I Introduction

Metro is considering substitution of Project LAE0332: Long Beach Park and Ride Lot Facility at 3rd St. and Pacific Ave. with the following seven projects; (1) LA0G598: Thousand Oaks Blvd Park and Ride Facility, (2) LAF1414: Third St. & La Verne Ave. Metro Gold Line Park and Ride Facility, (3) LAF5514: Vermont Ave. Bike Lane, Manchester-El Segundo, (4) LAF3515: San Fernando Rd Bike Path, Phase 3, (5) LAF5518: LA River Bike Path, Headwaters, Owensmouth-Mason, (6) LAF5627: Duarte Gold Line Station Ped and Bicycle Improvements, and (7) LA0G1130 City of Carson Active Transportation Projects

(1) Project to be deleted

LAE0332: Long Beach Park and Ride Lot Facility at 3rd St. and Pacific Ave: Proposes a Park & Ride Lot at 3rd Street and Pacific Avenue south of the MTA Blue Line Pacific station with approximately 400 parking spaces serving Metro Blue Line users.

- Estimated Project Competion Date: June, 2014
- Number of Parking Spaces: 400

(2) Projects to be used as substitution

LAF1414 - Third Street & La Verne Avenue Parking Lot for the County of Los Angeles : Proposes constructing a parking lot at Third Street and La Verne Avenue to provide 87 spaces for a park and ride lot for Metro Gold Line and other transit users.

- Estimated Project Competion Date: Oct, 2016
- Number of Parking Spaces: 87

LA0G598 - Thousand Oaks Blvd Park and Ride Facility for the City of Westlake Village : Proposes design and construction of a Park and Ride facility (31107 Thousand Oaks Blvd) with 75 parking spaces at the proposed community recreational facility.

- Estimated Project Competion Date: Oct, 2016
- Number of Parking Spaces: 75

LAF3515 - San Fernando Rd. Bike Path Ph. IIIB Construction: Construct 2.5 mile Class I bike path within METRO right-of-way along San Fernando Rd. between Tuxford St. and Cohasset St.

- Estimated Project Competion Date: Jan, 2016
- Bike Facility: 2.5 mile Class I Bike path

LAF5514 - Vermont Ave Bike Lane : Manchester Blvd to El Segundo Blvd. Funds are requested to design and construct Class II bike lanes on Vermont Av.

- Estimated Project Competion Date: Dec, 2016
- Bike Facility: 3.0 mile Class II Bike lane

LAF5518 - LA River Bike Path : Construction of a bicycle/pedestrian path from Owensmouth Av to Mason Av (1.5 miles) along the south bank of the LA River.

- Estimated Project Competion Date: Dec, 2016
- Bike Facility: 1.5 mile Class I Bike path

LAF5627 - Duarte Gold Lone Station Ped & Bike Improvements: Design and construction of pedestrian and bicycle improvements around Duarte Gold Line Station, including 1.9 mile of Class I Bike path.

- Estimated Project Competion Date: Dec, 2016
- Bicycle Facility: 1.9 mile Class I Bike path

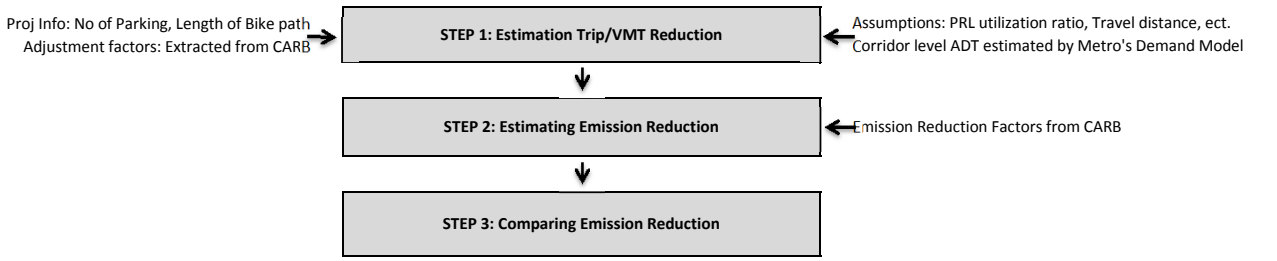
LAEG1130 - Citywide Bike and Pedestrian Improvements : The infrastructure component includes a Class II bike lane (1.1 mile) on Santa Fe Ave, high visibility crosswalks, countdown pedestrian signals, curb ramps, etc.

- Estimated Project Competion Date: Dec, 2016
- Bicycle Facility: 1.1 mile Class II Bike lane

II METHODOLOGY

In order to verify that these projects have similar air quality benefits and thus can be substituted for one another, we conducted an air quality benefits analysis based on the "Methods to Find the Cost-Effectiveness of Funding Air Quality Projects For Evaluating Motor Vehicle Registration Fee Projects and Congestion Mitigation and Air Quality Improvement (CMAQ) Projects" published by the California Air Resources Board (ARB) in May 2005 (validated in 2013), as well as 2013 Emission Factor Tables (also by ARB).

This was conducted through a three step process; (1) Estimating the Vehicle Miles Travelled (VMT) reduction and trip reduction for commute trips based on the number of parking spaces and parking lot utilization ratio (for PRL projects) and length of bike facilities and ADT (for bicycle facility projects) (2) Estimating air emission reduction by multiplying number of trips/VMTs and air emission factors (3) Comparing air quality benefits of original project with the substitution projects. Figure below presents the air emission reduction benefits estimation process.



(1) Formulas, Input Values and Assumptions for Park & Ride Lot projects

Table II-1 Input Values for Park & Ride Lot Projects (CARB - May, 2013)

Inputs	Default	Units	Comments
For the Vanpool			
Days (**D**)	250	days (of operation)/year	Suggested defaults are weekday vanpools - 250 days
Ridership (**R**)		total trips (riders)/day	One-way trips by riders (or number of boardings) per day
Annual Van/Shuttle VMT (**Van VMT**)		annual miles	
For Auto Travel Reduced			
Adjustment (**A**) on Auto Trips: Portion of riders who did NOT previously use transit or vanpools.	0.3 (for vanpool) 0.3 (for rail)		The default (0.83) is for long-distance, commuter vanpool service. For new rail feeders, use 0.3 for the adjustment factor A.
Auto Trip Length (**L**)	25 (for vanpool) 8 (for rail)	miles one direction/trip	Suggested default for vanpools is 35 mile. 25 miles is used in this report
For Auto Travel Added to Access Vanpool/Shuttle			
Adjustment (**AA**) for Auto Access to and from PRL	0.75 (for Vanpool) 0.5 (for rail)		Enter the percentage of riders who drive to the vanpool service. The default (0.75) is for long-distance vanpools. For rail feeders, use 0.5..
Trip Length (**LL**) for Auto Access to and from vanpool/shuttle	5 (for vanpool) 2 (for rail)	miles one direction/trip	The default (5 mi) is for long-distance van pools. For rail feeders, use 2 mi.

Table II-2 Total Average Auto Emission Factors (CARB - May, 2013)

	Grams per Commute Trip End			
Project Life	**ROG**	**CO**	**Nox**	**PM2.5**
1~ 5 years (2014~2017)	0.764	6.046	0.303	0.006
6~10 years (2014~2023)	0.614	4.083	0.233	0.004
16~20 years (2014~2035)	0.462	3.593	0.162	0.004
	Grams per Vehicle Mile			
Project Life	**ROG**	**CO**	**Nox**	**PM2.5**
1~5 years (2014~2017)	0.191	2.239	0.217	0.087
6~10 years (2014~2023)	0.153	1.783	0.172	0.087
16~20 years (2014~2035)	0.119	1.356	0.13	0.087

Formulas **Units**

Annual Auto Trip Reduced = [(D) * (R) * (A)]*[1-(AA)] — trips/year

Annual Auto VMT Reduced = [(D) * (R) * (A)]* [(L) - (AA)*(LL)] — miles/year

Annual Emission Reductions (ROG, NOx, and PM10) = — lbs/year
[(Annual Auto Trips Reduced)*(Auto Trip End Factor)
+ (Annual Auto VMT Reduced)*(Auto VMT Factor)
- (Van VMT)*(Van VMT Factor)]/454

Ridership (R) = (Parking Spaces)*(Lot Utilization)*(2 commute trips/day)

Van VMT = [(R)/11]*(L)*(D)
(Assume 11 passenger per Vanpool)

Where
- Parking is the number of parking spaces for a new parking lot or the number of added spaces to an existing lot.
- Lot Utilization is the estimated lot utilization rate from monitored data OR use 0.75 as a default.
- The default for Adjustment (AA) for Auto Access to and from rail service is 0.5.
- The default for Adjustment (AA) for Auto Access to and from vanpool/shuttle should be 0.9 instead of 0.5.
- Use Emission Factors in Table I-2

(2) Formulas, Input Values and Assumptions for Bicycle Facility Projects

Table II-3 Input Values for Bicycle Facility Projects (CARB - May, 2013)

Inputs	Default	Units	Comments
Days (D)	200	Days of use/year	Consider local climate in number of days
Average Length (L) of bicycle trips	1.8	Miles per trip in one direction	Default is based on the National Personal Transportation Survey
Annual Average Daily Traffic (ADT)		Trips per day	Two-direction traffic volumes on roadway parallel to bike project. MAXIMUM IS 30,000.
Adjustment (A) on ADT for auto trips replaced by bike trips from the bike facility.	0.002		See Table I-3 Adjustment Factors table
Credit (C) for Activity Centers near the project.	0.0005		See Table I-4 Activity Centers table

Table II-4 Adjustment Factors on ADT (CARB - May, 2013)

BIKE FACILITY CLASS	AVERAGE DAILY TRAFFIC (ADT)	LENGTH OF BIKE PROJECT (one direction)	ADJUSTMENT FACTORS FOR CITIES WITH POP. > 250,000 and non-university towns < 250,000	ADJUSTMENT FACTORS FOR UNIVERSITY TOWNS WITH POP. < 250,000
Class 1 (bike path) & Class II (bike lane)	ADT ≤ 12,000 vehicles a day	≤ 1 mile	0.0019	0.0104
		>1 & ≤ 2 miles	0.0029	0.0155
		> 2 miles	0.0038	0.0207
Class 1 (bike path) & Class II (bike lane)	12,000< ADT ≤24,000 vehicles per day	≤ 1 mile	0.0014	0.0073
		>1 & ≤ 2 miles	0.002	0.0109
		> 2 miles	0.0027	0.0145
Class 2 bike lane	24,000< ADT ≤30,000 vehicles per day	≤ 1 mile	0.001	0.0052
		>1 & ≤ 2 miles	0.0014	0.0078
		> 2 miles	0.0019	0.0104

Table I-5 Activity Center Credits

Number of activity centers*	Credit (C) Within 1/2 mile	Credit (C) Within 1/4 mile
Three (3)	0.0005	0.001
More than 3 but less than 7	0.001	0.002
7 or more	0.0015	0.003

- Types of Activity Centers: Bank, church, hospital or HMO, light rail station (park & ride), office park, post office, public library, shopping area or grocery store, university or junior college
- The number of activity centers within 1/4 mile and/or 1/2 mile from the project corridor was provided by project sponsors

Formulas	**Units**
Annual Auto Trip Reduced = (D) * (ADT) * (A + C)	trips/year
Annual Auto VMT Reduced = (Auto Trips) * (L)	miles/year
Annual Emission Reductions (ROG, NOx, and PM10) = [(Annual Auto Trips Reduced)*(Auto Trip End Factor) + (Annual Auto VMT Reduced)*(Auto VMT Factor)]/454	lbs/year

Where

- ADT = 2014 ADT *(1+ Traffic Volume Increase (%))
- 2014 ADT for each project corridor was provided by project sponsors.
- Traffic volume increase (%) for each project corridor was extracted from LA Metro's travel demand model.
- Use Emission Factors in Table II-2

III EMISSION REDUCTION

III- 1 EMISSION REDUCTION BY SUBSTITUTION PROJECTS

(1) Summary of Results

Table III-1.1 Emission Reduction by Substitution Projects

Year	ROG	CO	NOx	PM2.5
2016	285.7	2,768.0	211.8	61.9
2023	255.0	2,293.1	185.6	68.7
2035	229.8	2,185.8	162.4	81.7

Table III-1.2 Trip/VMT Reduction by Substitution Projects

	2016		2023		2035	
PROJECT ID	TRIP REDUCTION	VMT REDUCTION	TRIP REDUCTION	VMT REDUCTION	TRIP REDUCTION	VMT REDUCTION
LAF1414	4,895	68,534	5,496	76,951	6,527	91,379
LA0G598	1,313	71,813	1,555	85,041	1,969	107,719
LAF3515	19,740	49,351	20,016	50,039	23,840	59,600
LAF5514	21,625	64,875	23,543	70,629	25,556	76,667
LAF5518	16,362	24,543	18,985	28,477	22,472	33,708
LAF5627	9,807	18,632	11,063	21,020	13,386	25,433
LA0G1130	16,813	18,495	19,616	21,577	23,539	25,893
TOTAL	**90,555**	**316,243**	**100,273**	**353,734**	**117,289**	**420,399**

(2) Detailed Calculation

- Park and Ride Lot Projects

	LAF1414		LA0G598	
Year	TRIP REDUCTION	VMT REDUCTION	TRIP REDUCTION	VMT REDUCTION
2016	4,895	68,534	1,313	71,813
2023	5,496	76,951	1,555	85,041
2035	6,527	91,379	1,969	107,719

	PRL for Rail feeder		PRL for suburban Vanpool	
INPUT VALUES	**LAF1414**		**LA0G598**	
Total Space	87		70	
Average Daily Utilization*				
2016	75%		50%	
2023	84%		59%	
2035	100%		75%	
Turnover	1		1	
Percent Effectivness				
Adjustment on Auto trips replaced by PRL	30%		30%	
Adjustment for Auto Access**	50%		75%	
Vehicle Trips (In/Out)	2		2	
Avg. Commute Distance***	8		25	
Avg. Travel Distance to PRL	2		5	
Reduction Days/Year	250		250	
Annual TRIP Reduction				
2016	**4,895**		**1,313**	
2023	**5,496**		**1,555**	
2035	**6,527**		**1,969**	
Annual VMT reduction				
2016	**68,534**		**111,598**	
2023	**76,951**		**132,156**	
2035	**91,379**		**167,397**	
Annual VAN VMT (assuming 11 passengers per Van)				
2016			**39,785**	
2023			**47,114**	
2035			**59,678**	
Annual Factor				
Days in a Year	365		365	
Weeks in a Year	52		52	
Slow Days in a Week	2.21		2.21	
Negligible Days		115		115
Trip Reduction Days/Year		250		250

- Bicycle Facilities Projects

	LAF5627		LA0G1130		LAF3515	
Year	TRIP REDUCTION	VMT REDUCTION	TRIP REDUCTION	VMT REDUCTION	TRIP REDUCTION	VMT REDUCTION
2016	9,807	18,632	16,813	18,495	19,740	49,351
2023	11,063	21,020	19,616	21,577	20,016	50,039
2035	13,386	25,433	23,539	25,893	23,840	59,600

	Class I bike path		Class II bike lane		Class I bike path	
INPUT VALUES	**LAF5627**		**LA0G1130**		**LAF3515**	
Bike Facility Length	1.9 mile		1.1 mile		2.5 mile	
Average Daily Traffic (ADT)*		2,014				
2016	8,304	8,000	21,000	20,000	20,984	20,900
2023	9,368		24,500		21,276	
2035	11,335		29,400		25,341	
Adjustment Factors						
Class I & II Bike Path	0.0029		0.0020		0.0027	
Activity Center Credit	0.0030		0.0020		0.0020	
Avg. Length of Bike Trip***	1.8		1.8		1.8	
Traffic Volume Change (LA Metro Travel Demand Model)						
2016	1.04		1.05		1.00	
2023	1.17		1.23		1.02	
2035	1.42		1.47		1.21	
Reduction Days/Year	200		200		200	
Total Auto TRIP Reduction	**LAF5627**		**LA0G1130**		**LAF3515**	
2016	**9,807**		**16,813**		**19,740**	
2023	**11,063**		**19,616**		**20,016**	
2035	**13,386**		**23,539**		**23,840**	
Annual VMT reduction						
2016	**18,632**		**18,495**		**49,351**	
2023	**21,020**		**21,577**		**50,039**	
2035	**25,433**		**25,893**		**59,600**	
Annual Factor						
Days in a Year	365		365		365	
Weeks in a Year	52		52		52	
Slow Days in a Week	3.17		3.17		3.17	
Negligible Days		165		165		165
Trip Reduction Days/Year		200		200		200

	LAF5518		LAF5514	
Year	TRIP REDUCTION	VMT REDUCTION	TRIP REDUCTION	VMT REDUCTION
2016	16,362	24,543	21,625	64,875
2023	18,985	28,477	23,543	70,629
2035	22,472	33,708	25,556	76,667

	Class I bike path		Class II bike lane	
INPUT VALUES	**LAF5518**		**LAF5514**	
Bike Facility Length	1.7 mile		3 mile	
Average Daily Traffic (ADT)*				
2016	27,248	26,000	27,702	27,000
2023	31,616		30,159	
2035	37,424		32,738	
Adjustment Factors				
Class I & II Bike Path	0.0020		0.0019	
Activity Center Credit	0.0010		0.0020	
Avg. Length of Bike Trip***	1.8		1.8	
Traffic Volume Change (LA Metro Travel Demand Model)				
2016	1.05		1.03	
2023	1.22		1.12	
2035	1.44		1.21	
Reduction Days/Year	200		200	
Total Auto TRIP Reduction	**LAF5518**		**LAF5514**	
2016	**16,362**		**21,625**	
2023	**18,985**		**23,543**	
2035	**22,472**		**25,556**	
Annual VMT reduction				
2016	**24,543**		**64,875**	
2023	**28,477**		**70,629**	
2035	**33,708**		**76,667**	
Annual Factor				
Days in a Year	365		365	
Weeks in a Year	52		52	
Slow Days in a Week	3.17		3.17	
Negligible Days		165		165
Trip Reduction Days/Year		200		200

III- 2 EMISSION REDUCTION BY ORIGIANL PROJECTS

(1) Summary of Results

Table III-2.1 Emission Reduction by Original Project

Year	ROG	CO	NOx	PM2.5
2016	170.6	1,855.4	165.8	60.7
2023	153.5	1,618.2	147.1	68.1
2035	140.8	1,493.7	131.1	80.8

Table III-2.2 Trip/VMT Reduction by Original Project

	2025		2030		2035	
PROJECT ID	TRIP REDUCTION	VMT REDUCTION	TRIP REDUCTION	VMT REDUCTION	TRIP REDUCTION	VMT REDUCTION
LAE0332	22,507	315,101	25,271	353,797	30,010	420,134
TOTAL	**22,507**	**315,101**	**25,271**	**353,797**	**30,010**	**420,134**

(2) Detailed Calculation

	LAE0332	
Year	TRIP REDUCTION	VMT REDUCTION
2016	22,507	315,101
2023	25,271	353,797
2035	30,010	420,134

PARKING & RIDE LOT		**LAE0332**	
Total Space		400	
Average Daily Utilization*			
	2016	75%	
	2023	84%	
	2035	100%	
Turnover		1	
Percent Effectivness			
Adjustment on Auto trips replaced by PRL		30%	
Adjustment for Auto Access		50%	
Vehicle Trips (In/Out)		2	
Avg. Commute Distance		8	
Avg. Travel Distance to PRL		2	
Reduction Days/Year		250	
Annual TRIP Reduction		LAE0332	
	2016	**22,507**	
	2023	**25,271**	
	2035	**30,010**	
Annual VMT reduction			
	2016	**315,101**	
	2023	**353,797**	
	2035	**420,134**	
Annual Factor			
Days in a Year		365	
Weeks in a Year		52	
Slow Days in a Week		2.21	
Negligible Days			115
Trip Reduction Days/Year			250

III-3. EMISSION REDUCTION COMPARISON

Table III-3.1 Air emission reduction by substitution projects (lbs)

Year	ROG	CO	NOx	PM2.5
2016	285.7	2,768.0	211.8	61.9
2023	255.0	2,293.1	185.6	68.7
2035	229.8	2,185.8	162.4	81.7

Table III-3.2 Air emission reduction by original project (lbs)

Year	ROG	CO	NOx	PM2.5
2016	170.6	1,855.4	165.8	60.7
2023	153.5	1,618.2	147.1	68.1
2035	140.8	1,493.7	131.1	80.8

Table III-3.3 Comparison: Substitution - Original (lbs)

Year	ROG	CO	NOx	PM2.5
2016	115.1	912.7	46.0	1.1
2023	101.5	674.9	38.5	0.6
2035	89.0	692.1	31.2	0.8