THE CITY OF FONTANA

# DEPARTMENT OF ENGINEERING

## Traffic Engineering Division

FONTANA
CALIFORNIA

# TRAFFIC IMPACT ANALYSIS (TIA) GUIDELINES

# FOR

# VEHICLE MILES TRAVELED (VMT) AND LEVEL OF SERICE ASSESSMENT

**October 21, 2020**

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## 1.0 INTRODUCTION

A Traffic Impact Analysis (TIA) assesses the impacts of traffic generated by a development project on the surrounding transportation network. It serves as a tool for the City to evaluate the effects a development will have on the City's transportation infrastructure, identify improvements required to maintain the City's Level of Service (LOS) standards and address Section XV (Transportation/Traffic) of Appendix G of the California Environmental Quality Act (CEQA) Guidelines. A TIA also help the City identify timing of infrastructure improvements and assists the City in prioritizing infrastructure projects.

The City of Fontana is located in San Bernardino County and as such, the San Bernardino Associated Governments (SANBAG) Congestion Management Plan (CMP) applies to the City. These guidelines generally follow the SANBAG TIA Guidelines, but also address new CEQA requirements and changes some of the requirements in the SANBAG TIA guidelines to address the changes in procedures due to the SANBAG Measure I Nexus Study. For example, with the approval of the Nexus Study, fair share calculations for the programmed improvements are no longer required. This also eliminates the 5-mile limit stated in the SANBAG Nexus Study to address new CEQA rulings.

## 2.0 PURPOSE OF THE GUIDELINES

These TIA guidelines describe the key elements required for preparing TIA reports. The purpose of these guidelines is to formalize a process for the preparation of TIAs within the City, thereby reducing inconsistencies in analysis parameters as well as assist in the subsequent preparation of environmental documents.

## 3.0 WHEN A TRAFFIC IMPACT ANALYSIS IS REQUIRED

Based on the parameters from the SANBAG CMP TIA Guidelines, a TIA must be prepared when a proposed change in land use, development project, or at local discretion, a group of projects are forecast to equal or exceed the CMP threshold of 250 two-way peak hour trips generated, based on trip generation rates published for the applicable use or uses in the Institute of Transportation Engineers' Trip Generation Manual or other approved data source. Pass-by trips shall not be considered in the threshold determination. However, industrial, warehousing and truck projects shall convert trucks to PCE's before applying the above threshold.

It should be noted that based on the parameters from the SANBAG CMP TIA Guidelines, jurisdictions that have implemented qualifying development mitigation fee programs that achieve development contribution requirements established by the SANBAG Development Mitigation Nexus Study are not required to prepare TIA reports for SANBAG review. Fontana is a participant in the SANBAG Measure I Nexus Study fee program and therefore, SANBAG review is not applicable to projects in Fontana. However, Fontana doesn't have agreements with Caltrans regarding State highway facilities within the City, and therefore, based on the CMP, any project meeting the CMP threshold of 250 two-way peak hour trips that expects to add at least 50 two-way peak hour trips to a State highway facility is required to prepare a TIA report for City and Caltrans' review.

- If a project is forecast to generate between 100 and 249 two-way peak hour trips, a traffic impact analysis will be required, but the extent of the analysis will be lesser.
- If a project generates between 50 and 100 two-way peak hour trips, a focused traffic analysis will be required.
- If a project generates less than 50 peak hour trips, a traffic analysis shall not be required, and a trip generation memo will be considered sufficient unless the City has specific concerns related to project access and interaction with adjacent intersections.

## 4.0 ANALYSIS METHODOLOGY

This section discusses the methodologies to be used in a traffic impact analysis.

### 4.1 Intersection Analysis

The traffic impact analysis shall include all intersections with more than 50 peak hour project trips. The City may, at its discretion, require analysis of additional intersections that do not meet the 50-trip threshold. Intersection analysis will be conducted using the latest Highway Capacity Manual (HCM) analysis procedures. In addition, HCM 2000 worksheets should also be provided if requested by the City. It is recommended that a software program that can output multiple HCM methodologies be used for analysis.

### 4.2 Roadway Link Analysis

Urban segments (i.e., segments on roadways that are generally signalized with spacing less than 2 miles) do not require segment analysis. Segment requirements can normally be determined by the analysis of lane requirements at intersections. At locations where the ultimate street cross sections are not constructed, a segment analysis could be required. Roadway link analysis could be conducted either based on daily traffic volumes or based on peak hour volumes using vehicle-to-capacity ratios.

### 4.3 Freeway analysis

Based on SANBAG guidelines, freeway segments with more than 100 two-way peak hour project trips will require analysis and analysis of freeway merge-diverge operations will be required if there are more than 50 peak hour project trips entering (or exiting) the freeway. These thresholds will be based on total vehicles (i.e. passenger cars and trucks if applicable) not on passenger car equivalents because the PCE factors are different for freeway mainline operations and freeway ramps. Freeway analyses shall be conducted using the latest Highway Capacity Manual (HCM) analysis procedures.

## 5.0 STUDY AREA

Intersections with more than 50 peak hour project trips will require analysis. In addition, roadway segments with more than 50 peak hour project trips could require analysis at locations where the ultimate street cross sections are not constructed, a segment analysis could be required. Freeway segments with more than 100 two-way project trips and merge diverge areas with more than 50 peak hour project trips will also be required.

A meeting with Department of Engineering will generally be necessary to discuss the specific scope of the study prior to preparing the traffic study.

## 6.0 ANALYSIS SCENARIOS

The TIA shall include the following analysis scenarios for roadway and intersection analysis:

1. **Existing Conditions** - The existing conditions analysis determines the current baseline for the analysis. The existing conditions analysis also forms the basis for all future analysis scenarios. (Identify any existing deficiencies). This will be based on traffic counts conducted for study intersections. Unless otherwise noted, a.m. and p.m. peak period counts will be conducted for all study intersections. Traffic counts older than one year at the time the scoping letter is submitted will not be acceptable, unless approved by City Traffic Engineering staff.

2. **Opening Year Without Project Conditions** — Opening year without project conditions will be based on application of a growth rate and/or adding traffic from reasonably foreseeable cumulative projects in the area, or by interpolating traffic volumes based on a traffic model.

3. **Opening Year With Project Conditions** — Project traffic will be added to opening year without project traffic volumes to determine opening year with project traffic volumes.

4. **Opening Year With Project Conditions With Mitigation**, if necessary.

5. **Future Build-out Year Without Project Conditions** — Future Year without project traffic volumes will be based on either a traffic model (SBTAM) or based on application of growth rates and addition of cumulative traffic volumes to be determined based on consultation with City staff. Future year will be 20 years from the opening day of the project, rounded up to the nearest multiple of 5.

6. **Future Build-out Year With Project Conditions** — Project traffic will be added to year 2040 without project traffic volumes to determine year 2040 with project traffic volumes.

7. **Future Build-out Year With Project Conditions With Mitigation**, if necessary.

    - If a project generates between 50 and 100 two-way peak hour trips, the analysis will only require Scenarios 1 through 4 identified above as part of a focused traffic analysis.
    - If a project is forecast to generate between 100 and 249 peak hour trips, year 2040 traffic volumes may be based on either an application of growth rate and addition of traffic from cumulative projects or based on the San Bernardino Transportation analysis Model (SBTAM) or other approved model.
    - If a project is forecast to generate more than 250 peak hour trips, year 2040 traffic volumes shall be based on the San Bernardino Transportation analysis Model (SBTAM)

or other approved model.

- For phased projects, the phases shall be identified and analyzed.

## 7.0 ANALYSIS PROCESS

This section discusses the traffic impact analysis process.

### 7.1 Scoping

Staff Consultation is an important part of preparation of a TIA. The consultant shall submit a scoping letter to the City describing the project and including, at minimum, the following information:

- Project Description
- Existing and proposed land uses
- Project Trip Generation
- Study Intersections and Roadway Segments (if required)
- Project Trip Distribution
- Project Trip Assignment
- Analysis Scenarios and Methodologies

The City will review the information provided and discuss the analysis requirements with the Consultant. The study area or other parameters could be changed by the City at this stage. See attached copy, Scoping Agreement for Traffic Impact Study in Appendix A. Copy of the approved scoping agreement should be included in the study appendices.

### 7.2 Trip Generation

The project trip generation shall be based on the latest edition of the ITE Trip Generation Manual. Approval must be obtained from the City prior to using other data sources. Pass by and diverted link trip calculations can be conducted based on the Trip Generation Manual. Pass by and diverted link trips shall be compared to traffic counts on project adjacent roadways to identify if existing traffic can support the pass by reductions. For mixed use projects, internal trip capture can be based on either the Trip Generation Manual or the traffic model.

For industrial uses, the ITE trip generation rates shall be converted to PCE trips based on vehicle splits from the Truck Trip Generation Study prepared by the City of Fontana. Passenger car and truck trips shall be identified separately, as well as the total PCE trips.

<u>Unknown Trip Generation Rates:</u>

For unique trip generators, a trip generation survey might be required. Some unique types of development or uses may not have rates/formulas published by ITE. In this case, a trip generation study may be conducted at a similar existing facility in order to determine acceptable trip generation rates to be used in the study. The type and location of the similar existing facility and the study methodology must be pre-approved by the City Engineer.

## 7.3 Trip Distribution

The project trip distribution shall be based on discussion with City staff. For projects generating more than 250 peak hour trips, the trip distribution shall be based on a traffic model. Distribution of truck traffic shall not be based on the traffic model since other factors such as truck routes play an important role in truck routing.

## 7.4 Background Volume Development

7.4.1 Existing Traffic – Existing traffic counts shall be conducted on a Tuesday, Wednesday, or Thursday on non-holiday weeks. Counts in the vicinity of a school should be taken when the school in session. For the analysis, traffic counts shall be converted to Passenger Car Equivalents (PCEs) based on vehicle classification counts conducted on at least one intersection at each CMP facility. The following PCE conversion factors shall be used:

| | |
|---|---|
| 2-Axle Trucks: | 2.0 PCE |
| 3-Axle Trucks: | 2.5 PCE |
| 4- and more Axle Trucks: | 3.0 PCE |

Intersections at which classification counts are not available shall be converted to PCEs using a factor of 2.5 PCE for all trucks. Traffic volumes at adjacent intersections with inconsistent traffic counts (more than 3% variance in approaches and departures) shall be balanced with the higher traffic volume approach to account for inconsistencies in traffic counts.

For freeway mainline volume development, traffic counts from the most recent Caltrans Counts database shall be used. Truck traffic shall be converted to PCEs based on a PCE factor of 1.5 for all trucks.

7.4.2 Forecast Traffic – All traffic forecasts will be based on PCEs. If a traffic model is used, forecast link volumes shall be identified in PCEs. Standard model post processing techniques shall be used consistent to SANBAG methodologies and then converted to turn volumes based on NCHRP-255 methodologies

## 7.5 Level of Service Analysis

Level of service analysis shall be based on HCM methodologies. The input parameters shall be consistent to the Highway Capacity Manual. The main parameters are summarized below:

| Input Parameter | Value |
|---|---|
| Base Saturation Flow Rate | 1900 pc/hr/ln. |
| Heavy Vehicle Factor | Based on traffic volumes if PCE conversion not conducted. If PCE conversion conducted, then 0%. |
| Cycle Length | 60-130 second. |
| Minimum Green Time | 10 seconds (for through movements only). In high |

| | |
|---|---|
| | pedestrian areas, the minimum green times shall be based on the CAMUTCD walk time calculations. |
| Lost Time | 2 seconds per phase. |
| Peak Hour Factor | Based on counts for existing and near term (less than 5 years) conditions. 0.95 for later scenarios (unless existing PHFs) are higher. |

**8.0 DETERMINATION OF EFFECTS**

The City's General Plan recommends a LOS standard of LOS C. Intersections which are forecast to operate at unsatisfactory conditions (i.e. at LOS worse than LOS C for city intersections) shall be identified as cumulatively deficient intersections.

Determination of deficient intersections will be based on a comparison of without and with project levels of service for each analysis year. An intersection effect occurs if project traffic increases the average delay at an intersection by more than the thresholds identified below.

| Thresholds of Significant Impact | |
|---|---|
| With Project LOS | Significant Impact Threshold |
| A/B | 10.0 Seconds |
| C | 8.0 Seconds |
| D | 5.0 Seconds |
| E | 3.0 Seconds |
| F | 1.0 Seconds |

The thresholds for LOS A, B and C do not apply to projects consistent with the General Plan.

**9.0 CIRCULATION IMPROVEMENTS**

**9.1 Circulation Improvements**

The City's General Plan[1] recommends a LOS standard of LOS C. Circulation improvements shall be recommended for every analysis location where the LOS standard is not met.

Only feasible circulation improvements shall be recommended. Circulation improvements that are determined to be infeasible and factors causing the improvement to be infeasible shall be discussed in the TIA. Funding mechanisms for all circulation improvements identified.

**9.2 Intersection Improvements**

At locations where a project is forecast to have an effect on a deficient intersection,

[1] These standards are subject to change; please review the General Plan to ensure the most recent standards are utilized.

improvements shall be identified to offset the projects' effects. It will be the project's responsibility to improve all intersections to an acceptable LOS. Project fair share costs should be calculated. If improvements are included in a fee program, the cost of implementing the improvements could be credited against fees payable by the project.

### 9.3 Improvement Fair-share Cost Calculations

The percentage of fair-share for the project shall be calculated at each location using the total trips generated by the project divided by the total "new" traffic, which is the net increase in traffic volume from all proposed projects (Other Projects plus Project) and growth using the following formula:

$$\text{Fair share \%} = \frac{\text{Project Trips}}{\text{Project Trips + Future Development Trips}} \times 100\%$$

Trips noted above should correspond to the peak hour where the impact occurs for intersection or daily trips for roadway segment impacts. If a project has impacts during both peak hours, then the analysis should identify the peak hour for fair share assessment that has the highest project burden for fair share contribution.

Prior to the issuance of building permits, the Project Applicant/Owner shall participate in the City's Development Impact Fee (DIF) program by paying the requisite DIF fee at the time of building permit, or as agreed to by the City and Project Applicant/Owner, for the improvements not included in a pre-existing fee program.

The cost of improvements shall be estimated using verifiable cost estimates from reliable and recognized sources such as the CMP guidelines. Fair-share cost of improvements shall be calculated using the fair-share percentage of the project volumes multiplied by total estimated cost of mitigation.

### 9.4 Traffic Signal Warrant Analysis

Intersections at which traffic signals are identified as improvements shall be evaluated for traffic signal warrants based on the California MUTCD for peak hour signal warrants unless data shows that other warrants could be applicable. The warrants analysis should be included in the study appendices.

## 10.0 SITE ACCESS AND SAFETY ANALYSIS

A site access analysis shall be conducted to verify driveway spacing, sight distances, and consistency with the City of Fontana Access Management Plan. The following analysis are recommended to improve project access circulation and to limit driveways and local access on arterial streets:

a. **Intersection Sight Distance** – All on-site intersections, project access driveways or streets to public roadways should provide adequate sight distance. Adequate intersection sight distance should be determined using the Caltrans Highway Design Manual.

b. **Driveway Length and Gated Entrance –** Primary project driveways should have a throat of sufficient length to allow vehicles to enter the project area without causing subsequent vehicles to back out onto the City street system. A turn around should be provided at all gated entrances.
c. **Limit Driveway Impacts –** Driveways and local streets access on arterial streets should be limited to minimize the impacts on arterial streets. Driveways should be located so as to maintain a reasonable distance from an adjacent intersection and/or driveway. Whenever possible, driveways shall be consolidated with adjacent properties.
d. **Corner Clearance –** A driveway should be a sufficient distance from a signalized intersection so that right-turn egress movements do not interfere with the right-turn queue at the intersection. In addition, every effort should be made to provide right-turn egress movements with sufficient distance to enter the left-turn pocket at the adjacent intersection.
e. **Right Turn Lanes at Driveways –** If the project right turn peak hour volume is 50 or more vehicles, a right-turn deceleration lane should be reviewed for appropriateness, when feasible, on all driveways accessing major and primary arterials. The length of right turn lane should be sufficient to allow a vehicle traveling at the posted speed to decelerate before entering the driveway as outlined in the Caltrans Highway Design Manual.
f. Adequacy of pedestrian Facilities.
g. Bicycle accessibility.
h. Accessibility from adjacent transit stops.

## 11.0 SPECIAL ISSUES

Although the above guidelines are applicable for most land development projects, special uses such as churches, school, special events venues, etc. might require additional or different analysis parameters. Please consult with City staff to verify analyses needs for special uses.

## 12.0 CEQA ASSESSMENT - VMT ANALYSIS

A key element of SB 743, signed in 2013, is the elimination of automobile delay and LOS as the sole basis of determining CEQA impacts. The most recent CEQA guidelines, released in December 2018, recommend VMT as the most appropriate measure of project transportation impacts. However, SB 743 does not prevent a city or county from continuing to analyze delay or LOS as part of other plans (i.e., the general plan), studies, or ongoing network monitoring.

The following recommendations assist in determining VMT impact thresholds and mitigation requirements for various land use project's Transportation Impact Studies.

### 12.1 Analysis Methodology

For purposes of SB 743 compliance, a VMT analysis should be conducted for land use projects as deemed necessary by the Traffic Division and would apply to projects that have the potential to increase the average VMT per service population (e.g. population plus employment) compared to the County's boundary. Normalizing VMT per service population essentially provides a transportation efficiency metric that the analysis is based on. Using this efficiency metric allows the user to compare the project to the remainder of the unincorporated area for purposes of identifying transportation impacts.

These guidelines are based on the SBCTA SB 743 Implementation Study which provides options for both methodologies and VMT screening. The methodologies and significance thresholds presented below are based on SBCTA recommendations from the Implementation Study.

## 12.2 Project Screening

There are four types of screening that lead agencies can apply to effectively screen projects from project-level assessment. These screening steps are summarized below:

**Step 1: Transit Priority Area (TPA) Screening**

Projects located within a TPA[2] may be presumed to have a less than significant impact absent substantial evidence to the contrary. This presumption may ***NOT*** be appropriate if the project:

1. Has a Floor Area Ratio (FAR) of less than 0.75;
2. Includes more parking for use by residents, customers, or employees of the project than required by the City requirements;
3. Is inconsistent with the applicable Sustainable Communities Strategy (as determined by the lead agency, with input from the Metropolitan Planning Organization); or
4. Replaces affordable residential units with a smaller number of moderate or high-income residential units.

**Step 2: Low VMT Area Screening**

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

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[2] A TPA is defined as a half mile area around an existing major transit stop or an existing stop along a high quality transit corridor per the definitions below.

Pub. Resources Code, § 21064.3 - 'Major transit stop' means a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.

Pub. Resources Code, § 21155 - For purposes of this section, a 'high-quality transit corridor' means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours.

For this screening in the SBCTA area, the SBTAM travel forecasting model was used to measure VMT performance for City of Fontana and for individual traffic analysis zones (TAZs). TAZs are geographic polygons similar to Census block groups used to represent areas of homogenous travel behavior. Total daily VMT per service population (population plus employment) was estimated for each TAZ. This presumption may not be appropriate if the project land uses would alter the existing built environment in such a way as to increase the rate or length of vehicle trips.

To identify if the project is in a low VMT-generating area, the analyst may review the SBCTA screening tool and apply the appropriate threshold, identified in Section 13.0, within the tool. Additionally, as noted above, the analyst must identify if the project is consistent with the existing land use within that TAZ and use professional judgement that there is nothing unique about the project that would otherwise be mis-represented utilizing the data from the travel demand model.

The SBCTA screening tool can be accessed at the following location:

https://sbcta.maps.arcgis.com/apps/webappviewer/index.html?id=779a71bc659041ad995cd48d9ef4052b users may identify the San Bernardino Transportation Analysis Model (SBTAM) traffic analysis zone (TAZ) in which the project is located.

Projects located in TAZs without baseline VMT data should perform VMT modeling using SBTAM to determine the appropriate project VMT rate.

**Step 3: Low Project Type Screening**

Local serving retail projects less than 50,000 square feet may be presumed to have a less than significant impact absent substantial evidence to the contrary. Local serving retail generally improves the convenience of shopping close to home and has the effect of reducing vehicle travel. Local serving[3] retail include the following:

- Supermarket
- Restaurant/café/bar
- Coffee/donut shop
- Dry cleaners
- Barbershop
- Hair/nails salon
- Walk-in medical clinic

[3] Other local serving uses may be eligible for screening at the direction of the Planning or Engineering Directors.

- Urgent care
- Auto repair/tire shop
- Gyms/health club
- Dance/yoga/fitness/material arts studio

In addition to local serving retail, the following local serving uses can also be presumed to have a less than significant impact absent substantial evidence to the contrary as their uses are local serving in nature:

- Local-serving K-12 schools
- Local parks
- Day care centers
- Local-serving gas stations
- Local-serving banks
- Local-serving hotels (e.g. non-destination hotels)
- Student housing projects on or adjacent to college campuses
- Local-serving assembly uses (places of worship, community organizations)
- Community institutions (Public libraries, fire stations, local government)
- Local serving community colleges that are consistent with the assumptions noted in the RTP/SCS
- Affordable or supportive housing
- Assisted living facilities
- Senior housing (as defined by HUD)

**Step 4: Project net daily trips less than 500 ADT**

Projects that generate fewer than 500 average daily trips (ADT) would not cause a substantial increase in the total citywide or regional VMT and are therefore presumed to have a less than significant impact on VMT. Appendix B, City of Fontana SB 743 Small Project Testing, provides additional discussion and analysis regarding the application of the 500 ADT screening criteria and how it has been established within the context of CEQA.

The latest edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual is the preferred source for calculating trip generation in the City of Fontana. The use of other sources of trip generation must be approved by the Engineering Department. The screening criteria trip limit is based on net trip generation after considering pass-by, internal capture, affordable housing, and/or existing land use trips.

- Pass-by trips include the portion of the project traffic that is already on the adjacent roadway and passes by the site as an intermediate stop. Typically applied to retail/commercial uses only. Pass-by should be consistent with ITE or other verified sources.

- Internal capture trips are trips that both begin and end on the project site. Commonly found in mixed-use developments, internal capture trips are often taken as walking or bicycling trips and can significantly reduce VMT. Internal capture credits should be consistent with the NCHRP Report 684 Enhancing Trip Capture Estimation for Mixed-Use Developments or other verified sources.

- Affordable housing trip credits can be taken for any dwelling unit within a project that is deemed affordable, as defined by the Planning Department.

- Existing land use trip credits can be taken for land uses on a project site that are currently or have been operational within 6 months from the time the application is filed.

Projects which generate less than 500 ADT include the following:

- Single family residential – 52 Dwelling Units or fewer
- Multi-family residential – 68 Dwelling Units or fewer
- General Office – 51,000 square feet or less
- Light Industrial – 100,000 square feet or less
- Warehousing – 287,000 square feet or less
- High-Cube Fulfillment Center Warehouse – 357,000 square feet or less

### 12.3 VMT Assessment for Non-Screened Development

Projects not screened through the steps above should complete VMT analysis and forecasting through the SBTAM model to determine if they have a significant VMT impact. This analysis should include 'project generated VMT' and 'project effect on VMT' estimates for the project TAZ (or TAZs) under the following scenarios:

- Baseline conditions - This data is already available in the web screening map.

- Baseline plus project for the project - The project land use would be added to the project TAZ or a separate TAZ would be created to contain the project land uses. A full base year model run would be performed and VMT changes would be isolated for the project TAZ and across the full model network. The model output must include reasonableness checks of the production and attraction balancing to ensure the project effect is accurately captured. If this scenario results in a less-than-significant impact, then additional cumulative scenario analysis may not be required.

- Cumulative no project - This data is available from SBCTA.

- Cumulative plus project - The project land use would either be added to the project TAZ or a separate TAZ would be created to contain the project land uses. The addition of project land uses should be accompanied by a reallocation of a similar amount of land use from other TAZs; especially if the proposed project is significant in size such that it would change other future developments. Land use projects will generally not change the cumulative no project control totals for population and employment growth. Instead, they will influence the land use supply through changes in general plan land use designations and zoning. If project land uses are simply added to the cumulative no project scenario, then the analysis should reflect this limitation in the methodology and acknowledge that the analysis may overestimate the project's effect on VMT.

The model output should include total VMT, which includes all vehicle trips and trip purposes, and VMT per service population (population plus employment). Total VMT (by speed bin) is needed as an input for air quality, greenhouse gas (GHG), and energy impact analysis while total VMT per service population is recommended for transportation impact analysis[4].

Both "plus project" scenarios noted above will summarize two types of VMT: (1) project generated VMT per service population and comparing it back to the appropriate benchmark noted in the thresholds of significance, and (2) the project effect on VMT, comparing how the project changes VMT on the network looking at Citywide VMT per service population or a sub-regional VMT per service population and comparing it to the no project condition.

Project-generated VMT shall be extracted from the travel demand forecasting model using the origin-destination trip matrix and shall multiply that matrix by the final assignment skims. The project-effect on VMT shall be estimated using a sub-regional boundary and extracting the total link-level VMT for both the no project and with project condition.

In some cases, it may be appropriate to extract the Project-generated VMT using the production-attraction trip matrix. This may be appropriate when a project is entirely composed of retail or office uses, and there is a need to isolate the home-based-work (HBW) VMT for the purposes of isolating commute VMT. *The City should evaluate the appropriate methodology based on the project land use types and context.*

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[4] This assumes that the lead agency will use VMT per service population for its impact threshold. If a lead agency decides to isolate VMT by trip purpose, then the lead agency would need to update this section of the recommended guidelines.

## 13.0 CEQA VMT Impact Thresholds

A project would result in a significant project-generated VMT impact if either of the following conditions are satisfied:

1. The baseline project-generated VMT per service population exceeds 15% below the baseline County of San Bernardino VMT per service population, or
2. The cumulative project-generated VMT per service population exceeds 15% below the baseline County of San Bernardino VMT per service population.

The project's effect on VMT would be considered significant if it resulted in either of the following conditions to be satisfied:

1. The baseline link-level boundary VMT per service population (City boundary) to increase under the plus project condition compared to the no project condition), or
2. The cumulative link-level boundary VMT per service population (City boundary) to increase under the plus project condition compared to the no project condition).

Please note that the cumulative no project shall reflect the adopted RTP/SCS; as such, if a project is consistent with the regional RTP/SCS, then the cumulative impacts shall be considered less than significant subject to consideration of other substantial evidence

## 14.0 CEQA VMT Mitigation Measures

To mitigate VMT impacts, the following choices are available to the applicant:

- Modify the project's built environment characteristics to reduce VMT generated by the project.
- Implement transportation Demand Management (TDM) measures to reduce VMT generated by the project.
  - Implement pedestrian and sidewalk improvements that meet or exceed the minimum requirements of the City of Fontana Municipal Code.
  - If constructing pedestrian network improvements is not necessary or feasible on or adjacent to the project site, then provide a fair share payment to a fund designated for off-site pedestrian network improvements somewhere else in the City (may require a nexus study)
  - Construct bicycle network improvements along the project's frontage consistent with the Community Mobility and Circulation of the adapted General Plan.
  - If constructing bicycle network improvements is not necessary or feasible on or adjacent to the project site, then provide a fair share payment to fund designated off-site bicycle network improvements somewhere else in the City (may require a nexus study).

- Participate in a VMT fee program and/or VMT mitigation exchange/banking program (if they exist) to reduce VMT from the project or other land uses to achieve acceptable levels.

As part of the SBCTA Implementation Study, key TDM measures that are appropriate to the region were identified. Measures appropriate for most of the SBCTA region are summarized in the technical memorandum "SB743 Implementation Mitigation and TDM Strategy Assessment" (provided in Appendix C). Evaluation of VMT reductions should be evaluated using state-of-the-practice methodologies recognizing that many of the TDM strategies are dependent on building tenant performance over time. As such, actual VMT reduction cannot be reliably predicted, and monitoring may be necessary to gauge performance related to mitigation expectations.

## 15.0 CEQA Assessment – Active Transportation and Public Transit Analysis

Potential impacts to public transit, pedestrian facilities and travel, and bicycle facilities and travel can be evaluated using the following criteria.

- A significant impact occurs if the project conflicts with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decreases the performance or safety of such facilities.

Therefore, the TIA should include analysis of a project to examine if it is inconsistent with adopted policies, plans, or programs regarding active transportation or public transit facilities, or otherwise decreases the performance or safety of such facilities and make a determination as to whether it has the potential to conflict with existing or proposed facilities supporting these travel modes

## 16.0 Transportation Impact Study Format

The recommended TIA format is as follows:

1. Executive Summary
    a. Table summarizing significant impacts and mitigation measures
2. Introduction
    a. Purpose of the TIA and study objective
    b. Project location and vicinity map (Exhibit)
    c. Project size and description
    d. Existing and proposed land use and zoning
    e. Site plan and proposed project (Exhibit)
    f. Proposed project opening year and analysis scenarios
3. Methodology and Impact Thresholds

4. Existing Conditions
    a. Existing roadway network
    b. Existing traffic control and intersection geometrics (Exhibit)
    c. Existing traffic volumes – AM and PM peak hour and ADT (Exhibit)
    d. Existing level of service (LOS) at intersections (Table)
    e. Existing bicycle facilities (Exhibit)
    f. Existing transit facilities (Exhibit)
    g. Existing pedestrian facilities
5. Project Traffic
    a. Trip generation (Table)
    b. Trip distribution and assignment (Exhibit)
    c. Project peak hour turning movements and ADT (Exhibit)
6. Background Conditions (Opening Year) Analysis
    a. No Project analysis
        i. Committed (funded) roadway improvements
        ii. Approved project trip generation (Table, if required)
        iii. Approved project trip assignment and distribution (Exhibit, if required)
        iv. Peak turning movement and ADT (Exhibit)
        v. Intersection level of service (Table)
        vi. Roadway segment level of service (Table)
    b. Plus Project analysis
        i. Plus Project peak turning movement and ADT (Exhibit)
        ii. Intersection level of service (Table)
        iii. Roadway segment level of service (Table)
        iv. Identification of intersection and roadway segment deficiencies
7. Cumulative Year Analysis
    a. No Project analysis
        i. Committed (funded) roadway improvements
        ii. Pending projects and verification of how they are included in the travel demand forecasting model
        iii. Cumulative Year peak turning movement and ADT (Exhibit)
        iv. Intersection level of service (Table)
        v. Roadway segment level of service (Table)
    b. Plus Project Analysis

        i. Plus Project peak turning movement and ADT (Exhibit)
        ii. Intersection level of service (Table)
        iii. Roadway segment level of service (Table)
        iv. Identification of intersection and roadway segment deficiencies

8. Traffic Signal Warrant Analysis
9. Site Access Analysis
10. Safety and Operation Improvement Analysis
11. Active Transportation and Public Transit Analysis
12. Improvements and Recommendations
    a. Proposed improvements at intersections
    b. Proposed improvements at roadway segments
    c. Recommended Improvements categorized by whether they are included in fee plan or not. (Identify if these improvements are included in an adopted fee program)
13. Vehicle Miles Traveled (VMT) Analysis
    a. Project VMT per person/employee for all analysis scenarios
    b. Project effect on VMT for all analysis scenarios
    c. Identification of VMT impacts
    d. Proposed VMT Mitigation Measures
14. Appendix
    a. Approved scope of work
    b. Traffic counts
    c. Intersection analysis worksheets
    d. VMT and TDM calculations
    e. VMT and TDM mitigation calculations
    f. Signal warrant worksheets

# Appendix A

City of Fontana Scoping Agreement for Traffic Impact Study

## *Exhibit A*

# SCOPING AGREEMENT FOR TRAFFIC IMPACT STUDY

This letter acknowledges the City of Fontana Engineering Department requirements for traffic impact analysis of the following project. The analysis must follow the SBCTA Congestion Management Plan (CMP) Guidelines Updated 2016.

Case No. (i.e. TR, PM, CUP, PP)
Related Cases -
SP No. ______
EIR No. ______
GPA No. ______
CZ No. ______
Project Name: ______
Project Address: ______
Project Description: ______

| | Consultant | Developer |
|---|---|---|
| Name: | | |
| Address: | | |
| | | |
| Telephone: | | |
| Fax: | | |

**A. Trip Generation Source:** (ITE 10th Edition)

Current GP Land Use ______ Proposed Land Use ______

Current Zoning ______ Proposed Zoning ______

| | Current Trip Generation In | Out | Total | Proposed Trip Generation In | Out | Total |
|---|---|---|---|---|---|---|
| AM Trips | | | | | | |
| PM Trips | | | | | | |

Internal Trip Allowance ☐ Yes ☐ No ( ______ % Trip Discount)
Pass-By Trip Allowance ☐ Yes ☐ No ( ______ % Trip Discount)

A pass-by trip discount is allowed for appropriate land uses per ITE trip generation handbook 3rd edition. The pass-by trips at adjacent study area intersections and project driveways shall be indicated on a report figure. (Attach table for detailed trip generation)

**B. Trip Geographic Distribution:** N ____ % S ____ % E ____ % W ____ %
(attach exhibit for detailed assignment)

**C. Background Traffic**

Project Opening & Future Build-Out Year: ______

Annual Ambient Growth Rate: ____ %

Phase Year(s) ______
Other area projects to be analyzed: ______

______

Model/Forecast methodology ______

*Exhibit B – Scoping Agreement – Page 2*

**D. Study intersections:** *(NOTE: Subject to revision after other projects, trip generation and distribution are determined, or comments from other agencies.)*

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________
8. ______________________
9. ______________________
10. ______________________

**E. Study Roadway Segments:** *(NOTE: Subject to revision after other projects, trip generation and distribution are determined, or comments from other agencies.)*

1. ______________________
2. ______________________
3. ______________________
4. ______________________
5. ______________________
6. ______________________
7. ______________________
8. ______________________
9. ______________________
10. ______________________

**E. Other Jurisdictional Impacts**

Is this project within a City's Sphere of Influence or one-mile radius of City boundaries? ☐ Yes ☐ No

If so, name of City Jurisdiction: ______________________

**F. Site Plan** (please attach reduced copy)

**G. Specific issues to be addressed in the Study (in addition to the standard analysis described in the Guideline)** (To be filled out by Engineering Department)
*(NOTE: If the traffic study states that "a traffic signal is warranted" (or "a traffic signal appears to be warranted," or similar statement) at an existing unsignalized intersection under existing conditions, 8-hour approach traffic volume information must be submitted in addition to the peak hourly turning movement counts for that intersection.)*

______________________________________________

**H. Existing Conditions**

Traffic count data must be new or recent. Provide traffic count dates if using other than new counts.
Date of counts______________________________________________

**Recommended by:**

______________________ ________
Consultant's Representative Date

**Approved Scoping Agreement:**

______________________
City of Fontana Traffic Engineer Date

Scoping Agreement Submitted on ____________

Revised on ________________

# Appendix B

## City of Fontana SB 743 Small Project Testing

# City of Fontana SB 743 Small Project Testing

## Background

Senate Bill (SB) 743 mandates that VMT replace LOS as the transportation metric under CEQA. As a result, the City of Fontana updated their TIA Guidelines to reflect VMT analysis for CEQA documents. The California Governor's Office of Planning and Research (OPR) issued a Technical Advisory in December 2018 which described their recommended procedures and methodology for VMT analysis. The OPR technical advisory recommended a small project screening of 110 Average Daily Trips (ADT). The Technical Advisory notes that CEQA provides categorical exemption 15303 for existing facilities, including additions to existing structures of up to 10,000 square feet (in urbanized areas), so long as the project is in an area where public infrastructure is available to allow for maximum planned development and the project is not in an environmentally sensitive area. OPR determined that "typical project types for which trip generation increases relatively linearly with building footprint (i.e., general office building, single tenant office building, office park, and business park) generate or attract 110-124 trips per 10,000 square feet". They concluded that absent substantial evidence otherwise, the addition of 110 or fewer trips could be presumed to have a less than significant impact.

This criteria is intended to screen small projects, but the City of Fontana has expressed concern that this level of development is not representative of a small project in the City. Furthermore, SB 743 has three stated goals: to reduce greenhouse gas emissions, to promote public health through active transportation, and to promote infill development. The City of Fontana believes that a small project screening criteria that is more reflective of small project developments in the City would assist in achieving the three stated goals associated with SB 743 as outlined below.

In order to test the definition of a small project while maintaining consistency with the goal of SB 743 to reduce GHG emissions, the City of Fontana retained Fehr & Peers to test how projects generating 500 ADT would effect Citywide VMT. Placeworks was also engaged to assist in determining what size project would generate 3,000 metric tons of carbon dioxide equivalent consistent with small project screening currently utilized for GHG emissions assessment in the South Coast Air Quality Management District guidelines.

## SBTAM VMT Testing

The San Bernardino Transportation Analysis Model (SBTAM) was utilized to test the change in Citywide VMT from six different land use projects that generate 500 ADT. The purpose of this testing was to determine if 500 ADT could be considered a "small project", or one that has a negligible effect on VMT, for the purposes of screening projects form VMT assessment.

Per the Institute of Transportation Engineers (ITE) 10th Generation Trip General Manual, Projects generating less than 500 daily vehicle trips generally corresponds to the following "typical" development potential:

- 52 single family housing units

- 68 multi-family, condominiums, or townhouse housing units
- 51,000 sq. ft. of office
- 100,000 sq. ft. of light industrial
- 287,000 sq. ft. of warehousing
- 357,000 sq. ft. of high cube transload and short-term storage warehouse

The Citywide boundary method VMT was calculated using the SBTAM 2016 base year model provided by SBCTA. The noted residential, office, and industrial projects were then added to the model to determine what, if any, change there would be in Citywide VMT. **Table 1** presents the results of this analysis.

**Table 1: Change in Citywide VMT with Developments Generating 500 ADT**

| Development | Citywide No Build Total VMT | Citywide Plus Project Total VMT | Change in Total VMT | Percent Change in Total VMT | Citywide No Build Total VMT per SP | Citywide Plus Project Total VMT per SP | Change in Total VMT per SP |
|---|---|---|---|---|---|---|---|
| Single family housing units | 2,614,262 | 2,574,154 | 1,733 | 0.07% | 9.689 | 9.685 | -0.004 |
| Multi-family, condominiums, or townhouse housing units | 2,614,262 | 2,615,046 | 784 | 0.03% | 9.689 | 9.679 | -0.010 |
| Office | 2,614,262 | 2,614,768 | 506 | 0.02% | 9.689 | 9.683 | -0.006 |
| Industrial[1] | 2,614,262 | 2,614,737 | 475 | 0.02% | 9.689 | 9.686 | -0.003 |

Source: SBTAM; Fehr & Peers, 2020

Notes:

1. SBTAM does not differentiate between Light industrial, Warehousing, and High cube transload and short-term storage warehouse. This test run represents all three of these use types generating 500 ADT. The GHG testing presented below distinguishes the differences between these use type's potential to generate GHG emissions.

Residential, office, and industrial projects all increase the total Citywide VMT by less than 0.1%. For non-residential development the change was less than 0.02%. These changes are very small when compared to VMT across the City.

Furthermore, the change in VMT per Service Population (residents plus employees) decreases with the addition of all project types that generate 500 ADT. It should be noted that the test projects were coded into zones that were representative of the City average VMT per service population to represent a "neutral" location. Test projects were not coded into a Low VMT area (as defined by the City's guidelines).

These results indicate that, for all tested project land use types, a project generating 500 ADT would generally not increase VMT and would likely result in a less than significant impact under the City's adopted VMT threshold of significance.

**CalEEMod GHG Testing**

In an effort to better correlate VMT thresholds to the greenhouse gas (GHG) thresholds for projects in the City of Fontana, Placeworks has identified screening sizes based on ADT specific to VMT generated by these types of projects in the City that would trigger the 3,000 metric tons of carbon dioxide equivalent (MTCO2e) per year threshold identified by the South Coast Air Quality Management District (South Coast AQMD) Working Group. Please note that this South Coast AQMD threshold is in draft form and has not been formally adopted.

Placeworks modified the default CalEEMod inputs to reflect local conditions.

Default transportation sector emissions data in CalEEMod are based on CARB's 2014 Emissions Factor Model (EMFAC). Since CalEEMod was released, CARB has released EMFAC 2017, which was approved by the US Environmental Protection Agency (EPA) in August 2019. Additionally, as a result of the relaxed federal GHG emissions and fuel economy standards under the Trump Administration's Safer Affordable Fuel-Efficient Vehicles for Model Years 2021-2026 Passenger Cars and Light Trucks (Final SAFE Rule), CARB released adjustment factors to EMFAC2014 and EMFAC2017, which are not accounted for in the default settings of CalEEMod1. Emissions factors in CalEEMod have been updated with the EMFAC2017 version 1.0.3 emissions factors for calendar year 2020 and the SAFE Rule adjustment factors released by CARB.

The trip generation rates for each of the land uses were provided by Fehr & Peers. These trip generation rates were derived from the SBTAM model for projects of these use types in the City of Fontana.

Average trip lengths are provided by Fehr & Peers and supplemented by CARB data. For the Industrial land use category, separate trip lengths were used for passenger cars and trucks (i.e., LDT, MDT, and HDT). All other land uses use the same average trip length for both passenger cars and trucks due to the low number of truck trips overall (0.5 percent of all trips).

All trip lengths were derived from the SBTAM model for projects of these use types in the City of Fontana, with the exception of the truck trip length, which references the noted CARB data2.

A summary of the screening sizes that would fall below 3,000 MTCO2e per year is shown in **Table**

---

1 CARB. 2020, June 26. EMFAC Off-Model Adjustment Factors for Carbon Dioxide (CO2) Emissions to Account for the SAFE Vehicles Rule Part One and the Final SAFE Rule. https://ww3.arb.ca.gov/msei/emfac_off_model_co2_adjustment_factors_06262020-final.pdf.

2 California Air Resources Board. 2007, October. Emissions Estimation Methodology for On-Road Diesel-Fueled Heavy-Duty Drayage Trucks at California Ports and Intermodal Rail Yards. Appendix B of Proposed Regulation for Drayage Trucks: Initial Statement of Reasons for Proposed Rulemaking. https://ww3.arb.ca.gov/msei/onroad/downloads/drayage_trucks/appbf.pdf.

**2.**

**Table 2: Projects Generating Below 3,000 MTCO2e**

| Development | ADT | MTCO2e Per Year |
|---|---|---|
| Single family housing units | 1,442 | 2,992 |
| Multi-family, condominiums, or townhouse housing units | 1,865 | 2,992 |
| Office | 1,328 | 2,997 |
| Light Industrial | 613[1] | 2,998 |
| Warehousing | 698[1] | 2,996 |
| High Cube Transload and short-term storage warehouse | 696[1] | 2,996 |

Source: Placeworks, 2020
Notes:

1. Light Industrial, Warehousing, and High Cube Transload and short-term storage warehouse ADT are presented as the sum of passenger vehicles and trucks as Passenger Car Equivalent (PCE).

The screening sizes identified by Placeworks show that the residential and office uses generate 3,000 MTCO2e per year when the project generates over 1,000 ADT. For the three industrial uses, projects generate 3,000 MTCO2e per year when the project generates over 600 ADT. For these uses, it would be reasonable to conclude that since projects generating over 600 ADT produce less than 3,000 MTCO2e per year, projects that generate 500 ADT would similarly generate less than 3,000 MTCO2e per year.

**Conclusions**

VMT testing using SBTAM and GHG testing using CalEEMod have demonstrated that projects generating 500 ADT in the City of Fontana will likely have a negligible effect on the Citywide VMT and would generate fewer than 3,000 MT CO2e per. Based on this assessment, the City could make a finding that projects generating 500 or fewer daily trips could be considered small and could be considered for low project screening.

# Appendix C

## SB743 Implementation Mitigation and TDM Strategy Assessment

## Technical Memorandum

FEHR PEERS

**TECHNICAL MEMORANDUM**

**Date:** 11.11.19

**To:** Steve Smith (SBCTA), Josh Lee (SBCTA), Albert Espinoza (City of Rancho Cucamonga), Jason Welday (City of Rancho Cucamonga), Baldwin Ngai (City of Rancho Cucamonga)

**From:** Jason Pack, PE and Delia Votsch, PE

**Subject:** SB 743 Implementation Mitigation and TDM Strategy Assessment OC18-0585

This technical memorandum summarizes our assessment of new research related to transportation demand management (TDM) effectiveness for reducing vehicle miles of travel (VMT). The purpose of this work was to understand what options are available to mitigate VMT, to compile new TDM information that has been published in research papers since release of the *Quantifying Greenhouse Gas Mitigation Measures,* CAPCOA, August 2010 and to identify those strategies suited to SBCTA member jurisdictions given the varying land use context. The land use and transportation context for SBCTA presents a challenge to the effectiveness of common TDM strategies for VMT reduction when applied at individual project sites due to limited travel choices. The matrix in Attachment A summarizes the overall evaluation of all the CAPCOA strategies while the matrix in Attachment B identifies the top twelve strategies suited for the study area.

# Mitigation Programs

The approach to the overall assessment includes two parts. The first part evaluated how VMT reduction strategies or projects could be developed or incorporated into existing funding programs such as Transportation Impact Fee (TIF) program. The purpose of incorporating VMT reduction strategies directly into existing programs is to provide greater certainty and effectiveness for VMT impact mitigation. The second part of the assessment identified potential new mitigation program concepts that may be worthy of further evaluation.

## Existing Programs

Most SBCTA member jurisdictions maintain Traffic Impact Fees. These programs collect a fair-share fee payment from new development to contribute to the cost of a capital improvement program (CIP) consisting of long-term transportation network expansion projects identified to accommodate planned population and employment growth. A common theme for the existing programs is that they focus on vehicle trips or vehicle LOS as the key metric for determining deficiencies and developing CIP projects.

In their current form, most of the impact fees would not qualify as VMT impact mitigation programs. Most CIPs include roadway capacity expansion that contributes to VMT increases. Expanding roadway capacity in congested areas induces new vehicle travel that diminishes congestion relief benefits and generates new VMT and emissions. Refer to the following websites for more research information and technical details.

- http://www.dot.ca.gov/newtech/researchreports/reports/2015/10-12-2015-NCST_Brief_InducedTravel_CS6_v3.pdf
- https://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_brief.pdf
- https://trrjournalonline.trb.org/doi/abs/10.3141/2653-02

Many CIPs also include operational improvements, such as signal coordination projects, which would not contribute to an increase in VMT. Most CIPs also include some transit, bicycle, and pedestrian projects that could contribute to VMT reduction.

If the transit, bicycle, and pedestrian projects were separated into a stand-alone CIP with a supporting nexus study based on VMT reduction, then a new VMT fee program could be developed that is dedicated to VMT impact mitigation. This could be a new program implemented by the SBCTA member jurisdictions as a collaborative or as individual jurisdictions. An example of this type of program has been developed the City of Los Angeles as part of their Coastal Transportation Corridor Specific Plan and West Los Angeles Transportation Improvement and Mitigation Specific Plan. Details are provided at the following website. http://www.westsidemobilityplan.com/ctcspwla-timp-final-eir/

It may also be possible for a development project applicant to fully fund a transit, bicycle, or pedestrian project from a CIP as an alternative to paying the fee directly. Some fee programs currently allow fee credits for development that expedites and completes CIP-identified projects. Using this option requires inclusion of the mitigation in a development agreement or an EIR.

Managing and reducing demand could accomplish the goal of reducing peak period VMT. The main source of congestion is typically defined as vehicles move too slowly (i.e., peak period speeds are lower than posted speed limits). This definition of congestion describes a symptom and fails to recognize that peak period travel consists of vehicles with poor seat utilization caused by not managing demand more effectively and mispricing travel demand. The existing roadway network has a limited capacity and this capacity is routinely filled up during peak periods in San Bernardino County by vehicles with solo drivers (i.e., low seat utilization). Further, limited facilities exist that prioritize travel by high occupancy vehicles. Increasing vehicle speeds and reducing delays substantially requires much greater seat utilization in existing vehicles (i.e., private vehicles and public transit). This change would also reduce VMT. Hence, refocusing on the combination of congestion management and VMT reduction would result in a different CIP that could qualify as VMT impact mitigation.

## New Mitigation Program Concepts

Beyond the conventional programs described above are two new concepts that are not currently available in The SBCTA area. For purposes of this study, these programs are defined as follows.

- **VMT Mitigation Exchange** – An exchange program is a concept where VMT generators can select from a pre-approved list of mitigation projects that may be located within the same jurisdiction or possibly from a larger area. The intent is to match the project's needed VMT reduction with a specific mitigation project of matching size and to provide evidence that the VMT reduction will reasonably occur.

- **VMT Mitigation Bank** – A mitigation bank is intended to serve as an entity or organization that pools fees from development projects across multiple jurisdictions to spend on larger scale mitigation projects. This concept differs from the more conventional impact fee program approach described above in that the fees are directed to a few larger projects that have the potential for a more significant reduction in VMT and the program is regional in nature.

As these new mitigation program concepts are still evolving, the specific descriptions and elements of the programs will likely change. The first resource document to describe and assess these programs was recently published by U.C. Berkeley and is entitled, "Implementing SB 743, An Analysis of Vehicle Miles Traveled Banking and Exchange Frameworks," The University of California Institute of Transportation Studies, October 2018. This document is a useful starting place for a dialogue about these programs.

The findings of the report are supportive of these concepts noting the following about the reasoning for their consideration.

> *Yet while methods for reducing VMT impacts—such as mileage pricing mechanisms, direct investments in new public transit infrastructure, transit access subsidies, and infill development incentives—are well understood, they may be difficult in some cases to implement as mitigation projects directly linked or near to individual developments. As a result, broader and more flexible approaches to mitigation may be necessary. In response, state and local policy makers are considering the creation of mitigation "banks" or "exchanges." In a mitigation bank, developers*

*would commit funds instead of undertaking specific on-site mitigation projects, and then a local or regional authority could aggregate these funds and deploy them to top-priority mitigation projects throughout the jurisdiction. Similarly, in a mitigation exchange, developers would be permitted to select from a list of pre-approved mitigation projects throughout the jurisdiction (or propose their own), without needing to mitigate their transportation impacts on-site. Both models can be applied at a city, county, regional, and potentially state scale, depending on local development patterns, transportation needs and opportunities, and political will.*

This reasoning is important for lead agencies in the SBCTA area because mitigating VMT impacts on a project-by-project basis is challenging especially in suburban land use contexts where travel choices are limited. That said, the UCB report and research conducted for this study identified the following key challenges with these types of programs.

- <u>Challenges for Mitigation Exchanges</u>
    - Potential mismatch between funds and mitigation projects available
    - Potential for reduced oversight of project selection
    - Difficulty in verifying VMT reductions and their sustainability especially with VMT generation changing over time due to disruptive transportation trends such as transportation network companies (TNCs) and autonomous vehicles (AVs)
    - Difficulty in demonstrating an essential nexus
    - Potential opposition to mitigation not directly occurring in the project impact area especially if impacts are concentrated in or near disadvantaged communities and the mitigation occurs in more affluent areas

- <u>Challenges for Mitigation Banks</u>
    - Increased need to conduct careful CEQA/Mitigation Fee Act analysis
    - Accounting challenge in delay from fee payment to project funding
    - Greater need for program administration budget
    - Political difficulty in distributing mitigation projects and coordinating across jurisdictions
    - Difficulty in verifying VMT reductions and their sustainability especially with VMT generation changing over time due to disruptive transportation trends such as transportation network companies (TNCs) and autonomous vehicles (AVs)
    - Difficulty in demonstrating an essential nexus
    - Potential opposition to mitigation not directly occurring in the project impact area especially if impacts are concentrated in or near disadvantaged communities and the mitigation occurs in more affluent areas

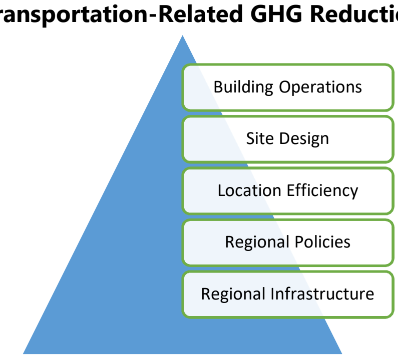
Another important element for either of these concepts is to have an entity that is responsible for establishing, operating, and maintaining the program. This is a potential role for a sub-regional or regional entity especially for programs that would extend mitigation projects beyond individual jurisdictional boundaries. A key part of 'operations' is that the entity will need the capability to provide verification of the VMT reduction performance and to adjust the program projects over time. Whether the entity is regional or sub-regional is another important consideration. A sub-regional entity could help minimize potential concerns about mitigation not occurring near the project site or in the same community.

The potential desire for VMT Mitigation Exchanges or Banks may depend on how lead agencies and developers respond to the initial implementation of SB 743 currently schedule to go into effect July 1, 2020. If many projects are found to have significant VMT impacts and problems occur with finding feasible mitigation measures for individual projects, then interest may grow for more program-based mitigation.

# TDM Strategies

This information can be used as part of the SB 743 implementation to determine potentially feasible VMT mitigation measures for individual land use projects in the SBCTA area. An important consideration for the mitigation effectiveness is the scale for TDM strategy implementation. The biggest effects of TDM strategies on VMT (and resultant emissions) derive from regional policies related to land use location efficiency and infrastructure investments that support transit, walking, and bicycling. While there are many measures that can influence VMT and emissions that relate to site design and building operations, they have smaller effects that are often dependent on final building tenants. **Figure 1** presents a conceptual illustration of the relative importance of scale.

**Figure 1: Transportation-Related GHG Reduction Measures**




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

**TABLE 1: SUMMARY OF TRANSPORTATION-RELATED CAPCOA MEASURES**

| Scope | Agents | CAPCOA Strategies (see full CAPCOA list below) |
|---|---|---|
| Building Operations | Employer, Manager | **26 total** from five CAPCOA strategy groups:<br>• **3** from 3.2 Site Enhancements group<br>• **3** from 3.3 Parking Pricing Availability group<br>• **15** from 3.4 Commute Trip Reduction group<br>• **2** from 3.5 Transit Access group<br>• **3** from 3.7 Vehicle Operations group |
| Site Design | Owner, Architect | **15 total** from three strategy groups:<br>• **6** from 3.1 Land Use group<br>• **6** from 3.2 Site Enhancements group<br>• **1** from 3.3 Parking group<br>• **2** from 3.6 Road Access group |
| Location Efficiency | Developer, Local Agency | **3 shared** with Regional and Local Policies |
| Alignment with Regional and Local Policies | Regional and local agencies | **3 shared** with Location Efficiency |
| Regional Infrastructure and Services | Regional and local agencies | **6 total** |

Of these strategies, some are likely to be effective in denser areas, while others will be less applicable in rural or suburban setting. In the SBCTA area, key factors that determine which reduction measures will be effective such as density and access to transit vary throughout and within the jurisdictions. To help narrow the list, we reviewed how land use context could influence each strategy's effectiveness and identified the seven for more detailed review. These strategies are described in Attachment B and listed below. Please note that disruptive trends, including but not limited to, transportation network companies (TNCs), autonomous vehicles (AVs), internet shopping, and micro-transit may affect the future effectiveness of these strategies.

1. Increase diversity of land uses – This strategy focuses on inclusion of mixed uses within projects or in consideration of the surrounding area to minimize vehicle travel in terms of both the number of trips and the length of those trips.

2. Provide pedestrian network improvements – This strategy focuses on creating a pedestrian network within the project and connecting to nearby destinations. Projects in the SBCTA area range in size, so the emphasis of this strategy for smaller projects would likely be the construction of network improvements that connect the project sites directly to nearby destinations. For larger projects, this strategy could focus on the development of a robust pedestrian network within the project itself. Alternatively, implementation could occur through an impact fee program such as the TUMF or benefit/assessment district based on local or regional plans.

3. Provide traffic calming measures and low-stress bicycle network improvements – This strategy combines the CAPCOA research focused on traffic calming with new research on providing a low-stress bicycle network. Traffic calming creates networks with low vehicle speeds and volumes that are more conducive to walking and bicycling. Building a low-stress bicycle network produces a similar outcome. Implementation options are similar to strategy 2 above. One potential change in this strategy over time is that e-bikes (and e-scooters) could extend the effective range of travel on the bicycle network, which could enhance the effectiveness of this strategy.

4. Implement car-sharing program – This strategy reduces the need to own a vehicle or reduces the number of vehicles owned by a household by making it convenient to access a shared vehicle for those trips where vehicle use is essential. Note that implementation of this strategy would require regional or local agency implementation and coordination and would not likely be applicable for individual development projects.

5. Increase transit service frequency and speed – This strategy focuses on improving transit service convenience and travel time competitiveness with driving. While the SBCTA area has fixed route rail and bus service that could be enhanced, it's also possible that new forms of low-cost demand-responsive transit service could be provided. The demand-responsive service could be provided as subsidized trips by contracting to private TNCs or Taxi companies. Alternatively, a public transit operator could provide the subsidized service but would need to improve on traditional cost effectiveness by relying on TNC ride-hailing technology, using smaller vehicles sized to demand, and flexible driver employment terms where drivers are paid by trip versus by hour. This type of service would reduce wait times for travelers and improve the typical in-vehicle travel time compared to traditional transit. Note that implementation of this strategy would require regional or local agency implementation, substantial changes to current transit practices, and would not likely be applicable for individual development projects.

6. Encourage telecommuting and alternative work schedules – This strategy relies of effective internet access and speeds to individual project sites/buildings to provide the opportunity for telecommuting. The effectiveness of the strategy depends on the ultimate building tenants and this should be a factor in considering the potential VMT reduction.

7. Provide ride-sharing programs – This strategy focuses on encouraging carpooling and vanpooling by project site/building tenants and has similar limitations as strategy 10 above.

Because of the limitations noted above, strategies 1, 2, 3, 4, and 7 are initially considered the highest priorities for individual land use project mitigation subject to review and discussion with the project team.

The VMT reduction strategies can be quantified using CACPOA calculation methodologies and recent ARB research findings. Attachment C provides calculation methodologies for each of the mitigations provided above, along with their range of effectiveness.

## Summary

To help understand the full range of VMT impact mitigation and their benefits and challenges, Table 2 provides a high-level summary comparison.

| Table 2 – Summary of VMT Impact Mitigation Options | | | |
|---|---|---|---|
| **Mitigation Option** | **Description** | **Benefits** | **Challenges** |
| No feasible action | This option recognizes that feasible mitigation is not available due to the land use or transportation context. | - Recognizes the limitations of VMT impact mitigation when alternatives to driving are not reasonably available. | Could result in more significant and unavoidable (SAU) impacts that require an EIR instead of a negative declaration. |
| Change project | This option would tend to focus on changing built environment characteristics of a project such as its land use density or diversity to reduce vehicle travel. | - Mitigation may not require long-term monitoring (see substantial evidence summarized in the *SB 743 Implementation TDM Strategy Assessment Technical Memorandum dated 6.11.18*).<br>- Mitigation reduces VMT (and other vehicle travel) in immediate vicinity of the project site. | Project applicants may resist land use or other built environment changes due to financial concerns and market feasibility. |
| TDM | This option relies on strategies to reduce vehicle travel through incentives and disincentives often tied to the cost and convenience of vehicle travel. | - Mitigation reduces VMT (and other vehicle travel) in immediate vicinity of the project site.<br>- Multiple mitigation strategies to choose from such that a project applicant may find co-benefits from the strategies also serving as project amenities. | - Mitigation monitoring required because effectiveness depends on building tenants, which can change over time. As a result, impacts will remain SAU.<br>- Creates potential financial equity issues between existing and new land uses. Existing land use with TDM mitigation will have lower operating costs.<br>- Limited reduction based on applicable or relevant strategies |
| Impact fee program | This option requires developing a new impact fee program with a nexus | - Provides clear expectations for | - Requires lead agency to develop stakeholder support and funding to |

| Table 2 – Summary of VMT Impact Mitigation Options | | | |
|---|---|---|---|
| **Mitigation Option** | **Description** | **Benefits** | **Challenges** |
| | based on VMT reduction. This type of nexus would allow the fee program capital improvement program (CIP) to include transit, bicycle, pedestrian and other types of projects that can demonstrate VMT reduction effectiveness. | developers about the VMT mitigation costs.<br>- Increases funding for VMT reduction projects such that larger and more effective projects may be implemented.<br>- May result in greater levels of VMT reduction compared to project-by-project mitigation. | create and maintain the fee program.<br>- Mitigation (e.g., CIP projects) may not occur in immediate vicinity of the project site where impacts of vehicle travel will be most directly felt by neighbors. |
| Mitigation bank/exchange | This option matches VMT generators with VMT reducers within or beyond jurisdictional boundaries through a third party. | - Could create mitigation options that may not otherwise be available or feasible.<br>- Not limited to jurisdictional boundaries.<br>- Could create incentive for new innovative mitigation ideas. | - Requires an entity capable of operating and maintaining the program with the ability to verify VMT reductions.<br>- Mitigation may not occur in immediate vicinity of the project site where impacts of vehicle travel will be most directly felt by neighbors. |
| General plan coverage | This option would address VMT impacts through a general plan update or amendment EIR and rely on CEQA Guidelines Section 15183 for subsequent project streamlining (as summarized in the *SB 743 Implementation Thresholds Assessment Technical Memorandum dated 10.31.18*). | - Addresses VMT reduction expectations in consideration of other jurisdictional objectives.<br>- Offers a wider range of mitigation options than at the project-scale.<br>- For subsequent projects consistent with the general plan, additional VMT impact analysis would not be required. | - General plan updates or amendments require substantial time and funding commitments. |

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**ATTACHMENT A**

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## Comparison of CAPCOA Strategies Versus New Research Since 2010

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

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**Comparison of CAPCOA Strategies Versus New Research Since 2010**

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|---|---|---|---|---|---|---|---|
| | | | | | New information | Change in VMT reduction compared to CAPCOA | Literature or Evidence Cited |
| Land Use/ Location | 3.1.3 | LUT-3 Increase Diversity of Urban and Suburban Developments | 9%-30% VMT reduction due to mixing land uses within a single development | Adequate | 1] VMT reduction due to mix of land uses within a single development. Mixing land uses within a single development can decrease VMT (and resulting GHG emissions), since building users do not need to drive to meet all of their needs. 2] Reduction in VMT due to regional change in entropy index of diversity. Providing a mix of land uses within a single neighborhood can decrease VMT (and resulting GHG emissions), since trips between land use types are shorter and may be accommodated by non-auto modes of transport. For example when residential areas are in the same neighborhood as retail and office buildings, a resident does not need to travel outside of the neighborhood to meet his/her trip needs. At the regional level, reductions in VMT are measured in response to changes in the entropy index of land use diversity. | 1] 0%-12%<br><br>2] 0.3%-4% | 1] Ewing, R. and Cervero, R. (2010). Travel and the Built Environment - A Meta-Analysis. Journal of the American Planning Association,76(3),265-294. Cited in California Air Pollution Control Officers Association. (2010).Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf<br><br>Frank, L., Greenwald, M., Kavage, S. and Devlin, A. (2011). An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy. WSDOT Research Report WA-RD 765.1. Washington State Department of Transportation. Retrieved from: http://www.wsdot.wa.gov/research/reports/fullreports/765.1.pdf<br><br>Nasri, A. and Zhang, L. (2012). Impact of Metropolitan-Level Built Environment on Travel Behavior. Transportation Research Record: Journal of the Transportation Research Board, 2323(1), 75-79.<br><br>Sadek, A. et al. (2011). Reducing VMT through Smart Land-Use Design. New York State Energy Research and Development Authority. Retrieved from: https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-08-29%20Final%20Report_December%202011%20%282%29.pdf<br><br>Spears, S.et al. (2014). Impacts of Land-Use Mix on Passenger Vehicle Use and Greenhouse Gas Emissions- Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm<br><br>2] Zhang, Wengia et al. "Short- and Long-Term Effects of Land Use on Reducing Personal Vehicle Miles of Travel." |
| Land Use/ Location | 3.1.5 | LUT-5 Increase Transit Accessibility | 0.5%-24.6% reduce in VMT due to locating a project near high-quality transit | Adequate | 1] VMT reduction when transit station is provided within 1/2 mile of development (compared to VMT for sites located outside 1/2 mile radius of transit). Locating high density development within 1/2 mile of transit will facilitate the use of transit by people traveling to or from the Project site. The use of transit results in a mode shift and therefore reduced VMT.<br><br>2] Reduction in vehicle trips due to implementing TOD. A project with a residential/commercial center designed around a rail or bus station, is called a transit-oriented development (TOD). The project description should include, at a minimum, the following design features:<br>• A transit station/stop with high-quality, high-frequency bus service located within a 5-10 minute walk (or roughly ¼ mile from stop to edge of development), and/or<br>• A rail station located within a 20 minute walk (or roughly ½ mile from station to edge of development)<br>• Fast, frequent, and reliable transit service connecting to a high percentage of regional destinations<br>• Neighborhood designed for walking and cycling | 1] 0%-5.8%<br><br>2] 0%-7.3% | 1] Lund, H. et al. (2004). Travel Characteristics of Transit-Oriented Development in California. Oakland, CA: Bay Area Rapid Transit District, Metropolitan Transportation Commission, and Caltrans.<br><br>Tal, G. et al. (2013). Policy Brief on the Impacts of Transit Access (Distance to Transit) Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/transitaccess/transit_access_brief120313.pdf<br><br>2] Zamir, K. R. et al. (2014). Effects of Transit-Oriented Development on Trip Generation, Distribution, and Mode Share in Washington, D.C., and Baltimore, Maryland. Transportation Research Record: Journal of the Transportation Research Board. 2413, 45–53. DOI: 10.3141/2413-05 |

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## Comparison of CAPCOA Strategies Versus New Research Since 2010

| CAPCOA Category | CAPCOA # | CAPCOA Strategy | CAPCOA Reduction | Strength of Substantial Evidence for CEQA Impact Analysis? | New Information Since CAPCOA Was Published in 2010: New information | New Information Since CAPCOA Was Published in 2010: Change in VMT reduction compared to CAPCOA | New Information Since CAPCOA Was Published in 2010: Literature or Evidence Cited |
|---|---|---|---|---|---|---|---|
| Land Use/ Location | 3.1.6 | LUT-6 Integrate Affordable and Below Market Rate Housing | 0.04%-1.20% reduction in VMT for making up to 30% of housing units BMR | Weak - Should only be used where supported by local data on affordable housing trip generation. | Observed trip generation indicates substantial local and regional variation in trip making behavior at affordable housing sites. Recommend use of ITE rates or local data for senior housing. | N/A | "Draft Memorandum: Infill and Complete Streets Study, Task 2.1: Local Trip Generation Study." *Measuring the Miles: Developing new metrics for vehicle travel in LA.* City of Los Angeles, April 19, 2017. |
| Neighborhood Site Enhancements | 3.2.1 | SDT-1 Provide Pedestrian Network Improvements | 0%-2% reduction in VMT for creating a connected pedestrian network within the development and connecting to nearby destinations | Adequate | VMT reduction due to provision of complete pedestrian networks. Only applies if located in an area that may be prone to having a less robust sidewalk network. | 0.5%-5.7% | Handy, S. et al. (2014). Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm |
| Neighborhood Site Enhancements | 3.2.2 | SDT-2 Provide Traffic Calming Measures | 0.25%-1% VMT reduction due to traffic calming on streets within and around the development | Adequate | Reduction in VMT due to expansion of bike networks in urban areas. Strategy only applies to bicycle facilities that provide a dedicated lane for bicyclists or a completely separated right-of-way for bicycles and pedestrians.<br><br>Project-level definition: Enhance bicycle network citywide (or at similar scale), such that a building entrance or bicycle parking is within 200 yards walking or bicycling distance from a bicycle network that connects to at least one of the following: at least 10 diverse uses; a school or employment center, if the project total floor area is 50% or more residential; or a bus rapid transit stop, light or heavy rail station, commuter rail station, or ferry terminal. All destinations must be 3-mile bicycling distance from project site. Include educational campaigns to encourage bicycling. | 0%-1.7% | Zahabi, S. et al. (2016). Exploring the link between the neighborhood typologies, bicycle infrastructure and commuting cycling over time and the potential impact on commuter GHG emissions. Transportation Research Part D: Transport and Environment. 47, 89-103. |
| Neighborhood Site Enhancements | 3.2.3 | SDT-3 Implement an NEV Network | 0.5%-12.7% VMT reduction for GHG-emitting vehicles, depending on level of local NEV penetration | Weak - not recommended without supplemental data. | Limited evidence and highly limited applicability. Use with supplemental data only. | N/A | City of Lincoln, MHM Engineers & Surveyors, Neighborhood Electric Vehicle Transportation Program Final Report, Issued 04/05/05, and City of Lincoln, A Report to the California Legislature as required by Assembly Bill 2353, Neighborhood Electric Vehicle Transportation Plan Evaluation, January 1, 2008. Cited in: California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf |

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Comparison of CAPCOA Strategies Versus New Research Since 2010

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|---|---|---|---|---|---|---|---|
| | | | | | New information | Change in VMT reduction compared to CAPCOA | Literature or Evidence Cited |
| Neighborhood Site Enhancements | 3.4.9 | TRT-9 Implement Car-Sharing Program | 0.4% - 0.7% VMT reduction due to lower vehicle ownership rates and general shift to non-driving modes | Adequate | Vehicle trip reduction due to car-sharing programs; reduction assumes 1%-5% penetration rate. Implementing car-sharing programs allows people to have on-demand access to a shared fleet of vehicles on an as-needed basis, as a supplement to trips made by non-SOV modes. Transit station-based programs focus on providing the "last-mile" solution and link transit with commuters' final destinations. Residential-based programs work to substitute entire household based trips. Employer-based programs provide a means for business/day trips for alternative mode commuters and provide a guaranteed ride home option. The reduction shown here assumes a 1%-5% penetration rate. | 0.3%-1.6% | Lovejoy, K. et al. (2013). Impacts of Carsharing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm<br><br>***Need to verify with more recent UCD research.*** |
| Parking Pricing | 3.3.1 | PDT-1 Limit Parking Supply | 5%-12.5% VMT reduction in response to reduced parking supply vs. ITE parking generation rate | Weak - not recommended. Fehr & Peers has developed new estimates for residential land use only that may be used. | CAPCOA reduction range derived from estimate of reduced vehicle ownership, not supported by observed trip or VMT reductions. Evidence is available for mode shift due to presence/absence of parking in high-transit urban areas; additional investigation ongoing | Higher | Fehr & Peers estimated a linear regression formula based on observed data from multiple locations. Resulting equation produces maximum VMT reductions for residential land use only of 30% in suburban locations and 50% in urban locations based on parking supply percentage reductions. |
| Parking Pricing | 3.3.2 | PDT-2 Unbundle Parking Costs from Property Cost | 2.6% -13% VMT reduction due to decreased vehicle ownership rates | Adequate - conditional on the agency not requiring parking minimums and pricing/managing on-street parking (i.e., residential parking permit districts, etc.). | Reduction in VMT, primarily for residential uses, based on range of elasticities for vehicle ownership in response to increased residential parking fees. Does not account for self-selection. Only applies if the city does not require parking minimums and if on-street parking is priced and managed (i.e., residential parking permit districts). | 2%-12% | Victoria Transport Policy Institute (2009). Parking Requirement Impacts on Housing Affordability. Retrieved March 2010 from: http://www.vtpi.org/park-hou.pdf. |

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|---|---|---|---|---|---|---|---|
| | | | | | New information | Change in VMT reduction compared to CAPCOA | Literature or Evidence Cited |
| Parking Pricing | 3.3.3 | PDT-3 Implement Market Price Public Parking | 2.8%-5.5% VMT reduction due to "park once" behavior and disincentive to driving | Adequate | Implement a pricing strategy for parking by pricing all central business district/employment center/retail center on-street parking. It will be priced to encourage park once" behavior. The benefit of this measure above that of paid parking at the project only is that it deters parking spillover from project supplied parking to other public parking nearby, which undermine the vehicle miles traveled (VMT) benefits of project pricing. It may also generate sufficient area-wide mode shifts to justify increased transit service to the area.<br><br>VMT reduction applies to VMT from visitor/customer trips only. Reductions higher than top end of range from CAPCOA report apply only in conditions with highly constrained on-street parking supply and lack of comparably-priced off-street parking. | 2.8%-14.5% | Clinch, J.P. and Kelly, J.A. (2003). Temporal Variance Of Revealed Preference On-Street Parking Price Elasticity. Dublin: Department of Environmental Studies, University College Dublin. Retrieved from: http://www.ucd.ie/gpep/research/workingpapers/2004/04-02.pdf. Cited in Victoria Transport Policy Institute (2017). Transportation Elasticities: How Prices and Other Factors Affect Travel Behavior. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm<br><br>Hensher, D. and King, J. (2001). Parking Demand and Responsiveness to Supply, Price and Location in Sydney Central Business District. Transportation Research A. 35(3), 177-196.<br><br>Millard-Ball, A. et al. (2013). Is the curb 80% full or 20% empty? Assessing the impacts of San Francisco's parking pricing experiment. Transportation Research Part A. 63(2014), 76-92.<br><br>Shoup, D. (2011). The High Cost of Free Parking. APA Planners Press. p. 290. Cited in Pierce, G. and Shoup, D. (2013). Getting the Prices Right. Journal of the American Planning Association. 79(1), 67-81. |
| Transit System | 3.5.3 | TST-3 Expand Transit Network | 0.1-8.2% VMT reduction in response to increase in transit network coverage | Adequate | Reduction in vehicle trips due to increased transit service hours or coverage. Low end of reduction is typical of project-level implementation (payment of impact fees and/or localized improvements). | 0.1%-10.5% | Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm |
| Transit System | 3.5.4 | TST-4 Increase Transit Service Frequency/Speed | 0.02%-2.5% VMT reduction due to reduced headways and increased speed and reliability | Adequate | Reduction in vehicle trips due to increased transit frequency/decreased headway. Low end of reduction is typical of project-level implementation (payment of impact fees and/or localized improvements). | 0.3%-6.3% | Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm |
| Transit System | 3.5.1 | TST-1 Provide a Bus Rapid Transit System | 0.02%-3.2% VMT reduction by converting standard bus system to BRT system | Adequate | No new information identified. | Same | N/A |
| Commute Trip Reduction | 3.4.1 | TRT-1 Implement CTR Program - Voluntary | 1.0%-6.2% commute VMT reduction due to employer-based mode shift program | Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-2 Implement CTR Program - Required Implementation/Monitoring" or with CAPCOA strategies TRT-3.4.3 through TRT-3.4.9. | Reduction in vehicle trips in response to employer-led TDM programs. The CTR program should include all of the following to apply the effectiveness reported by the literature:<br>• Carpooling encouragement<br>• Ride-matching assistance<br>• Preferential carpool parking<br>• Flexible work schedules for carpools<br>• Half time transportation coordinator<br>• Vanpool assistance<br>• Bicycle end-trip facilities (parking, showers and lockers) | 1.0%-6.0% | Boarnet, M. et al. (2014). Impacts of Employer-Based Trip Reduction Programs and Vanpools on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm |
| Commute Trip Reduction | 3.4.2 | TRT-2 Implement CTR Program - Required Implementation/Monitoring | 4.2%-21.0% commute VMT reduction due to employer-based mode shift program with required monitoring and reporting | Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or with CAPCOA strategies TRT-3.4.3 through TRT-3.4.9. | Limited evidence available. Anecdotal evidence shows high investment produces high VMT/vehicle trip reductions at employment sites with monitoring requirements and specific targets. | Same | Nelson/Nygaard (2008). South San Francisco Mode Share and Parking Report for Genentech, Inc.(p. 8) Cited in: California Air Pollution Control Officers Association. (2010). Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf |

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|---|---|---|---|---|---|---|---|
| Commute Trip Reduction | 3.4.4 | TRT-4 Implement Subsidized or Discounted Transit Program | 0.3%-20% commute VMT reduction due to transit subsidy of up to $6/day | Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring." | 1] Reduction in vehicle trips in response to reduced cost of transit use, assuming that 10-50% of new bus trips replace vehicle trips; 2] Reduction in commute trip VMT due to employee benefits that include transit 3] Reduction in all vehicle trips due to reduced transit fares system-wide, assuming 25% of new transit trips would have been vehicle trips. | 1] 0.3%-14%<br>2] 0-16%<br>3] 0.1% to 6.9% | 1] Victoria Transport Policy Institute. (2017). Understanding Transport Demands and Elasticities. Online TDM Encyclopedia. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm<br><br>2] Carolina, P. et al. (2016). Do Employee Commuter Benefits Increase Transit Ridership? Evidence rom the NY-NJ Region. Washington, DC: Transportation Research Board, 96th Annual Meeting.<br><br>3] Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm |
| Commute Trip Reduction | 3.4.15 | TRT-15 Employee Parking Cash-Out | 0.6%-7.7% commute VMT reduction due to implementing employee parking cash-out | Weak - Effectiveness is building/tenant specific. Research data is over 10 years old (1997). | Shoup case studies indicate a reduction in commute vehicle trips due to implementing cash-out without implementing other trip-reduction strategies. | 3%-7.7% | Shoup, D. (1997). Evaluating the Effects of Cashing Out Employer-Paid Parking: Eight Case Studies. Transport Policy. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/research/apr/past/93-308a.pdf. This citation was listed as an alternative literature in CAPCOA. |
| Commute Trip Reduction | 3.4.14 | TRT-14 Price Workplace Parking | 0.1%-19.7% commute VMT reduction due to mode shift | Adequate - Effectiveness is building/tenant specific. | Reduction in commute vehicle trips due to priced workplace parking; effectiveness depends on availability of alternative modes. Workplace parking pricing may include: explicitly charging for parking, implementing above market rate pricing, validating parking only for invited guests, not providing employee parking and transportation allowances, and educating employees about available alternatives. | 0.5%-14% | Primary sources:<br>Concas, S. and Nayak, N. (2012), A Meta-Analysis of Parking Price Elasticity. Washington, DC: Transportation Research Board, 2012 Annual Meeting.<br><br>Dale, S. et al. (2016). Evaluating the Impact of a Workplace Parking Levy on Local Traffic Congestion: The Case of Nottingham UK. Washington, DC: Transportation Research Board, 96th Annual Meeting.<br><br>Secondary sources:<br>Victoria Transport Policy Institute. (2017). Understanding Transport Demands and Elasticities. Online TDM Encyclopedia. Retrieved from: http://www.vtpi.org/tdm/tdm11.htm<br><br>Spears, S. et al. (2014). Impacts of Parking Pricing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm |
| Commute Trip Reduction | 3.4.6 | TRT-6 Encourage Telecommuting and Alternative Work Schedules | 0.07%-5.5% commute VMT reduction due to reduced commute trips | Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring." | VMT reduction due to adoption of telecommuting. Alternative work schedules could take the form of staggered starting times, flexible schedules, or compressed work weeks. | 0.2%-4.5% | Handy, S. et al. (2013). Policy Brief on the Impacts of Telecommuting Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/telecommuting/telecommuting_brief120313.pdf |
| Commute Trip Reduction | 3.4.7 | 1] TRT-7 Implement CTR Marketing<br>2] Launch Targeted Behavioral Interventions | 0.8%-4.0% commute VMT reduction due to employer marketing of alternatives | Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring." | 1] Vehicle trips reduction due to CTR marketing; 2] Reduction in VMT from institutional trips due to targeted behavioral intervention programs | 1] 0.9% to 26%<br>2] 1%-6% | 1] Pratt, Dick. Personal communication regarding the Draft of TCRP 95 Traveler Response to Transportation System Changes – Chapter 19 Employer and Institutional TDM Strategies. Transit Cooperative Research Program. Cited in California Air Pollution Control Officers Association. (2010).Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf<br><br>Dill, J. and Mohr, C. (2010). Long-Term Evaluation of Individualized Marketing Programs for Travel Demand Management. Portland, OR: Transportation Research and Education Center (TREC). Retrieved from: http://pdxscholar.library.pdx.edu/usp_fac<br><br>2] Brown, A. and Ralph, K. (2017.) "The Right Time and Place to Change Travel Behavior: An Experimental Study." Washington, DC: Transportation Research Board, 2017 Annual Meeting. Retrieved from: https://trid.trb.org/view.aspx?id=1437253 |

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|---|---|---|---|---|---|---|---|
| CAPCOA Category | CAPCOA # | CAPCOA Strategy | CAPCOA Reduction | Strength of Substantial Evidence for CEQA Impact Analysis? | New information | Change in VMT reduction compared to CAPCOA | Literature or Evidence Cited |
| Commute Trip Reduction | 3.4.11 | TRT-11 Provide Employer-Sponsored Vanpool/Shuttle | 0.3%-13.4% commute VMT reduction due to employer-sponsored vanpool and/or shuttle service | Adequate - Effectiveness is building/tenant specific. | 1] Reduction in commute vehicle trips due to implementing employer-sponsored vanpool and shuttle programs; 2] Reduction in commute vehicle trips due to vanpool incentive programs; 3] Reduction in commute vehicle trips due to employer shuttle programs | 1] 0.5%-5.0%<br>2] 0.3%-7.4%<br>3] 1.4%-6.8% | 1] Concas, Sisinnio, Winters, Philip, Wambalaba, Francis, (2005). Fare Pricing Elasticity, Subsidies, and Demand for Vanpool Services. Transportation Research Record: Journal of the Transportation Research Board, 1924, pp 215-223.<br><br>2] Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm<br><br>3] ICF. (2014). GHG Impacts for Commuter Shuttles Pilot Program. |
| Commute Trip Reduction | 3.4.3 | TRT-3 Provide Ride-Sharing Programs | 1%-15% commute VMT reduction due to employer ride share coordination and facilities | Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring." | Commute vehicle trips reduction due to employer ride-sharing programs. Promote ride-sharing programs through a multi-faceted approach such as:<br>• Designating a certain percentage of parking spaces for ride sharing vehicles<br>• Designating adequate passenger loading and unloading and waiting areas for ride-sharing vehicles<br>• Providing an app or website for coordinating rides | 2.5%-8.3% | Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm |
| Commute Trip Reduction | 3.4.10 | TRT-10 Implement a School Pool Program | 7.2%-15.8% reduction in school VMT due to school pool implementation | Adequate - School VMT only. | Limited new evidence available, not conclusive | Same | Transportation Demand Management Institute of the Association for Commuter Transportation. TDM Case Studies and Commuter Testimonials. Prepared for the US EPA. 1997. (p. 10, 36-38)<br><br>WayToGo 2015 Annual Report. Accessed on March 12, 2017 from http://www.waytogo.org/sites/default/files/attachments/waytogo-annual-report-2015.pdf |
| Commute Trip Reduction | 3.4.13 | TRT-13 Implement School Bus Program | 38%-63% reduction in school VMT due to school bus service implementation | Adequate - School VMT only. | VMT reduction for school trips based on data beyond a single school district.<br><br>School district boundaries are also a factor to consider. VMT reduction does not appear to be a factor that was considered in a select review of CA boundaries.<br><br>VMT reductions apply to school trip VMT only. | 5%-30% | Wilson, E., et al. (2007). The implications of school choice on travel behavior and environmental emissions. Transportation Research Part D: Transport and Environment 12(2007), 506-518. |
| Not Applicable - not a CAPCOA strategy | Not Applicable - not a CAPCOA strategy | Not Applicable - not a CAPCOA strategy | Not Applicable - not a CAPCOA strategy | Not Applicable - not a CAPCOA strategy | Bikeshare car trip substitution rate of 7-19% based on data from Washington DC, and Minneapolis/St. Paul. Annual VMT reduction of 151,000 and 57,000, respectively. Includes VMT for rebalancing and maintenance.<br><br>VMT reduction of 0.023 miles per day per bikeshare member estimated for Bay Area bikeshare, utilizing Minneapolis/St. Paul data from study above. | 57,000-151,000 annual VMT reduction, based on two large US cities.<br><br>VMT reduction of 0.023 miles per day per member, based on one large US city estimate. | Fishman, E., Washington, S., & Haworth, N. (2014). Bike share's impact on car use: Evidence from the United States, Great Britain, and Australia. Transportation Research Part D: Transport and Environment, 31, 13-20.<br><br>TDM Methodology: Impact of Carsharing Membership, Transit Passes, Bikesharing Membership, Unbundled Parking, and Parking Supply Reductions on Driving. Center for Neighborhood Technology, Peter Haas and Cindy Copp, with TransForm staff, May 5, 2016. |

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**ATTACHMENT B**

TDM STRATEGY EVALUATION - DRAFT V 1.0

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Relevant Strategies for Implementation in SBCTA Jurisdictions Due to Land Use Context

| CAPCOA Category | CAPCOA # | CAPCOA Strategy | CAPCOA Reduction | Strength of Substantial Evidence for CEQA Impact Analysis? | New Information Since CAPCOA Was Published in 2010 | | |
|---|---|---|---|---|---|---|---|
| | | | | | New information | Change in VMT reduction compared to CAPCOA(1) | Literature or Evidence Cited |
| Land Use/ Location | 3.1.3 | LUT-3 Increase Diversity of Urban and Suburban Developments | 9%-30% VMT reduction due to mixing land uses within a single development | Adequate | 1] VMT reduction due to mix of land uses within a single development; 2] Reduction in VMT due to regional change in entropy index of diversity. | 1] 0%-12%<br><br>2] 0.3%-4% | 1] Ewing, R. and Cervero, R. (2010). Travel and the Built Environment - A Meta-Analysis. Journal of the American Planning Association,76(3),265-294. Cited in California Air Pollution Control Officers Association. (2010).Quantifying Greenhouse Gas Mitigation Measures. Retrieved from: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf<br><br>Frank, L., Greenwald, M., Kavage, S. and Devlin, A. (2011). An Assessment of Urban Form and Pedestrian and Transit Improvements as an Integrated GHG Reduction Strategy. WSDOT Research Report WA-RD 765.1. Washington State Department of Transportation. Retrieved from: http://www.wsdot.wa.gov/research/reports/fullreports/765.1.pdf<br><br>Nasri, A. and Zhang, L. (2012). Impact of Metropolitan-Level Built Environment on Travel Behavior. Transportation Research Record: Journal of the Transportation Research Board, 2323(1), 75-79.<br><br>Sadek, A. et al. (2011). Reducing VMT through Smart Land-Use Design. New York State Energy Research and Development Authority. Retrieved from: https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-08-29%20Final%20Report_December%202011%20%282%29.pdf<br><br>Spears, S.et al. (2014). Impacts of Land-Use Mix on Passenger Vehicle Use and Greenhouse Gas Emissions- Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm<br><br>2] Zhang, Wengia et al. "Short- and Long-Term Effects of Land Use on Reducing Personal Vehicle Miles of Travel." |
| Neighborhood Site Enhancements | 3.2.1 | SDT-1 Provide Pedestrian Network Improvements | 0%-2% reduction in VMT for creating a connected pedestrian network within the development and connecting to nearby destinations | Adequate | VMT reduction due to provision of complete pedestrian networks. | 0.5%-5.7% | Handy, S. et al. (2014). Impacts of Pedestrian Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm |
| Neighborhood Site Enhancements | 3.2.2 | SDT-2 Provide Traffic Calming Measures | 0.25%-1% VMT reduction due to traffic calming on streets within and around the development | Adequate | Reduction in VMT due to building out a low-stress bike network; reduction in VMT due to expansion of bike networks in urban areas. | 0%-1.7% | 1] California Air Resources Board. (2016). Greenhouse Gas Quantification Methodology for the California Transportation Commission Active Transportation Program Greenhouse Gas Reduction Fund Fiscal Year 2016-17. Retrieved from: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/ctc_atp_finalqm_16-17.pdf.<br><br>2] Zahabi, S. et al. (2016). Exploring the link between the neighborhood typologies, bicycle infrastructure and commuting cycling over time and the potential impact on commuter GHG emissions. Transportation Research Part D: Transport and Environment. 47, 89-103. |
| Neighborhood Site Enhancements | 3.4.9 | TRT-9 Implement Car-Sharing Program | 0.4% - 0.7% VMT reduction due to lower vehicle ownership rates and general shift to non-driving modes | Adequate | Vehicle trip reduction due to car-sharing programs; reduction assumes 1%-5% penetration rate.<br><br>Car sharing effect on VMT is still evolving due to TNC effects. UCD research showed less effect on car ownership due to car sharing participation and an uncertain effect on VMT. | 0.3%-1.6% | Lovejoy, K. et al. (2013). Impacts of Carsharing on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm<br><br>Clewlow, Regina R. and Mishra, Gouri Shankar, (2017). Disruptive Transportation: The Adoption, Utilization, and Impacts of Ride-Hailing in the United States. UC Davis, Institute of Transportation Studies. Research Report - UCD-ITS-RR-17-07. |
| Transit System | 3.5.4 | TST-4 Increase Transit Service Frequency/Speed | 0.02%-2.5% VMT reduction due to reduced headways and increased speed and reliability | Adequate | Reduction in vehicle trips due to increased transit frequency/decreased headway. | 0.3%-6.3% | Handy, S. et al. (2013). Impacts of Transit Service Strategies on Passenger Vehicle Use and Greenhouse Gas Emissions - Policy Brief and Technical Background Document. California Air Resources Board. Retrieved from: https://arb.ca.gov/cc/sb375/policies/policies.htm |

TDM STRATEGY EVALUATION - DRAFT V 1.0

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## Relevant Strategies for Implementation in SBCTA Jurisdictions Due to Land Use Context

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|---|---|---|---|---|---|---|---|
| | | | | | New information | Change in VMT reduction compared to CAPCOA(1) | Literature or Evidence Cited |
| Commute Trip Reduction | 3.4.6 | TRT-6 Encourage Telecommuting and Alternative Work Schedules | 0.07%-5.5% commute VMT reduction due to reduced commute trips | Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring." | VMT reduction due to adoption of telecommuting | 0.2%-4.5% | Handy, S. et al. (2013). Policy Brief on the Impacts of Telecommuting Based on a Review of the Empirical Literature. California Air Resources Board. Retrieved from: https://www.arb.ca.gov/cc/sb375/policies/telecommuting/telecommuting_brief120313.pdf |
| Commute Trip Reduction | 3.4.3 | TRT-3 Provide Ride-Sharing Programs | 1%-15% commute VMT reduction due to employer ride share coordination and facilities | Adequate - Effectiveness is building/tenant specific. Do not use with "TRT-1 Implement CTR Program - Voluntary" or "TRT-2 Implement CTR Program - Required Implementation/Monitoring." | Commute vehicle trips reduction due to employer ride-sharing programs | 2.5%-8.3% | Victoria Transport Policy Institute. (2015). Ridesharing: Carpooling and Vanpooling. Online TDM Encyclopedia. Retrieved from: http://vtpi.org/tdm/tdm34.htm |

NOTES:

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