Senate Bill 743 Vehicle Miles Traveled Regional Baseline Study

Prepared for:
Mendocino Council of Governments

May 20, 2020

RS19-3819

FEHR PEERS

Funding

This project was funded with Caltrans' FY 2019/20 Sustainable Communities Grant funds (State Highway Account) plus local matching funds provided by the Mendocino Council of Governments' Local Transportation Funds. A contract was awarded to Fehr & Peers in the amount of $119,969, which included a subcontract of $4,443 for Ascent Environmental.

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1. Introduction

On September 27, 2013, Governor Jerry Brown signed Senate Bill (SB) 743 into law and started a process intended to fundamentally change transportation impact analysis as part of California Environmental Quality Act (CEQA) compliance. These changes include elimination of auto delay, level of service (LOS), and other similar measures of vehicular capacity or traffic congestion as a basis for determining significant impacts. Amendments and additions to the CEQA Guidelines eliminate auto delay for CEQA purposes and identify vehicle miles traveled (VMT) as the preferred CEQA transportation metric. Therefore, the jurisdictions in Mendocino County need to select VMT analysis methodologies, set new VMT thresholds for transportation impacts, and determine what mitigation strategies are most feasible.

This report:

- Provides an overview of SB 743 and related policies and how VMT may be measured
- Summarizes available VMT data for Mendocino County
- Discusses alternatives for VMT measurement methods and thresholds
- Recommends VMT methods and thresholds for lead agencies in Mendocino County
- Uses recent projects in Mendocino County to demonstrate how these methods and thresholds would be used
- Recommends transportation demand management (TDM) strategies for reducing VMT on projects in Mendocino County

2. Background

This chapter summarizes SB 743 and related policies and discusses how VMT may be measured.

2.1 Definitions

CEQA refers to the California Environmental Quality Act. This statute requires identification of any significant environmental impacts of state or local action including approval of new development or infrastructure projects. The process of identifying these impacts is typically referred to as the environmental review process.

LOS refers to "level of service," a metric that assigns a letter grade to network performance. The typical application of LOS in cities is to measure the average amount of delay experienced by vehicle drivers at an intersection during the most congested time of day and to assign a report card range from LOS A (fewer than 10 seconds of delay) to LOS F (more than 80 seconds of delay).

VMT refers to "vehicle miles traveled," a metric that accounts for the number of vehicle trips generated and the length or distance of those trips. For transportation impact analysis, VMT is commonly expressed as total VMT, total VMT per service population (residents plus employees), home-based VMT per resident (or capita), and home-based work VMT per employee for a typical weekday.

2.2 VMT Policy Overview

On September 27, 2013, Governor Jerry Brown signed SB 743 into law and started a process intended to fundamentally change transportation impact analysis as part of CEQA compliance. These changes include elimination of *auto delay, LOS, and other similar measures of vehicular capacity or traffic congestion* as a basis for determining significant impacts. The California Natural Resources Agency has issued amendments and additions to the CEQA Guidelines reflecting these changes (http://resources.ca.gov/ceqa/). The changes eliminate auto delay for CEQA purposes and identify VMT as the preferred CEQA transportation metric.

The Governor's Office of Planning and Research (OPR) has also issued supporting information entitled *Technical Advisory on Evaluating Transportation Impacts in CEQA* (December 2018) (http://opr.ca.gov/ceqa/updates/sb-743/), providing additional information on assessing VMT and setting significance thresholds.

The focus of SB 743's changes can be found in the following two legislative intent statements:

- Ensure that the environmental impacts of traffic, such as noise, air pollution, and safety concerns, continue to be properly addressed and mitigated through the California Environmental Quality Act.

- More appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions.

The changes to the CEQA Guidelines identify automobile[1] VMT as the preferred CEQA transportation metric and, upon their certification on December 28, 2018, eliminated use of auto delay and LOS statewide for CEQA transportation analysis. The new guidelines and the OPR technical advisory include specifications for VMT methodology and recommendations for significance thresholds and mitigation. As noted above, SB 743 requires impacts to transportation network performance to be viewed through a filter that promotes *"the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses."* VMT can help identify how projects (land development and infrastructure) influence accessibility (i.e., lower VMT may indicate increased multimodal access to places and people) and emissions, so its selection is aligned with the objectives of SB 743.

SB 743 does not prevent an agency from continuing to analyze delay or LOS as part of other plans (i.e. a general plan), fee programs, or ongoing network monitoring, but these metrics will no longer constitute the sole basis for CEQA impacts. Agencies determining that continued use of vehicle LOS is an important part of transportation analysis can still use vehicle LOS outside of the CEQA process. The most common applications will likely occur for jurisdictions wanting to use vehicle LOS to size roadways in their general plan or determine nexus relationships for their impact fee programs. Jurisdictions can also continue to condition projects to build transportation improvements through the entitlement process in a variety of ways, such as using general plan consistency findings.

2.3 VMT Assessment

This section explains how VMT may be estimated and forecasted.

2.3.1 VMT Measurement

VMT can be measured in a variety of ways depending on whether the intent is to capture the amount of automobile travel generated by a project (i.e., number of vehicle trips multiplied by their corresponding trip lengths) or a project's effect on VMT within a defined study area (i.e. a measure of absolute VMT). Project effect information is more meaningful for VMT analysis because land use projects and land use plans often influence the vehicle travel associated with neighboring land uses and may displace other existing trips within the region. VMT is a preferred metric for environmental effects because it indirectly captures how a project influences the environment related to greenhouse gas emissions and air quality pollution. VMT may also play a role in assessing impacts to pedestrians, bicyclists, transit riders, and travel

[1] While SB 743 did not define the term "automobile," OPR's *Technical Advisory* defines "automobile" as excluding heavy-duty trucks, i.e., automobile is defined as "on-road passenger vehicles, specifically cars and light trucks." (OPR *Technical Advisory*, p. 4.) However, OPR did note that "[h]eavy duty truck VMT could be included for modeling convenience and ease of calculation (for example, where models or data provide combined auto and heavy truck VMT)."

safety. Low VMT generating areas tend to have higher mode splits for walking, bicycling, and transit. These areas also benefit from less severe collisions often due to less vehicle travel and lower travel speeds.

VMT growth associated with land use and transportation projects is evaluated as part of adopted regional transportation plans (RTPs) and general plans. These plans and their EIRs typically consider the impacts of VMT growth at a regional or jurisdiction-wide level, usually through the effect that VMT growth has on air quality and greenhouse gas (GHG) emissions. Additional VMT reduction may be achieved at the project level especially through TDM strategies, which are not fully accounted for in regional level travel forecasting models, including MCOG's.

While VMT is focused on vehicle travel, the goal of reducing VMT growth focuses upon changing development patterns (e.g., land use mix and density) together with providing more pedestrian, bicycle, and transit infrastructure. These factors have an impact on the number and length of vehicle trips, and whether these trips displace other longer trips in the region. Efforts to reduce VMT may also include TDM strategies that encourage more efficient forms of travel or vehicle use. TDM strategies are discussed further in the Fehr & Peers in the Transportation Demand Management Strategies section.

2.3.2 VMT Estimates and Forecasts

VMT can be expressed in a variety of forms depending on specific objectives of the analysis. Examples of these forms include:

- Daily total VMT – All VMT generated by trips with at least one trip end in the jurisdiction for a typical weekday.
- Daily home-based VMT per resident – VMT generated by residents of households within the jurisdiction with at least one trip end at a dwelling unit for a typical weekday.
- Daily home-based VMT per worker – VMT generated by workers within the jurisdiction traveling between work and home for a typical weekday.
- Daily total VMT per service population – All VMT generated by residents and workers within the jurisdiction for a typical weekday.

VMT estimates for Mendocino County were developed using three different methods/tools (California Household Travel Survey, California State Travel Demand Model, and MCOG Travel Demand Forecasting Model) as discussed in Appendix A.

Estimates of current VMT and forecasts of future VMT are inherently dependent on the methodology used. These estimates and forecasts use trip generation rates based on observations of current travel behavior. These estimates may need to be modified to account for future changes in travel associated with internet shopping, increases in economic activity, changes in different modes of travel, such as transportation network companies (TNCs), e.g. Uber and Lyft, or future trends such as autonomous vehicles (AVs). Prior to COVID-19, expectations about the influence of these factors were that vehicle travel may increase over time as the human driving function is reduced or eliminated, operating and

parking costs are reduced, and access to a variety of vehicle types becomes more ubiquitous.[2] VMT trends will need to be monitored over time as COVID-19 economic outcomes may dampen these expectations. While VMT is currently linked to greenhouse gas emissions and air pollution, increases in vehicular fuel efficiency and electrification may eventually reduce these relationships, which may also necessitate updates to VMT methodology and significance thresholds.

2.4 VMT Thresholds

2.4.1 Background on CEQA Thresholds

Establishing CEQA thresholds for VMT requires complying with the statutory language added by SB 743, as well as guidance contained in CEQA Guidelines Section 15064, 15064.3, and 15064.7. The excerpts below highlight the amendments to the two CEQA Guidelines Sections that were certified by the California Natural Resources Agency and the Office of Administrative Law at the end of 2018.

§ 15064. Determining the Significance of the Environmental Effects Caused by a Project.

(a) Determining whether a project may have a significant effect plays a critical role in the CEQA process.

(1) If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, the agency shall prepare a draft EIR.

(2) When a final EIR identifies one or more significant effects, the lead agency and each responsible agency shall make a finding under Section 15091 for each significant effect and may need to make a statement of overriding considerations under Section 15093 for the project.

(b) **(1)** 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.

(2) Thresholds of significance, as defined in Section 15064.7(a), may assist lead agencies in determining whether a project may cause a significant impact. When using a threshold, the lead agency should briefly explain how compliance with the threshold means that the project's impacts are less than significant. Compliance with the threshold does not relieve a lead agency of the obligation to consider substantial evidence indicating that the project's environmental effects may still be significant.

Source: *Final Adopted Text for the 2018 Amendments and Additions to the State CEQA Guidelines.* California Natural Resources Agency (page 8), http://resources.ca.gov/ceqa/

[2] Harb, M., Xiao, Y., Circella, G., Mokhtarian, P. L., & Walker, J. L. (2018). Projecting travelers into a world of self-driving vehicles: estimating travel behavior implications via a naturalistic experiment. Transportation, 45(6), 1671-1685. https://link.springer.com/article/10.1007/s11116-018-9937-9.

§ 15064.7. Thresholds of Significance.

(a) ~~**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**~~. A threshold of significance is 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.

(b) **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.** Thresholds of significance to be adopted for general use as part of the lead agency's environmental review process must be adopted by ordinance, resolution, rule, or regulation, and developed through a public review process and be supported by substantial evidence. **Lead agencies may also use thresholds on a case-by-case basis as provided in Section 15064(b)(2).**

(c) When adopting **or using** thresholds of significance, a lead agency may consider thresholds of significance previously adopted or recommended by other public agencies or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence.

(d) Using environmental standards as thresholds of significance promotes consistency in significance determinations and integrates environmental review with other environmental program planning and regulation. Any public agency may adopt or use an environmental standard as a threshold of significance. In adopting or using an environmental standard as a threshold of significance, a public agency shall explain how the particular requirements of that environmental standard reduce project impacts, including cumulative impacts, to a level that is less than significant, and why the environmental standard is relevant to the analysis of the project under consideration. For the purposes of this subdivision, an "environmental standard" is a rule of general application that is adopted by a public agency through a public review process and that is all of the following:

(1) a quantitative, qualitative or performance requirement found in an ordinance, resolution, rule, regulation, order, plan or other environmental requirement;

(2) adopted for the purpose of environmental protection;

(3) addresses the environmental effect caused by the project; and,

(4) applies to the project under review.

Source: *Final Adopted Text for the 2018 Amendments and Additions to the State CEQA Guidelines*. California Natural Resources Agency (pages 14-15), http://resources.ca.gov/ceqa/

As noted in the CEQA sections above, lead agencies have the discretion to select thresholds on a case-by-case basis or develop and publish thresholds for general use. The remainder of this section focuses on guidance related to adopting thresholds for general use.

When developing and adopting new thresholds, the CEQA Guidelines are clear that thresholds must be supported by substantial evidence. For SB 743, the specific metric of focus is the change a project will

cause in VMT, which is an indirect measure of greenhouse gas emissions and air pollution. Since VMT is already used in the analysis of air quality, energy, and GHG impacts as part of CEQA compliance, the challenge for lead agencies is to answer the question, "What type or amount of change in VMT constitutes a significant impact for transportation purposes?" CEQA Guidelines Section 15064(b)(1) allows lead agencies the discretion to select their own thresholds and allow for differences in thresholds based on context such as urban versus rural areas.

2.4.2 OPR VMT Threshold Recommendations for Land Use Projects

SB 743 includes the following legislative intent statements, which were used to help guide OPR's VMT threshold recommendations.

- New methodologies under the California Environmental Quality Act are needed for evaluating transportation impacts that are better able to promote the state's goals of reducing greenhouse gas emissions and traffic-related air pollution, promoting the development of a multimodal transportation system, and providing clean, efficient access to destinations.
- More appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions.

To support these legislative intent statements, threshold recommendations are found in Section 15064.3 of the 2018 CEQA Guidelines amendments. and the *Technical Advisory on Evaluating Transportation Impacts in CEQA,* California Governor's Office of Planning and Research (OPR) (December 2018). Specific excerpts and threshold highlights are provided below.

> CEQA Guidelines Section 15064.3
>
> *(b) Criteria for Analyzing Transportation Impacts.*
>
> *(1) Land Use Projects. Vehicle miles traveled exceeding an applicable threshold of significance may indicate a significant impact. Generally, projects within one-half mile of either an existing major transit stop or a stop along an existing high quality transit corridor should be presumed to cause a less than significant transportation impact. Projects that decrease vehicle miles traveled in the project area compared to existing conditions should be presumed to have a less than significant transportation impact.*
>
> *(2) Transportation Projects. Transportation projects that reduce, or have no impact on, vehicle miles traveled should be presumed to cause a less than significant transportation impact. For roadway capacity projects, agencies have discretion to determine the appropriate measure of transportation impact consistent with CEQA and other applicable requirements. To the extent that such impacts have already been adequately addressed at a programmatic level, such as in a regional transportation plan EIR, a lead agency may tier from that analysis as provided in Section 15152.*
>
> Technical Advisory on Evaluating Transportation Impacts in CEQA (page 10)

> *Based on OPR's extensive review of the applicable research, and in light of an assessment by the California Air Resources Board quantifying the need for VMT reduction in order to meet the State's long-term climate goals, OPR recommends that a per capita or per employee VMT that is fifteen percent below that of existing development may be a reasonable threshold.*
>
> Technical Advisory on Evaluating Transportation Impacts in CEQA – Rural Projects Outside of Metropolitan Planning Organizations (MPOs) (page 19)
>
> *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 to the transit oriented development described above.*

The recognition that rural areas are different is consistent with the flexibility provided by CEQA Guidelines Section 15064(b)(1). In these areas, VMT per resident or per worker tends to be higher than in urban areas due to longer distances between origins and destinations and limited travel mode choices.

These (and the other) threshold recommendations in the *Technical Advisory* are intended to help achieve the state's GHG reduction goals and targets considered in development of OPR's *Technical Advisory* as follows;

- Assembly Bill 32 (2006) requires statewide greenhouse gas reductions to 1990 levels by 2020 and continued reductions beyond 2020.
- Senate Bill 32 (2016) requires at least a 40 percent reduction in greenhouse gas emissions by 2030.
- Pursuant to Senate Bill 375 (2008), the California Air Resources Board establishes greenhouse gas reduction targets for MPOs to achieve based on land use patterns and transportation systems specified in Regional Transportation Plans and Sustainable Community Strategies. At the time the *Technical Advisory* was released, target reductions by 2035 for the largest MPOs ranged from 13% to 16%. The current targets for these MPOs are 19%.
- Executive Order B-30-15 (2015) sets a GHG emissions reduction target of 40 percent below 1990 levels by 2030.
- Executive Order S-3-05 (2005) sets a GHG emissions reduction target of 80 percent below 1990 levels by 2050.
- Executive Order B-16-12 (2012) 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 to support 80 percent reduction in GHGs below 1990 levels by 2050.
- The California Air Resources Board Mobile Source Strategy (2016) describes California's strategy for containing air pollutant emissions from vehicles and quantifies VMT growth compatible with achieving state targets.

- The California Air Resources Board's 2017 Climate Change Scoping Plan Update: The Strategy for Achieving California's 2030 Greenhouse Gas Target describes California's strategy for reducing greenhouse gas emissions from vehicles and quantifies VMT growth compatible with achieving state targets.
- The Caltrans Strategic Management Plan (2015) calls for a 15 percent reduction in VMT per capita compared to 2010 levels by 2020.
- Executive Order B-55-18 (2018) established an additional statewide goal of achieving carbon neutrality as soon as possible, but no later than 2045, and maintaining net negative emissions thereafter.

Lead agencies should note that the OPR-recommended VMT thresholds are focused upon GHG reduction goals. As OPR's *Technical Advisory* (p. 8) explains,

> The VMT metric can support the three statutory goals: "the reduction of greenhouse gas emissions, the development of multimodal transportation networks, ***and*** a diversity of land uses." (Public Resources Code, § 21099, subdivision (b)(1), emphasis added.) However, in order for it to promote and support all three, lead agencies should select a significance threshold that aligns with state law on all three. State law concerning the development of multimodal transportation networks and diversity of land uses requires planning for and prioritizing increases in complete streets and infill development, but does not mandate a particular depth of implementation that could translate into a particular threshold of significance. Meanwhile, the State has clear quantitative targets for GHG emissions reduction set forth in law and based on scientific consensus, and the depth of VMT reduction needed to achieve those targets has been quantified. Tying VMT thresholds to GHG reduction also supports the two other statutory goals. Therefore, to ensure adequate analysis of transportation impacts, OPR recommends using quantitative VMT thresholds linked to GHG reduction targets when methods exist to do so.

While this is one of the SB 743 legislative intent objectives, a less clear connection is made to the other legislative intent objectives to encourage infill development and promote active transportation. SB 743 [Section 21099(b)(1)] also makes it explicit that criteria for determining the significance of transportation impacts shall promote "*…the reduction of greenhouse gas emissions, the development of multimodal networks, and a diversity of land uses.*" If GHG impacts are already being adequately addressed in another CEQA section, then more evidence may be desired about VMT threshold relationships to the other criteria. In particular, how should lead agencies balancing the accommodation of housing needs that contribute to land use diversity but also contribute to VMT increases? Given the status of housing supply shortages and affordability in California, this is not a small issue. The use of VMT as a new impact metric will likely trigger more significant impacts in suburban and rural areas that have the highest VMT generation rates and limited or costly mitigation options. Adding more impact mitigation costs to suburban and rural housing projects may be counter to land use diversity and adequate/affordable housing goals.

Specific VMT thresholds for residential, office (work-related), and retail land uses from the *Technical Advisory* are summarized below.

- Residential projects – A proposed project exceeding a level of 15 percent below existing (baseline) VMT per capita may indicate a significant transportation impact. Existing VMT per capita may be measured as regional VMT per capita, a citywide VMT per capita, or as geographic sub-area VMT per capita.
- Office projects – A proposed project exceeding a level of 15 percent below existing (baseline) regional VMT per employee may indicate a significant transportation impact.
- Retail projects – A net increase in total VMT may indicate a significant transportation impact.
- 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). Alternatively, a lead agency may consider only the project's dominant use. In the analysis of each use, a project should take credit for internal capture.
- Other non-residential project types – OPR recommends using the quantified thresholds above (page 17), thus a proposed project exceeding a level of 15 percent below existing regional VMT per employee for the proposed non-residential project type or resulting in a net increase in total VMT may be considered significant. Lead agencies, using more location-specific information, may develop their own more specific thresholds, which may include other land use types.
- Redevelopment projects – Where a project replaces existing VMT-generating land uses, if the replacement leads to a net overall decrease in VMT, the project would lead to a less-than-significant transportation impact. If the project leads to a net overall increase in VMT, then the thresholds described above should apply.

As shown above, OPR does not make consistent recommendations for employment land use projects. In some cases, OPR recommends a 15-percent reduction in per capita VMT, in some cases no increase in total VMT, and in some cases OPR leaves threshold selection to jurisdiction discretion. Evidence is lacking on what justifies different treatments across different land use types. Lead agencies that use the above thresholds should be prepared to justify their reasoning and be able to explain it to project applicants, decision makers, and the public.

The 15 percent reductions specified in the *Technical Advisory* are based on light-duty vehicle VMT (i.e., passenger cars and light trucks). They were also included before completion of ARB modeling of MPO regional transportation plan/sustainable communities strategies (RTP/SCSs). The ARB *Scoping Plan* and *Mobile Source Strategy* identifies that a 14.3 percent reduction in total VMT or a 16.8-percent reduction in light-duty vehicle VMT per capita from 2018 baseline levels is necessary to meet state GHG reduction goals by 2050. These reduction values are based on a fair share estimate of new development's responsibility for VMT reduction and presume that all 2050 California residents will be performing at the reduced VMT levels. If existing residents (those present in 2018) do not change their travel behavior and the full reduction in VMT was allocated to new growth, then the reduction goal would be much higher. Further, if VMT per capita trends continue to increase as noted in the *2018 Progress Report California's Sustainable Communities and Climate Protection Act*, California Air Resources Board, November 2018, then these reduction percentage values will have to increase. Also, the recommendation above for mixed-use projects to rely on the "dominant use" in VMT analysis may present new challenges. The term "dominant

use" is not defined in the CEQA statute or CEQA Guidelines. As such, there are many ways to define it, which could simply create more legal arguments for challenging projects.

The CEQA Guidelines explain "A lead agency has discretion to choose the most appropriate methodology to evaluate a project's vehicle miles traveled, including whether to express the change *in absolute terms, per capita, per household or in any other measure*." (Emphasis added; CEQA Guidelines, § 15064.3(b)(4).)OPR's guidance also recommends measuring VMT in absolute terms, which measures the total VMT in an area with and without the project. This approach is consistent with traditional CEQA analyses which measures impacts in comparison to existing conditions and with OPR's CEQA Guidelines amendments and *Technical Advisory*, which state that (1) "Projects that decrease vehicle miles traveled in the project area compared to existing conditions should be presumed to have a less than significant transportation impact." (CEQA Guidelines § 15064.3(b)(1).) (2) "Transportation projects that reduce, or have no impact on, vehicle miles traveled should be presumed to cause a less than significant transportation impact." ((CEQA Guidelines § 15064.3(b)(2).) (3) "Where development decreases VMT, lead agencies should consider the impact to be less than significant," (OPR *Technical Advisory*, p. 16.), (4) "Where a project replaces existing VMT-generating land uses, if the replacement leads to a net overall decrease in VMT, the project would lead to a less-than-significant transportation impact." (OPR *Technical Advisory*, p. 17.)

For rural areas outside MPOs, the *Technical Advisory* explains that VMT mitigation options are limited so thresholds may need to be set on a case-by-case basis. This rationale may not provide the best rationale for threshold setting. The intent of threshold setting is to determine what change in VMT would constitute a significant environmental impact considering SB 743's statutory goals and the associated CEQA Guidelines. While land use context is a valid consideration when setting thresholds so are these goals.

The *Technical Advisory* also makes specific VMT threshold recommendations for analyzing the impact of project generated VMT on baseline conditions but also recommends that VMT analysis consider a project's long-term effects on VMT, The *Technical Advisory* states (p. 6):

> [W]here methodologies exist that can estimate the full extent of vehicle travel from a project, the lead agency should apply them to do so. Where those VMT effects will grow over time, analyses should consider both a project's short-term and long-term effects on VMT.

Another factor for consideration is whether the project is consistent with the applicable RTP. Although OPR recommends that such consistency not be the sole basis for impact analysis (p. 22), it can be considered in conjunction with other factors especially whether a project would jeopardize the RTP's air quality conformity, which is tied directly to VMT. These recommendations raise key questions for lead agencies, as addressed in the next section.

2.4.3 Lead Agency Discretion in Setting VMT Thresholds

Prior to SB 743 implementation, CEQA Guidelines Section 15064.7 allowed lead agencies the discretion to select their own transportation impact metrics although substantial evidence was required to support

their decisions. For transportation impact metrics, SB 743 deleted vehicle delay as a metric, and CEQA Guidelines Section 15064.3 provided that, VMT is generally the most appropriate metric for land use projects. As to thresholds, additional questions have arisen as listed below.

- Question 1: Do lead agencies have discretion to set a different VMT threshold than recommended by OPR?
- Question 2: Do lead agencies need to establish VMT thresholds for cumulative impacts?
- Question 3: Do lead agencies need to use the same VMT methodology for setting thresholds and for conducting project VMT forecasts?

The answers to the first two questions require a legal perspective and were informed by a memorandum prepared by Remy Moose Manley (RMM) as part of the WRCOG SB 743 Implementation Pathway project, whose opinion is summarized below. Their full opinion is available as part of the WRCOG documentation at http://www.fehrandpeers.com/wrcog-sb743/ while a summary of their selected findings is presented below.

Question 1: Do lead agencies have discretion to set a different VMT threshold than recommended by OPR?

Setting a threshold lower than the 15-percent reduction recommended by OPR in their *Technical Advisory* is likely legally defensible, so long as the threshold is supported by substantial evidence. The substantial evidence is critical in the threshold setting process and should explain why the OPR-recommended threshold is not appropriate for the lead agency or project, and why another threshold was selected. This evidence will be the basis for supporting the recommended threshold and should carefully consider the definition of substantial evidence contained Section 15384 of the CEQA Guidelines. This answer considers the fact that the 15-percent reduction is not included in the statute or the updated CEQA Guidelines; rather it is only included in OPR's *Technical Advisory*. However, it is unknown how much weight future courts may give OPR's *Technical Advisory* since this is where OPR complies with Section 21099(b)(1) to develop recommendations for significance criteria.

The revisions to the CEQA Guidelines only include statements about what land use project types and locations may be presumed to have a less than significant VMT impact. Additional evidence allowing for a lower threshold (i.e., less than 15 percent) is also found in the discussion above about the recognition of land use context influencing VMT performance.

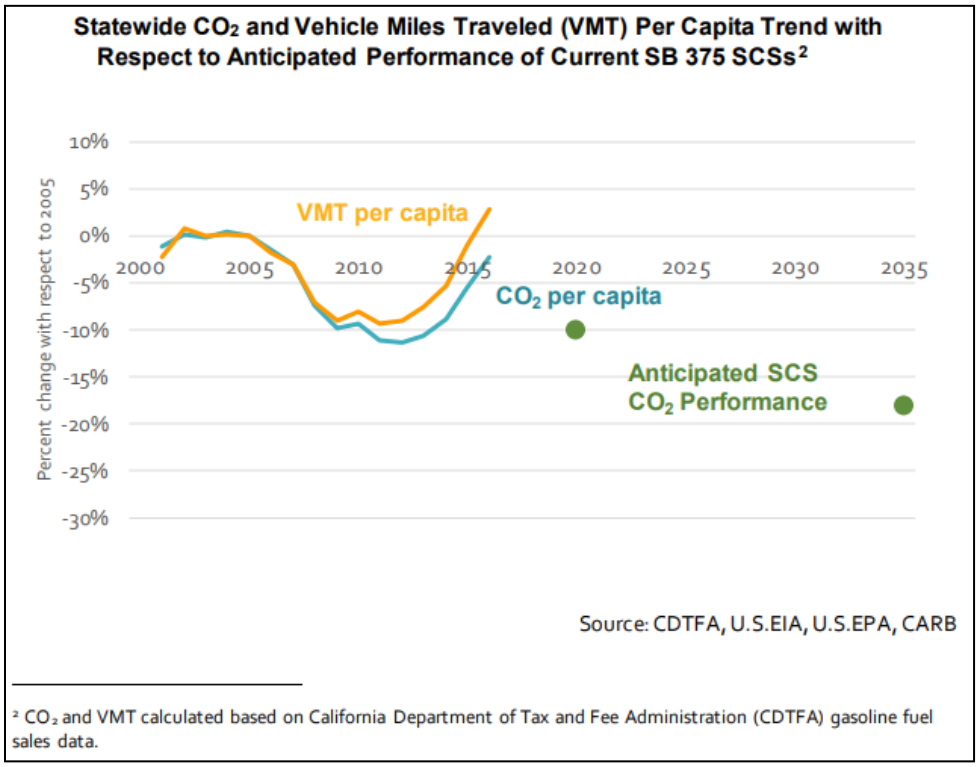
Question 2: Do lead agencies need to establish VMT thresholds for cumulative impacts?

In addition to direct impact analysis, lead agencies should address VMT impacts in the cumulative context. The CEQA Guidelines (and the case law) are clear that consideration of cumulative impacts is important to CEQA compliance. That said, a separate quantitative threshold may not be required if the threshold applied for project-specific impacts is cumulative in nature. VMT thresholds based on an efficiency form of the metric such as VMT per capita, can address both project and cumulative impacts in a similar manner that some air districts do for criteria pollutants and GHGs.

As explained in OPR's *Technical Advisory*, when using an absolute VMT metric, i.e., total VMT (as recommended below for retail and transportation projects), analyzing the combined impacts for a cumulative impacts analysis may be appropriate. A project that falls below an efficiency-based threshold that is aligned with long-term environmental goals and relevant plans would have no cumulative impact distinct from the project impact. Accordingly, a finding of a less-than-significant project impact would imply a less than significant cumulative impact, and vice versa. (OPR *Technical Advisory*, p. 6.)

A key consideration for cumulative scenarios is whether the rate of VMT generation gets better or worse in the long-term. If the rate is trending down over time, then the project level analysis may suffice. However, the trend direction must be supported with substantial evidence. This creates a potential issue for VMT because per capita VMT rates in California have been increasing, a trend inconsistent with RTP/SCS projections showing declines. The chart below from the *2018 Progress Report, California's Sustainable Communities and Climate Protection Act*, California Air Resources Board, November 2018 charts recent VMT per capita trends. This evidence could be used to justify the need for separate cumulative analysis to verify a project's long-term cumulative effects.

Figure 1: California VMT Trends



Source: 2018 Progress Report California's Sustainable Communities and Climate Protection Act, California Air Resources Board, 2018

For some projects, measuring project-generated VMT will only tell part of the impact story especially if they exceed a project threshold based on VMT per capita or similar efficiency metric. Measuring the "project's effect on VMT" may be necessary to fully explain the project's impact especially under

cumulative conditions. This occurs because of the nature of discretionary land use decisions. Cities and counties influence land supply through changes to general plan land use designations and zoning for parcels. These changes rarely, if ever, influence the long-term amounts of regional population and employment growth. Viewed through this lens, a full disclosure of VMT effects requires capturing how a project may influence the VMT generated by the project and nearby land uses. Also, some mitigation strategies that improve walking, bicycling, or transit to/from the project site can also reduce VMT from neighboring land uses (for example, installing a bike share station on the project site would influence the riding behavior of project residents and those living and working nearby).

Question 3: Do lead agencies need to use the same VMT methodology for setting thresholds and for conducting project VMT forecasts?

Lead agencies need to use consistent methods when forecasting VMT for threshold setting and project analysis to ensure an apples-to-apples comparison for identifying potential impacts. The project team has confirmed through case study comparisons[3] that failure to comply with this approach, as recommended by the *Technical Advisory,* can lead to erroneous impact conclusions. This is an important finding since the *Technical Advisory* also accepts that VMT analysis can be performed using sketch planning tools. Off-the-shelf sketch planning tools for VMT analysis do not contain trip generation rates or trip lengths consistent with local and regional travel forecasting models. These models are the most likely source for city-wide and region-wide VMT estimates used in setting thresholds because sketch planning tools cannot produce these aggregate-level VMT metrics. The *Technical Advisory* partially recognizes this issue by recommending that sketch planning tools use consistent trip lengths as the models used to produce thresholds, but it does not include a similar recommendation for trip generation rates. Both input variables, trip lengths and trip generation rates, need to be consistent with the travel forecasting model to produce accurate project impact analysis results.

2.4.4 Alternatives for VMT Measurement Methods and Thresholds

So how should lead agencies approach VMT threshold setting given their discretion? Since an impact under CEQA is a change to the existing environment, a starting level for potential thresholds would be the

[3] The table below shows the results of using different VMT methods. The green numbers under city and region are the threshold values (15% below the black values). If the travel demand model was used to set the italicized threshold values in the first row and the model was also used for the project analysis, then no impact would occur. If the project analysis instead used Institute of Transportation Engineers (ITE) trip generation rates and California Household Travel Survey (CHTS) trip lengths, then the project's 11.26 estimate would be higher than the model threshold values for both the City and Region resulting in a significant impact. Using thresholds derived from the ITE+CHTS data would have reversed this impact finding demonstrating that consistent methodology is essential for avoiding erroneous impact conclusions.

VMT Method	Existing Home-Based VMT per Capita		
	City	Region	Project
Travel demand model	9.86 (*8.38*)	11.97 (*10.17*)	5.46
ITE + CHTS	23.90 (*20.32*)	25.67 (*221.82*)	11.26

baseline (i.e., existing condition) VMT, VMT per capita, VMT per employee, or VMT per service population. Since VMT would normally be expected to increase or fluctuate with population and employment growth, changes in economic activity, and expansion of new vehicle travel choices (i.e., Uber, Lyft, autonomous vehicles, etc.), expressing VMT measurement in an efficiency metric form allows for comparisons to baseline conditions for land use projects, and land use plans. Establishing a threshold such as not exceeding baseline VMT per service population would mean that that future land uses would not have a significant transportation impact if they perform similar to existing land uses.

Alternatively, lead agencies can establish reductions from baseline levels as a threshold. How much of a reduction may depend on the values placed on vehicle use and its associated effects on mobility, economic activity, and environmental consequences. Working towards higher reductions in VMT becomes possible as the land use context changes to urban areas with higher densities and high-quality transit systems.

While OPR has developed specific VMT impact threshold recommendations for project-related impacts, current practice has not sufficiently evolved where a clear line can be drawn between "acceptable" and "unacceptable" levels of VMT change for the sole purpose of determining a significant transportation impact. Until SB 743, VMT changes were viewed through an environmental lens that focused on the relationship of VMT to fuel consumption and emissions. For transportation purposes, VMT has traditionally been used to evaluate whether land use or transportation decisions resulted in greater dependency on vehicle travel. Determining whether a portion of someone's daily vehicle travel is unacceptable or would constitute a significant transportation impact is generally not clear to lead agencies.

Another consideration in threshold setting is how to address cumulative VMT impacts and whether addressing them in the general plan EIR is advantageous for streamlining the review of subsequent land use and transportation projects given CEQA streamlining available through CEQA Guidelines Section 15183.[4] This section of the Guidelines relieves a project of additional environmental review if the environmental impact was adequately addressed in the general plan EIR and the project is consistent with the general plan, except if there are project-specific significant impacts peculiar to the project (see below).

> **15183. PROJECTS CONSISTENT WITH A COMMUNITY PLAN OR ZONING**
>
> (a) CEQA mandates that projects which are consistent with the development density established by existing zoning, community plan, or general plan policies for which an EIR was certified shall not require additional environmental review, except as might be necessary to examine whether there are project-specific significant effects which are peculiar to the project or its site. This streamlines the review of such projects and reduces the need to prepare repetitive environmental studies.

[4] A General Plan EIR can also be used to streamline project-level VMT analysis though other methods such as tiered EIRs (CEQA Guidelines Section 15152) and Program EIRs (CEQA Guidelines Section 15168).

The use of Section 15183 also addresses cumulative impacts as acknowledged in Section 15130(e).

> **15130. DISCUSSION OF CUMULATIVE IMPACTS**
>
> (e) If a cumulative impact was adequately addressed in a prior EIR for a community plan, zoning action, or general plan, and the project is consistent with that plan or action, then an EIR for such a project should not further analyze that cumulative impact, as provided in Section 15183(j).

For MCOG jurisdictions, addressing transportation VMT impacts in the City or County General Plan EIR could be useful in understanding how VMT reduction should be balanced against other community objectives when it comes to setting new VMT impact thresholds for SB 743.

Given the above information, each MCOG jurisdiction has at least five options for setting VMT thresholds.

- Option 1: Rely on OPR *Technical Advisory* MPO thresholds guidance
- Option 2: Rely on OPR *Technical Advisory* rural thresholds guidance
- Option 3: Set thresholds consistent with lead agency air quality, GHG reduction, and energy conservation goals as expressed in the General Plan
- Option 4: Set thresholds consistent with the General Plan or travel demand model future year VMT projections
- Option 5: Set thresholds based on baseline VMT performance, measured in absolute or efficiency metrics

Each of these options is discussed below.

Option 1: Rely on OPR Technical Advisory MPO thresholds

The first option is to simply rely on the threshold recommendations contained in the OPR *Technical Advisory*. As noted above, OPR generally recommends that impacts of land use projects (other than retail) should be measured against VMT per capita or VMT per worker threshold of 15 percent below that of baseline conditions (i.e., existing development).

For land use plans (i.e., a general plan, policy area plan, or specific area plan), a significant impact would occur if the respective thresholds above were exceeded in aggregate. This means that new population and employment growth combined with the planned transportation network would need to generate future VMT per capita or VMT per worker that is less than 85 percent of the baseline value to be considered less than significant. Land use projects and land use plans would also need to be consistent with the jurisdiction General Plan.

A potential limitation of the OPR recommendations is that the substantial evidence used to justify the thresholds is largely based on the state's air quality and GHG goals. Three issues arise from this reliance.

1. The OPR recommended threshold does not establish a level of VMT reduction that would result in the state meeting its air quality and GHG goals according to the *California Air Resources Board*

2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals (2019). This may create confusion with air quality and GHG impact analysis in environmental documents, which should already address the influence of VMT.

2. The OPR recommended thresholds do not directly reflect expectations related to the other SB 743 objectives related to statewide goals to promote public health through active transportation, infill development, multimodal networks, and a diversity of land uses. Recommending a reduction below baseline levels is consistent with these objectives, but the numerical value has not been tied to specific statewide values for each objective or goal.
3. State expectations for air quality and GHG may not align with local/lead agency expectations. Using state expectations for a local lead agency threshold may create inconsistencies with local city or county general plans.

Option 2: Rely on OPR Technical Advisory discussion for rural thresholds

As discussed above, the OPR *Technical Advisory* states, "*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….*"

When determining thresholds on a case-by-case basis, the lead agency could consider the following factors when making a significance determination.

- What are the state policy considerations for VMT reduction from rural areas? Is the amount of new VMT generated small enough that it would not interfere with the state's ability to achieve desired VMT and GHG emissions reductions?
- What is the land use context and associated lead agency policy for VMT reduction? Since the CEQA Guidelines allow for thresholds to vary based on land use context, the lead agency may consider sensitivity to VMT reduction in different land use contexts (i.e., rural areas, small towns, and unincorporated community centers).
- Is the project displacing other less efficient development? For example, is the project, diverting trips from more distant stores, which result in a net (absolute) VMT reduction, e.g. constructing a grocery store in a food desert? (OPR *Technical Advisory* p. 30)

However, because the Caltrans Transportation Impact Study Guideline (TISG) draft (discussed in more detail below) is supportive of the specific OPR *Technical Advisory* guidance, less restrictive thresholds are unlikely to be accepted for state highway facilities,

Option 3: Set thresholds consistent with lead agency air quality, GHG reduction, and energy conservation goals

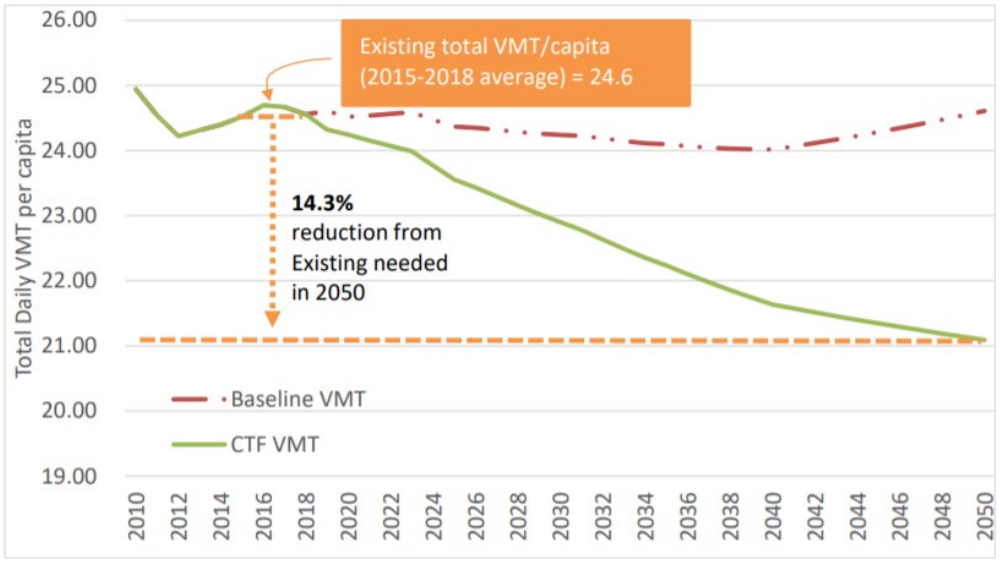
This option sets a threshold consistent with local air quality, GHG reduction, and energy conservation goals. This approach assumes that local air quality and GHG reduction goals in general plans, climate

action plans, or GHG reduction plans comply with the GHG reduction legislation and policies described above on pages 7 and 8.

- 40 percent below 1990 levels by 2030
- 80 percent below 1990 levels by 2050

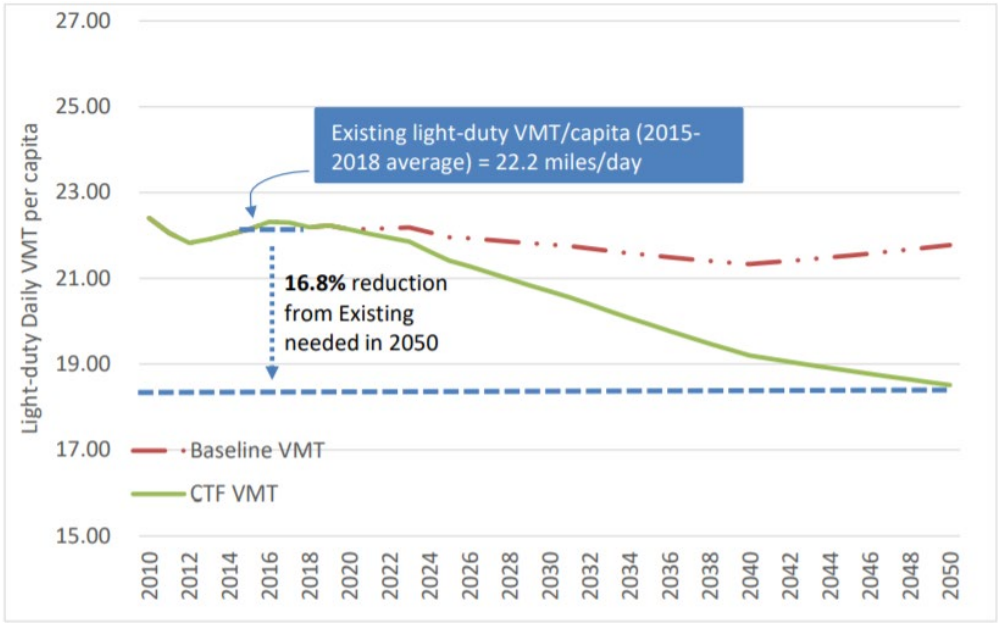
The ARB *Scoping Plan* and *Mobile Source Strategy* provide analysis related to how the state can achieve the legislative and executive goals while the Caltrans *Strategic Management Plan* and *Smart Mobility Framework* provide supportive guidance and metrics. An important recognition of the ARB *Scoping Plan* and *Mobile Source Strategy* is that the initial SB 375 targets alone were not sufficient to achieve state GHG reduction targets. The ARB *2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals* document provides updated information on VMT reductions needed to meet the State's GHG emission reduction targets by 2050. This document identifies two specific thresholds to meet these targets, a 14.3-percent reduction in total VMT per capita, and a 16.8-percent reduction in light-duty vehicle VMT per capita. While this evidence is tied largely to the state's emission reduction goals, the proposed VMT reductions associated with this approach to thresholds would also be supportive of multimodal networks, infill development, and greater land use diversity.

Figure 2: Statewide Total VMT/Capita



Source: *2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals*, ARB (pg. 10)
https://ww2.arb.ca.gov/sites/default/files/2019-01/2017_sp_vmt_reductions_jan19.pdf

Figure 3: Statewide Light-Duty VMT/Capita



Source: *2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals*, ARB (pg. 11) https://ww2.arb.ca.gov/sites/default/files/2019-01/2017_sp_vmt_reductions_jan19.pdf

One benefit of relying on ARB for a threshold recommendation is the CEQA Guidelines provision in Section 15064.7(c) highlighted below.

§ 15064.7. Thresholds of Significance.

(a) ~~**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.**~~ A threshold of significance is 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.

(b) **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.** Thresholds of significance to be adopted for general use as part of the lead agency's environmental review process must be adopted by ordinance, resolution, rule, or regulation, and developed through a public review process and be supported by substantial evidence. **Lead agencies may also use thresholds on a case-by-case basis as provided in Section 15064(b)(2).**

(c) When adopting **or using** thresholds of significance, a lead agency may consider thresholds of significance previously adopted or recommended by other public agencies or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence.

Source: Final Adopted Text for the 2018 Amendments and Additions to the State CEQA Guidelines. California Natural Resources Agency (p. 14) http://resources.ca.gov/ceqa/

ARB meets the criteria of being a public agency and having noted expertise in the areas of VMT and climate policy. Further, the recommended threshold values above were developed in specific consideration of SB 743 requirements. ARB's *2017 Scoping Plan* (p. 11) provides that its recommendations "are non-binding, and intended as supportive documentation that can be used at a lead agency's discretion to help substantiate significance thresholds used for purposes of compliance with SB 743, and to help minimize occurrence of duplicate or redundant analysis across transportation and climate resource impact areas under CEQA."

One other agency threshold to consider is based on Caltrans guidance. The Local Development-Intergovernmental Review (LD-IGR) Branch at Caltrans (https://dot.ca.gov/programs/transportation-planning/office-of-smart-mobility-climate-change/local-development-intergovernmental-review) seeks to reduce potential adverse impacts of local development on the state transportation system. As part of its responsibilities, each district branch performs reviews of CEQA environmental documents for local land use projects. These reviews include providing recommendations for transportation impact analysis such as metrics and thresholds.

When Caltrans reviews CEQA documents, they may function as a reviewing agency or a responsible agency. In a responsible agency role, Caltrans has approval authority over some component of the project such as an encroachment permit for access to the state highway system. Comments from Caltrans should be adequately addressed, and special attention should be paid to those comments when Caltrans serves as a responsible agency because an adequate response may be required to obtain their required approval.

Caltrans released a draft update to their TISG in February 2020 (https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/sb-743/2020-02-26-transmittal-and-draft-vmt-focused-tisg.pdf). Key points from this draft include the following:

- Caltrans recommends use of OPR's recommended thresholds for land use projects.
- Caltrans supports CEQA streamlining for land use projects in transit priority areas and areas with existing low VMT, as described in OPR's *Technical Advisory*.
- Caltrans recommends following the guidance on methods of VMT assessment found in OPR's *Technical Advisory*.
- Caltrans comments on a CEQA document may note methodological deviations from those methods and may recommend that significance determinations and mitigation be aligned with state GHG reduction goals as articulated in that guidance, ARB's *Scoping Plan*, and related documentation.
- In rural areas, Caltrans may comment requesting VMT-reducing strategies for the rural area be included programmatically, including at the General Plan level, for example. Caltrans will also recommend establishment of programs or methods to reduce VMT and support appropriate bicycle, pedestrian, and transit infrastructure, services or incentives.

With Caltrans endorsement of the recommended OPR thresholds, a state VMT threshold has been established for impacts to the state highway system. If a lead agency chooses a different threshold, they may have to complete more than one impact analysis.

Option 4: Set thresholds consistent with the General Plan or travel demand model future year VMT projections

VMT is a composite metric that is created as an output of combining a community's long-term population and growth projections with its long-term transportation network (i.e., the general plan). Other variables are also in play related to travel behavior, but land use changes and transportation network modifications are the items largely influenced or controlled by cities and counties. As such, to the extent total VMT across the model area network has been estimated in General Plan EIRs or other studies, each jurisdiction already has a total VMT growth "budget." This is the amount of absolute VMT change that is forecast to be caused from implementing the jurisdiction's General Plan. This VMT growth has already been planned for and determined to be "acceptable" by the jurisdiction. Regional planning agencies also incorporate the general plan growth as part of their RTPs and associated environmental impact analysis. This level of VMT could serve as the basis of a VMT threshold expressed as absolute VMT growth or as a VMT efficiency metric based on the future year VMT per capita, VMT per employee, or VMT per service population. Projects that would result in exceedances of projected future VMT would be considered to have a significant impact. The measurement of VMT could occur at the geographic subregion level, considering areas of comparable context (governmental jurisdiction and developmental intensity).

Potential limitations of this approach relate to the lack of a "baseline plus project" analysis and travel forecasting model sensitivity. If a general plan includes policies or implementation programs designed to reduce VMT through transportation demand management (TDM) strategies, the current MCOG travel demand model may not include these effects. Further, the current model does not capture major disruptive trend effects such as TNCs, AVs, internet shopping, or the recent COVID-19 effects.

Option 5: Set thresholds based on subregion baseline VMT performance

As noted above, an impact under CEQA begins with a change to the existing or baseline environment. There are a range of approaches to using this starting point for VMT impact analysis. At one end of the spectrum is "total daily VMT" generated under baseline conditions. Setting this value as the threshold for a jurisdiction basically creates a benchmark where any increase would be a significant impact. Alternatively, the baseline VMT per capita, VMT per employee, or VMT per service population could be used to establish an efficiency metric basis for impact evaluation. Using this form of VMT would mean that future land use projects would be expected to perform no worse than existing land use projects and only projects that cause an increase in the rate of VMT generation would cause significant impacts. Since VMT will increase or fluctuate with population and employment growth, changes in economic activity, and expansion of new vehicle travel choices (i.e., Uber, Lyft, autonomous vehicles, etc.), expressing VMT measurement in an efficiency metric form allows for more direct comparisons to baseline conditions for land use projects and land use plans.

Under this option, baseline plus project analysis may suffice for both project and cumulative purposes unless VMT trends are increasing over time. At a minimum, a qualitative assessment of RTP and General Plan consistency should still be included to verify the project avoids jeopardizing the air quality conformity and GHG reduction performance of other relevant plans.

The ARB *Scoping Plan* did not identify a scale at which VMT per capita reductions necessary to meet statewide goals should be measured, but instead provided the results of a statewide analysis. Larger scales (regional and up) will provide greater benefit to urbanized areas, as these areas generally have less VMT per capita. Subregional scales may provide greater benefit to less urbanized areas and less benefit to urban areas. However, subregional scales may provide greater incentive for VMT reductions in more urbanized areas than if a larger scale were used. The scale at which the baseline is measured (and thus how subregions are defined) may be subject to a future legal test.

2.4.5 Selecting Thresholds

Absent federal or state laws mandating VMT reduction goals from local agencies, VMT goals that the lead agency sets should be consistent with adopted plans. Adopting a VMT threshold is a discretionary action and should be consistent with the general plan in particular. Based on our review of local planning documents, provided in Appendix A, each jurisdiction has expressed policies related to VMT reduction, whether directly through reduction of VMT or vehicle travel, or in related goals pertaining to reducing air quality impacts, reducing greenhouse gas emissions, or improving energy efficiency. Therefore, a VMT thresholds approach which includes VMT reduction is appropriate. Lead agencies should also reconcile how their VMT threshold contributes to state goals for GHG reduction mentioned above and discuss how it is helping to meet these goals.

Determining an appropriate VMT threshold may depend whether the courts treat VMT more like air pollution and less like level of service (LOS). If VMT causes adverse effects to human health similar to air pollution, then the threshold should be tied to substantial evidence (i.e., scientific studies) that relate VMT to human health (or human welfare or safety). If this effect varies by area type, then the different thresholds may be appropriate. Currently (March 2020), the limited scientific evidence related to VMT changes and their potential for causing adverse effects on humans is the ARB *2017 Scoping Plan*. This analysis did not differentiate by area type so a change in rural VMT has no different effect on humans than a change in urban VMT. The VMT would still generate the same amount of GHG emissions (and air pollutant emissions plus other indirect adverse effects) that would still have the same contribution to climate change. Thus, thresholds based on the necessary reductions cited in the *Scoping Plan* of 16.8 percent light-duty vehicle VMT per capita and 14.3 percent total VMT per capita would be appropriate.

On the other hand, if VMT is treated more like LOS, then lead agencies would have a similar level of discretion to establish thresholds based on context (i.e., sensitivity to the amount of vehicle travel). Past practice allowed lead agencies to set LOS thresholds based largely on the local community's sensitivity to travel delay. This is consistent with CEQA Guidelines Section 15064: "…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." Rural areas

that were more sensitive were allowed to establish LOS thresholds that equated to lower levels of delay. Using this analogy, a lead agency could set VMT thresholds based on a community's sensitivity to the amount of vehicle travel or its associated effects.

If a lead agency wants to treat VMT like LOS, they should consult with their CEQA counsel. The basic rationale would be that VMT is simply another way of measuring transportation network performance and that the lead agency is granted the discretion to measure network performance expectations and their effects on humans. These effects are not limited to GHG, air pollution, and energy, but should also consider the other legislative intents of CEQA emphasized with italics below. This approach may require that the lead agency demonstrate compliance with state goals for GHG reduction, air quality conformity, and energy consumption.

> **Chapter 1: Policy**
>
> **§ 21000. LEGISLATIVE INTENT**
> The Legislature finds and declares as follows:
> (a) The maintenance of a quality environment for the people of this state now and in the future is a matter of statewide concern.
> (b) It is necessary to provide a high-quality environment that at all times is *healthful and pleasing to the senses and intellect of man.*
> (c) There is a need to understand the relationship between the maintenance of high-quality ecological systems and the general welfare of the people of the state, including their enjoyment of the natural resources of the state.
> (d) The capacity of the environment is limited, and it is the intent of the Legislature that the government of the state take immediate steps to identify any critical thresholds for the health and safety of the people of the state and take all coordinated actions necessary to prevent such thresholds being reached.
> (e) Every citizen has a responsibility to contribute to the preservation and enhancement of the environment.
> (f) The interrelationship of policies and practices in the management of natural resources and waste disposal requires systematic and concerted efforts by public and private interests to enhance environmental quality and to control environmental pollution.
> (g) It is the intent of the Legislature that all agencies of the state government which regulate activities of private individuals, corporations, and public agencies which are found to affect the quality of the environment, shall regulate such activities so that major consideration is given to preventing environmental damage*, while providing a decent home and satisfying living environment for every Californi*an.
>
> **§ 21001. ADDITIONAL LEGISLATIVE INTENT**
> The Legislature further finds and declares that it is the policy of the state to:
> (d) Ensure that the long-term protection of the environment, *consistent with the provision of a decent home and suitable living environment for every Californian*, shall be the guiding criterion in public decisions.

A potential challenge to any VMT threshold is that the ARB 2018 *Progress Report* includes evidence that VMT per capita is increasing and so are GHG per capita emissions. Further, the ARB Vision modeling of

VMT used in these reports did not consider the influence of TNCs or AVs and made several assumptions about future outcomes related to fuels and electric vehicles that may not meet a CEQA reasonably foreseeable definition. While this background condition exists, the requirement to consider "other substantial evidence" when making a significance finding may result in significant VMT impacts unless the threshold is no increase in total VMT.

Another potential challenge is that an increase in VMT is a possible detriment to overall safety. The OPR 2017 *General Plan Guidelines*, Appendix B, Transportation Safety, summarize research indicating that "higher total amounts of motor vehicle travel create higher crash exposure," and "reducing vehicle miles traveled reduces collision exposure and improves safety."

Regardless of the specific threshold a lead agency selects, they will still need to consider other substantial evidence related to VMT impacts when analyzing specific projects and making VMT impact significance determinations. This includes information such as the OPR and ARB VMT thresholds, the SB 32 scoping plan, the *2018 Progress Report California's Sustainable Communities and Climate Protection Act* progress report on SB 375 and the recent COVID-19 effects. How a lead agency considers this information may vary depending on their specific approach to CEQA and their sensitivity to project opposition and legal risk.

One approach to using thresholds and "other substantial evidence" when analyzing a project could follow the steps below.

1. Use the lead agency threshold to make initial significance determination.
2. Summarize the "other substantial evidence" that is relevant to making a VMT significance determination.
3. Recommend that the lead agency consider the other substantial evidence when making a final significance determination.
4. Upon receiving a written confirmation from the lead agency about the final impact determination, develop mitigation measures if appropriate.

2.5 Screening

Analysis of smaller, less complex projects can be simplified by using screening criteria. The OPR *Technical Advisory* suggests that screening thresholds may be used to identify when land use projects should be expected to cause a less-than-significant impact without conducting a detailed study. Screening is an option but is not mandatory. Because it requires limited substantial evidence to support its use on a project, it benefits project applicants and agencies wanting to streamline development review. However, the presumption of less than significant impact using screening of a project is based on limited information, and therefore screening adds some legal risk if challenged. The alternative is to do a full analysis for each project, trading more work for increasing the substantial evidence supporting an agency's VMT impact decisions.

The following screening thresholds are most applicable in Mendocino County jurisdictions:

- Projects consistent with an RTP or General Plan that generate less than 640 VMT per day. This value is based on the CEQA exemptions allowed for projects up to 10,000 square feet as described in CEQA Guidelines Sections 15303. The specific VMT estimate relies on the vehicle trip generation rate contained in the OPR *Technical Advisory* for small project screening and average vehicle trip lengths for Mendocino County based on the 2012 California Household Travel Survey (CHTS). Converting this value to an equivalent number of residential households would indicate that residential projects up to 22 units in Mendocino County could be screened out of analysis. Another option for residential projects is to simply rely on the CEQA Guidelines Section 15315 exemption for minor land divisions of four or fewer parcels. Four households would generate approximately 108 VMT per day in Mendocino County based on the 2012 CHTS. After updates are made to the MCOG travel forecasting model, these values may be updated to use trip lengths from that model.
- Residential and office projects that are located in areas below threshold VMT that incorporate similar features (i.e., density, mix of uses, transit accessibility).
- The OPR *Technical Advisory* also notes that local-serving retail projects, typically less than 50,000 square feet, improve retail destination proximity and thus shorten trips and reduce VMT. If defined in local zoning codes, lead agencies may use this definition to screen such projects. However, OPR also notes that lead agencies should also consider any project-specific information, such as market studies or economic impacts analyses, that might bear on customers' travel behavior. Such studies may be particularly relevant when retail projects larger than 50,000 square feet are evaluated.

Note that screening is also possible for transit priority areas (TPAs); however, no such areas exist in Mendocino County. TPAs are defined as areas within one-half mile of a major transit stop. Major transit stops[5] are typically defined as transit serving rail stations, ferry terminals, bus rapid transit, or transit stops on bus routes with headways of 15 minutes or less. For rural areas, transit headways are much longer than 15 minutes but the concept of concentrating growth around fixed route bus stops is still desirable to help reduce VMT. Since the state's goals around VMT and GHG reduction are not intended to reduce future population and employment growth, lead agencies in rural areas could also consider whether land use projects that concentrate growth around fixed route bus stops should be presumed to have a less than significant VMT impact.

Other screening criteria, such as for affordable residential projects, may be developed, but would need to be supported by substantial evidence consistent with CEQA Guidelines Section 15064.7, thus considering data, facts, research, and analysis.

If a project qualifies for screening, VMT may still be calculated for other analysis purposes such as air quality, GHG, and energy analysis. One acceptable method is to multiply the project's service population by the VMT per service population rate for the zone where its parcel(s) are located. If change in VMT by

[5] Public Resources Code Section 21064.3.

speed bin is desired, then the model should be updated to incorporate the project and determine this output.

3. Recommendations for MCOG Jurisdictions

Considering the information above, the following measures and thresholds are recommended for MCOG jurisdictions. These recommendations are based on a presumption that future travel behavior will be consistent with recent travel behavior. However, any subsequent changes including changes in usage of transportation networking companies (TNCs) such as Uber and Lyft, lower fuel prices, and public availability of autonomous vehicles (AVs) may change future travel behaviors, resulting in future VMT differing from current forecasts. As these trends evolve, models will need to be updated to reflect them.

Two measures and thresholds are specified, for project VMT and project effect on VMT. Project VMT is required in all cases; project effect on VMT may be required if VMT in the subregion is increasing over time. A flowchart summarizing this analysis is provided at the end of this section. More detailed discussions of the process and flowchart steps are provided in Appendix B.

3.1 Land Use Project VMT

3.1.1 Measure: Daily total VMT per service population

Daily total VMT per service population is an efficiency metric. VMT measurement as an efficiency metric allows for direct comparisons to baseline conditions for land use projects and land use plans.

Service population should include residents, employees, and students. Future MCOG travel forecasting model updates may consider adding tourists and seasonal residents to the model. The model currently includes seasonal dwelling units but does not have trip generation associated with them, as discussed in Appendix A.

Variation among model travel analysis zones (TAZs) in the mix of residential and work-related land uses may create anomalous patterns when screening using total VMT per service population, so, for screening purposes, two other measures may be useful:

- For residential land use projects, home-based VMT per resident
- For work-related land use projects, home-based work VMT per employee

3.1.2 Threshold: X percent below subregion baseline VMT per service population

A specific reduction "X" below subregion baseline VMT may be selected by each jurisdiction based on key factors such as the setting (as noted in CEQA Guidelines Section 15064(b)(1)), evidence related to VMT performance, and policies related to VMT reduction. Additional considerations can include related goals pertaining to reducing air quality impacts, reducing greenhouse gas emissions, or improving energy

efficiency. Each jurisdiction has stated goals or policies to some extent for these other considerations. Therefore, a threshold which includes VMT reduction is likely appropriate.

The *Technical Advisory* notes that in rural areas of non-MPO counties such as Mendocino County, fewer options may be available for reducing VMT, but that clustered small towns and small-town main streets may have substantial VMT benefits compared to isolated rural development. Therefore, a more modest reduction may be in line with general plan objectives and also appropriate for the land use context for Mendocino County.

However, when selecting a threshold, it is necessary to establish how natural and human environment harm is being avoided. Therefore, thresholds should not be tied to mitigation feasibility, and it is thus difficult to treat rural areas differently than urban areas. In this respect, VMT may be considered to be more like air quality, which generally uses specific thresholds used regardless of jurisdiction, and less like LOS, which generally uses thresholds based on local values and perceptions. The 14.3 percent reduction in total VMT per capita and the 16.8-percent reduction in light-duty vehicle VMT per capita recommended in ARB's 2017 *Scoping Plan* (for the MCOG model, which estimates total VMT, setting "X" equal to 14.3) are supported by substantial evidence. Additionally, they are referenced in the OPR *Technical Advisory* which has been endorsed by Caltrans in their draft TISG. Endorsement by Caltrans could establish them as a State threshold as noted above. Selecting a lesser value for "X" is not recommended. If a lesser value of "X" is selected, other substantial evidence will still need to be considered in the final impact determination, including the latest information from ARB on VMT thresholds and the ARB *2018 Progress Report, California's Sustainable Communities and Climate Protection Act*, which shows that statewide VMT trend is up.

Bicycle, pedestrian, and transit project may be presumed to have no VMT impact. However, project impacts on these modes and facilities still must be analyzed. Similarly, impacts of projects on the safety of the transportation system still must be analyzed.

For each project or plan that does not meet the screening criteria discussed further below, a project analysis baseline year (typically when the Notice of Preparation is filed) should be determined by interpolating between the MCOG travel demand forecasting model base and future years. This interpolation acknowledges the growth and VMT projected by the general plans for each jurisdiction. Alternatively, in areas with little or no growth, use of the model base year as the project analysis baseline year may be acceptable.

In all cases, the project or plan should be consistent with the jurisdiction's general plan and the Mendocino County Regional Transportation Plan. There are multiple options for determining consistency, but the project effect analysis methodology presented below allows for a quantitative determination that is likely important for other environmental impacts including air quality and greenhouse gases.

Subregions should be areas with comparable land use. Subregions discussed in Appendix A are

- Cities: Each incorporated city was defined as its own subregion

- City-adjacent areas: These are unincorporated areas with comparable land use adjacent to each city: Except for Point Arena, each city has land use adjacent to it with similar character of the city, but outside of the city limits. These areas are typically suburban in nature. Travel characteristics of these areas may be reasonably expected to be comparable to the adjacent city.
- Other coastal areas: Unincorporated areas along SR 1 outside of the City adjacent zones.
- Other US 101 corridor areas: Unincorporated areas along US 101 outside of the City adjacent zones.
- Other unincorporated areas: Unincorporated area not adjacent to any city or major corridor. The area away from cities, with less dense development, will have different travel characteristics that areas in or near cities. These areas are generally rural low-density, with some occasional clusters of housing or development.

If the subregion VMT per service population is decreasing over time, i.e. the model subregion VMT per service population in the cumulative year is less than in the base year, this analysis is sufficient. If VMT per service population in the subregion is increasing, the project VMT per service population should be calculated for the cumulative year and compared to the subregion's VMT per service population for the base year to determine whether the threshold of x% below subregion VMT is exceeded. If it does not, the project effect on VMT should also be calculated.

3.1.3 Methodology: Use the MCOG travel demand forecasting model to analyze VMT in areas covered by the model

The model is estimated, calibrated, and validated using local and regional data and can provide the most reasonable estimates of VMT. However, as noted in Appendix A, updates to the model are recommended, specifically splitting large TAZs, recalibration, and revalidation.

VMT per service population or resident should be estimated to one decimal place. Further precision is beyond the accuracy of the model.

Note that this methodology will not be sufficient for every potential project. The planner or engineer performing the project analysis should assess if project-specific data and calculations may provide a more appropriate answer than this methodology. Assessment should include consideration of the following:

- Does the project change the assumptions of the model? Examples include
    - Growth not reflected in the model
    - Changes to jurisdiction boundaries
    - Changes to land use that affect subregions (subregions outside of cities are based on comparable land use and travel behavior)
    - Land use not captured in the model
- Does the project have specific impacts outside of the model area?

- Does the project affect travel at specific, known locations outside of the model?
- Does the project include other changes outside the model boundaries?

- Does the project have other impacts that will not be captured by the model? Examples include
  - Seasonal rental travel not directly captured in the current model
  - Hospitals, which have different land use than medical offices
  - Special uses evaluated as discretionary action under CEQA

3.2 Land Use Project Effect on VMT

3.2.1 Measure: Total VMT

The effect of the project on model-wide total VMT measured across the network should also be evaluated if VMT per service population in the subregion is increasing over time and cumulative year project VMT per service population does not meet the threshold determined for the base year. Typically, this analysis includes the VMT disaggregated by speed bin for each of the following scenarios to be used as an input to air quality, GHG, and energy consumption impact analyses.

- Base year
- Base year plus project
- Cumulative year
- Cumulative year plus project

The project effect on VMT can then be calculated by the difference for each pair of scenarios (base year and cumulative year).

3.2.2 Threshold: Cumulative total VMT for the model area is reduced or unchanged with addition of the project

(This test will also provide evidence of consistency with the RTP and general plan presuming they are both accurately represented in the regional model.)

The project should also not increase the total VMT for the model area and should not change the total VMT by speed bin such that the emissions or energy consumption would increase with the project.

3.3 Screening: Implement screening criteria to simplify analysis for smaller projects

Analysis of smaller, less complex projects can be simplified by using screening criteria. If a project meets any of the following criteria, it may be presumed to cause a less-than-significant VMT impact without further study. This presumption is not a “safe harbor” but is subject to other substantial evidence verifying the presumption.

- The project generates less than 640 VMT per day and is consistent with the jurisdiction's general plan and the Regional Transportation Plan.
- The project is a local-serving retail or other local serving employment project less than 50,000 square feet (larger retail projects may also qualify due to distance from other population centers) and is consistent with the jurisdiction's general plan and the Regional Transportation Plan.
- The project is a residential or work-related land use, located in a TAZ with similar land uses and travel demand characteristics, and the TAZ VMT per service population is equal to or less than x % below the sub-regional mean. The project should also be consistent with the jurisdiction's general plan and the Regional Transportation Plan.
- The project is a residential-related land use and the TAZ home-based VMT per resident is equal to or less than x % below the sub-regional mean. The project should also be consistent with the jurisdiction's general plan and the Regional Transportation Plan.
- The project is a work-related land use and the TAZ home-based work VMT per employee is equal to or less than x % below the sub-regional mean. The project should also be consistent with the jurisdiction's general plan and the Regional Transportation Plan.

To simplify the determination if a project meets the last three criteria, the baseline total weekday VMT per service population, home-based VMT per resident, and home-based VMT per employee can be calculated for each TAZ and subregion. TAZs with a result lower than the sub-regional threshold can then be identified and mapped for use by planning department staff. A tool to simplify this analysis was developed. Instructions for using this tool, including screenshots, are provided in Appendix C.

3.4 Transportation Projects: Jurisdiction discretion

Transportation projects have the potential to change travel patterns and may lead to additional vehicle travel on the roadway network, also referenced as induced vehicle travel (OPR *Technical Advisory*, pp. 19-23, and Appendix 2). This is particularly true for roadway capacity expansion projects., Under CEQA Guidelines Section 15064.3(b)(2), lead agencies have the discretion to select their own metrics for all modes. Lead agencies can consider retaining current practices such as using LOS thresholds as identified in the General Plan but should evaluate whether use of LOS still complies with the new CEQA Guidelines expectations in Sections 15064.3, 15064, and 15064.7. Lead agencies that do not choose VMT will still need VMT as an input to air quality, GHG, and energy impact analysis. For transportation projects that increase roadway capacity, the VMT estimates and forecasts will also need to include induced travel effects that lead agencies may not have included in past practice. However, not all roadway projects will lead to induced travel.

Project types that would likely lead to a measurable and substantial increase in vehicle travel generally include addition of through lanes on existing or new highways, including general purpose lanes, HOV lanes, peak period lanes, auxiliary lanes, or lands through grade separated interchanges. The OPR *Technical Advisory* discussion about projects that increase roadway capacity (page 24) may imply that any increase in total VMT may indicate a significant impact. Preliminary Caltrans information states the following (emphasis added):

C. Thresholds

C1. What will Caltrans use as the CEQA threshold of significance? What is considered a VMT-significant impact?

CEQA does not require that a lead agency adopt thresholds of significance. As a statewide agency with projects in a variety of environmental settings, Caltrans has not adopted thresholds of significance, and instead makes significance findings on a case-by-case basis considering the unique circumstances of the project as well as the environmental setting. *Caltrans' draft guidance suggests that generally, an increase in "VMT attributable to the project" as defined in the OPR Technical Advisory should be considered significant unless there are project-specific circumstances, which would render the impact less than significant and that determination can be supported by substantial evidence.*

Source: Q&A from November 8, 2019 Webinar (https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/sb-743/2019-12-18-qa.pdf)

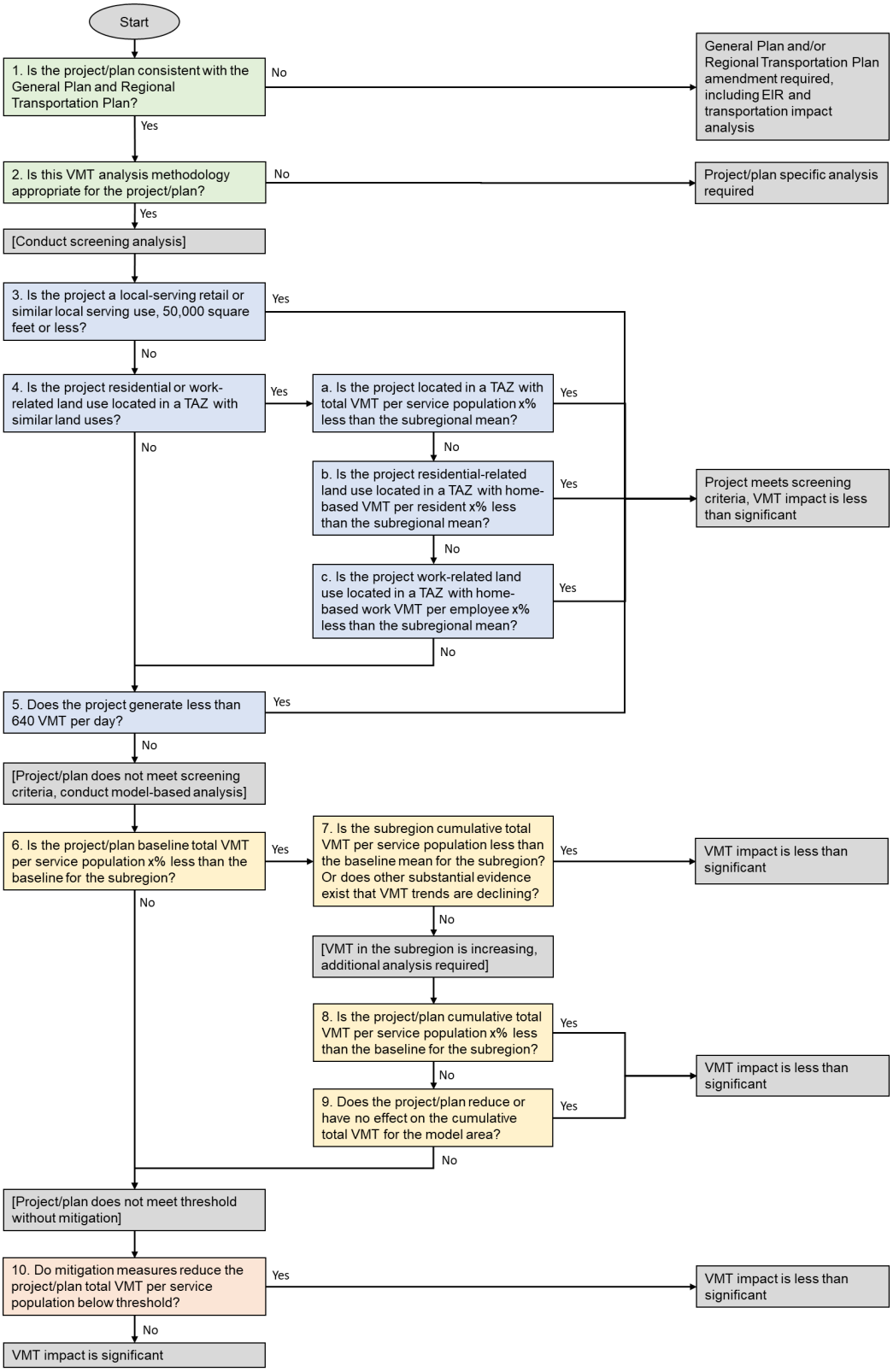
OPR's *Technical Advisory* provides an extensive list of projects which are unlikely to lead to induced travel, including addition of roadway capacity on local or collector streets provided the project also substantially improves multimodal conditions. (OPR *Technical Advisory*, pp. 20-21.) Appendix 2 to OPR's *Technical Advisory* provides specific guidance on calculating induced vehicle travel.

Assuming VMT is used as the metric, transit (except for on-demand transit) and active transportation projects may be considered to have less than significant impact.

3.5 Option for General Plan EIR Coverage of Land Use and Transportation Projects

Rather than analyzing VMT for each proposed land use and transportation project individually, a jurisdiction may choose to complete VMT impact analysis as part of the General Plan EIR and make specific use of CEQA Guidelines Section 15183 or other CEQA streamlining methods as noted above. Setting a threshold for the general plan itself and analyzing VMT impacts in the general plan EIR could preclude projects consistent with the general plan from further VMT impact analysis. The jurisdiction may adopt a threshold option from above or one that is based on substantial evidence, use it in the general plan EIR, determine if VMT impacts are significant, mitigate to the extent feasible, and adopt a statement of overriding consideration if determined to be appropriate. The lead agency can then tier off the general plan EIR for projects consistent with the general plan without doing additional VMT impact analysis.

3.6 Process Flowchart



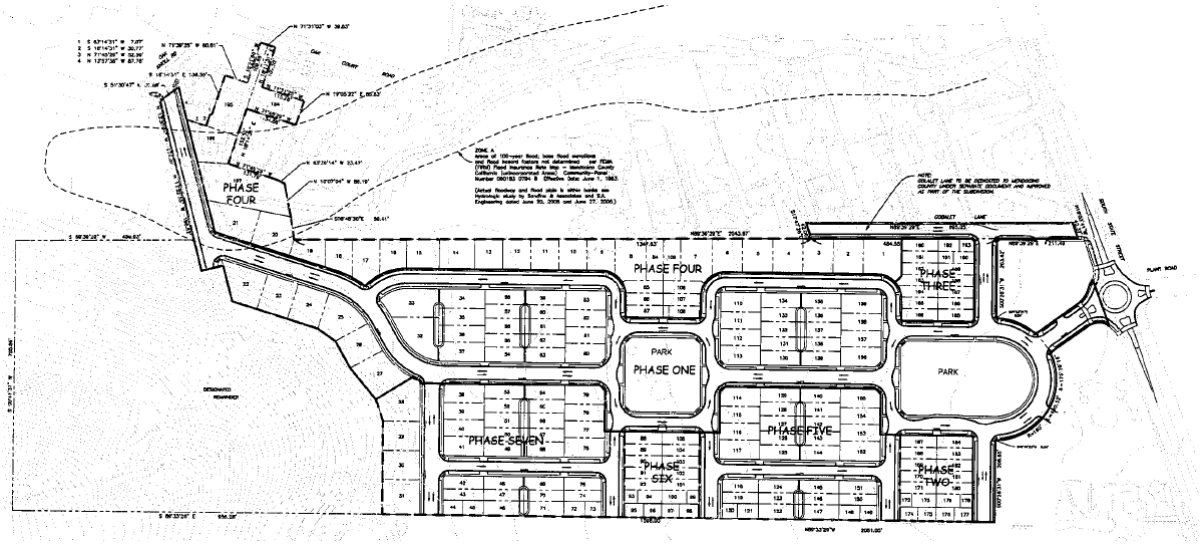
4. Test Cases for VMT Analysis

This section uses recent projects in Mendocino County as test cases for the proposed VMT analysis methodologies and thresholds. For each test case, the project was assessed to determine if the methodology was appropriate or if more detailed analysis was required. If the methodology was determined to be appropriate, the flowchart above was used to analyze the test case.

Each test case is discussed below. Analysis results are shown in italics.

4.1 Garden's Gate Subdivision

This proposed project consists of 123 detached homes and 74 townhouses just south of the Ukiah city limit, in the Ukiah Adjacent subregion.



Garden's Gate Tentative Map 1 (Garden's Gate Subdivision Draft Environmental Impact Report, September 2008)

4.1.1 Analysis

The project was assessed to determine if the methodology is appropriate, including:

- Does the project change the assumptions in the model?
- Does the project have specific impacts outside the model area?
- Does the project have specific impacts that will not be captured by the model?

The methodology is appropriate: the project does not change the assumptions in the model, nor have specific impacts outside the model area, nor have specific impacts that will not be captured by the model.

The questions in the flowchart were evaluated:

- Is the project/plan consistent with the General Plan and Regional Transportation Plan (RTP)?

  Yes: The project is consistent with the suburban residential designation in the Ukiah Valley Area Plan. The project is consistent with the land use in the model TAZ used to evaluate the RTP.

- Is the project a local-serving retail project, 50,000 square feet or less?

  No.

- Is the project/plan residential or work-related land use located in a TAZ with similar land uses?

  Yes, the project is residential and there is existing residential land use in the TAZ.

- Is the project/plan located in a TAZ with total VMT per service population x% less than the subregional mean?

  Yes. For this analysis, X was assumed to be 14.3 percent in accordance with the reduction in total VMT per capita recommended in the California Air Resource Board 2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals*. The base year was assumed to be 2019. The screening tool showed that the total VMT per service population for the TAZ is 36 percent less than Ukiah Adjacent subregional mean. Figure 4 shows the screening tool inputs and Figure 5 shows the screening tool results*

Figure 4: Screening tool inputs

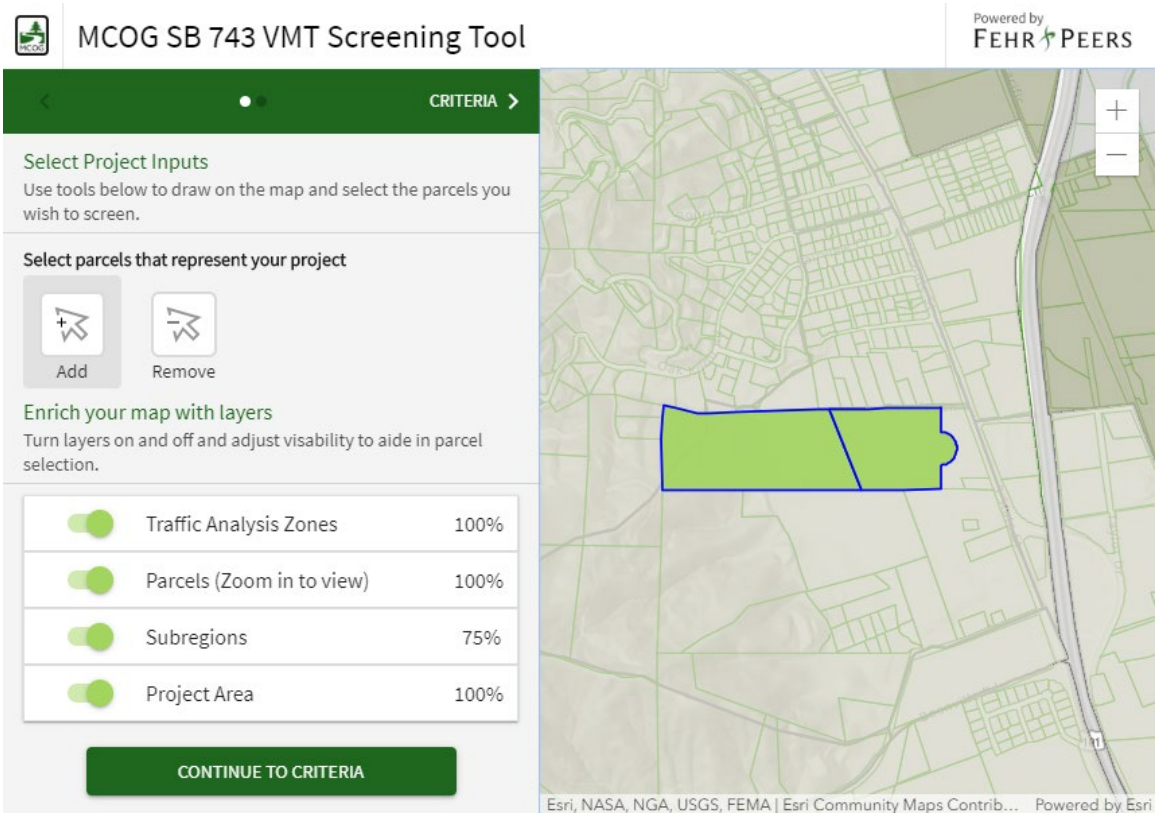
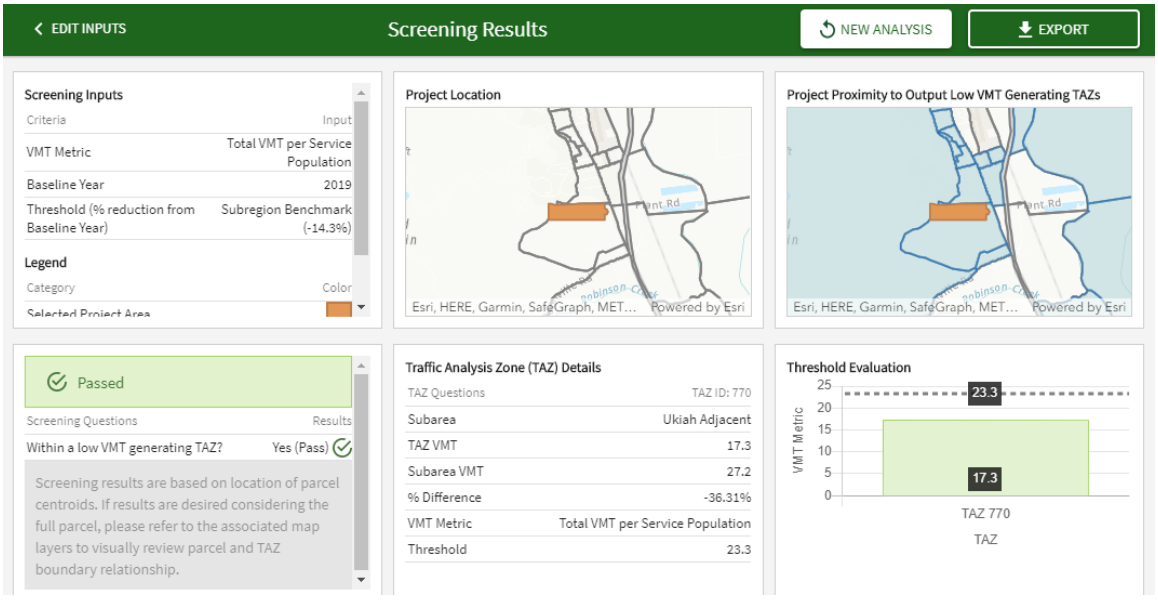


Figure 5: Screening tool results

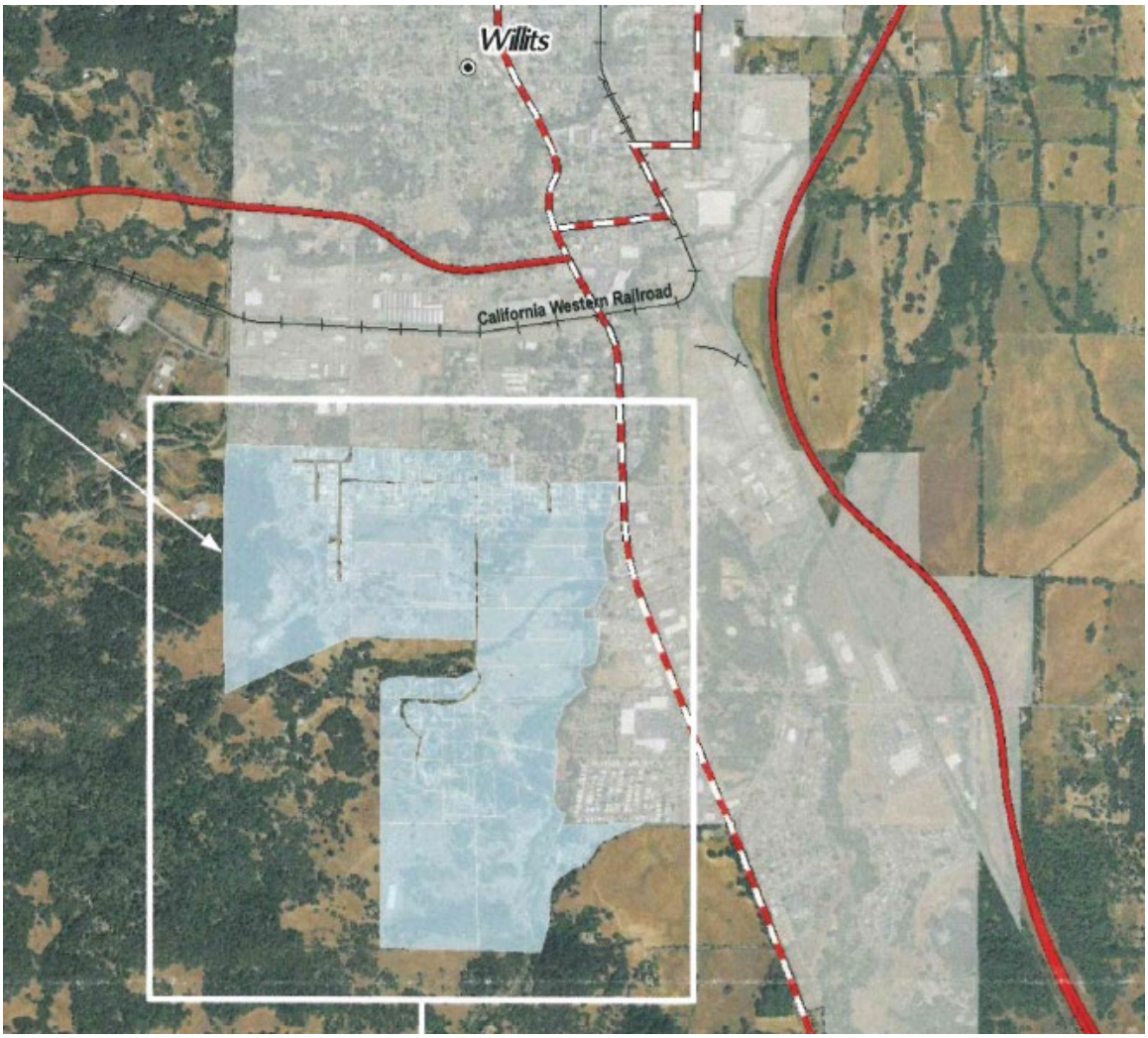


Conclusion: Project passes screening and supports the presumption that VMT impact is less than significant.

This evidence supports a conclusion that the project would have a less than significant VMT impact under baseline plus project conditions. This conclusion would also apply under cumulative conditions presuming no substantial changes to the subregion land use and transportation context.

4.2 Willits Sphere of Influence Expansion

This proposal is to expand the City of Willits sphere of influence to the southwest. The area would be rezoned for a mix of residential types, including single family dwelling units, duplexes, apartments, and senior housing. A minimum of 1,932 dwelling units would be planned.



Excerpt from Draft City SOI Update figure, Mendocino County, July 2019

4.2.1 Analysis

The project was assessed to determine if the methodology is appropriate, including:

- Does the project change the assumptions in the model?
- Does the project have specific impacts outside the model area?
- Does the project have specific impacts that will not be captured by the model?

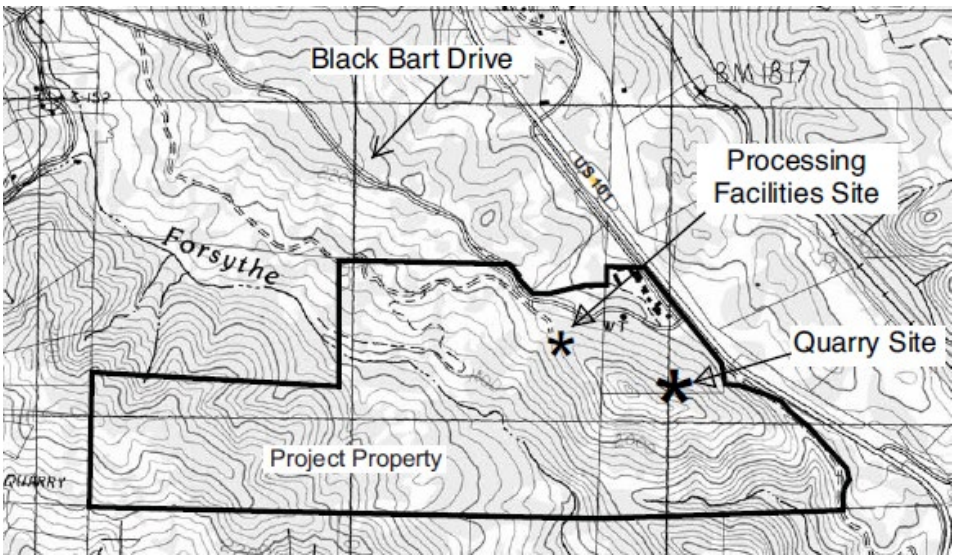
The methodology is not appropriate: the project would change the assumptions in the model including boundaries of the Willits Adjacent Subregion, and a general plan amendment would be necessary. Additionally, the travel forecasting models TAZs do not include this much growth, and the large addition to housing would change the model results.

To accomplish this analysis, the following actions would be necessary:

- Identify the expected housing mix.
- Identify the expected buildout timeline, including expectations for 2030, the cumulative year of the model.
- Update the model TAZs and subregions to reflect this change.
- Update the model results, with and without the project.
- Determine
    - Does the project effect on total VMT per service population, comparing no project to with project, result in reduce VMT for the model area?
    - Is the project VMT per service population in the baseline and cumulative scenarios 14.3% less than baseline for the subregion?

4.3 Harris Quarry Expansion

The proposed project would expand the existing quarry and construct an asphalt plant at the quarry site.



Excerpt from Figure 3-2, Project Vicinity, Harris Quarry Use Permit and Reclamation Plan Revised Draft Environmental Impact Report (Leonard Charles and Associates, May 2011)

4.3.1 Analysis

The project was assessed to determine if the methodology is appropriate, including:

- Does the project change the assumptions in the model?
- Does the project have specific impacts outside the model area?
- Does the project have specific impacts that will not be captured by the model?

The methodology is not appropriate: the project would result in changes to truck trips to specific quarries and asphalt plants outside of Mendocino County. The Mendocino County travel forecasting model cannot capture these trips. Thus, the methodology is not appropriate for this project, and a more specific analysis of VMT for the project is required.

The project EIR contained extensive analysis of truck trips and the project's impact on VMT as shown in the table below. Changes in trips to and from specific quarry locations were analyzed, and the change in VMT was determined.

Quarry Aggregate VMT	Base Permit		Project		Project plus Near Term Cumulative		Change In VMT
	Annual Trips	Annual VMT	Annual Trips	Annual VMT	Annual Trips	Annual VMT	
Harris	3,719	98,761	7,550	225,263	9,420	355,943	257,182
Davis Pit	3,721	322,636	3,579	318,899	970	96,567	-226,069
Keithly Ranch	4,959	415,506	4,747	401,631	1,303	126,538	-288,968
DNA River	1,240	145,695	1,209	144,970	217	28,896	-116,799
Cooks Humboldt	992	133,202	973	129,297	177	22,617	-110,585
Ford Gravel	9,920	287,671	8,096	236,262	9,649	372,762	85,091
Ten Mile	2,480	75,480	2,018	58,816	2,693	74,219	-1,261
Pieta	2,481	109,033	2,058	89,771	2,070	61,471	-47,562
Layton Rock	2,480	69,650	2,088	47,997	2,463	61,471	-8,179
Cooks Valley	2,480	329,488	2,420	319,171	513	65,387	-264,101
Wisley Ranch	744	25,178	591	19,419	814	25,373	195
Coal Mine	1,241	108,060	1,199	104,864	353	28,241	-79,819
Syar Healdsburg	2,449	326,041	2,412	319,551	447	65,321	-260,720
Kunzler	0	0	0	0	7,845	130,187	130,187
Total	***38,936***	***2,446,401***	***38,940***	***2,415,911***	***38,934***	***1,514,993***	***-931,408***
Plant (AC VMT)							
Harris	0	0	2,644	85,621	2,644	85,621	85,621
Granite	7,499	284,767	5,444	183,063	5,444	183,063	-101,704
Baxman	1,718	71,146	1,815	61,089	1,815	61,089	-10,057
Bodean/Syar (Santa Rosa)	2,501	445,239	1,816	318,347	1,816	318,347	-126,892
Total	***11,718***	***801,152***	***11,719***	***648,120***	***11,719***	***648,120***	***-153,032***
Project Total	**50,654**	**3,247,553**	**50,659**	**3,064,031**	**50,653**	**2,163,113**	**-1,084,440**
Note: VMT = Vehicle miles traveled							

Table 5.2-1, Vehicle Miles Traveled Summary, from Harris Quarry Use Permit and Reclamation Plan Revised Draft Environmental Impact Report (Leonard Charles and Associates, May 2011)

The analysis did not consider employee VMT; a full analysis should include this along with truck VMT. Considering all vehicle VMT, the project should be evaluated to determine if total VMT per service population is less than X percent of the existing quarry performance. Depending on the thresholds selected by Mendocino County, "X" could be assumed to be 14.3 percent, in accordance with the reduction in total VMT per capita recommended in the California Air Resource Board *2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals*.

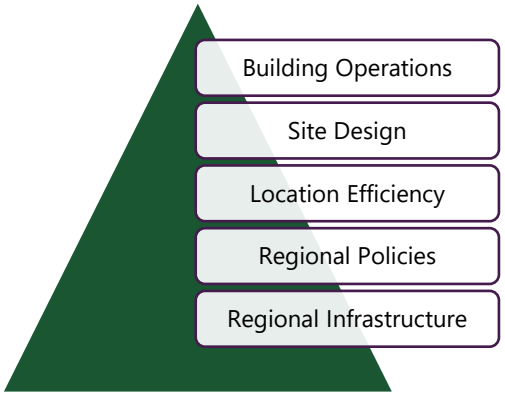
5. Transportation Demand Management Strategies

This section summarizes our assessment of new research related to transportation demand management (TDM) effectiveness for reducing VMT. The purpose of this work was to compile new TDM information that has been published in research papers since release of the *Quantifying Greenhouse Gas Mitigation Measures*, California Air Pollution Control Officers Association (CAPCOA), August 2010, and to assemble that research with other available data to compile a list of potential VMT reduction mitigation measures for use in Mendocino County given its small town and rural land use context. Attachment A in Appendix D summarizes the overall evaluation of all the CAPCOA strategies, and Attachment B in Appendix D identifies the top strategies suited for implementation in Mendocino County.

5.1 Strategy Review

The matrix in Attachment A summarizes the overall evaluation findings and provides a complete list of VMT reduction mitigation strategies based on new research. An important consideration for the effectiveness of these TDM strategies is the appropriate scale of implementation. The strategies described in section include regional, city, and community-scale transportation infrastructure strategies (for example, expanding the transit or bicycle network) and project-level strategies (for example, building site TDM strategies such as parking pricing and transit pass subsidies). The largest reductions in VMT (and resulting emissions) derive from regional and city policies related to land use location efficiency and infrastructure investments that support transit, walking, and biking. While there are many measures related to site design and building operations that can influence VMT, they typically have smaller effects that are often dependent on building tenants. Figure 6 presents a conceptual illustration of the relative importance of scale.

Figure 6: Transportation-Related GHG Reduction Measures



Source: Fehr & Peers, 2019

Of the 50 transportation-related strategies presented in the CAPCOA 2010 report, three are vehicle strategies unrelated to VMT reduction. Of the remaining 47, 41 are applicable at building and site level. The other six are functions of, or depend on, site location and/or actions by local and regional agencies or funders. Table 1 summarizes the strategies according to the scope of implementation and the agents who would implement them.

Table 1: Summary of Transportation-Related CAPCOA Measures

Scope	Agents	CAPCOA Strategies
Building Operations	Employer, Manager	**26** from five CAPCOA strategy groups: • 3 from 3.2 Site Enhancements group • 3 from 3.3 Parking Pricing Availability group • 15 from 3.4 Commute Trip Reduction group • 2 from 3.5 Transit Access group • 3 from 3.7 Vehicle Operations group
Site Design	Owner, Architect	**15** from three strategy groups: • **6** from 3.1 Land Use group • **6** from 3.2 Site Enhancements group • **1** from 3.3 Parking group • **2** from 3.6 Road Access group
Location Efficiency	Developer, Local Agency	**3** shared with Regional and Local Policies
Alignment with Regional and Local Policies	Regional and Local Agencies	**3** shared with Location Efficiency

Source: Fehr & Peers, 2019

We further reduced this list of strategies to the 27 included in Appendix D by eliminating strategies that require moving the project to a different location. Of these 27 strategies, only a few are likely to be effective in a rural or small-town setting such as Mendocino County. To winnow the list, we reviewed applicability at the project scale and how land use context could influence each strategy's effectiveness.

We identified seven strategies most likely to be effective in Mendocino County. These strategies are described in Attachment B and listed below. Note that disruptive trends, including but not limited to, transportation network companies (TNCs), autonomous vehicles (AVs), internet shopping, micro-transit, and the recent COVID-19 effects may affect the future effectiveness of these strategies.

- Community-scale strategies
    1. Provide pedestrian network improvements – This strategy focuses on creating a pedestrian network within the project and connecting to nearby destinations. Projects in Mendocino County tend to be small so the emphasis of this strategy would likely be the construction of network improvements that connect the project site directly to nearby destinations. Alternatively, implementation could occur through an impact fee program (discussed in more

detail below) or benefit/assessment district targeted to various areas in the County designated for improvements through local or regional plans. Implementation of this strategy may require regional or local agency coordination and may not be applicable for all individual land use development projects.

2. Provide traffic calming measures and low-stress bicycle network improvements – This strategy combines the CAPCOA research focused on traffic calming with new research on providing a low-stress bicycle network. Traffic calming creates networks with low vehicle speeds and volumes that are more conducive to walking and bicycling. Building a low-stress bicycle network produces a similar outcome. One potential change in this strategy over time is that e-bikes (and e-scooters) could extend the effective range of travel on the bicycle network, which could enhance the effectiveness of this strategy. Implementation options are similar to strategy 1 above. Implementation of this strategy may require regional or local agency coordination and may not be applicable for all individual land use development projects.
3. Increase transit service frequency and speed – This strategy focuses on improving transit service convenience and travel time competitiveness with driving. Given land use density in Mendocino County, this strategy may be limited to traditional commuter transit where trips can be pooled at the start and end locations or require new forms of demand-responsive transit service. The demand-responsive service could be provided as subsidized trips by contracting to private TNCs or taxi companies. Alternatively, a public transit operator could provide the subsidized service but would need to improve on traditional cost effectiveness by relying on TNC ride-hailing technology, using smaller vehicles sized to demand, and flexible driver employment terms where drivers are paid by trip versus by hour. Implementation of this strategy would require regional or local agency implementation and/or substantial changes to current transit practices, and therefore would not likely be applicable to individual development projects.

- Project-scale strategies

4. Increase diversity of land uses – This strategy focuses on inclusion of mixed uses within projects or in consideration of the surrounding area to minimize vehicle travel in terms of both the number of trips and the length of those trips.
5. Encourage telecommuting and alternative work schedules – This strategy relies of effective internet access and speeds to individual project sites/buildings to provide the opportunity for telecommuting. The effectiveness of the strategy depends on the ultimate building tenants and this should be a factor in considering the potential VMT reduction. Effectiveness may also be limited in more rural areas of the County with limited broadband internet access. At the time this report was developed (May 2020), the COVID-19 pandemic had resulted in large increases in telecommuting. The long-term effect of this behavior change will not be know for some time.
6. Implement car-sharing programs and ride-sharing programs – This strategy reduces the need to own a vehicle or reduces the number of vehicles owned by a household by making it convenient to access a shared vehicle for those trips where vehicle use is essential. Implementation of this strategy may require regional or local agency implementation and coordination and may not be applicable for all individual development projects. School-pools

(ridesharing programs for school children) and voluntary employer-based trip reduction programs could also be encouraged. This strategy also focuses on encouraging carpooling and vanpooling by project site/building tenants, which depends on the ultimate building tenants; this should be a factor in considering the potential VMT reduction.

7. Implement parking management – This strategy focuses on the management of parking to influence vehicle travel. Free and ubiquitous parking supply tends to increase vehicle use while reducing parking supply and pricing spaces can help reduce vehicle travel. A reduction in parking supply can also be used to incentivize infill development and higher density development by reducing the cost of building parking spaces. This strategy may be less effective in small-town and rural settings such as Mendocino County but will depend on the specific project site and the surrounding parking supply.

All seven strategies are suitable for use in Mendocino County. However, the most effective strategies are community scale and would likely require a program approach to implementation, such as an impact fee program, mitigation bank, or mitigation exchange. These approaches are discussed below. Project site mitigation effectiveness is more limited given the land use context. Overall, strategies 1, 2, 4, 5, and 6 are considered the highest priorities for Mendocino County.

5.2 Limitations of Quantification

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

5.2.1 Project Site Applications

TDM research has a variety of limitations but two that stand out are

- whether research findings scale to individual project sites, and
- whether land use context should be used to set maximum caps for individual projects.

Research that measures TDM strategy effect on VMT reduction often measures the effect at a scale that is larger than a single project or building site. Therefore, the transferability of the measured effect to a project site may be uncertain.

Another important consideration is the influence of the land use context surrounding a project site. The density and mix of surrounding land uses, plus the quality of available transit service, are all examples of land use context factors that influence vehicle trip making. Therefore, the CAPCOA methodology identifies VMT reduction maximums based on community types tied to land use context. The caps are applied at each step of the VMT reduction calculation (at the strategy scale, the combined strategy scale, and the global scale). However, these caps are not based on research related to the effectiveness of VMT reduction strategies in different land use contexts. Instead, the percentages were derived from a limited comparison of aggregate citywide VMT performance for Sebastopol, San Rafael, and San Mateo, where

VMT performance ranged from 0 to 17 percent below the statewide VMT/capita average based on data collected prior to 2002. Little to no evidence exists about the long-term performance of similar TDM strategies in different land use contexts. Therefore, VMT reductions from TDM strategies cannot be guaranteed in most cases.

5.2.2 Combining VMT Reduction Strategies

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

$$Total\ VMT\ Reduction = (1 - P_a) * (1 - P_b) * (1 - P_c) * \dots$$

where

$$P_x = percent\ reduction\ of\ each\ VMT\ reduction\ strategy$$

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

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

5.3 Limitations for Implementation

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

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

5.3.1 Addressing Limitations

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

- VMT Impact Fee Program – This concept resembles a traditional impact fee program in compliance with the mitigation fee act and uses VMT as a metric. The nexus for the fee program would be a VMT reduction goal consistent with the CEQA threshold established by a lead agency for SB 743 purposes. The main difference from a fee program based on a metric such as vehicle LOS is that the VMT reduction nexus results in a capital improvement program (CIP) consisting largely of transit, bicycle, and pedestrian projects. These types of fee programs are time consuming to develop, monitor, and maintain but are recognized as an acceptable form of CEQA mitigation if they can demonstrate that the CIP projects will be fully funded and implemented. The City of Los Angeles is the first city in California to complete a nexus study for this type of program.
- VMT Exchanges – This concept (along with VMT banks) borrows mitigation approaches from other environmental analysis such as wetlands. The concept relies on a developer agreeing to implement a predetermined VMT reducing project or proposing a new one in exchange for the ability to develop a VMT-generating project. The mitigation projects may or may not be located near the developer's project site. The concept requires a facilitating entity (such as the lead agency) to match the VMT generator (the development project) with the VMT reducing project and ensure through substantial evidence that the VMT reduction is valid. Another requirement is a determination of the necessary time period to demonstrate a VMT reduction. For example, how many years of VMT reduction are required to declare a VMT impact less than significant? A final requirement is that mitigation projects would not have otherwise occurred without the Exchange, which is a condition known as "additionality."
- VMT Banks – This concept attempts to create a monetary value for VMT reduction (for example., credits) such that a developer could purchase VMT reduction credits. The money exchanged for credits could be applied to local, regional, or state level VMT reduction projects or actions. This program is more complicated than an exchange and would require more time and effort to set up and implement. It would include the requirements above for an exchange, such as mitigation time periods and additionality determinations, while also tackling the unique challenge of estimating how much VMT reduction is associated with each credit and whether this value would change over time based on mitigation performance and new mitigation offerings.

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

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

Table 2: VMT Mitigation Program Type Comparison

Program Type	Pros	Cons
Impact Fee Program	• Common and accepted practice • Accepted for CEQA mitigation • Adds certainty to development costs • Allows for regional scale mitigation projects • Increases potential VMT reduction compared to project site mitigation only	• Time consuming and expensive to develop and maintain • Requires clear nexus between CIP projects and VMT reduction • Increases mitigation costs for developers because it increases feasible mitigation options
Mitigation Exchange	• Limited complexity • Reduced nexus obligation • Expands mitigation to include costs for programs, operations, and maintenance • Allows for regional scale mitigation projects • Allows for mitigation projects to be in other jurisdictions • Increases potential VMT reduction compared to project site mitigation only	• Requires additionality • Potential for mismatch between mitigation need (project site) and mitigation project location • Increases mitigation costs for developers because it increases feasible mitigation options • Unknown timeframe for mitigation life
Mitigation Bank	• Adds certainty to development costs • Allows for regional scale projects • Allows for mitigation projects to be in other jurisdictions • Allows regional or state transfers • Expands mitigation options to include costs for programs, operations, and maintenance • Increases potential VMT reduction compared to project site mitigation only	• Requires additionality • Time consuming and expensive to develop and maintain • Requires strong nexus • Political difficulty distributing mitigation dollars/projects • Increases mitigation costs for developers because it increases feasible mitigation options • Unknown timeframe for mitigation life

Source: Fehr & Peers, 2019

However, program-based approaches also have at least one disadvantage: they may lead to increased development costs. Adding impact mitigation costs to suburban and rural housing projects may be counter to lead agency land use diversity and adequate/affordable housing goals.

6. Appendices

Appendix A:
Baseline VMT Data

Introduction

This appendix discusses the following:

- Mendocino County region VMT data compiled from existing sources
- A review of the Mendocino Council of Governments (MCOG) travel demand forecasting model (TFM) suitability for vehicle miles traveled (VMT) estimation for California Environmental Quality Act (CEQA) analysis
- MCOG model VMT estimates for the Mendocino County region
- A review of sketch tools and recommendations areas not covered by the MCOG TFM
- A review of current planning documents relevant to Senate Bill (SB) 743 implementation and vehicle miles travelled (VMT)

VMT Data From Existing Sources

VMT data for the MCOG region was compiled from two existing sources, the California Household Travel Survey (CHTS) and the California State Travel Demand Model (CSTDM).

California Household Travel Survey

Table 1 shows VMT results from the CHTS. The survey was conducted in 2012. Sample sizes for each city are small, as noted in the table. Therefore, actual VMT may be notably different for every area other than the County as a whole. Any use of the city level data shown in grey highlights in the table is cautioned. Only at the full county level was the sample size sufficient for producing a complete set of statistically valid outputs. Also, because the survey is based on households, total VMT is not available.

Estimated VMT per resident in the unincorporated County is higher than that in Fort Bragg, Ukiah, or Willits. Data was not available for Point Arena.

Table 3: CHTS (2012) VMT Estimates

Metric	Fort Bragg	Ukiah	Willits	Unincorporated Mendocino County	Mendocino County
Household VMT	39,613	78,931	164,282	656,977	925,762
Home-based VMT	29,049	69,973	142,720	516,110	750,957
Home-based work trip length (miles)	2.3	4.7	8.7	13.0	9.4
Total Residents	11,482	12,106	14,668	40,133	78,388
Household VMT per resident	3.5	6.5	11.2	16.4	11.8
Home-based VMT per resident	2.5	5.8	9.7	12.9	9.6
Percentage of VMT that is home-based	73.3%	88.7%	86.9%	78.6%	81.1%
Sample Persons	43	44	41	207	335

Note: Data highlighted in grey are based on small sample sizes; actual numbers may be notably different.
Source: Caltrans 2013 (https://www.nrel.gov/transportation/secure-transportation-data/tsdc-california-travel-survey.html), Fehr & Peers 2019.

California State Travel Demand Model

Table 2 shows VMT results from the CSTDM. Base year of the model is 2010. Travel analysis zone (TAZ) boundaries in the model do not match directly to the boundaries of each city or population center. Thus, actual VMT will vary from these estimates. Also, the CSTDM does not provide the level of detail available in the MCOG model.

VMT per person in the unincorporated County is higher than that in Fort Bragg or Ukiah. Data was not available for Willits or Point Arena.

Table 4: CSTDM (2010) VMT Estimates

Metric	Fort Bragg	Ukiah	Mendocino County
Total VMT	29,099	31,276	1,287,478
Home-based VMT	21,601	22,087	994,004
Home-based work trip length (miles)	2.2	3.3	10.1
Residents	7,905	8,436	87,837
Total VMT per resident[1]	3.7	3.7	14.7
Home-based VMT per resident[1]	2.7	2.6	11.3
Percentage of VMT that is home-based	74.2%	70.6%	77.2%

Note: [1] VMT per resident is expressed as a generation rate and not a ratio. For example, VMT per resident is how much VMT is generated by the residents of a location. It does not include VMT on the model roadway network that is generated by other sources such as external trips that do not stop in the County.
Source: Caltrans 2015 (https://dot.ca.gov/programs/transportation-planning/multi-modal-system-planning/statewide-modeling [Caltrans website updates may limit available data]), Fehr & Peers 2019.

MCOG Travel Demand Forecasting Model Review

Fehr & Peers reviewed the MCOG TFM to assess its suitability to perform VMT estimation for CEQA transportation impact analysis. The Greater Ukiah Area Microsimulation Model was also reviewed as a potential tool for VMT estimation. While the microsimulation model can produce VMT as an output, it is only for a limited network. Further, the estimate of VMT is dependent on the MCOG travel demand outputs used as traffic volume inputs to the microsimulation model. For these reasons, the microsimulation model was not found to be appropriate for CEQA related VMT impact analysis that requires a full accounting of project VMT changes even beyond the County limits. The remainder of this discussion therefore focuses on MCOG TFM and additional expectations associated with CEQA compliance.

CEQA compliance has two basic elements:

- The legal risk of challenge associated with inadequately analyzing impacts due to use of models that do not meet benchmark expectations.
- The mitigation risk of mis-identifying the impact and the mitigation strategies to reduce the impact.

Agencies with a high risk of legal challenges will likely be concerned about both elements while agencies with less legal risk should still be concerned about the second element since it is also relevant for all other transportation analysis based on model forecasts.

CEQA Expectations for Environmental Impact Analysis

The CEQA Guidelines contain clear expectations for environmental analysis as noted below; however, the Guidelines are silent about what data, analysis methods, models, and mitigation approaches are adequate for transportation impacts.

> § 15003 (F) = fullest possible protection of the environment…
> § 15003 (I) = adequacy, completeness, and good-faith effort at full disclosure…
> § 15125 (C) = EIR [Environmental Impact Report] must demonstrate that the significant environmental impacts of the proposed project were adequately investigated…
> § 15144 = an agency must use its best efforts to find out and disclose…
> § 15151 = sufficient analysis to allow a decision which intelligently takes account of environmental consequences…

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

- CEQA does not require the use of any specific methodology. Agencies must have substantial evidence to support their significance conclusions. (Association of Irritated Residents v. County of Madera (2003) 107 Cal.App.4th 1383.)
- CEQA does not require a lead agency to conduct every test or perform all research, study, and experimentation recommended or demanded by commenters. (CEQA Guidelines, § 15204, subd. (a))
- CEQA does not require perfection in an EIR but rather adequacy, completeness and a good faith effort at full disclosure while including sufficient detail to enable those who did not participate in the EIR preparation to understand and consider meaningfully the issues raised by the project. (Kings County Farm Bureau v. City of Hanford (1990) 221 Cal.App.3d 692)
- Lead agencies should not use scientifically outdated information in assessing the significance of impacts. (Berkeley Keep Jets Over the Bay Comm. v. Board of Port Comm. (2001) 91 Cal.App.4th 1344.)
- Impact analysis should improve as more and better data becomes available and as scientific knowledge evolves. (Cleveland National Forest Foundation v. San Diego Association of Governments, Cal. Supreme Ct. S223603, 2017).

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

In setting specific CEQA expectations for travel forecasting models, an important consideration is that expectations may vary based on the variety of factors listed below.

- Complexity of the transportation network and number of operating modes
- Available data
- Urban versus rural setting
- Planned changes in the transportation network (particularly to major roads or transit systems)
- Availability of resources to develop and apply travel demand models
- Population and employment levels
- Congestion levels
- Regulatory requirements
- Types of technical and policy questions posed by decision makers
- Desired level of confidence in the analysis findings
- Anticipated level of legal scrutiny

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

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

- A travel forecasting model should be sensitive to those policies and project alternatives that the model is expected to help evaluate.
- A travel forecasting model should be capable of satisfying validation standards that are appropriate to the application.
- Project-level travel forecasts, to the extent that they follow a conventional travel model, should be validated following the guidelines of the *Travel Model Validation and Reasonableness Checking Manual, Second Edition* from the Federal Highway Administration (FHWA). Similar guidelines are provided in NCHRP Report 716. This level of validation is necessary, but not sufficient, for project-

level forecasts. Project-level forecasts often require better accuracy than can be obtained from a travel model alone.

- The model should be subject to frequent recalibrations to ensure that validation standards are continuously met.

Model Assessment

The information above was used to develop specific questions for assessing the MCOG TFM. This assessment is to help inform MCOG about potential improvements that may be desirable for future model applications intended for CEQA purposes and does not indicate that previous applications of the model were not appropriate.

The assessment used the following specific criteria. Criteria that are unique to SB 743 are highlighted in **bold text**.

- Model documentation – this criterion relies on the availability of documentation about the model's development including its estimation, calibration, and validation as well as a user's guide.
- Completed calibration and validation within the past 5 years – recent calibration and validation is essential for ensuring the model accurately captures evolving changes in travel behavior. Per NCHRP Report 765, "The model should be subject to frequent recalibrations to ensure that validation standards are continuously met."
- Demonstrated sensitivity to VMT effects across demographic, land use, and multimodal network changes – validation reporting checked for static and dynamic tests per the *2017 Regional Transportation Plan Guidelines for Metropolitan Transportation Planning Organizations*, California Transportation Commission (CTC), 2017 and *Travel Model Validation and Reasonableness Checking Manual, Second Edition*, Travel Model Improvement Program (TMIP), FHWA, 2010.
- Capable of producing both "project-generated VMT" and "project effect on VMT" estimates for households, home-based trips, and total trips – both metrics are essential for complete VMT analysis. Project-generated VMT is useful for understanding the VMT associated with the trips traveling to/from a project site. The "project's effect on VMT" is more essential for understanding the full influence of the project since it can alter the VMT generation of neighboring land uses.
- **Capable of producing regional, jurisdictional, and project-scale VMT estimates – VMT analysis for air quality, greenhouse gases, energy, and transportation impacts requires comparisons to thresholds at varying scales. For SB 743, the *Technical Advisory on Evaluating Transportation Impacts in CEQA*, December 2018, California Governor's Office of Planning and Research (OPR) recommends thresholds based on comparisons to regional or city-wide averages.**
- **Level of VMT estimates that truncate trip lengths at model or political boundaries – The OPR *Technical Advisory* states that lead agencies should not truncate any VMT analysis because of jurisdictional or model boundaries. The intent of this recommendation is to ensure that VMT forecasts provide a full accounting of project effects.**

The specific assessment findings for the MCOG TFM are contained in Table 3.

Table 5: MCOG Model Assessment

Screening Check	Screening Determination	Notes
Model documentation	Complete model documentation and user guide is available	MCOG Model Development Report MCOG User Guide
Completed calibration and validation within the past five years	Updated more than five years ago	Last calibrated in 2010
Demonstrated sensitivity to VMT effects across demographic, land use, and multimodal network changes	Sensitivity tests to land use and roadway network changes have been performed and documented.	Documentation of the sensitivity tests is included within the MCOG Model Development Report
Capable of producing both "project-generated VMT" and "project effect on VMT" estimates for households, home-based trips, and total trips.	Project-generated VMT – yes	As a trip-based model, household generated VMT is not an available output. The model is not able to separate home-based trips from total trips without modification of model scripting.
	Project effect on VMT – yes	
	Total VMT – yes	
	Household VMT – no	
	Home-based VMT – not without modification	
Capable of producing regional, jurisdictional, and project-scale VMT estimates.	Regional VMT - yes	The model covers all of Mendocino County except for the sparsely developed northwestern and southeastern corners. The model generally has a high level of detail in urban areas; some project-scale VMT estimates may be limited in rural areas with lower level of detail.
	Jurisdictional VMT - yes	
	Project-scale VMT - yes	
Level of VMT estimates that truncate trip lengths at model or political boundaries.	Depends on TAZ location.	The model truncates trips leaving Mendocino County. Trips to or from TAZs central to the County will tend to have less truncation than TAZs at the model border.

Source: Fehr & Peers 2019.

The main findings of the MCOG TFM assessment are listed below.

- Model documentation, consisting of a model development report and user guide, provides details of the model including input data, model validation, future year model, model limitations, and how to use the model. The user guide documents details regarding the model's land use and network, including how to modify inputs.
- The model covers all of Mendocino County except for the far northwestern and southeastern corners. These areas are rural with little development, and little development is expected in them.
- The model has not been recalibrated since it was originally developed in 2010. Recalibration is recommended.

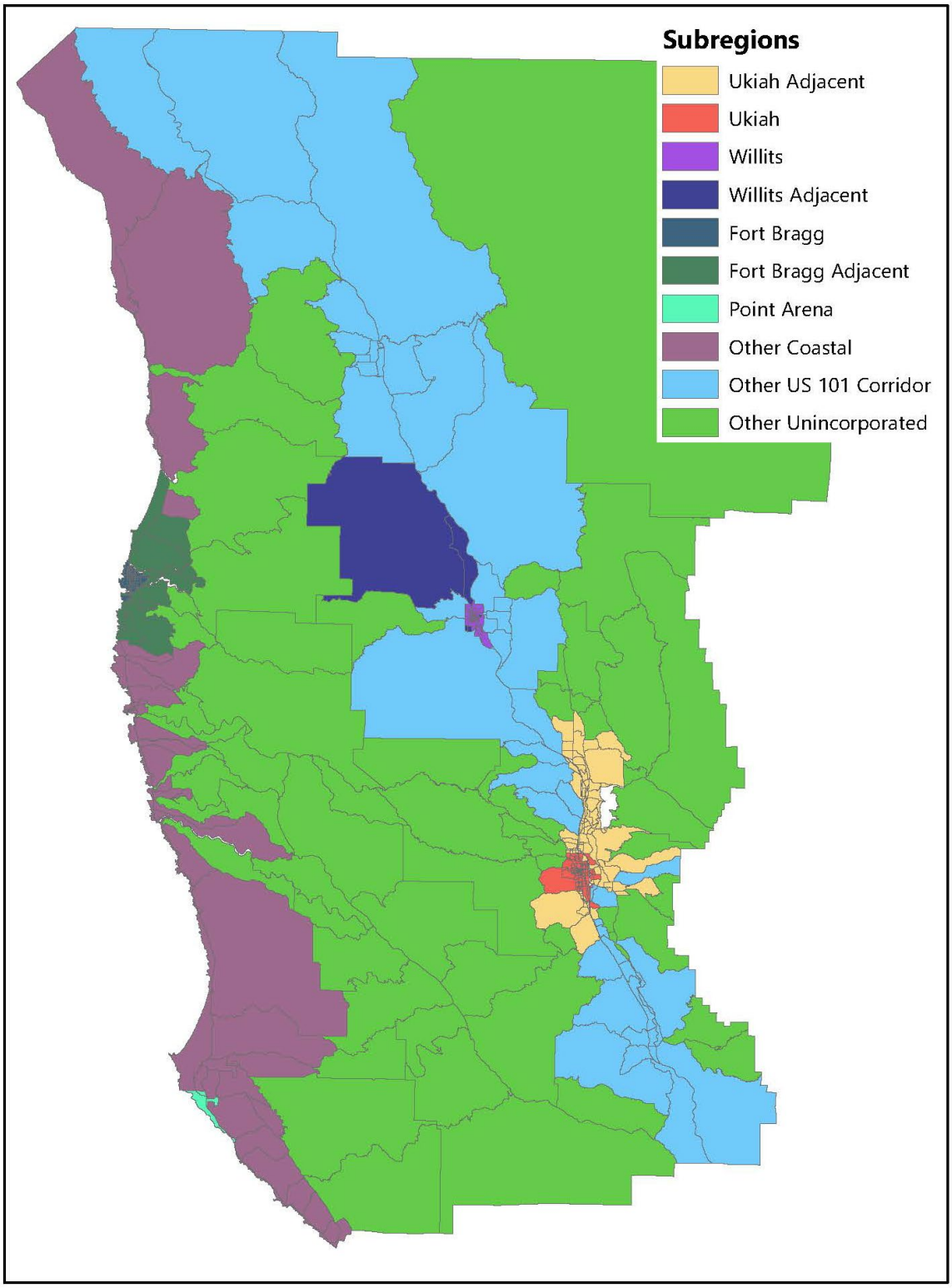
- The model includes seasonal dwelling unit data, but, as reported in the model development report, these units are given zero trip generation, due to uncertain frequency of use and accuracy of data. VMT estimates could be improved by additional study of these units.
- The model documentation covered sensitivity tests for both land use and roadway network changes.
- The model can produce VMT outputs that are commonly used for emissions modeling. New VMT metric forms that isolate the type of land use or trip purpose are not available as a current output. The model can provide total VMT estimates across multiple scales, but not household or home-based VMT estimates. Fehr & Peers has used model outputs to create home-based VMT estimates.
- The model is subject to trip length truncation at model boundaries. Fehr & Peers has corrected this limitation using CHTS data. The CHTS is discussed in more detail below. Fehr & Peers also updated the model to incorporate intrazonal trips in the VMT estimates.

Model VMT

After adjusting for trip length as described above, model VMT was assessed for base year and future year conditions. VMT was assessed for subregions with comparable land use. These subregions were defined as discussed below and shown in Figure 7 below.

- Cities: Each incorporated city was defined as its own subregion
- City-adjacent areas: These are unincorporated areas with comparable land use adjacent to each city: Except for Point Arena, each city has land use adjacent to it with similar character of the city, but outside of the city limits. These areas are typically suburban in nature. Travel characteristics of these areas may be reasonably expected to be comparable to the adjacent city.
- Other coastal areas: Unincorporated areas along SR 1 outside of the City adjacent zones.
- Other US 101 corridor areas: Unincorporated areas along US 101 outside of the City adjacent zones.
- Other unincorporated areas: Unincorporated area not adjacent to any city or major corridor. The area away from cities, with less dense development, will have different travel characteristics that areas in or near cities. These areas are generally rural low-density, with some occasional clusters of housing or development.

Figure 7: MCOG Subregions



Note that many of the model TAZs extend over large areas. Some of these TAZs include areas adjacent to a city as well as rural areas not adjacent to a city. These TAZs were assigned to subregions based on the location of the majority of land use. Accuracy of the model could be improved by splitting these TAZs.

The model uses dwelling units, students, hotel rooms, and jobs as land use inputs. VMT is frequently measured per resident, per employee, or per service population, where service population generally consists of residents, employees, and students. Data from the *Trip Generation Manual, 10th Edition*, ITE, 2017, was used to convert hotel rooms to employment and students to employment. Data from *the Trip Generation Manual* and California Department of Finance Report E-5 was also used to estimate residents from dwelling units. These conversion factors are shown in Table 4.

Table 6: MCOG TFM Land Use Conversion Factors

Land Use Type	Conversion Factor	Units	Source
Single Family Residential Dwelling Units	2.6	Residents per dwelling unit	ITE Trip Generation Manual (10th Edition) CA Dept. of Finance Report E-5 (2018)
Multi-Family Residential Dwelling Units	2.2	Residents per dwelling unit	ITE Trip Generation Manual (10th Edition) CA Dept. of Finance Report E-5 (2018)
Hotel Rooms	0.58	Employees per hotel room	ITE Trip Generation Manual (10th Edition)

Source: Fehr & Peers 2019.

VMT estimates for each subregion are shown in Table 5 for 2009 and Table 6 for 2030. This table includes total VMT (i.e., VMT from all vehicle trips, trip purposes, and all vehicle types) and total VMT per service population estimates. Service population is defined as the total number of residents, employees, and students. VMT per service population is expressed as a generation rate and not a ratio. For example, VMT per service population is how much VMT is generated by the residents, employee, and students of the project. It does not include VMT on the model roadway network that is generated by other sources such as external trips that do not stop in the County.

Table 7: MCOG TFM VMT Estimates, 2009

Subregion	Residents	Employees	Students	Service Population	Total VMT	Total VMT per Service Population[1]	Home-Based VMT	Home-Based VMT per Resident[1]
Ukiah	14,972	10,741	5,217	30,930	852,667	29.7	155,417	10.4
Ukiah adjacent	16,720	9,206	8,096	34,022	832,322	27.2	283,684	17.0
Willits	5,012	3,079	2,587	10,678	246,215	24.6	43,594	8.7
Willits adjacent	4,980	188	50	5,218	178,287	36.0	161,406	32.4
Fort Bragg	7,378	4,671	3,234	15,284	255,474	18.4	51,843	7.0
Fort Bragg adjacent	7,738	1,484	64	9,286	198,240	22.9	147,078	19.0
Point Arena	390	231	484	1,105	22,709	21.4	9,412	24.1
Other coastal	7,981	3,083	575	11,640	455,197	48.4	271,355	34.0
Other US 101 corridor	10,260	1,916	761	12,938	437,063	38.9	319,532	31.1
Other unincorporated	11,959	2,553	1,341	15,853	568,972	44.0	440,170	36.8
MCOG model area	87,393	37,151	22,409	146,953	2,923,152	31.2	1,883,492	21.6

Note: [1] VMT per service population or resident is expressed as a generation rate and not a ratio. For example, VMT per resident is how much VMT is generated by the residents of a location. It does not include VMT on the model roadway network that is generated by other sources such as external trips that do not stop in the County.
Source: Fehr & Peers 2019.

Table 8: MCOG TFM VMT Estimates, 2030

Subregion	Residents	Employees	Students	Service Population	Total VMT	Total VMT per Service Population[1]	Home-Based VMT	Home-Based VMT per Resident[1]
Ukiah	16,063	12,863	5,855	34,781	1,051,718	32.4	163,574	10.2
Ukiah adjacent	19,429	10,040	8,314	37,783	924,937	27.1	334,851	17.2
Willits	5,771	4,359	2,778	12,907	296,904	24.5	50,712	8.8
Willits adjacent	6,925	265	56	7,245	279,465	40.4	255,908	37.0
Fort Bragg	8,424	6,000	3,574	17,998	324,276	19.8	56,078	6.7
Fort Bragg adjacent	8,187	1,666	70	9,923	194,694	21.2	134,935	16.5
Point Arena	501	330	542	1,373	29,334	22.4	10,553	21.0
Other coastal	9,066	3,431	645	13,142	480,407	45.3	291,321	32.1
Other US 101 corridor	12,084	2,295	846	15,225	495,333	37.3	368,455	30.5
Other unincorporated	13,360	2,855	1,506	17,722	624,432	43.2	486,502	36.4
MCOG model area	99,810	44,103	24,186	168,099	3,387,947	31.4	2,152,888	21.6

Note: [1] VMT per service population or resident is expressed as a generation rate and not a ratio. For example, VMT per resident is how much VMT is generated by the residents of a location. It does not include VMT on the model roadway network that is generated by other sources such as external trips that do not stop in the County.
Source: Fehr & Peers 2019.

As shown in the VMT estimates, VMT per service population is generally higher in cities and areas adjacent to cities compared to other unincorporated areas. This is consistent with the CSTDM and CHTS results. Similarly, Fort Bragg VMT per service population was lower than that for Ukiah and Willits, also consistent with CSTDM results. Although all unincorporated areas away from cities had higher VMT per service population, results were somewhat lower along the US 101 corridor. From 2009 to 2030, VMT increases overall in accordance with service population growth, but VMT per service population changes by less than 1% for the model area as a whole.

Home-based VMT per resident estimated by the model in Table 5 was approximately double the estimates from the CHTS and CSTDM. Investigation indicated that both trip rate per resident and trip length were about one-third higher in the MCOG TFM than in the CHTS. As noted in the model assessment, seasonal dwelling units do not have trip generation included in the model, which may also affect these results. Further model development could be done to investigate these differences in conjunction with updating model calibration and validation.

Model Update Summary

Based on the analysis results above, the following changes to the model or supporting analysis tools have been completed or are recommended.

- Addition of intrazonal VMT estimation: *completed*
    - Developed methodology and included in VMT calculations
- Correction for trip truncation at model boundary: *completed*
    - Developed additions to gateway distances based on CHTS
- Calculation of home-based VMT: *completed*
    - Developed calculations using model output matrices
- Development of land use conversion factors: *completed*
    - Developed based on ITE and California Department of Finance data
- Updated calibration and validation: *recommended*
    - Updated traffic counts and other supporting data are required
- Split large TAZs: *recommended*
    - Analysis of parcel data and refinement of model roadway networks required

Local Planning Document Review

A review of local planning documents was conducted to help inform this study about the potential VMT reduction goals of local agencies. This information is important to help inform SB 743 VMT impact significance thresholds. Relevant goals, objectives, and policies are listed below. Goals directly related to VMT, such as for air quality, are also included.

Other policies in these plans may also be supported by VMT reduction but are not listed below. These policies include promotion of bicycling, walking, compact development, open space preservation, and natural resource conservation.

Mendocino Council of Governments

2017 Regional Transportation Plan

- Goals, Objectives, and Policies Preamble, page 22
    - This RTP emphasizes a strategy of investing transportation funds to bring greater mobility and access to services for all residents – including pedestrians, bicyclists, transit passengers of all ages and abilities, as well as trucks, buses and automobiles. Among other things, this

strategy will reduce greenhouse gas emissions (GHG) and household expenses by reducing vehicle miles traveled (VMT).

2013 Vision Mendocino 2030 Regional Blueprint Plan

- Goals, page 2
    - Reduces impacts to critical wildlife habitat, fertile agricultural land, and air quality
    - Encourages efficient use of resources, including water, energy, and materials

Mendocino County

2009 General Plan

- Development Element Policy DE-135, page 3-97
    - Evaluate and work to reduce the air quality impacts of all proposed transportation projects.
- Resource Management Policy RM-44, page 4-41
    - New development should be focused within and around community areas to reduce vehicle travel.
        - Action Item RM-44.1: Implement transit-, bicycle-, and pedestrian-oriented land use and site design strategies.
- Resource Management Policy RM-50, page 4-41
    - Mendocino County acknowledges the real challenge of climate change and will implement existing strategies to reduce greenhouse gas emissions and incorporate future measures that the State adopts in the coming years.
        - Action Item RM-50.3: Reduce Mendocino County's greenhouse gas emissions by adopting measures that reduce the consumption of fossil fuel energy resources.

2017 Mendocino Town Plan

- Growth Management Policy GM-9, pages 55-56
    - Consistent with Public Resources Code Section 30253, new development in the Town shall meet all of the following requirements, while assuring protection of the Town's unique characteristics as a special community:
      (f) Minimize energy consumption and vehicle miles traveled, including, but not limited to, by inclusion of pedestrian and bicycle ways in any arterial street, road, highway, bridge, or causeway;

2011 Ukiah Valley Area Plan

- Vision, page 2-10
    - The use of nonrenewable resources is minimized.
    - Ways to replace wasteful practices that imprudently use resources are developed and programs to reduce motor vehicle dependency are in place.

2002 Gualala Town Plan

- Section 2.3, Residential Development, page 210
    - A primary goal of the Gualala Town Plan is to concentrate future residential growth within the Town Plan area, thereby relieving development pressures on resource lands in the outlying areas. This is also intended to decrease automobile traffic and relieve traffic congestion by allowing for alternative modes of transportation.

City of Fort Bragg

2008 Fort Bragg Coastal General Plan

- Conservation, Open Space, Energy, & Parks Element
    - Goal OS-6: Reduce dependence on non-renewable energy and materials.
    - Goal OS-7: Improve air quality.
        - Program OS-7.2.1: Adopt a plan and timelines to reduce greenhouse gas emissions for City operations through the establishment and implementation of a Greenhouse Gas Reduction Action Plan.

2012 Fort Bragg Inland General Plan

- Conservation, Open Space, & Parks Element
    - Goal OS-7: Improve air quality.

2012 Fort Bragg Climate Action Plan

The plan included the following best practices:

- 2. Changing the built environment to include more compact development, mixed use development, and complete streets to reduce the need for commuting. The proposed Specific Plan will provide opportunities for compact and mixed-use development. Implementation of the City's Bicycle Master Plan and Residential Street Safety Plan will result in a better network of complete streets throughout the City.
- 3. Expand transportation alternatives by encouraging an alternative fueling station, coordinating with the Regional Blueprint Planning effort to improve transportation choices and reduce GHGs.

City of Ukiah

1995 General Plan and Growth Management Program

- Energy Goal EG-2: Improve the efficiency of energy use within the private transportation system.
- Energy Goal EG-3: Improve the efficiency of energy use within the City's and County's vehicle fleet.
    - Policy EG-3.2: Support car-pooling.

City of Willits

1992 General Plan

- Conservation and Open Space Policy 3.280
    - Promote alternatives to automobile use as a means of improving local air quality.

City of Point Arena

1995 General Plan/Local Coastal Plan

- 5. Air Quality Policies and Programs, per the County of Mendocino Air Quality Management District
    - 9. The City shall work with Caltrans, Mendocino Council of Governments, and other local agencies or institutions to develop programs that reduce the impact of automobile commuting.
        - Implementation Strategy 1: During the short-term planning period, request Caltrans and MCOG to identify suitable sites for park-and-ride lots within the planning area. Designate these sites within the Circulation Element.
        - Implementation Strategy 2: Encourage Banks, Savings and Loans, and other lending institutions to consider commute distances and associated travel costs when reviewing mortgage applications. This review should encourage people to live and work in the same community whenever possible.
        - Implementation Strategy 3: The City should construct appropriate park-and-ride lots on public land or other available areas as needed. The City (or County) may require new projects to construct park-and-ride lots as traffic and air quality mitigation.
        - Implementation Strategy 4: Utilize park-and-ride lot construction as an offset for new project traffic-created air pollution. Incorporate park-and-ride lot construction in standard CEQA mitigation measures for developments expected to generate over 500 ADT. Coordinate with MTA and major employers to establish express buses and vanpools to increase patronage of park-and-ride lots.

Appendix B:
VMT Impact Analysis Guidance

Introduction

This appendix provides guidance for traffic study guidelines that can be used by Mendocino Council of Governments (MCOG) member agencies for vehicle miles traveled (VMT) analysis. The guidance updates California Environmental Quality Act (CEQA) transportation analysis to address the requirements of Senate Bill (SB) 743.

This document is organized as follows:

- Current Traffic Study Guidance
- Analysis Methodology for Land Use Projects
- Analysis Methodology for Land Use Plans
- Analysis Methodology for Transportation Projects

Current Traffic Study Guidance

Existing traffic study guidance was reviewed for each of the MCOG jurisdictions and Caltrans.

MCOG Jurisdictions

No traffic study guidelines were identified for any of the MCOG jurisdictions. Several general plans had some discussion of traffic analysis generally focused on level of service (LOS). The general plan discussions are provided later in this appendix.

As discussed in the VMT Policy Overview section, SB 743 does not prevent an agency from continuing to analyze delay or level of service (LOS) as part of land use project entitlement review, other plans (i.e. a general plan), fee programs, or ongoing network monitoring. Agencies that consider continued use of vehicle LOS to be an important part of their transportation analysis process can still use vehicle LOS outside of the CEQA process. Therefore, LOS requirements do not need to be removed from these documents. However, roadway capacity expansion projects proposed to meet LOS requirements may cause VMT impacts that need to be addressed through the CEQA process.

Caltrans Transportation Impact Study Guide

Caltrans has released the *Transportation Impact Study Guide, Vehicle Miles Traveled-Focused DRAFT* (February 2020) (https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/sb-743/2020-02-26-transmittal-and-draft-vmt-focused-tisg.pdf). This Draft TISG only addressed VMT impact analysis and future updates may address other travel modes and safety. The TISG is intended to be used by the Caltrans Local Development-Intergovernmental Review (LD-IGR) program during environmental review of land use projects and plans. The TISG will replace the *Guide for the Preparation of Traffic Impact Studies* (Caltrans, 2002).

The objectives of the Draft TISG are to provide:

a. Guidance in determining when a lead agency for a land use project or plan should analyze possible impacts to the State Highway System, including its users.
b. An update to the *Guide for the Preparation of Traffic Impact Studies* (Caltrans, 2002) that is consistent with SB 743 and the CEQA Guidelines adopted on December 28, 2018.
c. Guidance for Caltrans land use review that supports state land use goals, state planning priorities, and GHG emission reduction goals.
d. Statewide consistency in identifying land use projects' possible transportation impacts to the State Highway System, and to identify potential non-capacity increasing mitigation measures.
e. Assumptions, data requirements, study scenarios, and analysis methodologies for a high-quality analysis of impacts to the State Highway System.
f. Recommendations for early coordination during the planning phase of a land use project to reduce the time, cost, and/or frequency of preparing a traffic impact study or other indicated analysis.

Analysis Methodology for Land Use Projects

The analysis methodology below is based upon a threshold of a 14.3-percent reduction in total VMT per resident derived from ARB's *2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals*. This specific form of the VMT metric was selected because the MCOG travel forecasting model estimates total vehicle volume. Although jurisdictions may select a different threshold, their decisions need to be supported by substantial evidence. Refer to the Alternatives for VMT Measurement Methods and Thresholds section for a discussion of threshold options.

The following steps describe the process for analyzing VMT impacts of land use projects. These steps are also depicted in the flowchart included in the Recommendations for MCOG Jurisdictions section of the report.

Initial Assessment

As the first steps in analysis, plan consistency and methodology appropriateness should be assessed. The following information will generally be required:

- Project site plan
- Project description identifying:
    - Project land uses and expected number of dwelling units, population, employees, and/or students by use
    - Proposed changes to public roadways
    - Proposed project phasing identifying dates of completion
    - Expected year of completion of the project

1. Determine if the project is consistent with the General Plan and Regional Transportation Plan.

The project should be consistent with the General Plan of the local jurisdiction, including the land use designated for the area. The project should also be consistent with the Regional Transportation Plan (RTP), including the model used for analyzing the RTP.

For purposes of making consistency findings with the general plan and RTP, verify that implementation of the project would not exceed the expected growth in its associated traffic analysis zone (TAZ) of the relevant travel forecasting models used for the general plan and RTP analysis.

If the project is inconsistent with either of these plans, a General Plan and/or RTP amendment may be required, including environmental impact review and transportation impact analysis.

2. Assess if this VMT analysis methodology is appropriate for the project.

The methodology described here will not be sufficient for every potential project. The planner or engineer performing the project analysis should assess if project-specific data and calculations may provide more appropriate results than this methodology. Assessment should include consideration of the following:

- Does the project change the inputs of the model? Examples include
    - Growth not reflected in the model
    - Changes to jurisdiction boundaries
    - Changes to land use that affect subregions (subregions outside of cities are based on comparable land use and travel behavior)
    - Land use not captured in the model
- Does the project have specific impacts outside of the model area?
    - Does the project affect travel at specific, known locations outside of the model?
    - Does the project include other changes outside the model boundaries?
- Does the project have other impacts that will not be captured by the model? Examples include
    - Seasonal rental travel not directly captured in the current model
    - Hospitals, which have different land use than medical offices
    - Special uses evaluated as discretionary action under CEQA

Screening

Lead agencies may choose to use an impact screening method to streamline land use project review for VMT impacts. If a project does not pass an initial screening test, then a full impact analysis is warranted. Screening may be conducted as outlined below. If a project meets any of these screening criteria, the presumption that VMT impact is less than significant is supported.

3. Determine if the project is a local-serving retail or similar local serving use, 50,000 square feet or less.

Local serving retail projects less than 50,000 square feet may be presumed to have a less than significant impact absent substantial evidence to the contrary. Local serving retail generally improves the convenience of shopping close to home and has the effect of reducing vehicle travel. Other local serving land uses such as dining may also be similarly evaluated.

4. Determine if the project is in a low VMT area with similar land uses.

Residential and office projects located within a low VMT generating area may be presumed to have a less than significant impact absent substantial evidence to the contrary. In addition, other employment-related and mixed-use land use projects may qualify for the use of screening if the project can reasonably be expected to generate VMT per resident, per worker, or per service population that is similar to the existing land uses in the low VMT area.

For this screening in the MCOG area, the MCOG travel forecasting model was used to measure VMT performance for individual subregions and for individual traffic analysis zones (TAZs). TAZs are geographic polygons similar to census block groups used to represent areas of homogenous travel behavior. If the project land use is similar to the existing TAZ land use, low VMT areas may be considered as follows:

a. Those TAZs that perform at or below the subregion threshold for total VMT per service population (residents plus employment and students) under baseline year conditions are considered low VMT areas. (The baseline year is considered the year in which notice of preparation is filed.)
b. For residential projects, those TAZs that perform at or below the subregion threshold for home-based VMT per resident under baseline year conditions are also considered low VMT areas.
c. For work-related projects, those TAZs that perform at or below the subregion threshold for home-based work VMT per employee under baseline year conditions are also considered low VMT areas.

MCOG has created a web-based screening tool for this purpose. The tool is available at https://devapps.fehrandpeers.com/MCOG_VMT_Screening/# (temporary location) or https://apps.fehrandpeers.com/MCOG_VMT_Screening/ (final location)

5. Determine if the project generates less than 640 VMT per day

This value is based on the CEQA exemptions allowed for projects up to 10,000 square feet as described in CEQA Guidelines Sections 15303. The specific VMT estimate relies on the vehicle trip generation rate contained in the OPR Technical Advisory for small project screening and average vehicle trip lengths for Mendocino County based on the 2012 California Household Travel Survey (CHTS). Converting this value to an equivalent number of residential households would indicate that residential projects up to 22 units in

Mendocino County could be screened out of analysis. After updates are made to the MCOG travel forecasting model, these values may be updated to use average trip lengths from that model.

Alternatively, the model may be used directly for this calculation.

VMT Analysis Using the MCOG Travel Forecasting Model

If the project does not meet any of the screening criteria through the steps above, VMT analysis and forecasting should be conducted using the MCOG travel forecasting model (or best available travel forecasting model) to determine if they have a significant VMT impact.

VMT analysis using the model should include the following general guidance:

- Conduct a sub-area validation of the model to determine if it accurately represents conditions in the area being analyzed. This is particularly important if the model is not current.
- Analyze baseline year conditions by using the base year model unless that year is more than 2 years older than the baseline year. Otherwise, interpolate between the model base and future years. This interpolation acknowledges the growth and VMT adopted by the General Plan. Baseline year is typically determined by the year notice of preparation is filed. Alternatively, in subregions with little or no growth use of the model base year as the project analysis baseline year may be acceptable but should be justified.
- Analyze project-level VMT effects of the project by adding project land use to the base year model to create a base year plus project scenario.
- Analyze cumulative VMT effects by modifying the allocation of future year land use growth based on the project's land use supply changes and public roadway changes significant enough to affect the model's network.
- Estimate VMT per service population to one decimal place.
- Utilize model post-processing tools that account for trip distances outside of the model area, based on trip distances from California Household Travel Survey (CHTS), Caltrans Statewide Travel Demand Model, or mobile device data. A detailed methodology discussion is available further below.
- Ensure intrazonal trip distances are included in the analysis. Fehr & Peers has done so in its estimates.
- Utilize conversion factors to translate households to residents and hotel rooms to employees, if necessary. Conversion factors appropriate to the MCOG travel forecasting model are provided in Table 1. However, project specific data should be used whenever available.

Table 9: MCOG TFM Land Use Conversion Factors

Land Use Type	Conversion Factor	Units	Source
Single Family Residential Dwelling Units	2.6	Residents per dwelling unit	ITE Trip Generation Manual (10th Edition) CA Dept. of Finance Report E-5 (2018)
Multi-Family Residential Dwelling Units	2.2	Residents per dwelling unit	ITE Trip Generation Manual (10th Edition) CA Dept. of Finance Report E-5 (2018)
Hotel Rooms	0.58	Employees per hotel room	ITE Trip Generation Manual (10th Edition)

Source: Fehr & Peers, 2019.

6. Determine if the project baseline total VMT per service population is 14.3 (or lead agency preference value) percent less than the baseline for the subregion.

The threshold, 14.3 percent less than the baseline for the subregion, is available from the screening tool. If the project does not meet the threshold reduction goal, proceed to mitigation.

If the project does meet the threshold reduction goal, proceed to the next step.

7. Determine if VMT trends for the subregion are declining.

If the subregion cumulative total VMT per service population is less than the baseline mean for the subregion, VMT may be considered to be declining. The model results for each subregion are summarized in Table 2 below. Other substantial evidence may also be used.

Table 10: Subregion Total VMT Per Service Population Trends from MCOG Travel Forecasting Model

Subregion	Trend
Ukiah	Increasing
Ukiah adjacent	Declining
Willits	Declining
Willits adjacent	Increasing
Fort Bragg	Increasing
Fort Bragg adjacent	Declining
Point Arena	Increasing
Other coastal	Declining
Other US 101 corridor	Declining
Other unincorporated	Declining
MCOG model area	Increasing

Source: Fehr & Peers 2020.

If VMT trends for the subregion are declining, the presumption that VMT impact is less than significant is supported.

If VMT trends for the subregion are not declining, proceed to the next step.

8. Determine if the project cumulative total VMT per service population is 14.3 percent (or lead agency preference value) is less than the baseline for the subregion.

If the subregion VMT trend is upward, the project cumulative total VMT per service population should be compared to the baseline threshold. If the project cumulative total VMT per service population is less that the baseline threshold, the presumption that VMT impact is less than significant is supported.

If it exceeds the baseline threshold, proceed to the next step.

9. Determine if the project reduces or has no effect on the cumulative total VMT for the model area.

The cumulative total VMT per service population for the model area should be calculated with and without the project. If the project decreases or has no effect on the total VMT per service population, the presumption that VMT impact is less than significant is supported.

If the project increases the total VMT per service population, proceed to mitigation.

Mitigation

If the project VMT is determined to be significant, mitigation measures should be identified and applied to determine if project VMT can be reduced to less than significant levels.

10. Determine if mitigation measures reduce the project total VMT per service population below the subregion threshold.

The Transportation Demand Management Strategies section identified strategies most likely to be effective to reduce VMT in Mendocino County. Appendix D summarizes recent research on these strategies. Mitigation strategies appropriate to the project should be assessed, and potential effect of these strategies on VMT estimated. Assessment may include evaluating project conditions, evaluating the potential effect of the mitigation measure based on magnitude of the change made, and assessing the VMT impact based on cited literature and/or evaluation using the MCOG travel forecasting model and the process above. Analysis must meet the substantial evidence criterion of CEQA Guidelines Section 15064.7, thus considering data, facts, research, and analysis.

If mitigation reduces total VMT per service population below the subregion threshold, the presumption that VMT impact is less than significant is supported but may require ongoing monitoring if the mitigation involves transportation demand management (TDM) strategies that are dependent on building tenant performance. If not, the presumption that VMT impact is significant is supported.

Analysis Methodology for Land Use Plans

Land use plans are not subject to screening and require specific VMT analysis. Land use plans can be tested for significant impacts using the same subregion baseline thresholds described in steps 6 to 10 above.

This analysis requires modeling the land use plan changes in the MCOG travel forecasting model to determine VMT impacts. To capture the project effect, the same cumulative year population and employment growth totals should be used model wide. The land use plan only influences land use allocation, so land use in other areas of the model should be adjusted such that the growth totals model-wide remain the same between the cumulative year no project and plus project scenarios.

Analysis Methodology for Transportation Projects

Use of VMT as an environmental impact metric for transportation projects is discretionary under the Section 15064.3(b)(2) of the updated CEQA Guidelines (http://resources.ca.gov/ceqa/docs/2018_CEQA_FINAL_TEXT_122818.pdf).

If a lead agency wants to use VMT, it is important that the analysis methodology and the forecasting account for any induced vehicle travel effects. The MCOG travel forecasting model can be used to perform

this analysis but it should be tested for induced vehicle travel sensitivity. The analysis should also account for potential increases in trip generation and changes in long-term land use patterns that may occur due to induced vehicle travel. These effects are not directly included in the MCOG model, but its inputs and parameters can be modified to include additional sensitivity, or off-model analysis methods such as the use of research-based elasticities can be used to measure regional VMT changes associated with changes in lane-miles associated with proposed projects. However, these elasticities were derived from urban areas and may not be appropriate for rural areas. The following resources should be consulted for induced vehicle travel recommended analysis practices.

- *Technical Advisory on Evaluating Transportation Impacts in CEQA*, California Governor's Office of Planning and Research, December 2018 (http://opr.ca.gov/docs/20190122-743_Technical_Advisory.pdf)
- "Closing the Induced Vehicle Travel Gap Between Research and Practice," *Transportation Research Record: Journal of the Transportation Research Board*, Volume 2653, 2017 (https://trrjournalonline.trb.org/doi/pdf/10.3141/2653-02)

Using VMT as a transportation project impact metric would allow for a variety of transit, bicycle, and pedestrian projects to be presumed to have a less than significant impact. Smaller roadway network modifications such as intersection restriping could also be presumed to have a less than significant impact. Roadway capacity expansion projects are the types of projects that can increase vehicle travel and VMT by changing people's travel behavior including making new vehicle trips and making longer vehicle trips. If a lead agency treated transportation projects similar to land use projects in the above case studies, then a potential threshold option would be to consider any increase in baseline (or cumulative no project) total VMT per service population within the jurisdiction or region as a significant impact.

Summary of General Plan Traffic Study Guidance

Mendocino County 2009 General Plan

- Development Element Policy DE-149, page 3-101
    - Major development applications shall include traffic studies to evaluate and mitigate cumulative effects on network level of service and safety.

City of Fort Bragg 2008 Fort Bragg Coastal General Plan

- Policy C-2.6 Traffic Studies for High Trip Generating Uses, page 5-11
    - Traffic studies shall be required for all major development proposals, including but not limited to, drive-through facilities, fast food outlets, convenience markets, major tourist accommodations, shopping centers, commercial development, residential subdivisions, and other generators of high traffic volumes that would affect a Level of Service. Traffic studies shall identify, at a minimum:
      (a) the amount of traffic to be added to the street system by the proposed development;

(b) other known and foreseeable projects and their effects on the street system;
(c) the direct, indirect, and cumulative adverse impacts of project traffic on street system operations, safety, and public access to the coast;
(d) mitigation measures necessary to provide for project traffic while maintaining City Level of Service standards;
(e) the responsibility of the developer to provide improvements; and
(f) the timing of all improvements.

City of Ukiah 1995 General Plan and Growth Management Program

- Implementation Measure CT-16.4(d), page 23
    - Continue to analyze project impacts on the capacity of the City's roadway system as part of CEQA review, and require design and mitigation measures in consultation with provider agencies. IF CEQA review or other analysis of the traffic impacts of a proposed development project concludes that a proposed project would result in a significant deterioration of service or would cause level of service standards to be exceeded, respond in one of the following ways:
      (i) Require project redesign in order to prevent service from deterioration or capacities being exceeded, provided that economic use of the property is not prevented.
      (ii) Condition the project on developer funding of improvements needed to maintain services and/or provide additional traffic improvements.
      (iii) Approve the project if it can be found that it will:
      ~ Generate substantial overriding public benefits;
      ~ Be in compliance with the other goals and policies of the General Plan; and
      ~ Benefit the public health, safety and general welfare of the community.
- Policy CT-16. 5: Work to develop methods of accommodating projects without degrading level of service, pages 23-24
    - Implementation Measure CT-16. 5 (a): In the event that the average daily traffic of the proposal places the level of service within ten percent of dropping to Level of Service D as shown in Implementation Measure CT-16.2(e) or Level of Service C as shown in Implementation Measure CT-16.3(a) for Residential Streets or in the event that the road has a level of service of D, the project proponent shall be required to use the services of an appropriately licensed traffic engineer to prepare a more detailed traffic study, including an assessment of the impacts of the proposed project on the street's future level of service.
    - Implementation Measure Cf-16.5(b): The detailed traffic study shall provide recommendations related to overall improvements - or use improvements recommended in any traffic improvement program prepared by the City or County - needed in the area to prevent degradation of level of service and shall also define the proportional share of the improvements that are attributable to the proposed project conditions.
    - Implementation Measure Cf-16.5(c): If the road has an existing level of service of E or F, the proponent shall be required to use the services of a licensed traffic engineer to prepare a

more detailed traffic study, including an assessment of the impacts of the proposed project on the street's future level of service.

- Implementation Measure Cf-16.5(d): The detailed traffic study shall provide recommendations related to overall improvements - or use improvements recommended in any traffic improvement program prepared by the City - needed in the area to increase the segment level of service, or decrease the traffic demand on the segment served by the project to level of service D. The study shall also define the proportional share of the improvements that are attributable to the proposed project conditions.

City of Willits 1992 General Plan

- Circulation Implementation Measure 2.320
  - Require traffic impact studies for proposed projects which would generate 50 or more peak hour vehicle trips. Studies shall include mitigation measures designed to maintain adherence to level of service standards contained in the General Plan.

City of Point Arena 1995 General Plan/Local Coastal Plan

- 3.3. Street Capacity Policies and Programs, pages V-3 to 4
  - 6. Traffic studies shall be required for all major development proposals and may be required at the discretion of the city under other circumstances where there may be significant effects on the street system overall, and including but not limited to whenever the City processes Planned Residential Development (PRD) or commercial development proposals or tentative subdivision maps or when any proposal would potentially increase a Level of Service. Traffic studies shall identify, as a minimum:
    (a) the amount of traffic to be added to the system by the proposed development
    (b) other known planned projects and their effects on the street system
    (c) the direct, indirect and cumulative adverse impacts of project traffic on street system operations, safety, and public access to the coast.
    (d) mitigation measures necessary to provide for project traffic while maintaining city level-of-service standards
    (e) the responsibility of the developer to provide improvements
    (f) the timing of all improvements.
- 4. Implementation of the Traffic Circulation Element, page V-8
  - Require traffic studies for all new development contributing 50 peak hour traffic trips to Main Street, School Street, or any intersection of State Route 1 as determined by the Institution of Transportation Engineers (ITE) standards for trip generation or whenever the City processes Planned Residential proposals or tentative subdivision maps or when any proposal would potentially increase a Level of Service or where there would be significant direct, indirect, or cumulative impacts to Highway One traffic capacity in rural areas north and south of the City.

Trip Length Adjustments for SB 743 Analysis

SB 743 implementation has created the need to modify travel demand models to ensure they capture the full trip length for those trips that start or end outside the model boundary. This need stems from the CEQA guidance listed below and the general desire to avoid arbitrary truncation of trip lengths based on model or political boundaries.

- According to the Technical Advisory, the assessment should cover the full area in which driving patterns are expected to change, including induced growth impacts and cumulative impacts. OPR states that the VMT estimation should not be truncated at a modeling or jurisdictional boundary for convenience of analysis when travel behavior is substantially affected beyond that boundary. (p. 6 and 23 - Technical Advisory on Evaluating Transportation Impacts in CEQA, OPR, December 2018)
- CEQA Guidelines section 15277:
    - "…. Any emissions or discharges that would have a significant effect on the environment in the State of California are subject to CEQA where a California public agency has authority over the emissions or discharges." Since VMT is the key input for mobile emissions, tracking the full length of trips is essential for complying with this expectation.

Since all travel demand models in California have boundaries, they truncate trip lengths to varying degrees. Truncation tends to be most severe at the edge of the model boundary and when the modeled area exhibits a high proportion of external travel (i.e., from a suburban area in one region to a job center in another region). To compensate for the influence of model boundaries, the following steps can be used to modify trip lengths through model gateways.

Trip Length Adjustment Process

Adjusting the length of trips leaving a model boundary requires appending extra distance at the model gateway zone (or external centroid) connector as outlined below. This process results in new gateway distances that are weighted based on the amount and location of external travel origins and destinations. Other adjustment methods that are available include appending extra trip lengths to each individual origin-destination (OD) trip pair in the model or expanding the model's zone structure to cover a larger area. Both of the methods are much more resource and time intensive and are not covered further in this appendix.

1. Model IX and XI Trips at Gateways

The first step of this process is to determine trip volume leaving or entering the model boundary. These are referred to in the remainder of this appendix as internal-to-external (IX) and external-to-internal (XI) trips. This data can be generated either from OD trip matrices or by conducting a select zone analysis to track trips to the model gateways. The volume at the gateways for this purpose should not include external-to-external (XX) through trips. A table that identifies all gateways, IX volume, and XI volume

should be prepared similar to the example below from the Mendocino Council of Governments (MCOG) model.

Example Model Gateway and IX, XI Link Volumes Table

Gateway ID	Gateway	Link ID	IX Volume	XI Volume
7081	SR 1 - South	7081	1,190	1,190
7083	US 101 - South	7083	5,004	5,004
7082	US 101 - North	7082	567	567
7085	SR 20 - East	7085	3,529	3,529
7086	SR 175 - East	7086	551	551

2. Origin-Destination Data between Model and External Areas

Determining the full length of trips leaving or entering a model boundary requires an OD dataset that includes flows between the model area and the area external to the model. How much of the external area to include is an important question. Per the CEQA guidance cited, the full length of trip between their start and end is desired. Whether this extends outside of California has not been legally tested so it is possible that capturing trip lengths even beyond state limits could be necessary. An appropriate OD dataset should be chosen based on the details of your project, context of the study area, level of CEQA risk, and available time and budget for analysis. An assessment of each of the OD data sources is presented in the table below.

Origin-Destination Data Assessment

Origin-Destination Data Sources	Description	Advantages	Disadvantages
Available travel demand model larger than local model	All regional models in California nest within the California State Travel Demand Model (CSTDM). All local models (i.e., city models) nest within the CSTDM and their respective regional models.	• CSTDM Includes TAZs for the entire state of California • Regional models are often the source model for local model variants, so they have a high compatibility for making gateway adjustments. • CSTDM and regional models include changes in travel patterns over time between base and future years.	• Larger models may have greater aggregation and only coarse correspondence between TAZs in the smaller model. • Regional models may not fully capture full trip length. • CSTDM has not been recently calibrated and validated. • CSTDM truncates trip at state boundary.
California Household Travel Survey (CHTS)	Survey of California resident travel that documents full length of OD travel.	• Robust sample with data available for most cities and counties above 50,000 population. Data may be sufficient for smaller jurisdictions based on a review of the sample • Includes all trip purposes.	• Insufficient detail below city level. • 2012 data may not reflect recent changes in travel patterns. • Does not include data about future travel.
Longitudinal Employer-Household Dynamics Data (LEHD)	Employer/Employee data showing locations of where employees live and work, visualized in an online portal with export to OD tables, produced by the U.S. Census Bureau.	• Data available at the census tract level (or custom TAZ structure). • 2017 data is current. • Quick production of OD data.	• Employment data is only relevant for calculating trip lengths for home-based work trips, does not include other trip purposes. • Does not include data about future travel.
Mobile device OD Data	Data from smartphone/GPS devices that can be used to estimate OD trip tables associated with specific gateways.	• Data available at small scales (i.e., 250-meter grid cell, census block group, or custom traffic analysis zone). • Data scale allows isolation of specific land uses in many cases. • 2019 data available from multiple vendors. • Data includes all 365 days of the year and can be aggregated. • Limited trip length truncation. • Includes all trip purposes.	• Minimum purchase cost is about $5000, more expensive if greater detail/number of zones is desired. • Does not include data about future travel.

3. Gateway Identification

After identifying an appropriate OD data source, the next step requires determining the gateway(s) based on the model used in your project, which trips from the OD data source would travel through. An assessment of options for this process is presented the table below.

Gateway Identification Methods and Assessment

Data Source	Gateway Identification Method
Available travel demand model larger than local model	• A highway skimming procedure to determine the gateway used for each OD pair for each assignment time period. This method is not able to track more than one gateway for an OD pair. • A select zone and select link assignment procedure to determine the gateway(s) for an OD pair. This method requires more processing/computing time – dependent on the specific travel model and software.
Mobile Device OD Data	• Data purchase includes identification of gateway locations and automatic filtering to create associated OD trip tables.
Streamlined selection with Google Maps (or online mapping program)	• Spreadsheet template that creates a link to Google Maps for each OD pair, manual identification of gateway(s) in the routing is required. • An off-model, quick assessment tool, suitable for limited number of OD pairs. • Not able to quantify the split across multiple routes/gateways (if applicable) for an OD pair. • Time consuming; not suitable for large number of OD pairs due to manual process.

4. Weighted Average Trip Length Beyond Model Gateways

The trip length adjustment process ultimately requires calculating the weighted average distance beyond each model gateway. A list of options for this process is identified in the table below. Some of the processes calculate the distance beyond the model gateway directly; while other processes generate distance between each OD pair first, with a separate calculation for distance beyond the model gateway.

Trip Length Beyond Model Boundary – Methods and Assessment

Data Source	Trip Length Method Description
Available travel demand model larger than local model	• Creates a new link variable equal to the link length for all the links external to the local model and 0 for all the links internal to the local model, and then uses a highway skimming procedure to skim this link variable to generate the total distance outside of the gateway for each OD pair for each assignment time period. • Uses a select zone and select link assignment procedure to generate the volume distribution for each selected gateway, and calculates the weighted average distance based on the select link volume associated with each gateway.
CHTS	• Estimates total OD distances between origin-destination for each trip record. • Calculates the distance from the trip-end within the model boundary to the gateway for each record, based on the distance skim from the model, and subtracts it from the total CHTS OD distance to generate external trip length for each trip record. • Aggregates the external trip distance across all the trip records to generate average external trip distance for each gateway.
Mobile Device OD Data	• Distance between origins-destinations through each gateway are provided in the dataset. • Calculates the distance from the trip-end within the model boundary to the gateway based on the distance skim from the model and subtracts it from the total mobile device OD distance to generate external trip length for each gateway.
Streamlined selection with Google Maps (or online mapping program)	• Links to Google Maps and generates a path for each OD pair. • Calculates the distance between the manually identified gateway(s) and the trip end location external to the model boundary, based on the shortest travel time path between the OD pair.

Process Summary

An analyst can mix and match the procedures based on the most appropriate method for each step. For example, if CHTS is the most appropriate OD dataset to generate external trip length estimates, the user can generate the OD trip matrices based on CHTS while following the TAZ structure of the CSTDM, then identify local model gateways in the CSTDM highway network, and calculate the average trip length beyond each gateway, using the distance skims of the CSTDM, weighted by trips from the CHTS OD trip matrices.

Trip Length Adjustment User Guide and Resources

This section provides a user-guide and links to resources for the data sources and processes previously described in this appendix.

California Statewide Travel Demand Model (CSTDM)

Caltrans maintains and updates the California Statewide Travel Demand Model, and provides resources regarding the model on their website:

- https://dot.ca.gov/programs/transportation-planning/multi-modal-system-planning/statewide-modeling

Information regarding the previous version of the CSTDM is no longer available on Caltrans' website. Caltrans is currently in the process of updating the statewide travel demand model. Requests regarding statewide modeling should be directed to Caltrans.

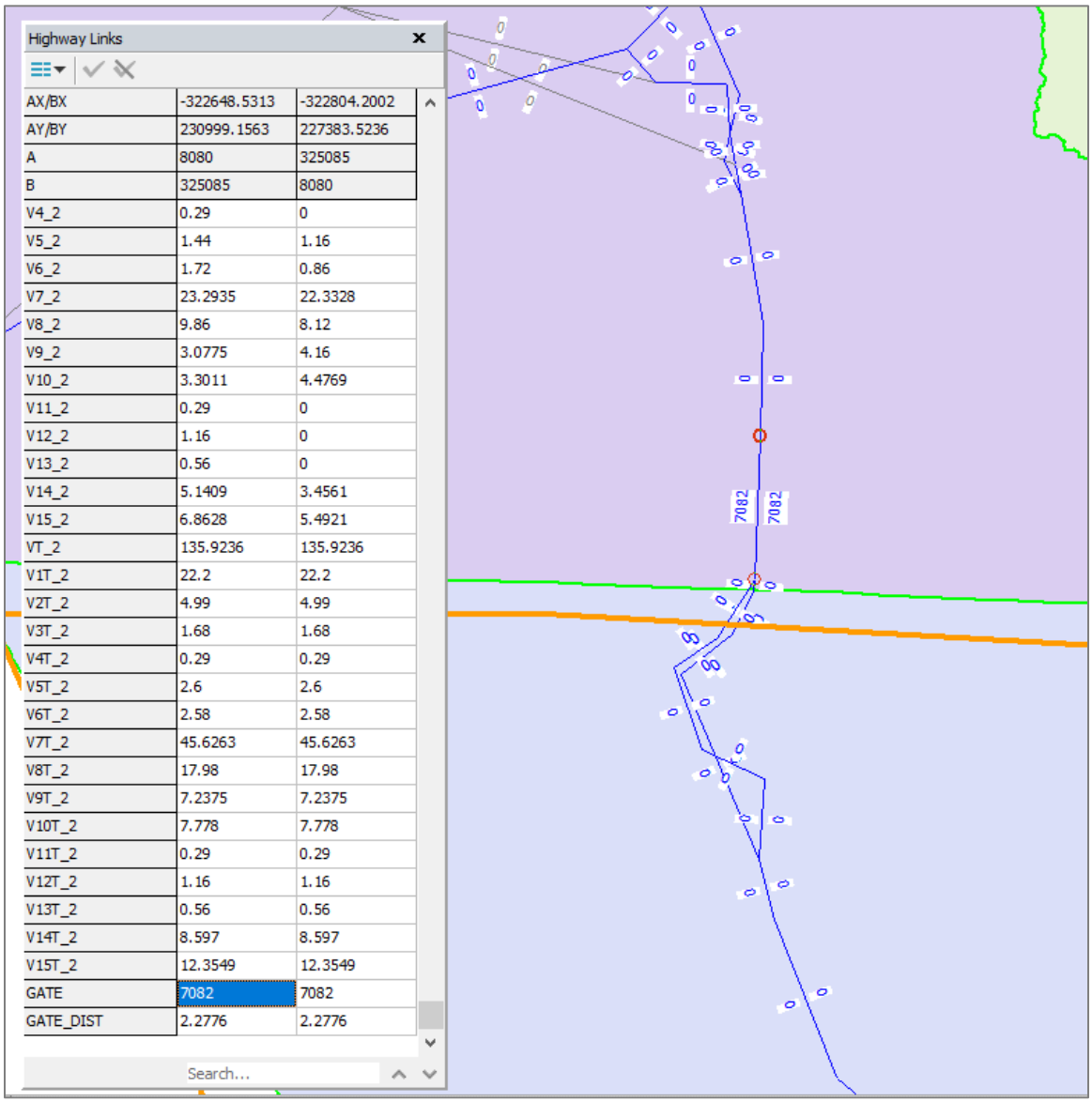
An example of the CSTDM used for OD data, gateway selection, and trip length beyond local model gateways is described below:

- Create correspondence between Study Area TAZs within local/regional model to the Statewide Model TAZs, similar to the example from the Mendocino Council of Governments (MCOG) Model, as shown in the table below.

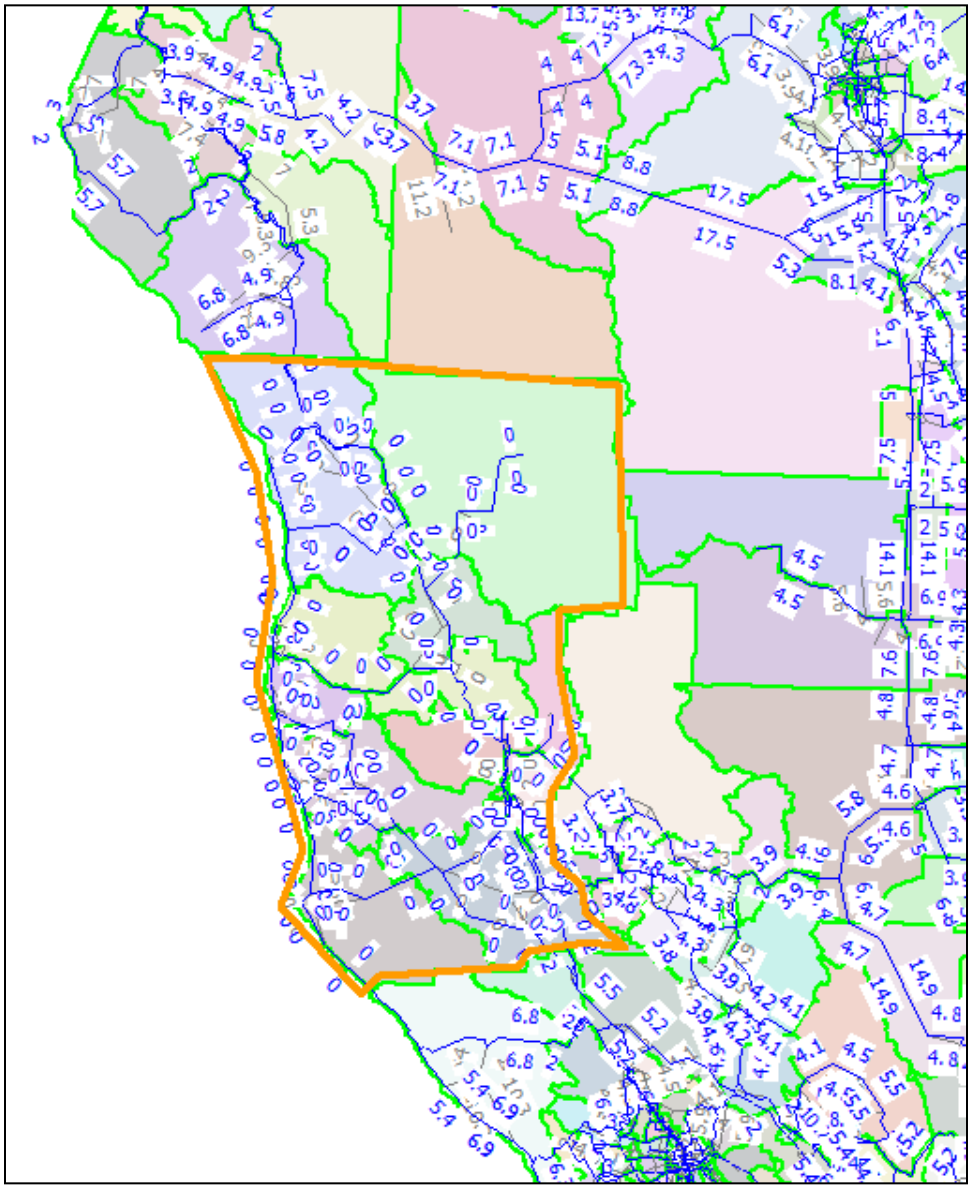
Example TAZ Correspondence Table

MCOG TAZ	CSTDM TAZ
1	256
3	259
5	259
6	259
7	259
8	260
9	260
10	260

- Add "Gate" attribute to CSTDM roadway network links and set "Gate" equal to gateway id only for those links identified as the locations corresponding to the local/regional model gateways.



- Add "Gate_Dist" attribute to CSTDM roadway network links and set "Gate_Dist" equal to the link distance for those links outside the local/regional model boundary. All the CSTDM roadway links inside the local/regional model boundary will have a "Gate_Dist" attribute of 0.



- Run a highway skim on the CSTDM roadway network to skim the shortest travel time between each OD pair, tracking the gateway and distance outside the local model boundary. A sample Cube Voyager script for this step is included at the end of this appendix. An example output of this process is presented in the table below.

Example OD with Gate Identification and Distance Beyond Local Model

CSTDM Origin TAZ	CSTDM Destination TAZ	Volume	Gateway ID	Distance Beyond Local Model Boundary (mi)
246	2	0.21	7082	189.31
246	108	0.1	7082	82.73
246	118	0.42	7082	13.65
246	119	0.29	7082	22.88
246	139	0.13	7085	167.35
246	141	0.07	7085	169.53
246	173	0.25	7082	106.45
246	201	0.07	7085	126.73

- For each gateway, summarize the average distance beyond the local model boundary weighted by volume at each gateway. An example is presented in the table below.

Example Weighted Average Distance Beyond Local Model Boundary

Gateway ID	Gateway	Weighted Average Distance Beyond Local Model Boundary (mi)
7081	SR 1 - South	28.4
7083	US 101 - South	63.2
7082	US 101 - North	44.7
7085	SR 20 - East	46.4
7086	SR 175 - East	15.9

- Tag the gateway distance from the above step using CSTDM to the gateways in the local/regional model and multiply to the gateway volume from the local/regional model to determine the gateway external VMT to the local/regional model. Make sure not to double-count any overlap

distance that's already accounted for in the VMT calculation from the local/regional model. An example for this calculation for IX trips from the MCOG model is shown in the table below.

Example Adjustment Gateway and IX, XI Link Volumes Table

Gateway	Weighted Average Distance Beyond Local Model Boundary (From CSTDM)	MCOG IX Volume	MCOG IX VMT Beyond Local Model Boundary
SR 1 - South	28.4	1,190	33,796
US 101 - South	63.2	5,004	316,253
US 101 - North	44.7	567	25,345
SR 20 - East	46.4	3,529	163,746
SR 175 - East	15.9	551	8,761

California Household Travel Survey (CHTS)

CHTS data was collected by Caltrans and is shared on the following website.

- https://www.nrel.gov/transportation/secure-transportation-data/tsdc-california-travel-survey.html

An example of CHTS data filtered for IX trips for Mendocino County is shown below. This example requires processing of the survey data and specific formatting such that it contains trip origin, destination, distance, and volume information.

oTract	oPlace	oCounty	dTract	dPlace	dCounty	distance_fine	time	avgSpeed	numVehTrips
6045010200	Unincorporatec	Mendocino	6023011500	Unincorpoi	Humboldt	24	30	50	232.2
6045010200	Unincorporatec	Mendocino	6023011500	Unincorpoi	Humboldt	24	30	50	0
6045010400	Fort Bragg	Mendocino	6033001000	Kelseyville	Lake	86	120	45	491.32
6045010500	Fort Bragg	Mendocino	6001450752	Dublin	Alameda	194	330	35	486.56
6045010700	Willits	Mendocino	6023001000	Arcata	Humboldt	133	170	45	0
6045010700	Willits	Mendocino	6023001000	Arcata	Humboldt	134	170	45	261.41
6045010700	Willits	Mendocino	6023011500	Unincorpoi	Humboldt	60	70	50	62.31
6045010700	Willits	Mendocino	6023011500	Unincorpoi	Humboldt	72	120	35	210.39
6045010700	Willits	Mendocino	6033000802	Clearlake	Lake	64	65	60	164
6045010700	Willits	Mendocino	6033001000	Kelseyville	Lake	51	70	45	221.9
6045010700	Willits	Mendocino	6075016500	San Francis	San Francisco	134	155	50	0
6045010700	Willits	Mendocino	6075016500	San Francis	San Francisco	135	155	50	49.48
6045010700	Willits	Mendocino	6081604800	Millbrae	San Mateo	149	200	45	89.91
6045010700	Willits	Mendocino	6097153403	Sebastopol	Sonoma	89	120	45	0
6045010700	Willits	Mendocino	6105000400	Mad River	Trinity	123	285	25	191.16
6045010801	Unincorporatec	Mendocino	6097152000	Santa Rosa	Sonoma	71	90	45	46.84
6045010802	Unincorporatec	Mendocino	6055201700	Angwin	Napa	83	120	40	103.69
6045010900	Unincorporatec	Mendocino	6023011100	Rio Dell	Humboldt	128	190	40	129.99
6045010900	Unincorporatec	Mendocino	6033000300	North Lake	Lake	28	60	30	274.5
6045010900	Unincorporatec	Mendocino	6033000400	Lakeport	Lake	34	40	50	916.13
6045011002	Unincorporatec	Mendocino	6001421700	Berkeley	Alameda	159	195	50	240.48

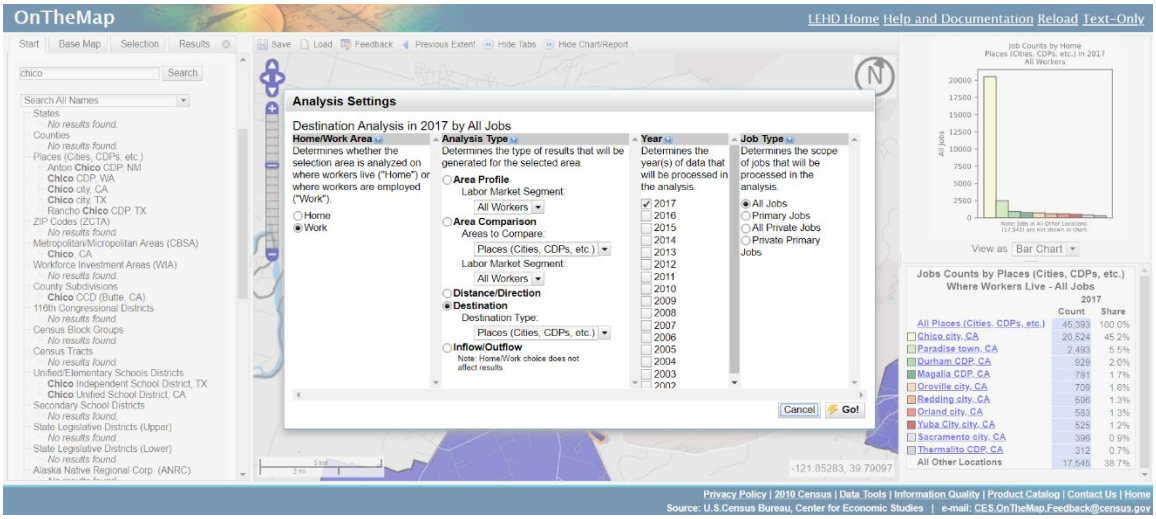
Longitudinal Employer-Household Dynamics Data (LEHD)

LEHD data can be accessed using the following online resource.

- https://onthemap.ces.census.gov/

OD data using this resource can be identified by searching a study area (City, County, or can upload a shapefile with specific geography) and looking at the "Destination" Analysis Type.

- For IX trips, use the "Home" setting for Home/Work Area
- For XI trips, use the "Work" setting for Home/Work Area



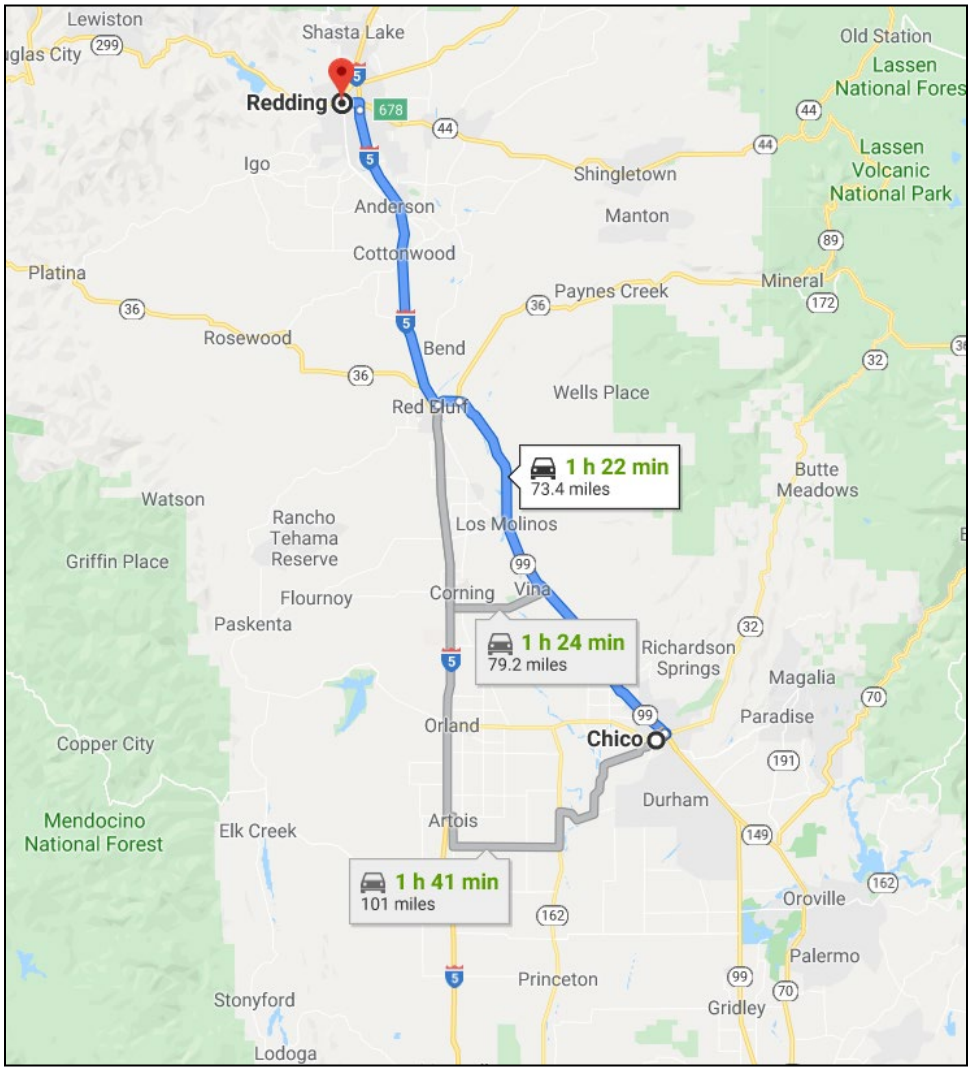
Mobile Device OD Data

Streetlight is one vendor that can provide data for OD, gateway identification, and trip lengths. A middle filter analysis is needed to determine which particular gateway a trip passes through. An example showing IX trips from Chico to areas beyond the Butte Council of Governments (BCAG) Model boundary is presented below.

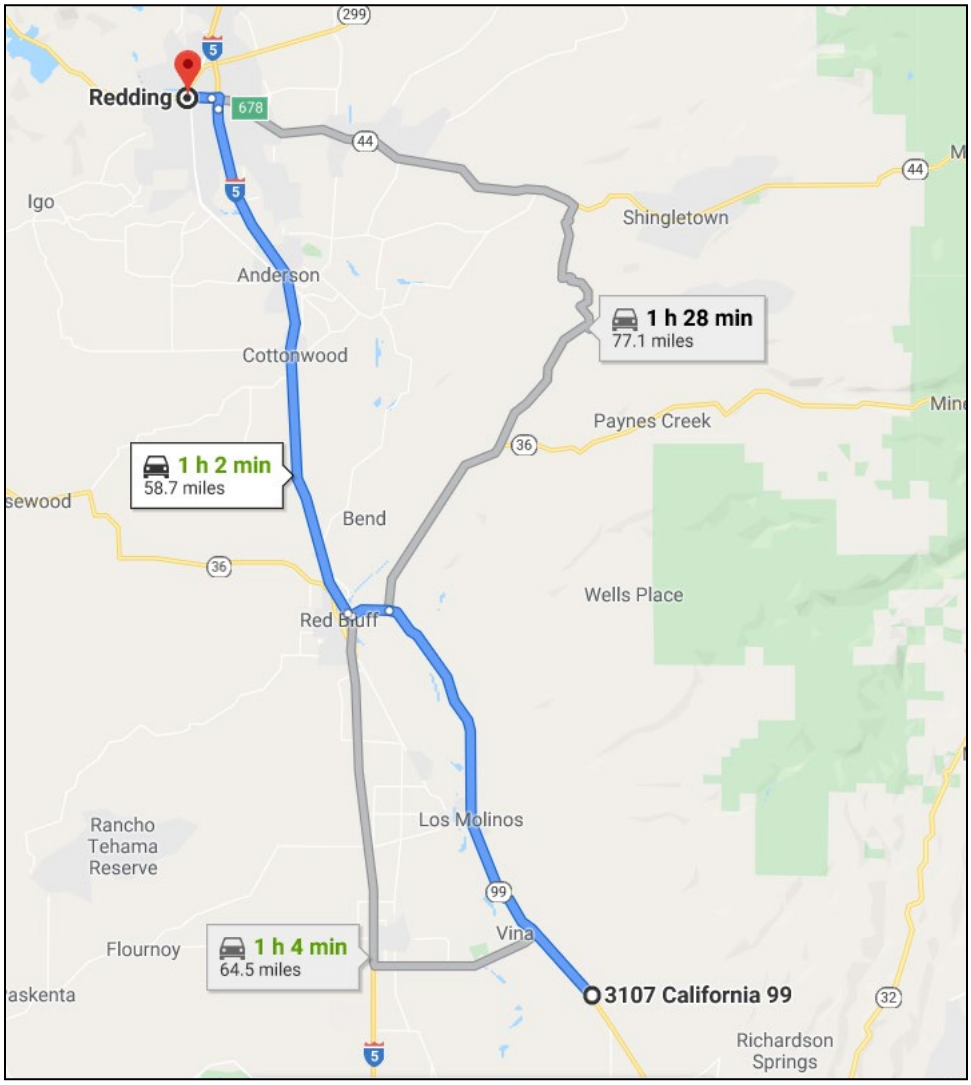
Type of Travel	Origin Zone ID	Origin Zone Name	Middle Filter Zone ID	Middle Filter Zone Name	Destination Zone ID	Destination Zone Name	Day Type	Day Part	Total O-M-D Traffic (Sample Trip Counts)
Personal	6	Biggs	1	CA 99 North of	16	Tehama County	1: Weekday (M-Th)	0: All Day (12am-12am)	3
Personal	6	Biggs	1	CA 99 North of	23	Shasta County	1: Weekday (M-Th)	0: All Day (12am-12am)	2
Personal	6	Biggs	9	Honcut Rd	30	Yuba County	1: Weekday (M-Th)	0: All Day (12am-12am)	3
Personal	6	Biggs	11	CA 70 South of	20	Nevada County	1: Weekday (M-Th)	0: All Day (12am-12am)	1
Personal	6	Biggs	11	CA 70 South of	26	Placer County	1: Weekday (M-Th)	0: All Day (12am-12am)	2
Personal	6	Biggs	11	CA 70 South of	30	Yuba County	1: Weekday (M-Th)	0: All Day (12am-12am)	4
Personal	6	Biggs	12	Larkin Rd	28	Sutter County	1: Weekday (M-Th)	0: All Day (12am-12am)	2
Personal	6	Biggs	12	Larkin Rd	30	Yuba County	1: Weekday (M-Th)	0: All Day (12am-12am)	1
Personal	6	Biggs	13	CA 99 South of	19	Glenn County	1: Weekday (M-Th)	0: All Day (12am-12am)	1
Personal	6	Biggs	13	CA 99 South of	26	Placer County	1: Weekday (M-Th)	0: All Day (12am-12am)	1
Personal	6	Biggs	13	CA 99 South of	27	Sacramento Coun	1: Weekday (M-Th)	0: All Day (12am-12am)	49
Personal	6	Biggs	13	CA 99 South of	28	Sutter County	1: Weekday (M-Th)	0: All Day (12am-12am)	174
Personal	6	Biggs	13	CA 99 South of	29	Yolo County	1: Weekday (M-Th)	0: All Day (12am-12am)	7
Personal	6	Biggs	13	CA 99 South of	30	Yuba County	1: Weekday (M-Th)	0: All Day (12am-12am)	17
Personal	6	Biggs	14	Almond Orchard	28	Sutter County	1: Weekday (M-Th)	0: All Day (12am-12am)	3
Personal	6	Biggs	15	Gridley Road	18	Colusa County	1: Weekday (M-Th)	0: All Day (12am-12am)	3
Personal	6	Biggs	17	Biggs-Willows R	18	Colusa County	1: Weekday (M-Th)	0: All Day (12am-12am)	3
Personal	6	Biggs	17	Biggs-Willows R	19	Glenn County	1: Weekday (M-Th)	0: All Day (12am-12am)	8
Personal	6	Biggs	19	Ord Ferry Road	19	Glenn County	1: Weekday (M-Th)	0: All Day (12am-12am)	1
Personal	6	Biggs	20	CA 32 Hamilton	19	Glenn County	1: Weekday (M-Th)	0: All Day (12am-12am)	2
Personal	7	Chico	1	CA 99 North of	16	Tehama County	1: Weekday (M-Th)	0: All Day (12am-12am)	2482
Personal	7	Chico	1	CA 99 North of	19	Glenn County	1: Weekday (M-Th)	0: All Day (12am-12am)	6
Personal	7	Chico	1	CA 99 North of	23	Shasta County	1: Weekday (M-Th)	0: All Day (12am-12am)	643
Personal	7	Chico	1	CA 99 North of	27	Sacramento Coun	1: Weekday (M-Th)	0: All Day (12am-12am)	2
Personal	7	Chico	1	CA 99 North of	30	Yuba County	1: Weekday (M-Th)	0: All Day (12am-12am)	1
Personal	7	Chico	3	CA 32 North of	14	Plumas County	1: Weekday (M-Th)	0: All Day (12am-12am)	19
Personal	7	Chico	3	CA 32 North of	16	Tehama County	1: Weekday (M-Th)	0: All Day (12am-12am)	4

Google Maps (for Gateway Identification and Trip Length Beyond Local Model Gateways)

Google Maps (or similar online mapping tool) can be used as a quick tool for gateway identification and for determining trip lengths beyond a local model boundary. An example of trips from Chico leaving the BCAG model boundary to Redding is shown below. Trips for this OD pair pass through the gateway on SR 99 (based on the shortest travel time).



After a gateway is identified, the distance from the gate location to the trip end outside of the local model boundary can also be searched, as shown below.



Cube Voyager Sample Script

```
;TAZs from local model within the CSTDM
Project1='246-261'
;=================================================
; PM peak period highway skim
RUN PGM=highway
NETI=..\LoadedNetworks\HwyNetwork_Loaded_PM_?.net                    ; input network
MATO=Skim_PM_?.mat, MO=1-4, NAME=TIME,GATE,GATE_DIST,FULL_DIST  ; output skim matrix
   PHASE=ILOOP
      PATH=LI.TIME_2,MW[1]=PATHTRACE(LI.TIME_2), MW[2]=PATHTRACE(LI.GATE),
MW[3]=PATHTRACE(LI.GATE_DIST), MW[4]=PATHTRACE(LI.DISTANCE)
endphase
ENDRUN
;=================================================
; Summarize OD Volumes and Skim Matrices
RUN PGM=MATRIX
   MATI[1]=..\TripTables\OD_?.mat
         MATI[2]=Skim_PM_?.mat
   MATO=OD_Gate_VMT_?.mat, MO=1-6,
name=VOL_DAY,GATE,GATE_DIST,GATE_VMT_DAY,FULL_DIST,FULL_VMT
MW[1]=mi.1.1 + mi.1.2 + mi.1.3 + mi.1.4 + mi.1.5 + mi.1.6 + mi.1.7 + mi.1.8 + mi.1.9 + mi.1.10 + mi.1.11 +
mi.1.12 + mi.1.13 + mi.1.14 + mi.1.15      + mi.1.16 + mi.1.17 + mi.1.18 + mi.1.19 + mi.1.20 + mi.1.21 +
mi.1.22 + mi.1.23 + mi.1.24 + mi.1.25 + mi.1.26 + mi.1.27 + mi.1.28 + mi.1.29 + mi.1.30 + mi.1.31 +
mi.1.32 + mi.1.33 + mi.1.34 + mi.1.35 + mi.1.36 + mi.1.37 + mi.1.38 + mi.1.39 + mi.1.14 + mi.1.41 +
mi.1.42 + mi.1.43 + mi.1.44 + mi.1.45 + mi.1.46 + mi.1.47 + mi.1.48 + mi.1.49 + mi.1.50 + mi.1.51 +
mi.1.52 + mi.1.53 + mi.1.54 + mi.1.55 + mi.1.56 + mi.1.57 + mi.1.58 + mi.1.59 + mi.1.60
         MW[2]=mi.2.2
         MW[3]=mi.2.3
         MW[4]=MW[1]*MW[3]
         MW[5]=mi.2.4
         MW[6]=MW[1]*MW[5]
ENDRUN
;=========================
; Export to CSV
run pgm=matrix
filei mati[1] = OD_Gate_VMT_?.mat
fileo mato[1]= OD_Gate_VMT_?_IX.csv, MO=1-6, FORMAT=csv, PATTERN=IJM:V, DEC=d, DELIMITER=','
fileo mato[2]= OD_Gate_VMT_?_XI.csv, MO=7-12, FORMAT=csv, PATTERN=IJM:V, DEC=d, DELIMITER=','
         IF (I=@Project1@)
                  MW[1]=MI.1.1  EXCLUDE=@Project1@
                  MW[2]=MI.1.2  EXCLUDE=@Project1@
                  MW[3]=MI.1.3  EXCLUDE=@Project1@
                  MW[4]=MI.1.4  EXCLUDE=@Project1@
                  MW[5]=MI.1.5  EXCLUDE=@Project1@
                  MW[6]=MI.1.6  EXCLUDE=@Project1@
         ELSE
```

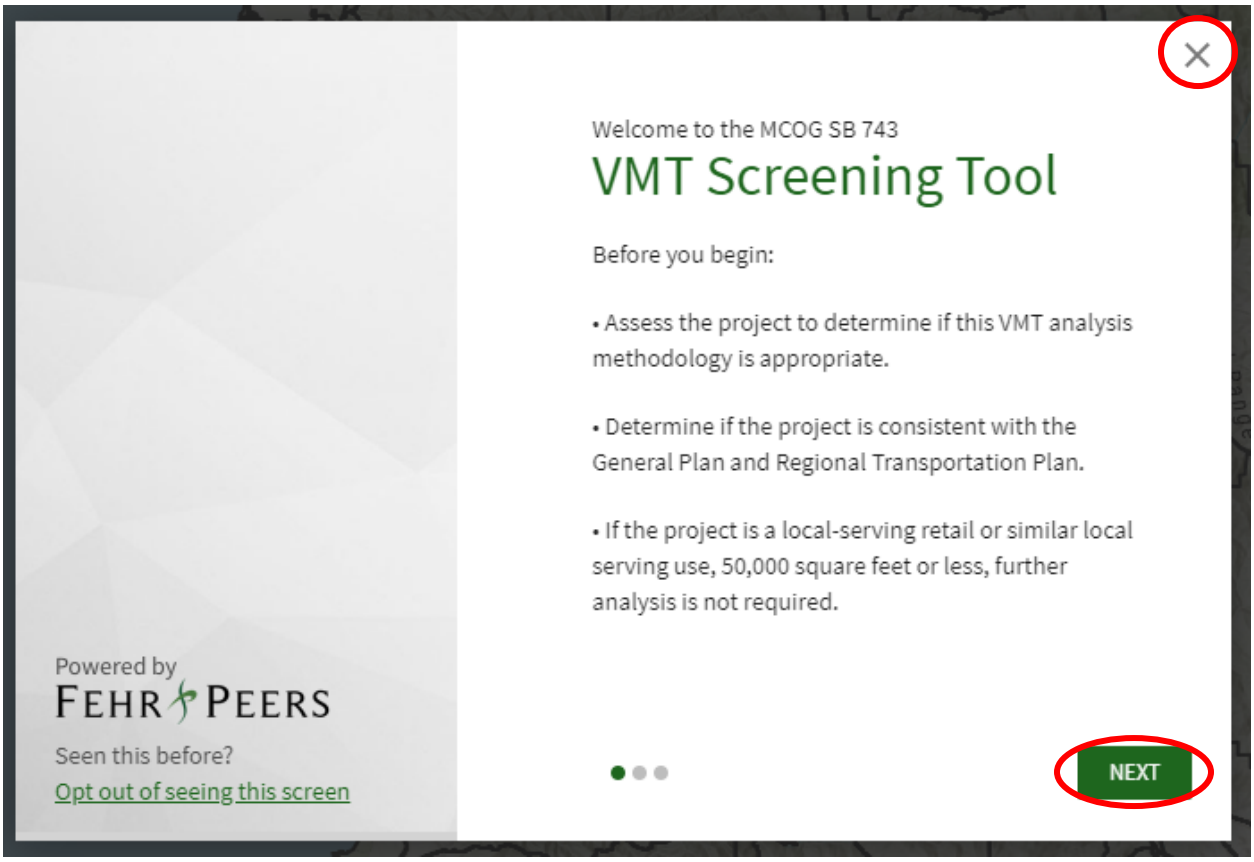
```
            MW[1]=0
            MW[2]=0
            MW[3]=0
            MW[4]=0
            MW[5]=0
            MW[6]=0
        ENDIF

        JLOOP
        IF (I=@Project1@ & J=@Project1@)
            MW[7]=0
            MW[8]=0
            MW[9]=0
            MW[10]=0
            MW[11]=0
            MW[12]=0
        ELSEIF (J=@Project1@)
            MW[7]=MI.1.1
            MW[8]=MI.1.2
            MW[9]=MI.1.3
            MW[10]=MI.1.4
            MW[11]=MI.1.5
            MW[12]=MI.1.6
        ELSE
            MW[7]=0
            MW[8]=0
            MW[9]=0
            MW[10]=0
            MW[11]=0
            MW[12]=0
        ENDIF
        ENDJLOOP
ENDRUN
```

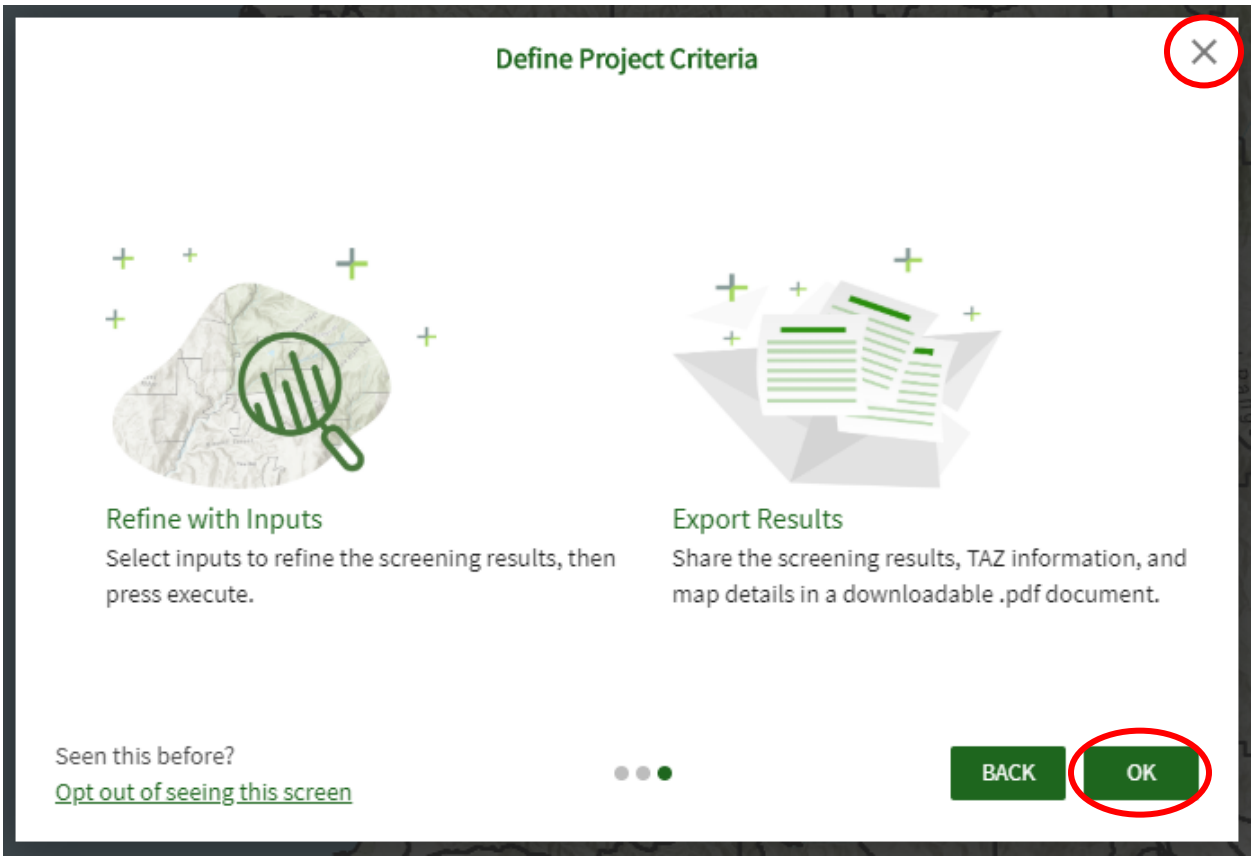
Appendix C:
VMT Screening Tool

To support the screening process, a screening tool was developed for MCOG jurisdictions. The tool uses data from the MCOG travel forecasting model to compare the VMT per service population, home-based VMT per resident, and home-based work VMT per employee for the TAZ in which a study parcel is located to the same measure for the subregion in which the parcel is located. Using this tool, a parcel can be evaluated for screening without additional runs of the travel demand model.

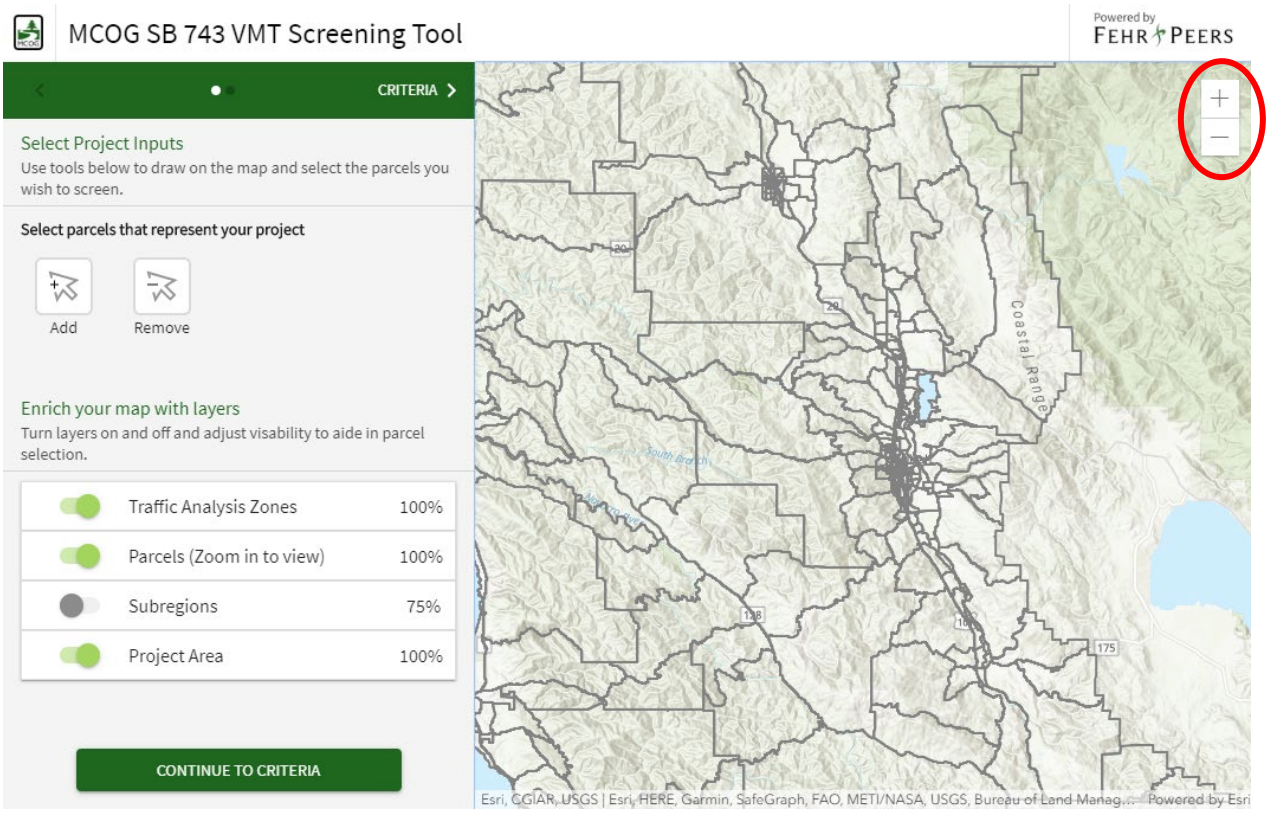
To use the tool, navigate to https://devapps.fehrandpeers.com/MCOG_VMT_Screening/# (temporary location) or https://apps.fehrandpeers.com/MCOG_VMT_Screening/ (final location). A splash screen displays a summary of instructions for using the tool. Click "NEXT" to view the next screen of instructions).



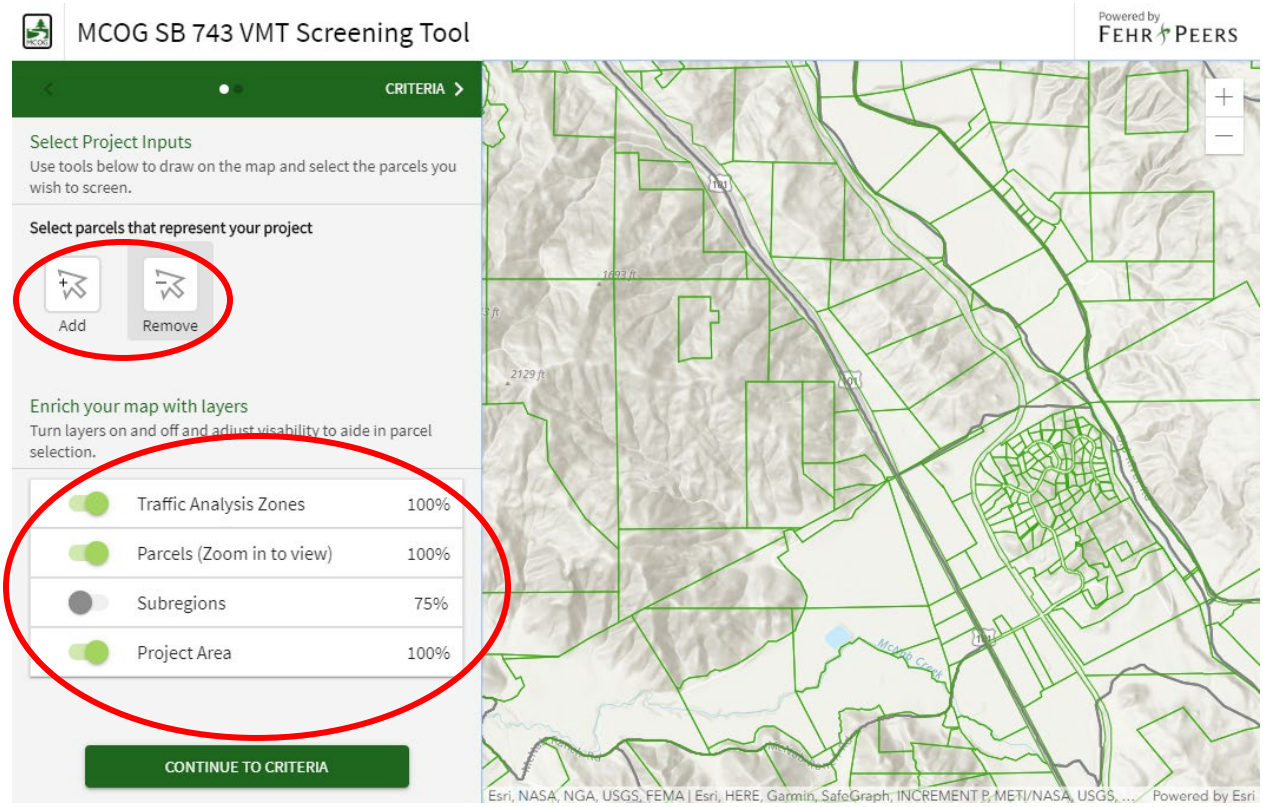
Click the "X" or "OK" on the last page to close the splash screen and enter data.



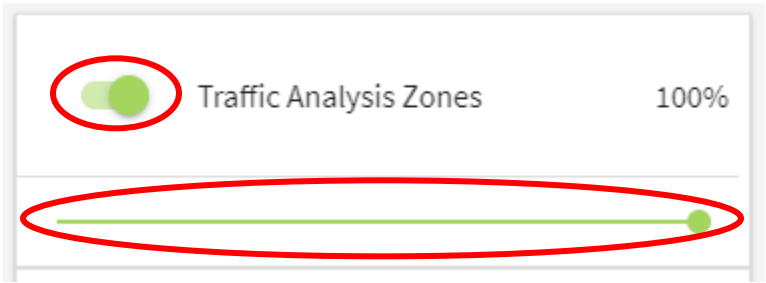
An input window is then shown. The mouse may be used to navigate the map by scrolling and zooming or using the "+" and "-" buttons.



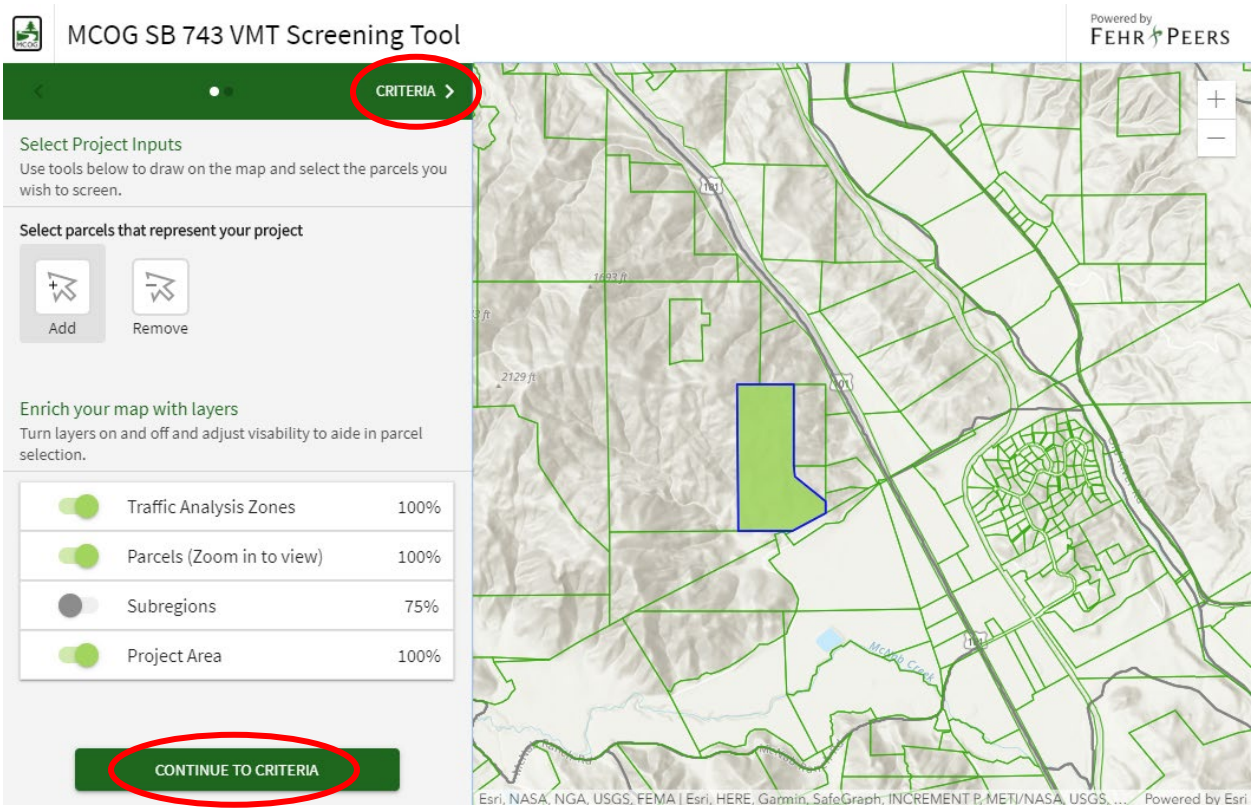
If you do not see the parcels, zoom in until you see the green lines. Use the arrow "Add" and "Remove" buttons to add or remove analysis parcels. Click on a layer name to make adjustments to the layer. TAZs will be shown with a grey outline.



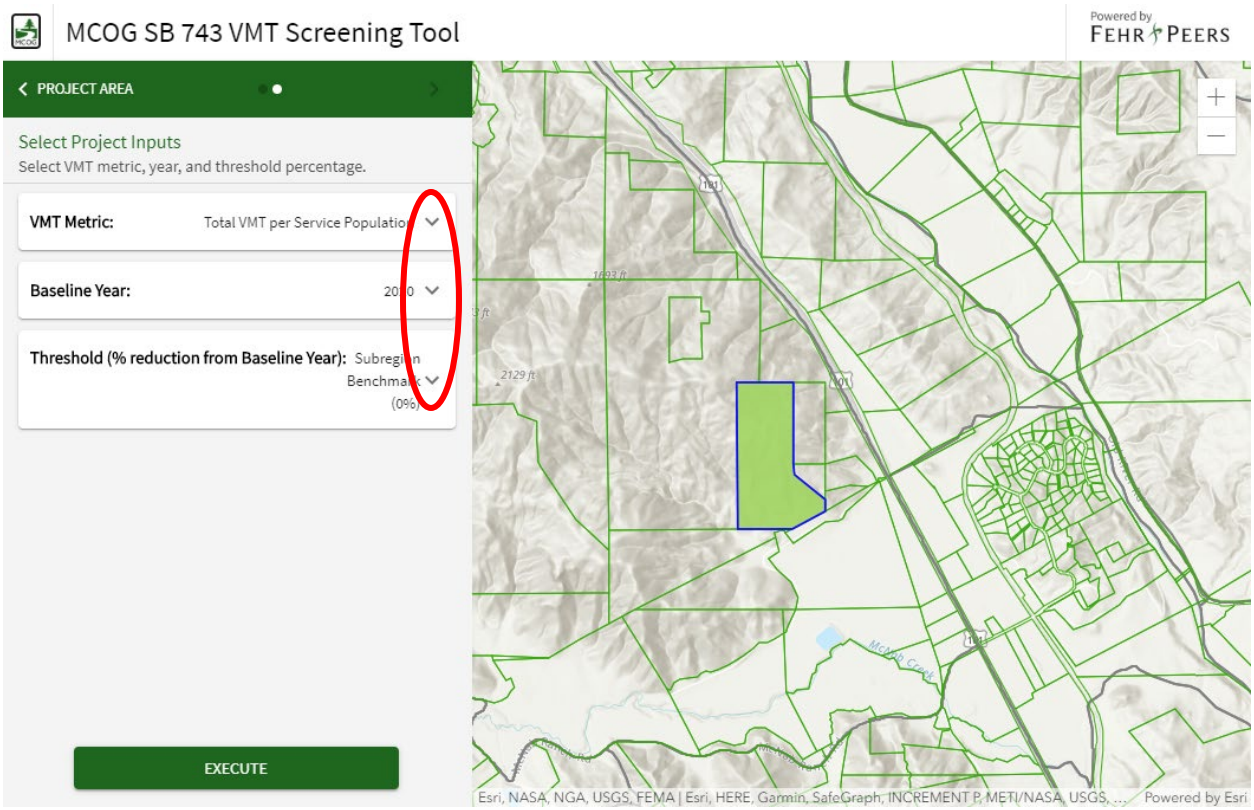
Once clicked, the layer will open to reveal a slider. Use the slider to adjust the visibility of the layer. Use the switch to turn the layer on and off.



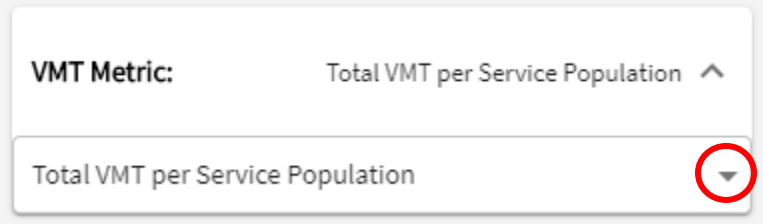
A selected parcel (the project area) will be displayed with green fill and a blue outline. Click on "CRITERIA >" or "CONTINUE TO CRITERIA" to proceed to the next screen.



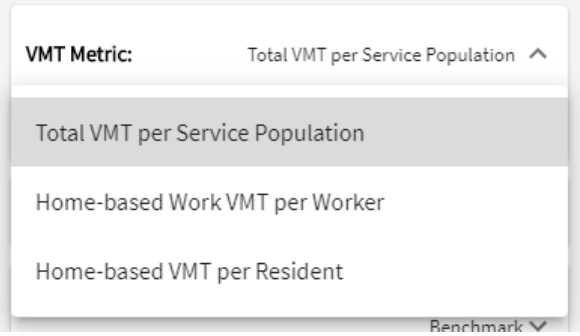
To select project inputs, click the arrows to open and close options for "VMT Metric," "Baseline Year," or "Threshold."



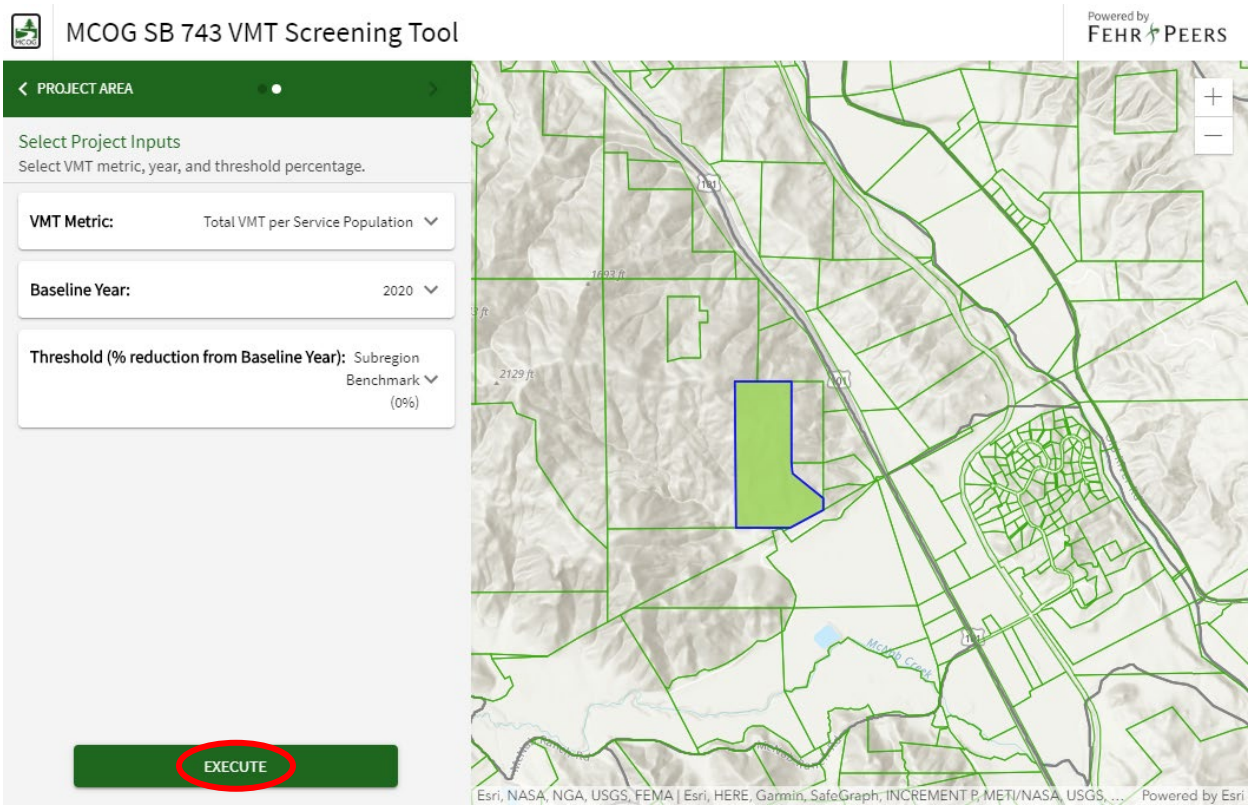
After the input is opened, click the solid arrow to show options.



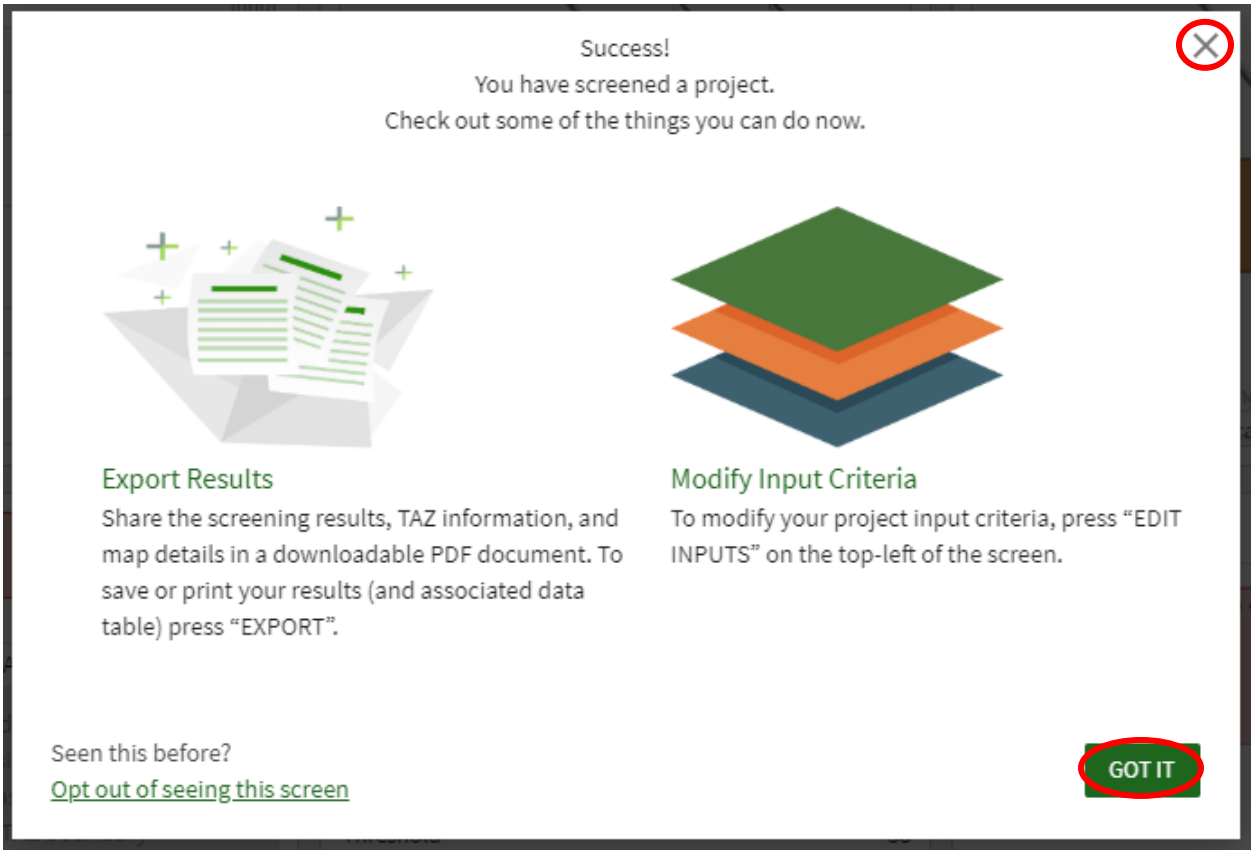
Then click on an option to select it. The selected option will be highlighted in gray.



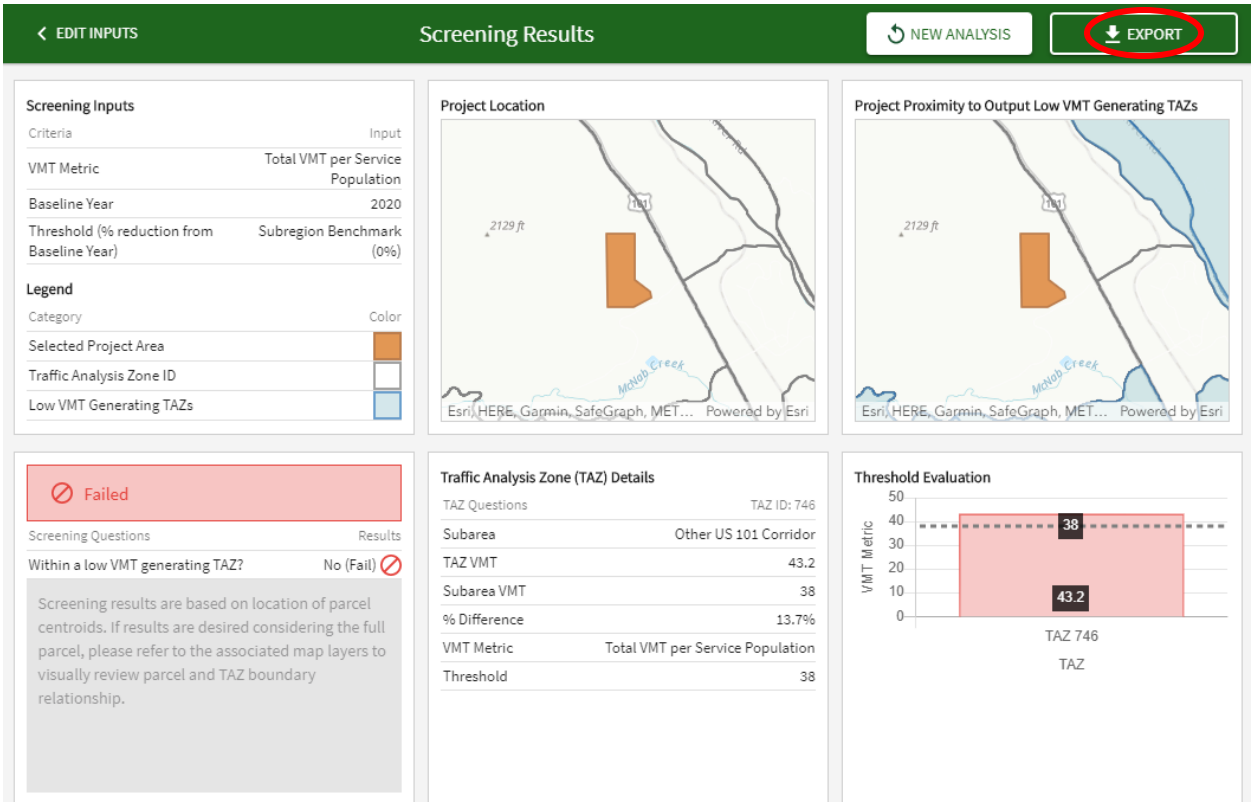
Repeat this option selection process for "Baseline Year" and "Threshold." After desired options are selected, click "EXECUTE" to obtain results for the selected parcel.



Results are returned after a few seconds. A splash screen will provide further instructions. Click the "X" or "GOT IT" button to close the splash screen and view the results.



Results will then be displayed, including screening input options selected, whether screening passed or failed, and details of the screening results. To export these results, click the "EXPORT" button.

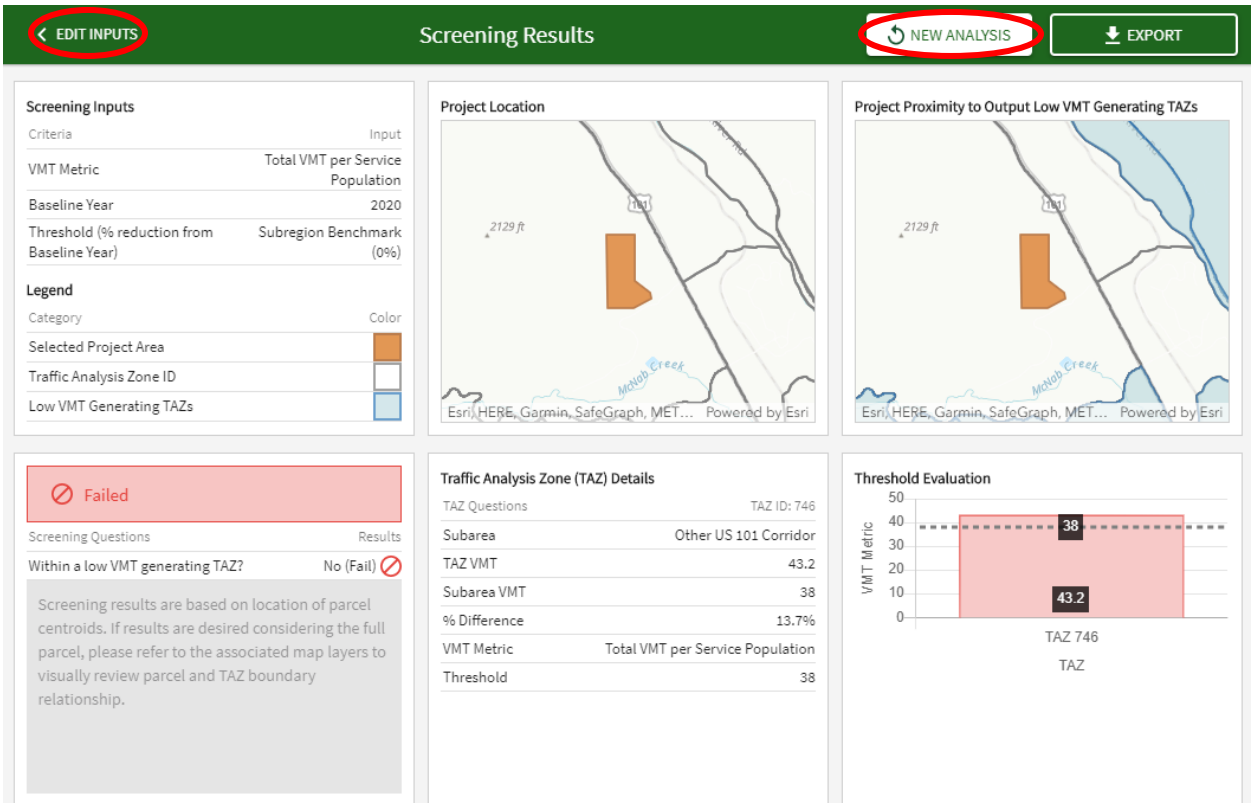


After clicking the export button, two files will be available for download:

- A comma-separated values (.csv) file with the numeric results of the analysis
- A portable document format (.pdf) file with the images displayed in the screening results window

The export process works best with the Chrome browser. There is a known bug in the Firefox browser which prevents the images from being exported. However, a screenshot may also be used to capture an image of the results.

After the screening results are reviewed and saved as desired, the user may click on "< EDIT INPUTS" to go back and change parameters or options in the analysis. Alternatively, the user may start a new analysis from the beginning by pressing the "NEW ANALYSIS" button.



Appendix D:
TDM Strategy Evaluation

Attachment A: Transportation Demand Strategies Assessment

Comparison of CAPCOA Strategies Versus New Research Since 2010

CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	Applicable to Individual Land Use Projects?	New Information Since CAPCOA Was Published in 2010		
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Land Use/Location	3.1.1	LUT-1 Increase Density	0.8% - 30% VMT reduction due to increase in density	Adequate	Yes - however, the project must increase residential or employment density by at least 10%.	Increasing residential density is associated with lower VMT per capita. Increased residential density in areas with high jobs access may have a greater VMT change than increases in regions with lower jobs access. The range of reductions is based on a range of elasticities from -0.04 to -0.22. The low end of the reductions represents a -0.04 elasticity of demand in response to a 10% increase in residential units or employment density and a -0.22 elasticity in response to 50% increase to residential/employment density.	0.4% -10.75%	Primary sources: Boarnet, M. and Handy, S. (2014). Impacts of Residential Density on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Secondary source: Stevens, M. (2017). Does Compact Development Make People Drive Less? Journal of the American Planning Association, 83(1), 7-18.
Land Use/Location	3.1.9	LUT-9 Improve Design of Development	3.0% - 21.3% reduction in VMT due to increasing intersection density vs. typical ITE suburban development	Adequate	Yes	No update to CAPCOA literature; advise applying CAPCOA measure only to large developments with significant internal street structure.	Same	N/A
Land Use/Location	3.1.4	LUT-4 Increase Destination Accessibility	6.7%-20% VMT reduction due to decrease in distance to major job center or downtown	Adequate	Yes	Reduction in VMT due to increased regional accessibility (jobs gravity). Locating new development in areas with good access to destinations reduces VMT by reducing trip lengths and making walking, biking, and transit trips more feasible. Destination accessibility is measured in terms of the number of jobs (or other attractions) reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones.	0.5%-12%	Primary sources: Handy, S. et al. (2014). Impacts of Network Connectivity on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Handy, S. et al. (2013). Impacts of Regional Accessibility on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Secondary source: Holtzclaw, et al. (2002.) Location Efficiency: Neighborhood and Socioeconomic Characteristics Determine Auto Ownership and Use – Studies in Chicago, Los Angeles, and Chicago. Transportation Planning and Technology, Vol. 25, pp. 1–27.

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Land Use/ Location	3.1.3	LUT-3 Increase Diversity of Urban and Suburban Developments	9%-30% VMT reduction due to mixing land uses within a single development	Adequate	Yes	1] VMT reduction due to mix of land uses within a single development. Mixing land uses within a single development can decrease VMT (and resulting GHG emissions), since building users do not need to drive to meet all of their needs. 2] Reduction in VMT due to regional change in entropy index of diversity. Providing a mix of land uses within a single neighborhood can decrease VMT (and resulting GHG emissions), since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. At the regional level, reductions in VMT are measured in response to changes in the entropy index of land use diversity.	1] 0%-12% 2] 0.3%-4%	1] Ewing, R. and Cervero, R. (2010). Travel and the Built Environment - A Meta-Analysis. Journal of the American Planning Association,76(3),265-294. Cited in California Air Pollution Control Officers Association. (2010).Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf Frank, L., Greenwald, M., Kavage, S. and Devlin, A. (2011). An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy. WSDOT Research Report WA-RD 765.1. Washington State Department of Transportation. Retrieved from: http://www.wsdot.wa.gov/research/reports/fullreports/765.1.pdf Nasri, A. and Zhang, L. (2012). Impact of Metropolitan-Level Built Environment on Travel Behavior. Transportation Research Record: Journal of the Transportation Research Board, 2323(1), 75-79. Sadek, A. et al. (2011). Reducing VMT through Smart Land-Use Design. New York State Energy Research and Development Authority. Retrieved from: https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-08-29%20Final%20Report_December%202011%20%282%29.pdf Spears, S.et al. (2014). Impacts of Land-Use Mix on Passenger Vehicle Use and Greenhouse Gas Emissions- Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm 2] Zhang, Wengia et al. "Short- and Long-Term Effects of Land Use on Reducing Personal Vehicle Miles of Travel."

Attachment A: Transportation Demand Strategies Assessment

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Land Use/ Location	3.1.5	LUT-5 Increase Transit Accessibility	0.5%-24.6% reduce in VMT due to locating a project near high-quality transit	Adequate	Yes - the project must include the TOD design features.	1] VMT reduction when transit station is provided within 1/2 mile of development (compared to VMT for sites located outside 1/2 mile radius of transit). Locating high density development within 1/2 mile of transit will facilitate the use of transit by people traveling to or from the Project site. The use of transit results in a mode shift and therefore reduced VMT. 2] Reduction in vehicle trips due to implementing TOD. A project with a residential/commercial center designed around a rail or bus station, is called a transit-oriented development (TOD). The project description should include, at a minimum, the following design features: • A transit station/stop with high-quality, high-frequency bus service located within a 5-10 minute walk (or roughly ¼ mile from stop to edge of development), and/or • A rail station located within a 20 minute walk (or roughly ½ mile from station to edge of development) • Fast, frequent, and reliable transit service connecting to a high percentage	1] 0%-5.8% 2] 0%-7.3%	1] Lund, H. et al. (2004). Travel Characteristics of Transit-Oriented Development in California. Oakland, CA: Bay Area Rapid Transit District, Metropolitan Transportation Commission, and Caltrans. Tal, G. et al. (2013). Policy Brief on the Impacts of Transit Access (Distance to Transit) Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/transitaccess/transit_access_brief120313.pdf 2] Zamir, K. R. et al. (2014). Effects of Transit-Oriented Development on Trip Generation, Distribution, and Mode Share in Washington, D.C., and Baltimore, Maryland. Transportation Research Record: Journal of the Transportation Research Board. 2413, 45–53. DOI: 10.3141/2413-05
Land Use/ Location	3.1.6	LUT-6 Integrate Affordable and Below Market Rate Housing	0.04%-1.20% reduction in VMT for making up to 30% of housing units BMR	Weak - Should only be used where supported by local data on affordable housing trip generation.	Potentially yes - the use of this strategy would need to be supported by local data.	Observed trip generation indicates substantial local and regional variation in trip making behavior at affordable housing sites. Recommend use of ITE	N/A	"Draft Memorandum: Infill and Complete Streets Study, Task 2.1: Local Trip Generation Study." Measuring the Miles: Developing new metrics for vehicle travel in LA. City of Los Angeles, April 19, 2017.
Neighborhood Site Enhancements	3.2.1	SDT-1 Provide Pedestrian Network Improvements	0%-2% reduction in VMT for creating a connected pedestrian network within the development and connecting to nearby destinations	Adequate	No - this strategy would require a project to integrate into a larger overall network of pedestrian facilities that would require local and/or regional agency coordination to implement. Current research supports city and neighborhood level VMT reductions, but none of the literature reviewed contains and evaluation of project-specific reductions.	VMT reduction due to provision of complete pedestrian networks. Only applies if located in an area that may be prone to having a less robust sidewalk network.	0.5%-5.7%	Handy, S. et al. (2014). Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm

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Neighborhood Site Enhancements	3.2.2	SDT-2 Provide Traffic Calming Measures	0.25%-1% VMT reduction due to traffic calming on streets within and around the development	Adequate	Potentially yes - The requirements for the project-level definition must be met. In general, this strategy would require a project to integrate into a larger overall network of bicycle facilities that would require local and/or regional agency coordination to implement.	Reduction in VMT due to expansion of bike networks in urban areas. Strategy only applies to bicycle facilities that provide a dedicated lane for bicyclists or a completely separated right-of-way for bicycles and pedestrians. Project-level definition: Enhance bicycle network citywide (or at similar scale), such that a building entrance or bicycle parking is within 200 yards walking or bicycling distance from a bicycle network that connects to at least one of the following: at least 10 diverse uses; a school or employment center, if the project total floor area is 50% or more residential; or a bus rapid transit stop, light or heavy rail station, commuter rail station, or ferry terminal. All destinations must be 3-mile bicycling distance from project site. Include educational campaigns to encourage bicycling.	0%-1.7%	Zahabi, S. et al. (2016). Exploring the link between the neighborhood typologies, bicycle infrastructure and commuting cycling over time and the potential impact on commuter GHG emissions. Transportation Research Part D: Transport and Environment. 47, 89-103.
Neighborhood Site Enhancements	3.2.3	SDT-3 Implement an NEV Network	0.5%-12.7% VMT reduction for GHG-emitting vehicles, depending on level of local NEV penetration	Weak - not recommended without supplemental data.	No - the evidence supporting this strategy is limited.	Limited evidence and highly limited applicability. Use with supplemental data only.	N/A	City of Lincoln, MHM Engineers & Surveyors, Neighborhood Electric Vehicle Transportation Program Final Report, Issued 04/05/05, and City of Lincoln, A Report to the California Legislature as required by Assembly Bill 2353, Neighborhood Electric Vehicle Transportation Plan Evaluation, January 1, 2008. Cited in: California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

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Neighborhood Site Enhancements	3.4.9	TRT-9 Implement Car-Sharing Program	0.4% - 0.7% VMT reduction due to lower vehicle ownership rates and general shift to non-driving modes	Adequate	No - this strategy would require local and/or regional agency coordination to implement.	Vehicle trip reduction due to car-sharing programs; reduction assumes 1%-5% penetration rate. Implementing car-sharing programs allows people to have on-demand access to a shared fleet of vehicles on an as-needed basis, as a supplement to trips made by non-SOV modes. Transit station-based programs focus on providing the "last-mile" solution and link transit with commuters' final destinations. Residential-based programs work to substitute entire household based trips. Employer-based programs provide a means for business/day trips for alternative mode commuters and provide a guaranteed ride home option. The reduction shown here assumes a 1%-5% penetration rate.	0.3%-1.6%	Lovejoy, K. et al. (2013). Impacts of Carsharing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Need to verify with more recent UCD research.
Parking Pricing	3.3.1	PDT-1 Limit Parking Supply	5%-12.5% VMT reduction in response to reduced parking supply vs. ITE parking generation rate	Weak - not recommended. Fehr & Peers has developed new estimates for residential land use only that may be used.	Yes - evidence is only available to support taking these reduction high-transit urban areas.	CAPCOA reduction range derived from estimate of reduced vehicle ownership, not supported by observed trip or VMT reductions. Evidence is available for mode shift due to presence/absence of parking in high-transit urban areas; additional investigation ongoing	Higher	Fehr & Peers estimated a linear regression formula based on observed data from multiple locations. Resulting equation produces maximum VMT reductions for residential land use only of 30% in suburban locations and 50% in urban locations based on parking supply percentage reductions.
Parking Pricing	3.3.2	PDT-2 Unbundle Parking Costs from Property Cost	2.6% -13% VMT reduction due to decreased vehicle ownership rates	Adequate - conditional on the agency not requiring parking minimums and pricing/managing on-street parking (i.e., residential parking permit districts, etc.).	Yes - however, the project must be in a location that does not require parking minimums and has priced or permitting on-street parking.	Reduction in VMT, primarily for residential uses, based on range of elasticities for vehicle ownership in response to increased residential parking fees. Does not account for self-selection. Only applies if the city does not require parking minimums and if on-street parking is priced and managed (i.e., residential parking permit districts).	2%-12%	Victoria Transport Policy Institute (2009). Parking Requirement Impacts on Housing Affordability. Retrieved March 2010 from: http://www.vtpi.org/park-hou.pdf.

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Parking Pricing	3.3.3	PDT-3 Implement Market Price Public Parking	2.8%-5.5% VMT reduction due to "park once" behavior and disincentive to driving	Adequate	Yes - however, the VMT reductions would only apply to visitor or customer trips.	Implement a pricing strategy for parking by pricing all central business district/employment center/retail center on-street parking. It will be priced to encourage park once" behavior. The benefit of this measure above that of paid parking at the project only is that it deters parking spillover from project supplied parking to other public parking nearby, which undermine the vehicle miles traveled (VMT) benefits of project pricing. It may also generate sufficient area-wide mode shifts to justify increased transit service to the area. VMT reduction applies to VMT from visitor/customer trips only. Reductions higher than top end of range from CAPCOA report apply only in conditions with highly constrained on-street parking supply and lack of comparably-priced off-street parking.	2.8%-14.5%	Clinch, J.P. and Kelly, J.A. (2003). Temporal Variance Of Revealed Preference On-Street Parking Price Elasticity. Dublin: Department of Environmental Studies, University College Dublin. Retrieved from: http://www.ucd.ie/gpep/research/workingpapers/2004/04-02.pdf. Cited in Victoria Transport Policy Institute (2017). Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm Hensher, D. and King, J. (2001). Parking Demand and Responsiveness to Supply, Price and Location in Sydney Central Business District. Transportation Research A. 35(3), 177-196. Millard-Ball, A. et al. (2013). Is the curb 80% full or 20% empty? Assessing the impacts of San Francisco's parking pricing experiment. Transportation Research Part A. 63(2014), 76-92. Shoup, D. (2011). The High Cost of Free Parking. APA Planners Press. p. 290. Cited in Pierce, G. and Shoup, D. (2013). Getting the Prices Right. Journal of the American Planning Association. 79(1), 67-81.
Transit System	3.5.3	TST-3 Expand Transit Network	0.1-8.2% VMT reduction in response to increase in transit network coverage	Adequate	No - expanding the transit network would require local and/or regional agency coordination to implement.	Reduction in vehicle trips due to increased transit service hours or coverage. Low end of reduction is typical of project-level implementation (payment of impact fees and/or localized improvements).	0.1%-10.5%	Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Transit System	3.5.4	TST-4 Increase Transit Service Frequency/Speed	0.02%-2.5% VMT reduction due to reduced headways and increased speed and reliability	Adequate	No - increasing the quality of transit service would require local and/or regional agency coordination to implement.	Reduction in vehicle trips due to increased transit frequency/decreased headway. Low end of reduction is typical of project-level implementation (payment of impact fees and/or localized improvements).	0.3%-6.3%	Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Transit System	3.5.1	TST-1 Provide a Bus Rapid Transit System	0.02%-3.2% VMT reduction by converting standard bus system to BRT system	Adequate	No - the conversion of standard bus system to BRT would require local and/or regional agency coordination to implement.	No new information identified.	Same	N/A

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Commute Trip Reduction	3.4.1	TRT-1 Implement CTR Program - Voluntary	1.0%-6.2% commute VMT reduction due to employer-based mode shift program	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-2 Implement CTR Program - Required Implementation/Monitoring" or with CAPCOA strategies TRT-3.4.3 through TRT-3.4.9.	Yes - however, the effectiveness of a voluntary CTR program would be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Reduction in vehicle trips in response to employer-led TDM programs. The CTR program should include all of the following to apply the effectiveness reported by the literature: • Carpooling encouragement • Ride-matching assistance • Preferential carpool parking • Flexible work schedules for carpools • Half time transportation coordinator • Vanpool assistance • Bicycle end-trip facilities (parking, showers and lockers)	1.0%-6.0%	Boarnet, M. et al. (2014). Impacts of Employer-Based Trip Reduction Programs and Vanpools on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Commute Trip Reduction	3.4.2	TRT-2 Implement CTR Program - Required Implementation/Monitoring	4.2%-21.0% commute VMT reduction due to employer-based mode shift program with required monitoring and reporting	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or with CAPCOA strategies TRT-3.4.3 through TRT-3.4.9.	Yes - however, the effectiveness of a CTR program would be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Limited evidence available. Anecdotal evidence shows high investment produces high VMT/vehicle trip reductions at employment sites with monitoring requirements and specific targets.	Same	Nelson/Nygaard (2008). South San Francisco Mode Share and Parking Report for Genentech, Inc.(p. 8) Cited in: California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf
Commute Trip Reduction	3.4.4	TRT-4 Implement Subsidized or Discounted Transit Program	0.3%-20% commute VMT reduction due to transit subsidy of up to $6/day	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of a transit subsidy program would be building tenant specific and may require monitoring to evaluate the program's effectiveness.	1] Reduction in vehicle trips in response to reduced cost of transit use, assuming that 10-50% of new bus trips replace vehicle trips; 2] Reduction in commute trip VMT due to employee benefits that include transit 3] Reduction in all vehicle trips due to reduced transit fares system-wide, assuming 25% of new transit trips would have been vehicle trips.	1] 0.3%-14% 2] 0-16% 3] 0.1% to 6.9%	1] Victoria Transport Policy Institute. (2017). Understanding Transport Demands and Elasticities. Online TDM Encyclopedia. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm 2] Carolina, P. et al. (2016). Do Employee Commuter Benefits Increase Transit Ridership? Evidence rom the NY-NJ Region. Washington, DC: Transportation Research Board, 96th Annual Meeting. 3] Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Commute Trip Reduction	3.4.15	TRT-15 Employee Parking Cash-Out	0.6%-7.7% commute VMT reduction due to implementing employee parking cash-out	Weak - Effectiveness is building/tenant specific. Research data is over 10 years old (1997).	Yes - however, the effectiveness of employee parking cash-out could be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Shoup case studies indicate a reduction in commute vehicle trips due to implementing cash-out without implementing other trip-reduction strategies.	3%-7.7%	Shoup, D. (1997). Evaluating the Effects of Cashing Out Employer-Paid Parking: Eight Case Studies. Transport Policy. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/research/apr/past/93-308a.pdf. This citation was listed as an alternative literature in CAPCOA.

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Commute Trip Reduction	3.4.14	TRT-14 Price Workplace Parking	0.1%-19.7% commute VMT reduction due to mode shift	Adequate - Effectiveness is building/tenant specific.	Yes - however, the effectiveness of pricing workplace parking could be building tenant specific and may require monitoring to evaluate the program's effectiveness.	Reduction in commute vehicle trips due to priced workplace parking; effectiveness depends on availability of alternative modes. Workplace parking pricing may include: explicitly charging for parking, implementing above market rate pricing, validating parking only for invited guests, not providing employee parking and transportation allowances, and educating employees about available alternatives.	0.5%-14%	Primary sources: Concas, S. and Nayak, N. (2012), A Meta-Analysis of Parking Price Elasticity. Washington, DC: Transportation Research Board, 2012 Annual Meeting. Dale, S. et al. (2016). Evaluating the Impact of a Workplace Parking Levy on Local Traffic Congestion: The Case of Nottingham UK. Washington, DC: Transportation Research Board, 96th Annual Meeting. Secondary sources: Victoria Transport Policy Institute. (2017). Understanding Transport Demands and Elasticities. Online TDM Encyclopedia. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm Spears, S. et al. (2014). Impacts of Parking Pricing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Commute Trip Reduction	3.4.6	TRT-6 Encourage Telecommuting and Alternative Work Schedules	0.07%-5.5% commute VMT reduction due to reduced commute trips	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of telecommuting and alternative work schedules is building tenant specific and may require monitoring to evaluate the program's effectiveness.	VMT reduction due to adoption of telecommuting. Alternative work schedules could take the form of staggered starting times, flexible schedules, or compressed work weeks.	0.2%-4.5%	Handy, S. et al. (2013). Policy Brief on the Impacts of Telecommuting Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/telecommuting/telecommuting_brief120313.pdf
Commute Trip Reduction	3.4.7	1] TRT-7 Implement CTR Marketing 2] Launch Targeted Behavioral Interventions	0.8%-4.0% commute VMT reduction due to employer marketing of alternatives	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of CTR marketing and behavioral intervention programs is building tenant specific and may require monitoring to evaluate the program's effectiveness.	1] Vehicle trips reduction due to CTR marketing; 2] Reduction in VMT from institutional trips due to targeted behavioral intervention programs	1] 0.9% to 26% 2] 1%-6%	1] Pratt, Dick. Personal communication regarding the Draft of TCRP 95 Traveler Response to Transportation System Changes – Chapter 19 Employer and Institutional TDM Strategies. Transit Cooperative Research Program. Cited in California Air Pollution Control Officers Association. (2010).Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf Dill, J. and Mohr, C. (2010). Long-Term Evaluation of Individualized Marketing Programs for Travel Demand Management. Portland, OR: Transportation Research and Education Center (TREC). Retrieved from: http://pdxscholar.library.pdx.edu/usp_fac 2] Brown, A. and Ralph, K. (2017.) "The Right Time and Place to Change Travel Behavior: An Experimental Study." Washington, DC: Transportation Research Board, 2017 Annual Meeting. Retrieved from: https://trid.trb.org/view.aspx?id=1437253
Commute Trip Reduction	3.4.11	TRT-11 Provide Employer-Sponsored Vanpool/Shuttle	0.3%-13.4% commute VMT reduction due to employer-sponsored vanpool and/or shuttle service	Adequate - Effectiveness is building/tenant specific.	Yes - however, the effectiveness of the employer-sponsored vanpool/shuttle programs is dependent on the building tenant specific and the quality of the vanpool/shuttle service being provided. This reduction strategy may require monitoring to evaluate the program's effectiveness.	1] Reduction in commute vehicle trips due to implementing employer-sponsored vanpool and shuttle programs; 2] Reduction in commute vehicle trips due to vanpool incentive programs; 3] Reduction in commute vehicle trips due to employer shuttle programs	1] 0.5%-5.0% 2] 0.3%-7.4% 3] 1.4%-6.8%	1] Concas, Sisinnio, Winters, Philip, Wambalaba, Francis, (2005). Fare Pricing Elasticity, Subsidies, and Demand for Vanpool Services. Transportation Research Record: Journal of the Transportation Research Board, 1924, pp 215-223. 2] Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm 3] ICF. (2014). GHG Impacts for Commuter Shuttles Pilot Program.

Comparison of CAPCOA Strategies Versus New Research Since 2010

CAPCOA Category	CAPCOA #	CAPCOA Strategy	CAPCOA Reduction	Strength of Substantial Evidence for CEQA Impact Analysis?	Applicable to Individual Land Use Projects?	New Information Since CAPCOA Was Published in 2010		
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Commute Trip Reduction	3.4.3	TRT-3 Provide Ride-Sharing Programs	1%-15% commute VMT reduction due to employer ride share coordination and facilities	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of the ride-sharing programs is building tenant specific and may require monitoring to evaluate the program's effectiveness.	Commute vehicle trips reduction due to employer ride-sharing programs. Promote ride-sharing programs through a multi-faceted approach such as: • Designating a certain percentage of parking spaces for ride sharing vehicles • Designating adequate passenger loading and unloading and waiting areas for ride-sharing vehicles • Providing an app or website for coordinating rides	2.5%-8.3%	Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm
Commute Trip Reduction	3.4.10	TRT-10 Implement a School Pool Program	7.2%-15.8% reduction in school VMT due to school pool implementation	Adequate - School VMT only.	Not applicable, unless if the project being evaluated is a school.	Limited new evidence available, not conclusive	Same	Transportation Demand Management Institute of the Association for Commuter Transportation. TDM Case Studies and Commuter Testimonials. Prepared for the US EPA. 1997. (p. 10, 36-38) WayToGo 2015 Annual Report. Accessed on March 12, 2017 from http://www.waytogo.org/sites/default/files/attachments/waytogo-annual-report-2015.pdf
Commute Trip Reduction	3.4.13	TRT-13 Implement School Bus Program	38%-63% reduction in school VMT due to school bus service implementation	Adequate - School VMT only.	Not applicable, unless if the project being evaluated is a school.	VMT reduction for school trips based on data beyond a single school district. School district boundaries are also a factor to consider. VMT reduction does not appear to be a factor that was considered in a select review of CA boundaries. VMT reductions apply to school trip VMT only.	5%-30%	Wilson, E., et al. (2007). The implications of school choice on travel behavior and environmental emissions. Transportation Research Part D: Transport and Environment 12(2007), 506-518.
Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	Not Applicable - not a CAPCOA strategy	No -evidence currently does not show a project-specific VMT reductions, the current studies have shown city-wide VMT reductions from changes in travel modes.	Bikeshare car trip substitution rate of 7-19% based on data from Washington DC, and Minneapolis/St. Paul. Annual VMT reduction of 151,000 and 57,000, respectively. Includes VMT for rebalancing and maintenance. VMT reduction of 0.023 miles per day per bikeshare member estimated for Bay Area bikeshare, utilizing Minneapolis/St. Paul data from study above.	57,000-151,000 annual VMT reduction, based on two large US cities. VMT reduction of 0.023 miles per day per member, based on one large US city estimate.	Fishman, E., Washington, S., & Haworth, N. (2014). Bike share's impact on car use: Evidence from the United States, Great Britain, and Australia. Transportation Research Part D: Transport and Environment, 31, 13-20. TDM Methodology: Impact of Carsharing Membership, Transit Passes, Bikesharing Membership, Unbundled Parking, and Parking Supply Reductions on Driving. Center for Neighborhood Technology, Peter Haas and Cindy Copp, with TransForm staff, May 5, 2016.

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Land Use/ Location	3.1.3	LUT-3 Increase Diversity of Urban and Suburban Developments	9%-30% VMT reduction due to mixing land uses within a single development	Adequate	Yes	1] VMT reduction due to mix of land uses within a single development; 2] Reduction in VMT due to regional change in entropy index of diversity.	1] 0%-12% 2] 0.3%-4%	1] Ewing, R. and Cervero, R. (2010). Travel and the Built Environment - A Meta-Analysis. Journal of the American Planning Association,76(3),265-294. Cited in California Air Pollution Control Officers Association. (2010).Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf Frank, L., Greenwald, M., Kavage, S. and Devlin, A. (2011). An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy. WSDOT Research Report WA-RD 765.1. Washington State Department of Transportation. Retrieved from: http://www.wsdot.wa.gov/research/reports/fullreports/765.1.pdf Nasri, A. and Zhang, L. (2012). Impact of Metropolitan-Level Built Environment on Travel Behavior. Transportation Research Record: Journal of the Transportation Research Board, 2323(1), 75-79. Sadek, A. et al. (2011). Reducing VMT through Smart Land-Use Design. New York State Energy Research and Development Authority. Retrieved from: https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-08-29%20Final%20Report_December%202011%20%282%29.pdf Spears, S.et al. (2014). Impacts of Land-Use Mix on Passenger Vehicle Use and Greenhouse Gas Emissions-Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm 2] Zhang, Wengia et al. "Short- and Long-Term Effects of Land Use on Reducing Personal Vehicle Miles of Travel."
Neighborhood Site Enhancements	3.2.1	SDT-1 Provide Pedestrian Network Improvements	0%-2% reduction in VMT for creating a connected pedestrian network within the development and connecting to nearby destinations	Adequate	No - this strategy would require a project to integrate into a larger overall network of pedestrian facilities that would require local and/or regional agency coordination to implement. Current research supports city and neighborhood level VMT reductions, but none of the literature reviewed contains and evaluation of project-specific reductions.	VMT reduction due to provision of complete pedestrian networks.	0.5%-5.7%	Handy, S. et al. (2014). Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Neighborhood Site Enhancements	3.2.2	SDT-2 Provide Traffic Calming Measures	0.25%-1% VMT reduction due to traffic calming on streets within and around the development	Adequate	Potentially yes - The requirements for the project-level definition must be met. In general, this strategy would require a project to integrate into a larger overall network of bicycle facilities that would require local and/or regional agency coordination to implement.	Reduction in VMT due to building out a low-stress bike network; reduction in VMT due to expansion of bike networks in urban areas.	0%-1.7%	1] California Air Resources Board. (2016). Greenhouse Gas Quantification Methodology for the California Transportation Commission Active Transportation Program Greenhouse Gas Reduction Fund Fiscal Year 2016-17. Retrieved from: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/ctc_atp_finalqm_16-17.pdf. 2] Zahabi, S. et al. (2016). Exploring the link between the neighborhood typologies, bicycle infrastructure and commuting cycling over time and the potential impact on commuter GHG emissions. Transportation Research Part D: Transport and Environment. 47, 89-103.

Relevant Strategies for Implementation in MCOG Jurisdictions

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Neighborhood Site Enhancements	3.4.9	TRT-9 Implement Car-Sharing Program	0.4% - 0.7% VMT reduction due to lower vehicle ownership rates and general shift to non-driving modes	Adequate	No - this strategy would require local and/or regional agency coordination to implement.	Vehicle trip reduction due to car-sharing programs; reduction assumes 1%-5% penetration rate. Car sharing effect on VMT is still evolving due to TNC effects. UCD research showed less effect on car ownership due to car sharing participation and an uncertain effect on VMT.	0.3%-1.6%	Lovejoy, K. et al. (2013). Impacts of Carsharing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm Clewlow, Regina R. and Mishra, Gouri Shankar, (2017). Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-Hailing in the United States. UC Davis, Institute of Transportation Studies. Research Report - UCD-ITS-RR-17-07.
Transit System	3.5.4	TST-4 Increase Transit Service Frequency/Speed	0.02%-2.5% VMT reduction due to reduced headways and increased speed and reliability	Adequate	No - increasing the quality of transit service would require local and/or regional agency coordination to implement.	Reduction in vehicle trips due to increased transit frequency/decreased headway.	0.3%-6.3%	Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm
Commute Trip Reduction	3.4.6	TRT-6 Encourage Telecommuting and Alternative Work Schedules	0.07%-5.5% commute VMT reduction due to reduced commute trips	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of telecommuting and alternative work schedules is building tenant specific and may require monitoring to evaluate the program's effectiveness.	VMT reduction due to adoption of telecommuting	0.2%-4.5%	Handy, S. et al. (2013). Policy Brief on the Impacts of Telecommuting Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/telecommuting/telecommuting_brief120313.pdf
Commute Trip Reduction	3.4.3	TRT-3 Provide Ride-Sharing Programs	1%-15% commute VMT reduction due to employer ride share coordination and facilities	Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring."	Yes - however, the effectiveness of the ride-sharing programs is building tenant specific and may require monitoring to evaluate the program's effectiveness.	Commute vehicle trips reduction due to employer ride-sharing programs	2.5%-8.3%	Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm
Parking Pricing	3.3.2	PDT-2 Unbundle Parking Costs from Property Cost	2.6% -13% VMT reduction due to decreased vehicle ownership rates	Adequate - conditional on the agency not requiring parking minimums and pricing/managing on-street parking (i.e., residential parking permit districts, etc.).	Yes - however, the project must be in a location that does not require parking minimums and has priced or permitting on-street parking.	Reduction in VMT, primarily for residential uses, based on range of elasticities for vehicle ownership in response to increased residential parking fees. Does not account for self-selection. Only applies if the city does not require parking minimums and if on-street parking is priced and managed (i.e., residential parking permit districts).	2%-12%	Victoria Transport Policy Institute (2009). Parking Requirement Impacts on Housing Affordability. Retrieved March 2010 from: http://www.vtpi.org/park-hou.pdf.

NOTES:

(1) For specific VMT reduction ranges, refer to the cited literature.