California Senate Bill 743 Implementation Assistance Project:
Case Studies on Using Vehicle Miles Traveled to Evaluate Transportation Impacts in CEQA

Widening State Route 210 in San Bernardino County

Case Study

January 2020

The SB 743 Implementation Assistance Project was coordinated by the Urban Sustainability Accelerator, a joint program of the Toulan School of Urban Studies and Planning and the Institute for Sustainable Solutions at Portland State University

Participating Agencies

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We make special mention here of some of the most active participants: **Mike McKeever** (who initiated the project), former CEO of the Sacramento Area Council of Governments (SACOG); **Chris Ganson** (a leading participant in every phase), with the California Governor's Office of Planning and Research; **Jeannie Lee** (who led the Legal Advisory Committee), also with the California Governor's Office of Planning and Research; **Kate White** with the California State Transportation Agency; **Bruce Griesenbeck** with the Sacramento Area Council of Governments; **Ping Chang** with the Southern California Association of Governments; **Ron Milam** at Fehr & Peers Transportation Consultants; **Jamey Volker** at Volker Law Offices, and PhD candidate in Transportation Technology and Policy at UC Davis.

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The analysis for this particular case study on the widening of State Route 210 was carried out by **Amy Lee** at the Sacramento Area Council of Governments, with assistance from **Ping Chang** and his expert staff at the Southern California Association of Governments – particularly **Hao Cheng**, **Hsi-Hwa Hu**, **Guoxiong Huang**, and **Daniel Tran**.

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1. About the SB 743 Implementation Assistance Project

This case study is one of five undertaken as part of the SB 743 Implementation Assistance Project: From Driving More to Driving Less, a collaboration among California state agencies and metropolitan planning organizations, consulting professionals and project staff (see names in Appendix A). The project was coordinated by the Urban Sustainability Accelerator at Portland State University.

The purpose of the project was to assist with the development and implementation of new Guidelines governing transportation impact analysis under CEQA (California Environmental Quality Act). These were being drafted to carry out the groundbreaking provisions of California Senate Bill 743, which fundamentally changed transportation impact analysis as part of CEQA compliance. The updated CEQA Guidelines were adopted in December 2018 during the course of this project.

The nationally important feature of SB 743 (passed in 2013) was the elimination of auto delay, level of service (LOS), and similar measures of traffic congestion or vehicular capacity as a basis for determining the significant transportation impacts of new projects. Charged with selecting a replacement metric and developing associated guidance, the Governor's Office of Planning and Research (OPR) chose Vehicle Miles Traveled (VMT) – i.e., the amount and distance of automobile travel attributable to a project – as the preferred CEQA transportation metric going forward.

That shift necessitated corresponding changes in how transportation impacts are to be mitigated – from such methods as widening roads or adding turn lanes to improve LOS standards, to measures such as increasing transit service or instituting parking fees to reduce project-generated VMT.

The five case studies that form the core of this project represent a sample of previously approved land use and transportation projects, selected by the project's leadership to highlight different topics in implementing OPR's updated guidelines and technical guidance being drafted at the time. Each case study draws on a project's environmental impact report (EIR) and related documents prepared under the former LOS maintenance standard as a basis for illustrating what a new, VMT-based transportation impact analysis would look like, pursuant to the updated CEQA statute, guidelines, and technical advisory.

You can find more details about the project on the website at https://www.sb743.org. This includes the other case studies, related workshops, and a resource library.

Disclaimer: The approach and technical methods used here are illustrations of how the new CEQA analysis can be approached; they are not endorsements of that approach by any of the participating governments or technical experts. Reasonable minds can and do differ regarding how to implement the Guidelines. That was true even among the distinguished experts who contributed to these case studies. CEQA gives lead agencies significant discretion in how they undertake their CEQA responsibilities and these case studies illustrate ways in which that discretion can be exercised.

2. SR 210 Road Widening Project Description

(a) Prefatory Note

When this project began in October 2016, OPR's[1] proposed revisions[2] to the CEQA Guidelines implementing SB 743 included roadway expansion projects among the types of projects that would likely need to use vehicle miles traveled (VMT) rather than automobile delay as the metric for analyzing their transportation impacts. The proposed SR 210 roadway widening project was selected as a case study for this project with that understanding.

However, in November 2017 OPR issued a comprehensive package of proposed updates to the CEQA Guidelines that included updates to the SB 743-related sections. Specifically, revisions to Guidelines section 15064.3(b)(2) gave lead agencies discretion, when analyzing transportation impacts from roadway capacity projects, to "determine the appropriate measure of transportation impact consistent with CEQA and other applicable requirements." [3] This meant that lead agencies for transportation projects could choose to use another metric, such as level of service (LOS), to evaluate their transportation impacts rather than having to use a VMT metric as with land use projects.

Despite that change, this case study of VMT impact analysis for a highway capacity expansion project should still be relevant and useful to lead agencies and others implementing SB 743 for a number of reasons, including:

- Lead agencies might wish to choose VMT as the metric for impact analysis because of a policy preference; or because VMT mitigation might cost less than building additional capacity to mitigate a significant impact under a LOS standard; or because it is the most appropriate metric for meeting the project's CEQA requirements. In these cases, the technical analysis issues addressed in this case study and the examination of different methods for mitigating VMT will be of interest.
- It is already best practice to include analysis of induced travel, expressed in VMT, as part of the growth-inducing impact analysis required under current CEQA law. Such an analysis requires discussing the characteristic of projects that "may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively"[4] – such as by encouraging vehicle travel – which would then need to be measured. Since a roadway expansion project can induce substantial VMT, estimating this induced VMT "is critical to

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[1] "OPR" stands for the Governor's Office of Planning and Research. See glossary in Appendix B for definitions of terms and acronyms used in this case study.

[2] *2016 Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA: Implementing Senate Bill 743 (Steinberg, 2013)*, Governor's Office of Planning and Research, January 22, 2016. Available at: http://opr.ca.gov/docs/Revised_VMT_CEQA_Guidelines_Proposal_January_20_2016.pdf.

[3] Page 79 in *Proposed Updates to the CEQA Guidelines (Final)*, Governor's Office of Planning and Research, November 2017. Available at: http://opr.ca.gov/docs/20171127_Comprehensive_CEQA_Guidelines_Package_Nov_2017.pdf.

[4] See section 15126.2(e) in *Guidelines for Implementation of the California Environmental Quality Act,* 2019. (Hereafter "CEQA Guidelines" or "Guidelines.") Available at: http://resources.ca.gov/ceqa/docs/2019_CEQA_Statutes_and_Guidelines.pdf (pp. 193-194).

calculating both transportation and other impacts" of roadway expansion projects. Induced travel "also has the potential to reduce or eliminate congestion relief benefits;" therefore "an accurate estimate of induced travel is needed to accurately weigh costs and benefits of a highway capacity expansion project"[5]

- CEQA also requires determining the amount of greenhouses gases (GHGs) generated by the project. This case study of SR 210 reviewed and tested different methods of estimating VMT (which directly generates GHGs) including analyzing the entire impact area and assessing induced travel. Lead agencies should benefit from these analyses and comparisons.

OPR's *Technical Advisory on Evaluating Transportation Impacts in CEQA*, published December 2018 (hereafter "Technical Advisory" or "TA"), provides VMT analysis recommendations for those jurisdictions that choose to use VMT to assess transportation impacts of roadway capacity projects.

This SR 210 case study also examines VMT mitigation strategies and discusses several options for regional mitigation strategies that could be applied to large VMT increases unable to be mitigated at the project level. It references, but does not explore, regional mitigation approaches that could be used to mitigate a spectrum of projects anticipated under a General Plan or Sustainable Communities Strategy. All of these options should be of interest to lead agencies and others responsible for implementing SB 743.

(b) Project Details

Background

This case study analyzes the proposed widening of State Route (SR) 210 in San Bernardino County to add a third mixed-flow lane in each direction.

In May 2016, the lead agency, Caltrans, in conjunction with San Bernardino Associated Governments and the City of Highland, prepared and adopted an Initial Study with a Proposed Mitigated Negative Declaration (IS-MND) for the project, called "State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue Project."[6]

As described in the IS-MND, the proposed project would "widen SR-210 from Sterling Avenue to San Bernardino Avenue in the cities of Highland, San Bernardino, and Redlands, as well as a portion of unincorporated San Bernardino County, California." While the widening would occur for 6.1 miles between post miles (PM) R26.3 and R32.4, the total length of the proposed project, including transition striping and signage limits, would be about 8.2 miles, from PM R25.0 to R33.2 (p. 1-1).

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[5] Page 23 in *Technical Advisory on Evaluating Transportation Impacts in CEQA,* California Governor's Office of Planning and Research, December 2018. (Hereafter "Technical Advisory" or "TA"). Available at: http://opr.ca.gov/docs/20190122-743_Technical_Advisory.pdf

[6] *Initial Study [with Proposed Mitigated Negative Declaration] for State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue Project*, Cities of Highland, San Bernardino, and Redlands, San Bernardino County, California. District 8– SBD – 210 (PM R25.0/R33.2), EA 0C700/PN 08-12000164. May 2016. Available at: https://www.gosbcta.com/wp-content/uploads/2020/01/210_MFLA_ISMND.pdf.

The stated purpose of the proposed project was to "eliminate an existing bottleneck, which would reduce congestion and improve operational efficiency by providing lane continuity with the existing segments of SR 210 to the west and east of the project limits" (p. 1-2).

Reasons for selection as a case study

SR 210 was selected as a case study for this project to examine how the new VMT metric for measuring transportation impacts could be applied to a road capacity expansion project. Of the five case studies undertaken for this project, SR 210 is the only one focused on a transportation project. It therefore provided an opportunity to test relevant sections of OPR's Technical Advisory and the applicable CEQA Guidelines implementing SB 743.

The proposed SR 210 project is consistent with the relevant regional transportation and transportation improvement plans adopted by the Southern California Association of Governments (SCAG). Specifically, it is included in both the 2012 Regional Transportation Plan (RTP) Amendment 1[7] and in the 2015 Federal Transportation Improvement Program[8] (IS-MND, p. 1-6).

Location

The IS-MND includes a regional vicinity map and a project location map (Figures 1-1 and 1-2 in the IS-MND) that are reproduced here as Figures 1 and 2.

[7] Adopted by SCAG on June 12, 2013 and approved by FHWA on July 15, 2013.

[8] Adopted by SCAG on September 11, 2014 and approved by FHWA on December 15, 2014.

Figure 1: Regional vicinity map for SR 210 project. (Source: SR 210 IS-MND.)

Figure 2: Detailed location map for SR 210 project. (Source: SR 210 IS-MND.)

3. CEQA Analysis

This section compares approaches to a CEQA transportation impact analysis before and after SB 743's implementation. We examine the following three topics of relevance to the SR 210 case study:

(a) Thresholds of significance (for transportation impacts)
(b) Transportation impact analysis
(c) Mitigation measures

(a) Thresholds of Significance

LOS-based thresholds for transportation impacts (CEQA pre-SB 743)

In its Initial Study (IS), Caltrans as lead agency applied the "environmental checklist" questions in Appendix G of the CEQA Guidelines.[9] Relevant to this case study, it examined question "a" in Section XVI (Transportation/Traffic) of Appendix G, which asks:

> Would the project conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?

Caltrans employed LOS thresholds to evaluate the project's impacts on the performance of the circulation system, and determined that the proposed Build Alternative would be consistent with Caltrans's "generally accepted" minimum LOS threshold of "D" for peak hour freeway operations, and would not conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system. Without the project, capacity and operating conditions on SR-210 between Highland Avenue and San Bernardino Avenue were projected to conflict with that standard, operating at LOS F during the AM and PM peak hours by Horizon Year 2040.

VMT-based thresholds for transportation impacts (CEQA post-SB 743)

Under SB 743's implementing regulations, lead agencies for roadway capacity expansion projects retain their usual discretion to "determine the appropriate measure of transportation impact consistent with CEQA and other applicable requirements" (Guidelines § 15064.3(b)(2)).

This means a lead agency may continue to use a measure based on automobile delay, such as LOS, or it may choose to use VMT as a metric. However, OPR's Technical Advisory notes that:

> Because a roadway expansion project can induce substantial VMT, incorporating quantitative estimates of induced VMT is critical to calculating both transportation and other impacts of these projects. An accurate estimate of

[9] Appendix G questions are often used to meet the requirements for an Initial Study provided the criteria set forth in the CEQA Guidelines have been met. The version of Appendix G at the time the IS was conducted is available at: http://resources.ca.gov/ceqa/docs/ab52/final-approved-appendix-G.pdf.

induced travel is needed to accurately weigh costs and benefits of a highway capacity expansion project (p. 23).

The Technical Advisory, however, does not recommend a specific VMT threshold of significance for induced travel. The simplest threshold a lead agency could adopt for VMT impacts from roadway expansion projects in metropolitan regions would be "no net induced travel." But more complex options are also possible. This case study presents one potential alternative threshold of significance.

OPR's Technical Advisory suggests that lead agencies, in developing a project-level VMT threshold for highway capacity expansion projects, base the threshold on the VMT levels required to achieve legally mandated GHG emissions reduction targets, as delineated by the California Air Resources Board (CARB) in its 2017 Scoping Plan-Identified VMT Reductions.[10]

Consistent with its evidence-based modeling scenario, CARB calculated VMT reduction per capita that would achieve State climate goals of 40% GHG emissions reduction from 1990 levels by 2030 and 80% GHG emissions reduction levels from 1990 by 2050. It applied California Department of Finance population forecasts, and found per-capita light-duty vehicle travel would need to be approximately 16.8 percent lower than existing, and overall per-capita vehicle travel would need to be approximately 14.3 percent lower than existing levels under that scenario (Technical Advisory, p. 11).

The Technical Advisory (TA) outlines a method for developing a threshold of significance for road projects (see pp. 22-23). It is based on the VMT reductions identified in CARB's *2017 Climate Change Scoping Plan*[11] as necessary to meet the GHG reduction targets set by various legislative bills and executive orders since 2005. The TA also references CARB's 2016 *Mobile Source Strategy,* which incorporates GHG reductions from low-carbon fuels and vehicle technologies as well as "slower growth of light-duty [vehicle] VMT." [12]

CARB's Scoping Plan and its Mobile Source Strategy delineate VMT levels required to achieve legally mandated GHG emissions reduction targets. A lead agency should develop a project-level threshold based on those VMT levels, and may apply the following approach (see TA, pp. 22-23):

1. Propose a fair-share allocation of those budgets to their jurisdiction (e.g., by population).
2. Determine the amount of VMT growth likely to result from background population growth, and subtract that from their "budget."

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[10] *2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals*, California Air Resources Board, January 2017. Available at: https://ww2.arb.ca.gov/sites/default/files/2019-01/2017_sp_vmt_reductions_jan19.pdf

[11] *California's 2017 Climate Change Scoping Plan: The strategy for achieving California's 2030 greenhouse gas target*, California Air Resources Board, November 2017. Available at: https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf

[12] Page 36 in *Mobile Source Strategy,* California EPA and Air Resources Board, May 2016. Available at: https://ww3.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf

3. Allocate their jurisdiction's share between their various VMT-increasing transportation projects, using whatever criteria the lead agency prefers.

CARB's GHG emissions targets (40% below 1990 levels) require a *"15 percent reduction in total light-duty [vehicle] VMT in 2050 compared to baseline 2050 levels"* under the "Cleaner Technologies and Fuels Scenario."[13]

Half of that reduction (7.5 percent) is met by the 2035 Regional Transportation Plans and Sustainable Communities Strategies (RTPs/SCSs) adopted by California's metropolitan planning organizations pursuant to SB 375. But meeting CARB's 15% GHG emissions reduction targets by 2050 will require a further 7.5 percent reduction. Therefore, the proposed threshold for this case study is based on the RTP/SCS-forecasted VMT for the region in 2035, minus 7.5 percent.

As Table 1 shows, the total increase in VMT in the SCAG region permissible between the base year (2012) and 2035 that would still meet the CARP scoping plan target, is 2,288,285 VMT per day (92.5% of forecasted 2035 VMT minus the base year VMT).

Table 1: Potential VMT Threshold Methodology: Step One - Calculating Regional VMT Reduction Baseline

	Base Year (2012)	Future Year (2035)
(a) Regional VMT per day[1]	417,168,719	453,467,031
(b) Future regional VMT per day for SCAG region that meets scoping plan target reduction of 7.5%[2]		419,457,004
Percent change in VMT from base year that may occur but still meet CARB scoping plan goal	0.55%	
Allowable additional daily VMT from base year to meet scoping plan[3]	2,288,285	

[1] *From SCAG's 2016 RTP/SCS*

[2] *Scoping Plan GHG targets allow for a 0.55% increase from 2012 regional VMT. This can also be calculated as 2035 regional VMT minus 7.5%.*

[3] *The difference between (b) for 2035 (future year) and (a) for 2012 (base year).*

That allowable increase must then somehow be allocated to projects to obtain project-specific VMT significance thresholds, as discussed further below and in Table 2.

The 2,288,285 additional VMT can be allocated to projects in various ways – by lane miles, population, service area, service population, etc. Table 2 shows how to allocate this VMT by the project's percentage of the regional lane miles.

[13] Page 37 in *Mobile Source Strategy*, California Air Resources Board, May 2016. Available at: https://ww3.arb.ca.gov/planning/sip/2016sip/2016mobsrc.pdf. This would translate into light-duty VMT growth of only five percent by 2030, compared to current growth rates of approximately 11 percent.

Table 2: Allocation of Allowable VMT to Project Lane Miles	
Regional lane miles (2012)[1]	46,428
Project lane miles (i.e., added miles)[2]	16.4
Percent change in regional lane miles with project[3]	0.04%
Allowable additional daily VMT allocated to project (this is the VMT threshold of significance)[4]	808

[1] From SCAG's 2016 RTP/SCS base year transportation network.
[2] From the SR 210 IS-MND.
[3] Calculation: 16.4 (project lane miles)/46,428 (regional lane miles).
[4] Calculation: 2,288,285 (allowable additional daily VMT from base year to meet scoping plan) x 0.04% (percent change in lane miles).

The allowable additional 808 daily VMT allocated to the project is used in this case study as a threshold of significance for the project. Estimated project-generated VMT can be compared to this threshold.

(b) Transportation Impact Analysis

LOS-based impact analysis (CEQA pre-SB 743)

Section 2.17 of the SR 210 IS-MND evaluates the transportation and traffic impacts of the mixed-flow lane additions, as required by CEQA at that time. As mentioned above, the analysis addresses criteria listed in CEQA's "environmental checklist" in Appendix G of the CEQA Guidelines at that time. Relevant to this case study are checklist questions "a" and "b" in Section XVI (Transportation/Traffic); they ask if the project would:

a) Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, considering all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit.

b) Conflict with an applicable congestion management program, including but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways.

The IS-MND made the following determinations about each potential impact above[14]:

> <u>Impact "a"</u>: *No Impact.* The proposed project would reduce congestion and improve operational efficiency by providing lane continuity with the existing segments of SR-210 to the

[14] The presumptions of significance stated in the IS-MND come from the February 2014 *Traffic Operations Analysis Report (TOAR): SR-210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue in the County of San Bernardino*.

west of Highland Avenue and east of San Bernardino Avenue. In the Horizon Year 2040, nearly all mainline freeway segments on SR-210 within the project limits would operate at LOS D or better after implementation of the proposed project….Two segments (westbound SR-210 from San Bernardino Avenue to 5th Street-Greenspot Road, and SR-210 between SR-330 and Victoria Avenue) would operate at LOS E in evening hours. These same segments would operate at LOS F and E, respectively, under the No Build Alternative. Because the density and LOS of these freeway segments only slightly exceed the criteria for LOS D, the proposed improvements would meet the project's purpose and need (p. 2-250).

Impact "b": *No Impact.* The proposed project would not conflict with the County's congestion management program as established by the county congestion management agency, SANBAG (p. 2-252).

The Transportation & Traffic section of the IS-MND concludes that: "No avoidance, minimization, and/or mitigation is required" for the SR 210 project. It does, however, list six measures that will address impacts on the circulation system during the construction period (p. 253).

VMT impact analysis (CEQA post-SB 743)

OPR advises that: "If a project would likely lead to a measurable and substantial increase in vehicle travel, the lead agency should conduct an analysis assessing the amount of vehicle travel the project will induce" (Technical Advisory, p. 20). Such projects, it notes, generally include the addition of through lanes on highways, as in the SR 210 project.

As mentioned in the prefatory note to this case study, it is already best practice to include induced travel, measure in VMT, as part of the growth-inducing impact analysis required under current law. Such analysis requires discussing "the characteristic of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively" (Guidelines § 15126.2(e)).

The Technical Advisory (TA) includes a discussion of, and a methodology for, evaluating and estimating VMT impacts from roadway expansion projects, which applies to the SR 210 project. We illustrate below the use of the "elasticity" methodology recommended in the TA. Following that, as a thought exercise, we examine using a regional travel demand model to estimate VMT impacts.

Elasticity Method

To find the long-run VMT impacts of transportation projects, the TA (p. 24) points to academic studies that estimate long-run elasticities of VMT associated with highway capacity expansion projects.[15,16] These are separate from the VMT effects caused by non-project-related population growth and other changes.

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[15] Handy and Boarnet, *Impacts of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions*, Technical Background Document (Brief), California Air Resources Board, September 30, 2014. Available at: https://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_brief.pdf.

[16] Duranton and Turner, "The Fundamental Law of Road Congestion: Evidence from US Cities." *American Economic Review*. (2011) 101: 2616-2652. Available at: http://www.nber.org/papers/w15376.

In accordance with the Technical Advisory's (TA's) recommendation as well as the Guidelines and CEQA case law, we used 2012 lane miles and network VMT as the baseline against which to compare the impact of adding 16.4 miles of mixed-flow highway lanes (8.2 miles in each direction) to State Route 210. We illustrated use of each elasticity presented in Boarnet and Handy's 2014 paper (footnote 12), which was recommended by the TA, using the appropriate reference geography (county, metropolitan statistical area, etc.) and roadway types (highway, arterials, etc.).

We used loaded network data from SCAG's travel demand model to calculate lane miles and VMT. A lead agency could also use California Public Road Data (PRD) from Caltrans's Highway Performance Monitoring System,[17] though it would need to request the data in the appropriate format (VMT and lane miles by roadway type and by county) to perform the following analysis.

To estimate induced VMT with elasticities, we calculated the percent change in lane miles as a result of the 16.4 lane miles added by the project. We use the percent change in lane miles as follows:

$$Induced\ VMT = \begin{bmatrix} Percent\ Change \\ in\ Lane\ Miles \end{bmatrix} \times \begin{bmatrix} Baseline \\ VMT \end{bmatrix} \times [Elasticity]$$

The Handy and Boarnet article references seven different academic studies. Each study estimates a unique, long-run elasticity within the range of 0.39 to 1.03. We illustrate the use of all seven elasticities to estimate the range of induced VMT (see Table 3).

[17] Caltrans HPMS Data Library, at: http://www.dot.ca.gov/hq/tsip/hpms/datalibrary.php

Table 3: VMT Induced by 16.4 Miles of Mixed-Flow Highway Lane

Study	Publication Year	Study Location	Study Years	Geography	Roadway Types	Time Period	Elasticity	Lane Miles[1]	VMT[1]	Percent Change in Lane Miles	Induced VMT
Duranton & Turner	2011	United States	1983 - 2003	Metro Statistical Area	Interstate Highways	10 years	1.03	3,482	32,284,630	0.46%	152,800
Cervero	2003	California	1980 - 1994	County	Freeways in small- and medium-sized cities and suburban areas	Short Term	0.10	2,546	24,066,509	0.63%	15,124
						Long Term	0.39				58,985
Cervero & Hansen	2002	California	1976 - 1997	Urban County	State-Owned Roadways	Short term (1 year)	0.59	2,546	24,066,509	0.63%	89,220
						Intermediate (5 years)	0.79				119,464
Noland	2001	United States	1984 - 1996	State	All roadway types as reported by US DOT in *Highway Statistics*	Short Term	0.30 to 0.60	Not Analyzed			
						Long Term	0.70 to 1.00				
Noland and Cowart	2000	United States	1982 - 1996	Metro Statistical Area	Freeways & Arterials	Short Term	0.28	9,282	80,577,485	0.17%	38,891
						Long Term	0.90				125,005
Hansen and Huang	1997	California	1973 - 1990	County & MSA	State-Owned Highways	Short Term	0.20	Not Analyzed			
						Long Term - County	0.60 to 0.70	2,546	24,066,509	0.63%	98,308
						Long Term - Metro Area	0.90	4,313	46,999,837	0.37%	156,920

[1] From SCAG 2012 network data

SR 210 MSA = Riverside & San Bernardino Counties

As a result of the 16.4 miles of additional mixed-flow lanes, the short-run increase in VMT ranges from 38,891 to 89,220 VMT per day, depending on the elasticity selected. The long-run increase in VMT ranges from 98,308 to 156,920 VMT, also depending on the elasticity selected.

As discussed below, this estimated increase in daily VMT derived by this analysis is substantially greater than the estimated increase derived by using a regional travel demand model and which would was developed for the Environmental Impact Report.

At a regional scale, the induced VMT calculated in this analysis represents an increase of 0.02 to 0.04 percent over the long run. The short-run increase in VMT is 0.01 to 0.02 percent.

Regional Travel Demand Model Method

Because jurisdictions with access to regional travel demand models may attempt to use those models to estimate project-level VMT impacts, this case study attempts such an approach as a thought exercise. In its current form, the method discussed below would not suffice as a valid VMT impact analysis for CEQA purposes for at least two reasons: (1) it does not use an existing conditions baseline,[18] and (2) it truncates the project's (likely) actual impact area.[19]

Nonetheless, the method is a useful illustration of the difficulties in using a regional travel demand model to estimate project-level VMT impacts for transportation projects.

To illustrate the travel demand model approach, link-level volume data was taken from horizon-year 2035 runs of SCAG's travel demand model with and without the SR 210 mixed-flow lane additions, and organized into a set of concentric bands buffered around the major travel corridors in the project vicinity – see Figure 3.

The bands range in diameter from 1 to 15 miles. Volume differences between the two model runs are shown in the legend box of Figure 3. Red links indicate volume increases and green links indicate volume declines. Line width indicates the magnitude of the changes; specific volume ranges are noted in the legend. Figure 4 shows major travel corridors.

As Figure 3 shows, the travel demand model suggested significant shifts in VMT on road segments 15 to 20 miles from the project but with smaller changes closer in. How could this be?

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[18] In order to inform the public and decisionmakers of a project's environmental impacts – which is the primary goal of CEQA – the lead agency must in its CEQA impact analysis designate a "baseline" against which predicted effects can be described and measured (*Neighbors for Smart Rail v. Exposition Metro Line Construction Authority* (2013) 57 Cal. 4th at 439, 447). Both the CEQA Guidelines and the California Supreme Court agree that the baseline "normally" constitutes "the physical environmental conditions in the vicinity of the project" (Guidelines §§ 15125(a)) as they exist "*at the time the notice of preparation [of the EIR] is published*, or if no notice of preparation is published, *at the time environmental analysis is commenced*" (Guidelines § 15126.2a [emphasis added]); Neighbors for Smart Rail, 57 Cal.4th at 445; OPR, 2017a, *Proposed Updates to the CEQA Guidelines*, pp. 92-97).

[19] The CEQA-mandated geographical scope of impact analysis is "the area in which significant effects would occur either directly or indirectly as a result of the project," not just the project site or the area within a particular radius of the site (Guidelines § 15360).

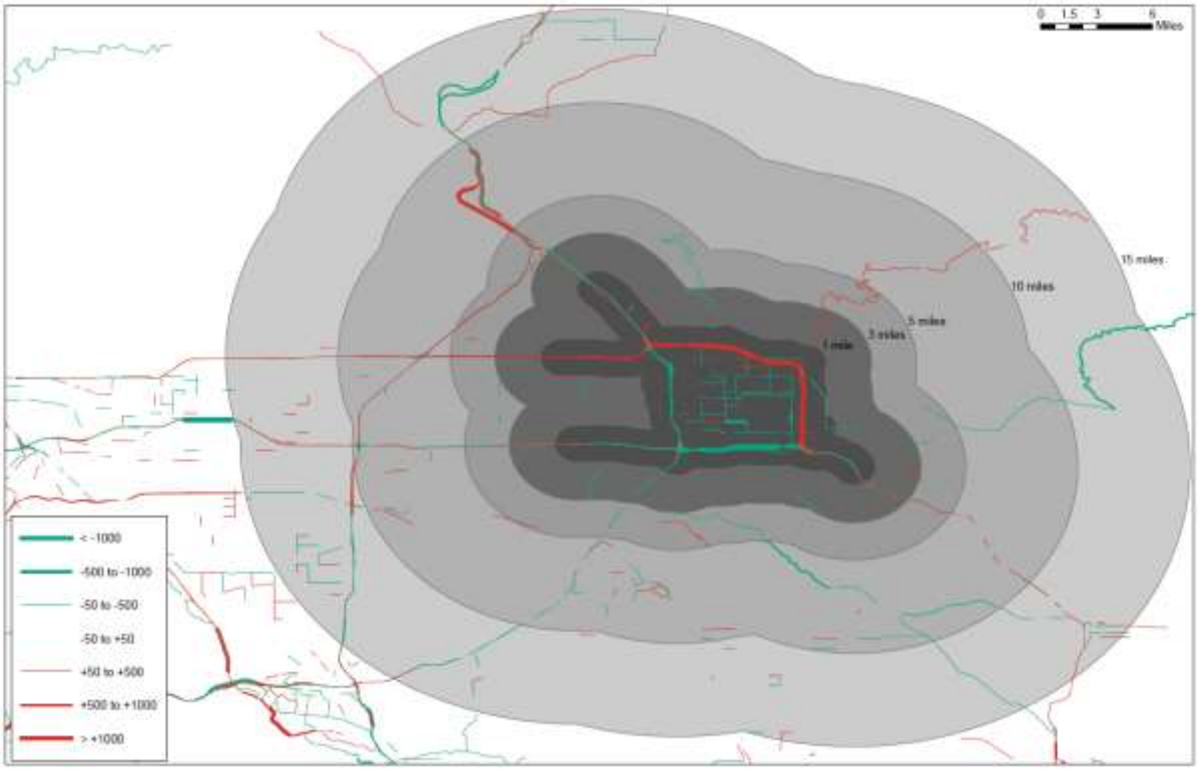

Figure 3: SR 210 impact area bands. (Data source: SCAG.)

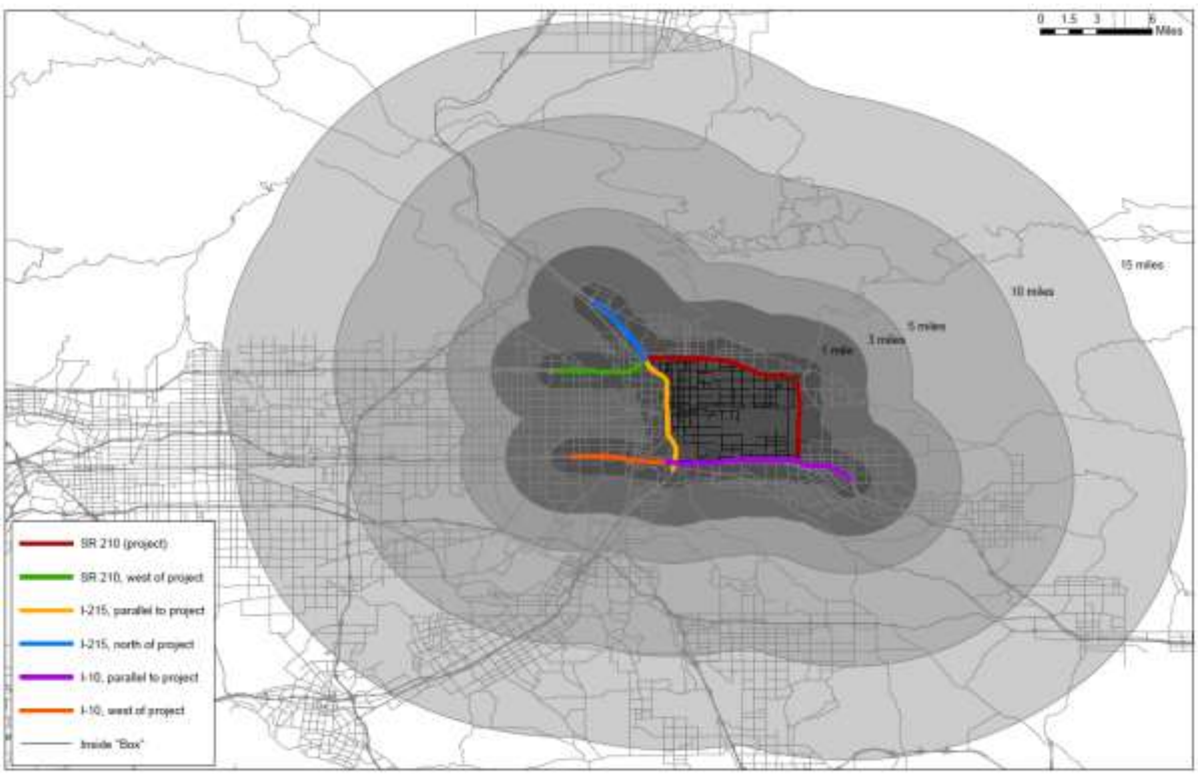

Figure 4: SR 210 and associated major travel corridors. (Data source: SCAG.)

With travel demand models that cover large geographies (e.g., regions and large counties) the effect on VMT of any one transportation (or land use) project can get lost in the "noise" created by other projects, model inputs and the random variability inherent to statistical travel models. This statistical and analytical "noise" created increases with distance from the project.

Bands were used to identify if a project-specific VMT effect could be discerned, and within what geographic area. The results, discussed below, are not evidence that the SR 210 project would only cause VMT increases within 1 mile of the lane additions. Rather, it illustrates the difficulty of using large-area travel demand models to assess the VMT impact of any one project, and the need for creative but defensible methods for identifying impact areas and ultimately, VMT.

For each corridor and distance band, Table 4 shows VMT data which professional judgment suggests is most relevant to identifying a discernable SR 210 impact area with a regional travel model. The top section of the table shows daily VMT by corridor; the lower section shows daily VMT by distance band, which includes both named corridors and all other regional model network links in the band.

Table 4. Percentage change in VMT by distance band; current no-build vs. future build condition. (Source: SCAG.)

Segment		Map Color	VMT - With Project	VMT - No Project	Absolute Change in VMT	Percent Change in VMT
SR 210 (project)	S1	(dark red)	938,688	881,525	57,163	6.48%
SR 210, west of project	S2	(green)	296,588	293,892	2,696	0.92%
I-215, parallel to project	S3	(yellow)	827,025	840,025	-13,000	-1.55%
I-215, north of project	S4	(blue)	195,767	197,491	-1,724	-0.87%
I-10, parallel to project	S5	(purple)	1,608,853	1,632,264	-23,412	-1.43%
I-10, west of project	S6	(orange-red)	710,255	711,691	-1,436	-0.20%
Inside "Box"		—	1,646,816	1,653,294	-6,478	-0.39%
Elsewhere		—	409,474,199	409,539,516	-76,968	-0.02%
All Segments (S1 + ... + S6)			4,577,176	4,556,888	20,288	0.45%
Segments + Inside Box			6,223,992	6,210,182	13,810	0.22%

Distance Band	VMT - With Project	VMT - No Project	Absolute Change in VMT	Percent Change in VMT
Project Links + Inside Box	6,227,831	6,214,002	13,829	0.22%
< 1 mile	3,142,202	3,145,968	-3,766	-0.12%
1-3 miles	4,001,414	4,002,686	-762	-0.02%
3-5 miles	5,469,849	5,472,090	-1,972	-0.04%
5-10 miles	17,990,241	17,989,208	-462	0.00%
10-15 miles	19,291,783	19,292,751	-1,546	-0.01%
> 15 miles	359,574,870	359,632,992	-68,479	-0.02%

To identify a discernable geographic area in which the lane additions to SR 210 have an effect on modeled VMT, the "Percent Change in VMT" shown in the last column of the table is most useful. The data in that column show that the greatest percent change in modeled VMT between the future-build and future-no-build scenarios occurs on SR 210 itself and several nearby interstates. The distance band that best corresponds to these corridors is the smallest - the “one-mile” band shown in the darkest shade in Figures 3 and 4 above. This one-mile band captures the largest percent change in modeled VMT (both increases and decreases) of all the bands analyzed.

However, as discussed above, these results are not evidence that the SR 210 project would only cause VMT increases within one mile of the lane additions. It would thus not suffice as a complete VMT impact estimate for CEQA purposes. Rather, as noted above, the results indicate the difficulty of using large-area travel demand models to assess the VMT impact or impact area of any one project.

In conclusion, the elasticity model approach seems more tractable and defensible than the regional travel demand model.

Estimates of VMT in air quality section of IS-MND

As part of the project’s air quality analysis, estimates of VMT were developed and published in an Air Quality Report.[20] (The VMT estimates were used to estimate Mobile Source Air Toxins [MSATs] required by state and federal environmental guidance and regulations). Table 3-5 in the report shows estimates of VMT for the Existing Year (2012) No-Build; Opening Year (2020) Build and No-Build; and Horizon Year (2040) Build and No-Build scenarios (pp. 3-49 to 3-51). These estimates were produced using the EMission FACtors (EMFAC) model (EMFAC2011), “which is maintained by CARB and approved by EPA for developing on-road motor vehicle emission inventories and conformity analyses” (p. 3-47).

As required by CEQA, the mobile source air impacts analysis includes pollutants generated by travel by all vehicles, not just the cars and light-duty trucks which are used to analyzing transportation impacts as provided and authorized by SB 743 and the implementing guidelines. For those reasons, the MSAT VMT forecast would not necessarily match the results of the application of SCAG’s regional travel demand model. Nonetheless it is worth making a comparison to see the magnitude of difference.

The all-vehicle VMT estimates using the EMFAC model show an increase of 0.5% in daily VMT (20,000 VMT) between the Opening Year Build scenario and Opening Year No-Build scenario. That is virtually the same as the 20,228 increase in daily VMT for the Opening Year in the travel demand model forecast in using the travel demand forecast model. But it is much less than the short term estimated increase of 38,891 to 89,220 VMT per day using the elasticity model, depending on the elasticity selected.

The EIR estimated a 1.5% increase in daily VMT (70,000 VMT) between the Horizon Year Build and Horizon Year No-Build scenarios, also substantially lower than the elasticity model forecast of a long-run increase in VMT ranging from 98,308 to 156,920 VMT.

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[20] *Air Quality Report for State Route 210 Mixed Flow Lane Addition from Highland Avenue to San Bernardino Avenue, Cities of Highland, San Bernardino, and Redlands*, State of California Department of Transportation in coordination with the San Bernardino Associated Governments (January 2015), San Bernardino County, California, District 8–SBD–210 (PM R25.0/R33.2) EA 0C700/PN 0812000164. Available at: https://www.gosbcta.com/wp-content/uploads/2020/01/210_MFLA_TS_AirQuality.pdf

(c) Mitigation Measures

LOS mitigation

No mitigation measures (and/or avoidance or minimization measures) were required for the SR 210 project since no significant transportation/traffic impacts were identified in the IS-MND or the associated Traffic Operations Analysis Report (TOAR).[21] In other words, the project would maintain LOS standards for the road network.

VMT mitigation

The VMT analysis, comparing VMT induced by the project (Table 3) to the VMT threshold of significance identified in Table 2, indicates that the project could result in significant transportation impacts without mitigation of the additional VMT. The extent of mitigation required to reduce VMT added by the project to less than significant depends upon which induced travel study and elasticity is used by the lead agency responsible for making the determination, based on substantial evidence.

As mentioned earlier, strategies to reduce VMT have been well-studied and documented in academic and professional literature. CARB hosts on its website a set of policy briefs that summarize the scientific literature about the impacts of transportation and land use policies on vehicle use and GHG emissions.[22]

In addition, the California Air Pollution Control Officers Association (CAPCOA) published a 2010 report titled *Quantifying Greenhouse Gas Mitigation Measures* (hereafter "CAPCOA 2010") that summarizes land use and transportation strategies to reduce VMT, and thus GHG emissions.[23]

We conducted an analysis, described below, using a selection of mitigation strategies found in the CAPCOA report and select policy briefs on CARB's website. Mitigation categories we looked at included pricing strategies, behavior change programs and education, land use, and transportation services. Below we discuss their application to the SR 210 expansion project.

Project-scale mitigation using road user pricing

Road user pricing is a primary strategy for mitigating VMT at the project scale. It can include tolling, cordon pricing, and distance charging. Further, it may be a feasible mitigation strategy for the lead

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[21] *Final Report: Traffic Operations Analysis Report, SR-210 Mixed Flow Lane Addition from Highland Avenue (Pm R25.0) To San Bernardino Avenue (Pm R33.2) in the County of San Bernardino*. EA 0C700. Prepared for San Bernardino Associated Governments in conjunction with Caltrans–District 8. February 2014. Available at: https://www.gosbcta.com/wp-content/uploads/2019/09/210_MFLA_TS_TrafficReport-2.pdf

[22] See https://ww3.arb.ca.gov/cc/sb375/policies/policies.htm.

[23] California Air Pollution Control Officers Association (CAPCOA), *Quantifying Greenhouse Gas Mitigation Measures,* August 2010 (see Chart 6-2, p. 55). Available at: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf. Note: Ron Milam at Fehr & Peers, who contributed to this SB 743 Implementation Assistance Project, and his colleague Jason Pack, PE, prepared a memo for several MPOs in February 2019 updating the research results compiled in the CAPCAO 2010 document. Their memo is available here: http://www.fehrandpeers.com/wp-content/uploads/2019/03/TDM-Strategies-Evaluation.pdf.

agencies of highway capacity projects.

Two studies (cited in Footnote 19) estimated the change in traffic volume after implementation of road user pricing. Depending on the facility under study, traffic volume was reduced by 12 to 23 percent after implementation of cordon pricing on weekdays.

Table 5 applies this elasticity to estimate the effect of road user pricing on VMT within the SR 210 corridor. It uses an average commute trip length in the metropolitan statistical area to calculate the reduction in VMT from the reduction in traffic flow. Estimated reductions range from 56,000 to 108,000 VMT as a result of cordon pricing, which could mitigate some or all of the induced VMT estimated in Table 3 above, depending on which elasticity is assumed.

Table 5: Road User Pricing[1]	
Average daily traffic flow on SR 210 (2040)	30,000
Change in traffic volume after implementation of pricing (%)[2]	-12% to -23%
Change in traffic volume on SR 210 (net)	-3,600 to -6,900
Average commute trip length in MSA[3]	15.76
Change in VMT (net)	-56,000 to -108,000

[1] Weekday dynamic pricing (always less than $5 USD per trip)

[2] Eliasson, Jonas, Lars Hultkrantz, et al., "The Stockholm congestion-charging trial 2006: Overview of effects," Transportation Research Part A: Policy and Practice, 43(3): 240-250 (2009) and Koh, Andrew, May, A.D., et al., "CURACAO: Coordination of Urban Road User Charging Organisational Issues. Final Report," 2009. Available at: http://www.its-toolkit.eu/2decide/toolkit/files/ITS_TOOLKIT_11_1314874486.pdf . See also: https://trimis.ec.europa.eu/sites/default/files/project/documents/20101007_163529_37308_CURACAO%20-%20Final%20activity%20report.pdf and https://trimis.ec.europa.eu/project/coordination-urban-road-user-charging-organisational-issues and http://www.isis-it.net/curacao/.

[3] California Statewide Travel Demand Model (CSTDM)

Cordon pricing as a mitigation strategy may not be the most appropriate pricing strategy to evaluate for SR 210, principally because of the absence of a strong central city or employment center around which to create the cordon, and also because of the project's location at the edge, rather than a center, of the metropolitan area. Nevertheless, the elasticities identified in Table 5 above may be useful for order of magnitude purposes.

Analysts could use a regional travel demand model to estimate more carefully the effects of road pricing on VMT, as it may be programmed to capture any relevant form of road pricing.

Regional-scale mitigation strategies

There are several programmatic strategies to mitigate VMT at the regional scale, including parking pricing, employment density, population density, and voluntary behavior change programs. Regional mitigation strategies would require establishment of governance protocols, but once established they could be used by lead agencies via in-lieu fees or fair-share contributions.

The implementation of a $3 per day charge for workplace parking could reduce regional daily VMT by 2.6%, nearly 11 million VMT in the base year of 2012, or 12 million VMT of the forecasted VMT in the project horizon year of 2035.[24]

A one percent increase in employment density applied to just 10% of the employment land in the region could reduce regional VMT by nearly 1.4 million VMT per day in 2035.[25] Similarly, a one percent increase in population density applied to 10% of the residential land could reduce regional VMT by over 4 million VMT per day.[26] Voluntary travel behavior change programs – including educational campaigns and travel feedback programs – could reduce "local" VMT (in San Bernardino County) by a maximum of nearly 1.7 million VMT per day.[27]

4. Insights and Policy Implications

(a) Implications for Policy Makers

In cases in which policy makers have chosen to use a VMT analysis of major road projects, they may wish to consider the relative benefits and challenges of regional versus project-level mitigation or should consider the most effective and realistic ways of mitigating highway projects encourage thinking about programmatic and regional approaches to mitigation.

Workshops and papers generated by this project describe the legal and administrative precedents for regional approaches that may be preferable to or more effective than project-level or local VMT mitigation strategies. Regional approaches include tiering (an established practice in CEQA), regional planning, and creating a regional mitigation bank. In lieu fees have also "been found to be valid

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[24] *Deakin et al.,* 1996, referenced in CAPCOA 2010, "Strategy 3.4.14: Price Workplace Parking: Range of Effectiveness: 0.1 – 19.7% commute vehicle miles traveled (VMT) reduction," pp. 260-65.

[25] See Zhou, B. and K. M. Kockelman, "Self-selection in home choice: use of treatment effects in evaluating relationship between built environment and travel behavior." *Transportation Research Record: Journal of the Transportation Research Board*, 2077(1): 54-61 (2008). The authors estimated a 3% decrease in VMT for every 1% increase in employment density. A 1% increase in employment density applied to the whole SCAG region would translate into a decrease of 13,604,011 daily VMT from the 2035 VMT forecast. Applied to just 10% of the region's employment, the reduction would be one tenth that amount, roughly 1.3 million daily VMT. Also see CAPCOA 2010, "Strategy 3.1.1: Increase Density Range of Effectiveness: 0.8 – 30.0% vehicle miles traveled (VMT) reduction," pp. 155-158.

[26] Kim, Jinwon and David Brownstone, "The impact of residential density on vehicle usage and fuel consumption: Evidence from national samples," *Energy Economics* 40: 196-206 (2013). For other research estimating the efficacy of residential density increases, see CAPCOA 2010, "Strategy 3.1.1: Increase Density Range of Effectiveness," pp. 155-158.

[27] Voluntary behavior changes can result in a 7% reduction in local VMT. See Sloman, L., S. Cairns, C. Newson, J. Anable, A. Pridmore, and P.Goodwin, *The Effects of Smarter Choice Programmes in the Sustainable Travel Towns: Summary Report*, Report to the Department for Transport, London, February 2010. Also see CAPCOA 2010, "Strategy 3.4.7: Implement Commute Trip Reduction Marketing Range of Effectiveness: 0.8 – 4.0% commute vehicle miles traveled (VMT) reduction," pp. 240-243.

mitigation where there is both a commitment to pay fees and evidence that mitigation will actually occur" (Technical Advisory, p. 27).

Another approach, developed in the course of this case study, is the concept of VMT mitigation offset exchanges, a form of market approach with parallels to both carbon trading and the transfer of development rights. Video and slide presentations on this concept are available on the project website at www.SB743.org.[28] For a project of this scale, many offsets might be required or the offset concept would need to have been integrated into a regional mitigation bank system.

(b) Technical Insights for Lead Agency Staff

- An impact area for VMT analysis typically will be wider than for LOS analysis, since LOS typically focuses only on the facility and its nearby intersections or interchanges—although modeling for LOS requires knowledge of trip routes and therefore destinations, so the area that must be modeled for both VMT and LOS is the full area over which travel behavior is modified.

- Travel models are well suited to estimating the effects of pricing strategies on travel behavior, and other families of mitigation strategies, including investments in transit. However, because travel models are unable by themselves to estimate land use changes, they are unable to estimate the full VMT impacts that CEQA requires without additional assessment outside the model, and iteration. In addition, large scale regional travel models generate "noise" effects far from the project may mask the effect of the project.

- A lead agency proposing a roadway capacity expansion may decide it is best analyzed using the elasticity method recommended in OPR's Technical Advisory. The elasticity approach, based on approximately 20 studies, factors in direct, indirect and induced travel, including travel resulting from land use changes (which are excluded when using a travel demand model). In many situations the elasticity method recommended by OPR appears more tractable and defensible.

[28] See also Elkind, Lamm and Prather, "An Analysis of Vehicle Miles Traveled Banking and Exchange Frameworks," published by the Center for Law, Energy and the Environment and the Institute for Transportation Studies at UC Berkeley (October 2018).

Appendix A:
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Appendix B:
Glossary of Terms and Acronyms Used in Case Studies

CalEEMod – California Emissions Estimator Model.

Caltrans – California Department of Transportation.

CAPCOA – California Air Pollution Control Officers Association.

CARB – California Air Resources Board.

CEQA – California Environmental Quality Act.

CMP – Congestion Management Program. The California state CMP requires urbanized counties to prepare their own CMPs in order to receive their share of gas tax revenue.

CRC – California Code of Regulations, which contains the CEQA Guidelines.

CSTDM – California Statewide Travel Demand Model.

DEIR – Draft Environmental Impact Report.

EIR – Environmental Impact Report.

HOV – High Occupancy Vehicle.

HQTA – High-Quality Transit Area. While not defined in statute, the term is used by some MPOs for mapping purposes, and is generally based on definitions of "major transit stop" and "high quality transit corridor" in the State Public Resources Code (specifically the section implementing SB 375, the Sustainable Communities Strategy). SCAG, for example, defines an HQTA for mapping purposes as "the area within one-half mile from major transit stops and high quality transit corridors."

HQTC– High Quality Transit Corridor, defined in CEQA as a corridor with fixed route bus service with service intervals of 15 minutes or less during peak commute hours.

Infill Site – defined in CEQA as a lot located within an urban area that has been previously developed, or on a vacant site where at least 75% of the perimeter of the site adjoins, or is separated only by an improved public right-of-way from parcels that are developed with qualified urban uses.

LOS – Level of Service, a standard for measuring vehicle delay, initially designed as a performance standard for highways. It is sometimes described as a ratio between the volume of vehicles and the capacity of a roadway. LOS standards in the Highway Capacity Manual (HCM) and AASHTO Geometric Design of Highways and Streets ("Green Book") use letters A through F, with A being the best and F the worst. LOS "A" describes free flow and "F" describes stop-and-go movement and gridlock.

Low-VMT Area – an area that exhibits VMT below the designated numeric threshold. For residential projects, this includes areas such as transportation analysis zones, or TAZs, that exhibit average VMT per capita less than or equal to 85% of existing city or regional household VMT per capita (Technical Advisory, p. 12).

Major Transit Stop – a site containing an existing rail station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service intervals of 15 minutes or less during the morning and afternoon peak commute periods (PRC § 21064.3). Major transit stops may be included in a regional transportation plan.

MPO – Metropolitan Planning Organization. Federal law requires that any urbanized area with a population of at least 50,000 be guided and maintained by a regional entity known as a metropolitan planning organization. SB 375 details specific roles for California MPOs, expanding their role in regional planning. Eighteen MPOs are designated in California, accounting for approximately 98% of the state's population.

OPR – California Governor's Office of Planning and Research.

PRC – Public Resources Code for the state of California, which contains the CEQA statutes.

RTP – Regional Transportation Plan. A long-term blueprint of a region's transportation system, which identifies and analyzes transportation needs of the metropolitan region and creates a framework for project priorities. Usually RTPs are conducted every five years and plan for thirty years into the future. They are normally the product of recommendations put forth and studies carried out by an MPO, with the participation of dozens of transportation and infrastructure specialists.

SACOG – Sacramento Area Council of Governments, one of the largest MPOs in California.

SACSIM – Sacramento Activity-Based Travel Simulation model, used for regional travel forecasting.

SANBAG – San Bernardino Associated Governments. SANBAG (or "SanBAG") was the regional transportation planning agency and MPO for San Bernardino County, and the funding agency for the county's transit systems. In January 2017, SANBAG split into the San Bernardino County Transportation Authority (SBCTA) and the San Bernardino Council of Governments (SBCOG).

SB 375 – California Senate Bill 375, the "Sustainable Communities and Climate Protection Act of 2008," which is an effort to reduce greenhouse gases by requiring each MPO to develop a "Sustainable Communities Strategy" that integrates transportation, land-use and housing policies to plan for achievement of the greenhouse gas emissions target for their region.

SB 743 – California Senate Bill 743, passed in 2013 – the subject of these case studies.

SCAG – Southern California Association of Governments, the MPO for six of the ten counties in Southern California (Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura). It is the largest MPO in the country, representing over 18.5 million people in an area covering over 38,000 square miles.

SCS – Sustainable Communities Strategy, required by SB 375.

TA – Technical Advisory. OPR publishes a series of these advisories on CEQA-related aspects.

TAZ – Traffic Analysis Zone (or "Transportation Analysis Zone"), the unit of geography most commonly used in transportation planning models. The population of a zone varies, but a zone of under 3,000 people is common for a typical metropolitan planning software. The spatial extent also varies, ranging from very large areas in an exurb to a few city blocks or buildings in a central business district.

TIP – Transportation Improvement Program.

TPA – Transit Priority Area. An area within one-half mile of a major transit stop that is existing or planned, if the planned stop is scheduled to be completed within the planning horizon included in a Transportation Improvement Program adopted pursuant to sections 450.216 and 450.322 of Title 23 of the Code of Federal Regulations (PRC § 21099(a)(7)).

TPP – Transit Priority Project. A TPP meets these specifications: (1) contains at least 50 percent residential use, based on total building square footage and, if the project contains between 26% and 50% nonresidential uses, a floor area ratio of not less than 0.75; (2) provides a minimum net density of at least 20 dwelling units per acres; and (3) is within one-half mile of a major transit stop or high-quality transit corridor included in a regional transportation plan (PRC § 21155(b)).

URBEMIS – URBan EMISsions model, used for quantifying emissions from land use projects.

VMT – Vehicle Miles Traveled, which as a result of SB 743 replaces LOS as the metric for measuring transportation impact under CEQA.