VMT THRESHOLDS AND IMPLEMENTATION GUIDELINES

MCAG | MERCED COUNTY ASSOCIATION OF GOVERNMENTS

LSA

November 2022

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VMT THRESHOLDS AND IMPLEMENTATION GUIDELINES

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EXECUTIVE SUMMARY

Senate Bill (SB) 743, which became effective July 1, 2020, changes the way transportation impacts are determined in California Environmental Quality Act (CEQA) documents. SB 743 replaces the metric for determining transportation impacts using motor vehicle delay and Level of Service (LOS) to Vehicle Miles Traveled (VMT) in CEQA traffic impact studies. As a result of the SB 743 final rulemaking and the implementation deadline of July 1, 2020, the Merced County Association of Governments (MCAG) has prepared this document as a regional guide for the seven member jurisdictions - Merced County and the cities of Atwater, Dos Palos, Gustine, Livingston, Los Banos, and Merced. The member jurisdictions can adopt the recommendations in the regional guidelines as appropriate based on their individual circumstances, such as growth policies and economic development goals.

This document provides a detailed discussion on implementing the CEQA VMT metric as applicable to the MCAG member jurisdictions. Substantial evidence and explanation on establishing the "Region," VMT screening criteria, and VMT analysis thresholds are also described. The following topics establish the steps for preparation of VMT analysis. Each topic is discussed in more detail further in this report.

- **Definition of 'Region':** Merced County is recommended as the region for VMT analysis purposes.
- **Standardized Screening Methods:** Projects within a Transit Priority Area that meet additional requirements, local-serving retail projects up to 50,000 square feet (sf), residential, office, industrial, or mixed-use projects within low-VMT generating areas, projects with 100 percent affordable housing units, and projects that are consistent with the jurisdiction's General Plan and generate fewer than 1,000 daily trips may be screened out from the need for a VMT analysis. Additionally, projects that are not consistent with the jurisdiction's General Plan but generate fewer than 500 daily trips may also be screened out from a VMT analysis.
- **Appropriate VMT Significance Thresholds for Development Projects, Transportation Projects, and Community/General Plans:** For all projects (except retail), a significance threshold of 86 percent of the existing regional average of the respective VMT metric is recommended. For retail projects, a significance threshold of no net increase in VMT is recommended. For mixed use projects, the VMT thresholds are based on the respective thresholds for the various land use components. For transportation projects, net increase in induced VMT is recommended as the significance threshold. Finally, for land use plans, the existing regional average VMT per capita, VMT per employee, and/or VMT per service population is recommended as the threshold of significance.
- **Feasible Mitigation Strategies:** A list of VMT mitigation measures applicable to development projects, transportation projects, and plans in the context of the MCAG member jurisdictions is provided for projects which may not meet the recommended significance thresholds. Additionally, implementation of a future VMT mitigation bank, VMT mitigation exchange, and/or VMT impact fee are discussed as potential future regional VMT mitigation mechanisms.

MCAG recommends the use of the MCAG Travel Demand Model (TDM) for VMT analysis purposes. The MCAG TDM is the regional travel demand model applicable to jurisdictions within Merced County for evaluating project VMT. The appropriate use of the MCAG TDM for VMT calculations is further elaborated in subsequent chapters of this document.

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ABBREVIATIONS AND ACRONYMS

ADT	Average Daily Trips
CalEEMod	California Emissions Estimator Model
Caltrans	California Department of Transportation
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CO_2e	Carbon Dioxide Equivalent
EIR	Environmental Impact Report
EO	Executive Order
GHG	Greenhouse Gas
GWP	Global Warming Potential
HOT	High-Occupancy Toll
HOV	High-Occupancy Vehicle
HQTA	High-Quality Transit Area
ITE	Institute of Transportation Engineers
LOS	Level of Service
MCAG	Merced County Association of Governments
MPO	Metropolitan Planning Organization
MT	Metric Ton
NCST	National Center for Sustainable Transportation
OPR	Governor's Office of Planning and Research
PRC	Public Resources Code
RTP	Regional Transportation Plan
SB	Senate Bill
SCS	Sustainable Communities Strategy
sf	Square foot/Feet
SOC	Statement of Overriding Considerations
TA	Technical Advisory
TDM	Travel Demand Model
TPA	Transit Priority Area
VMT	Vehicle Miles Traveled

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1.0 INTRODUCTION

Senate Bill (SB) 743, which became effective July 1, 2020, changes the way transportation impact assessments are conducted in California Environmental Quality Act (CEQA) documents. Most notably, rulemaking in support of SB 743 replaces motor vehicle delay, as measured by Level of Service (LOS), with Vehicle Miles Traveled (VMT) as the metric for use in CEQA transportation impact assessments.

In January 2019, the Natural Resources Agency and the Governor's Office of Planning and Research (OPR) codified SB 743 into the Public Resources Code (PRC) and the *State CEQA Guidelines.*

OPR published a Technical Advisory (TA) in December of 2018, as a resource to guide the assessment of the VMT metric, establish thresholds of significance, and recommends mitigation measures. The laws and rules governing the CEQA process are contained in the CEQA statute (PRC Section 21000 and following), the *State CEQA Guidelines* (California Code of Regulations, Title 14, Section 15000 and following), published court decisions interpreting CEQA, and locally adopted CEQA procedures. The TA is intended as a reference document; it does not have the weight of law. However, any decision to deviate from the TA recommendations should be supported by substantial evidence.

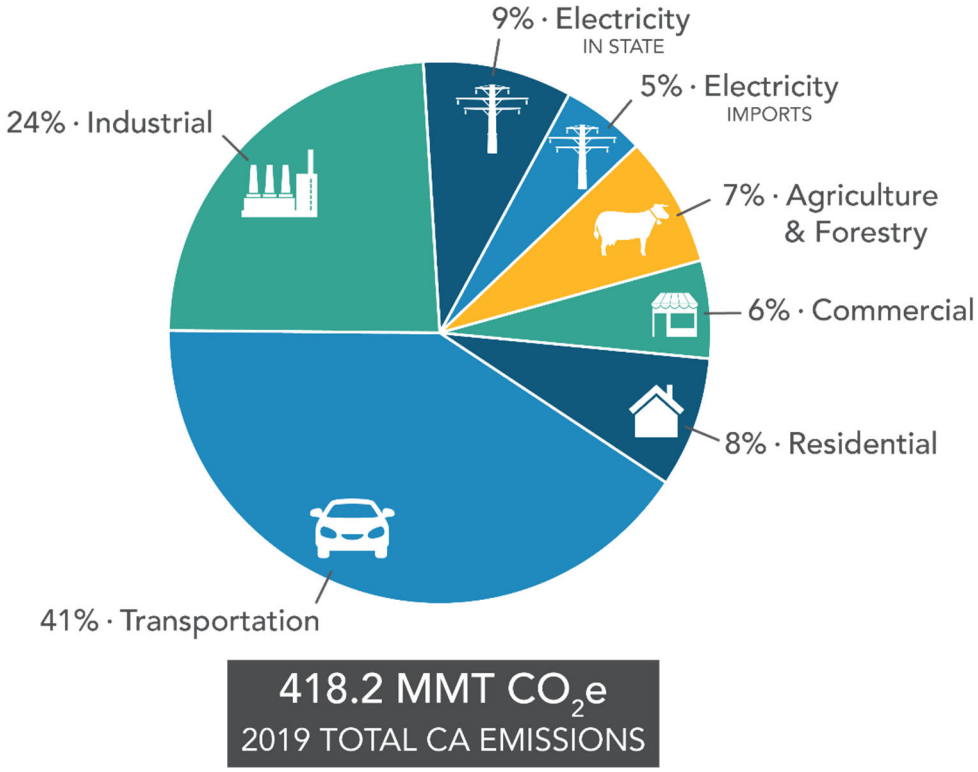
The State of California is committed to reducing greenhouse gas (GHG) emissions and achieving long-term climate change goals. As a means for achieving statewide sustainability and climate goals, California legislation is focused on reducing VMT to achieve statewide climate goals. Over the last 40 years, across the state, VMT has far exceeded that of the state's population increase during the same period. Transportation is the single largest sector contributing to California's GHG emissions. Approximately 41 percent of statewide GHG emissions are generated by the transportation sector, primarily passenger cars and light-duty trucks (see Figure 1, following page). State mandates pertaining to GHG emissions include reducing the number of single-occupancy vehicle trips and the length of vehicle trips.

This document provides a guide and substantial evidence for Merced County Association of Governments (MCAG) and its member jurisdictions in setting the thresholds of significance for CEQA transportation studies. The report is organized into the following seven chapters:

- **Chapter 1 – Introduction:** This chapter establishes the purpose and objective of this report.
- **Chapter 2 – Definition of Region:** This chapter describes the comparative geographic baseline of a region for analysis purposes.
- **Chapter 3 –Screening Criteria:** OPR acknowledges that certain projects are either low VMT generators, or, by virtue of their location, would have a less than significant impact. This chapter provides the recommended screening criteria to identify potentially exempt projects.
- **Chapter 4 –VMT Threshold Analysis for Development Projects:** This chapter identifies the VMT thresholds of significance, which would result in a significant CEQA impact. The actual VMT metric (either an efficiency rate or total VMT) is described. The process of VMT analysis is also described in this chapter.
- **Chapter 5 – VMT Threshold Analysis for Transportation Projects:** This chapter describes the methodology used to evaluate significant CEQA impacts associated with transportation projects.

Many non-capacity capital projects may be presumed to have a less than significant impact. Capacity-enhancing transportation projects may produce significant VMT impacts and would therefore be subject to a comprehensive VMT analysis including an induced travel assessment.

- **Chapter 6 – VMT Threshold Analysis for Land Use Plans:** This chapter provides guidance and substantial evidence to support the threshold recommendation for land use plans and CEQA transportation analyses by MCAG member jurisdictions.
- **Chapter 7 – VMT Mitigation Strategies:** The discussion provided in this chapter is intended as a reference and guide for use in the identification of feasible VMT mitigation options that may be used to offset project-related VMT impacts. It should be noted that this discussion is not intended to represent a full list of VMT mitigation measures available or feasible to the MCAG member jurisdictions. As in previous CEQA practice, it is generally the lead agency who identifies mitigation measures to offset the specific project-related impacts identified in an environmental document.



Source: https://ww2.arb.ca.gov/ghg-inventory-data

Figure 1: 2019 GHG Emissions in California by Economic Sector

2.0 DEFINITION OF REGION: VEHICLE MILES TRAVELED CONTEXT

To quantify a project's impact related to the VMT metric, a geographic context must be established. In the motor vehicle delay-based (LOS) analyses, a project study area is the geographic context for measuring a project's traffic impacts. A project study area is generally determined by the incremental increase in traffic generated by the project and the project's potential to create travel delays in the area. This generally includes intersections and roadway segments where the project would add a prescribed number of peak-hour trips. Lead agencies typically limit the LOS-based project study area boundaries within their jurisdictions.

Unlike delay-based LOS analyses, VMT produces a regional impact that is not defined by roadway, intersection, or jurisdictional boundaries. OPR acknowledges this in its TA (page 6), which states:

> *"Lead agencies should not truncate any VMT analysis because of jurisdictional or other boundaries, for example, by failing to count the portion of a trip that falls outside the jurisdiction or by discounting the VMT from a trip that crosses a jurisdictional boundary."*

The majority of trips are commute and shopping trips occurring between residential, office, and retail uses. Therefore, pursuant to the OPR TA, the recommendations for VMT thresholds for the three primary land use types (residential, office, and retail) are based on a comparison to a *regional average.* OPR does not explicitly define the regional average, and instead, recommends:

1. *In cases where the region is substantially larger than the geography over which most workers would be expected to live, it might be appropriate to refer to a smaller geography, such as the county, that includes the area over which nearly all workers would be expected to live. (page 16)*
2. *For residential projects in unincorporated county areas, the local agency can compare a residential project's VMT to (1) the region's VMT per capita, or (2) the aggregate population weighted VMT per capita of all cities in the region. (page 15)*

In most of urbanized areas throughout the state, the county boundary is selected as the region for purposes of VMT analysis. The primary attribute considered is that the regional definition includes the majority of the trip origins and/or destinations within that region. The denominator of all subsequent land development VMT analyses will include the vast majority of all home-based trips as the comparative.

The geographic boundary needs to contain the majority of trips that either originate in or are destined to the jurisdiction boundary. To determine this boundary, a review of the regional travel demand model data that includes MCAG and its member jurisdictions, was evaluated.

Mobility, as related to vehicle travel, can be studied using a trip-based approach or a tour-based approach. A trip-based approach calculates VMT as individual trips to and from the project. On the other hand, a tour-based approach considers a chain of linked trips that includes the project as a trip. The State supports the trip-based approach and states "When available, tour-based assessment is ideal because it captures travel behavior more comprehensively. But where tour-based tools or data

are not available for all components of an analysis, a trip-based assessment of VMT serves as a reasonable proxy." (OPR TA page 5)

The MCAG Travel Demand Model (TDM) is the regional model for the County. This model is applicable to jurisdictions within Merced County, including the unincorporated county for evaluating project VMT. This model is also trip-based and was used to evaluate the typical 'trip catchment areas' for the MCAG member jurisdictions. Additionally, consistent with the OPR TA, only trips having origins or destinations or both within the specific jurisdiction were considered for this analysis. External pass-through trips were not considered as these are not required for the analysis.

As illustrated in Figure 2, based on the analysis using the MCAG TDM, individual MCAG member jurisdictions have a variable percentage of trips contained within themselves, but, for all the jurisdictions, approximately 95 percent or more trips are contained within Merced County. The remaining four to five percent trips travel beyond the County boundary. This data was validated by the MCAG travel demand modeling consultant and is included in Appendix A.

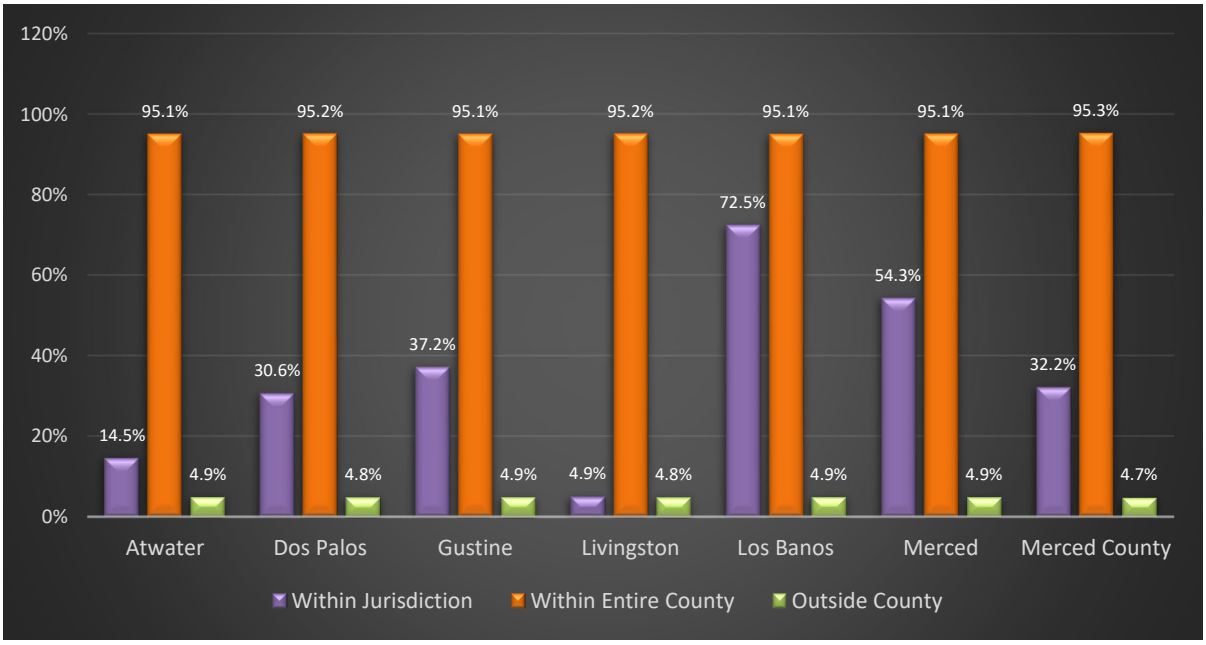


Figure 2: Share of Total Trips Having Origins/Destinations within Individual Jurisdictions, within Entire Merced County, or Outside the County (2015 MCAG TDM)

Therefore, Merced County is an appropriate 'region' for VMT analysis purposes because for all the MCAG member jurisdictions, majority of the trips (approximately 95 percent) are contained within this distinct area.

3.0 SCREENING CRITERIA

The TA acknowledges that certain activities and projects may result in a reduction of VMT and GHG emissions and may therefore be assumed to produce a less than significant transportation impact. Due to a presumption of less than significant impact as accepted by OPR, a variety of projects may be screened out of SB 743-related VMT analysis requirements.

3.1 DEVELOPMENT PROJECTS

For development projects, screening factors may include a project's size, location, proximity to transit, and trip-making potential. One or more of the following project attributes may be presumed to produce a less than significant VMT impact:

- The project is within 0.5 mile (mi) of a transit priority area or a high-quality transit area and is consistent with the Regional Transportation Plan (RTP)/Sustainable Communities Strategy (SCS), has a floor area ratio (FAR) equal or greater than 0.75, does not provide an excessive amount of parking, or does not reduce the number of affordable residential units. In accordance with SB 743, "transit priority areas" are defined as "an area within one-half mile of a major transit stop that is existing or planned, if the planned stop is scheduled to be completed within the planning horizon included in a Transportation Improvement Program. A Major transit stop means: "a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service of 15 minutes or less during the morning and afternoon peak commute periods." A high-quality transit area or corridor is a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours.

  Figure 3 depicts transit priority areas within Merced County, including high-quality transit areas (within 0.5 mile of a major transit stop) served by The Bus (Merced's Regional Transit System) with service intervals of 15 minutes or less. Projects proposed in these areas may be presumed to have a less-than-significant transportation impact unless the project is inconsistent with the RTP/SCS, has an FAR less than 0.75, provides an excessive amount of parking, or reduces the number of affordable residential units.
- The project includes local-serving retail with a combined area of less than 50,000 square feet (sf).
- Redevelopment projects that result in an equal or net reduction in VMT may be considered to have less than significant VMT impact. A net reduction in VMT would occur if the land use proposed by the project would generate less VMT than the existing land use.
- The project includes 100 percent affordable housing units.
- A project consistent with the jurisdiction's General Plan may be successfully screened if the project would generate fewer than 1,000 average daily trips (ADT), while a project not consistent with the jurisdiction's General Plan may be screened if the project would generate fewer than 500 ADT (See section 3.1.1 below.)
- Institutional/government and public service uses that support community health, safety and welfare may also be screened from subsequent CEQA VMT analysis. These facilities (e.g., police stations, fire stations, government offices, utilities, public libraries, community centers, and refuse stations) would be a part of the community and, as public services, the VMT would be

accounted for within the community. Any other similar use not included in the list can be approved on a case-by-case basis by the local jurisdiction as applicable. As such, these uses would result in reduction in total VMT due to the proximity of these services within the community. Additionally, many of these facilities would generate fewer than 1,000 ADT and/or use vehicles other than passenger-cars or light-duty trucks. These other vehicle fleets are subject to regulation outside of CEQA, such as the California Air Resources Board (CARB) and the San Joaquin Valley Air Pollution Control District.

- Local parks, daycare centers, student housing projects on or adjacent to a college campus, local-serving gas stations, banks, and K–12 public schools.
- Projects located in areas with low VMT may be screened out from further CEQA analysis. The TA acknowledges that residential and office projects located in areas having a low VMT, (which incorporate features such as density, mix of uses, transit accessibility), tend to exhibit similarly low VMT. Also, areas that are mapped as low VMT areas do not need to prepare a detailed VMT analysis. Therefore, residential, office, industrial, or mixed-use projects that are consistent with the lead agency's General Plan and located within low VMT areas (using the MCAG VMT Screening Tool[1] and applying appropriate thresholds) may be presumed to have similar low VMT profiles and could be screened out from the need for further VMT analysis. It should be noted that if a project constitutes a General Plan Amendment or Zone Change, such projects will be evaluated on a case-by-case basis. Figures 4, 5, and 6 illustrate the VMT per capita, VMT per employee, and VMT per service population screening maps for the region.
- The 2022 *State CEQA Guidelines* Section 15007 (c) states that "if a document meets the content requirements in effect when the document is sent out for public review, the document shall not need to be revised to conform to any new content requirements in Guideline amendments taking effect before the document is finally approved." Therefore, if a development/land use plan/ transportation project is already cleared by a certified Environmental Impact Report (EIR) or an adopted Negative Declaration/Mitigated Negative Declaration, then subsequent projects that are consistent with the approved project will not require a new VMT analysis.

3.1.1 Average Daily Trips (ADT) Threshold

Although OPR recommends 110 ADT as an appropriate threshold, this number is not based on any analysis of GHG reduction potential but, rather, on a CEQA categorical exemption. Under Section 15301(e)(2) of the *CEQA Guidelines*, existing facilities, including additions to existing structures of up to 10,000 sf are exempt from CEQA review if the project is located in an area where public infrastructure is available to allow for maximum planned development and the project is not located in an environmentally sensitive area.

Similar adjustments have been successfully implemented in other jurisdictions. The justification for the increase in the proposed screening threshold based on reduction of GHG emissions, is further described below.

[1] MCAG VMT Screening Tool: https://gis1.lsa.net/mcagvmt/

According to OPR, projects have a linear increase in trip generation with respect to the building footprint. Specifically, between 110 and 124 daily vehicle trips are anticipated per 10,000 sf. Based on this assumption, OPR recommends 110 ADT as the screening threshold.

The California Emissions Estimator Model (CalEEMod) is a tool provided by CARB and is accepted as the statewide standard to evaluate air quality and GHG emission impacts for CEQA assessment. As such, CalEEMod was used to characterize the effect of changes in project-related ADT to the resulting GHG emissions. To account for geographical relevance to project location, LSA calculated trip lengths from the MCAG TDM. The trip lengths were calculated for various project types and trip purposes. Table A shows the resulting annual VMT and GHG emissions produced by incremental ADT for single-family residential projects.

Table A: Representative VMT and GHG Emissions from CalEEMod

Average Daily Trips (ADT)	Annual Vehicle Miles Traveled (VMT)	Vehicular GHG Emissions (Metric Tons of CO_2e per year)	Total Project GHG Emissions (Metric Tons of CO_2e per year)
200	711,204	306.48	370.20
300	1,083,739	467.02	564.22
400	1,422,408	612.96	740.41
500	1,794,944	773.50	934.43
600	2,167,479	934.04	1,128.27
750	2,675,482	1,152.95	1,392.73
1,000	3,589,887	1,547.00	1,868.68
1,500	5,384,831	2,320.50	2,803.11

Source: CalEEMod version 2020.4.0.

CalEEMod = California Emissions Estimator Model; GHG = Greenhouse Gas; CO_2e = carbon dioxide equivalent

A common GHG emissions threshold is 3,000 metric tons (MT) of carbon dioxide equivalent[2] (CO_2e) per year. As shown in Table A, a project with an ADT lower than 1,500 would generally be expected to have a total project emission of less than 3,000 MT CO_2e/year. LSA conducted this exercise for several other land uses to identify appropriate GHG screening thresholds. Table B shows the potential maximum GHG screening thresholds (up to 3,000 MT) for these land uses.

While OPR recommends 110 ADT as the VMT screening threshold, the GHG analysis above concludes that projects with up to 1,500 ADT could be potentially screened out from VMT analysis. As a conservative approach, the MCAG *VMT Thresholds and Implementation Guidelines* document recommends a daily trip threshold of 1,000 ADT be applied to projects that are consistent with the lead agency's General Plan. However, for projects that are not consistent with the lead agency's General Plan, a screening threshold of 500 ADT may be applied. A sample list of size of projects

[2] CO_2e is a concept developed to provide one metric that includes the effects of numerous GHGs. The global warming potential (GWP) of each GHG characterizes the ability of each GHG to trap heat in the atmosphere relative to another GHG. The GWPs of all GHGs are combined to derive the CO_2e.

generating fewer than 1,000 and 500 daily vehicle trips that would be eligible to be exempt from a VMT analysis are included in Table C.

Table B: CO_2e Emission Rates by Land Use Type

Land Use	Units	Total $MTCO_2e$ per year	Annual $MTCO_2e$ per DU or TSF
Single-Family Residential	170 DU	2,996.95	17.63
Low-Rise Multifamily Residential	247 DU	2,991.46	12.11
Mid-Rise Multifamily Residential	349 DU	2,994.91	8.58
Office	240 TSF	2,992.16	12.47
Warehouse	614 TSF	2,998.41	4.88
Light Industrial	361 TSF	2,992.96	8.29
Hotel	309 Rooms	2,998.56	9.70
Medical Office	86 TSF	2,971.57	34.55
Hospital	125 Beds	2,986.23	23.89
Shopping Center	43 TSF	2,946.34	68.52
Strip Mall	83 TSF	2,999.79	36.14

Source: California Emissions Estimator Model (CalEEMod) version 2020.4.0.
DU = Dwelling Units; TSF = Thousand Square Feet; CO_2e = carbon dioxide equivalent

Table C: VMT Screening Thresholds for Sample Land Uses

Land Use	Size of Projects (Requiring a GPA)	Size of Projects (Not Requiring a GPA)
Single-Family Residential[1]	53 DU	106 DU
Low-Rise Multifamily Residential[2]	74 DU	148 DU
Mid-Rise Multifamily Residential[3]	110 DU	220 DU
Office	46.125 TSF	92.250 TSF
Warehouse	292.397 TSF	584.795 TSF
Light Industrial	102.669 TSF	205.338 TSF
Hotel	62 Rooms	125 Rooms
Medical Office[4]	13.888 TSF	27.777 TSF
Hospital	22 Beds	44 Beds

Notes: DU = Dwelling Units; TSF = Thousand Square Feet
Project sizes have been determined based on trip generation rates obtained from the ITE *Trip Generation Manual* (11th Edition).
[1] The project sizes have been provided for single-family detached residential only.
[2] The project sizes have been provided for low-rise multifamily residential (not close to rail transit) only.
[3] The project sizes have been provided for mid-rise multifamily residential (not close to rail transit) only.
[4] The project sizes have been provided for stand-alone medical office buildings only.

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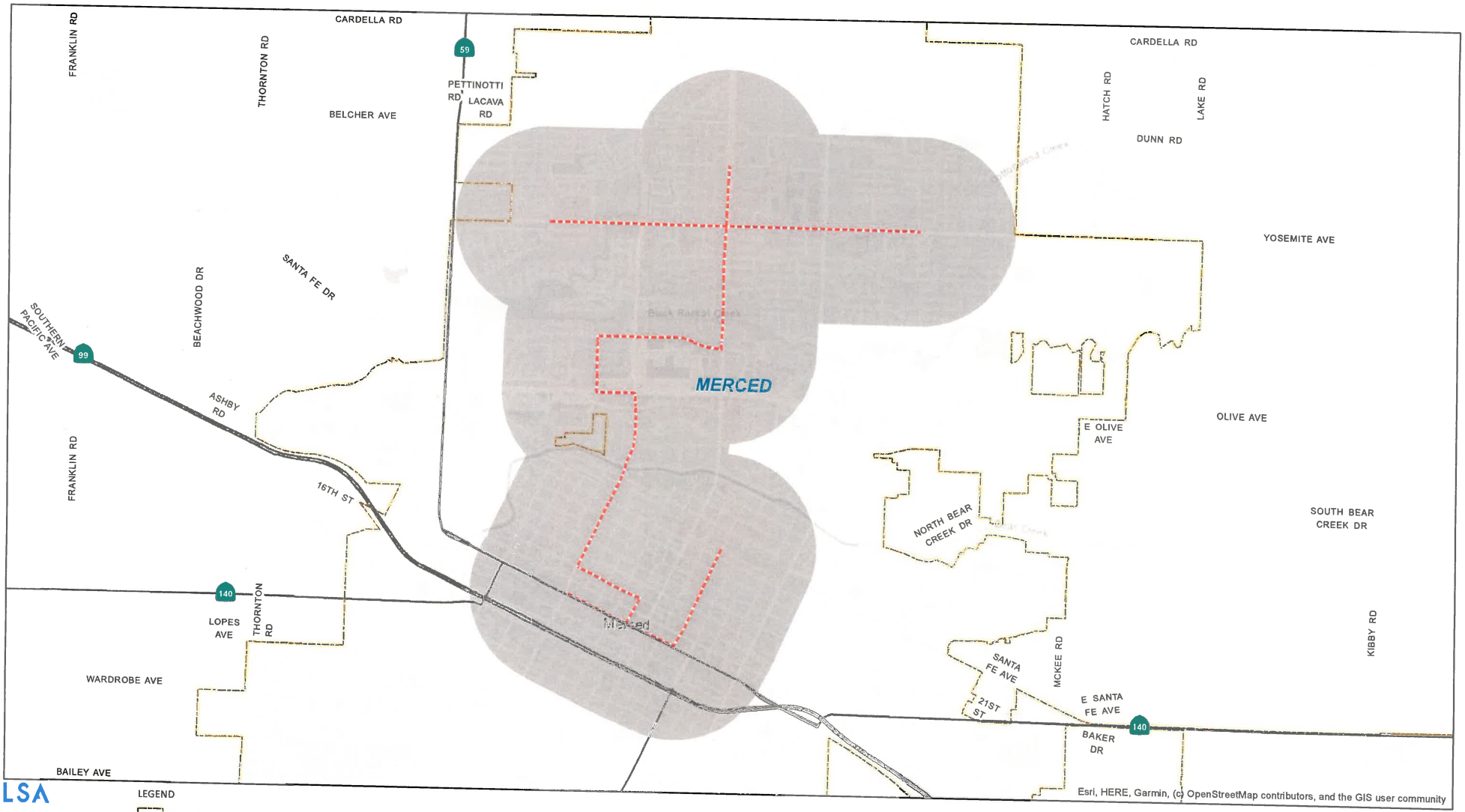

FIGURE 3

SOURCE: MCAG

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MCAG SB 743 (VMT) Implementation Plan

High-Quality Transit Area within Merced County

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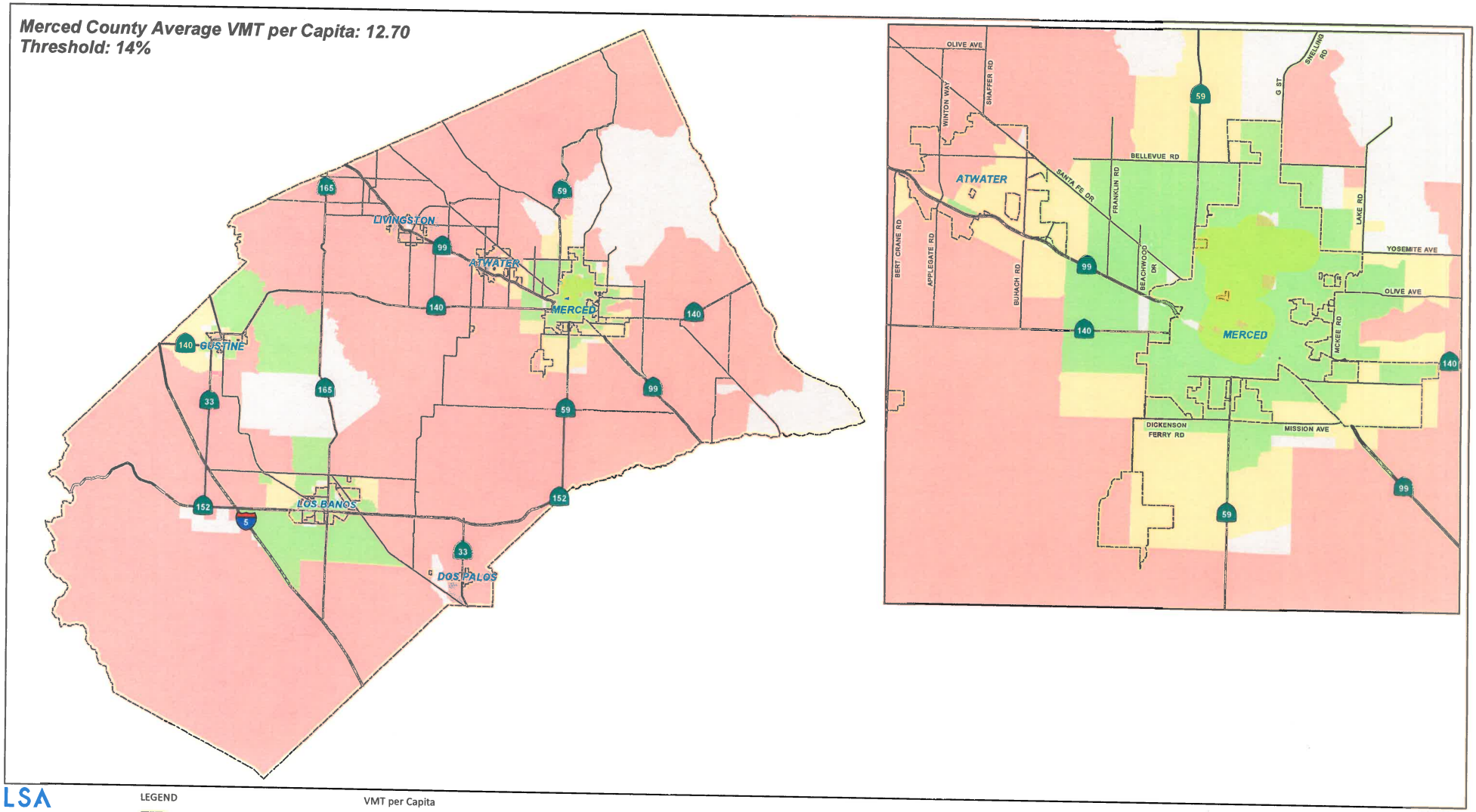

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FIGURE 4

Merced County Association of Governments
VMT Thresholds and Implementation Guidelines
VMT per Capita Screening Map for Merced County

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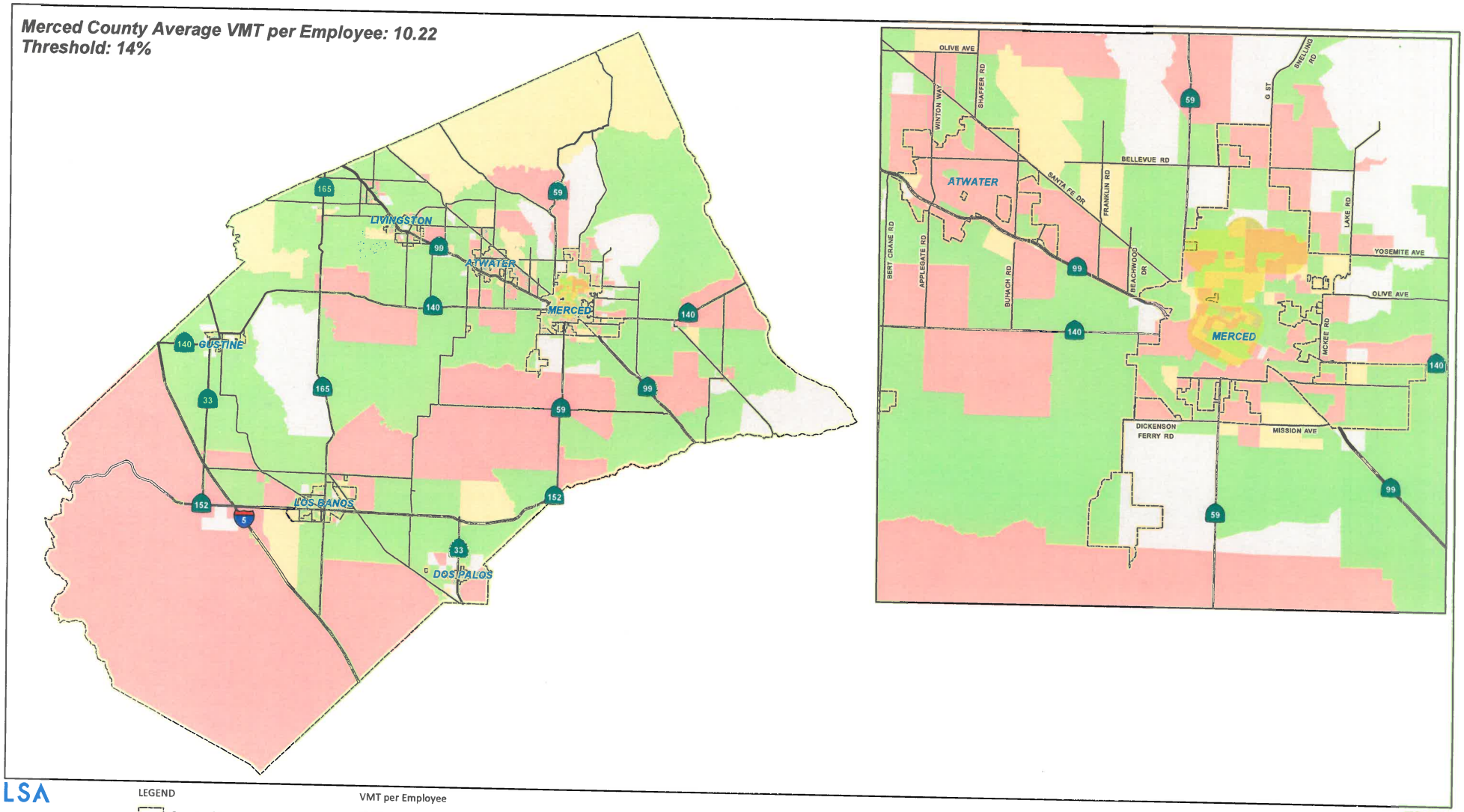

FIGURE 5

Merced County Association of Governments
VMT Thresholds and Implementation Guidelines
VMT per Employee Screening Map for Merced County

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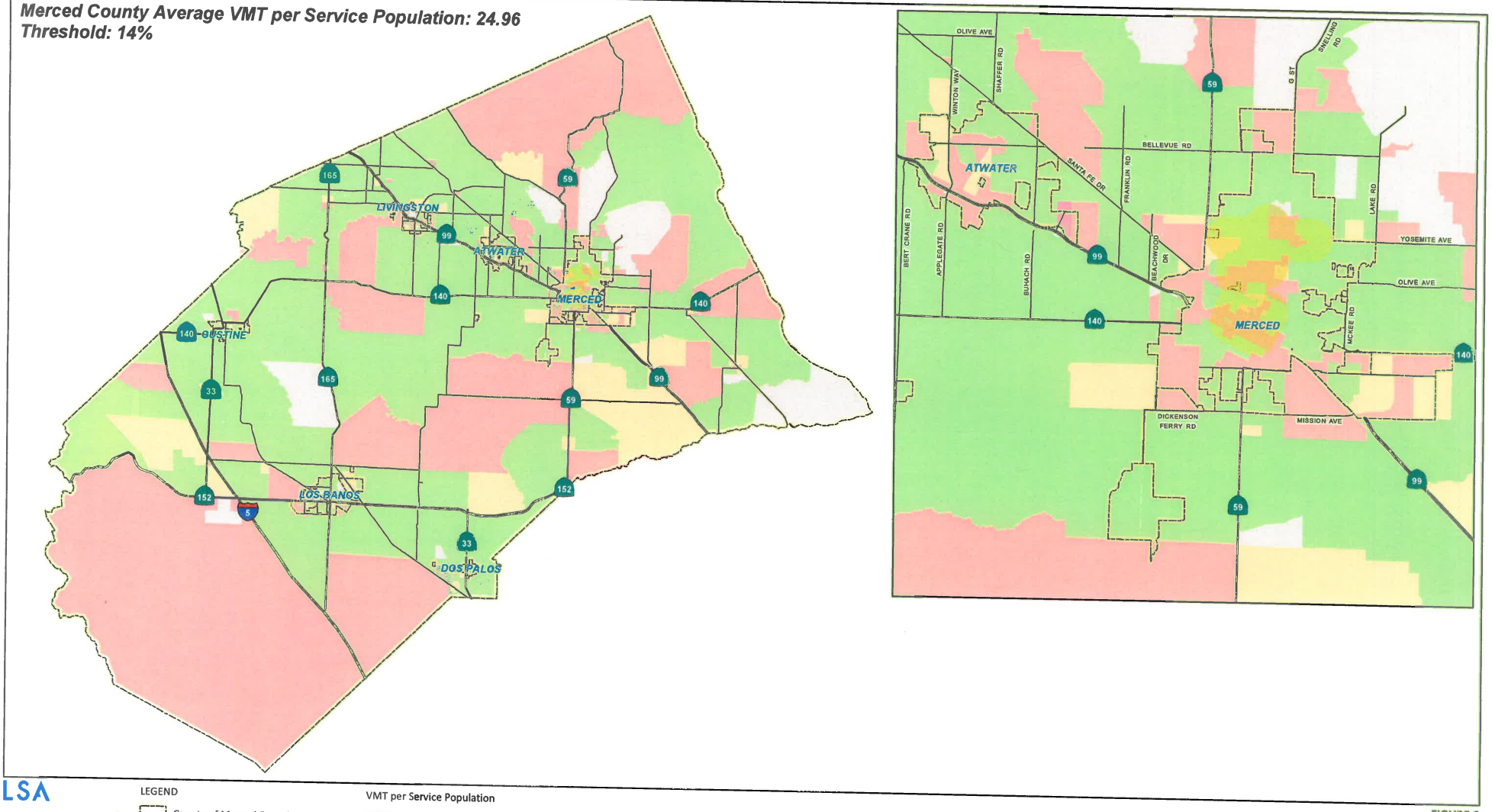
Merced County Average VMT per Service Population: 24.96
Threshold: 14%



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LEGEND

- County of Merced Boundary
- MCAG City Jurisdictions Boundary
- High Quality Transit Area

VMT per Service Population

- No Population or Employment
- Less than 21.47
- 21.47 - 24.96
- Greater than 24.96

0 19375 38750
FEET

SOURCE: MCAG Travel Demand Model 2015 Base Year
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FIGURE 6

Merced County Association of Governments
VMT Thresholds and Implementation Guidelines
VMT per Service Population Screening Map for Merced County

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3.2 TRANSPORTATION PROJECTS

Transportation projects refer to capital improvement projects that relate to roadway widening, roadway infrastructure improvements, active transportation projects or operational improvements. The primary attribute to consider with transportation projects is the potential to increase vehicle travel demand, also referred to as 'induced travel.' While the lead agency has discretion to continue to use a delay-based LOS analysis for CEQA disclosure of transportation projects, changes in vehicle travel must be quantified. To comply with SB 743, the lead agency may solely use VMT analysis for CEQA disclosure of transportation impacts, but may also require a LOS analysis for design, traffic operations, and safety purposes to comply with the lead agency's General Plan Circulation Element. The TA identifies the types of transportation improvement projects that would not likely lead to a substantial or measurable increase in vehicle travel and which would, therefore, not require further VMT analysis. These include the following:

- Rehabilitation, maintenance, replacement, safety, and repair projects designed to improve the condition of existing transportation assets (e.g., highways; roadways; bridges; culverts; Transportation Management System field elements such as cameras, message signs, detection, or signals; tunnels; transit systems; and assets that serve bicycle and pedestrian facilities) that do not add additional motor vehicle capacity.
- Roadside safety devices or hardware installation such median barriers and guardrails.
- Roadway shoulder enhancements to provide "breakdown space," dedicated space for use only by transit vehicles, to provide bicycle access, or to otherwise improve safety, but which will not be used as automobile vehicle travel lanes.
- Addition of an auxiliary lane of less than 1 mile in length designed to improve roadway safety.
- Installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left-turn, right-turn, and U-turn pockets, two-way left-turn lanes, or emergency breakdown lanes that are not utilized as through lanes.
- Addition of roadway capacity on local or collector streets, provided the project also substantially improves conditions for pedestrians, cyclists, and, if applicable, transit.
- Conversion of existing general-purpose lanes (including ramps) to managed lanes or transit lanes, or changing lane management in a manner that would not substantially increase vehicle travel.
- Addition of a new lane that is permanently restricted for use only by transit vehicles.
- Reduction in the number of through lanes.
- Grade separation to separate vehicles from rail, transit, pedestrians, or bicycles, or to replace a lane in order to separate preferential vehicles (e.g., high-occupancy vehicles [HOV], high-occupancy toll [HOT] lane traffic, or trucks) from general vehicles.
- Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority features.

- Installation of traffic metering systems, detection systems, cameras, changeable message signs, and other electronics designed to optimize vehicle, bicycle, or pedestrian flow.
- Timing of signals to optimize vehicle, bicycle, or pedestrian flow.
- Installation of roundabouts or traffic circles.
- Installation or reconfiguration of traffic calming devices.
- Adoption of or increase in tolls.
- Addition of tolled lanes, where tolls are sufficient to mitigate VMT increase.
- Initiation of a new transit service.
- Conversion of streets from one-way to two-way operation with no net increase in the number of traffic lanes.
- Removal or relocation of off-street or on-street parking spaces.
- Adoption or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs).
- Addition of traffic wayfinding signage.
- Rehabilitation and maintenance projects that do not add motor vehicle capacity.
- Addition of new or enhanced bike or pedestrian facilities on existing streets/highways or within existing public rights-of-way.
- Addition of Class I bike paths, trails, multi-use paths, or other off-road facilities that serve non-motorized travel.
- Installation of publicly available alternative fuel/charging infrastructure.
- Addition of passing lanes, truck climbing lanes, or truck brake-check lanes in rural areas that do not increase overall vehicle capacity along the corridor.

Additionally, transit and active transportation projects generally reduce VMT and, therefore, may be presumed to cause a less than significant impact on transportation. This presumption may apply to all passenger rail projects, bus and bus rapid-transit projects, and bicycle and pedestrian infrastructure projects. The lead agency may use this CEQA presumption of less than significant impact to aid in the prioritization of capital improvement projects, as the CEQA process for any of these project types would be more streamlined than other capacity-enhancing projects.

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4.0 VMT THRESHOLD ANALYSIS FOR DEVELOPMENT PROJECTS

4.1 THRESHOLDS

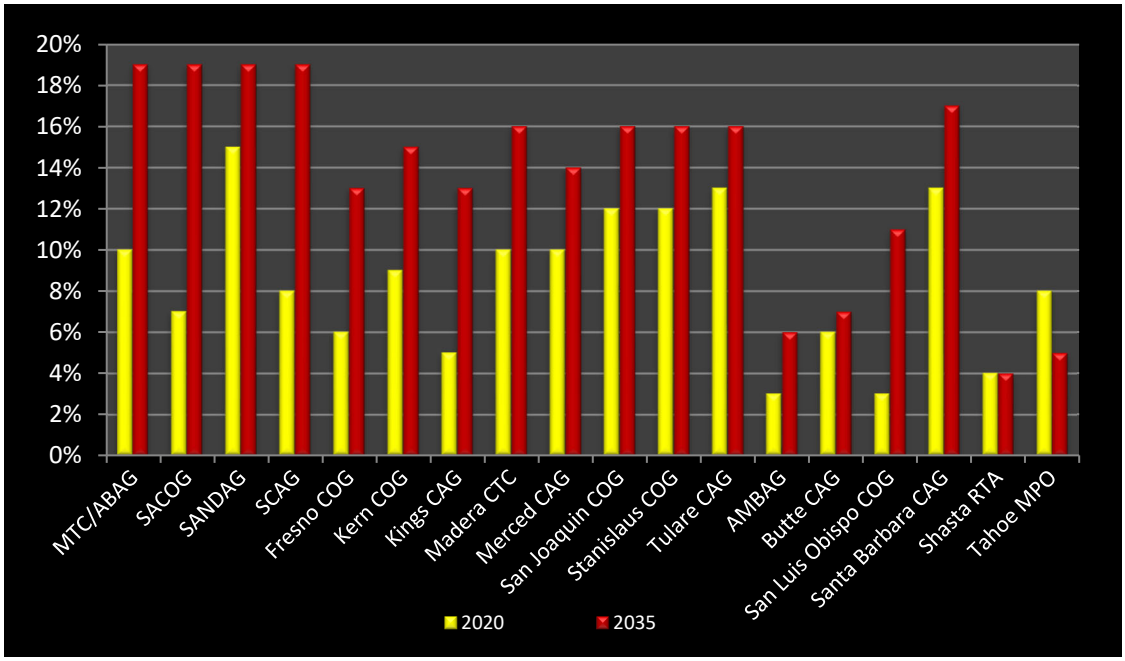
The TA clarifies that SB 743 and all CEQA VMT transportation analyses refer to automobile travel. Here, the term automobile refers to on-road passenger vehicles, specifically cars and light-duty trucks. Heavy-duty trucks should be addressed in other CEQA sections (air quality, greenhouse gas, noise, and health risk assessment analysis) and are subject to regulation in a separate collection of rules under CARB jurisdiction. This approach was amplified by Chris Ganson, former Senior Advisor for Transportation at OPR, in a presentation to the Fresno Council of Governments (October 23, 2019) and by Ellen Greenberg, the California Department of Transportation (Caltrans) Deputy Director for Sustainability, at the San Joaquin Valley Regional Planning Agencies' Directors' Committee meeting (January 9, 2020).

OPR has identified home-based work trips as the primary type used in the home-based travel demand modeling. This includes residential uses, office uses, and retail uses. The home-based work trip type is the primary trip type generated during the peak hours of commuter traffic in the morning and evening periods.

The focus of transportation impact assessment has shifted from congestion relief to climate resiliency. The purpose of the CEQA analysis is to disclose and ultimately reduce GHG emissions by reducing the number and length of automobile trips. As part of the SB 375 land use/transportation integration process and GHG emissions goal setting, the State and Regional Transportation Planning Agencies have agreed to reduce statewide GHG emissions by an average of approximately 15 percent by 2035 through an approach based on improved integration of land use and transportation planning. Figure 7 illustrates SB 375 regional GHG emissions reduction targets for all the 18 Metropolitan Planning Organizations (MPOs) in California that CARB established in 2018. Furthermore, in its *2017 Scoping Plan-Identified VMT Reductions and Relationship to State Climate Goals*, CARB recommends total VMT per capita rates be reduced to approximately 15 percent below existing conditions. While the current target is 15 percent, CARB periodically revises the target based on changing information and, therefore, the target might be revised in the future. Additionally, for purposes of VMT analysis, the existing setting will follow the base year scenario in the regional travel demand model, the MCAG TDM. It is to be noted that the base year scenario in the model is also periodically revised and, as a result, the existing setting will change accordingly.

Specifically, the TA recommends:

- *A proposed (residential) project exceeding a level of 15 percent below existing regional average VMT per capita may indicate a significant transportation impact.*
- *A similar threshold would apply to office projects (15 percent below existing regional average VMT per employee).*
- *VMT generated by retail projects would indicate a significant impact for any net increase in total VMT.*



Source: https://ww2.arb.ca.gov/our-work/programs/sustainable-communities-program/regional-plan-targets.

Figure 7: SB 375 Regional Plan Climate Targets for California's 18 MPOs

It is noted that the aggregate GHG emission reduction sought after by CARB in the 2017 Scoping Plan is 15 percent statewide. This is one reason OPR believes the 15 percent reduction in VMT is appropriate. The aggregate 15 percent GHG emission reduction applies across all land use and transportation activities and would indicate that the State and its individual MPOs are compliant with the SB 375 goals, the overall State climate change strategy, and Scoping Plan objectives.

CARB establishes GHG targets for each of the 18 MPOs in the State, reviews the SCSs, and makes a determination of whether the SCSs would achieve GHG reduction targets if implemented. In the spring of 2018, CARB adopted new GHG targets for all the 18 MPOs in the State based on the 2017 Scoping Plan and other new data as illustrated in Figure 7. CARB established a 14 percent GHG reduction target for 2035 for the Merced region. The State recognizes that Merced County's contribution to the aggregate 15 percent statewide GHG emission reduction is 14 percent. Other regions may achieve lower reductions to achieve the aggregate statewide goal.[1] As such, reduction in GHG directly corresponds to reduction in VMT. In order to reach the statewide GHG reduction goal of 15 percent, the Merced region must reduce GHG by 14 percent. The method of reducing GHG by 14 percent is to reduce VMT by 14 percent as well.

Therefore, Merced County member jurisdictions may establish a threshold for land use developments, specifically residential and office, of 86 percent of the existing regional average as indicative of a significant transportation impact. For retail projects, increase in total regional roadway VMT with the implementation of the project would indicate a significant transportation impact. As such, total

[1] The latest GHG targets by region can be found at https://ww2.arb.ca.gov/our-work/programs/sustainable-communities-program/regional-plan-targets.

roadway VMT needs to be calculated using the final roadway assignment outputs from the MCAG TDM.

Other distinct land uses are not identified for threshold development in the OPR TA. For other non-residential projects, a significance threshold of 86 percent of existing regional average VMT per employee is recommended. The only exceptions would be hotels, hospitals, medical offices, and related projects. These land uses are service oriented facilities which includes both visitors and employees. Therefore, for such projects, VMT per service population (population/users + employment) is recommended as the VMT metric. Any other similar use could be evaluated using the same metric subject to approval of the methodology by the local jurisdiction on a case-by-case basis. As such, a significance threshold of 86 percent of the existing regional average VMT per service population is recommended for these projects.

Evaluation of mixed-use projects may be for each land use component of the project using the most appropriate VMT metric. Credit for internal trip capture may be made. Internal trip capture may be calculated using the latest edition of the Institute of Transportation Engineers (ITE) *Trip Generation Manual,* the MCAG TDM, or other applicable sources approved by the lead agency. The appropriate methodology for calculating project's internal capture would be determined in consultation with the lead agency's Traffic Engineer. The significance threshold for these projects would be the respective VMT thresholds for its different land use components.

A lead agency may develop VMT thresholds for other land uses as desired. However, it would require disclosure of substantial evidence, including the General Plan findings, and other traffic and air quality forecasting support data. Additionally, if the lead agency wishes to establish some other threshold less stringent than the 86 percent of the existing regional average recommended for residential and office projects, a body of substantial evidence would be necessary.

4.2 IMPACT ASSESSMENT

Figure 8 illustrates the VMT screening methodology for development entitlement projects. Additionally, Figures 9-A through 9-C illustrate the VMT analysis methodology for non-screened projects. Every development application is unique and may create alternative or modified steps through the process described in the aforementioned figures. Each step that diverges from this standard process should be accompanied with substantial evidence demonstrating compliance with other climate change and GHG emission reduction laws and regulations.

4.2.1 Agency Communication

As part of the site plan review process, the applicant should provide a detailed project description, including potential number of residents added or created by the project, and the applicable VMT analysis methodology. Key elements include a description of the project in sufficient detail to generate trips and the potential catchment area (i.e., trip lengths if no modeling is undertaken), estimated project VMT, project design features that may reduce the VMT from the project development, and the project location and associated existing regional VMT percentages. Further, the applicant or their consultant shall prepare a transportation analysis scope of work for review and approval by the lead agency.

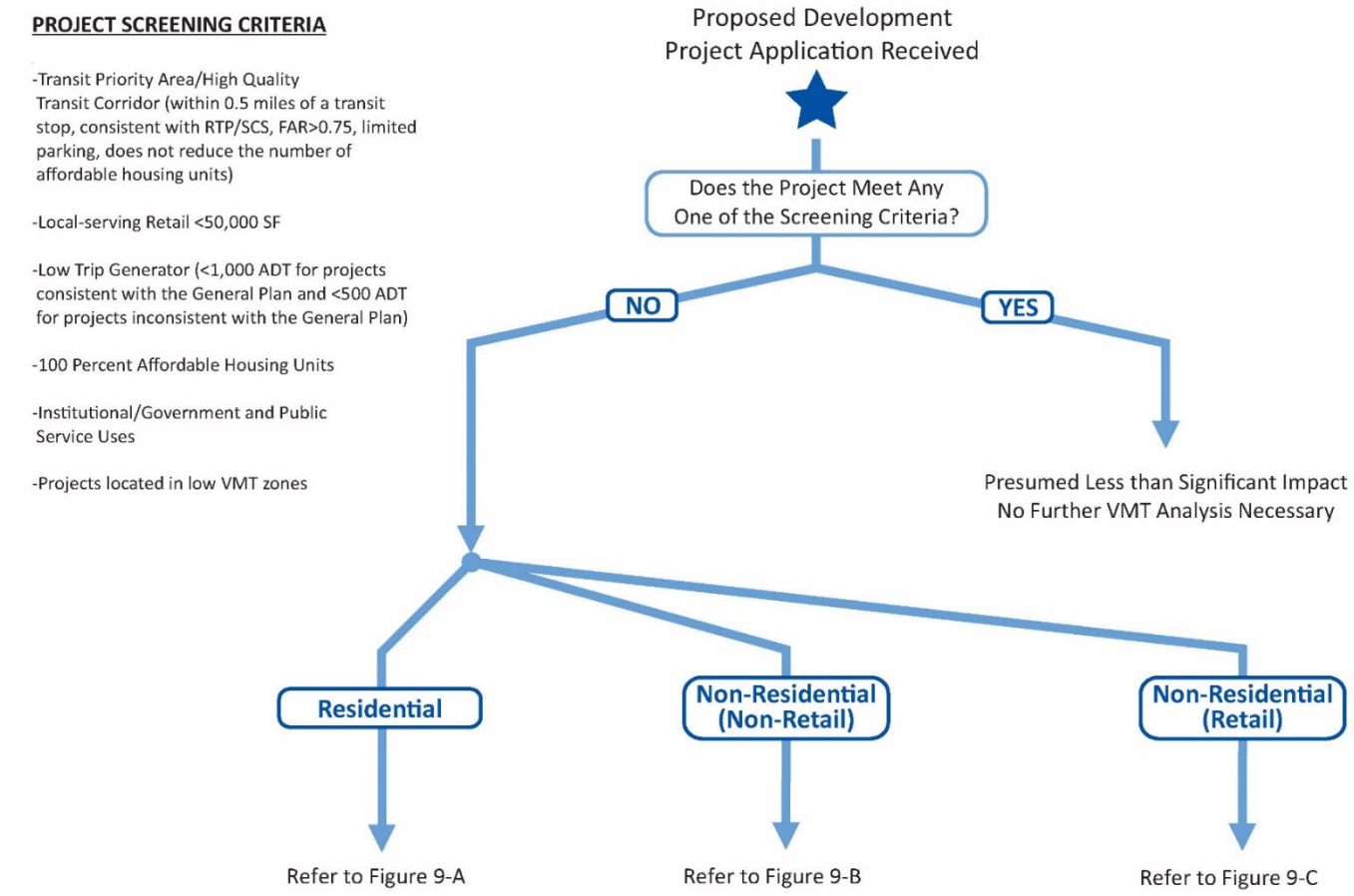


Figure 8: VMT Screening Methodology for Development Projects

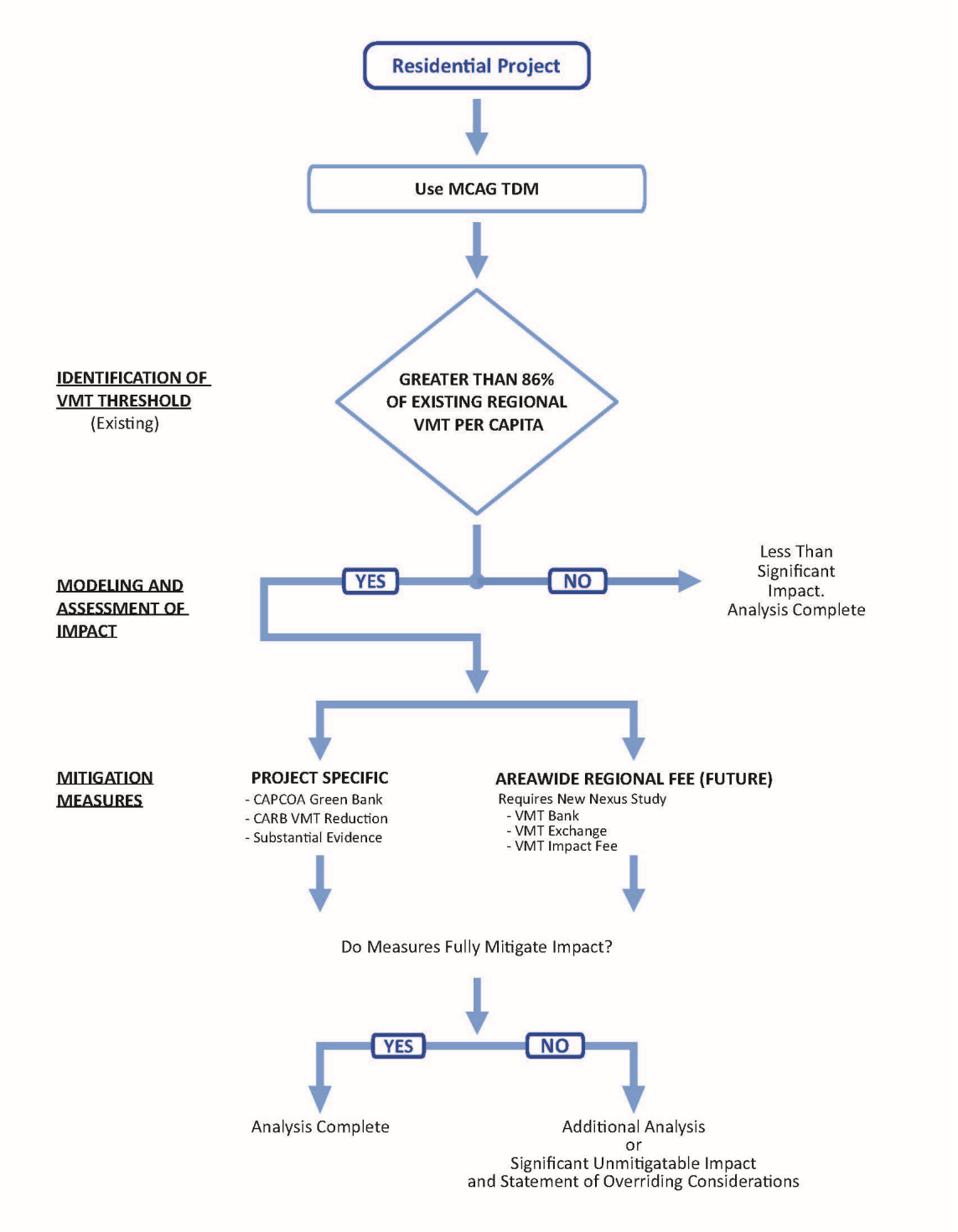


Figure 9-A: VMT Analysis Methodology for Non-Screened Residential Projects

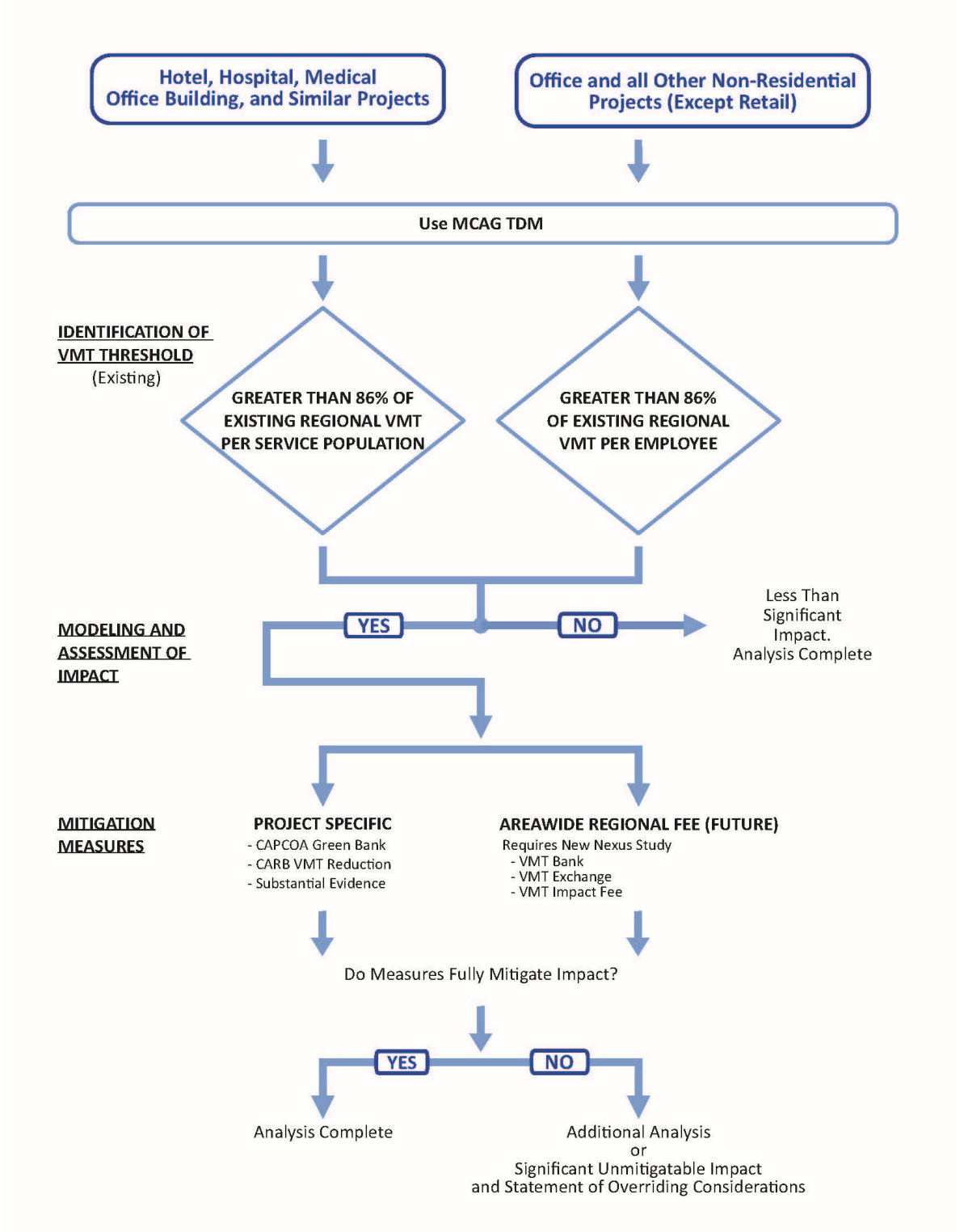


Figure 9-B: VMT Analysis Methodology for Non-Screened Non-Residential (Non-Retail) Projects

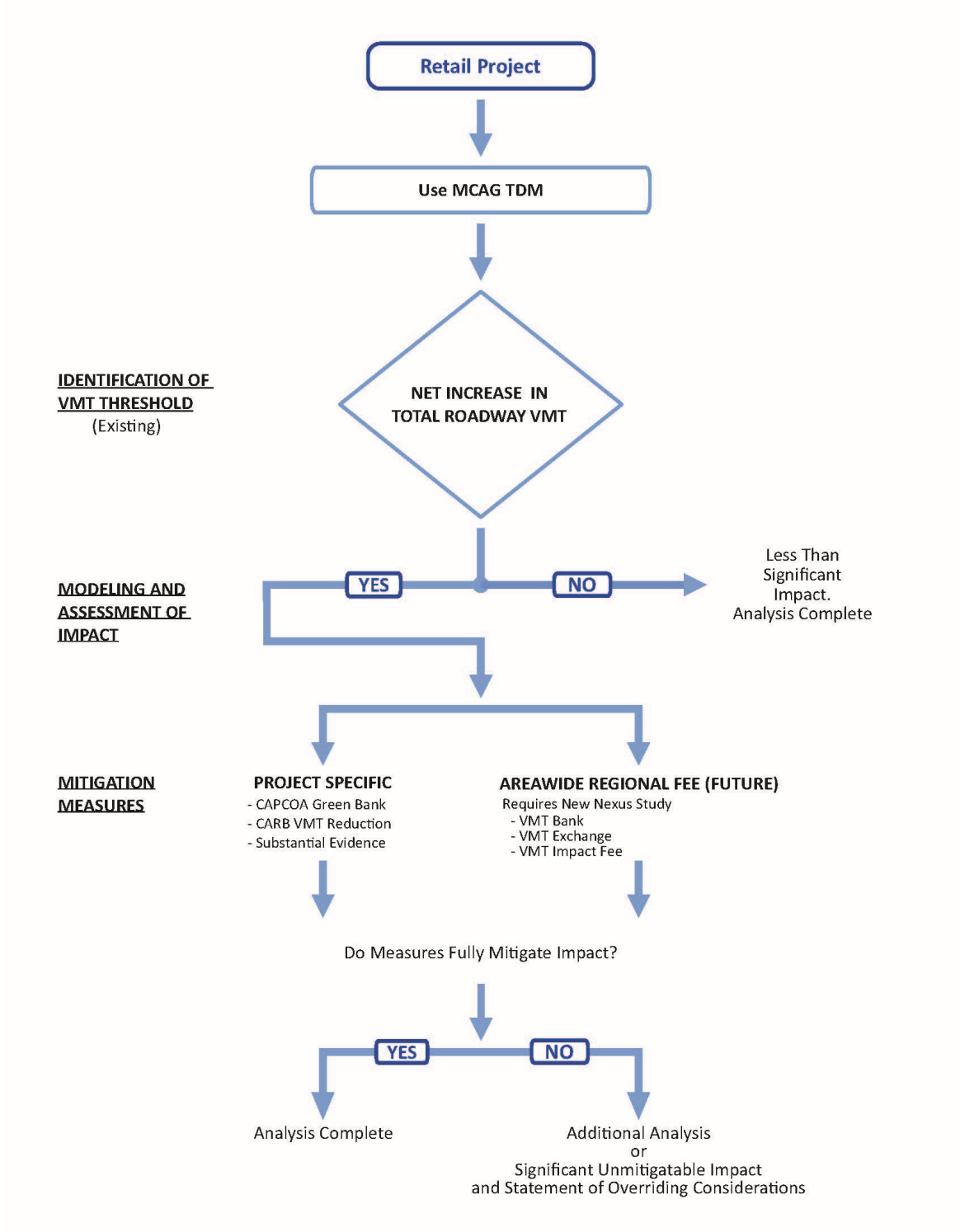


Figure 9-C: VMT Analysis Methodology for Non-Screened Non-Residential (Retail) Projects

Projects that will influence Caltrans facilities may be subject to the Caltrans Local Development-Intergovernmental Review program. As part of the program, Caltrans may review the VMT analysis methodology, findings, and mitigation measures to ensure consistency with statewide standards.

4.2.2 Project Screening

Once a development application is filed and determined to be complete for processing purposes, project screening may commence. If the project meets any one of the screening criteria, it may be presumed to have a less than significant transportation impact. No further VMT analysis would then be necessary and a Notice of Exemption may be filed. The CEQA document should enumerate the screening criteria and how the project meets or exceeds that applicable VMT threshold.

If project screening does not apply, a VMT analysis may be required. The extent of this analysis may be a simple algebraic demonstration or a more sophisticated traffic modeling exercise. This distinction is addressed later in this report.

4.2.3 VMT Identification

The project land use type will determine the appropriate metric to use (i.e., VMT per capita, VMT per employee, VMT per service population, or total VMT). Appropriate VMT metrics for different land uses are stated in Table D.

Table D: VMT Metrics for Land Use Projects

Land Use	VMT Metric
Residential	VMT per Capita
Office	VMT per Employee
Retail	Total VMT
Hotel, Hospital, Medical Office Building, or any similar use with approval from local jurisdiction	VMT per Service Population
Mixed-Use, Land Use Plan (General Plan/Specific Plan)	Respective VMT metrics for its different land use components
Other Land Uses	VMT per Employee

VMT = Vehicle Miles Traveled

For all projects that require a VMT analysis, use of the MCAG TDM is required unless the project includes a special land use that is difficult to analyze using a travel demand model. For the latter, the lead agency may require a qualitative analysis or an analysis using empirical data as applicable to the project.

Next, the project-generated VMT (per capita, per employee, per service population, or total) is compared to the appropriate significance threshold provided in Table E. If the project VMT metric is less than the significance threshold, the project is presumed to create a less than significant impact. No further VMT analysis for CEQA purposes would be required.

Should project VMT metrics exceed the significance threshold, mitigation measures will be required. It should be noted that the thresholds identified in Table E are based on the current version of the

MCAG TDM (provided by MCAG in May 2022). These thresholds are subject to change when a newer version of the MCAG TDM is available.

Table E: Significance Thresholds for VMT Analysis

VMT Metric	Threshold
VMT per Capita	10.92
VMT per Employee	8.79
VMT per Service Population	21.47

Source: 2015 MCAG TDM
VMT = Vehicle Miles Traveled

4.3 MITIGATION MEASURES

State law requires the project applicant to identify feasible offsets to mitigate VMT impacts generated by the proposed project. These may come from the mitigation strategies provided in this document (as described in Table F at the end of Chapter 7.0) or selected by the applicant based on their CEQA project experience and expertise. The lead agency must approve and accept the final VMT mitigation program ascribed to the project and the related VMT percentage reduction. A detailed discussion about project-specific mitigations is included in Section 7.2.1.

If it is determined that the selected VMT mitigation measures effectively reduce the project impact to less than the applicable threshold, the project is presumed to have an impact mitigated to a less than significant level. No further VMT analysis is required. If the project's VMT impact cannot be mitigated, the lead agency may (1) request the project be redesigned to reduce the VMT impact, or (2) require the preparation of an EIR with a Statement of Overriding Considerations (SOC) for the transportation impacts associated with the project. All feasible mitigation measures must be assigned to and carried out by the project even if an EIR/SOC is prepared.

5.0 VMT THRESHOLD ANALYSIS FOR TRANSPORTATION PROJECTS

The *2022 State CEQA Guidelines* include Section 15064.3.b.(2) to address transportation projects. It reads:

> *For roadway capacity projects, agencies have discretion to determine the appropriate measure of transportation impact consistent with CEQA and other applicable requirements.*

The lead agency may continue to use motor vehicle delay (LOS) metrics for transportation project design and traffic operation purposes as long as impacts related to "other applicable requirements" are disclosed. This has generally been interpreted as VMT impacts and other State climate objectives. These other applicable requirements may be found in other parts of an environmental document (e.g., air quality and GHG), or may be provided in greater detail in the transportation section.

In addition, projects processed under federal environmental rules have traditionally included a traffic operational analysis to meet the requirements of the National Environmental Policy Act. Federal review is generally required if a project uses federal funding or involves federal lands. Additional safety evaluations may need to be conducted outside the CEQA process since some desirable safety improvements may not be directly related to CEQA safety impacts.

For projects on the State Highway System, Caltrans will require sponsoring agencies to use VMT as the CEQA transportation impact assessment metric, and to evaluate the amount of VMT that is "attributable to the project" (January 9, 2020, conference). Caltrans' Intergovernmental Review process will review environmental documents for capacity-enhancing projects for their analysis of VMT impact.

A VMT assessment of a transportation project should disclose the VMT profile without the project and the difference in the VMT profile with the project. Any increase in VMT attributable to the proposed transportation project would result in a significant impact. A significant transportation project impact is presumed when VMT increases with the project as compared to the 'No Project' scenario.

Capacity improvement projects have the potential of producing significant transportation impacts because they tend to induce new travel. The OPR TA describes induced travel as the additional motor vehicle travel that is generated by the newly available capacity on the roadway. Induced travel may include route switching, time-of-day change, mode shift to single occupancy vehicle, longer trips, new trips to existing destinations, and additional travel due to new development. Current traffic models have limited abilities to forecast new trips and new developments associated with roadway capacity improvements, as land use or socioeconomic databases are fixed to a specific horizon date. OPR refers to a limited number of published studies that seek to define travel demand elasticities.

The most recent major study (Duranton & Turner 2011, p. 24) estimates an elasticity of 1.0, meaning that every one percent change in lane miles results in a one percent increase in VMT.

One method to quantify induced growth is recommended by the OPR TA:

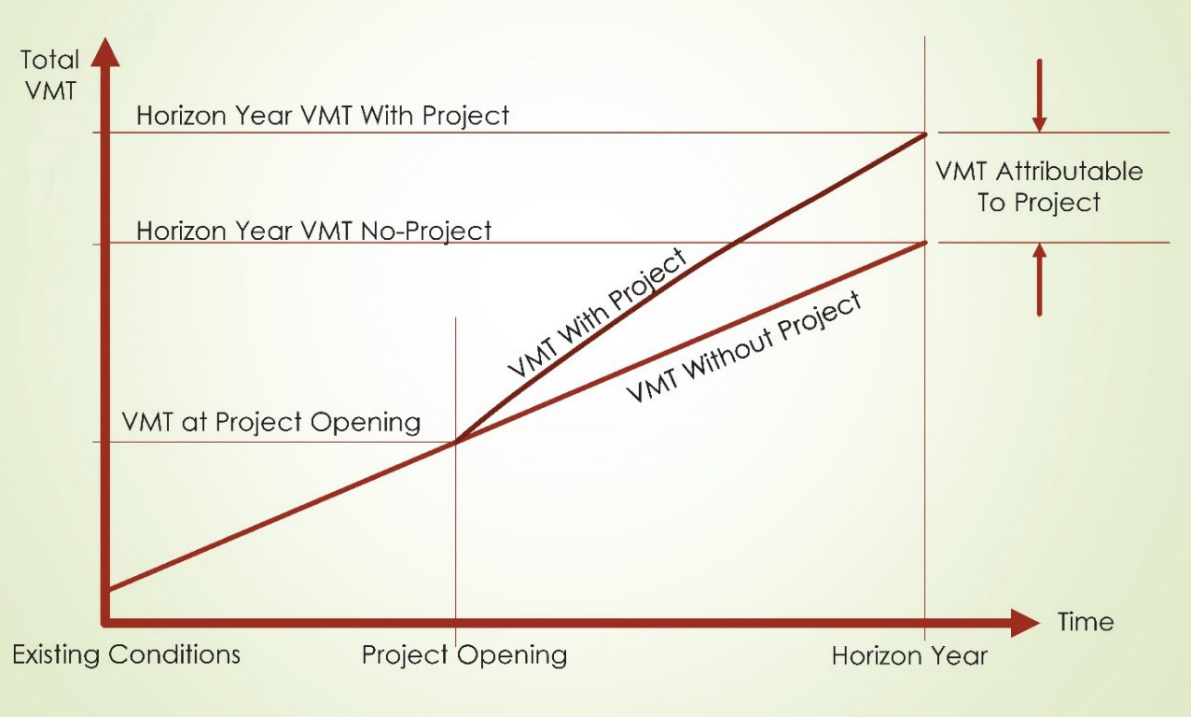
To estimate VMT impacts from roadway expansion projects:

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

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

OPR assigns this induced growth to project-induced changes in land use; that is, new land uses that are not included in any approved general or area plan and not accounted for in any traffic-forecasting tool.

Figure 10 provides a representative illustration of induced VMT attributable to a project.



Source: Presentation: Caltrans Transportation Analysis under CEQA or TAC: Significance Determinations for Induced Travel Analysis (SHCC Pre-Release Session 2 Jeremy Ketchum, Division of Environmental Analysis, Caltrans; March 2, 2020)

Figure 10: Induced Travel – VMT Attributable to Project

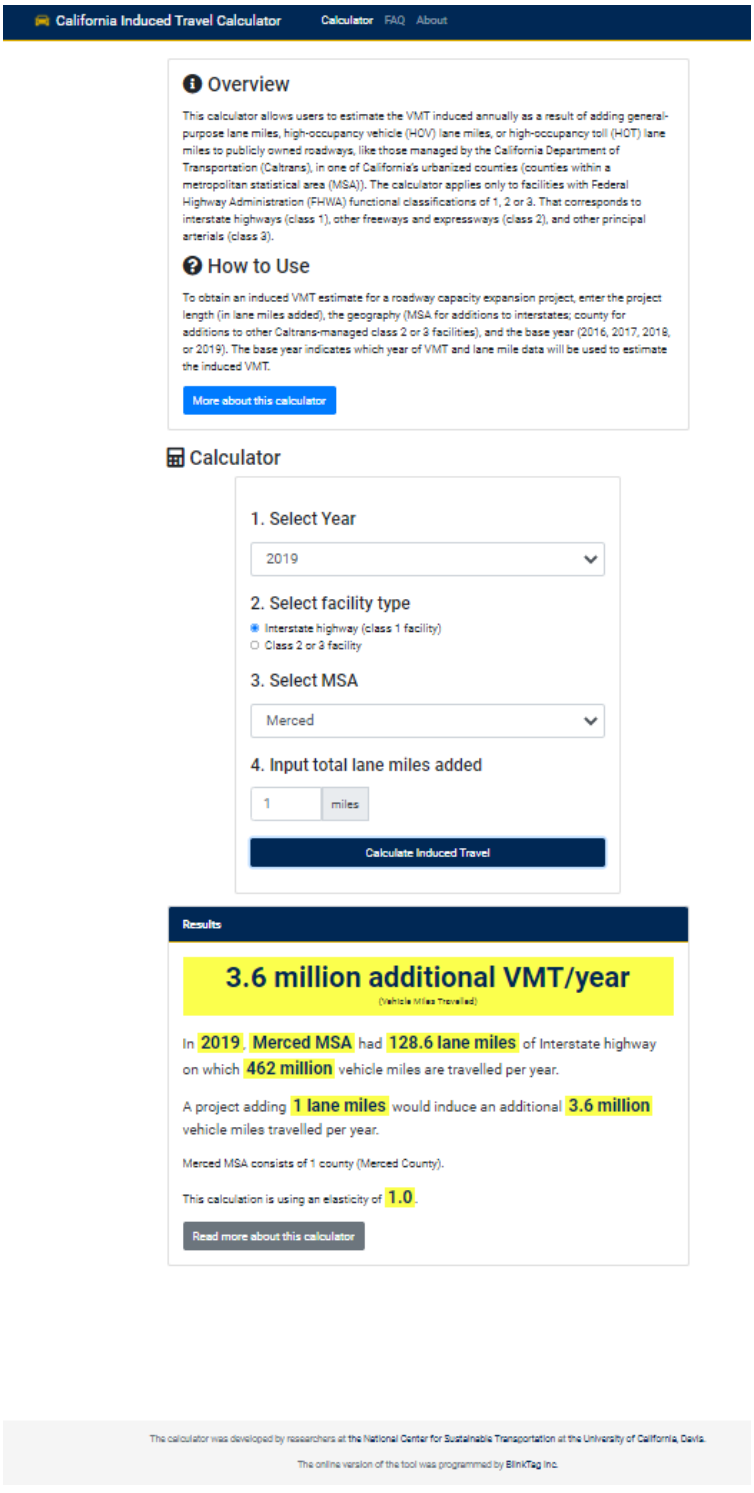
Caltrans has identified a computerized tool to estimate VMT generation from transportation projects. The tool (https://travelcalculator.ncst.ucdavis.edu) was developed by the National Center for Sustainable Transportation (NCST) at the University of California, Davis, and is based on travel demand elasticities and the relationship of lane mile additions with growth in VMT. It uses Federal Highway Administration definitions of facility type and ascribes VMT increases to each facility. Output data include increases in million miles of VMT per year. Caltrans is investigating the use of this tool for all of its VMT analyses of capital projects on the State Highway System. The NCST tool is available at https://blinktag.com/induced-travel-calculator. Figure 11 provides an illustration of that tool.

Other options to identify induced growth- and project-related VMT provided by the TA include:

1. **Employ an expert panel.** *An expert panel could assess changes to land use development that would likely result from the project. This assessment could then be analyzed by the travel demand model to assess effects on vehicle travel. Induced vehicle travel assessed via this approach should be verified using elasticities found in the academic literature.*
2. **Adjust model results to align with the empirical research.** *If the travel demand model analysis is performed without incorporating projected land use changes resulting from the project, the assessed vehicle travel should be adjusted upward to account for those land use changes. The assessed VMT after adjustment should fall within the range found in the academic literature.*
3. **Employ a land use model, running it iteratively with a travel demand model.** *A land use model can be used to estimate the land use effects of a roadway capacity increase, and the traffic patterns that result from the land use change can then be fed back into the travel demand model. The land use model and travel demand model can be iterated to produce an accurate result.*

A final advisory from the TA is provided below:

> *Whenever employing a travel demand model to assess induced vehicle travel, any limitation or known lack of sensitivity in the analysis that might cause substantial errors in the VMT estimate (for example, model insensitivity to one of the components of induced VMT described above) should be disclosed and characterized, and a description should be provided on how it could influence the analysis results. A discussion of the potential error or bias should be carried into analyses that rely on the VMT analysis, such as greenhouse gas emissions, air quality, energy, and noise.* (OPR TA page 34)



Source: https://blinktag.com/induced-travel-calculator/index.html

Figure 11: Caltrans Induced Travel Calculator

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6.0 VMT THRESHOLD ANALYSIS FOR LAND USE PLANS

The OPR TA provides guidance on the treatment of CEQA traffic analyses for land use plans (General Plan, Specific Plan) as follows:

- Analyze the VMT outcomes over the full area over which the plan may substantively affect travel patterns (the definition of region).
- VMT should be counted in full rather than split between origins and destinations (the full impact of the project VMT).

Specifically, OPR states, "A general plan, area plan, or community plan may have a significant impact on transportation if proposed new residential, office or retail land uses would in aggregate exceed the respective thresholds recommended above." (OPR TA page 18) This recommendation refers to a threshold of 15 percent lower than the existing regional average for residential and office uses and no net gain for retail land uses.

To assess a land use plan, use of a traffic-forecasting tool is recommended. The total VMT for the plan may be identified for all trips and all potential VMT contributors within the plan area. Model runs may be conducted for the existing base year and the horizon year (the future year scenario analyzed in the Circulation Element of the lead agency's General Plan) with the project (plan).

SB 375 establishes ambitious and achievable GHG reduction targets for the 18 MPOs in the State. Achievement of these targets is to be accomplished through the improved integration of regional land use and transportation planning processes; not solely through the imposition of new regulation on passenger cars and light-duty trucks.

CARB reviews the SCS that is produced as part of the RTP produced by each of the State's MPOs. The SCS details the strategies and programs the regional agencies are planning to implement to achieve its designated GHG emission reduction targets. CARB approved the new GHG reduction targets for all 18 MPOs in the State in the spring of 2018. The 2018 targets are applicable to the third SCSs for the MPOs.

Other legislative mandates and State policies are also supportive of GHG reduction targets. A sample of these include:

- Assembly Bill 32 (2006) requires statewide GHG emissions reductions to 1990 levels by 2020 and continued reductions beyond 2020.
- SB 32 (2016) requires at least a 40 percent reduction in GHG emissions from 1990 levels by 2030.
- Executive Order (EO) B-30-15 (2015) sets a GHG emissions reduction target of 40 percent below 1990 levels by 2030.
- EO S-3-05 (2005) sets a GHG emissions reduction target of 80 percent below 1990 levels by 2050.
- EO B-16-12 (2012) specifies a GHG emissions reduction target of 80 percent below 1990 levels by 2050 specifically for transportation.

These mandates suggest that a land use plan consistent with the regional RTP/SCS would generally help achieve the target GHG reductions for the region.

California PRC Section 15064.3(b)(4) states (in part) the following:

> *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.*

Since VMT is the largest contributor to GHG emissions, a land use plan consistent with regional RTP/SCS GHG reductions target would generally not have a significant VMT impact. Therefore, the recommended methodology for conducting VMT assessments for land use plans is to compare the existing VMT per capita, VMT per employee, and/or VMT per service population for the region with the respective expected horizon year VMT metrics for the different land use components (VMT per capita, VMT per employee, and/or VMT per service population) of the land use plan (project). If there is a net increase in the VMT metric under horizon year conditions, then the project will have a significant impact.

7.0 MITIGATION STRATEGIES

When a lead agency identifies a potentially significant CEQA VMT impact according to the thresholds described in this report, the agency must identify feasible mitigation measures to avoid or substantially reduce that impact. Unlike LOS impacts, which may be mitigated with location-specific motor vehicle delay improvements, VMT impacts typically require a more regional approach to mitigation, including the provision of incentives to effect changes in travel behavior. Enforcement of mitigation measures will still be subject to the mitigation monitoring requirements of CEQA, as well as the regular police powers of the agency. VMT mitigation measures may also be incorporated into the design of plans, policies, regulations, or projects.

7.1 DEFINITION OF MITIGATION

Section 15370 of the *2022 State CEQA Guidelines* defines mitigations as follows:

> *"Mitigation" includes:*
>
> *a. Avoiding the impact altogether by not taking a certain action or parts of an action.*
>
> *b. Minimizing impacts by limiting the degree or magnitude of the action and its implementation.*
>
> *c. Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment.*
>
> *d. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.*
>
> *e. Compensating for the impact by replacing or providing substitute resources or environments, including through permanent protection of such resources in the form of conservation easements.*

Section 15097 of the *CEQA Guidelines* states that, "the public agency shall adopt a program for monitoring or reporting on the revisions which it has required in the project and the measures it has imposed to mitigate or avoid significant environmental effects. A public agency may delegate reporting or monitoring responsibilities to another public agency or to a private entity which accepts the delegation; however, until mitigation measures have been completed the lead agency remains responsible for ensuring that implementation of the mitigation measures occurs in accordance with the program."

VMT mitigations may not necessarily be physical improvements. Such improvements are complex in nature and will significantly depend on changes in traveler behavior. Therefore, it will be important that lead agencies develop an appropriate monitoring program to ensure the implementation of these mitigation measures throughout the life of a project, in compliance with CEQA. The lead agency must also coordinate with other responsible agencies as part of the mitigation monitoring program to evaluate the ongoing feasibility and durability of the mitigations.

Historically, mitigation measures for LOS-based transportation impacts have addressed either trip generation reductions or traffic-flow-capacity enhancements. LOS mitigation measures typically

include physical infrastructure improvements adding capacity to intersections, roadways, ramps, and freeways. However, transportation demand management activities, active transportation amenities, and other measures designed to reduce the number of new single-occupancy vehicle trips are also potential LOS mitigation strategies.

VMT mitigation measures are significantly different. Most VMT mitigations may seem feasible from a theoretical perspective, but practical implementation of these strategies as formal CEQA mitigation measures in perpetuity is yet to be tested. Several of these mitigations are contextual and behavioral in nature. Their success will depend on the size and location of the project as well as expected changes in travel behavior. For example, a project providing a bike share program does not necessarily guarantee a travel mode change among the project's affected population; the level of improvement may be uncertain and subject to the travel preferences and attitudes of the population affected.

LOS mitigations (such as addition of turn lanes) focus more on rectifying a physical CEQA impact (strategy "c" of *State CEQA Guidelines* Section 15370). On the contrary, the majority of VMT mitigations (such as commute trip-reduction programs) aim at reducing or eliminating an impact over time through preservation and monitoring over the life of the project (strategy "d" of *State CEQA Guidelines* Section 15370). Additionally, some VMT mitigations (such as those focused on land use/ location-based policies) aim at minimizing impacts by reducing the number of trips generated by the projects (strategy "b" of *State CEQA Guidelines* Section 15370).

Furthermore, it may be determined that some VMT impacts are not able to be feasibly mitigated at the project level. Most VMT impacts occur within the context of a regional scale of analysis. The incremental change in VMT associated with a project in its particular locational setting might indicate a greater VMT deficit than individual mitigation strategies can offset. Only a regional solution (e.g., completion of a transit system, purchase of more transit buses, or gap closure of a bicycle lane network) may offer the incremental change necessary to reduce the VMT impact to an appropriate level of significance. Also, VMT, as a proxy for GHG emissions, may not require locational specificity. A project does not necessarily need to diminish the VMT at the project site to provide regional or statewide VMT and GHG reduction benefits. Offsets in an area where the benefit would be greater will have a more effective reduction in VMT and GHG and contribute to achievement of regional and statewide climate goals. This regional perspective provides the basis for cap-and-trade style VMT mitigation strategies.

The issues of regional scale, appropriate and timely fair share contributions from projects and/or local jurisdictions (partial versus comprehensive participation), and geographic ambiguity confound the certainty of the lead agency's identification of an effective VMT mitigation strategy. Section 15126.4 of the *State CEQA Guidelines* states, "Where several measures are available to mitigate an impact, each should be discussed and the basis for selecting a particular measure should be identified. **Formulation of mitigation measures shall not be deferred until some future time."** [Emphasis added.] Regional VMT mitigation is considered the most effective method for large-scale VMT reduction, as cost and implementation barriers are often greater than one project may feasibly accommodate. However, regionally scaled VMT mitigation strategies may be provided in the form of mitigation banks, fees, and/or exchanges, with individual projects subject to contribute to these programs consistent with applicable provisions to ensure compliance and consistency with CEQA and other legal requirements.

Section 21099 (b) (4) of the PRC states, "This subdivision [requiring a new transportation metric under CEQA] does not preclude the application of local general plan policies, zoning codes, conditions of approval, thresholds, or any other planning requirements pursuant to the police power or any other authority." Hence, although automobile delay will no longer be considered a significant impact under CEQA, the lead agency may still require projects to meet the LOS standards designated in its zoning code or general plan. Therefore, a project may still be required to propose LOS improvements for congestion relief in addition to the implementation of any VMT mitigation strategies as required by CEQA.

7.2 MITIGATION MEASURES AND PROJECT ALTERNATIVES

7.2.1 Land Development Projects and Community/General Plans

Transit in Merced
Source: https://www.mcagov.org/140/Transit-Joint-Powers

Mitigations and project alternatives for VMT impacts have been suggested by the OPR. VMT mitigations can be extremely diverse and can be classified under several categories such as land use/location, road pricing, transit improvements, commute trip reduction strategies, and parking pricing/policy. However, the issue with VMT mitigations is the quantitative measurement of the relief provided by the strategies. How much VMT reduction does a transportation demand management program, a bike share program, a transit route, or one mile of sidewalk provide? Improvements related to VMT reduction strategies have been quantified in sources such as the California Air Pollution Control Officers Association (CAPCOA) report *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity (CAPCOA Manual) Final Draft,* December 2021, and by various resources provided by CARB. This information is generally presented with a wide range of potential VMT reduction percentages.

Table F provides a summary of various VMT mitigation measures and project alternatives presented in the *CAPCOA Manual* (only those strategies directly attributed to transportation) for development projects. For any VMT mitigation measure, the project applicant will be required to provide substantial evidence while identifying a project-specific value. If that information is not available, the project should apply the low point of provided ranges for VMT reduction. Where a mitigation strategy does not have an identified VMT reduction range, the project applicant would be required to provide a reduction estimate supported by evidence.

As for land use plans, the OPR TA does not specifically identify any VMT mitigations. The potential VMT mitigation measures for community/general plans are similar to those available for development projects, with certain modifications. Therefore, the mitigation measures provided in Table F can be used as appropriate. Additional measures may also be applied with substantial evidence.

It must be noted that Table F provides only a summary of the VMT mitigations provided in the sources indicated above. The reader should refer to the original source for further details and for subsequent updates to the mitigation measures. Also, Table F does not provide an exhaustive list of VMT

mitigation measures for offsetting CEQA transportation impacts. Other measures may also be accepted by the lead agency based on the provision of substantial evidence.

As additional mitigation measures are evaluated to offset VMT impacts in the future for the *State CEQA Guidelines* process, linkages between a specific strategy and its quantified incremental VMT reduction effect must be established. This process may be based on the observations and measurements provided by other sources or by the lead agency's experience in these practices. The key to effective VMT mitigation is to base its efficacy on real and substantial evidence.

7.2.2 Transportation Projects

Although OPR provides detailed guidance on the assessment of induced-growth impacts associated with transportation improvement projects, it leaves the subject of specific VMT mitigation measures ambiguous. Only four strategies are recommended as potential mitigation options:

- Tolling new travel lanes to encourage carpools and fund transit improvements;
- Converting existing general-purpose lanes to HOV or HOT lanes;
- Implementing or funding off-site transportation demand management programs; and
- Implementing Intelligent Transportation Systems strategies to improve passenger throughput on existing lanes.

No quantified reduction percentage is allocated to these strategies and currently available data do not offer any substantial evidence that may provide guidance on levels of significance after implementation of these strategies. Review of the four recommended mitigation strategies suggests that OPR is directing strategies away from general-purpose mixed-flow lanes on expressways, freeways, and arterial highways. Additionally, the project description and Purpose and Need may conflict since congestion relief measures will conflict with VMT reduction strategies. The lead agency would be subject to an SOC for the capital project VMT impact.

7.3 FUNDING MECHANISMS

The change in methodology used for the assessment of CEQA transportation impacts from LOS to VMT will lead to a shift in and the scale of mitigation efforts from local and project-specific, to a more regional approach. OPR acknowledges the regional nature of VMT impacts and states that regional VMT reduction programs and fee programs (in-lieu fees and development impact fees) may be appropriate forms of mitigation. Fee programs are particularly useful to address cumulative impacts. It is very important for the lead agency to coordinate with MCAG to develop such mitigation programs that may be used to fund new transit service or develop applicable active transportation plans or other regionally scaled VMT mitigation activities. These programs are regional in nature and best suited for administration by a regional agency. Projects may be able to pay into the fee program to offset project VMT impact. Regional agencies may also wish to coordinate with appropriate stakeholders, including participating local jurisdictions, developers, and other interests while conducting nexus studies and checking for rough proportionality and compliance with CEQA.

Most of the VMT mitigations included in Table F are applicable in urban areas. They are less effective in suburban and rural contexts, where traditional transportation demand management strategies are less

feasible. Thus, site-specific strategies are more suitable in more densely urbanized areas, whereas program-level strategies may be more appropriate for some projects located in suburban or rural areas. In the latter approach, the cumulative VMT mitigation contributions provided in support of individual developments may be used to fund regional VMT reduction strategies that would not be feasible or cost-effective at the individual project scale. Apart from fee programs, program-based mitigation strategies may include VMT mitigation exchanges and/or VMT mitigation banks. The VMT mitigation exchange concept requires a developer to select and implement mitigation project(s) from a predetermined list of projects that would serve to reduce the excess new VMT generated by the proposed project. On the other hand, a mitigation banking program would assign monetary values for VMT reductions that would allow developers to purchase the applicable number of VMT reduction credits. These credits would be used to fund larger, regionally scaled VMT mitigation projects throughout the affected region.

As previously discussed, VMT impacts are regional in scope. Hence, there may at times be mitigation requirements that extend beyond the control of the lead agency, and without the ability of the lead agency to manage these mitigations, the impacts might remain significant and unaddressed. Additionally, the identification and management of regionally scaled improvements where developers contribute their fair share to mitigate impacts might prove to be difficult. Therefore, the lead agency may choose to work collaboratively with other jurisdictions within the region to ultimately establish VMT mitigation fee programs, mitigation banks, or exchanges to establish a regional mitigation pathway where developers contribute to a regionally administered VMT mitigation funding pool in a manner commensurate to the impact of their individual project. Procedural flow charts for VMT mitigation banks, exchanges, and impact fees are illustrated in Figures 12, 13, and 14, respectively.

Figure 12: Procedural Flow Chart – VMT Bank

Source: VMT Mitigation Through Banks and Exchanges: Understanding New Mitigation Approaches. A White Paper by Fehr & Peers (January 2020).

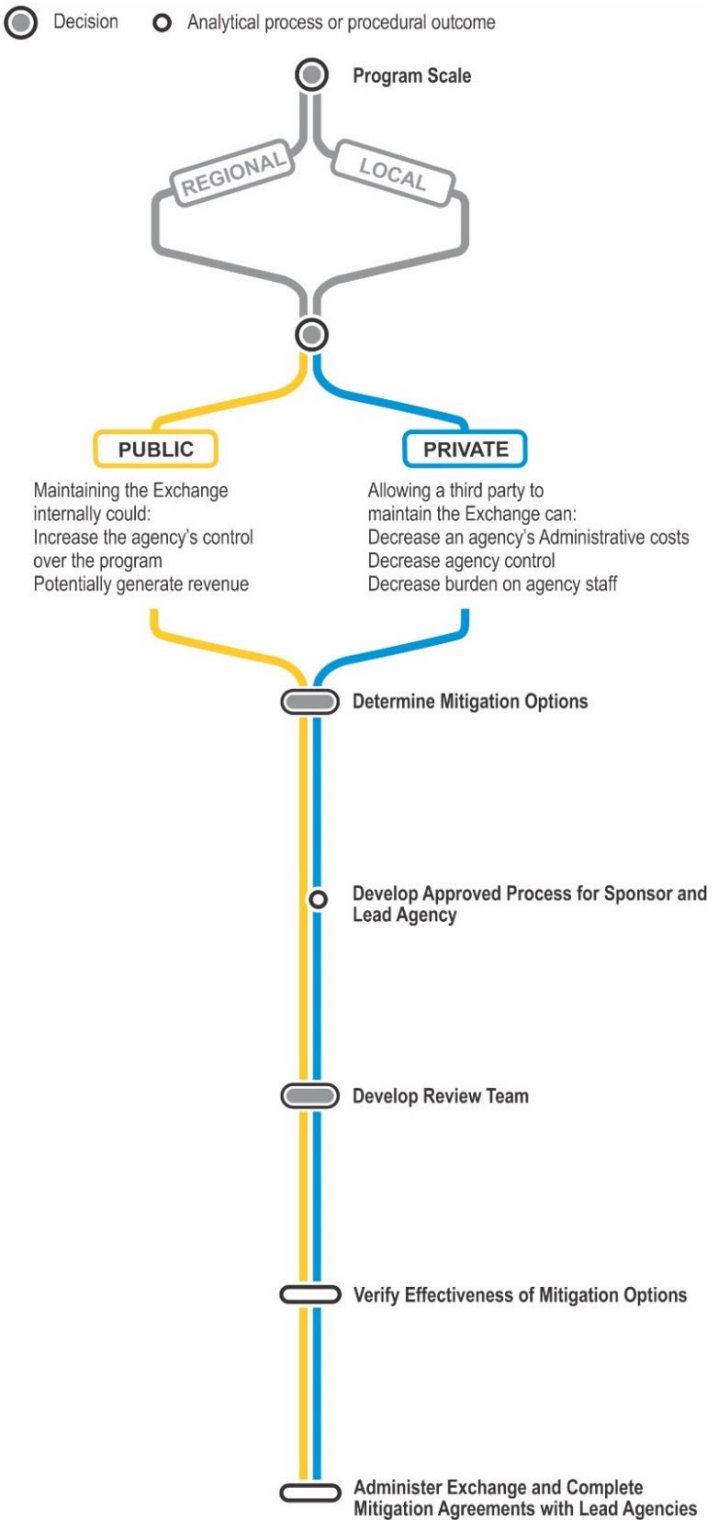

Figure 13: Procedural Flow Chart – VMT Exchange

Source: VMT Mitigation Through Banks and Exchanges: Understanding New Mitigation Approaches. A White Paper by Fehr & Peers (January 2020).

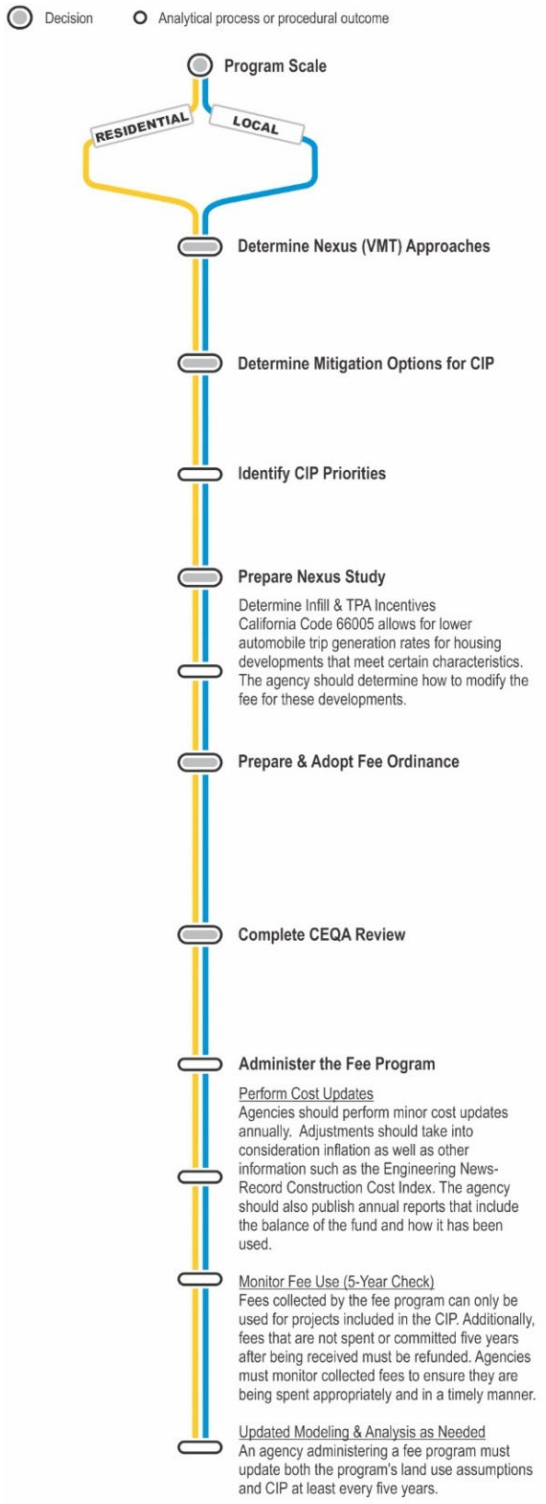

Figure 14: Procedural Flow Chart – VMT Impact Fee
Source: Understanding New Mitigation Approaches. A White Paper by Fehr & Peers (January 2020).

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Table F - Vehicle Miles Traveled Mitigation Measures for Land Development Projects

No.	CAPCOA Mitigation Measure No.	Mitigation Measure	Measure Description	Locational Context	Scale of Application	Implementation Requirements	Expanded Mitigation Options	Formula	VMT Reduction
1	T-1	Increase Residential Density	This measure accounts for the vehicle miles traveled (VMT) reduction achieved by a project that is designed with a higher density of dwelling units (DU) compared to the average residential density in the U.S. Increased densities affect the distance people travel and provide greater options for the mode of travel they choose. Increasing residential density results in shorter and fewer trips by single-occupancy vehicles and thus a reduction in GHG emissions. This measure is best quantified when applied to larger developments and developments where the density is somewhat similar to the surrounding area due to the underlying research being founded in data from the neighborhood level.	Urban, Suburban	Project/Site	This measure is most accurately quantified when applied to larger developments and/or developments where the density is somewhat similar to the surrounding neighborhood.	When paired with Measure T-2, Increase Job Density, the cumulative densification from these measures can result in a highly walkable and bikeable area, yielding increased co-benefits in VMT reductions, improved public health, and social equity.	Refer to California Air Pollution Control Officers Association (CAPCOA) report Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity (CAPCOA Manual), Final Draft, December 2021, page 71.	Up to 30.0 percent project VMT in the study area
2	T-2	Increase Job Density	This measure accounts for the VMT reduction achieved by a project that is designed with a higher density of jobs compared to the average job density in the U.S. Increased densities affect the distance people travel and provide greater options for the mode of travel they choose. Increasing job density results in shorter and fewer trips by single-occupancy vehicles and thus a reduction in GHG emissions.	Urban, suburban	Project/Site	This measure is most accurately quantified when applied to larger developments and/or developments where the density is somewhat similar to the surrounding neighborhood.	When paired with Measure T-1, Increase Residential Density, the cumulative densification from these measures can result in a highly walkable and bikeable area, yielding increased co-benefits in VMT reductions, improved public health, and social equity.	Refer to CAPCOA Manual, page 74.	Up to 30.0 percent project VMT in the study area
3	T-3	Provide Transit-Oriented Development	This measure would reduce project VMT in the study area relative to the same project sited in a non-transit-oriented development (TOD) location. TOD refers to projects built in compact, walkable areas that have easy access to public transit, ideally in a location with a mix of uses, including housing, retail offices, and community facilities. Project site residents, employees, and visitors would have easy access to high-quality public transit, thereby encouraging transit ridership and reducing the number of single-occupancy vehicle trips and associated GHG emissions.	Urban, suburban. Rural only if adjacent to commuter rail station with convenient rail service to a major employment center.	Project/Site	To qualify as a TOD, the development must be a residential or office project that is within a 10-minute walk (0.5 mile) of a high frequency transit station (either rail, or bus rapid transit with headways less than 15 minutes). Ideally, the distance should be no more than 0.25 to 0.3 of a mile but could be up to 0.5 mile if the walking route to station can be accessed by pedestrian-friendly routes. Users should confirm "unmitigated" or "baseline" VMT does not already account for reductions from transit proximity.	When building TOD, a best practice is to incorporate bike and pedestrian access into the larger network to increase the likelihood of transit use.	Refer to CAPCOA Manual, page 77.	Up to 31.0 percent project VMT in the study area
4	T-4	Integrate Affordable and Below Market Rate Housing	This measure requires below market rate (BMR) housing. BMR housing provides greater opportunity for lower income families to live closer to job centers and achieve a jobs/housing match near transit. It is also an important strategy to address the limited availability of affordable housing that might force residents to live far away from jobs or school, requiring longer commutes. The quantification method for this measure accounts for VMT reductions achieved for multifamily residential projects that are deed restricted or otherwise permanently dedicated as affordable housing.	Urban, suburban	Project/Site	Multifamily residential units must be permanently dedicated as affordable for lower income families. The California Department of Housing and Community Development (2021) defines lower-income as 80 percent of area median income or below, and affordable housing as costing 30 percent of gross household income or less.	Pair with Measure T-1, Increase Residential Density, and Measure T-2, Increase Job Density, to achieve greater population and employment diversity.	Refer to CAPCOA Manual, page 81.	Up to 28.6 percent project/site multifamily residential VMT
5	T-5	Implement Commute Trip Reduction Program (Voluntary)	This measure will implement a voluntary commute trip reduction (CTR) program with employers. CTR programs discourage single-occupancy vehicle trips and encourage alternative modes of transportation such as carpooling, taking transit, walking, and biking, thereby reducing VMT and GHG emissions. Voluntary implementation elements are described in this measure.	Urban, suburban	Project/Site	Voluntary CTR programs must include the following elements to apply the VMT reductions reported in literature. ▪ Employer-provided services, infrastructure, and incentives for alternative modes such as ridesharing (Measure T-8), discounted transit (Measure T-9), bicycling (Measure T-10), vanpool (Measure T-11), and guaranteed ride home. ▪ Information, coordination, and marketing for said services, infrastructure, and incentives (Measure T-7).	Other strategies may also be included as part of a voluntary CTR program, though they are not included in the VMT reductions reported by literature and thus are not incorporated in the VMT reductions for this measure. This program typically serves as a complement to the more effective workplace CTR measures such as pricing workplace parking (Measure T-12) or implementing employee parking "cash-out" (Measure T-13).	Refer to CAPCOA Manual, page 84.	Up to 4.0 percent project/site employee commute VMT

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Table F - Vehicle Miles Traveled Mitigation Measures for Land Development Projects

No.	CAPCOA Mitigation Measure No.	Mitigation Measure	Measure Description	Locational Context	Scale of Application	Implementation Requirements	Expanded Mitigation Options	Formula	VMT Reduction
6	T-6	Implement Commute Trip Reduction Program (Mandatory Implementation and Monitoring)	This measure will implement a mandatory CTR program with employers. CTR programs discourage single-occupancy vehicle trips and encourage alternative modes of transportation such as carpooling, taking transit, walking, and biking, thereby reducing VMT and GHG emissions.	Urban, suburban	Project/Site	The mandatory CTR program must include all other elements (i.e., Measures T-7 through T-11) described for the voluntary program (Measure T-5) plus include mandatory trip reduction requirements (including penalties for non-compliance) and regular monitoring and reporting to ensure the calculated VMT reduction matches the observed VMT reduction.	This program typically serves as a complement to the more effective workplace CTR measures, such as pricing workplace parking (Measure T-12) or implementing employee parking "cash-out" (Measure T-13).	Refer to CAPCOA Manual, page 87.	Up to 26.0 percent project/site employee commute VMT
7	T-7	Implement Commute Trip Reduction Marketing	This measure will implement a marketing strategy to promote the project site employer's CTR program. Information sharing and marketing promote and educate employees about their travel choices to the employment location beyond driving such as carpooling, taking transit, walking, and biking, thereby reducing VMT and GHG emissions.	Urban, suburban	Project/Site	The following features (or similar alternatives) of the marketing strategy are essential for effectiveness. ▪ Onsite or online commuter information services. ▪ Employee transportation coordinators. ▪ Onsite or online transit pass sales. ▪ Guaranteed ride home service.	This measure could be packaged with other commute trip reduction measures (Measures T-8 through T-13) as a comprehensive CTR program (Measure T-5 or T-6).	Refer to CAPCOA Manual, page 90.	Up to 4.0 percent project/site employee commute VMT
8	T-8	Provide Ridesharing Program	This measure will implement a ridesharing program and establish a permanent transportation management association with funding requirements for employers. Ridesharing encourages carpooled vehicle trips in place of single-occupied vehicle trips, thereby reducing the number of trips, VMT, and GHG emissions.	Urban, suburban	Project/Site	Ridesharing must be promoted through a multifaceted approach. Examples include the following. ▪ Designating a certain percentage of desirable parking spaces for ridesharing vehicles. ▪ Designating adequate passenger loading and unloading and waiting areas for ridesharing vehicles. ▪ Providing an app or website for coordinating rides.	When providing a ridesharing program, a best practice is to establish funding by a non-revocable funding mechanism for employer-provided subsidies. In addition, encourage use of low-emission ridesharing vehicles (e.g., shared Uber Green). This measure could be paired with any combination of the other commute trip reduction strategies (Measures T-7 through T-13) for increased reductions.	Refer to CAPCOA Manual, page 93.	Up to 8.0 percent project/site employee commute VMT
9	T-9	Implement Subsidized or Discounted Transit Program	This measure will provide subsidized or discounted, or free transit passes for employees and/or residents. Reducing the out-of-pocket cost for choosing transit improves the competitiveness of transit against driving, increasing the total number of transit trips and decreasing vehicle trips. This decrease in vehicle trips results in reduced VMT and thus a reduction in GHG emissions.	Urban, suburban	Project/Site	The project should be accessible either within 1 mile of high-quality transit service (rail or bus with headways of less than 15 minutes), 0.5 mile of local or less frequent transit service, or along a designated shuttle route providing last-mile connections to rail service. If a well-established bikeshare service (Measure T-22-A) is available, the site may be located up to 2 miles from a high-quality transit service. If more than one transit agency serves the site, subsidies should be provided that can be applied to each of the services available. If subsidies are applied for only one service, all variable inputs below should also pertain only to the service that is subsidized.	This measure could be paired with any combination of the other commute trip reduction strategies (Measures T-7 through T-13) for increased reductions.	Refer to CAPCOA Manual, page 96.	Up to 5.5 percent from employee/resident vehicles accessing the site
10	T-10	Provide End-of-Trip Bicycle Facilities	This measure will install and maintain end-of-trip facilities for employee use. End-of-trip facilities include bike parking, bike lockers, showers, and personal lockers. The provision and maintenance of secure bike parking and related facilities encourages commuting by bicycle, thereby reducing VMT and GHG emissions.	Urban, suburban	Project/Site	End-of-trip facilities should be installed at a size proportional to the number of commuting bicyclists and regularly maintained.	Best practice is to include an onsite bicycle repair station and post signage on or near secure parking and personal lockers with information about how to reserve or obtain access to these amenities. This measure could be paired with any combination of the other commute trip reduction strategies (Measures T-7 through T-13) for increased reductions.	Refer to CAPCOA Manual, page 101.	Up to 4.4 percent project/site employee commute VMT
11	T-11	Provide Employer-Sponsored Vanpool	This measure will implement an employer-sponsored vanpool service. Vanpooling is a flexible form of public transportation that provides groups of 5 to 15 people with a cost-effective and convenient rideshare option for commuting. The mode shift from long-distance, single-occupied vehicles to shared vehicles reduces overall commute VMT, thereby reducing GHG emissions.	Urban, suburban, rural	Project/Site	Vanpool programs are more appropriate for the building occupant or tenant (i.e., employer) to implement and monitor than the building owner or developer.	When implementing a vanpool service, best practice is to subsidize the cost for employees that have a similar origin and destination and provide priority parking for employees that vanpool. This measure could be paired with any combination of the other commute trip reduction strategies (Measures T-7 through T-13) for increased reductions.	Refer to CAPCOA Manual, page 105.	Up to 20.4 percent project/site employee commute VMT

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No.	CAPCOA Mitigation Measure No.	Mitigation Measure	Measure Description	Locational Context	Scale of Application	Implementation Requirements	Expanded Mitigation Options	Formula	VMT Reduction
12	T-12	Price Workplace Parking	This measure will price onsite parking at workplaces. Because free employee parking is a common benefit, charging employees to park onsite increases the cost of choosing to drive to work. This is expected to reduce single-occupancy vehicle commute trips, resulting in decreased VMT, thereby reducing associated GHG emissions.	Urban, suburban	Project/Site	Implementation may include the following. • Explicitly charging for employee parking. • Implementing above-market rate pricing. • Validating parking only for invited guests (or not providing parking validation at all). • Not providing employee parking and transportation allowances. In addition, this measure should include marketing and education regarding available alternatives to driving.	Best practice is to ensure that other transportation options are available, convenient, and have competitive travel times (i.e., transit service near the project site, shuttle service, or a complete active transportation network serving the site and surrounding community), and that there is not alternative free parking available nearby (such as on-street). This measure is substantially less effective in environments that do not have other modes available or where unrestricted street parking or other offsite parking is available nearby and has adequate capacity to accommodate project-related vehicle parking demand.	Refer to CAPCOA Manual, page 110.	Up to 20.0 percent project/site employee commute VMT
13	T-13	Implement Employee Parking Cash-Out	This measure will require project employers to offer employee parking cash-out. Cash-out is when employers provide employees with a choice of forgoing their current subsidized/free parking for a cash payment equivalent to or greater than the cost of the parking space. This encourages employees to use other modes of travel instead of single occupancy vehicles. This mode shift results in people driving less and thereby reduces VMT and GHG emissions.	Urban, suburban	Project/Site	To prevent spill-over parking and continued use of single occupancy vehicles, residential parking in the surrounding area must be permitted, and public on-street parking must be market rate.	This measure could be paired with many other commute trip reduction strategies (Measures T-7 through T-11) for increased reductions.	Refer to CAPCOA Manual, page 114.	Up to 12.0 percent project/site employee commute VMT
14	T-14	Provide Electric Vehicle Charging Infrastructure	Install onsite electric vehicle chargers in an amount beyond what is required by the 2019 California Green Building Standards (CALGreen) at buildings with designated parking areas (e.g., commercial, educational, retail, multifamily). This will enable drivers of plug-in hybrid electric vehicles (PHEVs) to drive a larger share of miles in electric mode (eVMT), as opposed to gasoline-powered mode, thereby displacing GHG emissions from gasoline consumption with a lesser amount of indirect emissions from electricity. Most PHEVs owners charge their vehicles at home overnight. When making trips during the day, the vehicle will switch to gasoline mode if/when it reaches its maximum all-electric range.	Urban, suburban, rural	Project/Site	Parking at the chargers must be limited to electric vehicles.	In addition to increasing the percentage of electric miles for PHEVs, the increased availability of chargers from implementation of this measure could mitigate consumer "range anxiety" concerns and increase the adoption and use of battery electric vehicles (BEVs), but this potential effect is not included in the calculations as a conservative assumption. Expanded mitigation could include quantification of the effect of this measure on BEV use.	-	-
15	T-15	Limit Residential Parking Supply	This measure will reduce the total parking supply available at a residential project or site. Limiting the amount of parking available creates scarcity and adds additional time and inconvenience to trips made by private auto, thus disincentivizing driving as a mode of travel. Reducing the convenience of driving results in a shift to other modes and decreased VMT and thus a reduction in GHG emissions. Evidence of the effects of reduced parking supply is strongest for residential developments.	Urban, suburban	Project/Site	This measure is ineffective in locations where unrestricted street parking or other offsite parking is available nearby and has adequate capacity to accommodate project-related vehicle parking demand.	When limiting parking supply, a best practice is to do so at sites that are located near high quality alternative modes of travel (such as a rail station, frequent bus line, or in a higher density area with multiple walkable locations nearby). Limiting parking supply may also allow for more active uses on any given lot, which may support Measures T-1 and T-2 by allowing for higher density construction.	Refer to CAPCOA Manual, page 123.	Up to 13.7 percent from resident vehicles accessing the site
16	T-16	Unbundle Residential Parking Costs from Property Cost	This measure will unbundle, or separate, a residential project's parking costs from property costs, requiring those who wish to purchase parking spaces to do so at an additional cost. On the assumption that parking costs are passed through to the vehicle owners/drivers utilizing the parking spaces, this measure results in decreased vehicle ownership and, therefore, a reduction in VMT and GHG emissions. Unbundling may not be available to all residential developments, depending on funding sources.	Urban, suburban	Project/Site	Parking costs must be passed through to the vehicle owners/drivers utilizing the parking spaces for this measure to result in decreased vehicle ownership.	Pair with Measure T-19-A or T-19-B to ensure that residents who eliminate their vehicle and shift to a bicycle can safely access the area's bikeway network.	Refer to CAPCOA Manual, page 127.	Up to 15.7 percent project VMT in the study area
17	T-17	Improve Street Connectivity	This measure accounts for the VMT reduction achieved by a project that is designed with a higher density of vehicle intersections compared to the average intersection density in the U.S. Increased vehicle intersection density is a proxy for street connectivity improvements, which help to facilitate a greater number of shorter trips and thus a reduction in GHG emissions.	Urban, suburban	Plan/Community	Projects that increase intersection density would be building a new street network in a subdivision or retrofitting an existing street network to improve connectivity (e.g., converting cul-de-sacs or dead-end streets to grid streets).	Pair with Measure T-18, Provide Pedestrian Network Improvement, to best support use of the local pedestrian network.	Refer to CAPCOA Manual, page 131.	Up to 30.0 percent from vehicle travel in the plan/community

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Table F - Vehicle Miles Traveled Mitigation Measures for Land Development Projects

No.	CAPCOA Mitigation Measure No.	Mitigation Measure	Measure Description	Locational Context	Scale of Application	Implementation Requirements	Expanded Mitigation Options	Formula	VMT Reduction
18	T-18	Provide Pedestrian Network Improvement	This measure will increase the sidewalk coverage to improve pedestrian access. Providing sidewalks and an enhanced pedestrian network encourages people to walk instead of drive. This mode shift results in a reduction in VMT and GHG emissions.	Urban, suburban, rural	Plan/Community	The GHG reduction of this measure is based on the VMT reduction associated with expansion of sidewalk coverage expansion, which includes not only building of new sidewalks but also improving degraded or substandard sidewalk (e.g., damaged from street tree roots). However, pedestrian network enhancements with non-quantifiable GHG reductions are encouraged to be implemented, as discussed under Expanded Mitigation Options.	When improving sidewalks, a best practice is to ensure they are contiguous and link externally with existing and planned pedestrian facilities. Barriers to pedestrian access and interconnectivity, such as walls, landscaping buffers, slopes, and unprotected crossings should be minimized. Other best practice features could include high-visibility crosswalks, pedestrian hybrid beacons, and other pedestrian signals, mid-block crossing walks, pedestrian refuge islands, speed tables, bulb-outs (curb extensions), curb ramps, signage, pavement markings, pedestrian-only connections and districts, landscaping, and other improvements to pedestrian safety (see Measure T-35, Provide Traffic Calming Measures).	Refer to CAPCOA Manual, page 134.	Up to 6.4 percent from vehicle travel in the plan/community
19	T-19-A	Construct or Improve Bike Facility	This measure will construct or improve a single bicycle lane facility (only Class I, II, or IV) that connects to a larger existing bikeway network. Providing bicycle infrastructure helps to improve biking conditions within an area. This encourages a mode shift on the roadway parallel to the bicycle facility from vehicles to bicycles, displacing VMT and thus reducing GHG emissions. When constructing or improving a bicycle facility, a best practice is to consider local or state bike lane width standards. A variation of this measure is provided as T-19-B, Construct or Improve Bike Boulevard.	Urban, suburban	Plan/Community. This measure reduces VMT on the roadway segment parallel to the bicycle facility (i.e., the corridor). An adjustment factor is included in the formula to scale the VMT reduction from the corridor level to the plan/community level.	The bicycle lane facility must be either Class I, II, or IV. Class I bike paths are physically separated from motor vehicle traffic. Class IV bikeways are protected on-street bikeways, also called cycle tracks. Class II bike lanes are striped bicycle lanes that provide exclusive use to bicycles on a roadway.	Implement alongside Measures T-22-A, T-22-B, and/or T-22-C to ensure that micromobility users can ride safely along bicycle lane facilities and not have to ride along pedestrian infrastructure, which is a risk to pedestrian safety.	Refer to CAPCOA Manual, page 138.	Up to 0.8 percent from vehicles on parallel roadways
20	T-19-B	Construct or Improve Bike Boulevard	Construct or improve a single bicycle boulevard that connects to a larger existing bikeway network. Bicycle boulevards are a designation within Class III Bikeway that create safe, low-stress connections for people biking and walking on streets. This encourages a mode shift from vehicles to bicycles, displacing VMT and thus reducing GHG emissions. A variation of this measure is provided as T-19-A, Construct or Improve Bike Facility, which is for Class I, II, or IV bicycle infrastructure.	Urban, suburban	Plan/Community. This measure reduces VMT on the roadway segment parallel to the bicycle facility (i.e., the corridor). An adjustment factor is included in the formula to scale the VMT reduction from the corridor level to the plan/community level.	The following roadway conditions must be met. ▪ Functional classification: local and collector if there is no more than a single general-purpose travel lane in each direction. ▪ Design speed: <= 25 miles per hour. ▪ Design volume <= 5,000 average daily traffic. ▪ Treatments at major intersections: both directions have traffic signals (or an effective control device that prioritizes pedestrian and bicycle access such as rapid flashing beacons, pedestrian hybrid beacons, high-intensity activated crosswalks, TOUCANs), bike route signs, "sharrowed" roadway markings, and pedestrian crosswalks.	Construct boulevards with forced turns for vehicles every few blocks to minimize through traffic while ensuring that speed and volume metrics are met. Implement alongside Measures T-22-A, T-22-B, and/or T-22-C to ensure that micromobility users can ride safely along bicycle lane facilities and not pedestrian infrastructure, which is a risk to pedestrian safety.	Refer to CAPCOA Manual, page 143.	Up to 0.2 percent from vehicles on roadways
22	T-20	Expand Bikeway Network	This measure will increase the length of a city or community bikeway network. A bicycle network is an interconnected system of bike lanes, bike paths, bike routes, and cycle tracks. Providing bicycle infrastructure with markings and signage on appropriately sized roads with vehicle traffic traveling at safe speeds helps to improve biking conditions (e.g., safety and convenience). In addition, expanded bikeway networks can increase access to and from transit hubs, thereby expanding the "catchment area" of the transit stop or station and increasing ridership. This encourages a mode shift from vehicles to bicycles, displacing VMT and thus reducing GHG emissions. When expanding a bicycle network, a best practice is to consider bike lane width standards from local agencies, state agencies, or the National Association of City Transportation Officials' Urban Bikeway Design Guide.	Urban, suburban	Plan/Community	The bikeway network must consist of either Class I, II, or IV infrastructure.	As networks expand, ensure safe, secure, and weather-protected bicycle parking facilities at origins and destinations. Also, implement alongside T-22-A, T-22-B, and/or T-22-C to ensure that micromobility options can ride safely along bicycle lane facilities and not have to ride along pedestrian infrastructure, which is a risk to pedestrian safety.	Refer to CAPCOA Manual, page 147.	Up to 0.5 percent from vehicle travel in the plan/community
23	T-21-A	Implement Conventional Carshare Program	This measure will increase carshare access in the user's community by deploying conventional carshare vehicles. Carsharing offers people convenient access to a vehicle for personal or commuting purposes. This helps encourage transportation alternatives and reduces vehicle ownership, thereby avoiding VMT and associated GHG emissions. A variation of this measure, electric carsharing, is described in Measure T-21-B, Implement Electric Carshare Program.	Urban, suburban	Plan/Community	The GHG mitigation potential is based, in part, on literature analyzing one-way carsharing service with a free-floating operational model. This measure should be applied with caution if using a different form of carsharing (e.g., roundtrip, peer-to-peer, fractional).	When implementing a carshare program, best practice is to discount carshare membership and provide priority parking for carshare vehicles to encourage use of the service.	Refer to CAPCOA Manual, page 151.	Up to 0.15 percent from vehicle travel in the plan/community

Table F - Vehicle Miles Traveled Mitigation Measures for Land Development Projects

No.	CAPCOA Mitigation Measure No.	Mitigation Measure	Measure Description	Locational Context	Scale of Application	Implementation Requirements	Expanded Mitigation Options	Formula	VMT Reduction
24	T-21-B	Implement Electric Carshare Program	This measure will increase carshare access in the user's community by deploying electric carshare vehicles. Carsharing offers people convenient access to a vehicle for personal or commuting purposes. This helps encourage transportation alternatives and reduces vehicle ownership, thereby avoiding VMT and associated GHG emissions. This also encourages a mode shift from internal combustion engine vehicles to electric vehicles, displacing the emissions-intensive fossil fuel energy with less emissions-intensive electricity. Electric carshare vehicles require more staffing support compared to conventional carshare programs for shuttling electric vehicles to and from charging points. A variation of this measure, conventional carsharing, is described in Measure T-21-A, Implement Conventional Carshare Program.	Urban, suburban	Plan/Community	The GHG mitigation potential is based, in part, on literature analyzing one-way carsharing service with a free-floating operational model. This measure should be applied with caution if using a different form of carsharing (e.g., roundtrip, peer-to-peer, fractional).	When implementing a carshare program, best practice is to discount carshare membership and provide priority parking for carshare vehicles to encourage use of the service.	Refer to CAPCOA Manual, page 158.	Up to 0.18 percent GHG reduction from vehicle travel in the plan/community. Please refer to VMT reduction formula on CAPCOA Manual, page 158.
25	T-22-A	Implement Pedal (Non-Electric) Bikeshare Program	This measure will establish a bikeshare program. Bikeshare programs provide users with on-demand access to bikes for short-term rentals. This encourages a mode shift from vehicles to bicycles, displacing VMT and thus reducing GHG emissions. Variations of this measure are described in Measure T-22-B, Implement Electric Bikeshare Program, and Measure T-22-C, Implement Scootershare Program.	Urban, suburban	Plan/Community	The GHG mitigation potential is based, in part, on literature analyzing docked (i.e., station-based) bikeshare programs. This measure should be applied with caution if using dockless (free-floating) bikeshare.	Best practice is to discount bikeshare membership and dedicate bikeshare parking to encourage use of the service. Also consider including space on the vehicle to store personal items while traveling, such as a basket.	Refer to CAPCOA Manual, page 160.	Up to 0.02 percent from vehicle travel in the plan/community
26	T-22-B	Implement Electric Bikeshare Program	This measure will establish an electric bikeshare program. Electric bikeshare programs provide users with on-demand access to electric pedal assist bikes for short-term rentals. This encourages a mode shift from vehicles to electric bicycles, displacing VMT and reducing GHG emissions. Variations of this measure are described in Measure T-22-A, Implement Pedal (Non-Electric) Bikeshare Program, and Measure T-22-C, Implement Scootershare Program.	Urban, suburban	Plan/Community	The GHG mitigation potential is based, in part, on literature analyzing docked (i.e., station-based) bikeshare programs. This measure should be applied with caution if using dockless (free-floating) bikeshare.	Best practice is to discount electric bikeshare membership and dedicate electric bikeshare parking to encourage use of the service. Consider also including space on the vehicle to store personal items while traveling, such as a basket.	Refer to CAPCOA Manual, page 164.	Up to 0.06 percent from vehicle travel in the plan/community. This quantification methodology does not account for the miles traveled from vehicle travel of program employees picking up and dropping off bikes.
27	T-22-C	Implement Scootershare Program	This measure will establish a scootershare program. Scootershare programs provide users with on-demand access to electric scooters for short-term rentals. This encourages a mode shift from vehicles to scooters, displacing VMT and thus reducing GHG emissions. Variations of this measure are described in Measure T-22-A, Implement Pedal (Non-Electric) Bikeshare Program, and Measure T-22-B, Implement Electric Bikeshare Program.	Urban, suburban	Plan/Community	The GHG mitigation potential is based, in part, on literature analyzing docked (i.e., station-based) bikeshare programs. This measure should be applied with caution given the likely higher popularity of scootershare compared to bikeshare.	Best practice is to discount scootershare membership and dedicate scootershare parking to encourage use of the service. Consider also including space on the vehicle to store personal items while traveling, such as a basket.	Refer to CAPCOA Manual, page 168.	Up to 0.07 percent from vehicle travel in the plan/community. This quantification methodology does not account for the miles traveled from vehicle travel of program employees picking up and dropping off scooters.
28	T-23	Provide Community-Based Travel Planning	This measure will target residences in the plan/community with community-based travel planning (CBTP). CBTP is a residential-based approach to outreach that provides households with customized information, incentives, and support to encourage the use of transportation alternatives in place of single occupancy vehicles, thereby reducing household VMT and associated GHG emissions.	Urban, suburban	Plan/Community	CBTP involves teams of trained travel advisors visiting all households within a targeted geographic area, having tailored conversations about residents' travel needs, and educating residents about the various transportation options available to them. Due to the personalized outreach method, communities are typically targeted in phases.	Pair with any of the Measures from T-17 through T-22-C to ensure that residents that are targeted by CBTP who want to use alternative transportation have the infrastructure and technology to do so.	Refer to CAPCOA Manual, page 172.	Up to 2.3 percent from vehicle travel in the plan/community
29	T-24	Implement Market Price Public Parking (On-Street)	This measure will price all on-street parking in a given community, with a focus on parking near central business districts, employment centers, and retail centers. Increasing the cost of parking increases the total cost of driving to a location, incentivizing shifts to other modes and thus decreasing total VMT to and from the priced areas. This VMT reduction results in a corresponding reduction in GHG emissions.	Urban, suburban	Plan/Community	When pricing on-street parking, best practice is to allow for dynamic adjustment of prices to ensure approximately 85 percent occupancy, which helps prevent induced VMT due to circling behaviors as individuals search for a vacant parking space. In addition, this method should primarily be implemented in areas with available alternatives to driving, such as transit availability within 0.5. mile or areas of high residential density nearby (allowing for increased walking/biking). If the measure is implemented in a small area, residential parking permit programs should be considered to prevent parking intrusion on nearby streets in residential areas without priced parking.	Pricing on-street parking also helps support individual projects with priced onsite parking by removing potential alternative parking locations.	Refer to CAPCOA Manual, page 175.	Up to 30.0 percent from vehicle travel in the plan/community

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Table F - Vehicle Miles Traveled Mitigation Measures for Land Development Projects

No.	CAPCOA Mitigation Measure No.	Mitigation Measure	Measure Description	Locational Context	Scale of Application	Implementation Requirements	Expanded Mitigation Options	Formula	VMT Reduction
30	T-25	Extend Transit Network Coverage or Hours	This measure will expand the local transit network by either adding or modifying existing transit service or extending the operation hours to enhance the service near the project site. Starting services earlier in the morning and/or extending services to late-night hours can accommodate the commuting times of alternative-shift workers. This will encourage the use of transit and therefore reduce VMT and associated GHG emissions.	Urban, suburban	Plan/Community	There are two primary means of expanding the transit network: by increasing the frequency of service, thereby reducing average wait times and increasing convenience, or by extending service to cover new areas and times.	This measure is focused on providing additional transit network coverage, with no changes to transit frequency. This measure can be paired with Measure T-26, Increase Transit Service Frequency, which is focused on increasing transit service frequency, for increased reductions.	Refer to CAPCOA Manual, page 179.	Up to 4.6 percent from vehicle travel in the plan/community
31	T-26	Increase Transit Service Frequency	This measure will increase transit frequency on one or more transit lines serving the plan/community. Increased transit frequency reduces waiting and overall travel times, which improves the user experience and increases the attractiveness of transit service. This results in a mode shift from single occupancy vehicles to transit, which reduces VMT and associated GHG emissions.	Urban, suburban	Plan/Community	Refer to measure description.	This measure is focused on providing increased transit frequency, with no changes to transit network coverage. This measure can be paired with Measure T-25, Extend Transit Network Coverage or Hours, which is focused on increasing transit network coverage, for increased reductions.	Refer to CAPCOA Manual, page 185.	Up to 11.3 percent GHG reduction from vehicle travel in the plan/community. Please refer to VMT reduction formula on CAPCOA Manual, page 185.
32	T-27	Implement Transit-Supportive Roadway Treatments	This measure will implement transit-supportive treatments on the transit routes serving the plan/community. Transit-supportive treatments incorporate a mix of roadway infrastructure improvements and/or traffic signal modifications to improve transit travel times and reliability. This results in a mode shift from single occupancy vehicles to transit, which reduces VMT and the associated GHG emissions.	Urban, suburban	Plan/Community	Treatments can include transit signal priority, bus-only signal phases, queue jumps, curb extensions to speed passenger loading, and dedicated bus lanes.	This measure could be paired with other Transit subsector strategies (Measure T-25 and Measure T-29) for increased reductions.	Refer to CAPCOA Manual, page 189.	Up to 0.6 percent from vehicle travel in the plan/community
33	T-28	Provide Bus Rapid Transit	This measure will convert an existing bus route to a bus rapid transit (BRT) system. BRT includes the following additional components, compared to traditional bus service: exclusive right-of-way (e.g., busways, queue jumping lanes) at congested intersections, increased limited-stop service (e.g., express service), intelligent transportation technology (e.g., transit signal priority, automatic vehicle location systems), advanced technology vehicles (e.g., articulated buses, low-floor buses), enhanced station design, efficient fare-payment smart cards or smartphone apps, branding of the system, and use of vehicle guidance systems. BRT can increase the transit mode share in a community due to improved travel times, service frequencies, and the unique components of the BRT system. This mode shift reduces VMT and the associated GHG emissions.	Urban, suburban	Plan/Community	The measure quantification methodology accounts for the increase in ridership from (1) improved travel times from transit signal prioritization, (2) increased service frequency, and (3) the unique ridership increase associated with a full-featured BRT service operating on a fully segregated running way with specialized (or stylized) vehicles, attractive stations, and efficient fare collection practices. To take credit for the estimated emissions reduction, the user should implement, at minimum, these components.	This measure could be paired with Measure T-25, Extend Transit Network Coverage or Hours, and Measure T-29, Reduce Transit Fares, for increased reductions.	Refer to CAPCOA Manual, page 193.	Up to 13.8 percent from vehicle travel in the plan/community. Please refer to VMT reduction formula on CAPCOA Manual, page 195.
34	T-29	Reduce Transit Fares	This measure will reduce transit fares on the transit lines serving the plan/community. A reduction in transit fares creates incentives to shift travel to transit from single-occupancy vehicles and other traveling modes, which reduces VMT and associated GHG emissions. This measure differs from Measure T-8, Implement Subsidized or Discounted Transit Program, which can be offered through employer-based benefits programs in which the employer fully or partially pays the employee's cost of transit.	Urban, suburban	Plan/Community	Transit fare reductions can be implemented systemwide or in specific fare-free or reduced-fare zones.	This measure could be paired with other Transit subsector strategies (Measure T-25, Extend Transit Network Coverage or Hours, and Measure T-26, Increase Transit Service Frequency) for increased reductions.	Refer to CAPCOA Manual, page 200.	Up to 1.2 percent from vehicle travel in the plan/community

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Table F - Vehicle Miles Traveled Mitigation Measures for Land Development Projects

No.	CAPCOA Mitigation Measure No.	Mitigation Measure	Measure Description	Locational Context	Scale of Application	Implementation Requirements	Expanded Mitigation Options	Formula	VMT Reduction
35	T-30	Use Cleaner-Fuel Vehicles	This measure requires use of cleaner-fuel vehicles in lieu of similar vehicles powered by gasoline or diesel fuel. Cleaner-fuel vehicles addressed in this measure include electric vehicles, natural gas and propane vehicles, and vehicles powered by biofuels such as composite diesel (blend of renewable diesel, biodiesel, and conventional fossil diesel), ethanol, and renewable natural gas. The full GHG emissions impact of cleaner fuels depends on the emissions from the vehicle's tailpipe as well as the emissions associated with production of the fuel (sometimes termed "upstream" emissions). For example, tailpipe GHG emissions from renewable natural gas are identical to tailpipe GHG emissions from conventional natural gas; the GHG benefits of renewable natural gas come from the fact that it is produced from biomass. Similarly, BEVs have zero tailpipe emissions, but properly accounting for their GHG impacts requires quantifying the emissions associated with the electricity generation needed to charge the vehicle's batteries.	Not-applicable	Project/Site or Plan/Community	-	If using electric vehicles, pair with Measure T-14 to ensure that electric vehicles have sufficient access to charging infrastructure.	-	-
36	T-31-A	Locate Project in Area with High Destination Accessibility	The measure requires development in an area with high accessibility to destinations. Destination accessibility is measured in terms of the number of jobs or other attractions (e.g., schools, supermarkets, and health care services) that are reachable within a given travel time or travel distance, and tends to be highest at central locations and lowest at peripheral ones. When destinations are nearby, the travel time between them is less, thus increasing the potential for people to walk and bike to those destinations and, therefore, reducing the VMT and associated GHG emissions. As an implementation consideration, projects should consider accessibility by people of all functional abilities and incorporate design principles such as Universal Design.	Urban, suburban	Project/Site	-	This is a variation of measure T-31-B.	-	-
37	T-31-B	Improve Destination Accessibility in Undeserved Areas	This measure accounts for the VMT reduction that would be achieved by constructing job centers or other attractions (e.g., schools, supermarkets, and health care services) for residents in underserved areas (e.g., food deserts). When destinations are nearby, the travel time between them is less, thus increasing the potential for people to walk and bike to those destinations, reducing VMT and associated GHG emissions. As an implementation consideration, projects should consider accessibility by people of all functional abilities and incorporate design principles such as Universal Design.	Urban, suburban	Plan/Community	-	This is a variation of measure T-31-A.	-	-
38	T-32	Orient Project Toward Transit, Bicycle, or Pedestrian Facility	This measure requires projects to minimize setback distance between the project and planned or existing transit, bicycle, or pedestrian corridors. A project that is designed around an existing or planned transit, bicycle, or pedestrian corridor encourages sustainable mode use. As an implementation consideration, projects should consider accessibility by people of all functional abilities and incorporate design principles such as Universal Design.	Urban, suburban, rural	Project/Site	-	-	-	-
39	T-33	Locate Project near Bike Path/Bike Lane	This measure requires projects to be located within 0.5-mile bicycling distance to an existing Class I or IV path or Class II bike lane. A project that is designed around an existing or planned bicycle facility encourages sustainable mode use. The project design should include a comparable network that connects the project uses to the existing off-site facilities that connect to work/retail destinations. As an implementation consideration, projects should provide sufficient and convenient bicycle parking and long-term storage, ideally near the bike lane itself, for residents, employees, and visitors, and a bicycle repair station with tools and equipment.	Urban, suburban	Project/Site	-	This measure can be implemented with Measure T-9.	-	-

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Table F - Vehicle Miles Traveled Mitigation Measures for Land Development Projects

No.	CAPCOA Mitigation Measure No.	Mitigation Measure	Measure Description	Locational Context	Scale of Application	Implementation Requirements	Expanded Mitigation Options	Formula	VMT Reduction
40	T-34	Provide Bike Parking	This measure requires projects provide short-term and long-term bicycle parking facilities to meet peak season maximum demand. Parking can be provided in designated areas or added within rights-of-way, including by replacing parking spaces with bike parking corrals. Ensure that bike parking can be accessed by all, not just project employees or residents.	Urban, suburban, rural	Project/Site or Plan/Community	-	-	-	-
41	T-35	Provide Traffic Calming Measures	This measure requires projects to include pedestrian/bicycle safety and traffic calming measures above jurisdictional requirements. Roadways should also be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others. Providing traffic calming measures encourages people to walk or bike instead of using a vehicle. This mode shift will result in a decrease in vehicle miles traveled. Traffic calming also promotes active transportation, which improves physical health.	Urban, suburban, rural	Plan/Community	-	-	-	-
42	T-36	Create Urban Non-Motorized Zones	The measure requires projects to convert a percentage of its roadway miles to transit malls, linear parks, or other non-motorized zones. These features encourage non-motorized travel and thus a reduction in vehicle miles traveled. This measure is only applicable to projects located in urban environments. Consider access issues for paratransit users and those with mobility impairments.	Urban	Plan/Community	-	-	-	-
43	T-37	Dedicate Land for Bike Trails	This measure requires projects to provide for, contribute to, or dedicate land for the provision of off-site bicycle trails linking the project to designated bicycle commuting routes in accordance with an adopted citywide or countywide bikeway plan. Existing desire paths can make good locations, as it represents a community-identified transportation need.	Urban, suburban, rural	Plan/Community	-	-	-	-
44	T-38	Provide First and Last Mile TNC Incentives	This measure requires a first-last mile partnership between a municipality/transit agency and a transportation network company (TNC) for subsidized, shared TNC rides to or from the local transit station within a specific geographic area. This measure encourages a shift to transit mode for longer trips. Consider providing inclusive mechanisms so people without bank accounts, credit cards, or smart phones can access the incentives.	Urban, suburban, rural (only if the project is adjacent to a commuter rail station with convenient rail service to a major employment center)	Plan/Community	-	-	-	-
45	T-39	Implement Preferential Parking Permit Program	This measure requires projects provide preferential parking in terms of free or reduced parking fees, priority parking, or reserved parking in convenient locations (such as near public transportation or building entrances) for commuters who carpool, vanpool, ride-share or use sustainably fueled vehicles. Projects should also provide wide parking spaces to accommodate vanpool vehicles. Commercial preferential parking can accommodate workers who work non-standard hours by providing opportunities to participate. Residential preferential parking can consider an equitable distribution of permits, giving priority to owners of sustainably fueled vehicles.	Urban, suburban	Project/Site	-	-	-	-

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Table F - Vehicle Miles Traveled Mitigation Measures for Land Development Projects

No.	CAPCOA Mitigation Measure No.	Mitigation Measure	Measure Description	Locational Context	Scale of Application	Implementation Requirements	Expanded Mitigation Options	Formula	VMT Reduction
46	T-40	Implement School Bus Program	This measure will provide school bus service transporting students to a school project. A school bus service can reduce the number of private vehicle trips to drop-off or pick-up students, thereby reducing VMT and associated GHG emissions, as well as onsite air pollution emissions, especially if the bus is zero emissions. Best practices include concentrating service for students who live further away from schools, providing service both before and after school, and encouraging parents to utilize the service. This measure is more effective at schools that draw students from a larger enrollment area, such as high schools or private schools.	Urban, suburban, rural	Project/Site	-	-	-	-
47	T-41	Implement a School Pool Program	This measure requires projects create a ridesharing program for school children. Most school districts provide bussing services to public schools only. School pool helps match parents to transport students to private schools, or to schools where students cannot walk or bike but do not meet the requirements for bussing. A school pool program can help reduce onsite air pollutant emissions at the school by reducing private vehicle trips, especially if the pool vehicle is zero emissions.	Urban, suburban, rural	Project/Site	-	-	-	-
48	T-42	Implement Telecommute and/or Alternative Work Schedule Program	This measure requires projects to permit employee telecommuting and/or alternative work schedules and monitor employee involvement to ensure forecasted participation matches observed participation. While this measure certainly reduces commute-related VMT, recent research has shown that total VMT from telecommuters can exceed VMT from non-telecommuters. In addition, telecommuting affects commercial and residential electricity use, complicating the calculation of the net effect and attribution of emissions. More specifically, an office with fewer employees could result in a decrease in the project's energy used to operate equipment and provide space heating and air conditioning. Conversely, an increase in telecommuters using their private homes as workspaces could result in a residential increase in energy for those same end uses and appliances. While this measure is currently not quantified and, according to some studies, could result in total VMT increases and other disbenefits, it is recommended that users review the most recent literature at the time of their project initiation to see if new findings more conclusively support a quantifiable emissions reduction.	Urban, suburban, rural	Project/Site	-	-	-	-
49	T-43	Provide Real-Time Transit Information	This measure requires projects provide real-time bus/train/ferry arrival time, travel time, alternative routings, or other transit information via electronic message signs, dedicated monitor or interactive electronic displays, websites, or mobile apps. This makes transit service more convenient and may result in a mode shift from auto to transit, which reduces VMT.	Urban, suburban, rural	Plan/Community	-	-	-	-

Table F - Vehicle Miles Traveled Mitigation Measures for Land Development Projects

No.	CAPCOA Mitigation Measure No.	Mitigation Measure	Measure Description	Locational Context	Scale of Application	Implementation Requirements	Expanded Mitigation Options	Formula	VMT Reduction
50	T-44	Provide Shuttles (Gas or Electric)	This measure will provide local shuttle service through coordination with the local transit operator or private contractor. The shuttles will provide service to and from commercial centers to nearby transit centers to help with first and last mile connectivity, thereby incentivizing a shift from private vehicles to transit, reducing associated GHG emissions. Electric shuttle vehicles provide a marginally more effective reduction to GHG emissions compared to gas- or diesel-fueled shuttles due to their use of less emissions-intensive electric power. Shuttles that serve only the project residents and/or employees may be seen as increasing gentrification and exclusionary. Consider allowing all people to use the shuttle, regardless of status. Note that this measure can also be implemented at the Project/Site scale by a large employer as part of a Trip Reduction Program.	Urban, suburban	Project/Site	-	-	-	-
51	T-45	Provide On-Demand Microtransit	This measure will provide small-scale, on-demand public transit services that can offer fixed routes and schedules or flexible routes and on-demand scheduling (e.g., Metro Micro) through coordination with the local transit operator or private contractor. Microtransit aims to offer shorter wait times and improved reliability compared to the bus and rail system to further incentivize alternative transportation modes that are less emissions-intensive than private vehicle trips. On-demand rides can be booked using smartphone applications or call centers. Note that this measure may also be applicable at the Project/Site scale for a large employer (e.g., Google's Via2G pilot) as part of a Trip Reduction Program.	Urban, suburban	Project/Site or Plan/Community	-	-	-	-
52	T-46	Improve Transit Access, Safety, and Comfort	This measure requires projects improve transit access and safety through sidewalk/crosswalk safety enhancements, bus shelter improvements, improved lighting, and other features. Work with the community to determine barriers to use, most desired improvements, and other access challenges.	Urban, suburban, rural (only if the project is adjacent to a commuter rail station with convenient rail service to a major employment center, or if there is available transit and the project is close to jobs/services)	Plan/Community	-	-	-	-
52	T-47	Provide Bike Parking Near Transit	This measure requires the project to provide short-term and long-term bicycle parking near rail stations, transit stops, and freeway access points where there are commuter or rapid bus lines. Include locations for shared micromobility devices as well as higher-security parking for personal bicycles.	Urban, suburban	Plan/Community	-	-	-	-
53	T-48	Implement Area or Cordon Pricing	This measure requires projects implement a cordon pricing scheme. The pricing scheme will set a cordon (boundary) around a specified area to charge a toll to enter the area by vehicle. The cordon location is usually the boundary of a central business district or urban center but could also apply to substantial development projects with limited points of access. The toll price can be based on a fixed schedule or be dynamic, responding to real-time congestion levels. It is critical to have an existing, high quality transit infrastructure for the implementation of this strategy to reach a significant level of effectiveness. The pricing signals will only cause mode shifts if alternative modes of travel are available and reliable. This measure should provide an exception for low-income residents or workers within the pricing zone.	Urban	Plan/Community	-	-	-	-

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Table F - Vehicle Miles Traveled Mitigation Measures for Land Development Projects

No.	CAPCOA Mitigation Measure No.	Mitigation Measure	Measure Description	Locational Context	Scale of Application	Implementation Requirements	Expanded Mitigation Options	Formula	VMT Reduction
54	T-49	Replace Traffic Controls with Roundabout	This measure requires projects install a roundabout as a traffic control device to smooth traffic flow, reduce idling, eliminate bottlenecks, and manage speed. In some cases, roundabouts can improve traffic flow and reduce emissions. The emission reduction depends heavily on what the roundabout is compared to (e.g., uncontrolled intersection, stop sign, traffic signal). Design roundabout so cyclists have the option to join traffic or bypass the roundabout with an adjacent path.	Urban, suburban, rural	Plan/Community	-	-	-	-
55	T-50	Required Project Contributions to Transportation Infrastructure Improvement	This measure requires projects contribute to traffic-flow improvements or other multi-modal infrastructure projects that reduce emissions and are not considered as substantially growth inducing. The local transportation agency should be consulted for specific needs. Larger projects may be required to contribute a proportionate share to the development and/or continuation of a regional transit system. Contributions may consist of dedicated right-of-way, capital improvements, or easements. Ensure the jurisdictional fee system does not disadvantage infill projects over greenfield projects.	Urban, suburban, rural	Plan/Community	-	-	-	-
56	T-51	Install Park-and-Ride Lots	This measure requires projects install park-and-ride lots near transit stops and high occupancy vehicle lanes. Park-and-ride lots also facilitate car- and vanpooling. Parking lots can also incorporate cool pavements, tree canopy, or solar photovoltaic shade canopies to reduce the urban heat island effect as well as evaporative emissions from parked vehicles and dedicated electric vehicle parking spots and/or charging infrastructure.	Suburban, rural	Plan/Community	-	-	-	-
57	T-52	Designate Zero Emissions Delivery Zones	This measure requires the municipality to designate certain curbside locations as commercial loading zones exclusively available for zero-emission commercial delivery vehicles. Doing so replaces tailpipe diesel emissions from last-mile delivery vehicles as well as heavy duty drayage trucks moving goods with less emissions-intensive electric vehicles and potentially micromobility for food and parcel delivery. Locations should be prioritized based on land use density and existing exposure from air pollution.	Urban	Plan/Community	-	-	-	-
58	T-53	Electrify Loading Docks	This measure will require that Transport Refrigeration Units and auxiliary power units (APUs) be plugged into the electric grid at the loading dock instead of running on diesel. The indirect GHG emission from electricity generation can partially offset the emissions reduction from fuel reductions. Electrifying loading docks can reduce exposure to air pollutants for workers and drivers.	Urban, suburban, rural	Project/Site	-	-	-	-
59	T-54	Install Hydrogen Fueling Infrastructure	The measure requires projects to implement accessible hydrogen fuel cell fueling infrastructure. Drivers of fuel cell electric vehicles (FCEV), from individual passenger vehicles to haul truck fleets, will be able to refuel using this infrastructure. The expansion of hydrogen fueling locations indirectly supports the uptake of FCEV in place of the typical internal combustion engine vehicle fueled by carbon-emitting gasoline and diesel.	-	Project/Site or Plan/Community	-	-	-	-

Source: *Handbook for Analyzing Greenhouse Gas Emission Reductions, Assessing Climate Vulnerabilities, and Advancing Health and Equity,* Final Draft, by the California Air Pollution Control Officers Association, December 2021.

APPENDIX A:

MCAG TRAVEL DEMAND MODELING SUPPORT SERVICES - SB 743 COORDINATION

FEHR PEERS

Memorandum

Date: October 21, 2022

To: Natalia Austin, MCAG

From: Mike Wallace, Fehr & Peers

CC: Elizabeth Forte and Blake Dunford, MCAG
Ambarish Mukherjee and Ravi Palakurthy, LSA

Subject: MCAG Travel Demand Modeling Support Services (20220727NA)
Task Order 1 – SB 743 Coordination

LA22-3394

This memo summarizes the review performed by Fehr & Peers of the existing travel behavior data and travel model outputs, SB 743 summary data provided by LSA, and recommendations on use of the model for SB 743 application. The review focused on the internalization for Los Banos, the VMT per service population compared to the VMT per person and VMT per employee, and trip distances for trips beyond the model boundary.

Highlights

- Location based services (LBS) data summarized from the StreetLight Data InSight platform were obtained to represent the observed travel patterns in 2019 and 2022.
- Los Banos internal capture in the model (72% in the base year and 76% in the future years) is consistent with the observed data from StreetLight Data (73% in 2019 and 63% in 2022).
- Based on the model and observed data, no changes to the model for Los Banos are recommended.
- Based on the data available, the travel model representation of external travel, and the project schedule, it is recommended that the CHTS data currently being used for external travel continue to be used for this round of target setting. Updates to the model and the data are recommended for the future.
- With the model land use inputs being used in the SB 743 VMT screening, the VMT per service population does not fully reflect the people generating activity and is not recommended for screening. This is especially true for land uses such as hospitals and hotels where visitor population is not in the service population but they generate a

substantial amount of the vehicle travel. Instead, it is recommended that unique uses perform analysis outside of the travel demand model screening framework.

Observed Travel Behavior Details

This section summarizes the travel model and observed data for daily vehicle trips associated with Los Banos. For consistency with the travel model, daily weekday vehicle trips with at least one trip end within Los Banos were obtained from StreetLight Data InSight platform and were summarized at the Census Block Group (CBG) level for 2019 and 2022 to minimize the impact of COVID-19 on travel. The CBG data outside of Los Banos were aggregated to city and county level, with the focus being on trips within Los Banos, within Merced County excluding Los Banos, and trip outside of Merced County. The travel model data for daily vehicle trips were summarized at the same level of geography.

As shown in Table 1, the trips within Los Banos range between 72% and 76% for the model scenarios and 73% and 63% for the StreetLight Data.

Table 1: Summary of Daily Vehicle Travel for Los Banos

Trips between Los Banos	Model				Observed Data	
	2015	2020	2035	2046	2019	2022
Los Banos	72%	76%	76%	76%	73%	63%
Merced County	17%	19%	19%	20%	18%	26%
Outside Merced County	10%	5%	5%	5%	9%	11%

External Travel

Currently the model calculates the travel external to the county by trip purpose and aggregates the trips for traffic assignment. Similarly, the average travel distance at the gateways that reflects travel beyond the county is an estimated total distance for all trips with one trip within the county. To reflect the total distance of travel by purpose for use in SB 743 target setting, screening, and project evaluation, LSA is using the California Household Travel Survey (CHTS). Given the model functionality and other data sources being updated next year, this method will be documented and revised in the future as needed.

VMT per Service Population

The model trip generation and travel activity is based on residential units and non-residential area, with a factor that calculates the persons per household and employees per area based on

the MCAG land use allocations used in the RTP/SCS. The exception to this is for schools which are based on total student enrollment and students are used to estimate employees. This does not cause issues when calculating home-based VMT per household population or home-work VMT per employee since the trips generated are related to the population. For special land use types such as hotels or like hospitals, the trips generated are based on both employees and patients/visitors, while the area is used to calculate only employees. As such, the VMT per service population for special uses may be much higher than other uses due to the exclusion of persons generating activity not included in the service population estimate. It is recommended that rather than using VMT per Service Population as a screening criterion, special uses not be screened out of analysis and instead perform analysis to reflect the characteristics of the land use development.

Next Steps

The model will be updated in 2023 to reflect travel behavior, household travel surveys, and land use changes. Fehr & Peers will coordinate with MCAG staff to determine how the interregional travel is reflected, particularly in the trips exiting the model area. Separating trucks from passenger trips, including interregional transit, and other enhancements to the model may also be considered.