

## APPENDIX W – OFF-MODEL ADJUSTMENTS

The three-county travel demand model was used to evaluate the land use and transportation project scenarios for the Regional Transportation Plan Update. The model provided vehicle miles traveled (VMT) estimates for each scenario. Despite significant improvements to the policy sensitivity and multi-modal utility of travel demand models, the effects of implementing some programs must still be handled by post-processing transportation model results. Specifically, it has limitations in its ability to calculate the benefits of transportation improvements/programs such as Transportation Demand Management and Transportation Systems Management (TDM/TSM) projects, which includes Intelligent Transportation Systems (ITS), bike and pedestrian projects, rideshare programs, and electrical vehicle market penetration.

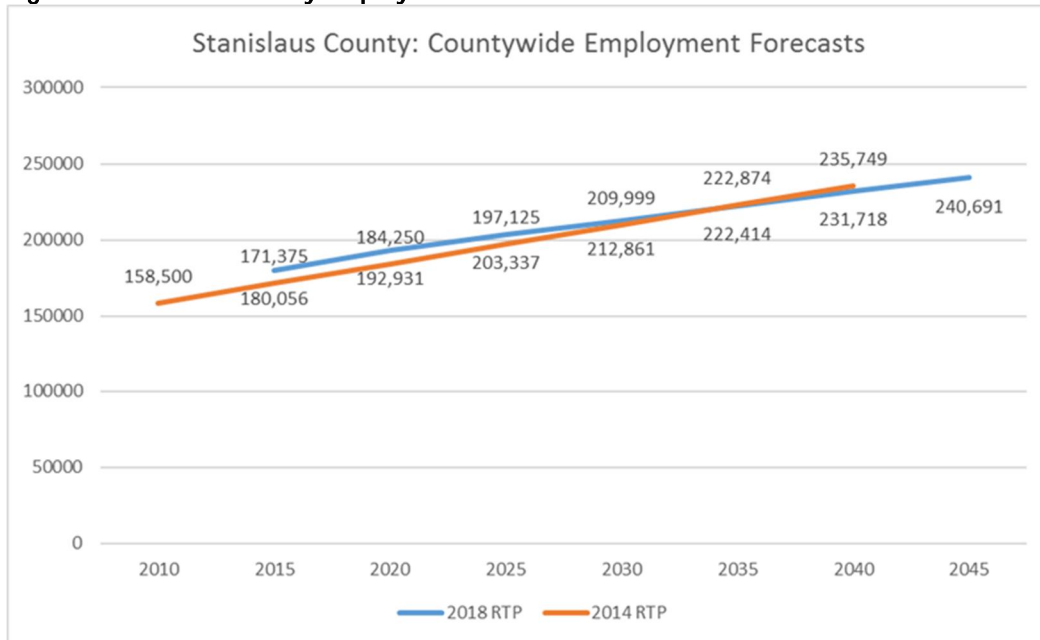
The model's estimates of VMT for the preferred scenario were adjusted to account for estimated VMT reductions anticipated from the following services and programs:

- Cal-Vans (initiation of new vanpool service in Stanislaus County)
- ACE Forward (Extension of ACE train service to Modesto and Ceres)
- Active transportation projects (per the 2018 RTP Tier I Project List)
- San Joaquin Valley Air Pollution Control District (SJVAPCD) Rule 9410 (Voluntary Employer-based Travel Demand Management Program)

An off-model VMT reduction analysis was performed for each program listed above, except for SJVAPCD Rule 9410. For Rule 9410, the VMT benefit analysis performed as part of the 2014 RTP/SCS was used. This analysis of voluntary TDM program effectiveness per SJVAPCD Rule 9410 included two separate analyses – a detailed TRIMMS modeling analysis performed as part of the 2014 RTP/SCS and ARB's analysis of rule effectiveness developed by Sierra Research. The two approaches produced similar results. Given that employment forecasts are a major driver to both approaches and that the updated countywide employment forecasts for Stanislaus County are very similar to the operative forecasts used for the 2014 RTP/SCS (see figure below), the 2014 RTP/SCS 2040 VMT reduction results were simply prorated to reflect a 2035 analysis horizon for the 2018 RTP/SCS. The most up to date employment forecast is shown on the next page in **Figure 1**.

Care was taken to ensure that double-counting of VMT benefits was minimized. All VMT benefits are assumed to be attributed to light-duty vehicles and would therefore be applicable to ARB's GHG Reduction Target methodology.

**Figure 1. Stanislaus County Employment Forecasts**



**Table 1** shows the assumed VMT reductions from these programs. To determine the effect these programs have on the SB 375 GHG emission reduction target in Stanislaus County, StanCOG’s model-based 2035 SB 375 stratified VMT total should be reduced by the VMT reduction sum of 213,934 to yield a revised countywide VMT estimate. The revised VMT estimate, as input into the EMFAC model, will yield a 2035 GHG emissions estimate for computing target compliance with the GHG reduction target.

**Table 1: Off Model Daily VMT Adjustments**

Year	CalVans	ACE Forward	Active Transportation	TDM	Total
2035	5,471	30,755	25,609	152,099	213,934

Information about these services and programs and their estimated impacts to VMT within Stanislaus County are provided in the following attachments:

**Attachment 1.** CalVans **Attachment 2.** ACE Forward

**Attachment 3.** Active Transportation

**Attachment 4.** Rule 9410 Employer-Based Travel Demand Management (2042 results prorated to 2035)

# Memorandum

**To:** StanCOG  
**From:** Darryl DePencier  
**Re:** STANCOG CalVans Vanpool Off-Model VMT Benefits  
**Date:** May 2018

CalVans is planning to add Vanpool service in Stanislaus County. It is anticipated that single occupant vehicle drivers will opt to use the new vanpool capacity thereby reducing VMT within the County. Most vanpools serve inter-county commutes, so the service will have much greater VMT benefit than what is shown for just Stanislaus County.

The service is assumed to start with between 2 and 10 vans, and similar services have been shown to have an annual growth rate of 5 to 10%. VMT savings were calculated assuming that:

- Average Stanislaus vanpool distance is 16 miles (32-mile round trip)
- Average passenger load is 11 people
- Service would begin operating in 2018

Table 1 shows the daily VMT savings under nine operating scenarios based on 2, 5, and 10 starting vans, and on 5, 7.5, and 10 percent annual growth rates.

**Table 1. Daily VMT Savings**

Year	2 Vans			5 Vans			10 Vans		
	5%	7.5%	10%	5%	7.5%	10%	5%	7.5%	10%
2018	640	640	640	1,600	1,600	1,600	3,200	3,200	3,200
2019	672	688	704	1,680	1,720	1,760	3,360	3,440	3,520
2020	706	740	774	1,764	1,849	1,936	3,528	3,698	3,872
2021	741	795	852	1,852	1,988	2,130	3,704	3,975	4,259
2022	778	855	937	1,945	2,137	2,343	3,890	4,274	4,685
2023	817	919	1,031	2,042	2,297	2,577	4,084	4,594	5,154
2024	858	988	1,134	2,144	2,469	2,834	4,288	4,939	5,669
2025	901	1,062	1,247	2,251	2,654	3,118	4,503	5,309	6,236
2026	946	1,141	1,372	2,364	2,854	3,430	4,728	5,707	6,859
2027	993	1,227	1,509	2,482	3,068	3,773	4,964	6,135	7,545
2028	1,042	1,319	1,660	2,606	3,298	4,150	5,212	6,595	8,300
2029	1,095	1,418	1,826	2,737	3,545	4,565	5,473	7,090	9,130
2030	1,149	1,524	2,009	2,873	3,811	5,021	5,747	7,622	10,043
2031	1,207	1,639	2,209	3,017	4,097	5,524	6,034	8,193	11,047
2032	1,267	1,762	2,430	3,168	4,404	6,076	6,336	8,808	12,152
2033	1,331	1,894	2,673	3,326	4,734	6,684	6,653	9,468	13,367
2034	1,397	2,036	2,941	3,493	5,089	7,352	6,985	10,179	14,704

2035	1,467	2,188	3,235	3,667	5,471	8,087	7,334	10,942	16,174
2036	1,540	2,353	3,558	3,851	5,881	8,896	7,701	11,763	17,792
2037	1,617	2,529	3,914	4,043	6,322	9,785	8,086	12,645	19,571
2038	1,698	2,719	4,306	4,245	6,797	10,764	8,491	13,593	21,528
2039	1,783	2,923	4,736	4,458	7,306	11,840	8,915	14,613	23,681
2040	1,872	3,142	5,210	4,680	7,854	13,024	9,361	15,709	26,049
2041	1,966	3,377	5,731	4,914	8,443	14,327	9,829	16,887	28,654
2042	2,064	3,631	6,304	5,160	9,077	15,760	10,320	18,153	31,519

The middle scenario was selected assuming five starting vans with a 7.5% annual growth rate resulting in 1,849 vehicle miles saved in 2020, 5,471 in 2035, and 9,077 in 2042. The high and low scenarios for growth and van starts was provided to StanCOG by the director of CalVans. The middle ground scenario incorporates both assumptions at a moderately conservative level.

# Memorandum

**To:** StanCOG  
**From:** Darryl DePencier  
**Re:** Altamont Commuter Express Extension – Stanislaus County VMT Savings  
**Date:** May 2018

The StanCOG 2018 RTP/SCS includes an extension of the Altamont Commuter Express (ACE) through Stanislaus and Merced Counties with stops in Modesto, Ceres, and Turlock. The service would then continue to the city of Merced. ACE service would include one train per day in each direction between Stanislaus County and San Jose, and three trains per day between Stanislaus County and Sacramento. For the purposes of this analysis, it was assumed that all four trains would operate with seven-passenger cars capable of transporting up to 70 people apiece. This could displace as many as 1,960 single occupant vehicles each day. The three Sacramento-bound trains would offer a transfer at Lathrop for those traveling to Alameda County or San Jose.

The Longitudinal Employment and Housing Dynamic (LEHD) was used to quantify the number of people whose commute patterns would most likely be able to take advantage of the ACE services. Commuters living within four miles of the proposed stations in Modesto, Ceres, Turlock, Livingston, and Merced who work within one mile of the existing ACE stations in San Joaquin, Alameda, and Contra Costa Counties, and the proposed station in Sacramento were considered as the likely rider pool.

**Table 1** identifies the number of commuters for each station location and the number of daily vehicle miles that could be saved by each rider using that station.

**Table 1 – ACE Station Potential Commute Riders**

Station	Commuters to Other ACE Stations	Percent	Average Stanislaus County Commute Distance (mi)
Modesto	1,394	52.5	8
Ceres	439	16.5	12
Turlock	448	16.9	20
Livingston	63	2.4	25
Merced	310	11.7	25

This group of commuters represent approximately 69,410 single occupant vehicle miles on Stanislaus County roadways each day and a much larger number of miles on Merced, San Joaquin, Alameda, Santa Clara, and Sacramento County roadways. At full capacity, the ACE services would be able to replace nearly 74% of those vehicle miles.

For the purposes of this analysis, it was assumed that 90% of the available capacity would be used on the single train between Merced and San Jose by the time the train departs the station in Modesto, carrying 441 passengers. Assuming those passengers are collected at a ratio similar to their commuting populations as shown in **Table 1**, 11,533 vehicle miles would be saved each day. The Sacramento trains were assumed to be at 50% of their capacity upon departure from Modesto carrying 245 passengers

each, or 735 passengers total, saving 19,222 vehicle miles each day for a total of 30,755 vehicle miles with all four trains.

**Figures 1 through 5** show the commute destinations for people living within the four-mile capture zone of each station.

# Memorandum

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**To:** StanCOG  
**From:** Makinzie Clark  
**Re:** STANCOG Active Transportation Project Off-Model VMT Benefits  
**Date:** May 2018

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This memorandum describes the active transportation demand for the Draft 2018 STANCOG Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). The total number of new cyclists in 2035 resulting from the 2018 RTP/SCS Tier I active transportation improvements is estimated to be 14,490 persons (including commuters and recreational cyclists). The total daily reduction in vehicle miles traveled is anticipated to be 25,609 miles.

## **Methodology**

The number of new cyclists was estimated using the National Cooperative Highway Research Program (NCHRP) 552 methodology provided in the *Guidelines for Analysis of Investment in Bicycle Facilities*. The NCHRP 552 report provides national level research that suggest commute mode share can be used to extrapolate a more general mode share for bicycles using a best fit formula. In subsequent validation, the report suggests that the results of this analysis are typically within the 95% confidence interval, and when they are not, they provide a conservative estimate.

NCHRP 552 provides methodology and assumptions to measure and forecast the demand for bicycling based on population and employment data. The total number of new cyclists anticipated is based on the 2018 RTP/SCS future land use (Scenario 2) population and employment data. Given that population is not a model parameter, future year population by TAZ was estimated by multiplying future households by TAZ with a household occupancy factor. The latter was based on the baseline (2015) countywide household and population estimates developed by UOP.

Using the VMIP2 traffic analysis zone structure and associated 2035 land use data used for the 2018 RTP/SCS, the amount of population and employment within one and one-half mile of the proposed bicycle facilities included in the 2018 RTP/SCS Tier I Capital Improvement Program (CIP) project list was determined. Only those improvements reported in sufficient detail, including location and improvement limits, could be analyzed. Other inputs, such as bicycle mode share of commute trips (0.5%), and adult population percentage of the total population (72.6%), were based on American Community Survey (ACS) 2012-2016 5-year estimates for Stanislaus County.

Applying the NCHRP 552 methodology to the pedestrian/bicycle improvements yields 2,134 new commuters and 12,356 new recreational cyclists. The total reduction in vehicle miles traveled was estimated based on a 7.6-mile average roundtrip commute distance, assuming 100% of cyclist commute trips (2,134 trips) and 10% of recreational cyclist trips (1,236 trips) to replace vehicle trips. The NCHRP 552 analysis generates three demand response estimates: low, moderate, and high. In this case, the high estimate was chosen for the following reasons:

1. This assessment does not capture the full extent of active transportation investments, as many bicycle improvement descriptions lacked the requisite detail to include in the analysis.

2. Stanislaus County is conducive to cycling due to the flat terrain and moderate weather.
3. Many of the active transportation Tier I improvements included new Class I and Class II facilities, which typically encourage bicycle use.

**Table 1** presents the results of the NCHRP 552 analysis for cyclist demand under 2035 conditions, assuming 100% of bicycle commute trips and 10% of bicycle recreation trips as replacing vehicle trips (i.e. resulting in VMT saved).

**Table 1 – Scenario 2 Cyclist Demand**

Recreation Benefit	Persons	Bicycle Miles Traveled	VMT Saved
<i>Total New Commuters</i>	2,134	16,218	16,218
<i>Total New Recreation Cyclists</i>	12,356	93,906	9,391
<b>Total New Cyclists</b>	<b>14,490</b>	<b>110,124</b>	<b>25,609</b>

**Table 2** and **Table 3** provide the NCHRP 552 demand inputs and results respectively.

**Figure 1** shows the 2018 RTP/SCS Tier I bicycle transportation improvements analyzed.

**Figure 2** presents the NCHRP 552 analysis buffer zones used to estimate the future employment and population values within one-half mile (2640-feet), one mile (5280-feet), and one and one-half mile 7920-feet) distances from bicycle transportation improvements.



**Table 2 – NCHRP 552 Demand Profile**

Demand					
Jurisdiction:	Stanislaus				
Total Population:	1,294,809	Within 1.5 mile			
Total Commuters:					
Total Population Under 18 Years Old	354,778				
Commuter Percentage					
Adult Population Percentage	72.60%	27.40%			ACS 2012-2016
Existing Bicycle Commuters (if known)					
Total Bicyclist Commuters					
Bicycle Commute Mode Share:	0.50%	Provided by Journey to Work			ACS 2012-2016
Children Bicycle Percentage (NHTS 2001)	5.00%				
Population near Facility, 2400m	564,749	1.5 miles	Less 1 miles		
Population near Facility, 1600m	431,278	1 mile	less .5 miles		
Population near Facility, 800m	298,782	1/2 mile			
Total Bicyclist Commuters, 2400m	2,824				
Total Bicyclist Commuters, 1600m	2,156				
Total Bicyclist Commuters, 800m	1,494				
Adult Population near Facility, 2400m	410,008				
Adult Population near Facility, 1600m	313,108				
Adult Population near Facility, 800m	216,916				
Adult Bicycling Rate, High	2.10%				
Adult Bicycling Rate, Moderate	1.00%				
Adult Bicycling Rate, Low	0.50%				
Total Adult Bicycling Rates, High 2400m	8,610				
Total Adult Bicycling Rates, High 1600m	6,575				
Total Adult Bicycling Rates, High 800m	4,555				
Total Adult Bicycling Rates, Moderate 2400m	4,100				
Total Adult Bicycling Rates, Moderate 1600m	3,131				
Total Adult Bicycling Rates, Moderate 800m	2,169				
Total Adult Bicycling Rates, Low 2400m	2,050				
Total Adult Bicycling Rates, Low 1600m	1,566				
Total Adult Bicycling Rates, Low 800m	1,085				
Total Child Cyclists, 2400m	7,737				
Total Child Cyclists, 1600m	5,909				
Total Child Cyclists, 800m	4,093				
Likelihood Multiplier, 2400m	0.15				
Likelihood Multiplier, 1600m	0.44				
Likelihood Multiplier, 800m	0.51				
Total New Commuters, 2400m	424				
Total New Commuters, 1600m	949				
Total New Commuters, 800m	762				
Total New Adult Cyclists, High 2400m	1,292				
Total New Adult Cyclists, High 1600m	2,893				
Total New Adult Cyclists, High 800m	2,323				
Total New Adult Cyclists, Moderate 2400m	615				
Total New Adult Cyclists, Moderate 1600m	1,378				
Total New Adult Cyclists, Moderate 800m	1,106				
Total New Adult Cyclists, Low 2400m	308				
Total New Adult Cyclists, Low 1600m	689				
Total New Adult Cyclists, Low 800m	553				
Total New Child Cyclists, 2400m	1,161				
Total New Child Cyclists, 1600m	2,600				
Total New Child Cyclists, 800m	2,088				
Total New Cyclists, High	14,490				
Total New Cyclists, Moderate	11,081				
Total New Cyclists, Low	9,532				

**Table 3 – NCHRP 552 Results**

Recreation Benefit		7.6	roundtrip miles		Per day
Total New Cyclists, High	14490		110124		25608.96
Total New Cyclists, Moderate	11081		84215.6		23018.12
Total New Cyclists, Low	9532		72443.2		21840.88
					100%
Total New Commuters, 2400m	2134		16218.4		16218.4
					10%
Total New Recreation Cyclists, High	12356		93905.6		9390.56
Total New Recreation Cyclists, Moderate	8947		67997.2		6799.72
Total New Recreation Cyclists, Low	7398		56224.8		5622.48

*Note: 7.6-mile is considered the average roundtrip commute distance.*

Figure 1 – 2018 RTP/SCS Tier I Bicycle Improvements

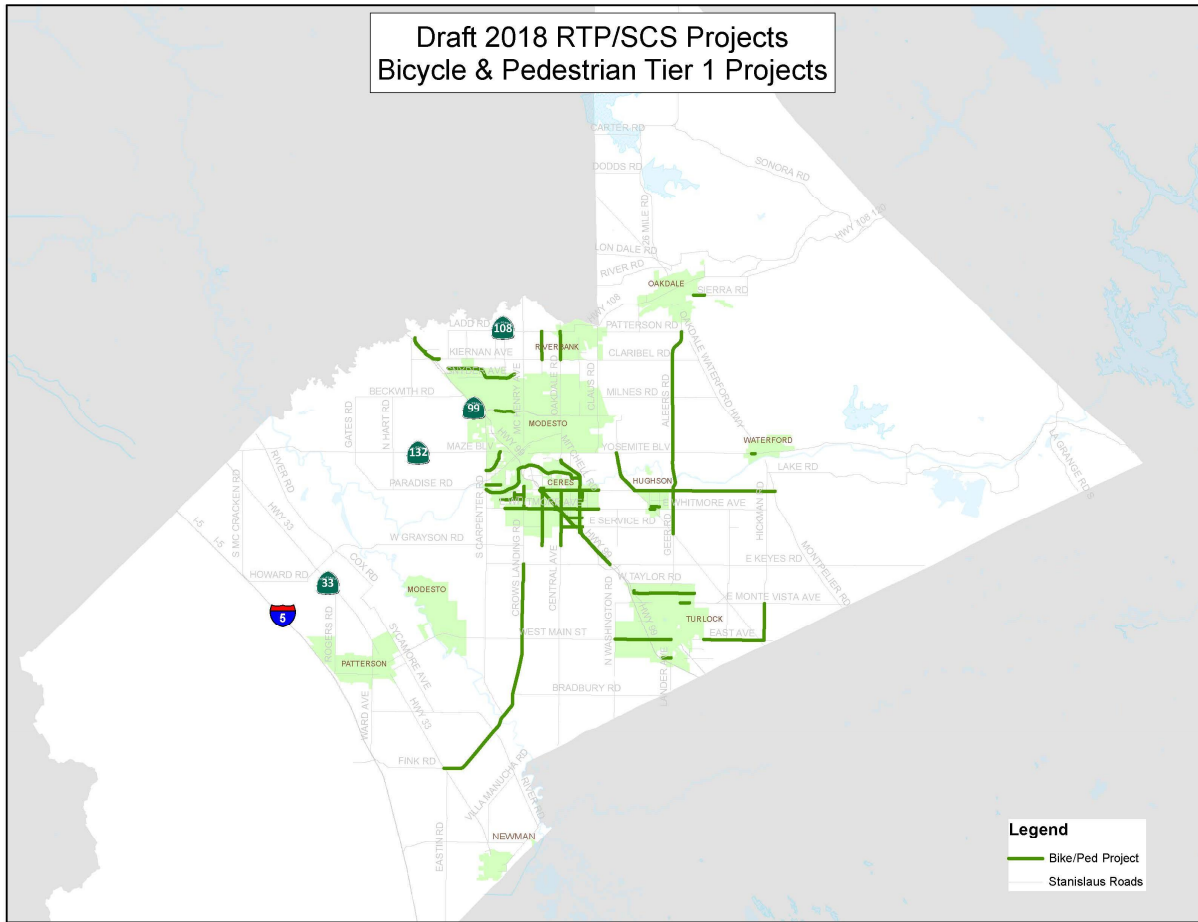


Figure 2 – NCHRP 552 Analysis Buffer Zones

