Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impacts in CEQA

Implementing Senate Bill 743 (Steinberg, 2013)

January 20, 2016

I. Explanation of Revised Updates to the CEQA Guidelines Implementing Senate Bill 743

A. Background

Senate Bill 743 mandates a change in the way that public agencies evaluate transportation impacts of projects under the California Environmental Quality Act. Legislative findings in that bill plainly state that California's foundational environmental law can no longer treat vibrant communities, transit and active transportation options as adverse environmental outcomes. On the contrary, aspects of project location and design that influence travel choices, and thereby improve or degrade our air quality, safety, and health, must be considered.

The Legislature mandated that these changes occur in the Guidelines that implement CEQA for several reasons. For one, as administrative regulations, updates to the CEQA Guidelines are vetted publicly and thoroughly. The Office of Planning and Research began to engage the public in the development of these recommendations as soon as Governor Brown signed Senate Bill 743 into law. Moreover, the development of these recommendations has been iterative, giving experts, the public and affected entities many opportunities to weigh-in. This revised draft of the Guidelines is the latest iteration. Further, as implementation is monitored, and methodologies improve, the Guidelines can be updated as needed.

Once finally adopted, these Guidelines should result in a better, more transparent evaluation of project impacts, and better environmental outcomes. Procedurally, traffic studies that accompany in-depth environmental review will now typically take days rather than weeks to prepare. Because models to estimate vehicle miles traveled are publicly available, decision-makers and the public will be better able to engage in the review process. Substantively, a focus on vehicle miles traveled will facilitate the production of badly-needed housing in urban locations. It will also facilitate transit projects and better uses of existing infrastructure as well as bicycle and pedestrian improvements. As a result, people will have better transportation options. It also means that CEQA will no longer mandate roadways that focus on automobiles to the exclusion of every other transportation option. It will no longer mandate excessive, and expensive, roadway capacity.

As indicated above, this revised draft is the product of many months of intensive engagement with the public, public agencies, environmental organizations, development advocates, industry experts, and many others. Because the changes from the preliminary discussion draft are meaningful and substantive, OPR again invites public review and comment on this proposal.

This document contains an explanation of how the proposal has changed from the preliminary discussion draft. It also briefly explains how the proposal changed in response to specific public input. Finally, this document includes the revised draft of proposed new section 15064.3 as well as a draft Technical Advisory that more thoroughly describes recommended methodologies.

B. Explanation of What Changed from, and What Remains the Same as, the Preliminary Discussion Draft

Many of the basics of the proposal will look familiar. OPR continues to recommend vehicle miles traveled as the most appropriate measure of project transportation impacts. Further, this proposal continues to recommend that development proposed near transit, as well as roadway rehabilitation, transit, bicycle and pedestrian projects, should be considered to have a less than significant transportation impact. Moreover, OPR continues to recommend application of that measure across the state. Finally, OPR continues to recommend that implementation be phased in over time.

Reviewers will also see several improvements on the preliminary discussion draft. First, much of the detail that OPR originally proposed to include in the new Guidelines section has been moved to a new draft Technical Advisory (see Section III of this document). Doing so will make more clear what in the proposal is a requirement versus a recommendation. Second, the recommended thresholds of significance have been refined to both better align with the state's climate policies and recognize the tremendous diversity of California's communities. Further, the threshold recommendations are accompanied by better access to relevant data (such as outputs from the Caltrans' Statewide Travel Demand Model). Third, OPR now recommends that the new procedures remain optional for a two-year period. This opt-in period will enable those agencies that are ready to make the switch from level of service to vehicle miles traveled to do so, but gives time to other agencies that have indicated that they need more time to become acquainted with the new procedures.

C. How the Revised Draft Responds to Public Input

OPR received nearly 200 comment letters on the preliminary discussion draft. The following contains excerpts from those comments representing some of the major themes in the input that OPR received. Following each excerpt is a brief explanation of how OPR responded to the comment in the revised draft.

1. "We applaud the State of California and [OPR] for taking this **transformative step** forward…"

OPR agrees that the outcome of these changes may be transformative. The degree to which consideration of a project's vehicle miles traveled leads to healthier air and better transportation choices will depend on the choices of individual lead agencies. Those agencies will need to find that project changes, such as increasing transportation options and mix of uses, are feasible. We are more likely to see improved outcomes if these changes in CEQA are coupled with changes in local land use policies, such as reduced parking mandates, greater emphasis on transit, and more walkable community design.

2. "We applaud the selection of Vehicle Miles Traveled (VMT) as the primary metric for evaluating transportation impacts under CEQA. VMT is not only a **better measure of environmental impacts** than LOS; it is also **more equitable**."

OPR agrees that vehicle miles traveled is the most appropriate measure to replace level of service. As explained in detail in the Preliminary Evaluation of Alternatives, and in the Preliminary Discussion Draft, vehicle miles traveled directly relates to emissions of air pollutants, including greenhouse gases, energy usage, and demand on infrastructure, as well as indirectly to many other impacts including public health, water usage, water quality and land consumption. Some comments expressed desire to maintain the status quo, and disagreement with the policy of analyzing vehicle miles traveled. However, none of the comments offered any evidence that vehicle miles traveled is not a measure of environmental impact. Moreover, none of the comments produced any credible evidence that level of service is a better measure of environmental impact, or would better promote the statutory goals set forth in CEQA. For these reasons, OPR continues to recommend vehicle miles traveled the primary measure of transportation impacts.

3. "… concerned that **regional average VMT** does not account for the diversity of communities within the various regions."

While OPR finds that vehicle miles traveled is the best measure of transportation impact in all locations, some variation in *thresholds* may be appropriate in different parts of regions and the state. (See State CEQA Guidelines § 15064(b)("…the significance of an activity may vary with the setting").) Therefore, OPR's revised threshold recommendations provide that outside of central urban locations, reference to a city's average, or within unincorporated county areas, the average of the cities in the county, may be appropriate.

4. "*Unlike activity based models used by some of the larger MPOs*, average VMT by land use type is **not readily available** from the typical 4-step travel demand model…."

OPR acknowledges the concern expressed in some comments regarding data availability. The adequacy of any analysis "is to be reviewed in the light of what is reasonably feasible." (State CEQA Guidelines § 15151.) Even outside of the large metropolitan planning organizations, statewide data on vehicle miles traveled are available. For example, the California Statewide Travel Demand Model provides data on vehicle miles traveled throughout the state which can be used both for setting thresholds and for estimating VMT resulting from a proposed project.

5. "… a threshold based on any average inherently **encourages only marginal improvement**…. [W]e recommend that the threshold of significance be based on the **SB 375 regional targets**."

OPR agrees. The numeric threshold recommendations in the draft Technical Advisory therefore recommends that, in many cases, a project will have a less than significant transportation impact if it performs at least fifteen percent better than existing averages for the region or city. Fifteen percent is roughly consistent with the reduction targets set for the larger metropolitan planning organizations pursuant to SB 375. The greenhouse gas emissions reductions called for in AB 32 and Executive Orders B-30-15 (forty percent reduction by 2030) and S-3-05 (eighty percent reduction by 2050), which reflect scientific consensus on the magnitude of emissions reductions needed to avoid the worst effects of climate change, require that new development perform significantly better than average. Thus, OPR's revised threshold recommendation better reflects the greenhouse gas reduction goal set forth in SB 743, SB 375, AB 32 and other related climate goals.

6. The presumption [that projects near transit would have a less than significant impact] "would result in **missed opportunities** to include trip reduction measures where they are needed."

OPR disagrees that recommending a presumption of less than significant impacts for development projects located near transit would prevent local governments from requiring trip reduction in project design. First, local governments may condition project approvals pursuant to their police powers. (Pub. Resources Code § 21099(b)(4).) Thus, even if a project would have a less than significant impact under CEQA, cities and counties may condition project approvals based on local policy. Second, the recommended presumption may be rebutted. A lead agency may find that details about the project or its specific location indicate that the project may cause a significant transportation impact, despite being near transit, and thereby require trip reduction measures. Third, SB 743 specified that lead agencies may find use more stringent thresholds. (Pub. Resources Code § 21099(e).) OPR notes, however, that transit-oriented development itself is a key strategy for reducing VMT, and thereby reducing environmental impacts and developing healthy, walkable communities.

7. "…transit proximity is not an adequate indicator of VMT…. [W]e recommend adding one simple indicator…: **the project's parking ratio.**"

OPR agrees that excess parking may indicate higher vehicle miles traveled. OPR has, therefore, included parking among several factors that might lead an agency to determine that the presumption of less than significant impacts does not apply to a particular project.

8. "For some large roadway projects, **analysis of induced demand may be appropriate**." But there should be reasonable limits.

OPR agrees. Academic research shows us that adding new roadway capacity increases vehicle miles traveled. Not every transportation improvement will induce travel, however. The recommendations in the draft Technical Advisory clarify that certain transportation projects are not likely to induce significant new travel. Those projects include, among others, installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left, right, and U-turn pockets, or emergency breakdown lanes, new local or collector streets, conversion of general purpose lanes (including ramps) to managed lanes or transit lanes, etc.

9. "The factors affecting transportation safety are numerous and nuanced, and thus **not well suited for enumeration within the CEQA Guidelines**."

OPR agrees. While safety is a proper consideration under CEQA, the precise nature of that analysis is best left to individual lead agencies to account for project-specific and location-specific factors. OPR has removed the safety provisions from the proposed new section 15064.3. Instead, OPR describes potential considerations for lead agencies in the draft Technical Advisory.

10. "The inclusion of **an explicit list** [of mitigation measures and alternatives] creates the **presumption that each of the measures listed should be analyzed** for any project with a potentially significant impact."

OPR disagrees that a suggested list of mitigation measures and alternatives creates any presumption regarding the feasibility of any particular project. Nevertheless, moving the suggested mitigation measures and alternatives to the draft Technical Advisory will accomplish several goals. First, it continues to provide helpful information to lead agencies. Second, it reduces the size and increases the clarity of the regulatory text. Third, the list may be updated more frequently as the practice evolves. Because those goals can be accomplished in a technical advisory, OPR no longer proposes changes to Appendix F of the CEQA Guidelines at this time.

11. "A **minimum of two years** worth of time should be allowed between incorporation by local agencies in transit priority areas and implementation statewide."

OPR agrees that many lead agencies could benefit from additional time to implement the new rules. Indeed, OPR has seen significant strides in practitioners' understanding of vehicle miles traveled, and how best to study and mitigate it, in the time since OPR released the preliminary discussion draft. Recognizing that some agencies are ready to begin implementation immediately, the revised draft provides that analysis of vehicle miles traveled will be voluntary for two years following adoption of the new Guidelines. During that time, OPR will monitor implementation and may evaluate whether any updates to the Guidelines or Technical Advisory are needed.

D. Next Steps

OPR invites public review and comment on the revised draft Guidelines and draft Technical Advisory. Input may be submitted electronically to **CEQA.Guidelines@resources.ca.gov**. While electronic submission is preferred, suggestions may also be mailed or hand delivered to:

Christopher Calfee, Senior Counsel
Governor's Office of Planning and Research
1400 Tenth Street
Sacramento, CA 95814

Please submit all suggestions before **February 29, 2016** at **5:00p.m**. Once the comment period closes, OPR will review all written input and may revise the proposal as appropriate. Next, OPR will submit the draft to the Natural Resources Agency, which will then commence a formal rulemaking process. Once the Natural Resources Agency adopts the changes, they will undergo review by the Office of Administrative Law.

E. Tips for Providing Effective Input

OPR would like to encourage robust engagement in this update process. We expect that participants will bring a variety of perspectives. While opposing views may be strongly held, discourse can and should proceed in a civil and professional manner. To maximize the value of your input, please consider the following:

- In your comment(s), please clearly identify the specific issues on which you are commenting. If you are commenting on a particular word, phrase, or sentence, please provide the page number and paragraph citation.
- Explain why you agree or disagree with OPR's proposed changes. Where you disagree with a particular portion of the proposal, please suggest alternative language.
- Describe any assumptions and support assertions with legal authority and factual information, including any technical information and/or data. Where possible, provide specific examples to illustrate your concerns.
- When possible, consider trade-offs and potentially opposing views.
- Focus comments on the issues that are covered within the scope of the proposed changes. Avoid addressing rules or policies other than those contained in this proposal.
- Consider quality over quantity. One well-supported comment may be more influential than one hundred form letters.
- Please submit any comments within the timeframe provided.

II. *Revised* Proposed Changes to the CEQA Guidelines

Section II of this document includes proposed additions to the CEQA Guidelines, which are found in Title 14 of the California Code of Regulations. Note, these additions, must undergo a formal administrative rulemaking process, and once adopted by the Natural Resources Agency, be reviewed by the Office of Administrative Law.

***Proposed* New Section 15064.3. Determining the Significance of Transportation Impacts**

(a) Purpose.

Section 15064 contains general rules governing the analysis, and the determination of significance of, environmental effects. Specific considerations involving transportation impacts are described in this section. Generally, vehicle miles traveled is the most appropriate measure of a project's potential transportation impacts. For the purposes of this section, "vehicle miles traveled" refers to the amount and distance of automobile travel attributable to a project. Other relevant considerations may include the effects of the project on transit and non-motorized travel and the safety of all travelers. A project's effect on automobile delay does not constitute a significant environmental impact.

(b) Criteria for Analyzing Transportation Impacts.

Lead agencies may use thresholds of significance for vehicle miles traveled recommended by other public agencies or experts provided the threshold is supported by substantial evidence.

(1) Vehicle Miles Traveled and Land Use Projects. A development project that results in vehicle miles traveled exceeding an applicable threshold of significance may indicate a significant impact. Generally, development projects that locate within one-half mile of either an existing major transit stop or a stop along an existing high quality transit corridor may be presumed to cause a less than significant transportation impact. Similarly, development projects that decrease vehicle miles traveled in the project area compared to existing conditions may be considered to have a less than significant transportation impact.

(2) Induced Vehicle Travel and Transportation Projects. Additional lane miles may induce automobile travel, and vehicle miles traveled, compared to existing conditions. Transportation projects that reduce, or have no impact on, vehicle miles traveled may be presumed to cause a less than significant transportation impact. To the extent that the potential for induced travel has already been adequately analyzed at a programmatic level, a lead agency may incorporate that analysis by reference.

(3) Qualitative Analysis. If existing models or methods are not available to estimate the vehicle miles traveled for the particular project being considered, a lead agency may analyze the project's vehicle miles traveled qualitatively. Such a qualitative analysis would evaluate factors such as the availability of transit, proximity to other destinations (such as homes, employment and services), area demographics, etc. For many projects, a qualitative analysis of construction traffic may be appropriate.

(4) Methodology. The lead agency's evaluation of the vehicle miles traveled associated with a project is subject to a rule of reason. A lead agency should not confine its evaluation to its own political boundary.

A lead agency may use models to estimate a project's vehicle miles traveled, and may revise those estimates to reflect professional judgment based on substantial evidence. Any assumptions used to estimate vehicle miles traveled and any revisions to model outputs should be documented and explained in the environmental document prepared for the project.

(c) Applicability.

The provisions of this section shall apply prospectively as described in section 15007. A lead agency may elect to be governed by the provisions of this section immediately provided that it updates its own procedures pursuant to section 15022 to conform to the provisions of this section. After [two years from expected adoption date], the provisions of this section shall apply statewide.

Note: Authority cited: Sections 21083 and 21083.05, Public Resources Code. Reference: Sections 21099 and 21100, Public Resources Code; *California Clean Energy Committee v. City of Woodland* (2014) 225 Cal. App. 4th 173.

Proposed Changes to Existing Appendix G

XVI. TRANSPORTATION~~/TRAFFIC~~ -- Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Conflict with a~~n applicable~~ plan, ordinance or policy ~~**establishing measures of effectiveness for the**~~ **addressing the safety or** performance of the circulation system**, including transit, roadways, bicycle lanes and pedestrian paths (except for automobile level of service)?** ~~**, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit**~~?	☐	☐	☐	☐
b) ~~**Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county**~~	☐	☐	☐	☐

~~**congestion management agency for designated roads or highways?**~~ **Cause substantial additional vehicle miles traveled (per capita, per service population, or other appropriate efficiency measure)?**

☐ ☐ ☐ ☐

c) ~~**Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks**~~?

☐ ☐ ☐ ☐

Substantially **induce additional automobile travel by increasing physical roadway capacity in congested areas (i.e., by adding new mixed-flow lanes) or by adding new roadways to the network?** ~~**increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)**~~?

☐ ☐ ☐ ☐

d) Result in inadequate emergency access?

~~☐~~ ~~☐~~ ~~☐~~ ~~☐~~

☐ ☐ ☐ ☐

~~**f) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?**~~

III. Technical Advisory on Evaluating Transportation Impacts in CEQA

Section III of this document includes a draft Technical Advisory which contains OPR's technical recommendations and best practices regarding the evaluation of transportation impacts under CEQA. Unlike the provisions in Section II of this document, the Technical Advisory is not regulatory in nature. The purpose of this document is simply to provide advice and recommendations, which lead agencies may use in their discretion. Notably, OPR may update this document as frequently as needed reflect advances in practice and methodologies.

Technical Advisory on Evaluating Transportation Impacts in CEQA

Implementing Senate Bill 743 (Steinberg, 2013)

January 2016

Contents

A. Introduction

This technical advisory is one in a series of advisories provided by the Governor's Office of Planning and Research (OPR) as a service to professional planners, land use officials and CEQA practitioners. OPR issues technical guidance from time to time on issues that broadly affect the practice of land use planning and the California Environmental Quality Act (CEQA). Senate Bill 743 (Steinberg, 2013) required changes to the Guidelines Implementing the California Environmental Quality Act (CEQA Guidelines) regarding the analysis of transportation impacts. Those proposed changes identify vehicle miles traveled as the most appropriate metric to evaluate a project's transportation impacts. Those proposed changes also provide that the analysis of certain transportation projects must address the potential for induced travel. Once the Natural Resources Agency adopts these changes to the CEQA Guidelines, automobile delay, as measured by "level of service" and other similar metrics, will no longer constitute a significant environmental effect under CEQA.

This advisory contains technical recommendations regarding thresholds of significance, safety, and mitigation measures. OPR will continue to monitor implementation of these new provisions and may update or supplement this advisory from time to time in response to new information and advancements in modeling and methods.

B. Technical Considerations in Assessing Vehicle Miles Traveled

Many practitioners are familiar with accounting for vehicle miles traveled (VMT) in connection with long range planning, or as part of the analysis of a project's greenhouse gas emissions or energy impacts. While auto-mobility (often expressed as "level of service") may continue to be a measure for planning purposes, Senate Bill 743 directs a different measure for evaluation of environmental impacts under CEQA. This document provides technical background information on how to assess VMT as part of a transportation impacts analysis under CEQA.[1]

1. Considerations about what VMT to count

Consistent with the obligation to make a good faith effort to disclose the environmental consequences of a project, lead agencies have discretion to choose the most appropriate methodology to evaluate project impacts.[2] A lead agency can evaluate a project's effect on VMT in numerous ways. The purpose of this document is to provide technical considerations in determining which methodology may be most useful for various project types.

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[1] Additionally, Caltrans is in the process of completing a comprehensive multimodal Transportation Analysis Guide and Transportation Impact Study Guide (TAG-TISG), in collaboration with OPR and a variety of external partners, industry stakeholders, and analysis experts.

[2] The California Supreme Court has explained that when an agency has prepared an environmental impact report:

> [T]he issue is not whether the [lead agency's] studies are irrefutable or whether they could have been better. The relevant issue is only whether the studies are sufficiently credible to be considered as part of the total evidence that supports the [lead agency's] finding[.]

(*Laurel Heights Improvement Ass'n v. Regents of the University of California* (1988) 47 Cal.3d 376, 409; see also *Eureka Citizens for Responsible Gov't v. City of Eureka* (2007) 147 Cal.App.4th 357, 372.)

Background on Estimating Vehicle Miles Traveled

Before discussing specific methodological recommendations, this section provides a brief overview of modeling and counting VMT including some key terminology, starting with an example to illustrate some methods of estimating vehicle miles traveled.

<u>Example</u>

Consider the following hypothetical travel day (all by automobile):

1. Residence to Coffee Shop
2. Coffee Shop to Work
3. Work to Sandwich Shop
4. Sandwich Shop to Work
5. Work to Residence
6. Residence to Store
7. Store to Residence

Trip-based assessment of a project's effect on travel behavior counts VMT from individual trips to and from the project. It is the most basic, and traditionally most common, method of counting VMT. A trip-based VMT assessment of the residence in the above example would consider segments 1, 5, 6 and 7. For residential projects, the sum of home-based trips is called *home-based* VMT.

A *tour-based* assessment counts the entire home-back-to-home tour that includes the project. A tour-based VMT assessment of the residence in the above example would consider segments 1, 2, 3, 4, and 5 in one tour, and 6 and 7 in a second tour. A tour-based assessment of the workplace would include segments 1, 2, 3, 4, and 5. Together, all tours comprise *household* VMT.

Both trip- and tour-based assessments can be used as measures of transportation efficiency, using denominators such as per capita, per employee, or per person-trip.

Trip- and Tour-based Assessment of VMT

As illustrated above, a tour-based assessment of VMT is a more complete characterization of a project's effect on VMT. In many cases, a project affects travel behavior beyond the first destination. The location and characteristics of the home and workplace will often be the main drivers of VMT. For example, a residential or office development located near high quality transit will likely lead to some commute trips utilizing transit, affecting mode choice on the rest of the tour.

Characteristics of an office project can also affect an employee's VMT even beyond the work tour. For example, a workplace located at the urban periphery, far from transit, can cause an employee to need to own a car, which in turn affects the entirety of an employee's travel behavior and VMT. For this reason, when estimating the effect of an office development on VMT, it may be appropriate to consider total employee VMT if data and tools, such as tour-based models, are available. This is consistent with CEQA's requirement to evaluate both direct and *indirect* effects of a project. (See CEQA Guidelines § 15064(d)(2).)

Assessing Change in Total VMT

A third method, estimating the *change in total VMT* with and without the project, can evaluate whether a project is likely to divert existing trips, and what the effect of those diversions will be on total VMT. This method answers the question, "What is the net effect of the project on area VMT?" As an illustration, assessing the total change in VMT for a grocery store built in a food desert that diverts trips from more distant stores could reveal a net VMT reduction. The analysis should address the full area over which the project affects travel behavior, even if the effect on travel behavior crosses political boundaries.

Using Models to Estimate VMT

Travel demand models, sketch models, spreadsheet models, research, and data can all be used to calculate and estimate VMT (see Appendix F of the preliminary discussion draft.) To the extent possible, lead agencies should choose models that have sensitivity to features of the project that affect VMT. Those tools and resources can also assist in establishing thresholds of significance and estimating VMT reduction attributable to mitigation measures and project alternatives. When using models and tools for those various purposes, agencies should use comparable data and methods, in order to set up an "apples-to-apples" comparison between thresholds, VMT estimates, and mitigation VMT estimates.

Models can work together. For example, agencies can use travel demand models or survey data to estimate existing trip lengths and input those into sketch models such as CalEEMod to achieve more accurate results. Whenever possible, agencies should input localized trip lengths into a sketch model to tailor the analysis to the project location. However, in doing so, agencies should be careful to avoid double counting if the sketch model includes other inputs or toggles that are proxies for trip length (e.g. distance to city center). Generally, if an agency changes any sketch model defaults, it should record and report those changes for transparency of analysis. Again, trip length data should come from the same source as data used to calculate thresholds, to be sure of an "apples-to-apples" comparison.

Additional background information regarding travel demand models is available in the California Transportation Commission's "2010 Regional Transportation Plan Guidelines," beginning at page 35.

2. Recommendations Regarding Methodology

Proposed Section 15064.3 explains that a "lead agency may use models to estimate a project's vehicle miles traveled…." CEQA generally defers to lead agencies on the choice of methodology to analyze impacts. This section provides suggestions to lead agencies regarding methodologies to analyze vehicle miles traveled associated with a project.

Residential and Office Projects. A tour-based analysis is usually the best way to analyze VMT associated with residential and office projects. Where tour-based models are employed for office project analyses, because workplace location influences overall travel, either employee work tour VMT or VMT from all employee tours may be attributed to the employment center (and the same should be used to set the significance threshold). For this reason, screening maps (discussed in more detail below) using tour-based regional travel demand models can be used where they are available. Where tour-based tools or data are not available for all components of an analysis, an assessment of trip VMT can serve as a reasonable proxy. For example, where research-based evidence on the efficacy of mitigation measures is available for trip-based, then estimating the threshold, analyzing unmitigated project VMT, and mitigation would all need to be undertaken using a trip-based methods, for an apples-to-apples comparison. In this case, home based trips can be the focus for analysis of residential projects; home-based work trips can be the focus of the analysis for office projects.

For office projects that feature a customer component, such as a government office that serves the public, a lead agency can analyze the customer VMT component of the project using the methodology for retail development (see below).

Models and methodologies used to calculate thresholds, estimate project VMT, and estimate VMT reduction due to mitigation should be comparable. For example:

- A tour-based estimate of project VMT should be compared to a tour-based threshold, or a trip-based estimate to a trip-based VMT threshold.
- Where a travel demand model is used to estimate thresholds, the same model should also be used to estimate trip lengths as part of estimating project VMT
- Where only trip-based estimates of VMT reduction from mitigation are available, a trip-based threshold should be used

Retail Projects. Lead agencies should usually analyze the effects of a retail project by assessing the change in total VMT, because a retail projects typically re-route travel from other retail destinations. A retail project might lead to increases or decreases in VMT, depending on previously existing retail travel patterns.

Considerations for All Projects. Lead agencies should not truncate any VMT analysis because of political or other boundaries. CEQA requires environmental analyses to reflect a “good faith effort at full disclosure.” (CEQA Guidelines § 15151.) Thus, where methodologies exist that can estimate the full extent of vehicle travel from a project, the lead agency should apply them to do so. Analyses should also consider both short- and long-term effects on VMT.

C. General Principles to Guide Consideration of VMT Thresholds

The CEQA Guidelines set forth the general rule for determining significance:

> The determination of whether a project may have a significant effect on the environment calls for **careful judgment** on the part of the public agency involved, **based to the extent possible on scientific and factual data**. An ironclad definition of significant effect is not always possible because **the significance of an activity may vary with the setting**. For example, an activity which may not be significant in an urban area may be significant in a rural area.

(CEQA Guidelines § 15064(b) (emphasis added).) SB 743 directs OPR to establish specific "criteria for determining the significance of transportation impacts of projects[.]" (Pub. Resources Code § 21099(b)(1).)

As noted above, CEQA Guidelines Section 15064(b) confirms that context matters in a CEQA analysis. Further, lead agencies have discretion in the precise methodology to analyze an impact. (*See Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal. 3d 376, 409 ("the issue is not whether the studies are irrefutable or whether they could have been better" … rather, the "relevant issue is only whether the studies are sufficiently credible to be considered" as part of the lead agency's overall evaluation).) Therefore, lead agencies may perform multimodal impact analysis that incorporates those technical approaches and mitigation strategies that are best suited to the unique land use/transportation circumstances and specific facility types they are evaluating. For example, pedestrian safety need not be addressed on the mainline portion of a limited access freeway that prohibits pedestrian travel. Likewise, where multimodal transportation is to be expected, analysis might address safety from a variety of perspectives.

To assist in the determination of significance, many lead agencies rely on "thresholds of significance." The CEQA Guidelines define a "threshold of significance" to mean "an identifiable **quantitative, qualitative or performance level** of a particular environmental effect, non-compliance with which means the effect will ***normally*** be determined to be significant by the agency and compliance with which means the effect ***normally*** will be determined to be less than significant." (CEQA Guidelines § 15064.7(a) (emphasis added).) Agencies may adopt their own, or rely on thresholds recommended by other agencies, "provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence." (*Id*. at subd. (c).) Substantial evidence means "**enough relevant information** and reasonable inferences from this information that a fair argument can be made **to support a conclusion**, *even though other conclusions might also be reached*." (*Id*. at § 15384 (emphasis added).)

Thresholds of significance are not a safe harbor under CEQA; rather, they are a starting point for analysis:

> [T]hresholds cannot be used to determine automatically whether a given effect will or will not be significant. Instead, thresholds of significance can be used only as a measure of whether a certain environmental effect "will normally be determined to be significant" or "normally will be determined to be less than significant" by the agency. … In each instance, notwithstanding compliance with a pertinent threshold of significance,

> the agency must still consider any fair argument that a certain environmental effect may be significant.

(*Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal. App. 4th 1099, 1108-1109.)

Finally, just as the determination of significance is ultimately a "judgment call," the analysis leading to that determination need not be perfect. The CEQA Guidelines describe the standard for adequacy of environmental analyses:

> An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to **make a decision which intelligently takes account of environmental consequences**. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is **reasonably feasible**. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The **courts have looked not for perfection** but for **adequacy**, **completeness**, and a **good faith effort** at full disclosure.

(CEQA Guidelines § 15151 (emphasis added).)

These general principles guide OPR's recommendations regarding thresholds of significance for vehicle miles traveled set forth below.

D. Recommendations Regarding Significance Thresholds

Section 21099 of the Public Resources Code states that the criteria for determining the significance of transportation impacts must promote: (1) reduction of greenhouse gas emissions; (2) development of multimodal transportation networks; and (3) a diversity of land uses.

Various state policies establish quantitative greenhouse gas emissions reduction targets. For example:

- Assembly Bill 32 requires statewide greenhouse gas reductions to 1990 levels by 2020, and continued reductions beyond 2020.
- Pursuant to Senate Bill 375, the California Air Resources Board establishes greenhouse gas reduction targets for metropolitan planning organizations to achieve based on land use patterns and transportation systems specified in Regional Transportation Plans and Sustainable Community Strategies. Targets for the largest metropolitan planning organizations range from 13% to 16% reduction by 2035.
- Executive Order B-30-15 sets a GHG emissions reduction target of 40 percent below 1990 levels by 2030.
- Executive Order S-3-05 sets a GHG emissions reduction target of 80 percent below 1990 levels by 2050.
- Executive Order B-16-12 specifies a GHG emissions reduction target of 80 percent below 1990 levels by 2050 specifically for transportation.

- Senate Bill 391 requires the California Transportation Plan support 80 percent reduction in GHGs below 1990 levels by 2050.

Considering these various targets, the California Supreme Court observed:

> Meeting our statewide reduction goals does not preclude all new development. Rather, the Scoping Plan … assumes continued growth and depends on increased efficiency and conservation in land use and transportation from all Californians.

(*Center for Biological Diversity v. California Dept. of Fish & Wildlife* (2015) 2015 Cal. LEXIS 9478.) Indeed, the Court noted that when a lead agency uses consistency with climate goals as a way to determine significance, particularly for long-term projects, the lead agency must consider the project's effect on meeting long-term reduction goals. (*Ibid*.)

The targets described above indicate that we need substantial reductions in existing VMT to curb greenhouse gases, and other pollutants. Those targets do not translate directly into VMT thresholds for individual projects for numerous reasons, however, including the following:

- Some, though not all, of the emissions reductions needed to achieve those targets will be accomplished by other measures, including increased vehicle efficiency and decreased fuel carbon content. The California Air Resources Board's updated Scoping Plan explains: "Achieving California's long-term criteria pollutant and GHG emissions goals will require four strategies to be employed: (1) improve vehicle efficiency and develop zero emission technologies, (2) reduce the carbon content of fuels and provide market support to get these lower-carbon fuels into the marketplace, (3) *plan and build communities to reduce vehicular GHG emissions and provide more transportation options*, and (4) *improve the efficiency and throughput of existing transportation systems*." (California Air Resources Board, Scoping Plan, at p. 46 (emphasis added).) In other words, vehicle efficiency and better fuels are necessary, but insufficient, to address the greenhouse gas emissions from the transportation system. Land use patterns and transportation options must also change.

- New projects alone will not sufficiently reduce VMT to achieve those targets, nor are they expected to be the sole source of VMT reduction.

- Interactions between land use projects, and also between land use and transportation projects, existing and future, together affect VMT.

- Some projects will exhibit significant and unavoidable (above threshold) VMT impacts, while others will exhibit below-threshold VMT.

- Because regional location is the most important determinant of VMT, in some cases, streamlining CEQA review of projects in travel efficient locations may be the most effective means of reducing VMT.

- When assessing climate impacts of land use projects, use of an efficiency metric (e.g., per capita, per employee) may provide a better measure of impact than an absolute numeric threshold. (*Center for Biological Diversity*, *supra*.)

"Each public agency is encouraged to develop and publish thresholds of significance that the agency uses in the determination of the significance of environmental effects." (CEQA Guidelines § 15064.7(a).) Further, "a lead agency may consider thresholds of significance … recommended by other public agencies, provided the decision to adopt those thresholds is supported by substantial evidence." (Id. at subd. (c).) Public Resources Code section 21099 directs OPR to provide guidance on determining the significance of transportation impacts.

To that end, OPR finds, absent any more project-specific information to the contrary, that per capita or per employee VMT fifteen percent below that of existing development may be a reasonable threshold, for the reasons described below. (Note: Lead agencies may apply more stringent thresholds at their discretion (Section 21099).)

First, as described above, Section 21099 states that the criteria for determining significance must "promote the reduction in greenhouse gas emissions." SB 743 also states the Legislature's intent that the analysis of transportation in CEQA better promotes the state's goals of reducing greenhouse gas emissions. It cites in particular the reduction goals in the Global Warming Solutions Act and the Sustainable Communities and Climate Protection Act, both of which call for substantial reductions. As indicated above, the California Air Resources Board established long-term reduction targets for the largest regions in the state that ranged from 13 to 16 percent.

Second, Caltrans has developed a statewide VMT reduction target in its Strategic Management Plan. Specifically, it calls for a 15 percent reduction in per capita VMT, compared to 2010 levels, by 2020.

Third, fifteen percent reductions in VMT are typically achievable at the project level in a variety of place types. (Quantifying Greenhouse Gas Measures, p. 55 CAPCOA, 2010).

Fourth, the *First Update to the AB 32 Scoping Plan* states, "Recognizing the important role local governments play in the successful implementation of AB 32, the initial Scoping Plan called for local governments to set municipal and communitywide GHG reduction targets of 15 percent below then-current levels by 2020, to coincide with the statewide limit" (p. 113).

Achieving 15 percent lower per capita or per employee VMT than existing development is, therefore, both reasonably ambitious and generally achievable. The following pages describe a series of screening thresholds below which a detailed analysis may be not be required. Next, this advisory describes numeric thresholds recommended for various project types. Finally, this advisory describes analysis for certain unique circumstances.

1. Screening Thresholds

Screening Threshold for Small Projects

Many local agencies, including congestion management agencies, have developed screening thresholds (e.g., 100 vehicle trips per day) to indicate when detailed analysis is needed to determine consistency with the congestion management program. Projects that generate few trips will also generally tend to generate low vehicle miles traveled. Absent substantial evidence indicating that a project would generate a potentially significant level of vehicle miles traveled, projects that generate fewer trips than the threshold for studying consistency with a congestion management program, or 100 vehicle trips per day, 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. Therefore, lead agencies can use maps illustrating areas that exhibit below threshold VMT (see recommendations below) to screen out residential and office projects which may not require a detailed VMT analysis. A travel demand model or survey data can provide the existing household or work tour (or home-based or home-based-work) VMT that would be illustrated on such a map. (*See illustration of home-based VMT in the Butte region*.) Note that screening maps illustrating per household VMT (for residential projects) and per employee VMT (for office projects) will typically show below-threshold VMT for these land uses exists over different geographies. For projects that include both residential and office components, lead agencies may use each map as a screen for the respective portion of the project.

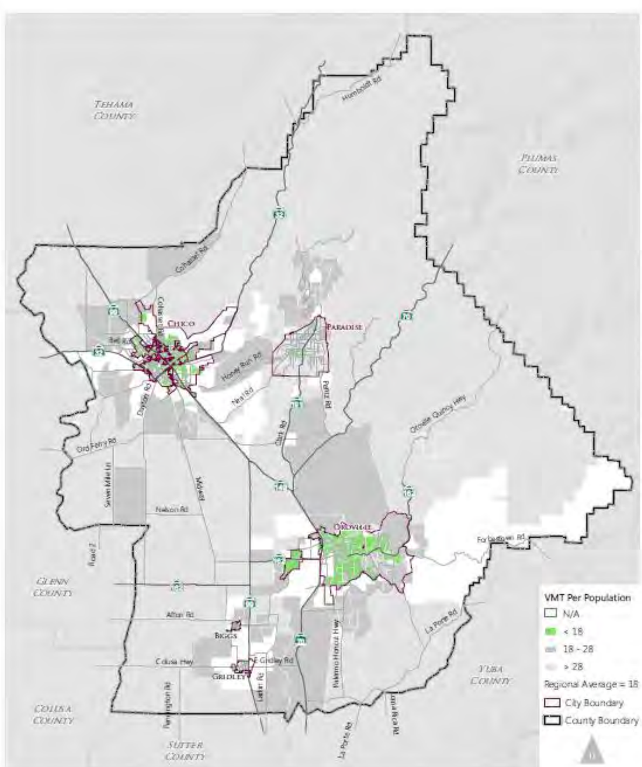

Figure x-x.

Home-Based (HBW & HBO) VMT Produced per Population

Presumption of Less Than Significant Impact Near Transit Stations

Lead agencies generally should presume that residential, retail, and office projects, as well as mixed use projects which are a mix of these uses, proposed within ½ mile of an existing major transit stop[3] or an existing stop along a high quality transit corridor[4] will have a less than significant impact on VMT. This presumption would not apply, however, if project-specific or location-specific information indicates that the project will still generate significant levels of VMT. For example, the presumption might not be appropriate if the project:

- Has a Floor Area Ratio (FAR) of less than 0.75
- Includes more parking for use by residents, customers, or employees of the project than required by the jurisdiction (only for jurisdictions specifying a parking minimum)
- Is inconsistent with the applicable Sustainable Communities Strategy (as determined by the lead agency, with input from the Metropolitan Planning Organization)

If these exceptions to the presumption might apply, the lead agency should conduct a detailed VMT analysis to determine whether the project would exceed VMT thresholds (see below).

2. Recommended Numeric Thresholds for Residential, Office and Retail Projects

Recommended threshold for residential projects: A project exceeding *both*
- Existing *city* household VMT per capita minus 15 percent *and*
- Existing *regional* household VMT per capita minus 15 percent

may indicate a significant transportation impact

Residential development that would generate vehicle travel less than *both* a level of 15 percent below city-wide VMT per capita[5] *and* a level of 15 percent below regional[6] VMT per capita may indicate a less

[3] Pub. Resources Code § 21064.3 ("'Major transit stop' means a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods").
[4] Pub. Resources Code § 21155 ("For purposes of this section, a high-quality transit corridor means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours").
[5] Note, use of an efficiency metric (e.g., per capita) is particularly appropriate when assessing VMT of certain land use projects such as residential and office buildings. (*Center for Biological Diversity*, *supra* ("a significance criterion

than significant transportation impact. (In other words, a project that generates greater than 85 percent of regional per capita VMT, but less than 85 percent of city-wide per capita VMT, would still be considered to have a less than significant transportation impact.) Residential development in unincorporated county areas generating VMT that exceeds 15 percent below VMT per capita in the aggregate of all incorporated jurisdictions in that county, *and* exceeds 15 percent below regional VMT per capita, may indicate a significant transportation impact. These thresholds can be applied to both household (tour-based) VMT and home-based (i.e. trip-based) VMT assessments.

Recommended threshold for office projects: A project exceeding a level of 15 percent below existing *regional VMT per employee* may indicate a significant transportation impact.

Office projects that would generate vehicle travel exceeding 15 percent below existing VMT per employee for the region may indicate a significant transportation impact. In cases where the region is substantially larger than the geography over which most workers would be expected to live, it might be appropriate to refer to a smaller geography, such as the county. Tour-based analysis of office project VMT, for example development of a tour-based screening map, typically should consider either total employee VMT or employee work tour VMT. Where tour-based information is unavailable for threshold determination, project assessment, or assessment of mitigation, home-based work trip VMT may be used throughout the analysis to maintain and “apples-to-apples” comparison.

Recommended threshold for retail projects: A net increase in total VMT may indicate a significant transportation impact

Because new retail development typically redistributes shopping trips rather than creating new trips,[7] estimating the total change in VMT (i.e. the difference in total VMT in the area affected with and without the project) is the best way to analyze a retail project’s transportation impacts.

By adding retail opportunities into the urban fabric and thereby improving retail destination proximity, local-serving retail development tends to shorten trips and reduce VMT. Lead agencies generally, therefore, may presume such development creates a less than significant transportation impact. Regional-serving retail development, on the other hand, which can lead to substitution of longer trips for shorter ones, might tend to have a significant impact. Where such development decreases VMT, lead agencies may consider it to have a less than significant impact.

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framed in terms of efficiency is superior to a simple numerical threshold because CEQA is not intended as a population control measure”).)

[6] As used in these recommendations, the term “regional” refers to the metropolitan planning organization or regional transportation planning agency boundaries within which the project would be located.

[7] Lovejoy et al. 2012.

Many cities and counties define local-serving and regional-serving retail in their zoning codes. Lead agencies may refer to those local definitions when available, but should also consider any project-specific information, such as market studies or economic impacts analyses that might bear on customers' travel behavior. Because lead agencies will best understand their own communities and the likely travel behaviors of future project users, they are likely in the best position to decide when a project will likely be local serving. Generally, however, development including stores larger than 50,000 square feet might be considered regional-serving, and so lead agencies should undertake an analysis to determine whether the project might increase or decrease VMT.

Mixed Use Projects

Lead agencies can evaluate each component of a mixed-use project independently, and apply the significance threshold for each project type included (e.g. residential and retail). In the analysis of each use, a project may take credit for internal capture.

Other Project Types

Residential, office and retail projects tend to have the greatest influence on VMT, and so OPR recommends the quantified thresholds described above for analysis and mitigation. Lead agencies, using more location-specific information, may develop their own more specific thresholds, which may include other land use types. In developing thresholds for other project types, or thresholds different from those recommended here, lead agencies should consider the purposes described in section 21099 of the Public Resources Code, in addition to more general rules in the CEQA Guidelines on the development of thresholds of significance.

Strategies that decrease local VMT but increase total VMT, for example strategies that forego development in one location and lead to it being built in a less travel efficient location, should be avoided.

RTP-SCS Consistency (All Land Use Projects)

Proposals for development outside of areas contemplated for development in a Sustainable Communities Strategy (SCS) may be less travel efficient than most development with the SCS. Further, Section 15125(d) of the CEQA Guidelines provides that lead agencies should analyze impacts resulting from inconsistencies with regional plans. For this reason, development in a location where the Regional Transportation Plan and Sustainable Communities Strategy (RTP/SCS) does not specify any development may indicate a significant impact on transportation.

3. Recommendations Regarding Land Use Plans

As with projects, agencies should analyze VMT outcomes of land use plans over the full area that the plan may substantively affect travel patterns, including beyond the boundary of the plan or jurisdiction geography. Analysis of specific plans may employ the same thresholds described above for projects. The following guidance for significance thresholds applies to General Plans, Area Plans, and Community Plans.

A land use plan may have a significant impact on transportation if it is not consistent with the relevant RTP/SCS. For this purpose, consistency with the SCS means all of the following must be true:

- Development specified in the plan is also specified in the SCS (i.e. the plan does not specify developing in outlying areas specified as open space in the SCS)
- Taken as a whole, development specified in the plan leads to VMT that is equal to or less than the VMT per capita and VMT per employee specified in the SCS

Thresholds for plans in non-MPO areas should be determined on a case-by-case basis.

4. Recommendations Regarding Regional Transportation Plans and Sustainable Communities Strategies

VMT outcomes of RTP/SCSs should be examined over the full area they substantively affect travel patterns, including outside the boundary of the plan geography.

An RTP/SCS achieving per capita VMT reductions sufficient to achieve SB 375 target GHG emissions reduction may constitute a less than significant transportation impact. In non-MPO counties, which do not receive GHG targets under SB 375, an RTP which achieves a reduction in per capita VMT may constitute a less than significant transportation impact.

5. Other Considerations

More Stringent Thresholds at Lead Agency Discretion

Public Resources Code section 21099 provides that a lead agency may adopt thresholds that are more protective of the environment than those that OPR recommends. Note that in some cases, streamlining projects in VMT-efficient locations may lead to larger VMT reductions than requiring VMT mitigation, by facilitating and thus increasing the share of location-efficient development.

Rural Projects Outside MPOs

In rural areas of non-MPO counties (i.e. areas not near established or incorporated cities or towns), fewer options may be available for reducing VMT, and significance thresholds may be best determined on a case-by-case basis. Note, however, that clustered small towns and small town main streets may have substantial VMT benefits compared to isolated rural development, similar on a percent per capita reduction basis as transit oriented development described above. Therefore, evaluating per capita VMT is still recommended.

Impacts to Transit

Because criteria for determining the significance of transportation impacts must promote "the development of multimodal transportation networks," lead agencies should consider project impacts to transit systems and bicycle and pedestrian networks. For example, a project that blocks access to a transit stop or blocks a transit route itself may interfere with transit functions. Lead agencies should consult with transit agencies as early as possible in the development process, particularly for projects that locate within one half mile of transit stops.

When evaluating impacts to multimodal transportation networks, lead agencies generally should not treat the addition of new users as an adverse impact. Any travel-efficient infill development is likely to add riders to transit systems, potentially slowing transit vehicle mobility, but also potentially improving overall destination proximity. Meanwhile, such development improves regional vehicle flow generally by loading less vehicle travel onto the regional network than if that development was to occur elsewhere.

Increased demand throughout a region may, however, cause a cumulative impact by requiring new or additional transit infrastructure. Such impacts may be best addressed through a fee program that fairly allocates the cost of improvements not just to projects that happen to locate near transit, but rather across a region to all projects that impose burdens on the entire transportation system.

E. Recommendations for Considering Transportation Project VMT Effects

A transportation project changes travel patterns and affects VMT. For example, a project that facilitates active transportation can cause mode shift away from automobile use, resulting in a reduction in VMT. Meanwhile, a roadway project can facilitate automobile travel, leading to more VMT. While CEQA does not require perfection in impact measurement, it is important to make a reasonably accurate estimate of effects on VMT from transportation projects in order to make reasonably accurate estimates of GHGs and other impacts associated with VMT.

Projects that would likely lead to an increase in VMT, and therefore should undergo analysis (including for purposes of accurately estimating GHG and other impacts that are affected by VMT), generally include:

- Addition of through lanes on existing or new highways, including general purpose lanes, HOV lanes, peak period lanes, auxiliary lanes, and lanes through grade-separated interchanges

Projects that would not likely lead to a substantial or measureable increase in VMT, and therefore should not require analysis, generally include:

- Rehabilitation, maintenance, replacement and repair projects designed to improve the condition of existing transportation assets (e.g., highways, roadways, bridges, culverts, tunnels, transit systems, and assets that serve bicycle and pedestrian facilities) and that do not add additional motor vehicle lanes
- Roadway shoulder enhancements to provide "breakdown space," otherwise improve safety or provide bicycle access
- Addition of an auxiliary lane of less than one mile in length designed to improve roadway safety
- Installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left, right, and U-turn pockets, or emergency breakdown lanes that are not utilized as through lanes
- Addition of roadway capacity on local or collector streets provided the project also substantially improves conditions for pedestrians, cyclists, and, if applicable, transit
- Conversion of existing general purpose lanes (including ramps) to managed lanes or transit lanes, or changing lane management in a manner that would not substantially decrease impedance to use
- Reduction in number of through lanes, e.g. a "road diet"
- Grade separation to separate vehicles from rail, transit, pedestrians or bicycles, or to replace a lane in order to separate preferential vehicles (e.g. HOV, HOT, or trucks) from general vehicles
- Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority (TSP) features
- Traffic metering systems
- Timing of signals to optimize vehicle, bicycle or pedestrian flow
- Installation of roundabouts
- Installation or reconfiguration of traffic calming devices
- Adoption of or increase in tolls
- Addition of tolled lanes, where tolls are sufficient to mitigate VMT increase (e.g., encourage carpooling, fund transit enhancements like bus rapid transit or passenger rail in the tolled corridor)
- Initiation of new transit service
- Conversion of streets from one-way to two-way operation with no net increase in number of traffic lanes
- Removal of off-street parking spaces
- Adoption or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs).
- Addition of traffic wayfinding signage
- Rehabilitation and maintenance projects that do not add motor vehicle capacity
- Any lane addition under 0.3 miles in length, including addition of any auxiliary lane less than 0.3 miles in length

Causes of Induced VMT. Induced VMT occurs where roadway capacity is expanded in a congested area, leading to an initial appreciable reduction in travel time. With lower travel times, the modified facility becomes more attractive to travelers, resulting in the following trip-making changes, which have implications for total VMT:

- **Longer trips.** The ability to travel a long distance in a shorter time increases the attractiveness of destinations that are further away, increasing trip length and VMT.
- **Changes in mode choice.** When transportation investments are devoted to reducing automobile travel time, travelers tend to shift toward automobile use from other modes, which increases VMT.
- **Route changes.** Faster travel times on a route attract more drivers to that route from other routes, which can increase or decrease VMT depending on whether it shortens or lengthens trips.
- **Newly generated trips.** Increasing travel speeds can induce additional trips, which increases VMT. For example, an individual who previously telecommuted or purchased goods on the internet might choose to accomplish those ends via automobile trips as a result of increased speeds.
- **Land Use Changes.** Faster travel times along a corridor lead to land development further along that corridor; that development generates and attracts longer trips, which increases VMT. Over several years, this component of induced VMT can be substantial, e.g. approximately half of the total effect on VMT.

These effects operate over different time scales. For example, changes in mode choice might occur immediately, while land use changes typically take a few years or longer. CEQA requires analysis to address both short term and long term effects.

Applying tolls to additional capacity will generally reduce the amount of additional VMT that results from adding that capacity. This is because tolls, like congestion, act as an "impedance factor" for traffic volumes in the lane. Because of the impedance effect, tolling can also be used to maintain free flow in a lane and keep it from becoming congested, resulting in the counterintuitive effect of impedance increasing flow. Studies have shown that *net* benefit from tolling improving vehicle flow can be greater than the sum of the tolls collected, leaving the tolls funds themselves as additional benefit that might be invested in transportation options.

Evidence of Induced VMT. A large number of peer reviewed studies have demonstrated a causal link between highway capacity increases and VMT increases. Of these, approximately twenty provide a quantitative estimate of the magnitude of the induced VMT phenomenon; of those, nearly all find substantial induced VMT.

Most of these studies express the amount of induced VMT as an "elasticity," which is a multiplier that describes the additional VMT resulting from an additional lane mile of roadway capacity added. For example, an elasticity of 0.8 would signify a 0.8 percent increase in VMT for every 1.0 percent increase in lane miles. Many distinguish "short run elasticity" (increase in vehicle travel in the first few years) from "long run elasticity" (increase in vehicle travel beyond the first few years). Long run elasticity is typically larger than short run elasticity, because as time passes, more of the components of induced VMT materialize. Generally, short run elasticity can be thought of as excluding the effects of land use change, while long run elasticity includes them. Most studies find a long run elasticity between 0.6 and just over 1.0 (California Air Resources Board *DRAFT Policy Brief on Highway Capacity and Induced Travel*, p. 2.), meaning that for every increase in capacity of one lane-mile there is a concomitant increase in VMT of 0.6 to 1.0 lane miles. The most recent major study (Duranton and Turner, 2011) reveals an elasticity of VMT by lanes miles of 1.03; in other words, each lane mile built resulted in 1.03 additional miles of vehicle travel. (An elasticity greater than 1.0 can occur because new lanes leverage travel behavior beyond just the project location.) In CEQA analysis, the long-run elasticity should be used, as it captures the full effect of the project rather than just the early-stage effect.

Quantifying Induced VMT Using Models. Lead agencies can use the methodology provided below for most projects that increase roadway capacity. However, where a roadway capacity project may exhibit an unusual characteristic or be set in an unusual context, a travel demand model and other tools may be used to estimate VMT resulting from the project. If such analysis indicates a change in VMT per change in lane miles that is outside the range found in literature, reasons for the discrepancy should be discussed in the CEQA document.

Proper use of a travel demand model will yield a reasonable estimate of short run induced VMT, generally including the following components:

- Trip length (generally increases VMT)
- Mode shift (generally shifts from other modes towards automobile use, increasing VMT)
- Route changes (can act to increase or decrease VMT)
- Newly generated trips (generally increases VMT) (Note that not all travel demand models have sensitivity to this factor, so an off-model estimate may be necessary if this effect could be expected to be substantial.)

However, estimating long run induced VMT also requires an estimate of effects of the project on land use. This component of the analysis is important because it has the potential to be a large component of the effect. Options for estimating and incorporating the VMT effects that precipitate from land use changes resulting from the project include:

1. *Employ a land use model, running it iteratively with a travel demand model.* A land use model (such as a PECAS model) can be used to estimate the effects of a roadway capacity increase, and the traffic patterns that result from the land use change can be fed back into the travel demand model.
2. *Employ an expert panel.* In place of a model, an expert panel can estimate land use development resulting from the project. Once developed, the estimates of land use changes can then be analyzed by the travel demand model to assess VMT effects. (See, e.g., *Conservation Law Found. v. FHA* (2007) 630 F. Supp. 2d 183.)

3. *Acknowledge omission of land use in VMT analysis, and adjust results to align with the empirical research.* The travel demand model analysis can be performed without an estimate of land use changes, and then the results can be compared to empirical studies of induced VMT found in the types of studies described above. If the modeled elasticity falls outside of that range, then the VMT estimate can be adjusted to fall within the range, or an explanation can be provided describing why the project would be expected to induce a different amount of VMT than a typical project. (For an example of an EIR that includes a number of these elements, see *Interstate 5 Bus/Carpool Lanes Project Final EIR, pp. 2-52 to 2-56.*)

In all cases, any limitation or known lack of sensitivity in the analysis that might cause substantial errors in the VMT estimate, e.g. model insensitivity to one of the components of induced VMT described above, should be disclosed and characterized, and a description should be provided on how it could influence the analysis results. A discussion of the potential error or bias should be carried also into analyses that rely on the VMT analysis, such as greenhouse gas emissions, air quality, and noise.

1. Recommended Significance Threshold for Transportation Projects

As explained above, Public Resources Code section 21099 directs OPR to recommend criteria for evaluating transportation impacts that promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses. These criteria would apply to all project types. This section of the technical advisory addresses criteria appropriate for transportation projects.

Transportation, including upstream (e.g. refinery) emissions, accounts for over half of California's greenhouse gas emissions. Achieving California's emissions reduction goals (described above) will, therefore, require steep reductions in emissions from the transportation sector. For example, the California Air Resources Board describes a scenario achieving the reduction goals set forth in Executive Order B-30-15 from the transportation sector in a fact sheet, *Cutting Petroleum Use in Half by 2030.* In sum, achieving those goals will require improving vehicle efficiency, reducing fuel carbon content, and improving travel efficiency (i.e. reducing VMT). Even with steep improvements in vehicle efficiency, a significant shift to zero emissions vehicles and sharp reductions in the carbon content of fuels, total statewide VMT could increase no more than 4 percent over 2014 levels.

Assuming, based on that information, that statewide VMT can increase up to 4 percent without obstructing California's long-term emissions reduction goals, we can determine a total increment of allowable increased VMT.

Therefore:

4% x [2014 statewide total VMT] = [Total Allowable VMT Increment]

This VMT increment can be divided among transportation projects expected to be completed by 2030 in order to determine a project-level VMT threshold:

[Total Allowable VMT Increment] / [Number of projects through 2030] = [Project VMT Threshold]

A project that leads to an addition of more VMT than the Project VMT Threshold may indicate a significant impact on VMT.

Following is an initial estimate of a recommended Transportation Project VMT Threshold:

California Statewide VMT (2014)	185,320,000,000 VMT/year
Allowable increase by 2030 (4 percent)	7,412,800,000 VMT/year
Estimated total transportation projects in California, expected completion date 2015-2030	3,572 Projects[8]
Fair share VMT per transportation project	2,075,220 VMT/year

2. Estimating VMT Impacts from Transportation Projects

CEQA requires analysis of a project's potential growth-inducing impacts. (Public Resources Code § 21100(b)(5); State CEQA Guidelines, § 15126.2(d).) Many agencies are familiar with the analysis of growth inducing impacts associated with water, sewer and other infrastructure. This technical advisory addresses growth that may be expected from roadway expansion projects.

Because a roadway expansion project can induce substantial VMT, incorporating estimates of induced VMT is critical to calculating both transportation and other impacts of these projects. Induced VMT also has the potential to reduce or eliminate congestion relief benefits, and an accurate estimate of it is needed to accurately weigh costs and benefits of a highway capacity expansion project.

VMT effects should be estimated using the *change in total VMT* method (as described in the previous section *Technical Considerations in Assessing Vehicle Miles Traveled/Considerations in what VMT to count*). This means that an assessment of total VMT without the project, and an assessment with the project, should be made; the difference between the two is the amount of VMT attributable to the project. The assessment should cover the full area in which driving patterns are expected to change; as with other types of projects, VMT estimation should not be truncated at a modeling or political boundary for convenience of analysis when travel behavior is substantially affected beyond that boundary.

[8] This preliminary estimate is based on a population-based extrapolation of SCAG's project list (SCAG's project list contains 1728 projects expected to be completed 2015-2030, and the SCAG region contains 48.4 percent of the population.) Agencies with more complete or specific data may use that data.

Transit and Active Transportation Projects

Transit and active transportation projects generally reduce VMT and therefore are presumed to cause a less than significant impact on transportation. This presumption may apply to all passenger rail projects, bus and bus rapid transit projects, and bicycle and pedestrian infrastructure projects. Streamlining transit and active transportation projects aligns with each of the three statutory goals by reducing GHG emissions, increasing multimodal transportation networks, and facilitating mixed use development.

Roadway Projects

Reducing roadway capacity (i.e. a "road diet") will generally reduce VMT and therefore is presumed to cause a less than significant impact on transportation.

Building new roadways, adding roadway capacity in congested areas, or adding roadway capacity to areas where congestion is expected in the future, typically induces additional vehicle travel. For the types of projects indicated previously as likely to lead to additional vehicle travel, an estimate should be made of the change in VMT resulting from the project.

For projects that increase roadway capacity, lead agencies can evaluate the potential induced VMT by applying the results of existing studies that examine the magnitude of the increase of VMT resulting from a given increase in lane miles. These studies estimate the percent change in VMT for every percent change in miles to the roadway system ("elasticity") (see U.C. Davis, Institute for Transportation Studies, "Increasing Highway Capacity Unlikely to Relieve Traffic Congestion," (October 2015); Boarnet and Handy, "Impact of Highway Capacity and Induced Travel on Passenger Vehicle Use and Greenhouse Gas Emissions," California Air Resources Board Policy Brief, September 30, 2014). Given that lead agencies have discretion in choosing their methodology, and the studies on induced travel reveal a range of elasticities, lead agencies may appropriately apply professional judgment in studying the effect of a particular project. The most recent major study (Duranton and Turner, 2011), estimates an elasticity of 1.0, meaning that every percent change in lane miles results in a 1 percent increase in VMT.

To estimate VMT impacts from roadway expansion projects:

1. Determine the total lane-miles over an area that fully captures travel behavior changes resulting from the project (e.g. generally the region; for projects affecting interregional travel, all affected regions)
2. Determine the percent change in total lane miles that will result from the project
3. Determine the total existing VMT over that same area
4. Multiply the percent increase in lane miles by the existing VMT, and then by the elasticity from the induced travel literature:

[% increase in lane miles] x [existing VMT] x [elasticity] = [VMT resulting from the project]

Because the research providing these elasticity estimates was undertaken in congested urban regions, this method should be applied only within MPOs; it would not be suitable for rural (non-MPO) locations in the state.

Certain roadway capacity projects might be expected to induce greater or lesser VMT than typical projects; some will even reduce VMT. For example, adding an extra lane to an especially critical and congested link (e.g. the San Francisco Bay Bridge) may leverage VMT growth far beyond that link, increasing VMT to a greater degree. On the other hand, adding a link that greatly improves connectivity (i.e. provides drivers a shorter route in exchange for a longer one) may in select cases reduce total VMT. Such projects may require more detailed analysis using models, and execution of this analysis requires a more nuanced understanding of the factors involved in induced VMT.

This section assists lead agencies in determining the significance of VMT impacts by referencing statewide goals established to achieve the greenhouse gas emissions reduction scientists say is needed to avert global environmental catastrophe. The method for determining the significance of transportation projects described in this section could also be applied at a programmatic level in a regional planning process. In that case, lead agencies could tier from that analysis to streamline later analysis at the project level. (See State CEQA Guidelines Section 15168.) For example, the total expected statewide increase in VMT that would allow for attainment of statewide greenhouse gas emissions reductions could be divided between regions by population to determine a regional-level "threshold." That program-level analysis of VMT would include effects of the program and its constituent projects on land use patterns, and the VMT that results from those land use effects. In determining whether a program-level document adequately analyzes potential induced demand, lead agencies should note that analyses that assume a fixed land use pattern, and which does not vary in response to the provision of roadway capacity, do not fully account for induced VMT from a project or program of roadway capacity expansion. On the other hand, where the analysis accounts for land use investment and development pattern changes that react in a reasonable manner to changes in accessibility created by transportation infrastructure investments (whether at the project or program level), the resulting changes in VMT might provide an appropriate basis for tiering.

Mitigation and alternatives.

Induced VMT has the potential to reduce or eliminate congestion relief benefits, increase VMT, and increase other environmental impacts that result from vehicle travel. If those effects are significant, the lead agency will need to consider mitigation or alternatives. In the context of increased travel induced by capacity increases, appropriate mitigation and alternatives that a lead agency might consider include the following:

- Tolling new lanes to encourage carpools and fund transit improvements
- Converting existing general purpose lanes to HOV or HOT lanes
- Implementing or funding travel demand management offsite
- Implementing Intelligent Transportation Systems (ITS) strategies to improve passenger throughput on existing lanes

Tolling and other management strategies can have the additional benefit of preventing congestion and maintaining free-flow conditions, conferring substantial benefits to road users as discussed above.

F. Analyzing Safety Impacts Related to Transportation

Public Resources Code section 21099 suggests that while automobile delay is not an environmental impact, lead agencies may still evaluate project impacts related to safety. The CEQA Guidelines currently suggest that lead agencies examine projects' potential to "[s]ubstantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)".

As with any other potential impact, CEQA requires lead agencies to make a judgment call "based to the extent possible on scientific and factual data." (State CEQA Guidelines § 15064(b).) Also like any other potential impact, "the significance of an activity may vary with the setting." (Ibid.) Lead agencies must base their evaluations of safety on objective facts, and not personal or subjective fears. The purpose of this section is to review some relevant considerations in evaluating potential transportation-related safety impacts.

Transportation by its nature involves some degree of collision risk. Every project will affect transportation patterns, and as a result may involve some redistribution of that risk.

Lead agencies may consider whether a project may cause substantially unsafe conditions for various roadway users. This section is not intended to provide a comprehensive list of potential transportation safety risks, but rather guidance on how to approach safety analysis given numerous potential risks.

Generally:

- Safety analysis in CEQA should focus on risk of fatality or injury, rather than property damage.
- Lead agencies should focus on concerns that affect many people, not just an individual.

- The potential safety concern must relate to actual project conditions, and not stem solely from subjective fears of an individual.
- Safety analysis in CEQA should focus on undue risks that can be reduced without adding other risks, particularly without increasing risk to vulnerable road users. (State CEQA Guidelines § 15126.2(a)(1)(D).) Safety analysis and mitigation under CEQA should not undermine overall public health, e.g. by reducing the physical activity benefits of active transportation.
- In analyzing safety, lead agencies should note that automobile delay in not an indication of environmental impact. (Pub. Resources Code § 21099(b)(2).)

In the past, transportation safety has focused on streamlining automobile flow and accommodating driver error, sometimes confounding motor vehicle mobility and speed with transportation system safety. An updated and more holistic approach has developed over the past decade, however. This updated approach focuses on three overlapping strategies:

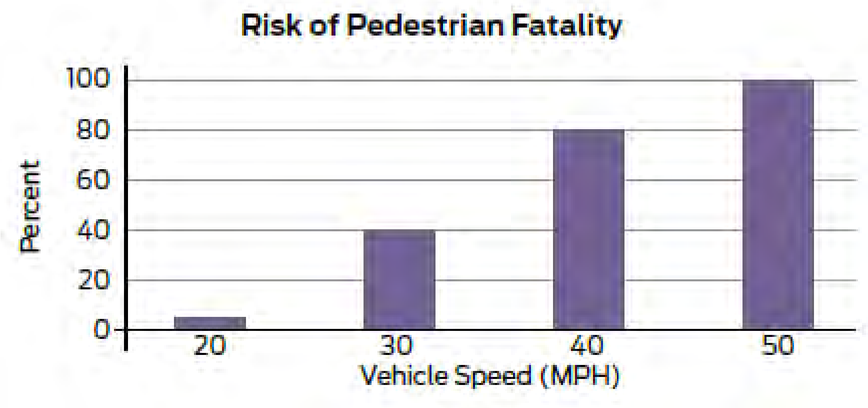
- Reduce speed and increase driver attention
- Protect vulnerable road users
- Reduce overall VMT and sprawl (see Ewing et al. (2003) below for definition of "sprawl")

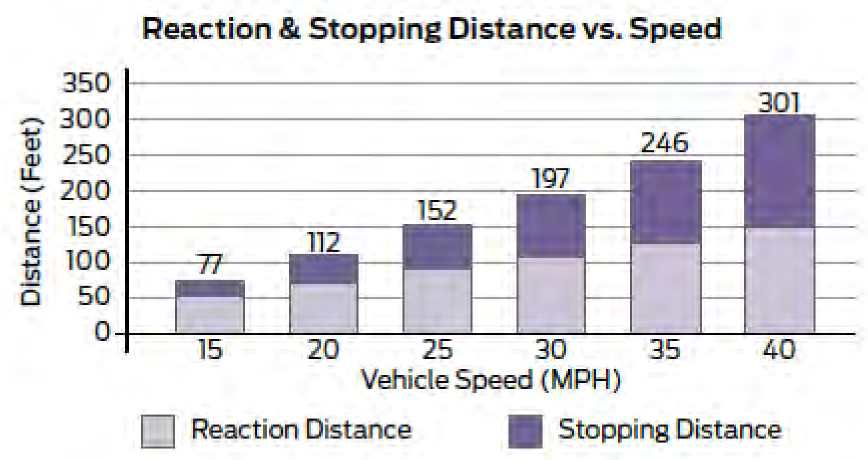
Newer design guidance builds on more recent research on transportation safety and articulates this updated approach. For example, the NACTO guidelines (which have been endorsed by Caltrans, as well as the cities of Davis, Oakland, San Francisco, San Diego, and San Mateo) state:

> "Conventional street design is founded in highway design principles that favor wide, straight, flat and open roads with clear zones that forgive and account for inevitable driver error. This is defined as "passive" design. In recent years a new paradigm has emerged for urban streets called proactive design. A proactive approach uses design elements to affect behavior and to lower speeds. Embracing proactive design may be the single most consequential intervention in reducing pedestrian injury and fatality. Since human error is inevitable, reducing the consequences of any given error or lapse of attention is critical. Cities around the country that have implemented measures to reduce and stabilize speed have shown a reduction in serious injuries and deaths for everyone on the road, from drivers to passengers to pedestrians."

Reducing Speed and Increasing Driver Attention

Vehicle speed plays a fundamental role in transportation safety. The NACTO Urban Street Design Guide, reports: "Vehicle speed plays a critical role in the cause and severity of crashes." Two charts from those guidelines below show risk associated with motor vehicle speeds.





Source: NACTO Urban Street Design Guide Overview

Higher speeds increase both the likelihood and severity of collisions. (Elvik (2005).) According to Elvik:

- "Speed is likely to be the single most important determinant of the number of traffic fatalities."
- "…[S]peed has a major impact on the number of accidents and the severity of injuries and that the relationship between speed and road safety is causal, not just statistical."
- "Changes in speed are found to have a strong relationship to changes in the number of accidents or the severity of injuries."
- "The relationship between speed and road safety is robust and satisfies all criteria of causality commonly applied in evaluation research."

Regardless of posted speed limits, designing roads to accommodate higher speeds safely actually leads to higher speeds. Except on limited access highways (i.e. freeways), widening and straightening roads does not increase safety. "Wider and straighter roadways lead motorists to travel at higher speeds, thus offsetting any safety benefits associated with increased sight distances." (Dumbaugh et al., 2009, citing Aschenbrenner & Biehl, 1994; Wilde, 1994).

Dumbaugh et al. (2009) breaks the problem down into its constituent parts, (1) crash incidence and (2) crash severity:

> "The safety problem with urban arterials can best be understood as a product of systematic design error. Widening and straightening these roadways to increase sight distances also has the effect of enabling higher operating speeds, which in turn increase stopping sight distance, or the distance a vehicle travels from the time when a driver initially observes a hazard, to the time when he or she can bring the vehicle to a complete stop. Higher stopping sight distances pose little problem when vehicles are traveling at relatively uniform speeds and have few reasons for braking. When these operating conditions can be met, as they are on grade-separated freeways, higher operating speeds have little or no effect on crash incidence.
>
> "But these operating conditions typically cannot be met on urban surface streets, where pedestrians, bicyclists, and crossing vehicles are all embedded in the traffic mix. Avoiding crashes under these conditions often requires motorists to bring their vehicles to a quick stop, which higher operating speeds and stopping sight distances make more difficult (Dumbaugh, 2005b; 2006…). The result is a systematic pattern of error in which drivers are unable to adequately respond to others entering the roadway, leading to increased crash incidence."

Dumbaugh et al. also points out that speed reduction requires design features and/or commercial vibrancy and activity that provide cues to motorists to slow their vehicle's speed, rather than simply a slower posted speed limit:

> "…placing commercial uses on arterial thoroughfares created a pedestrian safety problem... In practice, the solution to this problem in the United States has been to continue to locate such uses on arterial thoroughfares, but to reduce posted speed limits. In the absence of aggressive police enforcement, however, such practices have been uniformly unsuccessful at reducing vehicle operating speeds (Armour, 1986; Beenstock, Gafni, & Goldin, 2001; Zaal, 1994). The principal alternative, adopted by European designers, is to design urban surface streets to reduce vehicle speeds to safe levels.
>
> "We found pedestrian-scaled retail (the type of retail that was abandoned during the postwar period) to be associated with reductions in all types of crashes, and at significant levels for both total and injurious crashes. This is consistent with recent research on the subject, which finds that the pedestrian-scaled nature of these environments communicate to motorists that greater caution is warranted, leading to increased driver vigilance, lower operating speeds, and thus a better preparedness to respond to potential crash hazards that may emerge. The effective result is a reduction in crash incidence (Dumbaugh, 2005a; 2005b; 2006b; Garder, 2004; Naderi, 2003; Ossenbruggen, Pendharkar & Ivan, 2001)." (Dumbaugh et al. 2009, p. 323)

Dumbaugh et al. concludes that, except for limited-access freeways, reducing speeds is essential for safety, and also helps create livability:

> "In areas where pedestrian activity is present or expected, or where eliminating a roadway's access function [to businesses, residences, jobs, etc.] is either undesirable or inappropriate, the primary alternative to access management is to reduce operating speeds to levels that are compatible with the street's access-related functions (see Figure 8). This approach, sometimes referred to as the livable street approach, incorporates design features that encourage lower operating speeds, such as making buildings front on the street, incorporating aesthetic street lighting or landscaping along the roadside, enhancing the visual quality of pavement and signage, and adopting traffic calming or intersection control measures. In short, livable streets

> emphasize access over mobility. When compared to conventional arterial treatments, livable streets report roughly 35–40% fewer crashes per mile traveled, and completely eliminate traffic-related fatalities (Dumbaugh, 2005a; Naderi, 2003)." (Dumbaugh, 2009, p. 325)

Providing greater clear space around a roadway, e.g. wider shoulders or clearing trees, can lead to degraded driver attention, in addition to higher speeds. "In dense urban areas, less-"forgiving" design treatments—such as narrow lanes, traffic-calming measures, and street trees close to the roadway—appear to enhance a roadway's safety performance when compared to more conventional roadway designs. The reason for this apparent anomaly may be that less-forgiving designs provide drivers with clear information on safe and appropriate operating speeds" (Ewing and Dumbaugh, 2009). Greater accommodation of driver error especially increases risk to vulnerable road users such as pedestrians and cyclists.

Lane width has a particularly discernable impact on safety. The traditional approach to sizing lanes opts for wider lanes to accommodate driver error and to attempt to increase throughput. However, research reveals that wider lanes hinder both of these objectives. Karim (2015) examined the relationship between lane width and crash rates. A number of findings were corroborated across cities:

- Wider lanes (over 10.8 to 11.2 feet) are associated with 33% higher impact speeds and higher crash rates.
- Both narrow (less than 9.2 feet) and wide (over 10.2 to 10.5 feet) lanes have proven to increase crash risks, with equal magnitude. Wider lanes (wider than 10.8 feet) adversely affect overall side-impact collisions.
- The overall capacity of narrower lanes is higher.
- For large vehicles, no difference on safety and carrying capacity is observed between narrower and wider lanes.
- Pedestrian volumes decline as lanes widen.
- Intersections with narrower lanes provide the highest capacity for bicycles.

The study finds that driver behavior is impacted by the street environment, and narrower lanes in urban areas result in less aggressive driving and more ability to slow or stop a vehicle over a short distance to avoid collision. It also points out that co-benefits of narrower lanes include utilization of space to provide an enhanced public realm, including cycling facilities and wider sidewalks, or to save money on the asphalt not used by motorists. (Karim, 2015)

Yeo et al (2014) summarizes past studies that show both reducing intersection density and widening traffic lanes to worsen safety:

> "Wider traffic lanes turn out to be the reason for a higher risk of fatal crashes (Noland and Oh 2004), whereas a street with a narrower curb-to-curb distance is relatively safe (Gattis and Watts 1999). Areas with a high level of intersection density also tend to have fewer fatal crashes (Ladron de Gue- vara et al. 2004). According to Ewing and Dumbaugh (2009), the aforementioned road designs and street patterns create a less forgiving environment for drivers and thus help decrease traffic speed." (Yeo et al., 2014, p. 402)

Numerous studies found that narrowing lanes from today's standard practice would improve safety. However, one multi-state study found three specific circumstances where narrower lanes did not increase safety in all states studied, but only some of them. The following is provided as a caveat:

> "The research found three situations in which the observed lane width effect was inconsistent—increasing crash frequency with decreasing lane width in one state and the opposite effect in another state. These three situations are:
>
> - lane widths of 10 feet or less on four-lane undivided arterials.
> - lane widths of 9 feet or less on four-lane divided arterials.
> - lane width of 10 feet or less on approaches to four-leg STOP-controlled arterial intersections.
>
> "Because of the inconsistent findings mentioned above, it should not be inferred that the use of narrower lane must be avoided in these situations. Rather, it is recommended that narrower lane widths be used cautiously in these situations unless local experience indicates otherwise." (Potts, et al. 2007)

Protecting Vulnerable Road Users

To the extent that a lead agencies address safety in a CEQA analysis, the focus must be on protecting people. Thus, for example, lead agencies might analyze how a land use project or transportation infrastructure project that increases traffic speeds may burden its travel-shed with additional, undue risk. These risks might be mitigated by, for example, (1) reducing motor vehicle travel speeds, (2) increasing driver attention, (3) protecting vulnerable road users (e.g. providing a protected, Class IV bicycle path and/or shortening pedestrian crossing distances and providing pedestrian refuges and bulb-outs), or (4) reducing VMT by providing VMT mitigation. Mitigation should avoid creating additional risk to vulnerable road users and it should not reduce active transportation mode accessibility or connectivity.

Generally speaking, the safety of vulnerable road users (e.g. pedestrians and bicyclists) should be given relatively more attention, due to their vastly increased risk of serious injury and fatality. Also, policy and planning priorities to encourage multimodal and low-carbon travel, and improving safety is a key step in increasing use of those modes. Where there are safety tradeoffs, therefore, it is important to prioritize protection of vulnerable road users. Impacts to potential vulnerable road users should be considered whether or not specific facilities for those users are present.

Active transportation has substantial health benefits, so restricting pedestrian or bicycle access and connectivity in order to reduce collision risk may worsen overall health outcomes. And, any decision about whether to apply a safety measure that restricts access by pedestrians and cyclists should consider (1) the reduction in walking and biking that will result, and the resulting reduction in "safety in numbers" as well as overall health, and (2) the risk created by pedestrians or cyclists subverting the design purpose for convenience (e.g. crossing a street where prohibited) that might lead to additional safety risk.

Reducing overall VMT and Sprawl

Higher total amounts of motor vehicle travel creates higher crash exposure. Reducing vehicle miles traveled reduces collision exposure and improves safety (Dumbaugh and Rae, 2009, p. 325; Ewing, Scheiber, and Zegeer, 2003). As a result, infill development, which exhibits low VMT, itself provides safety benefits by reducing motor vehicle collision exposure, lowering speeds, and increasing pedestrian and cyclist volumes leading to "safety in numbers" (in addition to improving overall health broadly and substantially).

The fundamental relationship between VMT and safety is summarized by Yeo et al. (2014):

> "Multiple traffic safety studies showed that higher VMT was positively associated with the occurrence of traffic crashes or fatalities (e.g., Ewing et al. 2002, 2003; NHTSA 2011). The causal relationship between the mileage of total vehicle trips and crash occurrences can be explained by probability. With higher VMT, it is more likely that more crashes will occur (Jang et al. 2012)."

Sprawl-style development has also been shown to lead to elevated crash risk. The cause lies both in higher VMT levels and in design variables which influence speed and driver behavior (Yeo 2014). Ewing et al. (2003) points out that "[s]uburban and outlying intersections have been significantly overrepresented in pedestrian crashes compared with more urban areas, after control for exposure and other location factors."

More generally, Ewing et al. (2003) reveals that sprawl development (measured by (1) lowness of density, (2) lack of mixing of uses, (3) absence of thriving activity centers such as strong downtowns or suburban town centers, and (4) largeness of block sizes and poorness of street connectivity) leads to elevated transportation risk levels:

> "Our study indicates that sprawl is a significant risk factor for traffic fatalities, especially for pedestrians. The recognition of this relationship is key; traffic safety can be added to the other health risks associated with urban sprawl—namely, physical inactivity and air and water pollution.
>
> "…Sprawling areas tend to have wide, long streets that encourage excessive speed. A pedestrian struck by a motor vehicle traveling at 40 mph has an 85% chance of being killed, compared with a 45% chance of death at 30 mph and a 5% chance at 20 mph. Thus, developing land in a more compact manner may reduce pedestrian deaths, provided that the street network is designed for lower-speed travel."

Ewing et al. (2003) further demonstrates that, on the whole, counties characterized by the most sprawling land use patterns exhibit substantially higher crash risk (between four and five times the all-mode fatality rate) compared to the most compact counties:

TABLE 2—US Counties With Highest and Lowest Sprawl Index Values

	County	Metropolitan Area	Sprawl Index[a]	All-Mode Traffic Fatality Rate (per 100 000)
1	New York County, NY	New York	352.07	4.42
2	Kings County, NY	New York	263.65	4.46
3	Bronx County, NY	New York	250.72	4.20
4	Queens County, NY	New York	218.90	4.58
5	San Francisco County, Calif	San Francisco	209.27	6.31
6	Hudson County, NJ	Jersey City	190.06	5.91
7	Philadelphia County, Pa	Philadelphia	187.78	8.04
8	Suffolk County, Mass	Boston-Lawrence-Salem	179.37	4.49
9	Richmond County, NY	New York	162.89	5.63
10	Baltimore City, Md	Baltimore	162.76	7.68
439	Stokes County, NC	Greensboro-Winston-Salem-High Point	71.26	15.66
440	Miami County, Kans	Kansas City	71.03	38.80
441	Davie County, NC	Greensboro-Winston-Salem-High Point	70.99	25.84
442	Isanti County, Minn	Minneapolis-St Paul	70.12	12.78
443	Walton County, Ga	Atlanta	69.61	19.77
444	Yadkin County, NC	Greensboro-Winston-Salem-High Point	69.17	38.52
445	Goochland County, Va	Richmond-Petersburg	67.59	35.58
446	Fulton County, Ohio	Toledo	66.83	38.02
447	Clinton County, Mich	Lansing-East Lansing	66.63	16.99
448	Geauga County, Ohio	Cleveland	63.12	20.90

[a]Higher values of the index indicate more compact urban form; lower values indicate more sprawling urban form.

Source: Ewing et al., 2003

Beyond crash incidence rates and severity, delay in receiving medical care after a crash contributes to worse health outcomes from transportation safety in sprawling neighborhoods. Traditional impact analysis focuses on congestion as an inhibitor to emergency responses times. However, research shows that emergency response suffers more from greater distances to destinations found in sprawling areas than from congestion in compact and congested areas:

> "Emergency medical service (EMS) delay is another possible mediator that could help explain the direct non-VMT-involved sprawl effect on traffic fatalities. Urban sprawl increases EMS waiting time, and delay in ambulance arrival can increase the severity of traffic-related injuries (Trowbridge et al. 2009). 'For every 10% increase in population density'…the models estimated by Lambert and Meyer (2006, 2008) predict 'a 10.4% decrease in EMS run time' in the Southeastern United States and nationwide 'an average 0.61 percent decrease in average EMS run time.'" (Yeo et. al, 2014)

Collectively, research points to an approach on safety that aligns well with other state priorities and laws (e.g. infill priority, greenhouse gas reduction), as well as with the visions of many local jurisdictions for their own growth. Compact infill development, in addition to providing livable and vibrant neighborhoods, walkable communities, environmental benefits, land conservation, fiscal benefit and cost reduction for citizens, also improves traffic safety:

> "Our study, which addresses the built environment in a more comprehensive manner [than past studies], found population density to be associated with significantly fewer total and injurious crashes. …Individuals living in higher density environments drive less (Ewing & Cervero, 2001), thus reducing their overall exposure to crashes. When these reductions in VMT are aggregated across a larger population, they can potentially add up to notable reductions in population-level crash incidence." (Dumbaugh and Rae, 2009)
>
> "[Our] research findings suggest that enhancing traffic safety by reducing fatalities can be achieved by fighting against urban sprawl and promoting smart growth countermeasures. It will be important to revive city centers, to increase density, and to provide for mixed land uses. Urban design solutions that can enhance walkability at the meso- and microlevels may help reduce traffic fatalities." (Yeo et. al, 2014)

Attribution of Safety Impacts

Some safety impacts result from the effects of many past projects accumulated over time. An infill project, for example, may add an additional vehicle to a queue in a turn pocket or on a ramp causing it to extend into mainline traffic. Such an impact is the cumulative effect of many projects. (In any case, vehicle queueing resulting from a particular project frequently cannot be estimated accurately, especially where traffic is affected by many factors. Typical modeling error on traffic volumes at an intersection can reach 40 percent, and microsimulation performed to estimate queue lengths introduce further error. Other factors affect travel demand (e.g. the economy, the price of gasoline). Therefore, it is frequently impossible to meaningfully predict whether the direct effect of a development in an infill area will be the cause of a vehicle queue extending onto a highway mainline.)

Meanwhile, if a development generates or attracts such large amounts of automobile travel that it contributes a substantial portion of the traffic that leads to a queue onto the mainline, attributing that proportion of the associated risk to that project would be appropriate. This might be particularly so on the urban periphery where that traffic would be easily attributable to the project.

Addressing Tradeoffs and Finding Win-Win Safety Improvements

Traditional solutions for safety risks sometimes create other safety risks, impact human health in other ways, and sometimes are at cross purposes with other state and community interests such infill priority, greenhouse gas reduction, cost reduction, or access to destinations. When addressing safety impacts, a jurisdiction should frame and address those risks in a manner that helps forward the community's overall goals, while improving safety. Some modern approaches to reducing safety risk, developed over the past decade or two based on research, allow all safety to be improved while meeting these other goals. Here are three examples:

(1) A queue extending out of a turn pocket or off ramp can increase the risk of rear-end collisions. However, addressing that risk by adding additional vehicle capacity such as a second lane will lead to additional risk for pedestrian crossing. Addressing that risk by adding extra green time in the traffic signal timing will lead to shorter pedestrian crossing times and/or additional pedestrian wait time. Addressing these secondary risks by prohibiting pedestrian crossing will reduce connectivity of the pedestrian network, leading to reduced pedestrian mode share, which will increase risk by decreasing "safety in numbers" benefits and impact the health benefits associated with active mode travel. Meanwhile, improving safety with street design features that lower travel speeds to reduce crash incidence and severity can improve walkability.

(2) Surface roadway lanes can be redesigned from traditional 12.0 foot widths to with 9.2 to 10.8 foot widths with little or no down-side. Such a narrowing of lanes maintains motor vehicle capacity, increases bicycle capacity, maintains large vehicle capacity and safety, improves pedestrian crossings safety and comfort, increases pedestrian volumes, improves driver attention, decreases crash rates, decreases crash severity, reduces construction costs, reduces maintenance costs, reduces impermeable surface area, reduces construction and maintenance air quality and GHG emissions, and reduces space consumption. (Karim, 2015).

(3) Improving safety by adding signage and pavement markings that help reduce speeds and increase pedestrian visibility can have an array of benefits, including:
   - Decrease in crash incidence for all users, including vulnerable road users
   - Decrease in crash severity for all users, including vulnerable road users
   - Increase safety and comfort for pedestrians and cyclists, resulting in increased walking and biking mode share, in turn increasing safety in numbers effects for vulnerable road users and improving public health both via improved safety and increased physical activity.

   While reductions in automobile speed may initially increase auto mode travel times, improving conditions for pedestrians and cyclists can lead to finer grain land use development over time, and ultimately improve destination proximity and overall access to destinations.

Examples and Mischaracterizations of Detriments to Overall Safety

The following are examples of possible detriments to overall safety if not mitigated:

- An increase in VMT. More vehicle travel exposes motorists and other road users to more crash risk.
- An increase in pedestrian wait times. Many studies have found that pedestrian wait times play a role in crashes. Long wait times increase the risk some pedestrians will cross against a signal, creating a vulnerable road user collision risk (FHWA-RD-03-042, 2004)
- Site design elements that would create hazardous conditions for vulnerable road users

- Substantially increasing motor vehicle speeds, or increasing them to greater than 25 miles per hour where vulnerable road users are present without providing proper infrastructure for vulnerable road users (e.g. Class IV bikeways for cyclists)
- Substantially increasing intersection pedestrian crossing distances, e.g. for addition of a through or turn lane
- Signal lengths of greater than 90 seconds, which may lead to people crossing on a red signal with a gap in the vehicle platoons
- Increase in curb radius
- Installation of large curb radii, promoting higher speed motor vehicle turning movements, particularly endangering pedestrians and cyclists
- Addition or widening of on- and off-ramps where they meet surface roadways that increases pedestrian crossing distances or times, increase pedestrian wait times, or lead to a prohibition of pedestrian crossing
- Addition or widening of off-ramps in a manner that leads to higher speeds on surface streets
- Excessively large clearance zones along shoulders
- Wider than needed travel lanes (e.g. wider than 10.8 feet on surface streets)
- Multiple turn lanes at an intersection (e.g. a double left or double right turn lane)
- Placement of driveways in locations which will lead to highly elevated collision risk
- Excessively large driveways across sidewalks
- Substantially increased distances between pedestrian and bicycle crossings
- Roadway design speed (regardless of posted speed limit) that leads to actual speeds that are unsafe for cyclists and pedestrians

Safety issues can be mischaracterized with overly narrow perspective or traditional design guidance that has not been updated to reflect research. The following are examples of mischaracterizations of safety issues.

- Avoidance of installation of corner or mid-block crossings to avoid additional pedestrian traffic and conflict with vehicles (reduces pedestrian mode share, undoing safety in numbers)
- Avoidance of narrow (e.g. 10 foot) travel lanes on surface roadways (see discussion above)
- Avoidance of implementing sidewalk bulbs, widened sidewalks, parklets, or other curb extensions or removal of on-street parking for fear of exposing vulnerable users to vehicular traffic (these features slow traffic and improve walkability as discussed above)
- Addressing off-ramp queuing by limiting stop control on an exit ramp (this can lead to vehicles flowing unimpeded and at high speeds onto a local street, increasing risk for all road users).
- Avoidance of protected bicycle facilities adjacent to transit boarding islands to avoid conflicts between transit users and cyclists (this is safe with good design)
- Maintaining or providing parking spaces out of concern that road rage could result from traffic congestion or circling for parking as an outcome of the removal of on- or off-street parking spaces (adding parking increases VMT and overall crash exposure)

Examples of Potential Transportation Safety Mitigation Measures

- Intersection improvements
  - Visibility improvement
  - Shortening corner radii
  - Pedestrian safety islands
  - Accounting for pedestrian desire lines
- Signal changes
  - Reducing signal cycle lengths to less than 90 seconds to avoid pedestrian crossings against the signal
  - Providing a leading pedestrian interval
  - Provide a "scramble" signal phase where appropriate
- Roadway improvements
  - Add curb extensions or bulb-outs
  - Add bicycle facilities (On higher speed roads, add protected bicycle facilities)
  - Reduce travel lane width below 10.8 feet (but not below 9.2 feet)
  - Add traffic calming measures
  - Add landscaping features
- Network improvements
  - Provide shorter blocks
  - Provide mid-block crossings
- Reduce VMT
  - Increase density and/or diversity of land uses
  - Provide travel demand management measures
  - Provide transit
  - Provide pedestrian facilities
  - Provide bicycle facilities

G. Mitigation and Alternatives

When a lead agency identifies a significant impact, it must consider mitigation measures that would reduce that impact. The selection of particular mitigation measures, however, is always left to the discretion of the lead agency. Further, OPR expects that agencies will continue to innovate and find new ways to reduce vehicular travel. Several potential mitigation measures and alternatives to reduce vehicle miles traveled are described below. Notably, the suggested mitigation measures and alternatives were largely drawn from the California Air Pollution Control Officers Association's guide on Quantifying Greenhouse Gas Mitigation Measures. That guide relied on peer-reviewed research on the effects of various mitigation measures, and provides substantial evidence that the identified measures are likely to lead to quantifiable reductions in vehicle miles traveled.

Potential measures to reduce vehicle miles traveled include, but are not limited to:

- Improve or increasing access to transit.
- Increase access to common goods and services, such as groceries, schools, and daycare.
- Incorporate affordable housing into the project.
- Incorporate neighborhood electric vehicle network.
- Orient the project toward transit, bicycle and pedestrian facilities.

- Improve pedestrian or bicycle networks, or transit service.
- Provide traffic calming.
- Provide bicycle parking.
- Limit or eliminating parking supply.
- Unbundle parking costs.
- Provide parking or roadway pricing or cash-out programs.
- Implement or provide access to a commute reduction program.
- Provide car-sharing, bike sharing, and ride-sharing programs.
- Provide transit passes.

Examples of project alternatives that may reduce vehicle miles traveled include, but are not limited to:

- Locate the project in an area of the region that already exhibits low vehicle miles traveled.
- Locate the project near transit.
- Increase project density.
- Increase the mix of uses within the project, or within the project's surroundings.
- Increase connectivity and/or intersection density on the project site.
- Deploy management (e.g. pricing, vehicle occupancy requirements) on roadways or roadway lanes.

IV. Case Studies

The following case studies provide sample applications of the *Draft Technical Advisory on Evaluating Transportation Impacts in CEQA* ("Draft Technical Advisory").

The first is a mixed use residential and retail development in the City of Sacramento (Sacramento County). This case study employs the Greenhouse Gas Quantification Methodology (GGQM) developed by the Strategic Growth Council for the Affordable Housing and Sustainable Communities program (AHSC). To provide a more fine-grained analysis, we replace CalEEMod's regional average default trip length estimates with data taken from the California Statewide Travel Demand Model (CSTDM). We use CSTDM home-based travel VMT output data for the region as a whole to calculate a significance threshold using the methodology recommended in the Draft Technical Advisory.

The second is an office development in a suburban area in the City of Mission Viejo (Orange County). This case study uses CSTDM home-based-work trip length data to estimate VMT of office uses in that location and to estimate the significance threshold, and the CAPCOA *Quantifying Greenhouse Gas Mitigation Measures* to quantify the VMT reduction of a set of mitigation measures.

The first and second case studies employ the CSTDM to estimate trip lengths and project VMT, and to help determine thresholds. In many cases, this methodology will be sufficient to adequately analyze a project's vehicle miles traveled. However, where a lead agency desires a more rigorous analysis, it might choose to use a regional travel demand model where available. Regional travel demand are typically better calibrated and validated for local conditions and so may provide more precise estimates of vehicle miles traveled.

The third is a hypothetical typical highway expansion project in an outlying area in the Kern Council of Governments region. This case study uses Caltrans Performance Measurement System (PeMS) lane mile and VMT data, and elasticity estimates from academic literature, to assess additional VMT caused by the addition of lane miles to the highway network.

Note, these case studies provide merely examples of how various projects may be analyzed. Proposed new Section 15064.3(b)(4) leaves to lead agencies the precise choice of methodology:

> A lead agency may use models to estimate a project's vehicle miles traveled, and may revise those estimates to reflect professional judgment based on substantial evidence. Any assumptions used to estimate vehicle miles traveled and any revisions to model outputs should be documented and explained in the environmental document prepared for the project.

Thus, other models may appropriately be used to analyze vehicle miles traveled.

Mixed Use Project (Residential + Retail): Stockton and T

This case study provides an example of a VMT estimate for a mixed use (residential-retail) project. This case study is located in the City of Sacramento, Sacramento County, California.

Basic Project Characteristics

The proposed project is located at the corner of Stockton Boulevard and T Street—an inner-ring suburb near transit. It consists of 214 multifamily rental dwelling units and 6000 square feet retail in a 5 story building, as well as 24 single family dwelling owner-occupied units.

Analysis overview

Analyses for residential and retail portions of the development are conducted separately and results are compared to their respective recommended thresholds. For residential component, the AHSC GGQM is employed, with one enhancement: data recently made available from the California Statewide Travel Demand Model (CSTDM) are used to improve the accuracy of trip length estimates.

Note that a residential project that is located within ½ mile of transit is presumed to have a less than significant transportation impact. The project is located 0.27 miles from transit, and would therefore be presumed to have a less than significant transportation impact.

Further, the Draft Technical Advisory recommends that a residential project proposed in a location where existing development exhibits below-threshold VMT be presumed to have less than significant transportation impact. According to the CSTDM, the project is located in a Traffic Analysis Zone exhibiting 12.1 total VMT/cap and 8.4 Home Based VMT/capita. By comparison, the SACOG region as a whole exhibits an average 16.7 total VMT/capita and 12.8 Home Based VMT per capita. The Draft Technical Advisory's recommended threshold of fifteen percent below the regional average thus is 14.2 total VMT/capita and 10.88 Home Based VMT/per capita. Therefore, a screening map made using either total VMT/capita or Home Based VMT/capita would show the project to be in a below-threshold TAZ, and therefore may be presumed to lead to a less than significant transportation impact.

While the residential component of the project would be determined to have a less than significant impact on transportation by each of these two screening criteria, this case study nevertheless estimates VMT for the residential portion of the project in order to provide a demonstration of the methodology described in the Draft Technical Advisory.

The retail component consists solely of locally-serving retail, and therefore may be presumed to have a less than significant VMT impact. A lead agency that nevertheless chooses to estimate the retail component's vehicle miles traveled may conduct a travel demand model run. (CalEEMod is able to make a trip-based estimate of VMT from the retail portion of the project, but the Draft Technical Advisory cautions against using a trip-based methodology for retail uses, because it fails to account for the rerouting of trips from existing retail, and therefore falsely represents all trip-based VMT attracted to the project as new VMT.)

Estimate of Residential Project Component VMT

The following section provides a step-by-step description for using the AHSC GGQM to estimate project VMT. The AHSC GGQM employs the California Emissions Estimator Model (CalEEMod), a free and downloadable trip-based sketch model, substituting some off-model calculations where research and technical updates have not yet been incorporated into the model itself. We recommend obtaining a copy of the AHSC GGQM and referring to it alongside this description.

CalEEMod inputs on Project Characteristics and Land Use screens

On the CalEEMod Project Characteristics screen:

- Select "County" and enter "Sacramento"
- Set Land Use Setting to "Urban"
- Set operational year to 2016

CalEEMod Land Use Screen:

- Residential – Apartments Mid-Rise – 214 Units
- Residential – Single Family Housing – 24 Units
- Retail – Strip Mall – 6,000 square feet

Notes: The retail component is entered into CalEEMod solely so CalEEMod can estimate internal capture of the residential component trip-making activity by the retail contained within the project. We ignore CalEEMod's trip-based VMT estimate for the retail component itself, for the reasons described above.

Mitigation: CalEEMod Land Use and Site Enhancements and Commute Pages (Mitigation tab), and prescribed off-model methods

CalEEMod requires the project setting to be selected from a menu on the Land Use and Site Enhancements Screen. Per the GGQM, for this project, Urban Center is selected from the menu.

Increase Density (LUT-1):

Per AHSC GGQM, this calculation is undertaken outside CalEEMod.

Increase Density (LUT-1)		
Project density	48.6	du/ac
% Density increase	539%	
% VMT reduction	37.8%	
% VMT reduction taken	**30.0%**	

Increase Diversity:

The project contains retail development, so the Increase Diversity checkbox is checked in CalEEMod.

Improve Walkability Design (LUT-9):

Per the AHSC GGQM, this calculation is undertaken outside CalEEMod.

Improve Walkability Design (LUT-9)		
Intersections per sq. mi.	141.4	intersections/sq. mi.
%VMT reduction	35.1%	
%VMT reduction taken	**21.3%**	

Improve Destination Accessibility (LUT-4):

Rather than use CalEEMod or the AHSC GGQM to adjust for regional location (i.e. "distance to Downtown/Jobs Center), trip lengths from the California Statewide Travel Demand Model are inputted into CalEEMod.

Increase Transit Accessibility (LUT-5):

Inputted distance to nearest transit station, 0.27 mi, into CalEEMod.

Integrate Below Market Rate Housing (LUT-6)

The project does not contain below market rate housing, so this items is left unchecked in CalEEMod.

Improve Pedestrian Network (SDT-1)

The project includes new sidewalks along its borders, so the item is checked in CalEEMod, and "project site" is selected from the menu.

Provide Traffic Calming Measures (SDT-2)

The project does not provide traffic calming measures, so the item is left unchecked and the menus are left blank.

Implement NEV Network (SDT-3)

The project does not implement an NEV network, so the item is left unchecked and the input field is left at 0.

Limit Parking Supply (PDT-1)
The project is not parked below zoning, so the item is left unchecked and the input field is left at 0.

Unbundle Parking Costs (PDT-2)

Parking costs are not unbundled, so the item is left unchecked and the input field is left at 0.

On-Street Market Pricing (PDT-3)

On street parking is by neighborhood parking permit, not priced, so the item is left unchecked and the input field is left at 0.

Provide BRT System (TST-1)

The project does not provide a BRT system, so the item is left unchecked and the input field is left at 0.

Expand Transit Network (TST-3)

The project does not expand transit the transit network, so the item is left unchecked and the input field is left at 0.

Increase Transit Frequency (TST-4)

The project does not increase transit frequency, so the item is left unchecked, the level of implementation is left blank, and the input field is left at 0.

Commute Mitigation

The project provides no commute reduction programs, so all fields on this page are left blank (at their default values).

CalEEMOD output

Per the AHSC GGQM, CalEEMod output data on VMT are recorded:

From "4.2 Trip Summary Information"	Annual VMT	
Land Use	Unmitigated	Mitigated
Apartments Mid Rise	2,673,841	1,917,994
Single Family Housing	433,117	310,682
Total	3,106,958	2,228,677

Addition of mitigation accounted for off-model

Per the AHSC GGQM, off model calculations, detailed above, are incorporated and an estimate of project VMT is made (in this case, capped at the maximum for a project in this location type):

Sum of additional % VMT Reductions	51.3%	
Additional VMT Reductions	1,593,869	VMT/year
Total Annual VMT Reductions	2,472,151	VMT/year
Percent VMT Reduction	79.6%	
Maximum Reduction for Urban Center (Compact Infill) Project Setting	40%	
Project VMT Reduction	40%	
Project VMT	1,864,175	VMT/year

Project per-capita VMT

CalEEMod estimates residential project population on the Land Use screen. For the Stockton and T project, it estimates a residential population of 635 persons.

Project Residential Population	635	persons
VMT/cap	*2,936*	*VMT/pers-yr*

Recommended Threshold

The CSTDM estimates Home Based VMT per capita in the SACOG region to be 12.8 VMT/cap per day. Applying an annualization factor of [Annual VMT] = [Daily VMT] * 365, annual per capita VMT is estimated at 4,672 VMT/cap per year. The threshold recommended by the Draft Technical Advisory is fifteen percent below regional VMT/cap, in this case 3,971 VMT/cap per year.

Daily VMT per capita	12.8	VMT/pers-day
Annual VMT per capita	4,672	VMT/pers-yr
Recommended threshold	3,971	VMT/pers-yr

Significance Determination

The project, factoring in mitigation (using the AHSC GGQM) and regional location (by employing the CSTDM trip lengths) would be expected to generate 2936 VMT/person-year. The threshold recommendation is 3971 VMT/person-year. The residential component of the Stockton and T project will generate VMT at rates well below the recommended threshold. This result is unsurprising for a centrally-located infill project near transit.

As discussed above, the retail portion of the project is locally-serving, and is therefore presumed to have a less than significant transportation impact. As a result, the project has a less than significant impact on transportation.

Office Project: Mission Viejo Medical Center

This case study provides an example of a VMT estimate for an office project. This Case Study is located in Mission Viejo, Orange County, California.

Basic Project Characteristics

The proposed project is located west of Medical Center Road, between Crown Valley Parkway and Marguerite Parkway. It is an office building consisting of 110,000 square feet of office space.

Analysis overview

An estimate of base (unmitigated) project VMT is made using data from the California Statewide Travel Demand Model (CSTDM). The threshold is also estimated using the CSTDM. Mitigation measures are quantified with substantial evidence from *Quantifying Greenhouse Gas Mitigation Measures* (California Air Pollution Control Officers Association (CAPCOA)).

VMT Quantification and Significance Determination

The CSTDM estimates average commute VMT for existing office uses in the vicinity of the project (specifically, within the Traffic Analysis Zone (TAZ) which encompasses the project) as 15.3 VMT/employee.

Meanwhile, the CSTDM estimates VMT/employee in the SCAG region as a whole to be 15.9 VMT/employee. Applying the threshold recommended by the Draft Technical Advisory, 15 percent below regional overall commute VMT/employee, the significance threshold would be 13.5 VMT/employee. Without any mitigation, therefore, this project could trigger a significant impact. To reduce its impact to below the recommended significance threshold, the project would need to reduce commute VMT to below 13.5 VMT per employee (in other words, reduce its VMT by 12.9 percent).

To mitigate VMT to less than significant levels, the project could implement a Trip Reduction Program. For example, the program could implement the following commute VMT reduction strategies to bring VMT below the threshold:

Mitigation Measure	*Percent Reduction*	*Substantial Evidence*
Implementation a 9/80 workweek for 10 percent of employees	0.7%	CAPCOA TRT-6
Provide a transit subsidy to all employees of 1.49/day	7.3%	CAPCOA TRT-4
Implement car sharing program	0.4%	CAPCOA TRT-9
Provide an employee vanpool program	2%	CAPCOA TRT-11
Implement a $6 daily employee parking charge	6.8%	CAPCOA TRT-14
Total	17.2%	

Source: Quantifying Greenhouse Gas Mitigation Measures, CAPCOA

According to the CAPCOA *Quantifying Greenhouse Gas Mitigation Measures,* a Commute Trip Reduction Program can reduce VMT by up to 21 percent. The 12.9 percent reduction required is therefore achievable using proven mitigation for which substantial evidence exists. The mix of strategies listed above would be expected to reduce VMT by 17.2 percent. As mitigation measures, these measures would be identified in the project's mitigation monitoring and reporting program.

Roadway Capacity Expansion Project: Addition of 2.2 Lane Miles

This case study provides an example of a VMT estimate for a roadway expansion project. This case study estimates the VMT impact of a hypothetical project that adds 2.2 lane-miles to a highway in the Kern Council of Governments region.

Analysis

Research on VMT effects of lane mile additions can be used to estimate the VMT effects of proposed roadway expansions, as described in the Draft Technical Advisory:

Elasticity = [% Change in VMT] / [% Change in Lane Miles]

or

VMT Impact = [% Change in Lane-Miles] * [baseline VMT on those lane-mi] * [elasticity]

Lane mile and VMT data are available from the Caltrans Performance Measurement System (PEMS):

PEMS Data (2013)	Interstate		Principal Arterial - Other Freeways and Expressways	
	Existing Lane-Miles	VMT (millions)	Existing Lane-Miles	VMT (millions)
KernCOG	385.22	1,288.79	285.25	1,045.15

In order to best align this analysis with the academic research from which the elasticities are taken, this case study focuses on interstate highways, freeways, and expressways. Lane miles and VMT from these facilities are aggregated from the raw data, and VMT is calculated using the formula above:

Interstate, Principal Arterial (Freeways and Expressways only)			
Lane Miles	VMT (millions)	%chg in LM	Induced VMT/year
670.47	2,333.94	0.328%	7,658,312

The most recent major study on induced travel, Duranton and Turner (2011), reveals an elasticity of VMT by lane miles of 1.03.

The percent change in lane miles is calculated by dividing project lane miles (2.2 miles) by the total lane miles of the applicable functional classes (670.47 miles) to yield a percent change in lane miles (0.328 percent). This is multiplied by the baseline VMT on those facilities (2,333,940,000 VMT) and an elasticity from the academic studies (1.0) to yield the total induced travel: 7,658,312 VMT/year.

Significance Determination

The Draft Technical Advisory provides a methodology for calculating a VMT threshold. Making use of draft data from the California Air Resources Board and an estimate of the number of transportation projects statewide through 2015, the Draft Technical Advisory recommends a transportation project threshold of 2,075,220 VMT/year. The project is estimated to induce 7,658,312 miles/year, a significant amount of VMT.

As mitigation, the project could administer a toll on the new and/or existing lane miles sufficient to reduce VMT to below-threshold levels, or manage new and/or existing lane miles (e.g. with an HOV requirement) to similarly reduce VMT. Alternately or in conjunction, travel demand management measures such as providing transit or active transportation service or facilities, providing park and ride facilities, or providing a vanpool program could be employed to similarly reduce VMT.