947						61,947	Alameda Contra Costa Transit
TOTAL		62,200						62,200	
Proposed Total Project Cost ($1,000s)									**Notes**
E&P (PA&ED)		1,006						1,006	
PS&E				5,000				5,000	
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON		40,000						40,000	
TOTAL		41,006		5,000				46,006	

Fund No. 1:	**State SB1 LPP - Local Partnership Program - Formula distribution (LPP-F)**								**Program Code**
Existing Funding ($1,000s)									30.10.724.100
Component	Prior	18-19	19-20	20-21	21-22	22-23	23-24+	Total	**Funding Agency**
E&P (PA&ED)		253						253	CTC
PS&E									$253 PAED voted 10/17/18
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL		253						253	
Proposed Funding ($1,000s)									**Notes**
E&P (PA&ED)		253						253	These funds were used for Phase 1.
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL		253						253	

Fund No. 2:	**Local Funds - Local Transportation Funds (LTF)**								**Program Code**
Existing Funding ($1,000s)									20.10.400.100
Component	Prior	18-19	19-20	20-21	21-22	22-23	23-24+	Total	**Funding Agency**
E&P (PA&ED)									AC Transit
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON		46,947						46,947	
TOTAL		46,947						46,947	
Proposed Funding ($1,000s)									**Notes**
E&P (PA&ED)		253						253	Match to SB1 LPP Formula funds. These funds were used for Phase 1.
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL		253						253	

Fund No. 3:	State SB1 LPP - Local Partnership Program - Competitive program (LPP-C)								Program Code
Existing Funding ($1,000s)									30.10.724.100
Component	Prior	18-19	19-20	20-21	21-22	22-23	23-24+	Total	Funding Agency
E&P (PA&ED)									CTC
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON		15,000						15,000	
TOTAL		15,000						15,000	
Proposed Funding ($1,000s)									Notes
E&P (PA&ED)									These funds will be used in Phase 2 for bus purchases. One year allocation extension granted by CTC in June 2019.
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON		15,000						15,000	
TOTAL		15,000						15,000	

Fund No. 4:	TIRCP								Program Code
Existing Funding ($1,000s)									
Component	Prior	18-19	19-20	20-21	21-22	22-23	23-24+	Total	Funding Agency
E&P (PA&ED)									CalSTA
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
Proposed Funding ($1,000s)									Notes
E&P (PA&ED)		500						500	$500,000 was used for Phase 1. $5 million will be used for Phase 2.
PS&E				5,000				5,000	
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL		500		5,000				5,500	

Fund No. 5:	Transit Capital Priorities (Federal Formula)								Program Code
Existing Funding ($1,000s)									
Component	Prior	18-19	19-20	20-21	21-22	22-23	23-24+	Total	Funding Agency
E&P (PA&ED)									FTA, MTC
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
Proposed Funding ($1,000s)									Notes
E&P (PA&ED)									These funds will be used for Phase 2 bus purchases and serve as match for SB1 LPP funds.
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON		25,000						25,000	
TOTAL		25,000						25,000	

STATE OF CALIFORNIA ● DEPARTMENT OF TRANSPORTATION

PROJECT PROGRAMMING REQUEST

DTP-0001 (Revised Mar, 1 2018 v7.08)

Complete this page for amendments only

Date: 03/10/20

District	County	Route	EA	Project ID	PPNO	Alt. ID
04	ALA			0419000094	2320B	

SECTION 1 - All Projects

Project Background

Originally SB1 Competitive funds were for 59 diesel-hybrid buses. AC Transit was approached by TIRCP to combine that grant with SB1 Competitive to purchase zero-emission buses.

Programming Change Requested

Purchase 40 zero-emission buses instead of 59 diesel hybrid buses.

Reason for Proposed Change

AC Transit does not wish to purchase any more hybrid buses going forward as the fleet will be transitioning into a zero emission fleet. Combining the SB1 grant with the TIRCP grant will enable us to purchase a sizeable zero emission fleet and infrastructure to get a headstart on this transition.

If proposed change will delay one or more components, clearly explain 1) reason the delay, 2) cost increase related to the delay, and 3) how cost increase will be funded

1. A project to acquire 40 zero-emission buses requires very detailed facilities and service planning and consider several operational options including which zero emission technology would work best for our service needs. 2. There are no specific cost increases due to the delay, cost increases are related to change in scope items. 3. Cost increases will be funded by FTA formula funds and other regional grant funds.

Other Significant Information

SECTION 2 - For SB1 Projects Only

Project Amendment Request (Please follow the individual SB1 program guidelines for specific criteria)

SECTION 3 - All Projects

Approvals

I hereby certify that the above information is complete and accurate and all approvals have been obtained for the processing of this amendment request.*

Name (Print or Type)	Signature	Title	Date
Eve Ng	Eve Ng	Capital Planning and Grants Manager	3/16/2020

Attachments

1) Concurrence from Implementing Agency and/or Regional Transportation Planning Agency
2) Project Location Map

Local Partnership Program
Benefits Forms

Project Information			
Project Title:	Purchase Zero Emission Buses - Phase 2	Date:	5/1/2020
Project Identifier (EA, PPNO, etc):			

Contact Information			
Nominating Agency:	Alameda-Contra Costa Transit Agency	Agency Completing Form:	Alameda-Contra Costa Transit Agency
Contact Person: Evelyn Ng	Phone: 510 891 5405	Contact Person: Evelyn Ng	Phone: 510 891 5405
Email Address: eng@actransit.org		Email Address: eng@actransit.org	

LPP Indicator	Suggested Measures/Outcomes	Unit	Current	Projected	
				Outcome	Year
Throughput	Average Peak Period Vehicle Trips	Time			
	Average Daily Vehicle Trips (ADT)	Each			
	Reduction in Daily Vehicle Hours of Delay	Hours			
	Daily VMT per capita	Each			
	Average Peak Period Vehicle Trips Multiplied by the Occupancy Rate	Each			
	Average Daily Vehicle Trips Multiplied by the Occupancy Rate	Each			
	Passengers per Vehicle Revenue Hour	Hours			
	Passengers per Vehicle Revenue Mile	Miles			
	Passenger Mile per Train Mile (Intercity Rail)	Miles			
	Boardings per capita	Each			
	Average Daily Passengers	Each	13,503	14,798	**2023**
	In the space below, qualitatively explain the assumptions and methodologies used for proposed throughput outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				
	Current passengers based on current ridership. Projected ridership adds 2% increase per year over current ridership, plus average Transbay ridership for 5 additional expansion buses in 2023.				
Safety	Fatalities per Vehicle Miles Traveled (VMT) and per capita	Each			
	Fatal Collisions per VMT and per capita	Each			
	Injury Collisions per VMT and per capita	Each			
	Other				
	In the space below, qualitatively explain the assumptions and methodologies used for proposed safety outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				
Accessibility	Percentage of population within 1/2 mile of a rail station or bus route.	Percent			
	Average travel time to jobs or school.	Time			
	Other				
	In the space below, qualitatively explain the assumptions and methodologies used for proposed accessibility outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				
Economic Development	Jobs created	Each			
	Benefit/Cost Ratio	Ratio			
	Other				
	In the space below, qualitatively explain the assumptions and methodologies used for proposed economic development outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				

Air Quality and Greenhouse Gas Reductions	Reduction in Particulate Matter (PM2.5)	Tons per year	0.11	0	
	Reduction in Particulate Matter (PM10)	Tons per year	0.11	0	
	Reduction in Carbon Dioxide (CO2)	Tons per year	4791	0	2023
	Reduction in Volatile Organize Compounds (VOC)	Tons per year			
	Reduction in Sulphur Oxides (SOx)	Tons per year			
	Reduction in Carbon Monoxide (CO)	Tons per year	26.5	0	
	Reduction in Nitrogen Oxide (NOx)	Tons per year	13.4	0	
	In the space below, qualitatively explain the assumptions and methodologies used for proposed emissions reduction outcomes.				
	For the proposed project, the reduction in particulate matter and NOx emissions was calculated using the California Air Resource Board (CARB) EMFAC2014 Web Database . The oldest active 40-foot diesel buses in the existing AC Transit fleet were delivered from 2003 through 2005. Assuming the new BEBs or FCEBs would replace older model year buses, EMFAC was run for a model year 2005 urban transit bus. It was assumed each bus travels approximately 40,000 miles per year at an average speed of 15 miles per hour.				
System Preservation	Pavement lane miles	Miles			
	Condition of pavement - percentage	Percent			
	Condition of bridge - percentage	Percent			
	Replacement of end-of-life buses	Each	40	40	
	In the space below, qualitatively explain the assumptions and methodologies used for proposed System Preservation outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				
	This project purchases brand new zero emission buses which replace diesel buses that have reached end of useful life.				
Reliability	Travel Time Variability (buffer index)	Time			
	Daily vehicle hours of delay per capita	Hours			
	Daily congested highway VMT per capita	Each			
	Other				
	In the space below, qualitatively explain the assumptions and methodologies used for proposed Reliability outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				
Mobility	Passenger Hours of Delay / Year	Hours			
	Average Peak Period Travel Time	Time			
	Average Non-Peak Period Travel Time	Time			
	Other				
	In the space below, qualitatively explain the assumptions and methodologies used for proposed Mobility outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				

Project Report

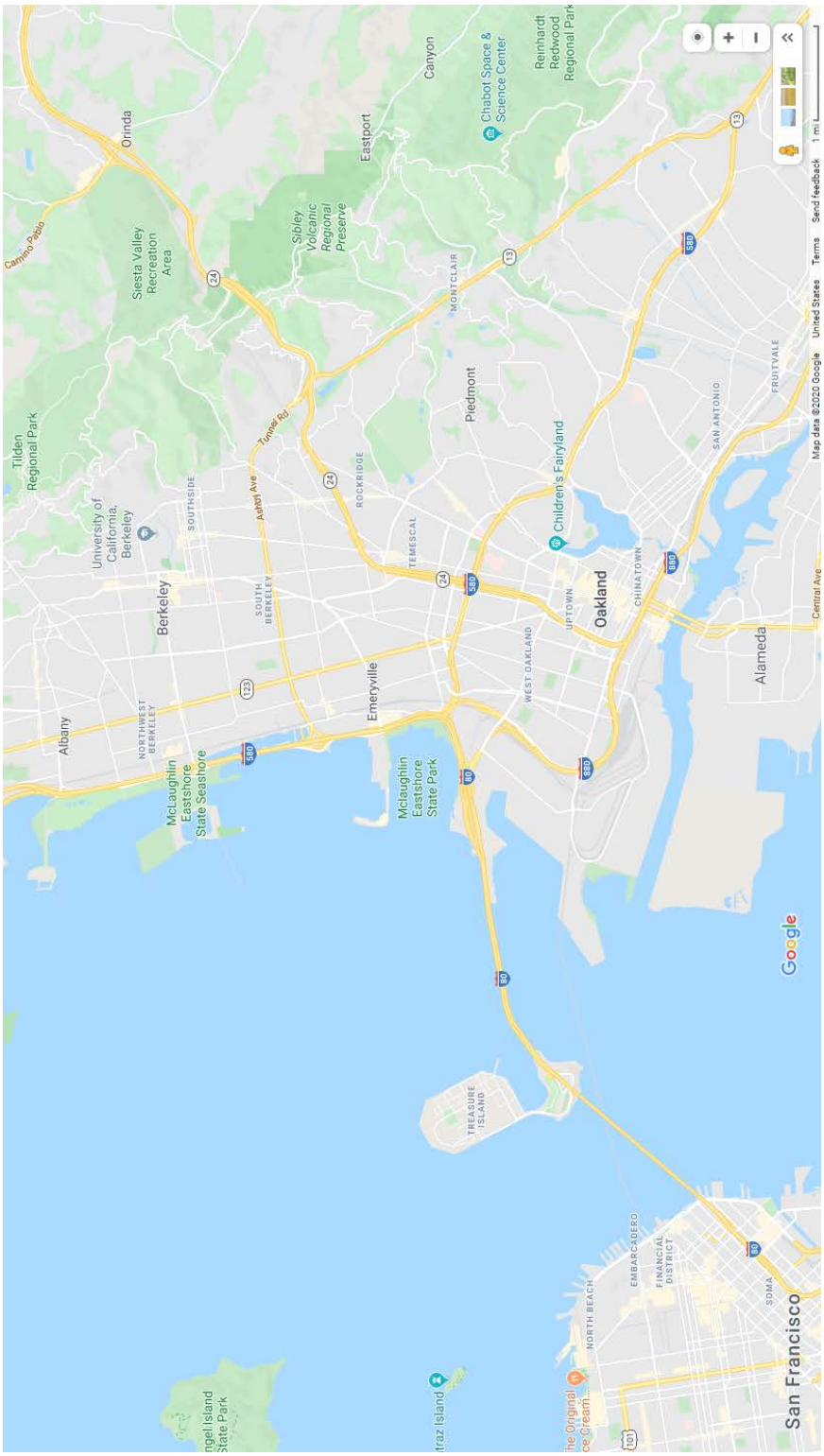
Alameda-Contra Costa Transit District

Purchase Zero-emission Buses Phase 2

PROJECT APPROVED by

Alameda-Contra Costa Transit District Board of Directors on February 26, 2020

Vicinity Map



1. INTRODUCTION

Original Project Title: Purchase 59 Hybrid Buses

New Project Title: Purchase Zero-Emission Buses Phase 2

2. BACKGROUND

Originally the project was adopted into the 2018 LPP Competitive Program to purchase 59 hybrid buses. However, in May 2018 we had an opportunity to leverage the SB1 funds to enhance our TIRCP-funded zero-emissions bus purchase project. In essence, we are combining our SB1 and TIRCP grant awards into a single project to acquire 40 zero-emission buses. This presented a great opportunity for both meeting the state's objectives for innovative clean transit and for our agency to become a leader in zero-emission bus technology as we convert our bus fleet into a zero-emission fleet. Overall the greenhouse gas emissions reduction from 40 zero-emission buses will be greater than for 59 diesel hybrid buses.

Original Project Scope:

This project is for the purchase of up to 59 new 40-foot hybrid diesel-electric buses equipped with realtime bus dispatch and tracking systems, electronic and cash fare collection, and bike racks to replace existing diesel buses that are due for retirement from fleet.

New Project Scope:

The Alameda-Contra Costa Transit District (AC Transit) is planning to purchase 40 zero-emission buses. This project will procure 40 replacement zero-emission buses. The project will be carried out in these phases:

Phase 1. Planning for facilities and service planning.

This phase included preliminary engineering and planning to determine the options for bus technology types and readiness of AC Transit's bus yards to install charging infrastructure. It also produced preliminary costs and schedule for the project. This phase was completed in March 2020.

Phase 2. Purchase of 40 replacement buses (20 fuel cell and 20 battery electric).

All buses purchased will be equipped with real-time bus dispatch and tracking systems, electronic and cash fare collection, traffic signal priority systems and bike racks. The SB1 Competitive funds will be used for Phase 2.

3. PURPOSE AND NEED

Original Project:

The purpose of purchasing up to 59 new hybrid buses is to replace buses that are due for retirement at the end of their 12-year useful life. With buses retiring, there is a need to purchase new buses to replace them in order to maintain fleet size and service levels. Changing the bus propulsion method from diesel to diesel-electric hybrid will reduce emissions and improve fuel economy.

New Project:

The purpose of the project is to purchase 40 replacement zero-emission buses.

AC Transit has several diesel buses that have reached end of useful life and need to be replaced. With buses retiring, there is a need to purchase new buses to replace them in order to maintain fleet size and service levels.

The 40 Zero-Emission Bus Project will be the largest ZEB deployment for AC Transit that will involve both electric and hydrogen technologies. It will provide much needed and valuable information to further assess the viability of ZEBs on a larger scale, and will allow the District to continue to deploy zero-emission buses in preparation for compliance with the California Air Resources Board (CARB) Innovative Clean Transit (ICT) Regulation. CARB has a target of having all transit buses in the state be zero-emission by 2040, which would mean all bus purchases by 2028 need to be zero-emission.

4. FUNDING, PROGRAMMING AND ESTIMATE

Original Project:

The cost estimate for a 40ft hybrid electric bus is approximately $800,000 per bus. Additional funds required for the project will come from a mix Federal Transit Administration 5307 and 5339 funds and regional bridge toll funds (AB664 and BATA) as stated in the Metropolitan Transportation Commission's FY2017-18 to FY2019-20 Transit Capital Priorities Program. AC Transit will apply for other sources of matching funds or provide District funds to cover any additional costs. Total project cost for 59 buses is approximately $47.2 million.

New Project:

Forty zero-emission buses will replace diesel buses that are due for retirement. The main sources of funding are from TIRCP and SB1 grant funds. The project will also

use FTA formula funds (a mix Federal Transit Administration 5307 and 5339 funds) and regional bridge toll funds (AB664 and BATA).

The funding in the table below indicates the funding sources for Phase 2 of the project, which is to purchase 40 zero-emission buses.

Project Items *(in $millions)*	**TYPE OF FUNDS**			**Total**
	TIRCP	**SB1**	**FTA / MTC**	
Bus purchase	$5.0	$15.0	$25.0	$45.0
Total	**$5.0**	**$15.0**	**$25.0**	**$45.0**

Programming

Phase 1: PA & ED $1,006,000
Phase 2: Bus purchase $45,000,000

Fund Source	Fiscal Year Estimate								
20.XX.###.###	Prior	18/19	19/20	20/21	21/22	22/23			Total
Component	In thousands of dollars ($1,000)								
PA&ED	1,006								1,006
Bus purchase		15,000		30,000					45,000
Total	1,006	15,000		30,000					46,006

6. PROEJCT SCHEDULE

Original Project:

Confirmation of vehicle specifications and purchasing process – October 2018
Purchase contract issued – December 2018
Delivery of vehicles – June 2020
Vehicles put into service – July 2020

New Project:

Phase 1 of the project will be completed by March 2020.

Phase 2 is beginning in June 2020 with requesting permission from AC Transit Board of Directors to purchase 40 zero-emission vehicles, followed by negotiation and award of contracts to bus manufacturers between July – December 2020.

The table below indicates anticipated dates for start and end of each milestone.

Phase	Project Milestones	Milestone Date Start	Milestone Date End
1	PA & ED – Preliminary engineering and environmental clearance	02/28/2020	02/28/2020
2	Contract award of 40 replacement zero-emission buses (through state contracts)	07/01/2020	12/31/2020
	Delivery of buses	06/01/2022	12/31/2022
	Testing and acceptance	01/01/2023	06/01/2023
	Close out	06/01/2023	03/01/2024

7. RISKS

Risks for this project are minimal. Bus prices are predetermined as they are currently published by California and Virginia state contracts.

8. PROJECT BENEFITS

A. Reduction of Greenhouse Gas Emissions

Original Project:

Purchasing 59 hybrid buses to replace diesel buses will have a significant impact on emissions. According to a 2008 study done by the National Renewable Energy Lab, hybrid electric vehicles have approximately 43% better fuel economy and lower emissions of CO, CO2, NOx PM10 etc. In addition regenerative braking reduces costs to the brake system (NREL 2008, NREL/CP-540-42534).

New Project:

The environmental benefits of replacing 40 diesel buses with 40 zero-emission buses are significant, estimated at an 97% reduction in particulate matter PM2.5, and 100% reduction in other greenhouse gases. In addition, 40 zero-emission buses also save much more in terms of greenhouse gas production, measured by grams of CO2e per mile. The 40 zero-emission buses would produce only 33% of what 59 diesel-hybrid buses would emit, based on 1,078 grams of CO2e per mile for a zero-emission bus, compared to 2,212 grams for a diesel-hybrid bus.

Significant amounts of greenhouse gases will be reduced by purchasing 40 zero-emission buses instead of 59 diesel hybrids. The environmental benefits of purchasing 40 zero-emission buses instead of 59 diesel hybrid buses are compared in this table:

Greenhouse Gas Type	59 Diesel Hybrid Buses	40 Zero Emission Buses	Percentage reduction
PM 2.5 (metric tons)	0.1217	0.0024	97%
PM10 (metric tons)	0.1217	0	100%
CO2 (metric tons)	3624.9600	0	100%
CO (metric tons)	29.3156	0	100%
NOx (metric tons)	14.9344	0	100%
CO2e per mile	125,198	43,120	50%

B. Disadvantaged Communities

For both the original and new project, the benefits for Disadvantaged Communities is the same as the buses would have been put into service throughout our service area.

Within AC Transit's service area, approximately fifty-four percent (54%) of the total miles driven are in area codes that have Disadvantaged Communities (DACs) within them. In addition, approximately forty-onepercent (41%) of the total stops of all local bus routes are within half a mile from a disadvantaged community. More than half of these routes have DACs within 50% of more of their total route.More than 60% of our service area encompasses Low-income Communities as defined by AB1550, and the majority of our service routes travel through these communities. (See attached Map of AC Transit Routeswithin Disadvantaged Communities and Low-Income Communities).

These new buses will be put in service throughout AC Transit's service area, and will therefore serve a great number of DACs as well as Low-income Communities.

9. ATTACHMENTS

A. Approval from AC Transit Board of Directors – February 26, 2020
B. Map of Low-Income Communities and Disadvantaged Communities AC Transit Routes and

ALAMEDA-CONTRA COSTA TRANSIT DISTRICT

Master Minute Order

File Number: 19-340a

Report ID: 19-340a **Type:** Regular - Planning **Status:** Agenda Ready

Agenda Section:

Meeting Body: Board of Directors - Regular Meeting

Report Created: 01/22/2020

Final Action:

Recommended Action: Consider the following actions associated with the 45 Zero Emission Bus (ZEB) Preliminary Design and Implementation Plan Project:

- Approve a mix of 45 zero emission buses by quantity and by type; and
- Authorize the release of solicitations associated with modifications to District facilities to accommodate an increase in the size of the battery electric bus fleet, including:

1) A Request for Qualifications (RFQ) for Design and Construction Administration (CA) services for the infrastructure required to support the expanded battery electric bus fleet;

2) A Request for Qualifications (RFQ) for Construction Management (CM) services for the infrastructure required to support the expanded battery electric bus fleet; and

3) An Invitation for Bid (IFB) for Construction Services to construct infrastructure required to support the expanded battery electric bus fleet.

Meeting Date: 02/26/2020

Agenda Number: 7.D.

Sponsors:

Enactment Date:

Attachments: STAFF REPORT, Att.1. Presentation

Enactment Number:

Hearing Date:

Effective Date:

History of Legislative File

Acting Body:	Date:	Action:	Sent To:	Due Date:	Return Date:	Result:

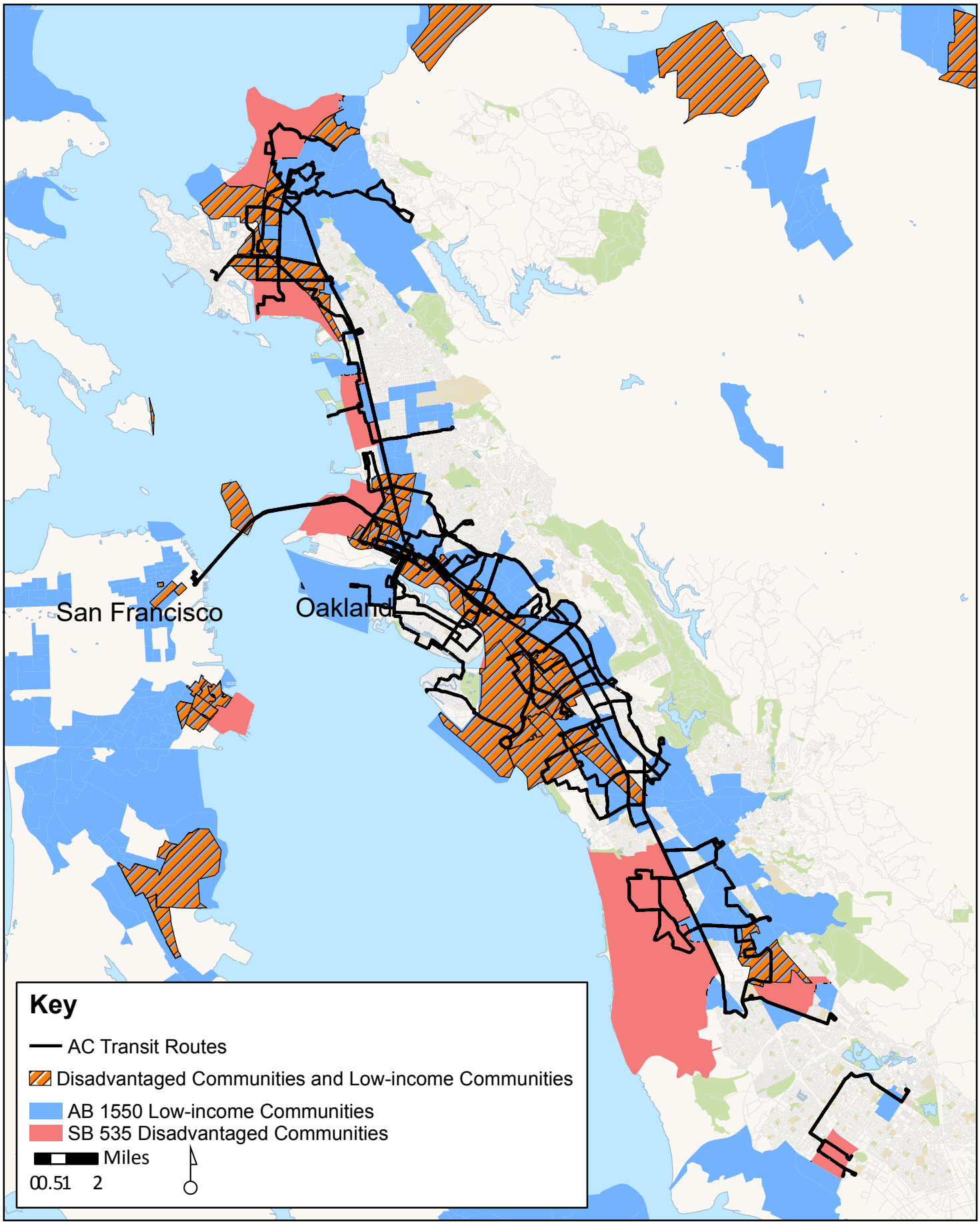
Board of Directors - Regular Meeting | 02/26/2020 Approved | Pass

Action Text: MOTION: PEEPLES/WALLACE to approve Option D to Equalize Quantities of Fuel Cell Electric Buses and Battery Electric Buses; and authorize the release of solicitations associated with modifications to District facilities to accommodate an increase in the size of the battery electric bus fleet, including: 1) a Request for Qualifications (RFQ) for Design and Construction Administration (CA) services for the infrastructure required to support the expanded battery electric bus fleet; 2) a Request for Qualifications (RFQ) for Construction Management (CM) services for the infrastructure required to support the expanded battery electric bus fleet; and 3) an Invitation for Bid (IFB) for Construction Services to construct infrastructure required to support the expanded battery electric bus fleet. The motion carried by the following vote:

Ayes: 7 President Wallace, Vice President Ortiz, Director Harper, Director Williams, Director Shaw, Director Peeples, Director Young

Attachment B

SB 535 Disadvantaged Communities and AB 1550 Low-income Communities Served by AC Transit



Alameda-Contra Costa Transit District

January 25, 2018

Susan Bransen, Executive Director
California Transportation Commission
1120 N Street, MS-52
P.O. Box 942873
Sacramento, CA 95814

Local Partnership Program (Competitive Program)

Dear Ms. Bransen,

With this letter, I am authorizing and approving AC Transit's application for the Senate Bill 1 Local Partnership Program (LPP) Competitive Program to secure funding for the purchase of 59 hybrid buses to replace retiring buses in our fleet.

These buses are needed in order to maintain our fleet and service levels in the East Bay which continues a fast growth rate in terms of jobs and population. Changing the bus propulsion method from diesel to diesel-electric hybrid will reduce emissions and improve fuel economy, which would be greatly beneficial to the environment. This, in particular, would have a very positive impact on the many Disadvantaged Communities that are within our service area.

We estimate that the project will cost approximately $47.2 million in total, and are applying for $15 million in LPP Competitive funds to assist in completing the project. We expect to put the new buses into service by 2020.

We hope you will consider our application for the Local Partnership Program funding favorably as it will support critically needed transit service in the East Bay.

Sincerely,

Michael Hursh
General Manager

ALAMEDA-CONTRA COSTA TRANSIT DISTRICT

APPLICATION FOR LOCAL PARTNERSHIP PROGRAM (COMPETITIVE)

JANUARY 30, 2018

I. PROJECT OVERVIEW

1. PROJECT TITLE

Purchase Hybrid Buses

2. PROJECT DESCPTION

This project is for the purchase of up to 59 new 40-foot hybrid diesel-electric buses equipped with real-time bus dispatch and tracking systems, electronic and cash fare collection, and bike racks to replace existing diesel buses that are due for retirement from fleet.

3. PROJECT SCOPE

The project is for the purchase of up to 59 new 40-foot hybrid electric buses equipped with real-time bus dispatch and tracking systems, electronic and cash fare collection, security cameras, and bike racks. The project is scalable downward – if AC Transit is awarded less than the requested amount, the number of hybrid buses purchased will scale down accordingly.

4. PURPOSE AND NEED

The purpose of purchasing up to 59 new hybrid buses is to replace buses that are due for retirement at the end of their 12-year useful life. With buses retiring, there is a need to purchase new buses to replace them in order to maintain fleet size and service levels. Changing the bus propulsion method from diesel to diesel-electric hybrid will reduce emissions and improve fuel economy.

5. REVERSIBLE LANE CONFIRMATION – Not Applicable

6. PRR FORM (ATTACHED)

II. PROJECT DELIVERY PLAN

1. SCHEDULE

Confirmation of vehicle specifications and purchasing process – October 2018

Purchase contract issued – December 2018

Delivery of vehicles – June 2020

Vehicles put into service – July 2020

2. DELIVERY RISKS

There are few delivery risks to this project as it will be a standard bus purchase project that involves purchase order, delivery, testing and putting the new buses into service. AC Transit currently has several hybrid buses in its fleet and is therefore familiar with the mechanics, maintenance and operations of these buses. Additional funding for the project will come from the Federal Transit Administration and other regional sources. This project is listed in the Metropolitan Transportation Commission's FY17-FY20 Transit Capital Priorities Program.

3. COST ESTIMATE

The cost estimate for a 40ft hybrid electric bus is approximately $800,000 per bus. Additional funds required for the project will come from a mix Federal Transit Administration 5307 and 5339 funds and regional bridge toll funds (AB664 and BATA) as stated in the Metropolitan Transportation Commission's FY2017-18 to FY2019-20 Transit Capital Priorities Program. AC Transit will apply for other sources of matching funds or provide District funds to cover any additional costs.

Total project cost for 59 buses - $47.2 million

4. FINANCIAL CAPACITY

If awarded, AC Transit will complete this project as described. If less than the full request is awarded, then the number of hybrid buses purchased (instead of standard diesel buses) will be reduced accordingly. Cost overruns will be covered by other sources of funding or by utilizing District funds.

III. PROJECT BENEFITS

1. EVALUATION CRITERIA

AC Transit is requesting $15 million in LPP competitive funds, which represents 32% of the overall project costs. An additional 52% of the funds for the project are secured from federal and regional grants and the remaining funds may be secured from other external sources or from District funds. This project is already programmed in the Metropolitan Transportation Commission's Transit Capital Priorities FY2018-FY2020 program and is therefore scheduled to be completed in the next three years.

We do not foresee any obstructions to beginning and completing this project as it will be a standard bus procurement. This project can commence as soon as funding is available.

This project will purchase up to 59 hybrid buses to replace regular diesel buses, which will lead to significant improvement in air quality. Within our Metropolitan Planning Organization, the Sustainable Communities Strategy is explained in the Plan Bay Area planning document. Purchasing new buses meets the maintenance and state of good repair goal of Plan Bay Area (Plan Bay Area 2040 performance target 13). New buses help maintain on-time service, which is the largest factor in rider satisfaction (Plan Bay Area 2040 performance target 11). Reduced emissions by replacing diesel buses with hybrid electric buses will greatly decrease greenhouse gas and other emissions targets (Plan Bay Area 2040 performance targets 1 and 3).

2. EMISSIONS IMPACT

Purchasing 59 hybrid buses to replace diesel buses will have a significant impact on emissions. According to a 2008 study done by the National Renewable Energy Lab, hybrid electric vehicles have approximately 43% better fuel economy and lower emissions of CO, CO2, NOx PM10 etc. In addition regenerative braking reduces costs to the brake system (NREL 2008, NREL/CP-540-42534).

According to a study by Hallmark, Wang and Sperry (2013), where they compared emissions between hybrid and regular diesel buses, the reduction in various greenhouse gases were significant, as summarized below:

Type of Pollutant	Reduction in Emissions for Hybrid compared to Regular Diesel
CO	24% to 40%
CO_2	32% to 98%
NOx	18% to 44%
HC	28% to 88%
PM	51% to 90%

Source: Hallmark, Shauna L., Wang, Bo & Sperry, Robert "Comparison of on-road emissions for hybrid and regular transit buses." Journal of the Air & Waste Management Association Vol. 63, Issue 10, 2013.

The SB1 Emissions Calculator Workbook is attached. The California Life Cycle Benefit/Cost Analysis Model Workbook is not applicable for our project.

3. BENEFIT-COST ANALYSIS

It is difficult to quantify the exact benefit-cost analysis for this project without real time testing to compare the performance of vehicles that were retired and new vehicles that replaced them. Overall, though the purchase price of a hybrid vehicle is approximately 50% higher than that of regular diesel, the savings over the 12 year life of the transit bus will outweigh the upfront cost. These savings would include fuel costs, costs of engine parts, braking and propulsion systems.

IV. COMMUNITY IMPACT

1. COMMUNITY INVOLVEMENT

AC Transit is the third-largest public bus system in California and the largest bus-only public transit system in the United States, serving 13 densely populated cities and adjacent unincorporated areas in Alameda and Contra Costa counties., including the Cities of Oakland, Fremont, Berkeley, Richmond, Hayward, San Leandro, Alameda, Albany, El Cerrito, Emeryville, Newark, Piedmont, and San Pablo. AC Transit provides local, rapid transit, and Transbay commuter service to San Francisco, San Mateo, and Santa Clara counties traversing the San Francisco-Oakland Bay, San Mateo-Hayward, and Dumbarton Bridges.

Letters of support from the following organizations are attached:

a. City of Alameda
b. City of Berkeley
c. City of Newark
d. City of Oakland
e. City of San Leandro

2. COMMUNITY BENEFITS AND IMPACT

i. Disadvantaged Communities

Within AC Transit's service area, approximately fifty-four percent (54%) of the total miles driven are in area codes that have Disadvantaged Communities (DACs) within them. In addition, approximately forty-one percent (41%) of the total stops of all local bus routes are within half a mile from a disadvantaged community. More than half of these routes have DACs within 50% of more of their total route.

More than 60% of our service area encompasses Low-income Communities as defined by AB1550, and the majority of our service routes travel through these communities. (See Maps of AC Transit Routes within Disadvantaged Communities and Low-income Communities)

These new hybrid buses will be put in service throughout AC Transit's service area, and will therefore serve a great number of DACs as well as Low-income Communities.

ii. Benefits and Impacts to Communities in General

There will be no impact to the community as buses will continue to operate on regular schedules. New buses will replace retiring buses as and when they are delivered and prepared to go into service.

iii. Consistency with RTP/SCS

In terms of land use and housing goals, AC Transit service is focused on existing urban areas and Priority Development Areas in Western Alameda and Contra Costa Counties. The renewal of our infrastructure, facilities, and vehicles, supports the regional Planned Bay Area 2040 goal of focused growth in existing communities along the existing transportation network.

Purchasing new buses also meets the maintenance and state of good repair goal of Planned Bay Area (Planned Bay Area 2040 performance target 13). New buses help maintain on-time service, which is the largest factor in rider satisfaction (Planned Bay Area 2040 performance target 11). Reduced emissions by replacing diesel buses with hybrid electric buses will greatly decrease greenhouse gas and other emissions targets (Planned Bay Area 2040 performance targets 1 and 3).

District: HQ

PROJECT: Purchase Hybrid Buses

EA:
PPNO:

PROJECT DESCRIPTION: Purchase Hybrid Buses to Replace Retiring Buses

1A PROJECT DATA

Project Location (enter 1 for So. Cal., 2 for No. Cal., or 3 for rural)	2
Length of Construction Period (years)	2

1B HIGHWAY DATA

Average Daily Vehicle-Miles Traveled (VMT)

	No Build	Build
Base (Year 1)	30,746	30,746
Forecast (Year 20)	38,036	38,036

Percent of VMT

	No Build		Build	
	Default	User Override	Default	User Override
Percent Truck	9%		9%	
Percent Bus	0%		0%	

Trip or Route Length (miles)

	No Build	Build
Average Trip Length for Passenger Vehicles	10	10
Average Trip Length for Trucks	10	10
Average Route Length for Buses	14	14

1C SYSTEM USAGE BY MODE

Vehicle-Miles Traveled (Passenger Vehicles)

	No Build	Build
Base (Year 1)	27979	27979
Forecast (Year 20)	34613	34613

Vehicle-Miles Traveled (Trucks)

	No Build	Build
Base (Year 1)	2767	2767
Forecast (Year 20)	3423	3423

Service-Miles (Buses)

	No Build	Build
Base (Year 1)	0	0
Forecast (Year 20)	0	0

Ton-Miles (Freight Locomotives)

	No Build	Build
Base (Year 1)		
Forecast (Year 20)		

1D AVERAGE SPEED/FUEL CONSUMPTION

Average Speed (Passenger Vehicles)

	No Build	Build
Base (Year 1)	35	35
Forecast (Year 20)	35	35

Average Speed (Trucks)

	No Build	Build
Base (Year 1)	35	35
Forecast (Year 20)	35	35

Average Speed (Buses)

	No Build	Build
Base (Year 1)	13	13
Forecast (Year 20)	13	13

Average Ton-Miles/Gallon (Freight Locomotive)

	No Build	Build
Base (Year 1)	468	468
Forecast (Year 20)	468	468

District: HQ

PROJECT: Purchase Hybrid Buses

EA:
PPNO:

2

INVESTMENT ANALYSIS

SUMMARY RESULTS

EMISSIONS REDUCTION	Short Tons: Total Over 20 Years	Short Tons: Average Annual	Value (mil. $): Total Over 20 Years	Value (mil. $): Average Annual
CO Emissions Saved	0	0	$ -	$ -
CO_2 Emissions Saved	0	0	$ -	$ -
NO_X Emissions Saved	0	0	$ -	$ -
PM_{10} Emissions Saved	0	0	$ -	$ -
$PM_{2.5}$ Emissions Saved	0	0		
SO_X Emissions Saved	0	0	$ -	$ -
VOC Emissions Saved	0	0	$ -	$ -

B

SUMMARY OF EMISSION REDUCTION BENEFITS

Year	TONS EMISSIONS SAVED (tons/yr)						
	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
1	0.000	0	0.000	0	0	0	0
20	0.000	0	0.000	0	0	0	0
2	0.000	0	0.000	0	0	0	0
3	0.000	0	0.000	0	0	0	0
4	0.000	0	0.000	0	0	0	0
5	0.000	0	0.000	0	0	0	0
6	0.000	0	0.000	0	0	0	0
7	0.000	0	0.000	0	0	0	0
8	0.000	0	0.000	0	0	0	0
9	0.000	0	0.000	0	0	0	0
10	0.000	0	0.000	0	0	0	0
11	0.000	0	0.000	0	0	0	0
12	0.000	0	0.000	0	0	0	0
13	0.000	0	0.000	0	0	0	0
14	0.000	0	0.000	0	0	0	0
15	0.000	0	0.000	0	0	0	0
16	0.000	0	0.000	0	0	0	0
17	0.000	0	0.000	0	0	0	0
18	0.000	0	0.000	0	0	0	0
19	0.000	0	0.000	0	0	0	0
Total	**0.000**	**0**	**0.000**	**0**	**0**	**0**	**0**

SUMMARY OF EMISSION REDUCTION BENEFITS

DOLLARS EMISSIONS SAVED (PV $/yr)					
CO	CO_2	NO_X	PM_{10}	SO_X	VOC
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	**0**	**0**	**0**	**0**	**0**

Parameters

This page contains all economic values and rate tables.
To update economic values automatically, change "Economic Update Factor."

General Economic Parameters

Year of Current Dollars for Model	2018	
Economic Update Factor (Using GDP Deflator)	1.00	1
Real Discount Rate	4.0%	2

Travel Time Parameters

	Value	Units	
Statewide Average Hourly Wage	$ 27.34	$/hr	3
Heavy and Light Truck Drivers			
Average Hourly Wage	$ 20.44	$/hr	3
Benefits and Costs	$ 10.97	$/hr	4
Value of Time			
Automobile	$ 13.65	$/hr/per	5
Truck	$ 31.40	$/hr/veh	5
Auto & Truck Composite	$ 18.95	$/hr/veh	6
Transit	$ 13.65	$/hr/per	5
Out-of-Vehicle Travel	2	times	5
Incident-Related Travel	3	times	7
Travel Time Uprater	0.0%	annual incr	

Vehicle Operating Cost Parameters

Average Fuel Price			
Automobile (regular unleaded)	$ 3.18	$/gal	8
Truck (diesel)	$ 3.00	$/gal	8
Sales and Fuel Taxes			
State Sales Tax (gasoline)	2.25%	%	9
State Sales Tax (diesel)	7.50%	%	9
Average Local Sales Tax	0.50%	%	9
Federal Fuel Excise Tax (gasoline)	$ 0.184	$/gal	9
Federal Fuel Excise Tax (diesel)	$ 0.244	$/gal	9
State Fuel Excise Tax (gasoline)	$ 0.278	$/gal	9
State Fuel Excise Tax (diesel)	$ 0.160	$/gal	9
Fuel Cost Per Gallon (Exclude Taxes)			
Automobile	$ 2.65	$/gal	
Truck	$ 2.40	$/gal	
Non-Fuel Cost Per Mile			
Automobile	$ 0.313	$/mi	10
Truck	$ 0.429	$/mi	11
Idling Speed for Op. Costs and Emissions	5	mph	

Accident Cost Parameters

Cost of a Fatality	$ 9,800,000	$/event	12
Cost of an Injury			
Level A (Severe)	$ 466,400	$/event	12
Level B (Moderate)	$ 127,000	$/event	12
Level C (Minor)	$ 64,900	$/event	12
Cost of Property Damage	$ 2,700	$/event	13
Cost of Highway Accident			
Fatal Accident	$ 10,800,000	$/accident	
Injury Accident	$ 148,800	$/accident	
PDO Accident	$ 9,700	$/accident	
Average Cost	$ 185,600	$/accident	
Statewide Highway Accident Rates			
Fatal Accident	0.006	per mil veh-mi	14
Injury Accident	0.29	per mil veh-mi	14
PDO Accident	0.55	per mil veh-mi	14
Non-Freeway	1.05	per mil veh-mi	15

Sources: 1) Office of Management and Budget (OMB), 2) Review of OMB and State Treasurer's Office data, 3) Bureau of Labor Statistics (BLS) OES, 4) BLS Employment Cost Index, 5) USDOT Department Guidance, 6) California Department of Transportation TSI and Traffic Operations, 7) IDAS model, 8) AAA Daily Fuel Gauge Report, 9) California Board of Equalization, 10) AAA Your Driving Costs, 11) American Transportation Research Institute, 12) USDOT VSL, 13) NHTSA, 14) TASAS summary 2013, 15) TASAS summary 2009

Highway Operations Parameters

	Value	Units	
Maximum V/C Ratio	1.56	-	16
Percent ADT in Peak Period		%	
Percent ADT in Average Peak Hour		%	
Annualization Factor	365	days/yr	

	Alpha	Beta	Capacity (vphpl)	Dep. Rate (vphpl)	
Freeway	0.20	10	2,000	1,800	16, 17
Expressway	0.20	10	2,000	1,800	16, 17
Conventional Highway	0.05	10	800	1,400	17
HOV Lanes	0.55	8	1,600		18

Non-HOV Lanes	Alpha	Beta	Capacity (vphpl)
No Build			
Build			

Sources: 16) Highway Capacity Manual, 17) NCHRP 387, 18) PeMS data

Active Transportation Parameters

General Travel Activity Characteristics Parameters	Value	Units	
Cycling Days per Year	365	days	
Walking Days per Year	365	days	
School Days per Year	180	days	
Vehicle Statistics			
Average Vehicle Speed	25	mph	
Average Vehicle Occupancy	1.25	persons / veh	*19*
Active Transportation User Characteristics			
Average Cycling Speed	11.80	mph	*20*
Average Walking Speed	3.00	mph	*21*
Number of Unlinked Cycling Trips per Day	1.93	trips	*19*
Number of Unlinked Pedestrian Trips per Day	2.38	trips	*19*
Diversion of Cyclists from Personal Vehicles	50%	assumption	
Diversion of Pedestrians from Personal Vehicles	50%	assumption	
Value of Travel Time			
Adults	$ 13.65	$/hr/per	
Children	$ 13.65	$/hr/per	
Cycling Journey Quality - Facility Preference Factors as Function of Distance by Facility Class			
Class I	0.57	-	*20*
Class II	0.49	-	*20*
Class III	0.92	-	*20*
Class IV	0.49	-	*20*
Note: Class IV assumed to be the same as Class II			
Walking Journey Quality Values per Mile by Amentity			
Street Lighting	$0.110	$/mi	*22*
Curb Level	$0.078	$/mi	*22*
Crowding	$0.055	$/mi	*22*
Pavement Evenness	$0.026	$/mi	*22*
Information Panels	$0.026	$/mi	*22*
Benches	$0.017	$/mi	*22*
Directional Signage	$0.017	$/mi	*22*
Health (Absenteeism Reduction)			
Average Absence of Employees	3.60	days/yr	*23*
Percentage Covered by Short-Term Sick Leave	95%	%	*24*
Percentage of Sick Days Reduced When Active at Least 30 Minutes per Day	6%	%	*25*
Health (Mortality Reduction)			
Percentage of Cyclists Aged 16-64	73.4%	%	*26*
Percentage of Pedestrians Aged 16-74	80.7%	%	*26*
Percentage Reduction in Mortality per 365 Annual Cycling Miles	4.5%	%	*27*
Percentage Reduction in Mortality per 365 Annual Walking Miles	9.0%	%	*27*
Morality Rate - All Causes (Aged 20-64)	266	#/100,000 people	*28*
Morality Rate - All Causes (Aged 20-74)	395	#/100,000 people	*28*

Sources: 19) 2000-2001 California Statewide Travel Survey, 20) Hood et al., 2011, 21) WHO HEAT Model, 2012, 22) Heuman et al., 2005, 23) CDC, 2007, 24) UK TAG, 2014, 25) WHO, 2003, 26) 2010-2012 California Household Transporation Survey, 27) WHO HEAT Model, 2016, 28) California Department of Health, 2010-2014 Death Rates, Table 5.2

Travel Demand Tables

Project Types

Highway Capacity Expansion			Please select a type of highway project
General Highway		GenHwy	
HOV Lane Addition		HOV	Enter HOV restriction in section 1B
HOT Lane Addition		HOT	Include toll payers as HOVs & check AVOs
Passing Lane		Passing	Enter a truck speed in section 1B
Intersection		Intersect	Remember to run model for both roads
Truck Only Lane		TruckLane	Remember to run macro for truck lane
Bypass		Bypass	Remember to run model for both roads
Queuing		Queuing	Add arrival rate & check departure rate in 1B
Pavement		Pavement	Enter pavement condition in section 1B
Rail or Transit Cap Expansion			Please select a type of rail or transit project
Passenger Rail		PassRail	Enter data in both sections 1B & 1E
Light-Rail (LRT)		LRT	Enter data in both sections 1B & 1E
Bus		Bus	Enter data in both sections 1B & 1E
Hwy-Rail Grade Crossing		HwyRail	Put hwy design in 1B, safety in 1C & crossing in 1D
Hwy Operational Improvement			Please select a type of op. improvement
Auxiliary Lane		AuxLane	Enter ramp design speed & on-ramp volume
Freeway Connector		FreeConn	Check percent traffic in weave in section 1B
HOV Connector		HOVConn	Check percent traffic in weave in section 1B
HOV Drop Ramp		HOVDrop	Check percent traffic in weave in section 1B
Off-Ramp Widening		OffRamp	Check percent traffic in weave in section 1B
On-Ramp Widening		OnRamp	Enter on-ramp volume & metering strategy
HOV-2 to HOV-3 Conv		HOV2to3	Check AVOs & trips in sections 1B & 2D
HOT Lane Conversion		HOTConv	Check AVOs & trips in sections 1B & 2D
Transp Mgmt Systems (TMS)			Please select a type of TMS project
Ramp Metering		RM	Enter model data, if avail, in sections 2A & 2C
Ramp Metering Signal Coord		AM	Enter model data, if avail, in sections 2A & 2C
Incident Management		IM	Enter model data, if avail, in sections 2A & 2C
Traveler Information		TI	Enter model data, if avail, in sections 2A & 2C
Arterial Signal Management		ASM	Complete only sections 1A, 1E & 2C
Transit Vehicle Location (AVL)		AVL	Enter transit agency costs in section 1D
Transit Vehicle Signal Priority		SigPriority	Check travel time in section 1D
Bus Rapid Transit (BRT)		BRT	Enter free-flow bus lane speed in section 1B
TMS Lookup Code		TMSLookup	
User Modified Inputs		UserAdjInputs	

DEMAND FOR TRAVEL IN PEAK PERIOD

(percent of total daily travel)

1	8.5%	8.5%	8.5%	8.5%	8.5%	8.5%
2	16.8%	16.8%	16.8%	16.8%	16.8%	16.8%
3	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
4	32.8%	32.8%	32.8%	32.8%	32.8%	32.8%
5	40.3%	40.3%	40.3%	40.3%	40.3%	40.3%
6	47.4%	47.4%	47.4%	47.4%	47.4%	47.4%
7	54.2%	54.2%	54.2%	54.2%	54.2%	54.2%
8	60.8%	60.8%	60.8%	60.8%	60.8%	60.8%
9	67.1%	67.1%	67.1%	67.1%	67.1%	67.1%
10	73.4%	73.4%	73.4%	73.4%	73.4%	73.4%
11	79.0%	79.0%	79.0%	79.0%	79.0%	79.0%
12	84.3%	84.3%	84.3%	84.3%	84.3%	84.3%
13	88.6%	88.6%	88.6%	88.6%	88.6%	88.6%
14	91.6%	91.6%	91.6%	91.6%	91.6%	91.6%
15	94.3%	94.3%	94.3%	94.3%	94.3%	94.3%
16	96.4%	96.4%	96.4%	96.4%	96.4%	96.4%
17	97.6%	97.6%	97.6%	97.6%	97.6%	97.6%
18	98.5%	98.5%	98.5%	98.5%	98.5%	98.5%
19	99.1%	99.1%	99.1%	99.1%	99.1%	99.1%
20	99.4%	99.4%	99.4%	99.4%	99.4%	99.4%
21	99.7%	99.7%	99.7%	99.7%	99.7%	99.7%
22	99.8%	99.8%	99.8%	99.8%	99.8%	99.8%
23	99.9%	99.9%	99.9%	99.9%	99.9%	99.9%
24	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: California Department of Transportation, 2010-2012 California Household Travel Survey, Final Report Appendix, June 2013

AGE COHORTS FOR MORTALITY RISK REDUCTION

(percent of population)

Mode	Age Cohort	Urban South	Urban North	Rural
Cycling	Age 16-64	70.5%	73.4%	66.0%
Walking	Age 16-74	76.2%	80.7%	70.0%

AVERAGE DISTANCE PER ACTIVE TRANSPORTATION TRIP

(miles/trip)

Mode	Age Cohort	Urban South	Urban North	Rural
Cycling	Adults	1.83	1.85	2.91
	Children <16	0.88	1.03	1.66
Walking	Adults	0.52	0.66	0.29
	Children <16	0.46	0.58	0.42

TRIP PURPOSE FOR ACTIVE TRANSPORTATION TRIPS

(percent of trips)

Mode	Trip Purpose	Urban South	Urban North	Rural
Cycling	Commuting	8%	11%	7%
	Recreation	15%	13%	15%
	Other Destination	77%	76%	78%
Walking	Commuting	5%	9%	4%
	Recreation	10%	10%	15%
	Other Destination	85%	81%	81%

Source: California Department of Transportation, 2010-2012 California Household Travel Survey database, 2012

Operating Cost Tables

FUEL CONSUMPTION RATES

(gal/veh-mi)

Speed	Auto*	Truck
5	0.1024	0.2112
6	0.0971	0.2056
7	0.0919	0.2000
8	0.0867	0.1944
9	0.0815	0.1888
10	0.0763	0.1832
11	0.0727	0.1707
12	0.0691	0.1583
13	0.0656	0.1459
14	0.0620	0.1335
15	0.0584	0.1211
16	0.0560	0.1181
17	0.0536	0.1150
18	0.0513	0.1120
19	0.0489	0.1089
20	0.0465	0.1059
21	0.0449	0.1011
22	0.0433	0.0963
23	0.0417	0.0916
24	0.0401	0.0868
25	0.0384	0.0821
26	0.0374	0.0804
27	0.0363	0.0788
28	0.0352	0.0771
29	0.0341	0.0755
30	0.0330	0.0738
31	0.0323	0.0750
32	0.0316	0.0763
33	0.0310	0.0774
34	0.0303	0.0786
35	0.0296	0.0799
36	0.0292	0.0796
37	0.0288	0.0794
38	0.0284	0.0792
39	0.0280	0.0790
40	0.0276	0.0788
41	0.0274	0.0796
42	0.0272	0.0804
43	0.0270	0.0812
44	0.0268	0.0820
45	0.0266	0.0828
46	0.0266	0.0826
47	0.0266	0.0824
48	0.0266	0.0821
49	0.0266	0.0819
50	0.0266	0.0817
51	0.0268	0.0826
52	0.0270	0.0834
53	0.0272	0.0842
54	0.0274	0.0850
55	0.0275	0.0858
56	0.0279	0.0839
57	0.0283	0.0820
58	0.0286	0.0802
59	0.0290	0.0783
60	0.0293	0.0764
61	0.0300	0.0756
62	0.0306	0.0749
63	0.0312	0.0741
64	0.0319	0.0734
65	0.0325	0.0726
66	0.0331	0.0765
67	0.0337	0.0804
68	0.0343	0.0842
69	0.0350	0.0881
70	0.0356	0.0920

** Includes motorcycles & motorhomes*
Note: Five mph is best estimate for idling

Source: California Air Resources Board, EMFAC2014, 2016 & 2036 average

Accident Tables

HIGHWAY INJURY SEVERITY FREQUENCY
(percent of injuries)

Event	Urban	Suburban	Rural	Average
Severe Injury (A)	4.78%	4.78%	4.78%	4.78%
Other Visible Injury (B)	25.54%	25.54%	25.54%	25.54%
Complaint of Pain (C)	69.68%	69.68%	69.68%	69.68%

Source: 2013 SWITRS Annual Report, Table 8C

RATES FOR NON-HIGHWAY ACCIDENT EVENTS
(events/million veh-mi)

Event	Pass Train	Light Rail	Bus	Freight Rail
Fatality	0.0555	0.2480	0.0349	0.9917
Injury	0.2519	3.9469	3.6535	7.7862
All Accidents	0.2775	5.3817	2.6733	13.5424

Sources: USDOT,Transportation Statistics Annual Report, Table 2-33, 2003 to 2012 average
FRA, Office of Safety Analysis, Table 1.13, 2008 to 2017 YTD average.

NUMBER OF FATALITIES
(events/accident)

Accident Type	Urban	Suburban	Rural	Average
Fatal Accident	1.09	1.08	1.14	1.11

NUMBER OF INJURIES
(events/accident)

Accident Type	Urban	Suburban	Rural	Average
Fatal Accident	0.81	0.82	1.12	0.95
Injury Accident	1.44	1.43	1.50	1.44

NUMBER OF VEHICLES INVOLVED
(events/accident)

Accident Type	Urban	Suburban	Rural	Average
Fatal Accident	1.51	1.69	1.58	1.63
Injury Accident	1.82	2.10	1.59	1.99
PDO Accident	1.80	2.03	1.59	1.96

DISTRIBUTION OF ACCIDENT TYPES
(percent of accidents)

Accident Type	Urban	Suburban	Rural	Average
Fatal Accident	1.18%	0.45%	1.92%	0.71%
Injury Accident	34.93%	33.09%	38.25%	33.98%
PDO Accident	63.89%	66.45%	59.83%	65.31%

Source: California Department of Transportation,TASAS Unit, 2010 to 2013 average

COST OF NON-HIGHWAY ACCIDENT EVENTS
($/event)

Event	Pass Train	Light Rail	Bus	Freight Rail
Fatality	$9,800,000	$9,800,000	$9,800,000	$9,800,000
Injury	$180,500	$180,500	$180,500	$180,500
Prop Damage	$78,800	$12,400	$3,800	$147,600

Sources: FTA, Transit Safety & Security Statistics, 2002 to 2011 average
FRA, Office of Safety Analysis, Table 3.16, 2014 to 2016 average.

COSTS OF NON-HIGHWAY ACCIDENTS
($/million veh-mi)

Value	Pass Train	Light Rail	Bus	Freight Rail
Cost	$611,200	$3,209,500	$1,011,600	$13,122,900

Source: Combination of above two tables

HIGHWAY-RAIL GRADE CROSSING INCIDENTS
(units in table)

Value	Incident	Fatality	Injury
Total Events	799	94	515
Avg per Incident		0.1176	0.6446
Cost per Event		$9,800,000	$180,500

Source: FRA, Office of Safety Analysis, 5.10 - Hwy/Rail Incidents Summary Table, California, Motor Vehicles, Public Crossings, Jan 2007 to Dec 2016

COST OF HIGHWAY ACCIDENTS
($/accident)

Accident Type	Urban	Suburban	Rural	Average
Fatal Accident	$10,800,000	$10,700,000	$11,300,000	$11,000,000
Injury Accident	$148,800	$148,600	$154,200	$149,300
PDO Accident	$9,700	$11,000	$8,600	$10,600
All Types	$185,600	$104,600	$281,100	$135,800

Source: Combination of above four tables

PASSING LANE ACCIDENT REDUCTION FACTORS
(rate with passing lane/rate without passing lane)

Minimum ADT	Fatality	Injury	PDO
0	25.0%	69.4%	92.6%
5,000	19.2%	80.3%	96.5%
10,000	84.0%	57.7%	97.8%

Source: Taylor and Jain, 1991

Emissions Tables

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2016

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	3.4104	81.98	0.2740	0.0028	0.0009	0.2826	0.0026
	5	3.6818	1213.16	0.3465	0.0133	0.0122	0.3386	0.0123
	6	3.5051	1148.57	0.3282	0.0123	0.0115	0.3105	0.0114
	7	3.3284	1083.98	0.3099	0.0113	0.0109	0.2824	0.0104
	8	3.1516	1019.40	0.2917	0.0103	0.0102	0.2543	0.0095
	9	2.9749	954.81	0.2734	0.0093	0.0096	0.2262	0.0086
	10	2.7982	890.22	0.2552	0.0083	0.0089	0.1982	0.0077
	11	2.7335	850.65	0.2497	0.0078	0.0085	0.1864	0.0072
	12	2.6688	811.08	0.2443	0.0072	0.0081	0.1747	0.0067
	13	2.6041	771.51	0.2389	0.0067	0.0077	0.1630	0.0062
	14	2.5395	731.95	0.2335	0.0062	0.0073	0.1512	0.0057
	15	2.4748	692.38	0.2281	0.0056	0.0070	0.1395	0.0052
	16	2.4099	664.13	0.2225	0.0053	0.0067	0.1314	0.0049
	17	2.3450	635.88	0.2168	0.0050	0.0064	0.1232	0.0046
	18	2.2801	607.62	0.2112	0.0047	0.0061	0.1150	0.0043
	19	2.2153	579.37	0.2056	0.0044	0.0058	0.1069	0.0040
	20	2.1504	551.12	0.1999	0.0040	0.0055	0.0987	0.0037
	21	2.0928	532.04	0.1948	0.0038	0.0053	0.0934	0.0035
	22	2.0353	512.95	0.1897	0.0036	0.0052	0.0881	0.0033
	23	1.9777	493.87	0.1846	0.0034	0.0050	0.0828	0.0031
	24	1.9202	474.78	0.1795	0.0032	0.0048	0.0775	0.0029
	25	1.8626	455.70	0.1744	0.0030	0.0046	0.0722	0.0027
	26	1.8252	442.81	0.1719	0.0028	0.0045	0.0693	0.0026
	27	1.7878	429.93	0.1693	0.0027	0.0043	0.0663	0.0025
	28	1.7504	417.04	0.1668	0.0026	0.0042	0.0633	0.0024
	29	1.7130	404.16	0.1643	0.0024	0.0041	0.0603	0.0023
	30	1.6756	391.27	0.1617	0.0023	0.0039	0.0573	0.0021
	31	1.6579	383.46	0.1613	0.0022	0.0039	0.0559	0.0021
	32	1.6402	375.65	0.1608	0.0022	0.0038	0.0544	0.0020
	33	1.6225	367.83	0.1603	0.0021	0.0037	0.0529	0.0019
	34	1.6048	360.02	0.1598	0.0020	0.0036	0.0515	0.0019
	35	1.5870	352.21	0.1593	0.0019	0.0035	0.0500	0.0018
	36	1.5734	347.40	0.1594	0.0019	0.0035	0.0491	0.0017
	37	1.5598	342.60	0.1594	0.0018	0.0034	0.0482	0.0017
	38	1.5462	337.79	0.1594	0.0018	0.0034	0.0474	0.0017
	39	1.5326	332.99	0.1594	0.0017	0.0033	0.0465	0.0016
	40	1.5190	328.18	0.1594	0.0017	0.0033	0.0456	0.0016
	41	1.5076	325.84	0.1598	0.0017	0.0033	0.0452	0.0015
	42	1.4963	323.50	0.1602	0.0016	0.0033	0.0449	0.0015
	43	1.4849	321.16	0.1607	0.0016	0.0032	0.0445	0.0015
	44	1.4736	318.82	0.1611	0.0016	0.0032	0.0441	0.0015
	45	1.4622	316.48	0.1615	0.0016	0.0032	0.0438	0.0015
	46	1.4550	316.61	0.1623	0.0016	0.0032	0.0438	0.0014
	47	1.4478	316.74	0.1631	0.0016	0.0032	0.0438	0.0014
	48	1.4405	316.87	0.1639	0.0016	0.0032	0.0437	0.0014
	49	1.4333	317.01	0.1647	0.0015	0.0032	0.0437	0.0014
	50	1.4261	317.14	0.1655	0.0015	0.0032	0.0437	0.0014
	51	1.4181	319.34	0.1663	0.0015	0.0032	0.0439	0.0014
	52	1.4101	321.54	0.1671	0.0015	0.0032	0.0442	0.0014
	53	1.4022	323.75	0.1678	0.0016	0.0033	0.0444	0.0014
	54	1.3942	325.95	0.1686	0.0016	0.0033	0.0446	0.0014
	55	1.3862	328.15	0.1694	0.0016	0.0033	0.0448	0.0014
	56	1.3680	332.21	0.1680	0.0016	0.0033	0.0448	0.0015
	57	1.3497	336.27	0.1666	0.0016	0.0034	0.0448	0.0015
	58	1.3315	340.33	0.1651	0.0016	0.0034	0.0448	0.0015
	59	1.3132	344.39	0.1637	0.0016	0.0035	0.0448	0.0015
	60	1.2950	348.45	0.1623	0.0016	0.0035	0.0448	0.0015
	61	1.3020	356.51	0.1640	0.0017	0.0036	0.0462	0.0015
	62	1.3089	364.56	0.1658	0.0017	0.0037	0.0477	0.0016
	63	1.3159	372.62	0.1675	0.0017	0.0037	0.0491	0.0016
	64	1.3229	380.68	0.1693	0.0018	0.0038	0.0505	0.0016
	65	1.3299	388.74	0.1710	0.0018	0.0039	0.0519	0.0017
	66	1.3750	397.41	0.1757	0.0018	0.0040	0.0544	0.0017
	67	1.4201	406.07	0.1804	0.0019	0.0041	0.0568	0.0017
	68	1.4653	414.74	0.1850	0.0019	0.0042	0.0592	0.0018
	69	1.5104	423.41	0.1897	0.0019	0.0043	0.0616	0.0018
	70	1.5555	432.08	0.1944	0.0020	0.0043	0.0640	0.0018

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2036

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	0.6940	45.66	0.0331	0.0014	0.0005	0.0462	0.0013
	5	1.0344	735.07	0.0699	0.0066	0.0074	0.1171	0.0061
	6	1.0041	696.96	0.0674	0.0061	0.0070	0.1088	0.0056
	7	0.9737	658.86	0.0650	0.0056	0.0066	0.1004	0.0052
	8	0.9434	620.76	0.0626	0.0051	0.0062	0.0920	0.0047
	9	0.9130	582.66	0.0601	0.0046	0.0058	0.0837	0.0043
	10	0.8827	544.56	0.0577	0.0041	0.0054	0.0753	0.0038
	11	0.8622	519.72	0.0564	0.0039	0.0052	0.0706	0.0036
	12	0.8416	494.88	0.0550	0.0036	0.0050	0.0659	0.0033
	13	0.8211	470.04	0.0537	0.0033	0.0047	0.0612	0.0030
	14	0.8006	445.20	0.0524	0.0030	0.0045	0.0565	0.0028
	15	0.7800	420.36	0.0510	0.0028	0.0042	0.0517	0.0025
	16	0.7621	403.50	0.0499	0.0026	0.0040	0.0486	0.0024
	17	0.7441	386.63	0.0489	0.0024	0.0039	0.0456	0.0022
	18	0.7261	369.76	0.0478	0.0023	0.0037	0.0425	0.0021
	19	0.7082	352.89	0.0467	0.0021	0.0035	0.0394	0.0019
	20	0.6902	336.02	0.0456	0.0019	0.0034	0.0363	0.0018
	21	0.6767	324.45	0.0448	0.0018	0.0032	0.0345	0.0017
	22	0.6632	312.87	0.0440	0.0017	0.0031	0.0327	0.0016
	23	0.6497	301.30	0.0431	0.0016	0.0030	0.0309	0.0015
	24	0.6362	289.73	0.0423	0.0015	0.0029	0.0291	0.0014
	25	0.6227	278.16	0.0415	0.0014	0.0028	0.0273	0.0013
	26	0.6110	270.26	0.0409	0.0014	0.0027	0.0261	0.0013
	27	0.5993	262.35	0.0402	0.0013	0.0026	0.0250	0.0012
	28	0.5877	254.45	0.0395	0.0012	0.0025	0.0238	0.0011
	29	0.5760	246.55	0.0389	0.0012	0.0025	0.0227	0.0011
	30	0.5643	238.64	0.0382	0.0011	0.0024	0.0215	0.0010
	31	0.5571	233.62	0.0380	0.0011	0.0023	0.0208	0.0010
	32	0.5500	228.61	0.0378	0.0010	0.0023	0.0201	0.0009
	33	0.5428	223.59	0.0376	0.0010	0.0022	0.0194	0.0009
	34	0.5356	218.57	0.0374	0.0010	0.0022	0.0187	0.0009
	35	0.5284	213.55	0.0372	0.0009	0.0021	0.0180	0.0008
	36	0.5216	210.51	0.0370	0.0009	0.0021	0.0176	0.0008
	37	0.5148	207.47	0.0368	0.0009	0.0021	0.0171	0.0008
	38	0.5079	204.43	0.0366	0.0008	0.0020	0.0167	0.0008
	39	0.5011	201.39	0.0364	0.0008	0.0020	0.0162	0.0008
	40	0.4943	198.35	0.0362	0.0008	0.0020	0.0158	0.0007
	41	0.4899	196.95	0.0362	0.0008	0.0020	0.0156	0.0007
	42	0.4855	195.54	0.0362	0.0008	0.0020	0.0155	0.0007
	43	0.4811	194.14	0.0363	0.0008	0.0019	0.0154	0.0007
	44	0.4768	192.74	0.0363	0.0007	0.0019	0.0152	0.0007
	45	0.4724	191.33	0.0363	0.0007	0.0019	0.0151	0.0007
	46	0.4679	191.33	0.0364	0.0007	0.0019	0.0150	0.0007
	47	0.4634	191.33	0.0364	0.0007	0.0019	0.0149	0.0007
	48	0.4589	191.33	0.0364	0.0007	0.0019	0.0149	0.0007
	49	0.4544	191.33	0.0364	0.0007	0.0019	0.0148	0.0007
	50	0.4500	191.32	0.0365	0.0007	0.0019	0.0147	0.0006
	51	0.4455	192.68	0.0365	0.0007	0.0019	0.0148	0.0007
	52	0.4410	194.05	0.0365	0.0007	0.0019	0.0148	0.0007
	53	0.4365	195.41	0.0365	0.0007	0.0020	0.0149	0.0007
	54	0.4320	196.77	0.0365	0.0007	0.0020	0.0150	0.0007
	55	0.4275	198.13	0.0365	0.0007	0.0020	0.0150	0.0007
	56	0.4226	200.79	0.0363	0.0007	0.0020	0.0152	0.0007
	57	0.4178	203.46	0.0362	0.0007	0.0020	0.0154	0.0007
	58	0.4130	206.12	0.0360	0.0007	0.0021	0.0156	0.0007
	59	0.4082	208.79	0.0359	0.0008	0.0021	0.0157	0.0007
	60	0.4034	211.45	0.0358	0.0008	0.0021	0.0159	0.0007
	61	0.4063	215.99	0.0367	0.0008	0.0022	0.0166	0.0007
	62	0.4093	220.54	0.0377	0.0008	0.0022	0.0173	0.0007
	63	0.4123	225.08	0.0387	0.0008	0.0023	0.0180	0.0008
	64	0.4152	229.62	0.0396	0.0008	0.0023	0.0188	0.0008
	65	0.4182	234.17	0.0406	0.0009	0.0023	0.0195	0.0008
	66	0.4203	238.62	0.0401	0.0009	0.0024	0.0197	0.0008
	67	0.4224	243.08	0.0396	0.0009	0.0024	0.0200	0.0008
	68	0.4246	247.54	0.0391	0.0009	0.0025	0.0203	0.0008
	69	0.4267	252.00	0.0386	0.0009	0.0025	0.0206	0.0008
	70	0.4288	256.46	0.0382	0.0009	0.0026	0.0209	0.0009

Emissions Tables

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2016

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	3.4104	81.98	0.2740	0.0028	0.0009	0.2826	0.0026
	5	3.6818	1213.16	0.3465	0.0133	0.0122	0.3386	0.0123
	6	3.5051	1148.57	0.3282	0.0123	0.0115	0.3105	0.0114
	7	3.3284	1083.98	0.3099	0.0113	0.0109	0.2824	0.0104
	8	3.1516	1019.40	0.2917	0.0103	0.0102	0.2543	0.0095
Truck	0	4.8572	39.19	1.7997	0.0015	0.2774	0.4175	0.0013
	5	5.1803	2187.60	7.9756	0.1137	0.0202	1.0547	0.1087
	6	4.9501	2147.78	7.8499	0.1140	0.0199	1.0224	0.1089
	7	4.7200	2107.96	7.7242	0.1143	0.0195	0.9901	0.1092
	8	4.4898	2068.13	7.5986	0.1146	0.0192	0.9579	0.1095
	9	4.2597	2028.31	7.4729	0.1148	0.0189	0.9256	0.1098
	10	4.0295	1988.49	7.3473	0.1151	0.0185	0.8934	0.1101
	11	3.7759	1843.50	6.7599	0.1061	0.0173	0.8082	0.1015
	12	3.5223	1698.51	6.1725	0.0972	0.0160	0.7230	0.0929
	13	3.2687	1553.51	5.5851	0.0882	0.0147	0.6378	0.0843
	14	3.0151	1408.52	4.9977	0.0792	0.0134	0.5525	0.0757
	15	2.7615	1263.53	4.4103	0.0703	0.0121	0.4673	0.0671
	16	2.6560	1263.49	4.4801	0.0705	0.0121	0.4442	0.0674
	17	2.5504	1263.44	4.5499	0.0708	0.0121	0.4210	0.0677
	18	2.4449	1263.40	4.6197	0.0711	0.0121	0.3979	0.0679
	19	2.3394	1263.35	4.6895	0.0713	0.0121	0.3747	0.0682
	20	2.2339	1263.31	4.7593	0.0716	0.0121	0.3516	0.0685
	21	2.1458	1237.01	4.6190	0.0677	0.0119	0.3310	0.0647
	22	2.0577	1210.72	4.4786	0.0637	0.0116	0.3105	0.0610
	23	1.9697	1184.43	4.3383	0.0598	0.0114	0.2900	0.0572
	24	1.8816	1158.13	4.1979	0.0559	0.0111	0.2695	0.0534
	25	1.7935	1131.84	4.0576	0.0520	0.0108	0.2489	0.0497
	26	1.7441	1138.52	4.0783	0.0519	0.0109	0.2424	0.0496
	27	1.6947	1145.20	4.0990	0.0518	0.0110	0.2358	0.0495
	28	1.6453	1151.87	4.1197	0.0517	0.0110	0.2293	0.0495
	29	1.5959	1158.55	4.1404	0.0517	0.0111	0.2227	0.0494
	30	1.5465	1165.23	4.1611	0.0516	0.0111	0.2162	0.0493
	31	1.5050	1199.22	4.2631	0.0526	0.0114	0.2128	0.0503
	32	1.4634	1233.21	4.3651	0.0537	0.0117	0.2095	0.0513
	33	1.4219	1267.20	4.4671	0.0547	0.0120	0.2061	0.0524
	34	1.3803	1301.19	4.5691	0.0558	0.0123	0.2028	0.0534
	35	1.3387	1335.18	4.6711	0.0568	0.0126	0.1994	0.0544
	36	1.3027	1331.17	4.6418	0.0575	0.0126	0.1934	0.0550
	37	1.2667	1327.17	4.6126	0.0581	0.0125	0.1873	0.0556
	38	1.2306	1323.16	4.5833	0.0587	0.0125	0.1812	0.0562
	39	1.1946	1319.16	4.5540	0.0593	0.0125	0.1751	0.0567
	40	1.1586	1315.15	4.5247	0.0599	0.0125	0.1690	0.0573
	41	1.1260	1312.39	4.5116	0.0598	0.0124	0.1638	0.0572
	42	1.0934	1309.62	4.4984	0.0597	0.0124	0.1585	0.0571
	43	1.0609	1306.85	4.4852	0.0596	0.0124	0.1533	0.0570
	44	1.0283	1304.08	4.4720	0.0594	0.0124	0.1480	0.0569
	45	0.9958	1301.32	4.4589	0.0593	0.0124	0.1428	0.0567
	46	0.9927	1264.42	4.3777	0.0582	0.0120	0.1381	0.0556
	47	0.9897	1227.52	4.2964	0.0570	0.0117	0.1334	0.0545
	48	0.9866	1190.62	4.2152	0.0559	0.0114	0.1287	0.0534
	49	0.9836	1153.73	4.1340	0.0547	0.0110	0.1240	0.0523
	50	0.9805	1116.83	4.0528	0.0535	0.0107	0.1193	0.0512
	51	0.9565	1133.04	4.1049	0.0565	0.0109	0.1190	0.0541
	52	0.9324	1149.25	4.1569	0.0595	0.0110	0.1188	0.0569
	53	0.9083	1165.46	4.2090	0.0625	0.0112	0.1185	0.0597
	54	0.8842	1181.67	4.2610	0.0654	0.0113	0.1182	0.0626
	55	0.8601	1197.87	4.3131	0.0684	0.0115	0.1179	0.0654
	56	0.8633	1184.58	4.2356	0.0702	0.0114	0.1175	0.0672
	57	0.8665	1171.29	4.1582	0.0721	0.0112	0.1170	0.0689
	58	0.8696	1158.00	4.0807	0.0739	0.0111	0.1166	0.0707
	59	0.8728	1144.71	4.0032	0.0757	0.0110	0.1162	0.0725
	60	0.8760	1131.42	3.9257	0.0776	0.0109	0.1157	0.0742
	61	0.8894	1131.74	3.9251	0.0750	0.0109	0.1151	0.0718
	62	0.9028	1132.07	3.9244	0.0725	0.0109	0.1145	0.0694
	63	0.9163	1132.39	3.9237	0.0700	0.0109	0.1139	0.0669
	64	0.9297	1132.72	3.9230	0.0674	0.0109	0.1133	0.0645
	65	0.9431	1133.04	3.9224	0.0649	0.0109	0.1127	0.0621
	66	0.9190	1151.08	3.9095	0.0614	0.0110	0.1098	0.0587
	67	0.8949	1169.12	3.8966	0.0579	0.0112	0.1070	0.0554
	68	0.8707	1187.17	3.8837	0.0544	0.0114	0.1042	0.0521
	69	0.8466	1205.21	3.8708	0.0509	0.0115	0.1014	0.0487
	70	0.8225	1223.25	3.8579	0.0475	0.0117	0.0986	0.0454

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2036

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	0.6940	45.66	0.0331	0.0014	0.0005	0.0462	0.0013
	5	1.0344	735.07	0.0699	0.0066	0.0074	0.1171	0.0061
	6	1.0041	696.96	0.0674	0.0061	0.0070	0.1088	0.0056
	7	0.9737	658.86	0.0650	0.0056	0.0066	0.1004	0.0052
	8	0.9434	620.76	0.0626	0.0051	0.0062	0.0920	0.0047
Truck	0	1.8187	31.73	3.5930	0.0006	0.0003	0.1107	0.0005
	5	4.6433	2312.07	10.1441	0.0129	0.0198	0.4427	0.0123
	6	4.3680	2256.43	9.6372	0.0124	0.0194	0.4211	0.0119
	7	4.0927	2200.78	9.1303	0.0120	0.0190	0.3996	0.0114
	8	3.8174	2145.13	8.6234	0.0115	0.0186	0.3780	0.0109
	9	3.5421	2089.48	8.1165	0.0110	0.0183	0.3564	0.0105
	10	3.2668	2033.84	7.6096	0.0105	0.0179	0.3349	0.0100
	11	2.9097	1905.69	6.8507	0.0103	0.0169	0.3092	0.0098
	12	2.5527	1777.54	6.0919	0.0100	0.0159	0.2835	0.0096
	13	2.1957	1649.39	5.3330	0.0098	0.0150	0.2578	0.0093
	14	1.8386	1521.24	4.5742	0.0096	0.0140	0.2322	0.0091
	15	1.4816	1393.10	3.8153	0.0093	0.0130	0.2065	0.0089
	16	1.3940	1385.68	3.6087	0.0089	0.0130	0.1945	0.0085
	17	1.3064	1378.26	3.4020	0.0085	0.0129	0.1824	0.0081
	18	1.2188	1370.84	3.1953	0.0081	0.0129	0.1704	0.0078
	19	1.1312	1363.42	2.9887	0.0077	0.0129	0.1583	0.0074
	20	1.0436	1356.00	2.7820	0.0073	0.0128	0.1463	0.0070
	21	0.9988	1325.74	2.5267	0.0072	0.0125	0.1372	0.0068
	22	0.9541	1295.48	2.2714	0.0070	0.0122	0.1282	0.0067
	23	0.9093	1265.22	2.0161	0.0068	0.0119	0.1192	0.0065
	24	0.8646	1234.96	1.7608	0.0066	0.0116	0.1101	0.0063
	25	0.8198	1204.71	1.5055	0.0065	0.0113	0.1011	0.0062
	26	0.7917	1207.23	1.4248	0.0063	0.0114	0.0973	0.0060
	27	0.7637	1209.75	1.3441	0.0061	0.0114	0.0936	0.0059
	28	0.7356	1212.27	1.2634	0.0060	0.0114	0.0898	0.0057
	29	0.7075	1214.80	1.1827	0.0058	0.0115	0.0861	0.0056
	30	0.6794	1217.32	1.1020	0.0056	0.0115	0.0823	0.0054
	31	0.6715	1233.43	1.0586	0.0055	0.0116	0.0796	0.0053
	32	0.6636	1249.54	1.0152	0.0054	0.0117	0.0769	0.0052
	33	0.6556	1265.65	0.9719	0.0054	0.0118	0.0742	0.0051
	34	0.6477	1281.76	0.9285	0.0053	0.0119	0.0715	0.0050
	35	0.6398	1297.87	0.8851	0.0052	0.0120	0.0688	0.0049
	36	0.6063	1289.71	0.8393	0.0051	0.0120	0.0653	0.0048
	37	0.5729	1281.55	0.7935	0.0050	0.0119	0.0619	0.0047
	38	0.5394	1273.38	0.7477	0.0049	0.0119	0.0584	0.0047
	39	0.5060	1265.22	0.7020	0.0048	0.0118	0.0549	0.0046
	40	0.4725	1257.05	0.6562	0.0047	0.0118	0.0515	0.0045
	41	0.4512	1253.52	0.6306	0.0047	0.0117	0.0493	0.0045
	42	0.4299	1249.98	0.6050	0.0046	0.0117	0.0471	0.0044
	43	0.4086	1246.45	0.5795	0.0046	0.0117	0.0450	0.0044
	44	0.3873	1242.91	0.5539	0.0046	0.0117	0.0428	0.0044
	45	0.3660	1239.37	0.5283	0.0045	0.0117	0.0406	0.0043
	46	0.3462	1218.01	0.5072	0.0045	0.0115	0.0385	0.0043
	47	0.3263	1196.64	0.4861	0.0045	0.0113	0.0364	0.0043
	48	0.3065	1175.28	0.4649	0.0045	0.0111	0.0343	0.0043
	49	0.2866	1153.91	0.4438	0.0044	0.0110	0.0322	0.0042
	50	0.2668	1132.54	0.4226	0.0044	0.0108	0.0301	0.0042
	51	0.2573	1134.57	0.4082	0.0044	0.0108	0.0288	0.0042
	52	0.2478	1136.59	0.3937	0.0043	0.0108	0.0275	0.0041
	53	0.2383	1138.62	0.3792	0.0043	0.0109	0.0262	0.0041
	54	0.2288	1140.64	0.3648	0.0042	0.0109	0.0250	0.0040
	55	0.2193	1142.66	0.3503	0.0042	0.0109	0.0237	0.0040
	56	0.2078	1127.35	0.3362	0.0041	0.0108	0.0227	0.0039
	57	0.1963	1112.03	0.3221	0.0040	0.0106	0.0217	0.0039
	58	0.1848	1096.71	0.3080	0.0040	0.0105	0.0207	0.0038
	59	0.1733	1081.40	0.2939	0.0039	0.0103	0.0197	0.0037
	60	0.1618	1066.08	0.2798	0.0038	0.0102	0.0188	0.0037
	61	0.1650	1070.20	0.2846	0.0039	0.0102	0.0192	0.0037
	62	0.1682	1074.31	0.2895	0.0040	0.0103	0.0196	0.0038
	63	0.1715	1078.43	0.2943	0.0040	0.0103	0.0200	0.0039
	64	0.1747	1082.54	0.2992	0.0041	0.0104	0.0204	0.0039
	65	0.1779	1086.66	0.3040	0.0041	0.0104	0.0208	0.0040
	66	0.1760	1103.78	0.3088	0.0042	0.0106	0.0212	0.0040
	67	0.1741	1120.90	0.3135	0.0042	0.0107	0.0216	0.0041
	68	0.1721	1138.02	0.3183	0.0043	0.0109	0.0220	0.0041
	69	0.1702	1155.14	0.3231	0.0043	0.0110	0.0224	0.0041
	70	0.1683	1172.25	0.3278	0.0044	0.0112	0.0228	0.0042

Emissions Tables

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2016

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	3.4104	81.98	0.2740	0.0028	0.0009	0.2826	0.0026
	5	3.6818	1213.16	0.3465	0.0133	0.0122	0.3386	0.0123
	6	3.5051	1148.57	0.3282	0.0123	0.0115	0.3105	0.0114
	7	3.3284	1083.98	0.3099	0.0113	0.0109	0.2824	0.0104
	8	3.1516	1019.40	0.2917	0.0103	0.0102	0.2543	0.0095
Bus	0	10.6824	82.09	2.0123	0.0012	0.0010	0.6855	0.0011
	5	19.5713	3427.66	22.0894	0.4156	0.0272	3.1109	0.3975
	6	18.6137	3345.92	21.1559	0.3970	0.0267	2.9232	0.3798
	7	17.6561	3264.17	20.2224	0.3785	0.0261	2.7356	0.3621
	8	16.6985	3182.43	19.2889	0.3600	0.0255	2.5480	0.3444
	9	15.7409	3100.68	18.3553	0.3415	0.0250	2.3604	0.3266
	10	14.7833	3018.94	17.4218	0.3230	0.0244	2.1728	0.3089
	11	13.9614	2881.27	16.5060	0.3034	0.0232	1.9877	0.2902
	12	13.1394	2743.60	15.5903	0.2838	0.0220	1.8026	0.2714
	13	12.3175	2605.93	14.6745	0.2642	0.0208	1.6175	0.2527
	14	11.4955	2468.25	13.7588	0.2446	0.0196	1.4324	0.2339
	15	10.6736	2330.58	12.8430	0.2250	0.0184	1.2473	0.2152
	16	10.6229	2266.47	12.7712	0.2193	0.0175	1.1680	0.2097
	17	10.5723	2202.36	12.6993	0.2136	0.0167	1.0886	0.2043
	18	10.5216	2138.25	12.6275	0.2079	0.0158	1.0093	0.1988
	19	10.4710	2074.14	12.5556	0.2022	0.0150	0.9300	0.1934
	20	10.4204	2010.03	12.4838	0.1965	0.0141	0.8506	0.1879
	21	8.8913	1886.19	11.1329	0.1690	0.0139	0.7311	0.1617
	22	7.3623	1762.35	9.7821	0.1416	0.0137	0.6115	0.1355
	23	5.8333	1638.51	8.4313	0.1142	0.0134	0.4920	0.1092
	24	4.3043	1514.66	7.0804	0.0868	0.0132	0.3724	0.0830
	25	2.7753	1390.82	5.7296	0.0594	0.0130	0.2529	0.0568
	26	2.7002	1372.44	5.6622	0.0576	0.0128	0.2422	0.0550
	27	2.6250	1354.06	5.5948	0.0558	0.0126	0.2315	0.0533
	28	2.5498	1335.67	5.5273	0.0539	0.0124	0.2208	0.0516
	29	2.4746	1317.29	5.4599	0.0521	0.0123	0.2102	0.0499
	30	2.3995	1298.91	5.3925	0.0503	0.0121	0.1995	0.0482
	31	2.3420	1282.69	5.3486	0.0492	0.0120	0.1915	0.0470
	32	2.2845	1266.48	5.3046	0.0480	0.0118	0.1836	0.0459
	33	2.2270	1250.27	5.2607	0.0469	0.0117	0.1757	0.0448
	34	2.1695	1234.05	5.2168	0.0457	0.0116	0.1678	0.0437
	35	2.1120	1217.84	5.1728	0.0445	0.0114	0.1598	0.0426
	36	2.0857	1213.36	5.0993	0.0437	0.0114	0.1557	0.0418
	37	2.0594	1208.88	5.0258	0.0429	0.0113	0.1516	0.0410
	38	2.0332	1204.40	4.9523	0.0421	0.0113	0.1475	0.0402
	39	2.0069	1199.92	4.8788	0.0413	0.0112	0.1434	0.0395
	40	1.9806	1195.43	4.8052	0.0405	0.0112	0.1393	0.0387
	41	1.9688	1187.57	4.7070	0.0397	0.0111	0.1362	0.0380
	42	1.9571	1179.70	4.6088	0.0389	0.0110	0.1330	0.0372
	43	1.9453	1171.83	4.5106	0.0382	0.0109	0.1298	0.0365
	44	1.9336	1163.96	4.4123	0.0374	0.0108	0.1267	0.0358
	45	1.9218	1156.09	4.3141	0.0367	0.0108	0.1235	0.0351
	46	1.8909	1152.61	4.2857	0.0369	0.0107	0.1221	0.0353
	47	1.8600	1149.13	4.2572	0.0371	0.0107	0.1208	0.0355
	48	1.8291	1145.65	4.2288	0.0373	0.0107	0.1194	0.0356
	49	1.7982	1142.17	4.2004	0.0375	0.0106	0.1180	0.0358
	50	1.7673	1138.69	4.1719	0.0377	0.0106	0.1166	0.0360
	51	1.7408	1137.05	4.2359	0.0389	0.0106	0.1169	0.0372
	52	1.7143	1135.42	4.2998	0.0402	0.0106	0.1172	0.0384
	53	1.6878	1133.78	4.3638	0.0414	0.0105	0.1175	0.0396
	54	1.6613	1132.15	4.4277	0.0427	0.0105	0.1178	0.0408
	55	1.6348	1130.51	4.4916	0.0440	0.0105	0.1181	0.0420
	56	1.6585	1135.25	4.5276	0.0451	0.0105	0.1215	0.0431
	57	1.6822	1139.98	4.5635	0.0463	0.0105	0.1249	0.0442
	58	1.7059	1144.71	4.5994	0.0474	0.0106	0.1283	0.0454
	59	1.7296	1149.45	4.6354	0.0486	0.0106	0.1317	0.0465
	60	1.7533	1154.18	4.6713	0.0497	0.0106	0.1351	0.0476
	61	1.7947	1155.82	4.5966	0.0489	0.0105	0.1380	0.0468
	62	1.8361	1157.45	4.5218	0.0481	0.0105	0.1409	0.0460
	63	1.8775	1159.09	4.4471	0.0473	0.0105	0.1439	0.0452
	64	1.9189	1160.73	4.3724	0.0465	0.0105	0.1468	0.0445
	65	1.9602	1162.37	4.2976	0.0457	0.0104	0.1497	0.0437
	66	2.1296	1155.48	4.0816	0.0427	0.0103	0.1552	0.0408
	67	2.2989	1148.59	3.8657	0.0396	0.0102	0.1606	0.0379
	68	2.4683	1141.70	3.6497	0.0366	0.0101	0.1660	0.0350
	69	2.6376	1134.81	3.4337	0.0336	0.0100	0.1715	0.0321
	70	2.8070	1127.92	3.2177	0.0306	0.0099	0.1769	0.0292

HIGHWAY EMISSIONS FACTORS (g/mi)

Model Year 2036

Mode	Speed	CO	CO_2	NO_X	PM_{10}	SO_X	VOC	$PM_{2.5}$
Auto	0	0.6940	45.66	0.0331	0.0014	0.0005	0.0462	0.0013
	5	1.0344	735.07	0.0699	0.0066	0.0074	0.1171	0.0061
	6	1.0041	696.96	0.0674	0.0061	0.0070	0.1088	0.0056
	7	0.9737	658.86	0.0650	0.0056	0.0066	0.1004	0.0052
	8	0.9434	620.76	0.0626	0.0051	0.0062	0.0920	0.0047
Bus	0	5.1788	80.98	2.5880	0.0012	0.0009	0.3524	0.0011
	5	9.8072	2999.55	5.2920	0.0368	0.0239	0.3870	0.0351
	6	9.1891	2922.57	5.0911	0.0348	0.0234	0.3644	0.0332
	7	8.5709	2845.60	4.8902	0.0329	0.0228	0.3417	0.0313
	8	7.9528	2768.62	4.6894	0.0309	0.0223	0.3191	0.0295
	9	7.3346	2691.64	4.4885	0.0289	0.0218	0.2964	0.0276
	10	6.7165	2614.67	4.2876	0.0270	0.0212	0.2738	0.0257
	11	6.1348	2484.67	3.9696	0.0252	0.0201	0.2512	0.0240
	12	5.5532	2354.67	3.6516	0.0234	0.0189	0.2286	0.0224
	13	4.9715	2224.67	3.3336	0.0217	0.0178	0.2060	0.0207
	14	4.3899	2094.67	3.0156	0.0199	0.0166	0.1833	0.0190
	15	3.8082	1964.68	2.6976	0.0182	0.0154	0.1607	0.0173
	16	3.6563	1904.74	2.5064	0.0180	0.0145	0.1489	0.0172
	17	3.5044	1844.81	2.3152	0.0179	0.0135	0.1370	0.0171
	18	3.3525	1784.88	2.1240	0.0178	0.0126	0.1251	0.0170
	19	3.2006	1724.95	1.9328	0.0176	0.0116	0.1133	0.0168
	20	3.0487	1665.02	1.7416	0.0175	0.0107	0.1014	0.0167
	21	2.5385	1582.49	1.6010	0.0148	0.0109	0.0929	0.0142
	22	2.0284	1499.96	1.4603	0.0122	0.0111	0.0843	0.0116
	23	1.5183	1417.43	1.3197	0.0095	0.0114	0.0758	0.0091
	24	1.0082	1334.89	1.1791	0.0068	0.0116	0.0673	0.0065
	25	0.4981	1252.36	1.0384	0.0041	0.0118	0.0587	0.0039
	26	0.4776	1237.58	0.9754	0.0040	0.0117	0.0559	0.0038
	27	0.4571	1222.81	0.9124	0.0039	0.0115	0.0531	0.0037
	28	0.4366	1208.03	0.8493	0.0038	0.0114	0.0503	0.0036
	29	0.4162	1193.25	0.7863	0.0037	0.0113	0.0474	0.0035
	30	0.3957	1178.47	0.7233	0.0036	0.0111	0.0446	0.0034
	31	0.3799	1165.30	0.6873	0.0035	0.0110	0.0424	0.0034
	32	0.3642	1152.13	0.6513	0.0035	0.0109	0.0401	0.0033
	33	0.3485	1138.97	0.6154	0.0034	0.0108	0.0379	0.0032
	34	0.3327	1125.80	0.5794	0.0033	0.0106	0.0356	0.0032
	35	0.3170	1112.63	0.5435	0.0033	0.0105	0.0334	0.0031
	36	0.3098	1109.21	0.5225	0.0032	0.0105	0.0319	0.0031
	37	0.3026	1105.78	0.5015	0.0032	0.0104	0.0305	0.0030
	38	0.2955	1102.35	0.4805	0.0031	0.0104	0.0290	0.0030
	39	0.2883	1098.92	0.4595	0.0031	0.0104	0.0276	0.0029
	40	0.2811	1095.50	0.4385	0.0030	0.0103	0.0262	0.0029
	41	0.2757	1088.64	0.4217	0.0030	0.0103	0.0249	0.0028
	42	0.2702	1081.79	0.4050	0.0029	0.0102	0.0237	0.0028
	43	0.2648	1074.94	0.3882	0.0029	0.0101	0.0224	0.0027
	44	0.2593	1068.09	0.3715	0.0028	0.0100	0.0212	0.0027
	45	0.2539	1061.24	0.3548	0.0027	0.0100	0.0199	0.0026
	46	0.2474	1059.07	0.3451	0.0027	0.0100	0.0193	0.0026
	47	0.2410	1056.90	0.3354	0.0027	0.0099	0.0187	0.0026
	48	0.2346	1054.73	0.3257	0.0027	0.0099	0.0181	0.0026
	49	0.2281	1052.56	0.3160	0.0027	0.0099	0.0175	0.0025
	50	0.2217	1050.39	0.3063	0.0027	0.0099	0.0169	0.0025
	51	0.2164	1048.76	0.3035	0.0027	0.0098	0.0165	0.0026
	52	0.2111	1047.14	0.3006	0.0027	0.0098	0.0161	0.0026
	53	0.2059	1045.51	0.2977	0.0028	0.0098	0.0157	0.0026
	54	0.2006	1043.88	0.2948	0.0028	0.0098	0.0152	0.0027
	55	0.1954	1042.25	0.2919	0.0028	0.0098	0.0148	0.0027
	56	0.1959	1045.09	0.2934	0.0029	0.0098	0.0148	0.0028
	57	0.1963	1047.93	0.2949	0.0029	0.0098	0.0149	0.0028
	58	0.1968	1050.76	0.2965	0.0030	0.0098	0.0149	0.0029
	59	0.1973	1053.60	0.2980	0.0031	0.0098	0.0149	0.0029
	60	0.1978	1056.44	0.2995	0.0031	0.0098	0.0149	0.0030
	61	0.2010	1057.33	0.2952	0.0031	0.0098	0.0151	0.0029
	62	0.2041	1058.23	0.2909	0.0030	0.0098	0.0153	0.0029
	63	0.2073	1059.13	0.2867	0.0030	0.0098	0.0154	0.0029
	64	0.2105	1060.03	0.2824	0.0030	0.0098	0.0156	0.0028
	65	0.2137	1060.93	0.2781	0.0029	0.0098	0.0158	0.0028
	66	0.2299	1055.18	0.2781	0.0029	0.0096	0.0162	0.0027
	67	0.2461	1049.43	0.2780	0.0028	0.0095	0.0166	0.0027
	68	0.2623	1043.68	0.2780	0.0028	0.0094	0.0170	0.0026
	69	0.2785	1037.93	0.2780	0.0027	0.0093	0.0174	0.0026
	70	0.2947	1032.18	0.2779	0.0027	0.0092	0.0178	0.0025

Source: California Air Resources Board, EMFAC 2014

Notes: 1) Zero mph corresponds to starts, 2) Other emissions factors include idling emissions and exclude diurnal and evaporative emissions, 3) Five mph is best estimate for idling

HEALTH COST OF TRANSPORTATION EMISSIONS

($/ton)

Area	Proj Loc	CO	CO_2e	NO_x	PM_{10}	SO_x	VOC
LA/South Coast	1	$160	$38	$63,900	$523,300	$196,600	$3,970
CA Urban Area	2	$80	$38	$18,700	$151,100	$75,500	$1,305
CA Rural Area	3	$75	$38	$13,900	$107,700	$54,400	$1,025

CO_2e Uprater 2.0% increase in value per year

Sources: McCubbin and Delucchi, 1996 for emissions other than CO2e
Interagency Working Group on Social Cost of Carbon, United States Government, 2016 for CO2e

PASSENGER TRAIN EMISSIONS FACTORS

(g/train-mile)

Mode	Year	CO	CO_2	NO_x	PM_{10}	SO_x	VOC	$PM_{2.5}$
Passenger Train	2002	45.67		583.58	62.02		19.73	
	2022	45.67		250.11	31.01		19.73	

LIGHT RAIL EMISSIONS FACTORS

(g/veh-mile)

Mode	Year	CO	CO_2	NO_x	PM_{10}	SO_x	VOC	$PM_{2.5}$
Light Rail	2002	0.14		1.13	0.17		0.06	
	2022	0.14		1.14	0.17		0.06	

FREIGHT LOCOMOTIVE EMISSIONS FACTORS

(g/gal)

Mode	Year	CO	CO_2	NO_x	PM_{10}	SOX	VOC	$PM_{2.5}$
Freight Rail	2030		10,206	28.10	0.43			
	2030		10,206	28.10	0.43			

Freight Rail Fuel Efficiency 468 ton-miles/gal
Fuel Burned at Idle 4.00 gal/hr

Sources: California Air Resources Board
Association of American Railroads, The Environmental Benefits of Moving Freight by Rail, June 2017
California Environmental Protection Agency / Air Resources Board, Technology Assessment:
Freight Locomotives, November 2016

Pavement Adjustments (used only for pavement projects)

PAVEMENT DETERIORATION

(IRI in inches/mile)

	Year 20, By Loading		
Year 0	Light	Medium	Heavy
0	125	150	350
25	150	200	500
50	175	250	675
75	200	300	750
100	275	400	750
125	325	475	750
150	400	575	750
175	500	700	750
200	575	750	750
225	650	750	750
250	750	750	750
275	750	750	750
300	750	750	750
325	750	750	750
350	750	750	750
375	750	750	750
400	750	750	750
425	750	750	750
450	750	750	750

Source: Paterson, 1987

VEHICLE OPERATING SPEED

(percent adjustment)

IRI	Auto	Truck
0	1.000	1.025
25	1.000	1.025
50	1.000	1.025
75	1.000	1.025
100	1.000	1.025
125	1.000	1.025
150	1.000	1.013
175	1.000	1.000
200	1.000	0.980
225	1.000	0.949
250	1.000	0.919
275	0.991	0.890
300	0.981	0.862
325	0.971	0.834
350	0.961	0.808
375	0.952	0.782
400	0.942	0.758
425	0.932	0.734
450	0.923	0.709

Source: Botterill, 1996 and 1997

FUEL CONSUMPTION

(percent adjustment)

IRI	Auto	Truck
0	0.971	0.961
25	0.977	0.965
50	0.980	0.970
75	0.982	0.975
100	0.985	0.980
125	0.990	0.986
150	0.995	0.993
175	1.000	1.000
200	1.005	1.007
225	1.012	1.017
250	1.019	1.026
275	1.027	1.036
300	1.034	1.047
325	1.041	1.058
350	1.050	1.070
375	1.061	1.085
400	1.072	1.100
425	1.082	1.114
450	1.093	1.129

Source: Texas Transportation Institute, 1994

NON-FUEL COSTS

(percent adjustment)

IRI	Auto	Truck
0	1.000	1.000
25	1.000	1.000
50	1.000	1.000
75	1.000	1.000
100	1.000	1.000
125	1.000	1.000
150	1.017	1.018
175	1.034	1.038
200	1.052	1.058
225	1.070	1.078
250	1.088	1.097
275	1.105	1.117
300	1.123	1.137
325	1.141	1.156
350	1.159	1.176
375	1.176	1.196
400	1.194	1.216
425	1.212	1.235
450	1.230	1.255

Source: ARRB Research Board TR VOC Model

Weaving Adjustments (used only for freeway connector, HOV connector, and HOV drop ramp projects)

VEHICLE OPERATING SPEED
(percent adjustment)

Percent Weaving	Freeway Conn	HOV Project
0.000	1.000	1.000
0.002	0.982	0.988
0.004	0.964	0.976
0.006	0.945	0.964
0.008	0.927	0.952
0.010	0.909	0.939
0.012	0.891	0.927
0.014	0.873	0.915
0.016	0.855	0.903
0.018	0.836	0.891
0.020	0.789	0.879
0.022	0.747	0.867
0.024	0.706	0.855
0.026	0.664	0.842
0.028	0.623	0.817
0.030	0.581	0.789
0.032	0.540	0.761
0.034	0.498	0.734
0.036	0.476	0.706
0.038	0.473	0.678
0.040	0.471	0.650
0.042	0.468	0.623
0.044	0.466	0.595
0.046	0.463	0.567
0.048	0.460	0.540
0.050	0.458	0.512
0.052	0.455	0.484
0.054	0.453	0.476
0.056	0.453	0.474
0.058	0.453	0.473
0.060	0.453	0.471
0.062	0.453	0.469
0.064	0.453	0.467
0.066	0.453	0.466
0.068	0.453	0.464
0.070	0.453	0.462
0.072	0.453	0.460
0.074	0.453	0.459
0.076	0.453	0.457
0.078	0.453	0.455
0.080	0.453	0.453

Source: Fitzpatrick, Brewer, and Venglar, 2003

TMS Adjustments (used only for ramp metering, ramp metering signal coordination, incident management, traveler information projects, AVL, transit priority, and BRT projects)

PEAK PERIOD SPEED, VOLUME, AND NON-HIGHWAY BENEFITS
(percent adjustment)

TMS	Without		With		Non-Highway Benefits			Total
Strategy	Speed	Volume	Speed	Volume	TT	VOC	Em	Benefit
AMoth	1.02	0.95	1.02	0.95	-5.05	12.81	1.37	0.74
AMsev	1.53	0.94	1.53	0.94	1.21	1.38	-0.37	1.00
IMoth	0.88	1.18	0.98	0.96	0.51	0.15	0.06	0.74
IMsev	1.01	0.97	1.01	0.95	0.30	0.31	0.30	1.00
NoAdj	1.00	1.00	1.00	1.00	0.00	0.00	0.00	1.00
ORoth	0.98	1.03	1.00	1.00	-0.07	-0.03	-0.07	
ORsev	0.95	1.03	1.00	1.00	0.00	0.00	5.67	
RMoth	1.00	1.00	1.03	0.97	-0.07	-0.03	-0.07	1.00
RMsev	1.00	1.00	1.05	0.97	0.00	0.00	5.67	1.00
TIoth	1.00	1.00	1.02	0.97	-0.11	-0.12	-0.35	1.00
TIsev	1.00	1.00	1.01	0.97	-0.39	-0.39	-0.35	1.00

Source: California Department of Transportation TMS Master Plan, 2003
29) Chaudhary and Messer, 2000

TRANSIT TRAVEL TIME AND AGENCY COST SAVINGS
(percent savings)

TMS Strategy	Travel Time	Agency Costs Capital	Agency Costs O&M
Transit Vehicle Location (AVL)	15%	2%	8%
Transit Vehicle Signal Priority	10%	-	-
Bus Rapid Transit (BRT)	29%	-	-

Sources: FHWA ITS Deployment Analysis System (IDAS), California PATH

CITY OF OAKLAND

CITY HALL • ONE CITY HALL PLAZA • OAKLAND, CALIFORNIA 94612

Office of the Mayor
Honorable Libby Schaaf

(510) 238-3141
FAX (510) 238-4731
TDD (510) 238-3254

January 22, 2018

Susan Bransen
Executive Director, California Transportation Commission
1120 N Street, MS-52
P.O. Box 942873
Sacramento, CA 95814

RE: Alameda-Contra Costa Transit District's FY 2018 Local Partnership Program Competitive Grant Application

Dear Ms. Bransen,

As Mayor of Oakland, I am pleased to support Alameda-Contra Costa Transit District's (AC Transit's) 2018 Local Partnership Program (LPP) grant application to purchase up to 59 urban 40-foot hybrid diesel-electric buses to replace existing diesel buses due for retirement. We need to upgrade and expand our bus fleet, particularly given our current and projected growth in jobs and housing, and our large populations in transit-dependent, low-income, Communities of Concern, and Community Air Risk Evaluation (CARE) communities. AC Transit is also needed to carry more people on the Bay Bridge Transbay Corridor, which is operating over capacity, and impacts Oakland communities.

Changing buses to diesel-electric hybrid will directly reduce diesel particulate emissions in Oakland, which would be greatly benefit the communities most affected by emissions and will also be more efficient to operate. AC Transit needs approximately $47.2 million for this project; they asking for $15 million in LPP Competitive funds which would greatly help leverage the project's funding package. I strongly support AC Transit's LPP grant application, as it will provide critically needed transit service and reduced emissions in the East Bay by 2020. Please contact Matt Nichols, my Policy Director for Transportation and Infrastructure (mdnichols@oaklandnet.com) if you have any questions.

Sincerely,

Libby Schaaf

City of Alameda California

January 23, 2018

Susan Bransen
Executive Director
California Transportation Commission
P.O. Box 942873
Sacramento, CA 95814

RE: Alameda-Contra Costa Transit District's FY 2018 Local Partnership Program Competitive Grant Application

Dear Ms. Bransen:

On behalf of the City of Alameda, I am pleased to support Alameda-Contra Costa Transit District's (AC Transit's) FY 2018 Local Partnership Program (LPP) competitive grant application to purchase up to 59 urban 40-foot hybrid diesel-electric buses to replace existing diesel buses that are due for retirement from the fleet. Changing the bus propulsion method from diesel to diesel-electric hybrid will reduce emissions and will improve fuel economy, which would be greatly beneficial to the environment. The new buses will be equipped with real-time bus dispatch and tracking systems, electronic and cash fare collection and bike racks.

These new buses are consistent with the City's Transportation Choices Plan (2018) and the Climate Plan (2008). Both of these City plans recommend more reliable bus service using more environmentally friendly buses that have a smaller carbon footprint and that transport the maximum number of bicycles. The City of Alameda and AC Transit have a vibrant partnership with these shared goals and have constant collaboration to ensure Alamedans' travel needs are well met. Being that Alameda does not have a BART station, AC Transit bus service is especially important to connect Alamedans with regional transit stations, including BART stations in Oakland and also to/from the two ferry terminals in Alameda and the new San Francisco Transbay terminal.

AC Transit estimates that the project will cost approximately $47.2 million in total, is asking for up to $15 million in LPP competitive funds to assist in completing the project, and expects to be able to have the new buses in service by 2020. The City of Alameda is supporting the AC Transit Fiscal Year 2018 LPP competitive application, as it will sustain critically needed bus service in Alameda and in the East Bay. Please contact me or Jennifer Ott, Director of Base Reuse and Transportation Planning, at 510-747-4747 or jott@alamedaca.gov if you have any questions or require additional information.

Sincerely,

Trish Herrera Spencer
Mayor

THS:mk

Office of the Mayor

2263 Santa Clara Avenue, Room 320
Alameda, California 94501
510.747.4701

Office of the Mayor

Jesse Arreguín
Mayor

January 22, 2018

Susan Bransen
Executive Director
California Transportation Commission
1120 N Street, MS-52
P.O. Box 942873
Sacramento, CA 95814

RE: Alameda-Contra Costa Transit District's FY 2018 Local Partnership Program Competitive Grant Application

Dear Ms. Bransen,

On behalf of the City of Berkeley, I am pleased to support Alameda-Contra Costa Transit District's (AC Transit's) FY 2018 Local Partnership Program (LPP) Competitive grant application to purchase up to 59 urban 40-foot hybrid diesel-electric buses to replace existing diesel buses that are due for retirement from fleet.

The new buses will be equipped with real-time bus dispatch and tracking systems, electronic and cash fare collection, and bike racks. These buses are needed in order to maintain our fleet and service levels in the East Bay which continues a fast growth rate in terms of jobs and population. Changing the bus propulsion method from diesel to diesel-electric hybrid will reduce emissions and improve fuel economy, which would be greatly beneficial to the environment. This, in particular, would have a very positive impact on the many Disadvantaged Communities that are within our service area.

We estimate that the project will cost approximately $47.2 million in total, and are asking for up to $15 million in LPP Competitive funds to assist in completing the project. We expect to be able to put the new buses into service by 2020.

We hope you will consider AC Transit's FY 2018 LPP Competitive application, as it will support critically needed transit service in the East Bay. Please contact me at 510-981-7100 or mayor@cityofberkeley.info if you have any questions or require additional information.

Sincerely,

Jesse Arreguín

Jesse Arreguín
Mayor, City of Berkeley

2180 Milvia Street, Berkeley, CA 94704 ▪ Tel: 510.981.7100 ▪ Fax: 510.981.7199 ▪ TDD: 510.981.6903
E-Mail: mayor@cityofberkeley.info ▪ Web: www.cityofberkeley.info/mayor

City of San Leandro
Civic Center, 835 E. 14th Street
San Leandro, California 94577
www.sanleandro.org

January 19, 2018

Susan Bransen
Executive Director
California Transportation Commission
1120 N Street, MS-52
P.O. Box 942873
Sacramento, CA 95814

RE: Alameda-Contra Costa Transit District's FY 2018 Local Partnership Program Competitive Grant Application

Dear Ms. Bransen,

On behalf of the City of San Leandro, I am pleased to support Alameda-Contra Costa Transit District's (AC Transit's) FY 2018 Local Partnership Program (LPP) Competitive grant application to purchase up to 59 urban 40-foot hybrid diesel-electric buses to replace existing diesel buses that are due for retirement from fleet.

The new buses will be equipped with real-time bus dispatch and tracking systems, electronic and cash fare collection, and bike racks. These buses are needed in order to maintain our fleet and service levels in the East Bay which continues a fast growth rate in terms of jobs and population. Changing the bus propulsion method from diesel to diesel-electric hybrid will reduce emissions and improve fuel economy, which would be greatly beneficial to the environment. This, in particular, would have a very positive impact on the many Disadvantaged Communities that are within our service area.

We estimate that the project will cost approximately $47.2 million in total, and are asking for up to $15 million in LPP Competitive funds to assist in completing the project. We expect to be able to put the new buses into service by 2020.

We hope you will consider AC Transit's FY 2018 LPP Competitive application, as it will support critically needed transit service in the East Bay. Please contact me or my staff member Caroline Hernandez at chernandez@sanleandro.org (510)577-3355 if you have any questions or require additional information.

Sincerely,

Pauline Russo Cutter

Pauline Russo Cutter
Mayor, City of San Leandro

CITY OF NEWARK, CALIFORNIA

37101 Newark Boulevard • Newark, California 94560-3796 • (510) 793-1400 • FAX (510) 794-2306

January 19, 2018

Susan Bransen
Executive Director
California Transportation Commission
1120 N Street, MS-52
P.O. Box 942873
Sacramento, CA 95814

RE: Alameda-Contra Costa Transit District's FY 2018 Local Partnership Program Competitive Grant Application

Dear Ms. Bransen,

On behalf of the City of Newark, I am pleased to support Alameda-Contra Costa Transit District's (AC Transit's) FY 2018 Local Partnership Program (LPP) Competitive grant application to purchase up to 59 urban 40-foot hybrid diesel-electric buses to replace existing diesel buses that are due for retirement from fleet.

The new buses will be equipped with real-time bus dispatch and tracking systems, electronic and cash fare collection, and bike racks. These buses are needed in order to maintain our fleet and service levels in the East Bay which continues a fast growth rate in terms of jobs and population. Changing the bus propulsion method from diesel to diesel-electric hybrid will reduce emissions and improve fuel economy, which would be greatly beneficial to the environment. This, in particular, would have a very positive impact on the many Disadvantaged Communities that are within our service area.

We estimate that the project will cost approximately $47.2 million in total, and are asking for up to $15 million in LPP Competitive funds to assist in completing the project. We expect to be able to put the new buses into service by 2020.

We hope you will consider AC Transit's FY 2018 LPP Competitive application, as it will support critically needed transit service in the East Bay. Please contact me or my staff member City Manager, John Becker (510-578-4914 or al.nagy@newark.org) if you have any questions or require additional information.

Sincerely,

Alan L. Nagy

Alan L. Nagy
Mayor

STATE OF CALIFORNIA ● DEPARTMENT OF TRANSPORTATION
PROJECT PROGRAMMING REQUEST
DTP-0001 (Revised July 2017) *General Instructions*

Amendment (Existing Project) No					Date: 1/26/18	
District	**EA**	**Project ID**	**PPNO**	**MPO ID**	**Alt Proj. ID**	
04				94526/240382/240706		

County	**Route/Corridor**	**PM Bk**	**PM Ahd**	**Project Sponsor/Lead Agency**	
ALA	various			Alameda-Contra Costa Transit District	
				MPO	**Element**
				MTC	Mass Transit

Project Manager/Contact	**Phone**	**E-mail Address**
Evelyn Ng	510-891 5405	eng@actransit.org

Project Title

Purchase Hybrid Buses

Location (Project Limits), Description (Scope of Work)

This project is for the purchase of 59 new 40-foot hybrid diesel-electric buses equipped with real-time bus dispatch and tracking systems, electronic and cash fare collection, and bike racks to replace existing diesel buses that are due for retirement from fleet. The buses will be deployed throughout AC Transit's service area across 13 densely populated cities and adjacent unincorporated areas in Alameda and Contra Costa counties.

Component	**Implementing Agency**
PA&ED	
PS&E	
Right of Way	
Construction	

Legislative Districts

Assembly:	D15, D17, D18, D20, D25	**Senate:**	D9, D10, D11	**Congressional:**	A11, CA12, CA13, CA15, CA

Project Benefits

Purchasing 59 hybrid buses to replace diesel buses will have a significant reduction on emissions. In addition there will be operational savings including fuel costs, costs of engine parts, braking and propulsion systems.

Purpose and Need

The purpose of purchasing 59 new hybrid buses is to replace buses that are due for retirement. With buses retiring, there is a need to purchase new buses to replace them in order to maintain fleet size and service levels. Changing the bus propulsion method from diesel to diesel-electric hybrid will reduce emissions and improve fuel economy.

Category	**Outputs/Outcomes**	**Unit**	**Total**
Intercity Rail/Mass Trans	Transit Vehicles		

ADA Improvements Y/N	Bike/Ped Improvements No	Reversible Lane analysis No
Includes Sustainable Communities Strategy Goals Yes	Reduces Greenhouse Gas Emissions Yes	

Project Milestone	**Existing**	**Proposed**
Project Study Report Approved		
Begin Environmental (PA&ED) Phase		
Circulate Draft Environmental Document (**Document Type**)		
Draft Project Report		
End Environmental Phase (PA&ED Milestone)		
Begin Design (PS&E) Phase		10/01/18
End Design Phase (Ready to List for Advertisement Milestone)		12/01/18
Begin Right of Way Phase		
End Right of Way Phase (Right of Way Certification Milestone)		
Begin Construction Phase (Contract Award Milestone)		12/01/18
End Construction Phase (Construction Contract Acceptance Milestone)		06/01/20
Begin Closeout Phase		07/01/20
End Closeout Phase (Closeout Report)		

ADA Notice For individuals with sensory disabilities, this document is available in alternate formats. For information call (916) 654-6410 or TDD (916) 654-3880 or write Records and Forms Management, 1120 N Street, MS-89, Sacramento,

STATE OF CALIFORNIA ● DEPARTMENT OF TRANSPORTATION

PROJECT PROGRAMMING REQUEST

DTP-0001 (Revised July 2017)

Date: 1/26/18

District	County	Route	EA	Project ID	PPNO	Alt Proj. ID
04	ALA	various				
Project Title:	Purchase Hybrid Buses					

Existing Total Project Cost ($1,000s)									
Component	Prior	18/19	19/20	20/21	21/22	22/23	23/24+	Total	**Implementing Agency**
E&P (PA&ED)									
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
Proposed Total Project Cost ($1,000s)									**Notes**
E&P (PA&ED)									
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON		253	46,947					47,200	
TOTAL		253	46,947					47,200	

Fund No. 1:									**Program Code**
Existing Funding ($1,000s)									
Component	Prior	18/19	19/20	20/21	21/22	22/23	23/24+	Total	**Funding Agency**
E&P (PA&ED)									CTC
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
Proposed Funding ($1,000s)									**Notes**
E&P (PA&ED)									LPP Formulaic
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON		253						253	
TOTAL		253						253	

Fund No. 2:									**Program Code**
Existing Funding ($1,000s)									
Component	Prior	18/19	19/20	20/21	21/22	22/23	23/24+	Total	**Funding Agency**
E&P (PA&ED)									CTC
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
Proposed Funding ($1,000s)									**Notes**
E&P (PA&ED)									LPP Competitive
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON			15,000					15,000	
TOTAL			15,000					15,000	

STATE OF CALIFORNIA ● DEPARTMENT OF TRANSPORTATION

PROJECT PROGRAMMING REQUEST

DTP-0001 (Revised July 2017)

Date: 1/26/18

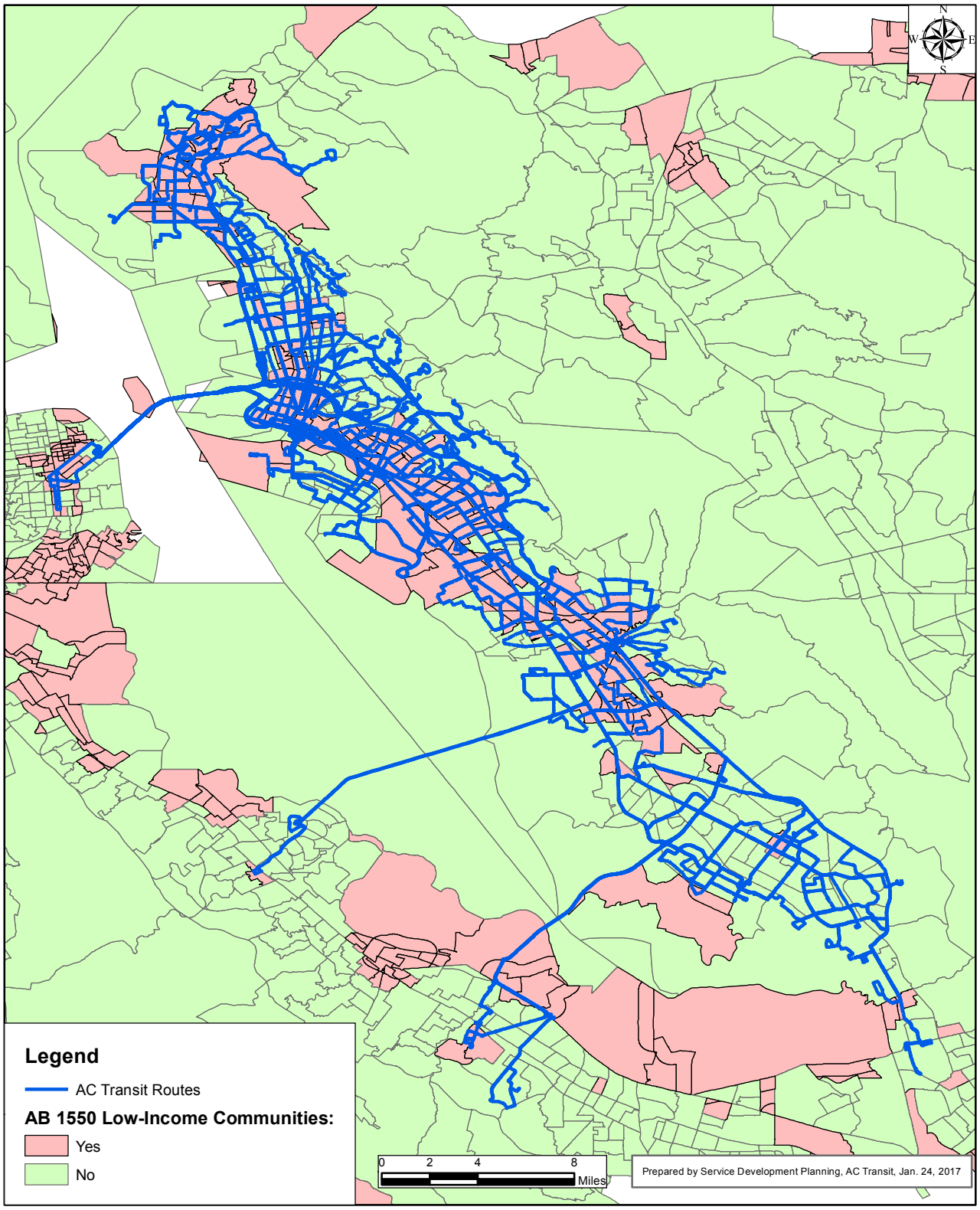
District	County	Route	EA	Project ID	PPNO	Alt Proj. ID
04	ALA	various				
Project Title:	Purchase Hybrid Buses					

Fund No. 3:									**Program Code**
Existing Funding ($1,000s)									
Component	Prior	18/19	19/20	20/21	21/22	22/23	23/24+	Total	**Funding Agency**
E&P (PA&ED)									FTA, MTC, Other
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
Proposed Funding ($1,000s)									**Notes**
E&P (PA&ED)									FTA 5339, BATA, AB 664, other local match
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON			31,947					31,947	
TOTAL			31,947					31,947	

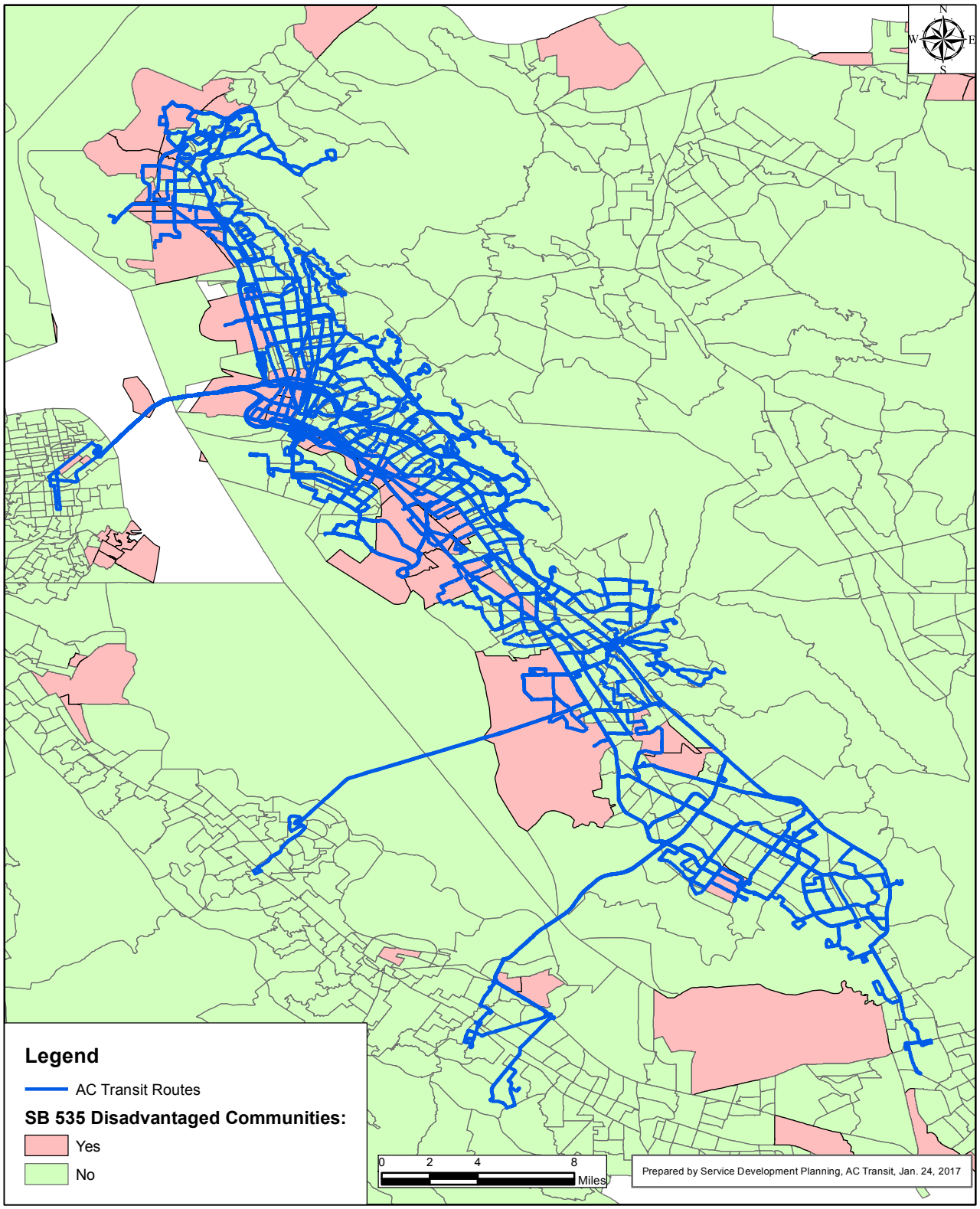
Fund No. 4:									**Program Code**
Existing Funding ($1,000s)									
Component	Prior	18/19	19/20	20/21	21/22	22/23	23/24+	Total	**Funding Agency**
E&P (PA&ED)									
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
Proposed Funding ($1,000s)									**Notes**
E&P (PA&ED)									
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									

Fund No. 5:									**Program Code**
Existing Funding ($1,000s)									
Component	Prior	18/19	19/20	20/21	21/22	22/23	23/24+	Total	**Funding Agency**
E&P (PA&ED)									
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									
Proposed Funding ($1,000s)									**Notes**
E&P (PA&ED)									
PS&E									
R/W SUP (CT)									
CON SUP (CT)									
R/W									
CON									
TOTAL									

AC Transit Routes & AB 1550 Low-Income Communities



AC Transit Routes & SB 535 Disadvantaged Communities



Local Partnership Program
Benefits Forms

Project Information			
Project Title:	Purchase Diesel-Hybrid Buses	Date:	5/1/2020
Project Identifier (EA, PPNO, etc):			

Contact Information			
Nominating Agency:	Alameda-Contra Costa Transit Agency	Agency Completing Form:	Alameda-Contra Costa Transit Agency
Contact Person: Evelyn Ng	Phone: 510 891 5405	Contact Person: Evelyn Ng	Phone: 510 891 5405
Email Address: eng@actransit.org		Email Address: eng@actransit.org	

LPP Indicator	Suggested Measures/Outcomes	Unit	Current	Projected	
				Outcome	Year
Throughput	Average Peak Period Vehicle Trips	Time			
	Average Daily Vehicle Trips (ADT)	Each			
	Reduction in Daily Vehicle Hours of Delay	Hours			
	Daily VMT per capita	Each			
	Average Peak Period Vehicle Trips Multiplied by the Occupancy Rate	Each			
	Average Daily Vehicle Trips Multiplied by the Occupancy Rate	Each			
	Passengers per Vehicle Revenue Hour	Hours			
	Passengers per Vehicle Revenue Mile	Miles			
	Passenger Mile per Train Mile (Intercity Rail)	Miles			
	Boardings per capita	Each			
	Average Daily Passengers	Each	17,700	18,415	**2023**
	In the space below, qualitatively explain the assumptions and methodologies used for proposed throughput outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				
	Current passengers based on current ridership. Projected ridership adds 2% increase per year over current ridership, plus average Transbay ridership for 5 additional expansion buses in 2023.				
Safety	Fatalities per Vehicle Miles Traveled (VMT) and per capita	Each			
	Fatal Collisions per VMT and per capita	Each			
	Injury Collisions per VMT and per capita	Each			
	Other				
	In the space below, qualitatively explain the assumptions and methodologies used for proposed safety outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				
Accessibility	Percentage of population within 1/2 mile of a rail station or bus route.	Percent			
	Average travel time to jobs or school.	Time			
	Other				
	In the space below, qualitatively explain the assumptions and methodologies used for proposed accessibility outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				
Economic Development	Jobs created	Each			
	Benefit/Cost Ratio	Ratio			
	Other				
	In the space below, qualitatively explain the assumptions and methodologies used for proposed economic development outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				

Air Quality and Greenhouse Gas Reductions	Reduction in Particulate Matter (PM2.5)	Tons per year			
	Reduction in Particulate Matter (PM10)	Tons per year	0.01	0	2023
	Reduction in Carbon Dioxide (CO2)	Tons per year	4545		2023
	Reduction in Volatile Organize Compounds (VOC)	Tons per year			
	Reduction in Sulphur Oxides (SOx)	Tons per year			
	Reduction in Carbon Monoxide (CO)	Tons per year	0.32	0	2023
	Reduction in Nitrogen Oxide (NOx)	Tons per year	2.71	0	2023
	In the space below, qualitatively explain the assumptions and methodologies used for proposed emissions reduction outcomes.				
	Assumptions based on Altoona testing results for a 40-foot diesel hybrid bus in an urban environment in the link below: https://mjbradley.com/sites/default/files/CNG%20Diesel%20Hybrid%20Comparison%20FINAL%2005nov13.pdf				
System Preservation	Pavement lane miles	Miles			
	Condition of pavement - percentage	Percent			
	Condition of bridge - percentage	Percent			
	Replacement of end-of-life buses	Each	40	40	
	In the space below, qualitatively explain the assumptions and methodologies used for proposed System Preservation outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				
	This project purchases brand new zero emission buses which replace diesel buses that have reached end of useful life.				
Reliability	Travel Time Variability (buffer index)	Time			
	Daily vehicle hours of delay per capita	Hours			
	Daily congested highway VMT per capita	Each			
	Other				
	In the space below, qualitatively explain the assumptions and methodologies used for proposed Reliability outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				
Mobility	Passenger Hours of Delay / Year	Hours			
	Average Peak Period Travel Time	Time			
	Average Non-Peak Period Travel Time	Time			
	Other				
	In the space below, qualitatively explain the assumptions and methodologies used for proposed Mobility outcomes. If another measure(s) is entered under "Other", describe the measure and why other suggested measure(s) were not used.				