Application of Criteria for a Project of Air Quality Concern

Project Title: Bay Area Express Lanes Network – Phase 1 Project

Project Summary for Air Quality Conformity Task Force Meeting: September 27, 2012

Description

- Project will not expand roadway, add pavement, or acquire right-of-way
- Construction will consist of restriping, installing tolling equipment and signage, and utility trenching
- Existing freeways and bridge approaches have existing single high-occupancy vehicle (HOV) lanes
- Express lanes facility will provide a new option for solo drivers to pay a toll to use, improving reliability and maximizing the overall efficiency of the freeway segments by reducing delay

Background

- NEPA process for Initial Study/Environmental Assessment (IS/EA) is in early stages
- Public review for IS/EA is scheduled for September 2013
- Seeking air quality conformity determination on or before December, 2012

Not a Project of Air Quality Concern (40 CFR 93.123(b)(1))

(i) New or expanded highway projects with significant number/increase in diesel vehicles?

- Not a new or expanded highway project
- The project would not a cause significant change in truck AADT or percent trucks
- Project would not expand/increase capacity for diesel vehicles—large trucks restricted from using HOV and express lanes by California Vehicle Code Section 21655(b)
- Operational improvements would benefit general purpose lanes that diesel vehicles use

(ii) Affects intersections at LOS D, E, or F with a significant number of diesel vehicles? – Not Applicable

(iii) New bus and rail terminals and transfer points?—Not Applicable

(iv) Expanded bus and rail terminals and transfer points?—Not Applicable

(v) Affects areas identified in PM_{10} or $PM_{2.5}$ implementation plan as site of violation?

- No state implementation plan for $PM_{2.5}$
- Therefore, not identified in plan as an area of potential violation
- Nearest PM_{10} or $PM_{2.5}$ violations in 2007 in Redwood City

Project Assessment Form for $PM_{2.5}$ Interagency Consultation

RTIP ID# 230703

TIP ID# REG110031

Air Quality Conformity Task Force Consideration Date
September 27, 2012

Project Description *(clearly describe project)* See attached **Figure 1, Project Location Map**

The Metropolitan Transportation Commission (MTC), the California Department of Transportation (Caltrans), and other partner Bay Area agencies are pursuing development of an integrated Bay Area system of express lanes to enhance mobility, improve travel time reliability. Express lanes allow single-occupancy vehicles to reduce travel times by using high-occupancy vehicle (HOV) lanes by paying a toll. Use of the HOV lanes by buses and qualifying carpools would remain free.

MTC has authority to implement and operate the Regional Express Lane Network on freeways in Alameda, Contra Costa and Santa Clara counties. MTC and Caltrans have selected the following initial set of five freeway segments as the first phase of the Regional Express Lane Network (Phase 1 Project): (1) Bay Bridge approach, (2) San Mateo Bridge approach, (3) Dumbarton Bridge approach, (4) Interstate 680 (I-680) between Alcosta Boulevard and Livorna Road, and (5) Interstate 880 (I-880) between Hegenberger/Lewelling to State Route 237 (SR 237). All five segments have existing HOV lane facilities. The Phase 1 Project would convert these HOV lanes to express lanes; no added capacity would be needed. Existing HOV lanes are not TCMs required under the Clean Air Plan.

Type of Project: Change to existing State highway/Change to existing HOV lane usage

County	**Narrative Location/Route & Postmiles**
Alameda, Contra Costa, Santa Clara	The Phase 1 Project includes 76 miles of freeway within Alameda, Contra Costa and Santa Clara Counties including the I-80 approach to the Bay Bridge, State Route 92 approach to the San Mateo Bridge, State Route 84 approach to the Dumbarton Bridge, I-680 between Alcosta Boulevard and Livorna Road; and, I-880 between Hegenberger/Lewelling to SR 237 Caltrans Project – EA#

Lead Agency: Metropolitan Planning Commission (MTC)

Contact Person	**Phone#**	**Fax#**	**Email**
Lisa Klein	510-817-5832	510-817-5848	lklein@mtc.ca.gov

Federal Action for which Project-Level PM Conformity is Needed *(check appropriate box)*

Categorical Exclusion (NEPA)		**EA or Draft EIS**	**FONSI or Final EIS**	**PS&E or Construction**	**Other**
	X				

Scheduled Date of Federal Action: March 2014

NEPA Delegation – Project Type *(check appropriate box)*

Exempt	**Section 6004 – Categorical Exemption**	**Section 6005 – Non-Categorical Exemption**

Current Programming Dates *(as appropriate)*

	PE/Environmental	**ENG**	**ROW**	**CON**
Start	March 2012	March 2012	N/A	2015
End	March 2014	March 2014	N/A	2015

$PM_{2.5}$ Project Assessment Form for Interagency Consultation

Project Purpose and Need (Summary): *(please be brief)*

Purpose: The purpose of the project is to better meet current and future traffic demands by optimizing use of the existing HOV lane capacity by allowing single occupant vehicles to access the HOV lane for a fee and maximizing the overall efficiency of the existing freeway segments by managing demand across all lanes. Additionally, the project provides a new option for travelers in each segment to reduce and improve travel time through payment of a fee/toll. According to California Vehicle Code Section 21655(b), large trucks are restricted from using HOV and express lanes. Therefore, the project would not expand or increase capacity for diesel vehicles.

Need: Significant daily congestion currently exists in the general purpose lanes during peak hours within each of the Phase 1 Project segments and will continue to increase with future traffic growth. This recurrent congestion reduces travel times, speed, and reliability through these corridors.

Surrounding Land Use/Traffic Generators *(especially effect on diesel traffic)*

The Phase I project is limited to the existing pavement on I-880, I-680, Bay Bridge approach, San Mateo Bridge approach, and Dumbarton Bridge approach.

The project study areas are in Alameda, Contra Costa, and Santa Clara counties. Land uses along the I-880 segment of the study area include industrial, manufacturing, warehousing, commercial, office, retail, residential, public and institutional, parks, and recreation. I-680 project limits are bordered by commercial and residential development, undeveloped hillsides and rural valleys. The three bridge approaches are generally surrounded by open space and bay lands, and include some industrial, commercial, and residential uses.

Brief summary of assumptions and methodology used for conducting analysis *(please keep this concise – specifics may include date of when traffic counts were conducted, studies where truck percentages were derived)*

The no-project scenario for each segment includes the existing high-occupancy vehicle (HOV) lanes operating at their current occupancy requirements. Observed annual average daily traffic (AADT) and truck AADT were obtained from the 2010 Caltrans truck volume report.

Traffic demand forecasts were developed using MTC Travel Model One. Current and forecast years were calculated as follows:

- Current baseline conditions were based off of the latest 2010 MTC Travel Model One run
- Horizon year 2035 forecasts were performed starting from the no-project networks paired with the preferred land use for the in-progress regional transportation plan (RTP)
- Opening year 2015 forecasts were interpolated between 2010 and 2035

The level-of-service (LOS) calculations apply the methodology for basic freeway segments in the Highway Capacity Manual 2000 (HCM). The service flow rate was calculated for each section of freeway in passenger car equivalents (PCEs) per hour per lane.

The HCM does not include a standard method for calculating LOS at toll plazas, therefore the LOS for the bridge approach projects cannot be directly reported. Instead, LOS shown for bridge approach projects are calculated based on bridge traffic. It is known from experience that the bridge approaches, particularly for the Bay Bridge, suffer queues during peak hours, and that the existing HOV bypass lanes provide substantial time savings to vehicles using them. Therefore, it is reasonable to assume a poor level-of-service for general use lanes given these conditions.

Opening Year: If facility is a highway or street, Build and No Build LOS, AADT, % and # trucks, truck AADT of proposed facility

Opening Year: 2015

No Build and Build LOS, 2015

			2015 No Project						2015 with Project					
		Network	All Lanes		Express Lane		General Purpose Lanes		All Lanes		Express Lane		General Purpose Lanes	
			Level of Service		Level of Service		Level of Service		Level of Service		Level of Service		Level of Service	
Facility	Direction and Location	Total Lanes	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)
Bay Bridge Approach*	WB, at San Francisco-Oakland Bay Bridge	5	D	D					D	D				
San Mateo Bridge Approach*	WB, at San Mateo-Hayward Bridge	3	B	C					B	C				
Dumbarton Bridge Approach*	WB, west of Dumbarton Bridge	3	C	A					C	B				
I-880 from SR-237 to Lewelling/Hegenberger	NB, north of JCT. RTE. 237	6			A	B	C	C			A	B	C	C
	NB, north of Fremont, JCT. RTE. 262 east	4			A	B	C	D			B	B	C	D
	NB, north of Fremont, south JCT. RTE. 84	4			B	C	D	D			C	C	D	D
	NB, north of Hayward, JCT. RTE. 92	5			B	C	C	D			C	C	C	D
I-880 from SR-237 to Lewelling/Hegenberger	SB, north of JCT. RTE. 237	6			B	B	C	C			A	B	C	C
	SB, north of Fremont, JCT. RTE. 262 east	4			B	B	C	D			B	B	D	D
	SB, north of Fremont, south of JCT. RTE. 84	4			C	C	D	D			C	C	D	D
	SB, north of Hayward, JCT. RTE. 92	5			C	C	D	D			C	C	D	D
	SB, north of JCT. RTE. 238 east	5			B	B	C	D			B	B	C	D
I-680 from Alcosta to Livorna	NB, north of San Ramon, Alcosta Blvd.	4			A	B	C	C			B	B	C	C
	SB, north of San Ramon, Alcosta Blvd.	4			B	B	C	D			B	B	C	C
		5	D	D					D	D				

Source: Parsons Brinckerhoff 2012

* The Highway Capacity Manual does not include a standard method for calculating LOS at toll plazas, therefore the LOS for the bridge approach projects cannot be directly reported.

Opening Year continued:

No Build and Build Total AADT and Truck AADT, 2015

		2015 No Project			2015 with Project		
Facility	**Direction and Location**	**AADT**	**Truck AADT**	**Percent Trucks**	**AADT**	**Truck AADT**	**Percent Trucks**
Bay Bridge Approach	WB, at San Francisco-Oakland Bay Bridge	127,800	3,000	2.3%	128,900	3,100	2.4%
San Mateo Bridge Approach	WB, at San Mateo-Hayward Bridge	43,800	2,700	6.2%	43,800	2,700	6.2%
Dumbarton Bridge Approach	WB, west of Dumbarton Bridge	34,000	900	2.6%	34,700	900	2.6%
I-880 from SR-237 to Lewelling/Hegenberger	Both, north of JCT. RTE. 237	208,000	11,600	5.6%	209,200	11,600	5.5%
	Both, north of Fremont, JCT. RTE. 262 east	181,500	8,500	4.7%	182,700	8,500	4.7%
	Both, north of Fremont, south JCT. RTE. 84	204,800	13,400	6.5%	207,000	13,400	6.5%
	Both, north of Hayward, JCT. RTE. 92	240,900	16,700	6.9%	243,000	16,700	6.9%
	SB, north of JCT. RTE. 238 east	110,100	9,100	8.3%	110,600	9,100	8.2%
I-680 from Alcosta to Livorna	Both, north of San Ramon, Alcosta Blvd.	158,400	8,300	5.2%	160,300	8,300	5.2%

Source: Parsons Brinckerhoff 2012

RTP Horizon Year / Design Year: If facility is a highway or street, Build and No Build LOS, AADT, % and # trucks, truck AADT of proposed facility

Horizon Year: 2035

No Build and Build LOS, 2035

			2035 No Project						2035 with Project					
		Network	All Lanes		Express Lane		General Purpose Lanes		All Lanes		Express Lane		General Purpose Lanes	
			Level of Service		Level of Service		Level of Service		Level of Service		Level of Service		Level of Service	
Facility	Direction and Location	Total Lanes	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)
Bay Bridge Approach*	WB, at San Francisco-Oakland Bay Bridge	5	D	D					D	D				
San Mateo Bridge Approach*	WB, at San Mateo-Hayward Bridge	3	B	C					B	C				
Dumbarton Bridge Approach*	WB, west of Dumbarton Bridge	3	C	B					C	B				
I-880 from SR-237 to Lewelling/Hegenberger	NB, north of JCT. RTE. 237	6			B	B	C	C			C	C	C	C
	NB, north of Fremont, JCT. RTE. 262 east	4			B	B	D	D			C	C	D	D
	NB, north of Fremont, south JCT. RTE. 84	4			C	C	D	D			C	C	D	D
	NB, north of Hayward, JCT. RTE. 92	5			B	C	D	D			C	C	D	D
I-880 from SR-237 to Lewelling/Hegenberger	SB, north of JCT. RTE. 237	6			B	B	C	C			A	C	C	C
	SB, north of Fremont, JCT. RTE. 262 east	4			C	C	D	E			C	C	D	E
	SB, north of Fremont, south of JCT. RTE. 84	4			C	C	D	D			C	C	D	D
	SB, north of Hayward, JCT. RTE. 92	5			C	C	D	D			C	C	D	D
	SB, north of JCT. RTE. 238 east	5			B	B	D	D			B	B	D	D
I-680 from Alcosta to Livorna	NB, north of San Ramon, Alcosta Blvd.	4			A	B	D	C			C	C	C	C
	SB, north of San Ramon, Alcosta Blvd.	4			B	B	C	D			C	C	C	C
		5	D	D										

Source: Parsons Brinckerhoff 2012

* The Highway Capacity Manual does not include a standard method for calculating LOS at toll plazas, therefore the LOS for the bridge approach projects cannot be directly reported.

RTP Horizon Year / Design Year continued
Horizon Year: 2035

No Build and Build, 2035

		2035 No Project			2035 with Project		
Facility	**Direction and Location**	**AADT**	**Truck AADT**	**Percent Trucks**	**AADT**	**Truck AADT**	**Percent Trucks**
Bay Bridge Approach	WB, at San Francisco-Oakland Bay Bridge	148,800	2,500	1.7%	154,400	3,000	1.9%
San Mateo Bridge Approach	WB, at San Mateo-Hayward Bridge	46,900	2,300	4.9%	47,000	2,300	4.9%
Dumbarton Bridge Approach	WB, west of Dumbarton Bridge	40,500	900	2.2%	41,500	900	2.2%
I-880 from SR-237 to Lewelling/Hegenberger	Both, north of JCT. RTE. 237	240,100	12,200	5.1%	245,900	12,400	5.0%
	Both, north of Fremont, JCT. RTE. 262 east	211,600	9,000	4.3%	217,500	9,100	4.2%
	Both, north of Fremont, south of JCT. RTE. 84	224,200	14,200	6.3%	234,800	14,400	6.1%
	Both, north of Hayward, JCT. RTE. 92	264,700	17,700	6.7%	274,900	17,800	6.5%
	SB, north of JCT. RTE. 238 east	126,600	9,800	7.7%	129,100	10,000	7.7%
I-680 from Alcosta to Livorna	Both, north of San Ramon, Alcosta Blvd.	172,000	8,700	5.1%	181,600	8,800	4.8%

Source: Parsons Brinckerhoff 2012

Opening Year: If facility is an interchange(s) or intersection(s), Build and No Build cross-street AADT, % and # trucks, truck AADT
For the opening year, the traffic analysis shows that the project would result in an increase in the total AADT by an average of 0.79 percent at the count locations and increase truck AADT by an average of 0.13 percent (change in truck AADT of 100 vehicles or less) at those same locations.

RTP Horizon Year / Design Year: If facility is an interchange (s) or intersection(s), Build and No Build cross-street AADT, % and # trucks, truck AADT
For the horizon year, the traffic analysis shows that the project would result in an increase in the total AADT by an average of 3.5 percent at the count locations and increase truck AADT by an average of 1.8 percent (change in truck AADT of 500 vehicles or less) at those same locations.

Opening Year: If facility is a bus, rail or intermodal facility/terminal/transfer point, # of bus arrivals for Build and No Build, % and # of bus arrivals will be diesel buses
Not applicable

RTP Horizon Year / Design Year: If facility is a bus, rail or intermodal facility/terminal/transfer point, # of bus arrivals for Build and No Build, % and # of bus arrivals will be diesel buses
Not applicable

Describe potential traffic redistribution effects of congestion relief *(impact on other facilities)*

The project would increase the use of the existing HOV lanes in each of the freeway segments by allowing solo drivers to pay a toll to use HOV lanes during AM and PM peak periods.

The project would result in a slight increase to AADT due primarily to the traffic redistribution effects of congestion relief. The primary change results from autos shifting from the general purpose lanes into the express lane, providing congestion relief in the general purpose lanes.

Faster travel times in the general purpose lanes may result in some diversion of vehicles from other facilities, such as East Bay arterials parallel to I-880, to the freeway due to reduced congestion level. In addition to the diversion effect from other facilities, other components of induced demand may occur, including mode shift, a change in destinations, and a change in frequency of trip making.

Comments/Explanation/Details *(please be brief)*

The project is in a nonattainment area for federal $PM_{2.5}$ standards. Therefore, according to 40 CFR Part 93, a hotspot analysis is required for conformity purposes. However, the Environmental Protection Agency (EPA) does not require hot spot analyses, qualitative or quantitative, for projects that are not listed in 40 CFR Section 93.123(b)(1) as a project of air quality concern (POAQC). Five types or categories of projects qualify as a POAQC. The following discussion evaluates whether the proposed project falls into any of these five POAQC categories.

The project does not qualify as a POAQC for the following reasons:

1. It is not a new or expanded highway project that would have a significant number of or increase in the number of diesel vehicles (40 CFR Section 93.123(b)(1)(i)).

   - The project would not add capacity to the existing freeway segments and would only convert the existing HOV lane(s) in these segments to HOT lanes. Therefore no addition capacity for diesel vehicles would be created. The majority of diesel trucks are restricted from using either HOV or HOT lanes, even for passing, by California Vehicle Code Section 21655(b).

   - The project would result in a slight increase (1.8 percent average) in truck volumes when compared to the No Build condition. This increase is due primarily to the traffic redistribution effects of congestion relief. However truck volume as a percentage of overall traffic on the freeway segments would remain the same or reduce in most cases.

   - By increasing the efficiency of unused HOV lane capacity, the project would improve congestion and reduce idling in the general purpose lanes that the trucks use.

2. The project does not affect any intersections (40 CFR Section 93.123(b)(1)(ii)).

3. It is not a new bus or rail terminal or transfer point (40 CFR Section 93.123(b)(1)(iii)).

4. It is not an expansion of an existing bus or rail terminal or transfer point (40 CFR Section 93.123(b)(1) (iv)).

5. There is no state implementation plan for $PM_{2.5}$, and the project area is therefore not identified in an implementation plan as an area of potential violation (40 CFR Section 93.123(b)(1)(v)).

Therefore, the project meets the Clean Air Act requirements and 40 CFR 93.116 without any explicit hotspot analysis. The project would not create a new, or worsen an existing, $PM_{2.5}$ violation.

Project Location Map

Figure 1

Source: Google Maps, Circlepoint, 2012.

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This technical memorandum presents traffic forecasts to be used for the PM 2.5 analysis of the Phase 1 Bay Area Express Lanes Network. The network analyzed includes the implementation of high-occupancy toll (HOT) lanes for the following locations:

- I-880 northbound from SR-237 to Lewelling Blvd. and I-880 southbound from Hegenberger Road to SR-237;
- I-680 northbound and southbound between Alcosta Blvd. and Livorna Road;
- Bay Bridge approach;
- San Mateo Bridge approach; and
- Dumbarton Bridge approach.

In each of these cases, the no-project scenario includes the existing high-occupancy vehicle (HOV) lanes operating at their current occupancy requirements.

The analysis starts from observed annual average daily traffic (AADT) and truck AADT, as reported in the 2010 Caltrans truck volume report[1]. Table 1 shows the observed values for locations within the project limits.

Table 1: Observed AADT and Truck AADT for Year 2010

Facility	Direction	Location		AADT	2010 Truck AADT	Percent Trucks
Bay Bridge Approach	WB	At:	San Francisco-Oakland Bay Bridge	122,500	3,200	2.6%
San Mateo Bridge Approach	WB	At:	San Mateo/Hayward Bridge	43,000	2,800	6.5%
Dumbarton Bridge Approach	WB	West Of:	Dumbarton Bridge	33,000	900	2.7%
I-880 from SR-237 to Lewelling/Hegenberger	Both	North. Of:	Jct. Rte. 237	200,000	11,400	5.7%
	Both	North. Of:	Fremont, Jct. Rte. 262 East	174,000	8,400	4.8%
	Both	North. Of:	Fremont, South Jct. Rte. 84	200,000	13,200	6.6%
	Both	North. Of:	Hayward, Jct. Rte. 92	235,000	16,500	7.0%
	SB	North. Of:	Jct. Rte. 238 East	106,000	8,900	8.4%
I-680 from Alcosta to Livorna	Both	North. Of:	San Ramon, Alcosta Boulevard	155,000	8,200	5.3%

[1] *2010 Annual Average Daily Truck Traffic on the California State Highway System*, Compiled by Traffic and Vehicle Data Systems, State of California, Business Transportation and Housing Agency, Department of Transportation.

Forecasts were prepared using MTC's Travel Model One. The latest 2010 run (2010_03_YYY) was used to establish the baseline. 2035 forecasts were performed starting from the no-project networks paired with the preferred land use (2035_03_070) for the in-progress regional transportation plan (RTP). 2020 volumes were interpolated between 2010 and 2035. The no-project networks were modified to ensure that the HOV lanes used the desired occupancy requirements. The networks with the project were coded to allow single-occupant vehicles into the express lane for a charge. HOV 3+ vehicles were allowed to enter for free. Access points were coded between each interchange, simulating continuous access conditions. The model includes highway assignments for the following five time periods:

- Early AM: 3-6 AM;
- AM Peak: 6-10 AM;
- Midday: 10 AM-3 PM;
- PM Peak: 3-7 PM; and
- Night: 7 PM-3 AM.

Traffic volumes from these five time periods are summed to obtain daily totals. The model was run iteratively, and the toll rate in each time period was adjusted between each run in order to achieve a flow rate in the express lanes as close to 1600 vehicles per hour as possible, reflecting a high level of throughput without degrading level-of-service. This methodology replicates the approach used to model HOT lanes in the ongoing RTP analysis and appropriately reflects the potential for induced demand that may result from the implementation of express lanes.

These model results were used to pivot from the count data using the difference method. In this way, the model predicts the growth in traffic, and the count determines the 2010 starting value. Table 2 shows the AADT and truck AADT for the year 2020, with and without the project. Table 3 shows the AADT and truck AADT for the year 2035 with and without the project.

The results indicate that implementing the projects would increase the total AADT by an average of 3.5% at the count locations and increase truck AADT by an average of 1.8% at those same locations. This increase is due primarily to the traffic redistribution effects of congestion relief. The primary change is that autos are shifted from the general purpose lanes into the express lane, providing congestion relief in the general purpose lanes. The faster travel times in the general purpose lanes cause some other vehicles to use the freeway, when they would not under the higher congestion level. These vehicles are diverted from other facilities such as East Bay arterials parallel to I-880. In addition to the diversion effect from other facilities, these results other components of induced demand, including mode shift, a change in destinations, and a change in frequency of trip making.

Table 2: AADT and Truck AADT for Year 2020 with and without Project

				2020 No Project			2020 with Project		
Facility	Direction	Location		AADT	Truck AADT	Percent Trucks	AADT	Truck AADT	Percent Trucks
Bay Bridge Approach	WB	At:	San Francisco-Oakland Bay Bridge	133,000	2,900	2.2%	135,300	3,100	2.3%
San Mateo Bridge Approach	WB	At:	San Mateo/Hayward Bridge	44,600	2,600	5.8%	44,600	2,600	5.8%
Dumbarton Bridge Approach	WB	West Of:	Dumbarton Bridge	36,000	900	2.5%	36,400	900	2.5%
I-880 from SR-237 to Lewelling/Hegenberger	Both	North. Of:	Jct. Rte. 237	216,100	11,700	5.4%	218,400	11,800	5.4%
	Both	North. Of:	Fremont, Jct. Rte. 262 East	189,000	8,600	4.6%	191,400	8,700	4.5%
	Both	North. Of:	Fremont, South Jct. Rte. 84	209,700	13,600	6.5%	213,900	13,700	6.4%
	Both	North. Of:	Hayward, Jct. Rte. 92	246,900	16,900	6.8%	251,000	17,000	6.8%
	SB	North. Of:	Jct. Rte. 238 East	114,200	9,300	8.1%	115,200	9,300	8.1%
I-680 from Alcosta to Livorna	Both	North. Of:	San Ramon, Alcosta Boulevard	161,800	8,400	5.2%	165,700	8,500	5.1%

Table 3: AADT and Truck AADT for Year 2035 with and without Project

				2035 No Project			2035 with Project		
Facility	Direction	Location		AADT	Truck AADT	Percent Trucks	AADT	Truck AADT	Percent Trucks
Bay Bridge Approach	WB	At:	San Francisco-Oakland Bay Bridge	148,800	2,500	1.7%	154,400	3,000	1.9%
San Mateo Bridge Approach	WB	At:	San Mateo/Hayward Bridge	46,900	2,300	4.9%	47,000	2,300	4.9%
Dumbarton Bridge Approach	WB	West Of:	Dumbarton Bridge	40,500	900	2.2%	41,500	900	2.2%
I-880 from SR-237 to Lewelling/Hegenberger	Both	North. Of:	Jct. Rte. 237	240,100	12,200	5.1%	245,900	12,400	5.0%
	Both	North. Of:	Fremont, Jct. Rte. 262 East	211,600	9,000	4.3%	217,500	9,100	4.2%
	Both	North. Of:	Fremont, South Jct. Rte. 84	224,200	14,200	6.3%	234,800	14,400	6.1%
	Both	North. Of:	Hayward, Jct. Rte. 92	264,700	17,700	6.7%	274,900	17,800	6.5%
	SB	North. Of:	Jct. Rte. 238 East	126,600	9,800	7.7%	129,100	10,000	7.7%
I-680 from Alcosta to Livorna	Both	North. Of:	San Ramon, Alcosta Boulevard	172,000	8,700	5.1%	181,600	8,800	4.8%

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This technical memorandum presents the level-of-service (LOS) information to be used for the PM 2.5 analysis of the Phase 1 Bay Area Express Lanes Network. These level-of-service calculations are performed using the traffic forecasts presented in the accompanying July 26 memorandum "Traffic Forecasts for PM 2.5 Analysis for Phase 1 Network".

The calculations apply the methodology for basic freeway segments in the Highway Capacity Manual 2000 (HCM). The approach used was to calculate the service flow rate for each section of freeway in passenger car equivalents (PCEs) per hour per lane. Given this calculated service flow rate, the HCM thresholds are applied to determine the LOS, based on the values shown in Table 1.

Table 1: LOS Thresholds from HCM 2000

EXHIBIT 23-2. LOS CRITERIA FOR BASIC FREEWAY SEGMENTS

Criteria	LOS A	LOS B	LOS C	LOS D	LOS E
FFS = 75 mi/h					
Maximum density (pc/mi/ln)	11	18	26	35	45
Minimum speed (mi/h)	75.0	74.8	70.6	62.2	53.3
Maximum v/c	0.34	0.56	0.76	0.90	1.00
Maximum service flow rate (pc/h/ln)	820	1350	1830	2170	2400
FFS = 70 mi/h					
Maximum density (pc/mi/ln)	11	18	26	35	45
Minimum speed (mi/h)	70.0	70.0	68.2	61.5	53.3
Maximum v/c	0.32	0.53	0.74	0.90	1.00
Maximum service flow rate (pc/h/ln)	770	1260	1770	2150	2400
FFS = 65 mi/h					
Maximum density (pc/mi/ln)	11	18	26	35	45
Minimum speed (mi/h)	65.0	65.0	64.6	59.7	52.2
Maximum v/c	0.30	0.50	0.71	0.89	1.00
Maximum service flow rate (pc/h/ln)	710	1170	1680	2090	2350
FFS = 60 mi/h					
Maximum density (pc/mi/ln)	11	18	26	35	45
Minimum speed (mi/h)	60.0	60.0	60.0	57.6	51.1
Maximum v/c	0.29	0.47	0.68	0.88	1.00
Maximum service flow rate (pc/h/ln)	660	1080	1560	2020	2300
FFS = 55 mi/h					
Maximum density (pc/mi/ln)	11	18	26	35	45
Minimum speed (mi/h)	55.0	55.0	55.0	54.7	50.0
Maximum v/c	0.27	0.44	0.64	0.85	1.00
Maximum service flow rate (pc/h/ln)	600	990	1430	1910	2250

Note:
The exact mathematical relationship between density and v/c has not always been maintained at LOS boundaries because of the use of rounded values. Density is the primary determinant of LOS. The speed criterion is the speed at maximum density for a given LOS.

For the freeway sections (I-680 and I-880), level-of-service is calculated separately for express lanes versus the general purpose lanes. In the no-build scenario, the express lanes operate as high-occupancy vehicle (HOV) lanes. In the build scenario, the express lanes will be priced to ensure that the level-of-service does not fall below LOS C, corresponding to no more than about 1600 vehicles per hour per lane. The freeway sections use the thresholds for a 65 mph free flow speed.

The Highway Capacity Manual does not include a standard method for calculating LOS at toll plazas, so the LOS for the bridge approach projects cannot be directly reported. It is known from experience that the bridge approaches, particularly for the Bay Bridge, suffer queues during peak hours, and that the existing HOV bypass lanes provide substantial time savings to vehicles using them. Therefore, it is reasonable to assume a poor level-of-service given these conditions. These conditions are expected to persist or worsen in the future, although increased FasTrak penetration may mitigate the toll plaza congestion somewhat.

Regardless of the toll plaza effect, the bridges themselves do result in a capacity constraint. In an effort to quantify the LOS for the bridge approach projects, the LOS of the bridge itself was calculated instead of the LOS of the toll plaza. In this calculation, vehicles are combined across all lanes, because traffic returns to mixed flow once the express lane bypasses the queue at the toll plaza. It is important to note that this reported LOS is only intended to provide an extremely basic understanding of operating conditions on the bridges, and that a much more detailed assessment would be needed for operational planning.

In all cases, the LOS was calculated for a four-hour AM peak period from 6-10 AM, and a four-hour PM peak period, from 3-7 PM. The peak period volumes were derived by from the average annual daily traffic (AADT) reported in the accompanying memo by first applying a factor to convert to average weekday daily traffic (AWDT). Then a factor was applied to convert from the daily traffic to the peak period traffic. These factors are shown in Table 2. They were derived from the PeMS data, with the AADT to AAWT conversion being calculated based on the 2010 annual totals, and the peak period factors were calculated based on Tuesdays through Thursdays in October of 2010.

Table 2: Factors to Convert from AADT to Peak Period Volumes

		AADT to AWDT Factor		AWDT to AM Peak Period (6-10 AM) Factor		AWDT to PM Peak Period (3-7 PM) Factor	
Location	Direction	All Vehicles	Trucks	All Vehicles	Trucks	All Vehicles	Trucks
Bay Bridge Approach	WB	1.021	1.129	0.270	0.213	0.217	0.208
San Mateo Bridge Approach	WB	1.040	1.046	0.224	0.235	0.276	0.292
Dumbarton Bridge Approach	WB	1.127	1.130	0.415	0.354	0.182	0.186
I-880	NB	1.041	1.140	0.217	0.248	0.256	0.144
	SB	1.041	1.224	0.241	0.339	0.247	0.109
I-680	NB	1.058	1.150	0.236	0.228	0.254	0.272
	SB	1.059	1.166	0.228	0.234	0.274	0.254

The peak period volumes were then converted to passenger car equivalents (PCEs) by applying a PCE factor of 1.5 to trucks, consistent with the HCM recommendation for level terrain. This was converted to an hourly flow, and then divided by the number of lanes to get the PCEs per hour per lane used in the threshold lookup. The number of lanes sometimes changes over the length of the corridor, so typical areas were used to determine the number of lanes.

Table 3 shows the resulting LOS values for the 2020 no-build condition. Table 4 shows the LOS values for 2020 with the project. Tables 5 and 6 show the LOS values for 2035 without and with the project.

Table 3: Level-of-Service for Year 2020 without Project

				Network	All Lanes		Express Lane		General Purpose Lanes	
					Level of Service		Level of Service		Level of Service	
Facility	Direction	Location		Total Lanes	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)
Bay Bridge Approach	WB	At:	San Francisco-Oakland Bay Bridge	5	D	D				
San Mateo Bridge Approach	WB	At:	San Mateo/Hayward Bridge	3	B	C				
Dumbarton Bridge Approach	WB	At:	Dumbarton Bridge	3	C	A				
I-880 from SR-237 to Lewelling/Hegenberger	NB	North. Of:	Jct. Rte. 237	6			A	B	C	C
	NB	North. Of:	Fremont, Jct. Rte. 262 East	4			A	B	C	D
	NB	North. Of:	Fremont, South Jct. Rte. 84	4			B	C	D	D
	NB	North. Of:	Hayward, Jct. Rte. 92	5			B	C	C	D
I-880 from SR-237 to Lewelling/Hegenberger	SB	North. Of:	Jct. Rte. 237	6			B	B	C	C
	SB	North. Of:	Fremont, Jct. Rte. 262 East	4			B	B	C	D
	SB	North. Of:	Fremont, South Jct. Rte. 84	4			C	C	D	D
	SB	North. Of:	Hayward, Jct. Rte. 92	5			C	C	D	D
	SB	North. Of:	Jct. Rte. 238 East	5			B	B	C	D
I-680 from Alcosta to Livorna	NB	North. Of:	San Ramon, Alcosta Boulevard	4			A	B	C	C
	SB	North. Of:	San Ramon, Alcosta Boulevard	4			B	B	C	D
				5	D	D				

Table 4: Level-of-Service for Year 2020 with Project

				Network	All Lanes		Express Lane		General Purpose Lanes	
					Level of Service		Level of Service		Level of Service	
Facility	Direction	Location		Total Lanes	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)
Bay Bridge Approach	WB	At:	San Francisco-Oakland Bay Bridge	5	D	D				
San Mateo Bridge Approach	WB	At:	San Mateo/Hayward Bridge	3	B	C				
Dumbarton Bridge Approach	WB	At:	Dumbarton Bridge	3	C	B				
I-880 from SR-237 to Lewelling/Hegenberger	NB	North. Of:	Jct. Rte. 237	6			A	B	C	C
	NB	North. Of:	Fremont, Jct. Rte. 262 East	4			B	B	C	D
	NB	North. Of:	Fremont, South Jct. Rte. 84	4			C	C	D	D
	NB	North. Of:	Hayward, Jct. Rte. 92	5			C	C	C	D
I-880 from SR-237 to Lewelling/Hegenberger	SB	North. Of:	Jct. Rte. 237	6			A	B	C	C
	SB	North. Of:	Fremont, Jct. Rte. 262 East	4			B	B	D	D
	SB	North. Of:	Fremont, South Jct. Rte. 84	4			C	C	D	D
	SB	North. Of:	Hayward, Jct. Rte. 92	5			C	C	D	D
	SB	North. Of:	Jct. Rte. 238 East	5			B	B	C	D
I-680 from Alcosta to Livorna	NB	North. Of:	San Ramon, Alcosta Boulevard	4			B	B	C	C
	SB	North. Of:	San Ramon, Alcosta Boulevard	4			B	B	C	C
				5	D	D				

Table 5: Level-of-Service for Year 2035 without Project

				Network	All Lanes		Express Lane		General Purpose Lanes	
					Level of Service		Level of Service		Level of Service	
Facility	Direction	Location		Total Lanes	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)
Bay Bridge Approach	WB	At:	San Francisco-Oakland Bay Bridge	5	D	D				
San Mateo Bridge Approach	WB	At:	San Mateo/Hayward Bridge	3	B	C				
Dumbarton Bridge Approach	WB	At:	Dumbarton Bridge	3	C	B				
I-880 from SR-237 to Lewelling/Hegenberger	NB	North. Of:	Jct. Rte. 237	6			B	B	C	C
	NB	North. Of:	Fremont, Jct. Rte. 262 East	4			B	B	D	D
	NB	North. Of:	Fremont, South Jct. Rte. 84	4			C	C	D	D
	NB	North. Of:	Hayward, Jct. Rte. 92	5			B	C	D	D
I-880 from SR-237 to Lewelling/Hegenberger	SB	North. Of:	Jct. Rte. 237	6			B	B	C	C
	SB	North. Of:	Fremont, Jct. Rte. 262 East	4			C	C	D	E
	SB	North. Of:	Fremont, South Jct. Rte. 84	4			C	C	D	D
	SB	North. Of:	Hayward, Jct. Rte. 92	5			C	C	D	D
	SB	North. Of:	Jct. Rte. 238 East	5			B	B	D	D
I-680 from Alcosta to Livorna	NB	North. Of:	San Ramon, Alcosta Boulevard	4			A	B	D	C
	SB	North. Of:	San Ramon, Alcosta Boulevard	4			B	B	C	D
				5	D	D				

Table 6: Level-of-Service for Year 2035 with Project

				Network	All Lanes		Express Lane		General Purpose Lanes	
					Level of Service		Level of Service		Level of Service	
Facility	Direction	Location		Total Lanes	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)
Bay Bridge Approach	WB	At:	San Francisco-Oakland Bay Bridge	5	D	D				
San Mateo Bridge Approach	WB	At:	San Mateo/Hayward Bridge	3	B	C				
Dumbarton Bridge Approach	WB	At:	Dumbarton Bridge	3	C	B				
I-880 from SR-237 to Lewelling/Hegenberger	NB	North. Of:	Jct. Rte. 237	6			C	C	C	C
	NB	North. Of:	Fremont, Jct. Rte. 262 East	4			C	C	D	D
	NB	North. Of:	Fremont, South Jct. Rte. 84	4			C	C	D	D
	NB	North. Of:	Hayward, Jct. Rte. 92	5			C	C	D	D
I-880 from SR-237 to Lewelling/Hegenberger	SB	North. Of:	Jct. Rte. 237	6			A	C	C	C
	SB	North. Of:	Fremont, Jct. Rte. 262 East	4			C	C	D	E
	SB	North. Of:	Fremont, South Jct. Rte. 84	4			C	C	D	D
	SB	North. Of:	Hayward, Jct. Rte. 92	5			C	C	D	D
	SB	North. Of:	Jct. Rte. 238 East	5			B	B	D	D
I-680 from Alcosta to Livorna	NB	North. Of:	San Ramon, Alcosta Boulevard	4			C	C	C	C
	SB	North. Of:	San Ramon, Alcosta Boulevard	4			C	C	C	C
				5	D	D				

Technical Memorandum

Bay Area Express Lanes Network
2015 Traffic Forecasts and LOS for PM 2.5 Analysis
August 24, 2012

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This technical memorandum presents 2015 traffic forecasts and level-of-service information to be used for the PM 2.5 analysis of the Phase 1 Bay Area Express Lanes Network. These results build upon and follow the same methodology as the results presented in two previous memoranda:

- A July 24, 2012 memo regarding "Traffic Forecasts for PM 2.5 Analysis for Phase 1 Network", and
- An August 7, 2012 memo regarding "Level of Service for PM 2.5 Analysis for Phase 1 Network".

The current memo adds information for an assumed 2015 opening year, whereas the previous documents showed 2020 and 2035 analysis years.

Table 1 shows the projected average annual daily traffic (AADT) and the truck AADT for the proposed projects in the year 2015. Table 2 shows the anticipated level-of-service in the year 2015 for the 4-hour AM and PM peak periods without the project. Table 3 shows the anticipated level-of-service in the year 2015 for the 4-hour AM and PM peak periods with the project.

The results show implementing the project would cause total AADT on these facilities to increase by up to 1%. This increase occurs because some vehicles are shifted from the more congested general purpose lanes into the less congested express lanes. This shift improves travel times in the general purpose lanes, and makes the corridor more attractive to some additional drivers. The results show that the truck AADT changes by 100 vehicles or less.

Table 1: AADT and Truck AADT for Year 2015 with and without Project

				2020 No Project			2020 with Project		
Facility	Direction	Location		AADT	Truck AADT	Percent Trucks	AADT	Truck AADT	Percent Trucks
Bay Bridge Approach	WB	At:	San Francisco-Oakland Bay Bridge	127,800	3,000	2.3%	128,900	3,100	2.4%
San Mateo Bridge Approach	WB	At:	San Mateo/Hayward Bridge	43,800	2,700	6.2%	43,800	2,700	6.2%
Dumbarton Bridge Approach	WB	West Of:	Dumbarton Bridge	34,500	900	2.6%	34,700	900	2.6%
I-880 from SR-237 to Lewelling/Hegenberger	Both	North. Of:	Jct. Rte. 237	208,000	11,600	5.6%	209,200	11,600	5.5%
	Both	North. Of:	Fremont, Jct. Rte. 262 East	181,500	8,500	4.7%	182,700	8,500	4.7%
	Both	North. Of:	Fremont, South Jct. Rte. 84	204,800	13,400	6.5%	207,000	13,400	6.5%
	Both	North. Of:	Hayward, Jct. Rte. 92	240,900	16,700	6.9%	243,000	16,700	6.9%
	SB	North. Of:	Jct. Rte. 238 East	110,100	9,100	8.3%	110,600	9,100	8.2%
I-680 from Alcosta to Livorna	Both	North. Of:	San Ramon, Alcosta Boulevard	158,400	8,300	5.2%	160,300	8,300	5.2%

Table 2: Level-of-Service for Year 2015 without Project

				Network	All Lanes		Express Lane		General Purpose Lanes	
					Level of Service		Level of Service		Level of Service	
Facility	Direction	Location		Total Lanes	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)
Bay Bridge Approach	WB	At:	San Francisco-Oakland Bay Bridge	5	D	D				
San Mateo Bridge Approach	WB	At:	San Mateo/Hayward Bridge	3	B	C				
Dumbarton Bridge Approach	WB	At:	Dumbarton Bridge	3	C	A				
I-880 from SR-237 to Lewelling/Hegenberger	NB	North. Of:	Jct. Rte. 237	6			A	B	C	C
	NB	North. Of:	Fremont, Jct. Rte. 262 East	4			A	B	C	D
	NB	North. Of:	Fremont, South Jct. Rte. 84	4			B	C	D	D
	NB	North. Of:	Hayward, Jct. Rte. 92	5			B	C	C	D
I-880 from SR-237 to Lewelling/Hegenberger	SB	North. Of:	Jct. Rte. 237	6			B	B	C	C
	SB	North. Of:	Fremont, Jct. Rte. 262 East	4			B	B	C	D
	SB	North. Of:	Fremont, South Jct. Rte. 84	4			C	C	D	D
	SB	North. Of:	Hayward, Jct. Rte. 92	5			C	C	D	D
	SB	North. Of:	Jct. Rte. 238 East	5			B	B	C	D
I-680 from Alcosta to Livorna	NB	North. Of:	San Ramon, Alcosta Boulevard	4			A	B	C	C
	SB	North. Of:	San Ramon, Alcosta Boulevard	4			B	B	C	D
				5	D	D				

Table 3: Level-of-Service for Year 2015 with Project

				Network	All Lanes		Express Lane		General Purpose Lanes	
					Level of Service		Level of Service		Level of Service	
Facility	Direction	Location		Total Lanes	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)	AM (6-10)	PM (3-7)
Bay Bridge Approach	WB	At:	San Francisco-Oakland Bay Bridge	5	D	D				
San Mateo Bridge Approach	WB	At:	San Mateo/Hayward Bridge	3	B	C				
Dumbarton Bridge Approach	WB	At:	Dumbarton Bridge	3	C	B				
I-880 from SR-237 to Lewelling/Hegenberger	NB	North. Of:	Jct. Rte. 237	6			A	B	C	C
	NB	North. Of:	Fremont, Jct. Rte. 262 East	4			B	B	C	D
	NB	North. Of:	Fremont, South Jct. Rte. 84	4			C	C	D	D
	NB	North. Of:	Hayward, Jct. Rte. 92	5			C	C	C	D
I-880 from SR-237 to Lewelling/Hegenberger	SB	North. Of:	Jct. Rte. 237	6			A	B	C	C
	SB	North. Of:	Fremont, Jct. Rte. 262 East	4			B	B	D	D
	SB	North. Of:	Fremont, South Jct. Rte. 84	4			C	C	D	D
	SB	North. Of:	Hayward, Jct. Rte. 92	5			C	C	D	D
	SB	North. Of:	Jct. Rte. 238 East	5			B	B	C	D
I-680 from Alcosta to Livorna	NB	North. Of:	San Ramon, Alcosta Boulevard	4			B	B	C	C
	SB	North. Of:	San Ramon, Alcosta Boulevard	4			B	B	C	C
				5	D	D				