Sacramento Area Council of Governments

SENATE BILL 743 IMPLEMENTATION TOOLS

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1 INTRODUCTION

The implementation of Senate Bill 743 (SB 743) will cause a change in the way that transportation studies will be conducted under the California Environmental Quality Act (CEQA). Vehicle miles traveled (VMT) will be the new performance measure used to determined significant transportation impacts, replacing automobile level of service and delay. The Sacramento Area Council of Governments (SACOG) undertook this study to provide tools and information for agencies in the SACOG region to implement SB 743 within their own jurisdictions. This chapter provides background information on SB 743 and the new expectation to complete a VMT analyses for CEQA transportation studies.

This project was conducted with the assistance of a Local Agency Working Group (LAWG) set up by SACOG. The LAWG consisted of staff members of agencies within the SACOG region who provided verbal and written comments that were incorporated into this report. A series of LAWG meetings were held starting in July 2019 and concluding in April 2020.

Senate Bill 743 Legislation

The intent of SB 743 is to bring CEQA transportation analyses into closer alignment with other statewide policies regarding greenhouse gases, complete streets, and smart growth. Using VMT as a performance measure instead of Level of Service (LOS) is intended to discourage suburban sprawl, reduce greenhouse gas emissions, and encourage the development of smart growth, complete streets, and multimodal transportation networks.

SB 743 was passed by the legislature and signed into law in the fall of 2013. This legislation changes the way that transportation impacts will be measured under the California Environmental Quality Act (CEQA). Starting on July 1, 2020, automobile delay and LOS may no longer be used as the performance measure to determine the transportation impacts of land development projects under CEQA. Instead, an alternative metric that supports the goals of the SB 743 legislation will be required. Although there is no requirement to use any particular metric, the use of VMT has been recommended by the Governor's Office of Planning and Research (OPR). This requirement does not modify the discretion lead agencies have to develop their own methodologies or guidelines, or to analyze impacts to other components of the transportation system, such as walking, bicycling, transit, and safety. SB 743 also applies to transportation projects, although agencies were given flexibility in the determination of the performance measure for these types of projects.

Governor's Office of Planning and Research Technical Advisory

The SB 743 legislation designated OPR to write detailed guidelines for implementation. The process of writing guidelines started in January 2014 and concluded in 2018. SB 743 was incorporated into CEQA by the Natural Resources Agency in December 2018 with a required implementation date of July 1,2020. The current statewide guidance for the implementation of SB 743 is covered in OPR's December 2018 Technical Advisory.

Under CEQA, lead agencies have local authority to determine their own methodologies and significance thresholds for CEQA technical analyses, and they are also required to provide substantial evidence for the basis of their decisions. OPR, in its Technical Advisory, generally provides substantial evidence for its recommendation. However, even OPR's recommendations

are subject to challenge and therefore it is recommended that agencies ensure they are providing their own justification as substantial evidence.

While OPR provides recommendations on many aspects of conducting a CEQA transportation analysis using VMT, OPR's guidance is not comprehensive and some key decisions are left for lead agencies to determine. Examples of cases where OPR does not provide guidance on key decisions include the following:

- Detailed models and methodology for VMT analysis based on local conditions
- Methodology for determining VMT that occurs outside regional boundaries
- Detailed guidance on how to conduct VMT analysis for mixed-use projects
- Significance thresholds for roadway improvement projects

Although OPR's Technical Advisory provides a substantial amount of information on how to conduct a VMT analysis under CEQA, additional work is needed at the local level, either through an overall guidance document or on a case-by-case basis and individual studies are conducted.

SB 743 Implementation Efforts of SACOG Member Agencies

Several agencies within the SACOG region have conducted or are in the process of conducting their own agency-specific SB 743 implementation studies. One agency in the region (the City of Elk Grove) has become an early implementor of SB 743. Detailed studies that are specific to an agency supersede the regional information provided in this report. Under CEQA, lead agencies have the authority to set their own thresholds and methodologies for CEQA technical studies.

2 DATA, MODELS, AND TOOLS FOR VEHICLE MILES TRAVELED ESTIMATION

This chapter describes the development of criteria that can be used to assess travel forecasting model suitability to perform CEQA transportation impact analysis and the general outcomes of applying that criteria to models available in the SACOG region. The intent of developing these criteria and performing an assessment is to start a dialogue with local agencies about the potential 'benchmarks' that could be used to assess model suitability for CEQA compliance.

CEQA compliance has two basic elements with associated risks: First, is the legal risk of challenge associated with inadequately analyzing impacts due to the use of models that do not meet benchmark expectations. And second, is the risk of mis-identifying impacts and the mitigation strategies to reduce those impacts. Agencies with a high risk of legal challenges will likely be concerned about both elements, while agencies with less legal risk will still be concerned about the second element since it is also relevant for all other transportation analysis based on model forecasts.

California Environmental Quality Act Expectations

The State CEQA Guidelines are documented under the California Code of Regulations. They contain clear expectations for environmental analysis, as noted below. However, the Guidelines are silent about what data, analysis methods, models, and mitigation approaches are adequate for transportation impacts.

<u>CEQA Guidelines – Expectations for Environmental Impact Analysis</u>

§ 15003 (F) = fullest possible protection of the environment…

§ 15003 (I) = adequacy, completeness, and good-faith effort at full disclosure…

§ 15125 (C) = EIR must demonstrate that the significant environmental impacts of the proposed project were adequately investigated…

§ 15144 = an agency must use its best efforts to find out and disclose…

§ 15151 = sufficient analysis to allow a decision which intelligently takes account of environmental consequences…

All of these suggest accuracy is important and have largely been recognized by the courts as the context for judging an adequate analysis. So, then what is the basis for determining adequacy, completeness, and a good faith effort when it comes to forecasting and transportation impact analysis? A review of relevant court cases suggests the following conclusions.

- CEQA does not require the use of any specific methodology. Agencies must have substantial evidence to support their significance conclusions. (Association of Irritated Residents v. County of Madera (2003) 107 Cal.App.4th 1383.)

- CEQA does not require a lead agency to conduct every test or perform all research, study, and experimentation recommended or demanded by commenters. (CEQA Guidelines, § 15204, subd. (a).)
- CEQA does not require perfection in an EIR but rather adequacy, completeness, and a good faith effort at full disclosure, while including sufficient detail to enable those who did not participate in the EIR preparation to understand and consider meaningfully the issues raised by the project. (Kings County Farm Bureau v. City of Hanford (1990) 221 Cal.App.3d 692.)
- Lead agencies should not use scientifically outdated information in assessing the significance of impacts. (Berkeley Keep Jets Over the Bay Comm. v. Board of Port Comm. (2001) 91 Cal.App.4th 1344.)
- Impact analysis should improve as more and better data becomes available and as scientific knowledge evolves. (Cleveland National Forest Foundation v. San Diego Association of Governments, Cal. Supreme Ct. S223603, 2017.)

These conclusions reinforce the basic tenet of CEQA that requires having substantial evidence to support all aspects of the impact analysis and related conclusions. Further, analysis should produce reasonable and meaningful results that are supported by substantial evidence. This expectation is grounded in the basic purpose behind environmental regulations like CEQA that attempt to reasonably identify and disclose potential impacts and to develop effective mitigation. Having reasonable and reliable travel forecasts is essential for meeting these expectations.

In setting specific CEQA expectations for travel forecasting models, an important consideration is that expectations may vary based on the following:

- Complexity of the transportation network and number of operating modes;
- Available data (e.g., traffic counts, transit passenger boarding counts, land use types, and densities, demographic data, etc.);
- Land use context (e.g., urban, suburban, rural setting, level of mix of use, balance, and match of jobs versus workers, etc.);
- Planned changes in the transportation network (particularly to major roads or transit systems);
- Availability of resources to develop and apply travel demand models;
- Population and employment levels;
- Congestion levels;
- Regulatory requirements;
- Types of technical and policy questions posed by decision makers;

- Desired level of confidence in the analysis findings; And
- Anticipated level of legal scrutiny.

In California, travel forecasts are generated using various forms of models that range from simple spreadsheets based on historic traffic growth trends to complex computer models that account for numerous factors that influence travel demand. According to *Transportation and Land Development*, 2nd Edition, ITE, 2002, the appropriate model depends on the size of the development project and its ability to affect the surrounding area. As projects increase in size, the likelihood of needing a complex model (such as a four-step model) increases because of the number of variables that influence travel demand and transportation network operations. The study area can also influence the type of model needed especially if congestion occurs or if multiple transportation modes operate in the study area. Either of these conditions requires robust models that can account for the myriad of travel demand responses that can occur from land use or transportation network changes.

The other relevant national guidance on model applications and forecasting is the *NCHRP Report 765, Analytical Travel Forecasting Approaches for Project-Level Planning and Design*, Transportation Research Board, 2014. This is a detailed resource with many applicable sections. A few direct excerpts worth noting about forecasting expectations for models are listed below.

- A travel forecasting model should be sensitive to those policies and project alternatives that the model is expected to help evaluate.
- A travel forecasting model should be capable of satisfying validation standards that are appropriate to the application.
- Project-level travel forecasts, to the extent that they follow a conventional travel model, should be validated following the guidelines of the Travel Model Validation and Reasonableness Checking Manual, Second Edition from FHWA. Similar guidelines are provided in NCHRP Report 716. This level of validation is necessary, but not sufficient, for project-level forecasts. Project-level forecasts often require better accuracy than can be obtained from a travel model alone.
- The model should be subject to frequent recalibrations to ensure that validation standards are continuously met.

Model Assessment

The information above was used as the basis for developing specific questions to assess existing travel forecasting models. These questions are organized into two categories. The first category considers model ownership and maintenance; the second category assesses model conditions and performance against select criteria from the guidance material above.

Model Ownership and Maintenance Assessment

Travel forecasting models developed for planning and impact analysis should be maintained, regularly calibrated and updated as explained above, to ensure they remain accurate and dependable for generating travel demand forecasts. To assess the status of

model ownership and maintenance, agencies were asked about their control of the following model components.

- Model documentation – Does the agency have the model development documentation and any related user guidance?
- Model files – Does the agency maintain the model input and output files?
- Model distribution – Does the agency control the distribution of the model files to users?

The general finding was that agencies fall into one of two groups. The first group require model user agreements to protect the agencies from liability while also providing expectations for appropriate model use. These agencies control the documentation and model files as well as their distribution to other users. The second group largely relies on their consultants to control model documentation, files, and distribution. The consultants will distribute model files upon request, but consultants may also share files as needed with other consultants without informing the agency.

Model Conditions and Performance

The following section details the model criteria and general assessment findings for the travel forecasting models within the SACOG region. This assessment is to help inform agencies about potential improvements that may be necessary for future model applications intended for CEQA purposes and does not indicate that previous applications of the model were not appropriate. The assessment used the following specific criteria. Criteria that are unique to SB 743 are highlighted in bold text.

- Model documentation – this criterion relies on the availability of documentation about the model's development including its estimation, calibration, and validation, as well as a user's guide.
- Completed calibration and validation within the past 5 years – recent calibration and validation is essential for ensuring the model accurately captures evolving changes in travel behavior. Per NCHRP Report 765, "The model should be subject to frequent recalibrations to ensure that validation standards are continuously met."
- **Demonstrated sensitivity to VMT effects across demographic, land use, and multimodal network changes - validation reporting will be checked for static and dynamic tests per the *2017 Regional Transportation Plan Guidelines for Metropolitan Transportation Planning Organizations*, CTC, 2017, and *Travel Model Validation and Reasonableness Checking Manual, Second Edition*, TMIP, FHWA, 2010.**
- **Capable of producing both "project-generated VMT" and "project effect on VMT" estimates for households, home-based trips, and total trips –'project-generated VMT' is useful for understanding the VMT associated with the trips**

traveling to/from a project site; the 'project effect on VMT' is more essential for understanding the full influence of the project since it can alter the VMT generation of neighboring land uses.

- Capable of producing regional, jurisdictional, and project-scale VMT estimates – VMT analysis for air quality, greenhouse gases, energy, and transportation impacts requires comparisons to thresholds at varying scales. For SB 743, the *Technical Advisory on Evaluating Transportation Impacts in CEQA*, December 2018, California Governor's Office of Planning and Research (OPR), recommends thresholds based on comparisons to regional or city-wide averages.
- Level of VMT estimates that truncate trip lengths at model or political boundaries – the OPR *Technical Advisory* states that lead agencies should not truncate any VMT analysis because of jurisdictional or model boundaries. The intent of this recommendation is to ensure that VMT forecasts provide a full accounting of project effects.

The main findings of assessing the available models based on these criteria are listed below.

- Model documentation is often incomplete especially with respect to user guides. The lack of documentation may limit the number of qualified users for each model because of the amount of time it would take to become proficient with the model.
- The SACOG SACSIM model is the only model in the region to be routinely recalibrated and validated. Other agencies have limited resources for model development and on-going maintenance.
- Many of the local models are variations of SACOG's SACMET model, which was last calibrated in 2005.
- Model validation of local models is largely limited to static testing. However, users can assess some model sensitivity through project applications. These applications provide insights about whether the model generally responds in the correct direction when making input changes. Insufficient testing and documentation are available to determine if the available models are appropriately sensitive for local projects requiring SB 743 analysis.
- New forms of VMT metrics that may be needed for SB 743 may require additional model programming. All the models can produce VMT outputs that are commonly used for emissions modeling. New VMT metric forms that isolate the type of land use or trip purpose are often not available as a current output.

- All the regional and local models share the same limitation related to trip length truncation at model boundaries. It should be noted that, as part of this project, Fehr and Peers provided a memo indicating recommended model revisions to overcome this limitation. SACOG will be incorporating these revisions into the regional travel demand model.

3 ESTIMATION OF PROJECT LEVEL VEHICLE MILES TRAVELED

There are many of models available that can provide numerical analysis to be used in estimating project-level VMT. For example, OPR provided a summary of 21 different models in its first draft of the SB 743 Technical Advisory (Updating Transportation Impacts Analysis in the CEQA Guidelines. OPR, 2014). While any of the models may be useful in in certain aspects of VMT analysis, the project team's review of VMT estimation methodologies led to the conclusion that VMT estimates produced using a travel demand model or produced by an agency-specific VMT analysis tool were most appropriate for within the SACOG region.

The remainder of this chapter includes a summary of conclusions followed by analysis and additional conclusions. Appendix A includes a summary of findings on the applicability of various sketch model tools for VMT analysis.

Summary

There are two recommended methodologies for VMT estimation:

- Use of a fully functional travel demand model, either by running the model for baseline conditions, with-project conditions, and potentially for other scenarios for comparison purposes (for large projects) or through use of screening methodologies (for small projects). The transportation model used for VMT estimation could either be the SACOG regional model or one of the many variants of the regional model developed by local agencies to provide more detailed analysis within their jurisdictions. If one of the local models is used, it should be sufficiently documented and maintained.
- Use of a customized spreadsheet or web-based tool for a specific study area or jurisdiction that is consistent with the VMT estimates used for setting thresholds. For example, if the SACSIM regional travel demand model, or a local variant of it, was used to establish VMT metrics (e.g. VMT per capita) used to set thresholds for significant impacts, a spreadsheet tool for estimating project-level VMT could be used, if that tool is consistent with the SACSIM travel demand model.

SACOG has committed to providing data and maps described in the OPR Technical Advisory (e.g. VMT per capita and VMT/employee maps for the SACSIM base year and adopted MTP/SCS horizon year, and transit priority area maps) that can be used for identifying projects that are candidates for exemption from VMT analysis (also referred to as "screening"). SACOG has also committed to providing data that can be potentially be used for developing VMT estimates for small projects throughout the region. In all cases, local lead agencies may have similar data and maps that would take precedence over regional data and maps for CEQA projects in that jurisdiction. See Appendix D for information on the status of SACOG's work in this area as of the date of this report.

The primary reason for the recommendations above is that VMT generation is highly dependent on the location of a project site with respect to the availability of alternative transportation modes and its location with respect to origins and destinations of trips within the regional area. Average vehicle trip length, which is an important component of VMT, is highly influenced by these factors. Transportation models are developed to take these factors into account and are widely accepted

for analysis of factors related to trip-making behavior. Customized spreadsheet and web-based methodologies can account for these factors by importing information from the model on a localized basis.

This recommendation is not meant to discourage local agencies from using alternative methodologies for VMT estimation if they have researched individual situations and have concluded that an alternative tool would provide a more accurate result for a specific application.

Analysis

The two methodologies recommended above are being used by jurisdictions throughout California. Use of a regional transportation model to analyze VMT for individual projects is described in the San Diego Regional Transportation Impact Study Guidelines (Institute of Transportation Engineers, San Diego Section, Transportation Capacity and Mobility Task Force, 2019, https://static1.squarespace.com/static/5ab6b8a33e2d09b08935bcb1/t/5d0c2f9ce5c55900014494ee/1561079734160/Guidelines+for+TIS+in+the+San+Diego+Region+-+May+2019.pdf). This document includes information on running the model for individual projects, use of screening tools, and types of projects that are appropriate for each of these methodologies.

Examples of agencies that currently are using or are planning to use customized spreadsheets and web-based methodologies include El Dorado County, the City of San Jose, the Santa Clara Valley Transportation Authority, the City of Los Angeles, and the Western Riverside Council of Governments. Methodologies which are currently readily available can be found at the following websites:

- City of San Jose: https://www.sanjoseca.gov/your-government/departments-offices/transportation/planning-policies/vehicle-miles-traveled-metric
- City of Los Angeles: https://ladot.lacity.org/businesses/development-review#transportation-assessment (See Transportation Assessment/VMT Calculator)
- Western Riverside Council of Governments: https://www.fehrandpeers.com/wrcog-sb743/

Several alternative methodologies were considered for VMT analysis, including the following:

- CalEEMod, an air quality analysis model that includes consideration of VMT
- Census data, which can provide average trip length information
- Customized methodologies provided by various developers
- Big data, particularly travel data collected by tracking cell phone movements
- Statewide transportation model

Potential use of each of these methodologies is described below.

Although CalEEMod is an accepted tool for use in air quality analyses, it has one important drawback for use in estimating VMT for transportation analyses. CalEEMod includes only very general estimates of trip length based on County-wide averages. It is therefore not able to

accurately distinguish the wide variations that occur in vehicle trip lengths for different project locations within a County. However, if the trip lengths are updated using defensible values (including the use of generated rates and trips lengths produced by the model used to determine threshold values), CalEEMod can be used in VMT analysis for a project. This would have the added benefit that CalEEMod is also used for emissions analysis.

Travel behavior survey data can be used to produce estimates of average trip lengths that is specific to a project's location. When combined with trip generation estimates, an estimate of VMT can be calculated for a project. Disadvantages of this approach are that this methodology is not widely used or accepted and it requires research to acquire the travel behavior survey data needed for the calculation. In addition, inaccuracies could occur if the trip generates and average trip lengths from the survey data were not comparable to the model used to determine threshold values.

There are many customized methodologies made available by various developers for general use and are not specifically tailored to an individual location or jurisdiction. A list of models was included in the 2014 SB 743 guidelines prepared by the Office of Planning and Research (Updating Transportation Impacts Analysis in the CEQA Guidelines, Preliminary Discussion Draft of Updates to the CEQA Guidelines Implementing SB 743, OPR, 2014). The project team reviewed these methodologies and did not discover a tool that is validated or widely accepted for VMT analysis of individual projects. These methodologies lack documentation and the maintenance frequency is unknown thereby making these tools unreliable for VMT analysis. In addition, these models have the same limitation described above for CalEEMod and travel behavior survey data related to potential inconsistencies with the model used to determine threshold values.

Existing travel data is available for purchase from companies who track cell phone movements and compile the data into formats that can be used by transportation engineers and planners. This methodology falls into the broad category of big data. By tracking cell movements into and out of an existing project, the VMT produced by that project can be estimated. It can then be presumed that similar projects in adjacent areas will produce similar levels of VMT. This is a relatively new methodology that has not yet been extensively used or accepted, although it does have promise for the future. This approach may be most beneficial for project land use types not included in travel demand models.

Caltrans has recently prepared a statewide travel forecasting model and has produced VMT/capita and VMT/employee estimates by traffic analysis zone. The results of this model can be used to produce rough estimates of these values for individual project analysis. The SACOG model and its local variants are considered to be more accurate for SB 743 analyses within the SACOG region.

Additional Recommendations and Conclusions

Following is a discussion of additional recommendations and conclusions related to the estimation of VMT results for individual projects:

- In addition to producing VMT, land development projects will attract trips oriented to other existing nearby and distant developments. This will change the trip-making behavior in the area and will affect the level of overall VMT. Depending on the characteristics of the project under analysis, it could either increase or decrease VMT in

the area which the project is located and the effect could either be relatively large or relatively small. In general, a project's overall effect on VMT can only be estimated by running a regional transportation model with and without the project. Since it is impractical to run the model for every project, judgment will need to be applied in determining which projects justify a model run. However, it is important to note that none of the other methodologies described above can estimate the VMT effect that a project will have in an overall area.

- When conducting VMT analyses for individual projects analysts will need to determine whether the base year for the analysis should reflect existing conditions or a future scenario. Only VMT analyses based on a fully functional travel demand model, such as the SACOG regional model or its local variations, or other county or sub-regional travel demand models that meet the requirements laid out in Chapter 2 above, will be able to analyze VMT for future scenarios. None of the other methodologies described above have this capability. Similar to the issue described above, judgment will need to be applied in determining when it is appropriate to analyze a project by running a future scenario using a transportation model in order to analyze future rather than existing VMT conditions.

- Analysts should be aware that there are different definitions of VMT that are used by the different methodologies. Therefore, the ideal situation is to use a common source for all analyses of VMT results and VMT averages. However, use of VMT results from different sources can be compared in situations when a common definition of VMT is used between the sources or when the analyst believes that any differences in VMT definitions can be overlooked in order to provide a reasonable level of accuracy.

In consideration of the information provided above, analysts running a travel demand model for VMT analysis could use the following methodology to determine VMT/capita or VMT/employee for a land use project:

1. Create a new traffic analysis zone in the model that includes just the project site. Input the project land use information and delete the underlying land use. Run the model and determine VMT/capita and/or VMT/employee for the project site.

2. Compare the VMT/capita and/or VMT/employee for the project site to appropriate regional or city-wide averages or other local thresholds as appropriate to determine whether the project has a significant VMT impact.

Analysts using screening maps could use the following methodology to determine VMT/capita or VMT/employee for a land use project:

1. Determine the geographic area (i.e. traffic analysis zone) where the project is located and look up the VMT/capita and/or VMT/employee for that geographic area use it as an estimate of the project's VMT/capita and/or VMT/employee.

2. Compare the VMT/capita and/or VMT/employee for the project site to appropriate regional or city-wide averages or other local thresholds as appropriate to determine whether the project has a significant VMT impact.

4 MINIMUM PROJECT SIZE FOR VEHICLE MILES TRAVELED ANALYSIS

This chapter provides information on determining the minimum project size that would require a VMT analysis. It includes a summary of conclusions, information provided by the Office of Planning and Research (OPR), methodologies on minimum project size developed as part of this project, and a discussion of additional potential methodologies.

Summary

The project team has come across the following alternative methodologies for the determination of the minimum project size for VMT analysis:

- Use the minimum project size recommended by the OPR in their December 2018 Technical Advisory, i.e. 110 average daily trips.
- Use a VMT-based minimum project size developed for this project using certain CEQA exemptions for small projects and information on VMT generation for the SACOG region from the 2012 California Household Travel Survey (CHTS). This would result in a minimum project size for VMT analysis of 237 daily trips. See text below for more information on the potential use of this threshold.
- Base minimum project size on the statistical probability of making a type 1 error (i.e. the probability of a project analysis drawing an incorrect conclusion that a project would exceed a VMT threshold). A specific level of risk on this issue could be set as a policy, and the minimum project size suitable for analysis based on statistical averages on travel could be calculated from that specified level of risk. One specific example has been developed using this methodology using the variation in VMT for a single-family home in the SACOG region using information from travel behavior surveys. Determination of minimum project size for VMT analysis would vary by: 1) the setting of acceptable type 1 error; (2) the setting of the VMT threshold, relative to the household survey data; and 3) the type of project for which the determination is made (e.g. multi-family projects would have a larger minimum project size than single-family projects.)
- Use of the minimum project size that has traditionally been used for determining whether a LOS-based traffic impact analysis is necessary. For agencies without a traditional minimum project size, consideration could be given to using the minimum project size for the County in which the project is located or from an adjacent jurisdiction.
- Adoption of a minimum project size for VMT analysis used by a different jurisdiction elsewhere in California.
- It would also be possible to develop a customized VMT-based minimum project size customized to an individual jurisdiction based on information provided in this memorandum.

Governor's Office of Planning and Research Recommended Minimum Project Size for Vehicle Miles Traveled Analysis

In their December 2018 Technical Advisory, the Office of Planning and Research recommends a minimum project size for VMT analysis of 110 average daily trips (ADT). This is based on a categorical exemption in CEQA for existing structures of up to 10,000 sq. ft. OPR calculates that an office building of this size has the potential to generate approximately 110 ADT and this is the basis for their recommendation.

There are two potential problems with using OPR's recommendations:

- OPR's recommendation results in a relatively low minimum project size for which a VMT analysis is required, especially in comparison to minimum project sizes that some agencies use for LOS-based traffic impact studies. Agencies who are not prepared for the use of 110 ADT as a minimum project size may find that they are processing many more transportation studies than previously. In addition, many of these studies for projects in suburban and rural areas may indicate a significant and unavoidable VMT. This finding would require the preparation of an EIR which would involve additional processing time and may make projects more difficult to implement.
- OPR's recommendation could be challenged because it is not based on VMT and therefore it is recommended that some more conservative agencies develop a minimum project size based on VMT.

The advantages and disadvantages of using a higher value for minimum project size are the reverse of the advantages and disadvantages of using the OPR-recommended value. Alternative approaches with a higher value for minimum project size are harder to justify but are more in line with the judgment of many transportation engineers and planners and would result in less CEQA processing time for many projects.

Any deviations from OPR's recommended value for minimum project size would be advised to include justification for the proposed approach. As one example, following is the justification used by the San Diego Region for recommending LOS-based minimum project sizes for VMT analysis.

"The advantage of this alternative for determining minimum project size is that it is based on the engineering judgment of professionals who are experts in determining the effect of projects on the transportation system. It has been used successfully for over 19 years in the San Diego region and has received wide acceptance from the transportation profession, decision makers, and the public. Transportation engineers and planners who support this alternative for determining minimum project size consider it to be equally valid for the current LOS-based transportation analyses as well as the new VMT-based analyses taking effect on July 1, 2020."

Alternative Minimum Project Sizes for VMT Analysis Developed for This Project

Two alternatives for developing minimum project size for VMT analysis have been developed as part of this project. Both have the advantages of being based on VMT and both result in higher minimum project sizes for VMT analysis than the value recommended by OPR. The disadvantage of these alternatives is that they may lack the level of authority that goes along with information produced by a state agency with legislative authority to provide guidance on SB 743.

The first alternative uses a VMT-based minimum project size using certain CEQA exemptions for small projects and information on VMT generation for the SACOG region from the 2012 California Household Travel Survey (CHTS). This would result in a minimum project size for VMT analysis of 237 daily trips. The following methodology was used:

- OPR estimated that non-residential uses could generate 110-124 daily trips based on a maximum project exemption size of 10,000 square feet (KSF).
- Using the lower end of this range to be conservative and the CHTS average trip length for office in the SACOG region (7.9 miles) results in a VMT generation of 869 VMT/day.
- A VMT of 836/day equates to approximately 20 single-family residential units based on a value of 42.9 VMT/household in the CHTS for the SACOG region.
- Based on the ITE Trip Generation Manual (10th Edition), 20 single-family homes would generate 237 daily trips, using the fitted curve methodology.

For the purposes of this calculation, the value of 237 daily trips is intended to apply to all land use types even though office and single-family dwelling units were the two land use types used in the calculation. Local agencies may wish to use similar data and calculations to provide a minimum project size specific to their circumstances. A Fehr and Peers white paper titled Small Project Screening for SB 743 provides background information used in developing this alternative is included in Appendix B.

The second alternative is to base minimum project size on the statistical probability of making a type 1 error (i.e. the probability of a project analysis drawing an incorrect conclusion that a project would exceed a VMT threshold). A specific level of risk on this issue could be set as a policy, and the minimum project size suitable for analysis based on statistical averages on travel could be calculated from that specified level of risk. One specific example has been developed using this methodology based on the variation in VMT for a single-family home in the SACOG region. Determination of minimum project size for VMT analysis would vary by: 1) the setting of acceptable type 1 error; (2) the setting of the VMT threshold, relative to the household survey data; and 3) the type of project for which the determination is made (e.g. multi-family projects would have a larger minimum project size than single-family projects). SACOG is working on providing an example minimum project size based on the concepts describe above. Information on the status of SACOG's work in this area as of the date of this report are provided in Appendix B.

SACOG member agencies who are interested in developing their own values for minimum project size for VMT analysis are encouraged to review Appendix B and the information provided above to help generate ideas.

Other Alternatives for Determining Minimum Project Sizes for VMT Analysis

Local agencies have traditionally included minimum project sizes in their guidelines for traffic impact analyses based on level of service and delay. Some analysts believe that the same minimum project sizes can be used VMT analyses. Table 4-1 shows a summary of current minimum project sizes used for LOS-based analyses in the SACOG region.

Many agencies throughout California are currently in the process of developing SB 743 guidelines and several have become early adopters. Table 4-2 shows a summary of minimum project sizes for VMT analysis that have already been published or adopted.

Table 4-1
Sample Minimum Project Size Guidelines from SACOG Region

Agency	**Guidelines for Minimum Project Size**	**Year Guidelines Adopted**
City of Roseville	50 PM peak hour trips	2016
City of Sacramento	100 daily trips	N/A
County of El Dorado	100 daily or 10 a.m. or p.m. peak hour trips	2014
County of Yolo	100 daily trips, fewer if trips are truck trips - 5 daily large truck trips requires a TIS	2010
County of Sacramento	1,000 daily trips or 100 a.m. or p.m. peak hour trips	2004

Table 4-2
Sample Minimum Project Size Rquirements for SB 743 Analysis

Agency	**Minimum Project Size**
City of Elk Grove	10 d.u. or 50,000 sq.ft. commercial
City of Los Angeles	250 ADT
San Diego Region	1,000 ADT if consistent with the General Plan; 500 ADT if inconsistent with the General Plan
City of San Jose	Based on OPR guidelines but states in terms of sq. ft.
City of Pasadena	10 d.u./10,000 sq.ft. commercial/300 ADT
City of San Diego	Based on OPR guidelines but using local trip generation. Result is 300 ADT.

5 MINIMUM PROJECT SIZE TO RUN A TRAVEL DEMAND MODEL FOR VMT ANALYSIS

This chapter provides information on determining the minimum project size that would require a running a model for VMT analysis. It includes a summary, a recommendation, and background analysis.

Summary

The project team has reviewed available statewide SB 743 guidance and local agency guidelines for LOS-based traffic impact studies. Only the San Diego Region and the City of San Diego provided guidance on the minimum project size to run a travel demand model. Local agencies in the SACOG region have not appeared to address this issue in a systematic way for either VMT analysis or historically for LOS-based analysis. The recommended method to address this issue is a checklist that would be used to evaluate projects on a case-by-case basis.

Recommendation

Tables 5-1A and 5-1B show recommended checklists to determine when to use a travel demand model (as opposed to screening maps) for VMT analysis.

It should be noted that the numerical values in the checklist are based on judgment and are recommended regional defaults as stated in the footnotes to the table. Local agencies could substitute different values based on local experience. There does not seem to be any logical basis for determining these values other than experience and judgment.

Background Information

In their December 2018 Technical Advisory, the Office of Planning and Research (OPR) mentions the use of map-based screening for VMT analysis of land development projects, saying that this methodology can be used to screen out projects in low-VMT areas from requiring a VMT analysis. Many agencies have determined that screening maps can be also be used to estimate VMT generation in high-VMT areas. The Technical Advisory also mentions the use of models for VMT analysis but does not mention a recommended project size where the use of models would be appropriate. This is an issue where no statewide guidance is provided.

The project team found a relative lack of statewide information to address the question of minimum project size to use a travel demand model for VMT analysis. In current LOS-based traffic impact analysis, our assumption is that the decision as to whether to run the a travel demand model to conduct a traffic impact analysis is done on a case-by-case basis determined by the judgment of the lead agency and other stakeholders. While this approach seems to work for LOS-based traffic impact analysis, VMT analysis is different in that it is a relatively new type of analysis and transportation engineers and planners do not necessarily have a basis or history for judgment-based decisions.

Table 5-1A
Checklist to Determine When Running a Travel Demand Model
is Necessary for VMT Analysis (1)

Check if Applicable	Project Characteristic
	Single Use Project With ADT Greater Than Minimum Value Set by Lead Agency (2)
	Mixed Use Project With ADT Greater Than Minimum Value Set by Lead Agency (2)
	Project is Inconsistent With General Plan With ADT Greater Than Minimum Value Set by Lead Agency (2)
	Project Occupies More Than One TAZ (3)
	Project Has Unusual Characteristics That VMT Screening Tools Can't Take into Account (4)
	Project has Both a Land Development and Transportation Component
	Project Includes Regional Retail Development

Notes: (1) A model run of a travel demand model is recommended if any of the project characteristics listed above are applicable.
(2) In order to use this table, it is suggested that lead agencies set a minimum ADT value for this project type, above which a travel demand model run is necessary.
(3) Projects occupying more than one TAZ tend to be harder to analyze using map-based analysis techniques.
(4) Examples of unusual chracteristics include projects that have longer or shorter trip lengths than a typical project of its type and projects that affect the trip-making behavior of the surrounding area such that VMT increases or decreases would result for nearby land uses.

Table 5-1B
Checklist to Determine When Running a Travel Demand Model
is Necessary for VMT Analysis (1)

Check if Applicable	Project Characteristic
	Project has Large VMT Effect on Non-Project Land Uses
	Project Includes Agency Changes to Transit Services
	Project is a Specific Plan
	Project Occupies More Than One TAZ (2)
	Project is Inconsistent With General Plan
	Project has Both a Land Development and Roadway Component

Notes: (1) A model run of a travel demand model is recommended if any of the project characteristics listed above are applicable.
(2) Projects occupying more than one TAZ tend to be larger and tend to be harder to analyze using map-based analysis techniques.

The current process for running a model for LOS-based analyses is the following:

- Lead agency determined that a model run is necessary.
- Project applicant or lead agency contracts with a qualified consultant to run the appropriate model. The model would be obtained from SACOG or a consulting firm authorized by the lead agency.
- Consultant runs model and provides results to the project team.

Based on experience in running travel demand models, the cost for a model run tends to range from $2,000 to $20,000 or more depending on the size of project and level of complication. The process and costs are expected to be similar with VMT-based analyses.

Analysis of alternatives to the recommended approach described above follows:

- Trip-Based Minimum Project Size Determined by Comparison to Total Regional Trip Generation: This alternative has the disadvantage that it is not based on VMT, but it has the advantage that project trip generation can easily be calculated. The recommendation would be that use of a travel demand model is recommended when project trip generation exceeds X% of total regional trip generation with X to be determined based on judgment.
- VMT-Based Minimum Project Size Determined by Comparison to Total Regional VMT: Under this alternative, projects would need to do an initial estimate of VMT using screening maps. Use of a travel demand model would be recommended when the resulting project VMT exceeds X% of total regional VMT with X to be determined based on judgment. One disadvantage of this approach is that the VMT determined using the screening maps would tend to be different than the VMT produced by the model, which could raise questions. A second disadvantage would be that projects in rural areas with low trip generation and high trip lengths may require a model run.
- Minimum Project Size Based on Value Used by Another Agency: This has the obvious disadvantage that it could be argued that it is not transferable to agencies in the SACOG region. However, if a regional consensus does not lead to recommendation of a specific value, this alternative may be appropriate for small agencies with limited resources who consider their CEQA analyses unlikely to be challenged.

It should be noted that when thinking about whether running a travel demand model is recommended for VMT analysis, the model in question could be the regional SACSIM model or a local variant of the regional model. In either case, SACOG or the local agency maintaining the model would provide the model to a qualified agency or consultant to prepare the appropriate model runs. The alternative to running the model would be to use VMT screening maps generated using a travel demand model and provided by SACOG or a local agency.

One additional consideration is that the determination of minimum project size to run a travel demand model is considered less likely to be challenged than other factors related to VMT analysis. In this case, transportation engineers and planners are simply determining which tool is appropriate to analyze a problem rather than setting a specific threshold.

6 VEHICLE MILES TRAVELED ANALYSIS OF GENERAL PLANS AND COMMUNITY PLANS

This chapter provides information on conducting VMT analysis for General Plans and Community Plans. This is considered to include overall land use plans that would guide future planning for a jurisdiction or community. These types of plans do not provide CEQA clearance to develop land on individual parcels but do provide CEQA clearance to change land use designations, as well as plans for proposed transportation improvements and other community features. This chapter is not intended to apply to specific plans, which generally seek to provide CEQA clearance for large land development projects. The remainder of the chapter includes a summary and background information.

Summary

VMT considerations for General Plans and Community Plans are different than for individual land development projects. The following issues can be considered:

- Should the General Plan or Community Plan VMT analysis be conducted using comparisons based on total VMT or an efficiency metric such as VMT/capita or VMT/service population?
- Should the General Plan or Community Plan compare to the previous plan or the existing condition?
- Should the significance threshold be based on a simple reduction in VMT or VMT/capita or a reduction of 15% in order to compare to the 15% below average threshold that is used for individual land development projects? Or are there other possible thresholds that could be considered?
- Does a General Plan or Community Plan VMT analysis always require a model run or are there cases where the analysis can be done without using a model?
- Should a General Plan or Community Plan VMT analysis be particularly concerned with VMT associated with trips having an origin or destination outside the SACOG region?

Background Information

In their December 2018 Technical Advisory, the Governor's Office of Planning and Research (OPR) recommends that a general plan may have a significant impact if its land uses in aggregate would exceed the OPR recommended thresholds used for individual land use projects (page 18). These thresholds are tied to a 15% reduction below baseline. This recommendation does require some interpretation because it focuses exclusively on the general plan's land use element and does not consider the plan as a whole, which also includes the circulation element and its effects on VMT. That said, the guidance is clear that the comparison is to baseline for impact determination purposes, which is the appropriate CEQA expectation.

There is one other CEQA requirement for general plans related to plan to plan comparisons to note. The general plan EIR shall also discuss any inconsistencies between the proposed general plan and the currently adopted general plan per CEQA Guidelines Section 15125(d). These

inconsistencies should consider CEQA Guidelines Section 15125(e), which requires analysis that examines potential future conditions in the adopted plan. Note the use of the wording "discuss" and "analysis that examines". These requirements indicate that a comparison between general plan alternatives (especially no project and proposed project) is recommended but is informational and does not serve as a basis for identifying impacts.

One other note about the OPR threshold recommendations is to consider that the Technical Advisory also includes reference to the ARB recommended thresholds of 16.8% for light-duty vehicle travel and 14.3% for total vehicle travel. OPR recommended 15% for light-duty vehicle travel based on a compilation of various plans and studies whereas the ARB recommendation was developed for SB 743 purposes and is tied to their scientific analysis of the required level of VMT reduction necessary to achieve state air quality and GHG goals. In other words, the ARB recommendations are supported by direct evidence. As such, lead agencies need to choose whether to rely on the OPR or ARB thresholds or develop their own.

This guidance leads to the following conclusions regarding the analysis of General Plans and Community Plans under SB 743:

- The guidance in OPR's Technical Advisory recommends the use of efficiency metrics related to VMT. Therefore, VMT/capita would seem to be the preferred performance measure for General Plans and Community Plans. Depending on the characteristics of the plan area a different efficiency metric may be appropriate, for example VMT/employee or VMT/service population (i.e. residents plus employees). The reporting of total VMT may be useful for some purposes, but it does not seem to be appropriate for setting of significance thresholds.
- Comparison of horizon year conditions with the plan to baseline conditions is needed for CEQA impact analysis, but comparison between general plan alternatives (including the no project condition) is recommended.
- Use of OPR's recommendations seems to lead to use of a VMT significance threshold for a general plan horizon year condition 15% below baseline conditions. Consideration could be given to use of ARB's recommended thresholds or other thresholds such as VMT/capita below the baseline condition (with appropriate justification).
- Typical practice dictates the use of a transportation model for VMT analyses of general plans. However, the project team is aware of one example of a VMT analysis for a General Plan conducted without a model, the 2012 Plumas County General Plan. This analysis will be provided as an example in the project materials.

7 VEHICLE MILES TRAVELED MITIGATION MEASURES

This chapter provides information on VMT mitigation measures. It includes a summary, background information, and technical analysis of TDM strategies that can be used in VMT mitigation.

Summary

Mitigation of VMT generated by land development projects is a relatively new concept. The related concept of trip-reduction strategies aimed at reducing the number of trips generated by projects has been under consideration for the past few decades, but the addition of trip length and the incorporation into the CEQA process require additional considerations.

The current VMT strategy being implemented or considered by most agencies is to list potential VMT mitigation measures and then provide one or more reference documents that are recommended to be used in estimating the effectiveness of proposed mitigation strategies. Based on the project team's investigations, use of the CAPCOA Report (California Air Pollution Control Officers Association's *Quantifying Greenhouse Gas Mitigation Measures, A Resource for Local Government to Assess Emission Reductions from Green Gas Mitigation Measures,* August 2010), supplemented by recent research conducted by Fehr and Peers included in the TDM strategies section of this chapter.

A few agencies have provided customized tools that can estimate the effectiveness of VMT mitigation strategies that are specific to their own jurisdictions. These include the City of San Jose, the City of Los Angeles, and the San Diego Association of Governments (SANDAG). In general, it is unlikely that these tools can be transferable to agencies in the SACOG region, but the SANDAG process includes a research document that may be helpful. Agencies within the SACOG region could consider developing their own customized tools for VMT mitigation analysis and this is a potential solution for any agency with the available resources.

VMT mitigation fees, mitigation banks, and mitigation exchange programs are potential future methods for handling mitigation, but a considerable amount of effort is needed to set up these types of programs.

Agencies may also set up programmatic approaches to VMT at the plan level (for example, in a General Plan) that would mitigate VMT to the extent feasible on an agency-wide basis and then issue a statement of overriding conditions if it is not feasible to completely mitigate the VMT impacts of the plan. This may allow individual projects that are consistent with the plan to tier off the programmatic statement of overriding conditions and avoid the necessity to prepare individual project EIR's.

Background Information

Potential mitigation strategies for VMT generated by land development projects can be described in the following general categories:

- Provision of improvements to the transportation system in the vicinity of the project site that would encourage trips to be made by transit, bicycling, or walking.

- Travel demand management (TDM) strategies that would reduce the level of trips generated by the project.
- Payment of VMT mitigation fees to mitigation fees programs, mitigation banks, or mitigation exchanges. This type of mitigation is only available if applicable programs have been set up in advance.

Examples of mitigation measures based on improving the transportation system include the following:

- Improve or increase access to transit.
- Improve pedestrian or bicycle networks, or transit facilities.
- Provide bicycle parking.

Examples of other mitigation measures based on TDM strategies include the following:

- Limit or eliminate parking supply.
- Unbundle parking costs.
- Provide parking cash-out programs.
- Implement or provide access to a commute reduction program.
- Provide car-sharing, bike sharing, and ride-sharing programs.
- Provide partially or fully subsidized transit passes.
- Shift single occupancy vehicle trips to carpooling or vanpooling by providing ride-matching services or shuttle services.
- Provide telework options.
- Provide incentives or subsidies that increase the use of modes other than a single-occupancy vehicle.
- Provide on-site amenities at places of work, such as priority parking for carpools and vanpools, secure bike parking, showers and locker rooms, and bicycle repair services.
- Provide employee transportation coordinators at employment sites.
- Provide a guaranteed ride home service to users of non-auto modes.

The most commonly recommended source for estimating the effect of VMT reduction strategies is the California Air Pollution Control Officers Association's *Quantifying Greenhouse Gas Mitigation Measures, A Resource for Local Government to Assess Emission Reductions from Green Gas Mitigation Measures* (CAPCOA, August 2010), also known as the CAPCOA Report. This report provides a methodology to quantify the reductions in vehicle miles traveled for many of the mitigation measures listed above.

Fehr and Peers is working for the California Air Resources Board (CARB) on the Net Zero Buildings Feasibility Study that includes a new literature review to update the evidence supporting the CAPCOA transportation strategies. This plus additional research conducted by Fehr and Peers has led to the development of the attached TDM Strategies Assessment. The CAPCOA document, updated by the Fehr and Peers research represents the most comprehensive source for general information on mitigating VMT impacts. The attached memo is a draft and updated information may be available by the end of the SB 743 Implementation Tools project.

It is recommended that users of the CAPCOA Report and the updated information consider the following:

- The CAPCOA VMT reduction strategies include built environment changes and transportation demand management (TDM) actions. Prior to any application of a built environment change to a project as mitigation, the project analyst should verify that the project VMT forecasting tool or model is appropriately accurate and sensitive to built-environment effects and that no double counting will occur in the application of the mitigation measure. The TDM actions are sensitive to the project site and ultimate building tenants. As such, VMT reductions associated with TDM actions cannot be guaranteed through CEQA mitigation without ongoing monitoring and adjustment.
- There are rules for calculating the VMT reduction when applying multiple mitigation measures. The CAPCOA Report rules should be considered.
- Only "new" mitigation measures should be included in the analysis to prevent double counting. For example, if the project is located near transit, the VMT reduction cannot be applied if the project utilized a model that factored in the project's proximity to transit.
- Mitigation measures should be applied to the appropriate user group (employees, guest/patrons, etc.). If a certain measure applies to multiple user groups, the weighted average should be considered as the effect of the mitigation measure will vary based on the user group.

It should be noted that the Sacramento Metropolitan Air Quality Management District (AQMD) has received a Caltrans SB 1 Adaptation Grant to update the CAPCOA report on quantifying greenhouse gas reduction measures. This update should be available within the next few years. During the process of developing these implementation tools, stakeholder discussed the desirability of keeping the CAPCOA report up to date on an ongoing basis. Projects such as the AQMD project should help, but the project team is not aware of any organized statewide efforts to deal with this issue.

Transportation Demand Management Assessment

This section summarizes the project team's assessment of research conducted by Fehr and Peers related to transportation demand management (TDM) effectiveness for reducing vehicle miles of travel (VMT). The purpose of this work was to compile new TDM information that has been published in research papers since release of the Quantifying Greenhouse Gas Mitigation Measures, California Air Pollution Control Officers Association (CAPCOA), August 2010 and to assemble that research with other available data to compile a list of potential VMT reduction mitigation measures for use in the SACOG region. The matrix in Appendix C

summarizes the overall evaluation findings and provides a complete list of VMT reduction mitigation strategies based on new research from the following reference material:

- Integrating Transportation Demand Management into the Planning and Development Process, A Reference for Cities (SANDAG, 2012)
- WRCOG SB 743 Implementation Pathway Document Package (Fehr & Peers, 2019)
- Mobility Management Toolbox (SANDAG, 2019).

An important consideration for the effectiveness of these TDM strategies is the appropriate scale of implementation. The strategies described in this section include region/city/community-scale transportation infrastructure strategies (e.g., expanding the transit or bicycle network), and project-level strategies (e.g., building site TDM strategies such as parking pricing and transit pass subsidies). The largest reductions in VMT (and resulting emissions) derive from regional/city policies related to land use location efficiency and infrastructure investments that support transit, walking, and biking. While there are many measures related to site design and building operations that can influence VMT, these measures typically have smaller effects and are often dependent on final building tenants. Figure 7-1 presents a conceptual illustration of the relative importance of scale

Of the 50 transportation-related strategies presented in the CAPCOA 2010 report, 41 are applicable at building and site level. The remaining nine are functions of, or depend on, site location and/ or actions by local and regional agencies or funders. Table 7-1 summarizes the strategies according to the scope of implementation and the agents who would implement them.

Figure 7-1 – Transportation Related Greenhouse Gas Reduction Measures

Table 7-1 – Summary of Transportation Related CAPCOA Measures

Scope	Agents	CAPCOA Strategies
Building Operations	• Employer • Manager	26 from five (5) CAPCOA Strategy Groups: • Three (3) from 3.2 Site Enhancement Group • Three (3) from 3.3 Parking Pricing Availability Group • 15 from 3.4 Commute Trip Reduction Group • Two (2) from 3.5 Transit Access Group • Three (3) from 3.7 Vehicle Operations Group
Site Design	• Owner • Architect	15 from three (3) CAPCOA Strategy Groups: • Six (6) from 3.1 Land Use Group • Six (6) from 3.2 Site Enhancement Group • One (1) from 3.3 Parking Pricing Availability Group • Two (2) from 3.6 Road Access Group
Location Efficiency	• Developer • Local Agency	Three (3) shared with Regional and Local Policies
Alignment with Regional and Local Policies	• Regional and Local Agencies	Three (3) shared with Location Efficiency

Note: Disruptive trends, including but not limited to, transportation network companies (TNCs), autonomous vehicles (AVs), internet shopping, and micro-transit may affect the future effectiveness of these strategies.

Limitations of Quantification

To be effective mitigation measures, TDM strategies must have sufficient evidence to quantify the level of VMT reduction that a strategy could achieve for a given project site. In general, the TDM strategies can be quantified using CAPCOA calculation methodologies but there are some important limitations for project site applications and combining strategies as explained below.

Project Site Applications

TDM research has a variety of limitations but two that stand out are whether research findings scale to individual project sites and whether land use context should be used to set maximum caps for individual projects. Research that measures TDM strategy effect on VMT reduction often measures the effect at a scale that is larger than a single project or building site. So, the transferability of the measured effect to a project site may be uncertain.

Another important consideration is the influence of the land use context surrounding a project site. The density and mix of surrounding land uses, plus the quality of available transit service, are all examples of land use context factors that influence vehicle trip making. As such, the CAPCOA methodology identifies VMT reduction maximums based on community types tied to land use context. The caps are applied at each step of the VMT reduction calculation (i.e., at the strategy scale, the combined strategy scale, and the global scale). However, these caps are not

based on research related to the effectiveness of VMT reduction strategies in different land use contexts.

Instead, the percentages were derived from a limited comparison of aggregate citywide VMT performance for Sebastopol, San Rafael, and San Mateo where VMT performance ranged from 0 to 17 percent below the statewide VMT/capita average based on data collected prior to 2002.

Little to no evidence exists about the long-term performance of similar TDM strategies in different land use contexts. As such, VMT reductions from TDM strategies cannot be guaranteed in most cases.

Combining VMT Reduction Strategies

Each of the CAPCOA TDM strategies can be combined with others to increase the effectiveness of VMT mitigation; however, the interaction between the various strategies is complex and sometimes counterintuitive. Generally, with each additional measure implemented, a VMT reduction is achieved, but the incremental benefit of VMT reduction may diminish. To quantify the VMT reduction that results from combining strategies, the formula below can be applied absent additional knowledge or information:

$$Total\ VMT\ Reduction = (1 - P_7) * (1 - P_1) * (1 - P\ ) * \ldots$$

Where:

P_1 = percent reduction of each VMT reduction strategy

This adjustment methodology is simply a mathematical approach to dampening the potential effectiveness and is not supported by research related to the actual effectiveness of combined strategies. The intent of including this formula is to provide a mechanism for dampening to minimize the potential to overstate the VMT reduction effectiveness.

Additional data is needed to support and refine the above approach for quantifying the effects of combining TDM strategies. Analysts should consider the available substantial evidence at the time a study is prepared to determine the most appropriate approach for CEQA review.

Limitation for Implementation

Physical project site TDM strategies often involve increasing land use density, changing the mix of uses, or altering the transportation network. However, a potential limitation of these physical design changes is that they may result in a project that no longer resembles the original applicant submittal. CEQA is intended to disclose the potential impacts of a project and mitigate those impacts but has limitations with regards to using mitigation to fundamentally change the project. Therefore, these strategies may result in an inconsistency with the project description when applied on an ad hoc basis.

Another common strategy is to add a TDM program to the project as a condition of approval. While evidence exists that TDM programs can reduce VMT, their success depends on the performance of future building tenants that can change over time. Hence, an effective TDM mitigation program will require ongoing monitoring and adjustment to ensure long-term VMT reduction is achieved. The cost to provide this monitoring may not be feasible for all projects. Without monitoring to ensure effectiveness, significant VMT impacts may remain significant and unavoidable.

Addressing Limitations

In response to the limitations of focusing exclusively on project site TDM strategies, new mitigation concepts are emerging that cover larger areas and rely on region- or city-scale programs to achieve VMT reductions. These program-based concepts are outlined below. As with all VMT mitigation, these programs require substantial evidence to demonstrate that the projects included in the programs would achieve the expected VMT reductions. Additionally, the discretionary action to adopt the program may require CEQA review.

1. VMT Impact Fee Program – This concept resembles a traditional impact fee program in compliance with the mitigation fee act and uses VMT as a metric. The nexus for the fee program would be a VMT reduction goal consistent with the CEQA threshold established by a lead agency for SB 743 purposes. The main difference from a fee program based on a metric such as vehicle LOS is that the VMT reduction nexus results in a capital improvement program (CIP) consisting largely of transit, bicycle, and pedestrian projects (although some roadway projects may reduce VMT if they provide a shorter route that would reduce travel distances). These types of fee programs are time consuming to develop, monitor, and maintain but are recognized as an acceptable form of CEQA mitigation if they can demonstrate that the CIP projects will be fully funded and implemented. The City of Los Angeles is the first city in California to complete a nexus study for this type of program.

2. VMT Exchanges – This concept (along with VMT banks) borrows mitigation approaches from other environmental analysis such as wetlands. The concept relies on a developer agreeing to implement a predetermined VMT reducing project or proposing a new one in exchange for the ability to develop a VMT-generating project. The mitigation projects may or may not be located near the developer's project site. The concept requires a facilitating entity (such as the lead agency) to match the VMT generator (the development project) with the VMT reducing project and ensure through substantial evidence that the VMT reduction is valid. Another requirement is a determination of the necessary time period to demonstrate a VMT reduction. For example, how many years of VMT reduction are required to declare a VMT impact less than significant? A final requirement is that mitigation projects would not have otherwise occurred without the Exchange, which is a condition known as 'additionality'.

3. VMT Banks – This concept attempts to create a monetary value for VMT reduction (e.g., credits) such that a developer could purchase VMT reduction credits. The money exchanged for credits could be applied to local, regional, or state level VMT

reduction projects or actions. This program is more complicated than an Exchange and would require more time and effort to set up and implement. It would include the requirements above for an Exchange such as mitigation time periods and additionality determinations while also tackling the unique challenge of estimating how much VMT reduction is associated with each credit and whether this value would change over time based on mitigation performance and new mitigation offerings.

Table 7-2 compares the pros and cons of the above programs. Although implementation of these programs would require an upfront cost, they have several advantages over project site TDM strategies.

- CEQA streamlining – These programs provide a funding mechanism for project mitigation and may require less project-site monitoring to demonstrate that significant impacts are reduced to a less-than-significant level. Additionally, projects could be screened from completing a quantitative VMT analysis; or, if a quantitative VMT analysis is required, the cost would be somewhat less than the cost for analyzing LOS impacts.
- Greater VMT reduction potential – Since these programs coordinate citywide land use and transportation projects, they have the potential to result in greater VMT reduction potential than site-level TDM strategies applied on a project-by-project basis.

  Additionally, these programs expand the amount of feasible mitigation for reducing VMT impacts.
- Legal defensibility – The VMT reduction programs can help build a case for a nexus between a VMT impact and funding for capital improvement programs.

Table 7-2 – Vehicle Miles Traveled Mitigation Program Type Comparison

Program Type	Pros	Cons
Impact Fee Program	• Common and accepted practice • Accepted for CEQA mitigation • Adds certainty to development costs • Allows for regional scale mitigation projects • Increases potential VMT reduction compared to project site mitigation only	• Time consuming and expensive to develop and maintain • Requires clear nexus between CIP projects and VMT reduction • Increases mitigation costs for developers because it increases feasible mitigation options
Mitigation Exchange	• Limited complexity • Reduced nexus obligation • Expands mitigation to	• Requires 'additionality' • Potential for mismatch between mitigation need

Program Type	Pros	Cons
	include costs for programs, operations, and maintenance • Allows for regional scale mitigation projects • Allows for mitigation projects to be in other jurisdictions • Increases potential VMT reduction compared to project site mitigation only	(project site) and mitigation project location • Increases mitigation costs for developers because it increases feasible mitigation options • Unknown timeframe for mitigation life
Mitigation Bank	• Adds certainty to development costs • Allows for regional scale projects • Allows for mitigation projects to be in other jurisdictions • Allows regional or state transfers • Expands mitigation options to include costs for programs, operations, and maintenance • Increases potential VMT reduction compared to project site mitigation only	• Requires 'additionality' • Time consuming and expensive to develop and maintain • Requires strong nexus • Political difficulty distributing mitigation dollars/projects • Increases mitigation costs for developers because it increases feasible mitigation options • Unknown timeframe for mitigation life

8 ADDITIONAL SENATE BILL 743 IMPLEMENTATION TOOLS

This chapter provides analysis of issues related to SB 743 that were of some interest to the project team and the LAWG but were not able to be analyzed in detail due to scope of work and budget limitations, including the following:

- Sample Guidelines for SB 743 Implementation
- Guidelines for Transportation Projects
- Analysis of Level of Service and Delay After Implementation of SB 743
- Pedestrian/Bicycle/Transit Analysis After Implementation of SB 743

Information provided in this chapter is based on agencies in California that are early adopters of SB 753 and regions that have provided regional guidelines for the implementation of SB 743, as follows:

Early Adopters of SB 743 and Relevant Websites

- City of Pasadena: https://www.cityofpasadena.net/transportation/complete-streets/transportation-impact-review/
- City of San Francisco: https://sfplanning.org/project/transportation-impact-analysis-guidelines-environmental-review-update
- City of Oakland: https://www.oaklandca.gov/resources/background-reports-for-modernizing-transportation-impact-review
- City of San Jose: https://www.sanjoseca.gov/your-government/departments-offices/transportation/planning-policies/vehicle-miles-traveled-metric
- City of Elk Grove: http://www.elkgrovecity.org/cms/one.aspx?pageId=2307482
- City of Los Angeles: https://ladot.lacity.org/businesses/development-review#transportation-assessment

In general, the Cities of San Jose and Elk Grove are considered to share some common characteristics with agencies in the SACOG region, while the Cities of Pasadena, San Francisco, and Oakland are considered to have characteristics that are generally different with respect to the implementation of SB 743.

Regional SB 743 Guidelines and Relevant Websites

- Western Riverside Council of Governments: https://www.fehrandpeers.com/wrcog-sb743/
- San Diego Region (Institute of Transportation Engineers): https://sandiegoite.org/tcm-task-force

Both of these regions are considered to share some common characteristics with agencies in the SACOG region and these regional guidelines are considered to have some potential applications for SACOG member agencies.

Using the resources listed above and other SB-743 resources, the project team has provided a brief analysis of the issues described above.

Sample Guidelines for SB 743 Implementation

Each of the five cities and two regions listed above have SB 743 guidelines that agencies within the SACOG region could use for ideas on how to implement SB 743 in their own jurisdictions. Following is a description of certain aspects of guidelines considered most applicable to the SACOG region:

- The guidelines written by the Cities of San Jose and Elk Grove are agency-specific guidelines prepared by agencies that share characteristics with agencies in the SACOG region.
- The Western Riverside Council of Governments (WRCOG) has provided a template that can be used by agencies to develop agency-specific transportation impact study guidelines to implement SB 743. WRCOG has also prepared a template City Council resolution that can be used to incorporate SB 743 into a City or County's policies
- The San Diego Regional Transportation Impact Study Guidelines provide relatively simplified guidance on SB 743 which may be suitable for use by smaller agencies.

Guidelines for Transportation Projects

SB 743 also applies to transportation projects. Per the adoption language when SB 743 was incorporated into CEQA by the Natural Resources Agency, lead agencies have the discretion to continue using level of service and delay as the performance measure to determine the impacts of transportation projects or to choose a different performance measure. OPR's Technical Advisory has identified VMT as the recommended performance measure for transportation projects. Most agencies around the state appear to be following OPR's recommendation to use VMT as the performance measure for transportation projects.

OPR's technical advisory and most individual SB 743 guidelines include a list of transportation projects that are presumed to have a less than significant impact on VMT due to small project size or project type.

Following are some approaches to VMT analysis for transportation projects:

- The City of Elk Grove uses a comparison of VMT/Service Population with and without the project for appropriate base year and future scenarios. For this purpose, service population is defined as residents plus employees.
- The City of San Jose uses a threshold of a 0.3% percent increase in VMT for every percent increase in lane miles based on certain geographic areas specific to the local area. The value of 0.3% is based on expected increases in lane miles in regional planning documents.
- The San Diego regional guidelines use a threshold that indicates that transportation projects that are consistent with the General Plan or Community Plan would have a less than significant impact on VMT.
- The City of Los Angeles uses a threshold that indicates any increase in VMT would cause a significant impact if a transportation project is not screened out of the requirement to conduct a VMT analysis.

Analysis of Level of Service and Delay After Implementation of SB 743

SB 743 does not prohibit the use of level of service and delay for general planning purposes and most agencies throughout California plan to continue to use analysis of level of service and delay to determine the level of roadway improvements that they will require from land development projects after implementation of SB 743. With the implementation of SB 743, the effect of land development projects on roadway level of service and delay will no longer be considered as CEQA impacts and any roadway improvements will no longer be considered to be CEQA mitigation. The early adopters and regional guidelines include guidance for analysis of level of service and delay after the implementation of SB 743. Some have lessened the roadway analysis requirements for land development projects under SB 743 while others basically use the same requirements for roadway analysis, with revised wording regarding impacts and mitigation as described above.

Pedestrian/Bicycle/Transit Analysis After Implementation of SB 743

With the implementation of SB 743, projects located within infill areas and with high levels of transit, bicycling, and walking activity will often have no significant transportation impact after the implementation of SB 743. Some agencies have an interest in requiring projects in these categories to provide local transportation improvements to promote transit use, bicycling, and walking. The City of San Jose's Transportation Analysis Handbook stands out as a document that addresses this issue in some detail.

SENATE BILL 743 IMPLEMENTATION TOOLS

APPENDIX A

Vehicle Miles Traveled Sketch Model Tools Applicability Findings

SACOG

SKETCH MODEL TOOL APPLICABILITY FINDINGS

Sketch Tool	Output	Defensibility	Sensitivity	Utility	Comments	User Experience: Benefits (UC Davis[1])	User Experience: Drawbacks (UC Davis[1])	Conclusions (UC Berkeley[2])	Conclusion
CalEEMod	VMT	++ Widespread use by air districts. Defensibility depends on use by others due to lack of documentation for trip lengths and known calculation problems.	+ Many parameters, but limited sensitivity to land use context, requires use of mitigation function to accurately represent mixed-use or infill projects, does not directly capture internalization, and mitigation function is not current or fully sensitive to TDM strategies.	++ Requires installation, which can cause errors due to older programming (not updated since 2016). Use of the tool is relatively straightforward but use of mitigation function is often necessary to accurately represent proposed projects.	CAPCOA/Trinity Consultants product, may not be able to make changes. Results depend on subjective inputs of users.	Many, customizable inputs; program interface reduces back-end error.	Many, customizable inputs; defaults and land use categories may misrepresent project and/or context area.	Easier data demands; difficult to determine location attributes, especially to avoid double counting; documentation did not provide enough guidance on method selection.	Not recommended for VMT calculations but could be used for TDM mitigation evaluation.
Sketch 7	% Change in VMT	+ Household (HH) VMT only. Hasn't been updated since 2012.	+ No internalization, no TDM reduction, no trip purpose. Produces % change in VMT, generic place types.	+ Must have regional travel demand model data as input.		Straightforward inputs & interface; system-level outputs; outputs include walk, bike, and transit trips.	Spreadsheet interface can become "buggy", break; regional TAZ data used to calibrate tool may be difficult to obtain.	[Not reviewed]	Not recommended.
VMT Impact Tool/Salon	% Change in VMT	+ HH VMT only	+ No internalization, no TDM reduction, no trip purpose.	+ Not intuitive as a project analysis tool.	Scenario testing for census tract level & above; not project-level.	[Not reviewed]	[Not reviewed]	[Not reviewed]	Not recommended.
GreenTRIP Connect	VMT; Change in VMT	+ HH VMT only	+ Affordable housing, TDM credit for 4 strategies,	++ Easy to use, but limited to residential land uses.	Would need to work with TransForm.	Simple user interface; straightforward outputs.	Measures only residential travel, even in mixed-use projects.	[Not reviewed]	Not recommended for VMT calculations, but could be used for TDM mitigation evaluation. Application in rural areas may not be valid.
UrbanFootprint	VMT	++ Uses MXD for trip generation. Trip lengths not based on observed data.	++ Many parameters. Sensitive to land use changes from adjacent parcels. No TDM reduction.	+ Robust tool but requires training to learn.	California acquired licenses for all cities and counties.	[Not reviewed]	[Not reviewed]	[Not reviewed]	Not recommended.
Envision Tomorrow	VMT	+ Added parameters diluted research.	++ Many parameters. No TDM reduction.	+ Open source, complex spreadsheet tool.	Primarily scenario planning; owned by Fregonese.	[Not reviewed]	[Not reviewed]	[Not reviewed]	Not recommended.
CA Smart Growth Tool	Trips	++	+ No trip purposes, no TDM reduction.	+		Few, intuitive inputs with direction of where to find them.	Calculates trips one land use at a time, and in limited context areas; calculates trips, not VMT.	[Not reviewed]	Not recommended.
TRIMMS	VMT	++ Used by SJCOG.	++ Includes TDM reductions for employees (not LU).	+	Has a few elements that do not exist in CAPCOA.	[Not reviewed]	[Not reviewed]	[Not reviewed]	Not recommended.
MXD/MXD+	Trips	+++	++ Many parameters, no TDM reduction.	++		Simple inputs categories; straightforward outputs.	Important input data may be difficult to find.	High data input demands; obtaining data required GIS capability.[3]	Not recommended.
VMT+	VMT	+ Educational Tool.	+ Limited parameters.	++ Easy to use.		[Not reviewed]	[Not reviewed]	[Not reviewed]	Not recommended.
TDM+	% Change in VMT	+++ CAPCOA-based.	++	++	Only does TDM reductions; needs to be coupled with VMT estimator. Being updated based on new TDM research from ARB Net Zero Building Feasibility Study.	[Not reviewed]	[Not reviewed]	[Not reviewed]	Could be used for TDM mitigation evaluation. Application in rural areas may not be valid.

Sources: Fehr & Peers, 2019 UC Davis, 2017; UC Berkeley, 2018.

Notes: + = lowest score, +++ = highest score

[1]Amy Lee, Kevin Fang, and Susan Handy; "Evaluation of Sketch-Level Vehicle Miles Traveled (VMT) Quantification Tools," National Center for Sustainable Transportation, August 2017.

[2]Elisa Barbour, Dan Chatman, Sarah Doggett, Stella Yip, and Manuel Santana; "SB 743 implementation: Challenges and Opportunities [Draft Final]," June 5, 2018.

[3]Analysis based on earlier, public spreadsheet tool; more advanced proprietary versions available.

SENATE BILL 743 IMPLEMENTATION TOOLS

APPENDIX B
Small Project Screenings for Senate Bill 743

SACOG

SMALL PROJECT SCREENING FOR SB743

The following document provides substantial evidence to support the screening on 'small' projects for SB 743 purposes. This is a conceptual approach for discussion purposes only.

The OPR Technical Advisory relies on a trip trigger based on CEQA exemptions.

Screening Threshold for Small Projects

Many local agencies have developed screening thresholds to indicate when detailed analysis is needed. Absent substantial evidence indicating that a project would generate a potentially significant level of VMT, or inconsistency with a Sustainable Communities Strategy (SCS) or general plan, projects that generate or attract fewer than 110 trips per day[19] generally may be assumed to cause a less-than-significant transportation impact.

Map-Based Screening for Residential and Office Projects

Residential and office projects that locate in areas with low VMT, and that incorporate similar features (i.e., density, mix of uses, transit accessibility), will tend to exhibit similarly low VMT. Maps created with VMT data, for example from a travel survey or a travel demand model, can illustrate areas that are

[19] CEQA provides a categorical exemption for existing facilities, including additions to existing structures of up to 10,000 square feet, so long as the project is in an area where public infrastructure is available to allow for maximum planned development and the project is not in an environmentally sensitive area. (CEQA Guidelines, § 15301, subd. (e)(2).) Typical project types for which trip generation increases relatively linearly with building footprint (i.e., general office building, single tenant office building, office park, and business park) generate or attract an additional 110-124 trips per 10,000 square feet. Therefore, absent substantial evidence otherwise, it is reasonable to conclude that the addition of 110 or fewer trips could be considered not to lead to a significant impact.

Two potential limitations of this trigger have been identified. First, the trigger is not tied to a VMT estimate. Second, the trigger does not consider residential land uses. To strengthen the evidence, we used specific CEQA exemptions related to residential projects and 2012 California Household Travel Survey (CHTS) household VMT estimates to develop the following modification to the OPR approach. The CEQA exemption sections are provided below.

15303. NEW CONSTRUCTION OR CONVERSION OF SMALL STRUCTURES

Class 3 consists of construction and location of limited numbers of new, small facilities or structures; installation of small new equipment and facilities in small structures; and the conversion of existing small structures from one use to another where only minor modifications are made in the exterior of the structure. The numbers of structures described in this section are the maximum allowable on any legal parcel. Examples of this exemption include, but are not limited to:

(a) One single-family residence, or a second dwelling unit in a residential zone. In urbanized areas, up to three single-family residences may be constructed or converted under this exemption.

(b) A duplex or similar multi-family residential structure, totaling no more than four dwelling units. In urbanized areas, this exemption applies to apartments, duplexes and similar structures designed for not more than six dwelling units.

(c) A store, motel, office, restaurant or similar structure not involving the use of significant amounts of hazardous substances, and not exceeding 2500 square feet in floor area. In urbanized areas, the exemption also applies to up to four such commercial buildings not exceeding 10,000 square feet in floor area on sites zoned for such use if not involving the use of significant amounts of hazardous substances where all necessary public services and facilities are available and the surrounding area is not environmentally sensitive.

Note: Authority cited: Section 21083, Public Resources Code; Reference: Sections 21084, Public Resources Code.

15315. MINOR LAND DIVISIONS

Class 15 consists of the division of property in urbanized areas zoned for residential, commercial, or industrial use into four or fewer parcels when the division is in conformance with the General Plan and zoning, no variances or exceptions are required, all services and access to the proposed parcels to local standards are available, the parcel was not involved in a division of a larger parcel within the previous 2 years, and the parcel does not have an average slope greater than 20 percent.

Note: Authority cited: Sections Section 21083, Public Resources Code; Reference: Section 21084, Public Resources Code.

Based on the 2012 CHTS, here are a range of VMT estimates for 2, 4, and 6 units using average VMT generation per household for the SACOG region.

SACOG Average – 42.9 VMT per household

- 2 units = 85.8 VMT per day
- 4 units = 171.6 VMT per day
- 6 units = 257.4 VMT per day (urban areas only)

Another option is to rely on the maximum level of development allowed by CEQA exemptions and convert that value to a 'dwelling unit equivalent' measure similar to impact fee programs. OPR estimated that non-residential uses could generate 110-124 daily trips based on a maximum project exemption size of 10,000 square feet (KSF). Using the lower end of the range and CHTS trip lengths produces a VMT equivalent for 10 KSF for CA and SACOG of 836 and 869, respectively. This equates to about 20 residential households.

ALTERNATIVE SMALL PROJECT SCREENING FOR SB 743

An alternative approach to determining minimum project size for SB 743 VMT analysis is based on the concept of *sample error* and *probability of a type II error*.

- *Sampling error* is related to drawing samples from the population, and comparing the average calculated from that sample to the population average and standard deviation. If you sampled a very small number of households (say 5 households) in a population with a large standard deviation, the chances that your sample is a good representation of the population is very low. If you sampled a very large number of households (say 1,000) the chances that your sample is a good representation of the population is much higher. It's this relationship that allows the *margin of error* for a survey to be calculated, and it is this relationship that shows that if your survey is based on a larger sample, the margin of error is lower.
- A "type II error" occurs if someone wrongly concludes that a given sample might fail a hypothesis, when in fact the sample could pass the hypothesis. For this application in SB 743, the hypothesis would be that a proposed project is likely to exceed the applicable VMT threshold, and should go through a full project-level VMT analysis, when in fact a percentage of projects of that size may actually fall below the threshold.
- Normally, we think about sample error and margin of error from that standpoint of estimating a given metric, like household income, or VMT per household or per capita rate. You look at the sample you have, calculate average household VMT for that sample, and based on the that sample and the known or assumed standard deviation in the population, estimate the margin of error and level of certainty we have in the sample average. However, the process can be reversed, and you can look at the margin of error and level of certainty you would like to achieve, and calculate the sample size you would need to achieve that margin of error or level of certainty. These probabilities can be used to quantify the likelihood of a type II error, and translate "sample size" into the project size.

The goal of this approach is to ensure that SB 743 VMT estimation and analysis is only performed if there is reasonable confidence that the analysis would not result in an avoidable type II error.

To operationalize this concept, a lead agency would:

- Set a threshold on probability of a type II error. For example, an agency could say that unless the likelihood of a type II error is 25 percent or less (i.e. one-in-four cases), a VMT analysis is not merited, since in one out of four cases, the actual project might generate VMT below the threshold, for purely random reasons.
- Adapt available household survey data on VMT generation to estimate an average VMT rate, and standard deviation for that rate, for relevant dwelling unit types. The SACOG 2018 Household Travel Survey is one option for doing these calculations. Table 1 provides VMT rates and standard deviations for all households, households in single family units, and households in other unit types, including multi-family units.
- Calculate the relevant minimum sample sizes to achieve the threshold probability of type II error, and translate that sample size into project sizes that can be used for screening.

Table 1. VMT per Household by Unit Type, SACOG Region

Household Types	Average*	Std. Dev.**	N
All HHs	44.3	43.5	3,779
Single Family Unit HHs	46.9	49.1	2,478
Multi-Family Unit HHs	33.1	35.2	1,301

Source: 2018 SACOG Household Travel Survey
Notes:
*Includes internal-to-region VMT only
**Not filtered for outliers in database

More detailed technical documentation of this approach, examples of its application, are available on the SACOG website.

https://www.sacog.org/sb-743-technical-assistance

SENATE BILL 743 IMPLEMENTATION TOOLS

APPENDIX C

Comparison of CAPCOA Strategies Versus New Research Since 2010

SACOG

CAPCOA Information					New Information Since CAPCOA Was Published in 2010		
Category	**Strategy #**	**Strategy Title**	**VMT Reduction**	**Strength of Substantial Evidence for CEQA Impact Analysis?**	**New information**	**VMT Reduction**	**Literature or Evidence Cited**
Land Use/Location	3.1.1	LUT-1 Increase Density	0.8% - 30% VMT reduction due to increase in density	Adequate	Increasing residential density is associated with lower VMT per capita. Increased residential density in areas with high jobs access may have a greater VMT change than increases in regions with lower jobs access. The range of reductions is based on a range of elasticities from -0.04 to -0.22. The low end of the reductions represents a -0.04 elasticity of demand in response to a 10% increase in residential units or employment density and a -0.22 elasticity in response to 50% increase to residential/employment density.	0.4% -10.75%	Primary sources: Boarnet, M. and Handy, S. (2014). Impacts of Residential Density on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Secondary source: Stevens, M. (2017). Does Compact Development Make People Drive Less? Journal of the American Planning Association, 83(1), 7-18.
Land Use/Location	3.1.9	LUT-9 Improve Design of Development	3.0% - 21.3% reduction in VMT due to increasing intersection density vs. typical ITE suburban development	Adequate	No update to CAPCOA literature; advise applying CAPCOA measure only to large developments with significant internal street structure.	Same	N/A
Land Use/Location	3.1.4	LUT-4 Increase Destination Accessibility	6.7%-20% VMT reduction due to decrease in distance to major job center or downtown	Adequate	Reduction in VMT due to increased regional accessibility (jobs gravity). Locating new development in areas with good access to destinations reduces VMT by reducing trip lengths and making walking, biking, and transit trips more feasible. Destination accessibility is measured in terms of the number of jobs (or other attractions) reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones.	0.5%-12%	Primary sources: Handy, S. et al. (2014). Impacts of Network Connectivity on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Handy, S. et al. (2013). Impacts of Regional Accessibility on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Secondary source: Holtzclaw, et al. (2002.) Location Efficiency: Neighborhood and Socioeconomic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles, and Chicago. Transportation Planning and Technology, Vol. 25, pp. 1–27.
Land Use/ Location	3.1.3	LUT-3 Increase Diversity of Urban and Suburban Developments	9%-30% VMT reduction due to mixing land uses within a single development	Adequate	1] VMT reduction due to mix of land uses within a single development. Mixing land uses within a single development can decrease VMT (and resulting GHG emissions), since building users do not need to drive to meet all their needs. 2] Reduction in VMT due to regional change in entropy index of diversity. Providing a mix of land uses within a single neighborhood can decrease VMT (and resulting GHG emissions), since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example, when residential areas are in the same neighborhood as retail	1] 0%-12% 2] 0.3%-4%	1] Ewing, R. and Cervero, R. (2010). Travel and the Built Environment - A Meta-Analysis. Journal of the American Planning Association,76(3),265-294. Cited in California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf Frank, L., Greenwald, M., Kavage, S. and Devlin, A. (2011). An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy. WSDOT Research Report WA-RD 765.1. Washington State Department of Transportation. Retrieved from: http://www.wsdot.wa.gov/research/reports/fullreports/765.1.pdf Nasri, A. and Zhang, L. (2012). Impact of Metropolitan-Level Built Environment on Travel Behavior. Transportation Research Record: Journal of the Transportation Research

CAPCOA Information					New Information Since CAPCOA Was Published in 2010		
Category	Strategy #	Strategy Title	VMT Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	New information	VMT Reduction	Literature or Evidence Cited
					and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. At the regional level, reductions in VMT are measured in response to changes in the entropy index of land use diversity.		Board, 2323(1), 75-79. Sadek, A. et al. (2011). Reducing VMT through Smart Land-Use Design. New York State Energy Research and Development Authority. Retrieved from: https://www.dot.ny.gov/divisions/engineering/technical- services/trans-r-and-d-repository/C-08-29%20Final%20Report_December%202011%20%282%29.pdf Spears, S.et al. (2014). Impacts of Land-Use Mix on Passenger Vehicle Use and Greenhouse Gas Emissions- Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm 2] Zhang, Wengia et al. "Short- and Long-Term Effects of Land Use on Reducing Personal Vehicle Miles of Travel."
Land Use/ Location	3.1.5	LUT-5 Increase Transit Accessibility	0.5%-24.6% reduce in VMT due to locating a project near high-quality transit	Adequate	1] VMT reduction when transit station is provided within 1/2 mile of development (compared to VMT for sites located outside 1/2-mile radius of transit). Locating high density development within 1/2 mile of transit will facilitate the use of transit by people traveling to or from the Project site. The use of transit results in a mode shift and therefore reduced VMT. 2] Reduction in vehicle trips due to implementing TOD. A project with a residential/commercial center designed around a rail or bus station, is called a transit- oriented development (TOD). The project description should include, at a minimum, the following design features: • A transit station/stop with high-quality, high-frequency bus service located within a 5- 10-minute walk (or roughly ¼ mile from stop to edge of development), and/or • A rail station located within a 20-minute walk (or roughly ½ mile from station to edge of development) • Fast, frequent, and reliable transit service connecting to a high percentage of regional destinations • Neighborhood designed for walking and cycling	1] 0%-5.8% 2] 0%-7.3%	1] Lund, H. et al. (2004). Travel Characteristics of Transit-Oriented Development in California. Oakland, CA: Bay Area Rapid Transit District, Metropolitan Transportation Commission, and Caltrans. Tal, G. et al. (2013). Policy Brief on the Impacts of Transit Access (Distance to Transit) Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/transitaccess/transit_access_brief120313.pdf 2] Zamir, K. R. et al. (2014). Effects of Transit-Oriented Development on Trip Generation, Distribution, and Mode Share in Washington, D.C., and Baltimore, Maryland. Transportation Research Record: Journal of the Transportation Research Board. 2413, 45–53. DOI: 10.3141/2413-05
Land Use/ Location	3.1.6	LUT-6 Integrate Affordable and Below Market Rate Housing	0.04%-1.20% reduction in VMT for making up to 30% of housing units BMR	Weak - Should only be used where supported by local data on affordable housing trip generation.	Observed trip generation indicates substantial local and regional variation in trip making behavior at affordable housing sites. Recommend use of ITE rates or local data for senior housing.	N/A	"Draft Memorandum: Infill and Complete Streets Study, Task 2.1: Local Trip Generation Study." Measuring the Miles: Developing new metrics for vehicle travel in LA. City of Los Angeles, April 19, 2017.

CAPCOA Information					New Information Since CAPCOA Was Published in 2010		
Category	**Strategy #**	**Strategy Title**	**VMT Reduction**	**Strength of Substantial Evidence for CEQA Impact Analysis?**	**New information**	**VMT Reduction**	**Literature or Evidence Cited**
Neighborhood Site Enhancements	3.2.1	SDT-1 Provide Pedestrian Network Improvements	0%-2% reduction in VMT for creating a connected pedestrian network within the development and connecting to nearby destinations.	Adequate for large area projects only such as a specific plan.	VMT reduction due to provision of complete pedestrian networks. Only applies if located in an area that may be prone to having a less robust sidewalk network.	0.5%-5.7%	Handy, S. et al. (2014). Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm All studies cited here focus on metropolitan regions as a whole, or on the urban core or suburban areas within those regions.
Neighborhood Site Enhancements	3.2.2	SDT-2 Provide Traffic Calming Measures	0.25%-1% VMT reduction due to traffic calming on streets within and around the development	Adequate for large area projects only such as a specific plan.	Reduction in VMT due to expansion of bike networks in urban areas. Strategy only applies to bicycle facilities that provide a dedicated lane for bicyclists or a completely separated right-of-way for bicycles and pedestrians. Project-level definition: Enhance bicycle network citywide (or at similar scale), such that a building entrance or bicycle parking is within 200 yards walking or bicycling distance from a bicycle network that connects to at least one of the following: at least 10 diverse uses; a school or employment center, if the project total floor area is 50% or more residential; or a bus rapid transit stop, light or heavy rail station, commuter rail station, or ferry terminal. All destinations must be 3-mile bicycling distance from project site. Include educational campaigns to encourage bicycling.	0%-1.7%	Zahabi, S. et al. (2016). Exploring the link between the neighborhood typologies, bicycle infrastructure and commuting cycling over time and the potential impact on commuter GHG emissions. Transportation Research Part D: Transport and Environment. 47, 89-103. For this purpose, automobile and bicycle trip information from origin–destination surveys for the years 1998, 2003 and 2008 are used. Neighborhood typologies are generated from different built environment indicators (population and employment density, land use diversity, etc.).
Neighborhood Site Enhancements	3.2.3	SDT-3 Implement an NEV Network	0.5%-12.7% VMT reduction for GHG- emitting vehicles, depending on level of local NEV penetration	Weak - not recommended without supplemental data.	Limited evidence and highly limited applicability. Use with supplemental data only.	N/A	City of Lincoln, MHM Engineers & Surveyors, Neighborhood Electric Vehicle Transportation Program Final Report, issued 04/05/05, and City of Lincoln, A Report to the California Legislature as required by Assembly Bill 2353, Neighborhood Electric Vehicle Transportation Plan Evaluation, January 1, 2008. Cited in California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA- Quantification-Report-9-14-Final.pdf

CAPCOA Information					New Information Since CAPCOA Was Published in 2010		
Category	**Strategy #**	**Strategy Title**	**VMT Reduction**	**Strength of Substantial Evidence for CEQA Impact Analysis?**	**New information**	**VMT Reduction**	**Literature or Evidence Cited**
Neighborhood Site Enhancements	3.4.9	TRT-9 Implement Car-Sharing Program	0.4% - 0.7% VMT reduction due to lower vehicle ownership rates and general shift to non-driving modes	Adequate	Vehicle trip reduction due to car-sharing programs; reduction assumes 1%-5% penetration rate. Implementing car-sharing programs allows people to have on-demand access to a shared fleet of vehicles on an as- needed basis, as a supplement to trips made by non-SOV modes. Transit station-based programs focus on providing the "last-mile" solution and link transit with commuters' final destinations. Residential-based programs work to substitute entire household-based trips. Employer-based programs provide a means for business/day trips for alternative mode commuters and provide a guaranteed ride home option. The reduction shown here assumes a 1%-5% penetration rate.	0.3%-1.6%	Lovejoy, K. et al. (2013). Impacts of Carsharing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Parking Pricing	3.3.1	PDT-1 Limit Parking Supply	5%-12.5% VMT reduction in response to reduced parking supply vs. ITE parking generation rate	Weak - not recommended. Fehr & Peers has developed new estimates for residential land use only that may be used.	CAPCOA reduction range derived from estimate of reduced vehicle ownership, not supported by observed trip or VMT reductions. Evidence is available for mode shift due to presence/absence of parking in high-transit urban areas; additional investigation required.	Depends on project type and size	Fehr & Peers estimated a linear regression formula based on observed data from multiple locations. Resulting equation produces maximum VMT reductions for residential land use only of 30% in suburban locations and 50% in urban locations based on parking supply percentage reductions.
Parking Pricing	3.3.2	PDT-2 Unbundle Parking Costs from Property Cost	2.6% -13% VMT reduction due to decreased vehicle ownership rates	Adequate - conditional on the agency not requiring parking minimums and pricing/managing on-street parking (i.e., residential parking permit districts, etc.).	Reduction in VMT, primarily for residential uses, based on range of elasticities for vehicle ownership in response to increased residential parking fees. Does not account for self-selection. Only applies if the city does not require parking minimums and if on- street parking is priced and managed (i.e., residential parking permit districts).	2%-12%	Victoria Transport Policy Institute (2009). Parking Requirement Impacts on Housing Affordability. Retrieved March 2010 from: http://www.vtpi.org/park-hou.pdf.
Parking Pricing	3.3.3	PDT-3 Implement Market Price Public Parking	2.8%-5.5% VMT reduction due to "park once" behavior and disincentive to driving	Adequate for large area projects only such as a specific plan.	Implement a pricing strategy for parking by pricing all central business district/employment center/retail center on- street parking. It will be priced to encourage park once" behavior. The benefit of this measure above that of paid parking at the project only is that it deters parking spillover from project supplied parking to other public parking nearby, which undermine the vehicle miles traveled (VMT) benefits of project pricing. It may also generate sufficient area- wide mode shifts to justify increased transit service to the area. VMT reduction applies to VMT from visitor/customer trips only. Reductions	2.8%-14.5%	Clinch, J.P. and Kelly, J.A. (2003). Temporal Variance of Revealed Preference On-Street Parking Price Elasticity. Dublin: Department of Environmental Studies, University College Dublin. Retrieved from: http://www.ucd.ie/gpep/research/workingpapers/2004/04-02.pdf. Cited in Victoria Transport Policy Institute (2017). Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm Hensher, D. and King, J. (2001). Parking Demand and Responsiveness to Supply, Price and Location in Sydney Central Business District. Transportation Research A. 35(3), 177-196. Millard-Ball, A. et al. (2013). Is the curb 80% full or 20% empty? Assessing the impacts of San Francisco's parking pricing experiment. Transportation Research Part A. 63(2014), 76-92. Shoup, D. (2011). The High Cost of Free Parking. APA Planners Press. p. 290. Cited in Pierce, G. and Shoup, D. (2013). Getting the Prices Right. Journal of the American

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					higher than top end of range from CAPCOA report apply only in conditions with highly constrained on-street parking supply and lack of comparably priced off-street parking.		Planning Association. 79(1), 67-81.
Transit System	3.5.3	TST-3 Expand Transit Network	0.1-8.2% VMT reduction in response to increase in transit network coverage	Adequate for large area projects only such as a specific plan.	Reduction in vehicle trips due to increased transit service hours or coverage. Low end of reduction is typical of project-level implementation (payment of impact fees and/or localized improvements).	0.1%-10.5%	Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Transit System	3.5.4	TST-4 Increase Transit Service Frequency/Speed	0.02%-2.5% VMT reduction due to reduced headways and increased speed and reliability	Adequate for large area projects only such as a specific plan.	Reduction in vehicle trips due to increased transit frequency/decreased headway. Low end of reduction is typical of project-level implementation (payment of impact fees and/or localized improvements).	0.3%-6.3%	Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Transit System	3.5.1	TST-1 Provide a Bus Rapid Transit System	0.02%-3.2% VMT reduction by converting standard bus system to BRT system	Adequate for large area projects only such as a specific plan.	No new information identified.	Same	N/A
Commute Trip Reduction	3.4.1	TRT-1 Implement CTR Program - Voluntary	1.0%-6.2% commute VMT reduction due to employer-based mode shift program	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-2 Implement CTR Program - Required Implementation/Monitoring" or with CAPCOA strategies TRT-3.4.3 through TRT-3.4.9.	Reduction in vehicle trips in response to employer led TDM programs. The CTR program should include all of the following to apply the effectiveness reported by the literature: • Carpooling encouragement • Ride-matching assistance • Preferential carpool parking • Flexible work schedules for carpools • Half time transportation coordinator • Vanpool assistance • Bicycle end-trip facilities (parking, showers and lockers)	1.0%-6.0%	Boarnet, M. et al. (2014). Impacts of Employer-Based Trip Reduction Programs and Vanpools on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Commute Trip Reduction	3.4.2	TRT-2 Implement CTR Program - Required Implementation/Monitoring	4.2%-21.0% commute VMT reduction due to employer-based mode shift program with required monitoring and reporting	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or with CAPCOA strategies TRT-3.4.3 through TRT-	Limited evidence available. Anecdotal evidence shows high investment produces high VMT/vehicle trip reductions at employment sites with monitoring requirements and specific targets.	Same	Nelson/Nygaard (2008). South San Francisco Mode Share and Parking Report for Genentech, Inc. (p. 8) Cited in: California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA- Quantification-Report-9-14-Final.pdf

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				3.4.9.			
Commute Trip Reduction	3.4.4	TRT-4 Implement Subsidized or Discounted Transit Program	0.3%-20% commute VMT reduction due to transit subsidy of up to $6/day	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	1] Reduction in vehicle trips in response to reduced cost of transit use, assuming that 10- 50% of new bus trips replace vehicle trips 2] Reduction in commute trip VMT due to employee benefits that include transit 3] Reduction in all vehicle trips due to reduced transit fares system-wide, assuming 25% of new transit trips would have been vehicle trips.	1] 0.3%-14% 2] 0-16% 3] 0.1% to 6.9%	1] Victoria Transport Policy Institute. (2017). Understanding Transport Demands and Elasticities. Online TDM Encyclopedia. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm 2] Carolina, P. et al. (2016). Do Employee Commuter Benefits Increase Transit Ridership? Evidence from the NY-NJ Region. Washington, DC: Transportation Research Board, 96th Annual Meeting. 3] Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Commute Trip Reduction	3.4.15	TRT-15 Employee Parking Cash-Out	0.6%-7.7% commute VMT reduction due to implementing employee parking cash out	Weak - Effectiveness is building/tenant specific. Research data is over 10 years old (1997).	Shoup case studies indicate a reduction in commute vehicle trips due to implementing cash-out without implementing other trip- reduction strategies.	3%-7.7%	Shoup, D. (1997). Evaluating the Effects of Cashing Out Employer-Paid Parking: Eight Case Studies. Transport Policy. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/research/apr/past/93-308a.pdf. This citation was listed as an alternative literature in CAPCOA.
Commute Trip Reduction	3.4.14	TRT-14 Price Workplace Parking	0.1%-19.7% commute VMT reduction due to mode shift	Adequate - Effectiveness is building/tenant specific.	Reduction in commute vehicle trips due to priced workplace parking; effectiveness depends on availability of alternative modes. Workplace parking pricing may include explicitly charging for parking, implementing above market rate pricing, validating parking only for invited guests, not providing employee parking and transportation allowances, and educating employees about available alternatives.	0.5%-14%	Primary sources: Concas, S. and Nayak, N. (2012), A Meta-Analysis of Parking Price Elasticity. Washington, DC: Transportation Research Board, 2012 Annual Meeting. Dale, S. et al. (2016). Evaluating the Impact of a Workplace Parking Levy on Local Traffic Congestion: The Case of Nottingham UK. Washington, DC: Transportation Research Board, 96th Annual Meeting. Secondary sources: Victoria Transport Policy Institute. (2017). Understanding Transport Demands and Elasticities. Online TDM Encyclopedia. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm Spears, S. et al. (2014). Impacts of Parking Pricing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Commute Trip Reduction	3.4.6	TRT-6 Encourage Telecommuting and Alternative Work Schedules	0.07%-5.5% commute VMT reduction due to reduced commute trips	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monit	VMT reduction due to adoption of telecommuting. Alternative work schedules could take the form of staggered starting times, flexible schedules, or compressed work weeks.	0.2%-4.5%	Handy, S. et al. (2013). Policy Brief on the Impacts of Telecommuting Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/telecommuting/telecommuting_brief120313.pdf

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				oring."			
Commute Trip Reduction	3.4.7	1] TRT-7 Implement CTR Marketing 2] Launch Targeted Behavioral Interventions	0.8%-4.0% commute VMT reduction due to employer marketing of alternatives	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	1] Vehicle trips reduction due to CTR marketing 2] Reduction in VMT from institutional trips due to targeted behavioral intervention programs	1] 0.9% to 26% 2] 1%-6%	1] Pratt, Dick. Personal communication regarding the Draft of TCRP 95 Traveler Response to Transportation System Changes – Chapter 19 Employer and Institutional TDM Strategies. Transit Cooperative Research Program. Cited in California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp- content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf Dill, J. and Mohr, C. (2010). Long-Term Evaluation of Individualized Marketing Programs for Travel Demand Management. Portland, OR: Transportation Research and Education Center (TREC). Retrieved from: http://pdxscholar.library.pdx.edu/usp_fac 2] Brown, A. and Ralph, K. (2017.) "The Right Time and Place to Change Travel Behavior: An Experimental Study." Washington, DC: Transportation Research Board, 2017 Annual Meeting. Retrieved from: https://trid.trb.org/view.aspx?id=1437253
Commute Trip Reduction	3.4.11	TRT-11 Provide Employer-Sponsored Vanpool/Shuttle	0.3%-13.4% commute VMT reduction due to employer-sponsored vanpool and/or shuttle service	Adequate - Effectiveness is building/tenant specific.	1] Reduction in commute vehicle trips due to implementing employer-sponsored vanpool and shuttle programs 2] Reduction in commute vehicle trips due to vanpool incentive programs 3] Reduction in commute vehicle trips due to employer shuttle programs	1] 0.5%-5.0% 2] 0.3%-7.4% 3] 1.4%-6.8%	1] Concas, Sisinnio, Winters, Philip, Wambalaba, Francis, (2005). Fare Pricing Elasticity, Subsidies, and Demand for Vanpool Services. Transportation Research Record: Journal of the Transportation Research Board, 1924, pp 215-223. 2] Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm 3] ICF. (2014). GHG Impacts for Commuter Shuttles Pilot Program.
Commute Trip Reduction	3.4.3	TRT-3 Provide Ride-Sharing Programs	1%-15% commute VMT reduction due to employer ride share coordination and facilities	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Commute vehicle trips reduction due to employer ride-sharing programs. Promote ride-sharing programs through a multi- faceted approach such as: • Designating a certain percentage of parking spaces for ride sharing vehicles • Designating adequate passenger loading and unloading and waiting areas for ride- sharing vehicles Providing an app or website for coordinating rides	2.5%-8.3%	Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm
Commute Trip Reduction	3.4.10	TRT-10 Implement a School Pool Program	7.2%-15.8% reduction in school VMT due to school pool implementation	Adequate for large area projects only such as a specific plan. Only applies to School VMT.	Limited new evidence available, not conclusive	Same	Transportation Demand Management Institute of the Association for Commuter Transportation. TDM Case Studies and Commuter Testimonials. Prepared for the US EPA. 1997. (p. 10, 36-38) WayToGo 2015 Annual Report. Accessed on March 12, 2017 from http://www.waytogo.org/sites/default/files/attachments/waytogo-annual-report-2015.pdf
Commute Trip Reduction	3.4.13	TRT-13 Implement School Bus Program	38%-63% reduction in school VMT due to school bus	Adequate for large area projects only such as a specific plan. Only applies to School VMT.	VMT reduction for school trips based on data beyond a single school district.	5%-30%	Wilson, E., et al. (2007). The implications of school choice on travel behavior and environmental emissions. Transportation Research Part D: Transport and Environment 12(2007), 506-518.

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			service implementation		School district boundaries are also a factor to consider. VMT reduction does not appear to be a factor that was considered in a select review of CA boundaries. VMT reductions apply to school trip VMT only.		
Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	Bikeshare car trip substitution rate of 7-19% based on data from Washington DC, and Minneapolis/St. Paul. Annual VMT reduction of 151,000 and 57,000, respectively. Includes VMT for rebalancing and maintenance. VMT reduction of 0.023 miles per day per bikeshare member estimated for Bay Area bikeshare, utilizing Minneapolis/St. Paul data	57,000-151,000 annual VMT reduction, based on two large US cities. VMT reduction of 0.023 miles per day per member, based on one large US city estimate.	Fishman, E., Washington, S., & Haworth, N. (2014). Bike share's impact on car use: Evidence from the United States, Great Britain, and Australia. Transportation Research Part D: Transport and Environment, 31, 13-20. TDM Methodology: Impact of Carsharing Membership, Transit Passes, Bikesharing Membership, Unbundled Parking, and Parking Supply Reductions on Driving. Center for Neighborhood Technology, Peter Haas and Cindy Copp, with TransForm staff, May 5, 2016.

APPENDIX D
SACOG Support for SB 743 Implementation

SACOG SUPPORT FOR SB 743 IMPLEMENTATION

SACOG is committed to providing member agencies technical support and assistance in implementation of SB 743, including the following:

•Ongoing hosting of the SB 743 Local Agency Working Group, as a forum for sharing information on SB 743 implementation, and for identifying and pursuing opportunities for collaborative work on SB 743 implementation.

•Posting of VMT per capita maps and data for the current Metropolitan Transportation Plan & Sustainable Community Strategy base year and horizon year. For the 2020 MTP/SCS, the base year is 2016, and the horizon year is 2040. The maps and data are available for use by any member agency in their own SB 743 implementation efforts.

•Posting of modeled regional VMT trip rates for generalized land use categories, and adjustment factors for key land use/transportation factors (accessibility, proximity to transit, etc.).

•Posting of the 2018 Household Travel Survey, for use in assessing travel behavior in the region, including VMT.

•Technical support for member agencies or their consultants using the current version of the SACSIM travel demand model (SACSIM19 for the 2020 MTP/SCS).

•For SACSIM19 and future versions of the SACSIM model, SACOG has committed to providing scripting and data files necessary to estimate VMT generated by residents or workers in the region but occurring outside the region's boundaries.

Current information on any of these options, as well as links to current versions or updates of data files, modeling scripts or documentation related to SB 743, go to:

https://www.sacog.org/sb-743-technical-assistance