TRAFFIC IMPACT ANALYSIS GUIDELINES FOR LOCAL TRANSPORTATION ANALYSIS AND VEHICLE MILES TRAVELED ANALYSIS

CITY OF BIG BEAR LAKE

SAN BERNARDINO COUNTY, CALIFORNIA

April 2022

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CITY OF BIG BEAR LAKE

SAN BERNARDINO COUNTY, CALIFORNIA

Prepared for:

City of Big Bear Lake
39707 Big Bear Boulevard
Big Bear Lake, California 92315

Prepared by:

LSA Associates, Inc.
1500 Iowa Avenue, Suite 200
Riverside, California 92507
(951) 781-9310

LSA Project No. GBL2101

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1.0 INTRODUCTION

Senate Bill (SB) 743, signed in 2013 and effective statewide since July 1, 2020, has changed the way transportation impacts are analyzed in the California Environmental Quality Act (CEQA) process. Vehicle miles traveled (VMT) replaces auto delay and level of service (LOS) as the metric for transportation impact determination. However, LOS still remains the metric for determining consistency with a jurisdiction's General Plan requirements.

Previously, the City used to require projects to follow the San Bernardino County Transportation Authority's (SBCTA) Congestion Management Plan (CMP) *Traffic Impact Analysis (TIA) Guidelines,* dated June 2016, for preparation of traffic studies within the City. The SBCTA CMP TIA guidelines were based on LOS as the criterion for determining CEQA transportation impacts. This document has been prepared to comply with the updated *CEQA Guidelines* for determining transportation impacts. As such, this document provides separate guidelines for LOS-based Local Transportation Analysis (LTA) (pursuant to the City's General Plan consistency requirements) and VMT analysis (pursuant to CEQA requirements).

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2.0 NEED FOR TRAFFIC IMPACT ANALYSIS

A TIA may be required for CEQA purposes, to evaluate General Plan consistency, or both. Therefore, a TIA has two components: an LTA for General Plan consistency purposes, and a VMT analysis to meet CEQA requirements. The following criteria should be used to determine whether an LTA or a VMT analysis or both are required for a project:

2.1 NEED FOR A LOCAL TRANSPORTATION ANALYSIS

An LTA will not be required for projects having certain types of activities (for example, local-serving projects) or for those with a limited trip generation. For the latter, the thresholds for determining the type of LTA report are as follows:

- If a project is forecast to generate fewer than 50 peak hour trips, then an LTA may not be required and a trip generation memorandum may be considered sufficient unless City staff has specific concerns about traffic operations at the project driveways and adjacent intersections.
- If a project is forecast to generate between 50 and 100 peak hour trips, then a focused LTA may be required, where the analyst will only need to analyze the project driveways and intersections adjacent to the project site.
- If a project is forecast to generate more than 100 trips, then a full LTA will be required.
- Additionally, the following projects may also be exempt from an LTA:
    - Plot plan and land use cases for projects of one acre or less.
    - Preschools, local-serving elementary schools, and local-serving middle schools.
    - Local-serving churches, lodges, community centers, neighborhood parks, and community parks.
    - Congregate care facilities that contain significant special services, such as medical facilities, dining facilities, recreation facilities, and support retail services.

However, the City reserves the right to require an applicant to prepare additional LOS-based traffic analysis under the following circumstances:

- Presence of an existing or potential safety problem.
- Location of the project in an environmentally or otherwise sensitive area, or in an area that is likely to generate public controversy.
- Presence of a nearby substandard intersection or street.
- Need for a focused study for access/operational issues.
- Request from an affected agency, such as the California Department of Transportation (Caltrans) or an adjacent jurisdiction (if the request is deemed reasonable and appropriate).

2.2 NEED FOR A VMT ANALYSIS

Based on the substantial evidence provided in the *City of Big Bear Lake VMT Thresholds and Implementation Analysis* (*VMT Analysis Guide*), dated February 2022, certain projects may be screened out from a detailed VMT analysis. These criteria are explained in detail in Section 5.1. If the project is not screened out, a full VMT analysis will be required as described in Chapter 5.0.

2.3 SCOPING AGREEMENT PROCESS

The analyst should submit a completed "TIA Scoping Form" (Appendix A) to the City's Engineering Division for review and approval, prior to the preparation of draft LTA and VMT analysis documents. A detailed scoping letter should be submitted along with the TIA Scoping Form describing the analysis methodologies and assumptions as listed below. Appropriate fees, as outlined in the Scoping Form, must be paid for review purposes. The scoping agreement process will help in finalizing the following key issues before preparation of the documents:

- Determination of study area, including intersections to be analyzed;
- Project trip generation, distribution, and assignment;
- Different assumptions for the traffic analysis, such as cumulative projects to be considered for background traffic, ambient growth rate to be used for volume development under future conditions, or integration with the San Bernardino Transportation Analysis Model (SBTAM) or any other model approved by City staff;
- VMT screening criteria (if applicable), or proposed methodologies/assumptions for VMT analysis;
- For projects anticipated to create operational deficiencies at Caltrans facilities, Caltrans may also require a traffic safety review as per the *Interim Local Development and Intergovernmental Review (LDIGR) Safety Review Practitioners Guidance*, dated December 2020; and
- Coordination with adjacent jurisdictions (if required).

3.0 LOCAL TRANSPORTATION ANALYSIS FOR GENERAL PLAN CONSISTENCY

Projects not screened out pursuant to the criteria in Section 2.1 will be required to complete an LTA for General Plan consistency following the guidelines stated below.

3.1 STUDY AREA

The minimum study area for the LTA should include any intersection of "Collector" or higher classification street, with another "Collector" or higher classification street at which the proposed project is anticipated to add 50 or more peak hour trips.

3.2 ANALYSIS SCENARIOS

The traffic analysis should be performed for the following scenarios:

- Existing Conditions.
- Opening Year Conditions: This is defined as traffic conditions in the opening year of the project. The traffic volumes for this scenario should be developed by adding an ambient growth to the traffic volumes under existing conditions. The ambient growth should be determined based on discussion with City staff.
- Opening Year plus Project Conditions: This is defined as the opening year without project conditions plus the project traffic.
- Cumulative Conditions: This is defined as opening year conditions plus traffic generated from approved and pending development projects in the study area. Information about such development projects should be obtained from City staff and adjacent jurisdictions.
- Cumulative plus Project Conditions: This is defined as the cumulative conditions plus the project traffic.

For projects that include a General Plan Amendment (GPA), Change of Zone (COZ), a Specific Plan, or anything else that increases traffic beyond what is approved in the City's General Plan, a horizon year analysis will be required. The following additional scenarios will be required in such cases:

- Horizon Year Conditions: This is defined as traffic conditions in the horizon year (this typically coincides with the horizon year in SBTAM). The traffic volumes for this scenario should be developed by using model volumes obtained from SBTAM or any other model approved by City staff and by applying appropriate post-processing methodologies. However, it is to be verified if all approved and pending development projects that may add project traffic to the study area are included in the model.
- Horizon Year plus Project Conditions: This is defined as the horizon year conditions plus the project traffic.

Projects that have different phases may be evaluated in one of the following three ways:

- The analyst can identify which phase of the project will require an improvement based on the comparison of opening year without and with project conditions.
- The analyst can provide an assessment for opening year conditions for each phase of the project.
- For large phased projects, the project can initially be evaluated as a whole. However, subsequent traffic studies will be required to be completed for implementation of each proposed phase to ensure that improvements are implemented as required.

Applicants must consult City staff to determine the appropriate approach for analyzing a proposed project with multiple phases. The first option noted above is recommended for most phased projects.

3.3 DATA COLLECTION, PROJECT TRIP GENERATION, AND FORECASTING METHODOLOGIES

3.3.1 Traffic Counts

To analyze traffic operations under existing conditions, traffic counts should be collected in the study area using the following guidelines:

- Peak period turning movement counts should be collected at all study intersections and/or driveways, including bicycle and pedestrian counts at intersections with high non-automotive use. For intersections with high percentages of heavy vehicles, turning movement counts for heavy vehicles should be done separately.
- Traffic counts should not be used if more than one year old, unless approved by City staff.
- Traffic counts should not be collected on weeks that include a holiday and non-school session time periods, unless approved by City staff.
- Traffic data should not be collected between Thanksgiving and the first week of the New Year, unless approved by City staff.
- Traffic counts should be collected on Tuesdays, Wednesdays, or Thursdays.
- For uses that generate greater traffic during the weekend or holidays, the City may require a weekend or holiday traffic analysis. This will require counts to be collected during weekends and/or holiday season.
- For congested traffic conditions, back-of-queue estimates by approach (and turning movement) may need to be conducted every 15 minutes as directed and required by City staff.
- Traffic counts should not be collected in an active construction work-zone.

Unless directed otherwise by City staff, counts should be collected during the following time periods presuming that the time period captures the beginning and end times of any congested condition.

- Morning (7.00 a.m. to 9.00 a.m.).
- Afternoon/evening (4.00 p.m. to 6.00 p.m.).

- Midday and "school-release" peak hours, as directed by City staff.
- Other peak or off-peak hours, weekends, or during peak season, depending on the project location and land use, and as directed by City staff.

The count data should be included in the LTA appendices.

3.3.2 Trip Generation

The project's trip generation should be developed either by conducting local trip generation surveys for at least three similar project sites following the methodology contained in the Institute of Transportation Engineers (ITE) *Trip Generation Handbook* or by using trip generation rates from the latest edition of the ITE *Trip Generation Manual*. Trip generation for high truck-generating uses such as high-cube warehouses or light industrial facilities, shall be determined on a case-by-case basis based on discussion with City staff. For specialty land uses, the City may require conducting trip generation surveys of three or more similar facilities to develop the project's trip generation. The proposed project trip generation should be included in the scoping form for review and approval prior to study initiation.

Internal capture may be considered for mixed-use developments. Internal trips should be determined using ITE's mixed-use trip generation method or using SBTAM, as approved by City staff. Internal capture assumptions and calculations should be documented in the scoping form for review and approval prior to study initiation.

Pass-by and diverted trips may be considered for certain commercial projects. Pass-by trip rates and diverted trip rates may be obtained from the ITE *Trip Generation Handbook* or any other source approved by City staff. The trip generation should be documented in the scoping form for review and approval prior to study initiation.

For projects that are anticipated to generate a high volume of truck traffic, all truck trips should be converted into Passenger Car Equivalents (PCEs) or the analyst should apply appropriate heavy vehicle percentages in the capacity assessment. The following PCE conversion factors should be used:

- 2-Axle Trucks = 1.5 PCE.
- 3-Axle Trucks = 2.0 PCE.
- 4-and more Axle Trucks = 3.0 PCE.

For warehousing and high-cube warehousing projects, the split between passenger vehicles and trucks as well as the truck mix should be obtained based on the latest South Coast Air Quality Management District (SCAQMD) requirements.

3.3.3 Trip Distribution

The project's trip distribution should be based on the expected origin-destination patterns for the project's land uses. For projects screened out from a VMT analysis, the distribution may be developed manually or by using select zone assignments from SBTAM. However, for projects

requiring a VMT analysis, the regional distribution must be developed from SBTAM using select zone runs in order to maintain consistency between the LOS and VMT analysis. Other data that may be used to help refine trip distribution patterns include the relative locations of population, commercial, recreational, and employment centers, existing peak hour link and turning movement volumes, ADT volumes, proximity to regional transportation corridors, and knowledge of local and regional traffic circulation. A preliminary trip distribution should be submitted in the scoping form for review and approval by the City staff. The trip distribution may be further refined and only finalized after consultation with City staff.

3.3.4 Horizon Year Traffic Volumes

The adopted SBTAM should be used to develop traffic volume forecasts under horizon year conditions by applying the National Cooperative Highway Research Program (NCHRP) post-processing methodologies. Prior to running the model, the analyst should review the land use growth allocations in the study area to verify that the allocations are representative of the available land supply created by previously approved projects, the General Plan, and applicable zoning.

3.4 ANALYSIS METHODOLOGIES

The intersection LOS analysis should be performed using the most recent version of the *Highway Capacity Manual (HCM)*. The following parameters should be considered for the analysis:

- Saturation Flow Rate should be based on field measurements or 1,900 passenger cars/hour/ lane. Saturation Flow Rate for turn lanes should be adjusted according to HCM defaults.
- Heavy Vehicle Factor should be based on the PCE factors provided in Section 3.3.2; if classification of heavy vehicles cannot be obtained, then the Heavy Vehicle Factor should be determined based on discussion with City staff.
- Grade should be based on existing or proposed grade of the facility.
- Minimum green time should be based on existing signal timings (timing sheets may be provided by City staff or timings may be collected in the field) unless suggested HCM values would result in improved operations and should be implemented.
- Cycle lengths should be based on existing signal timings or as measured in the field.
- Lost time should be consistent with HCM requirements.
- Peak hour factors (PHFs) should be based on count data; future PHF should be 0.95. If existing PHF is higher than 0.95, it should be used for future analysis scenarios.
- Intersection analysis should be performed using a software that follows HCM methodologies; for locations where intersections are closely spaced or where queues build over space and time (extending to other upstream or downstream intersections), microsimulation software as approved by City staff should be used to analyze the intersections as a system. This may require inclusion of freeway facilities.

In case of operational deficiencies, the following improvements should be considered:

- Exclusive left-turn lanes may be considered when peak hour left-turn volumes exceed 100 vehicles.
- Dual left-turn lanes may be considered when peak hour left-turn volumes exceed 300 vehicles.
- Protected or protected-permissive left-turn phasing may be considered when the peak hour left-turn volumes exceed 200 vehicles or as determined by a traffic analysis showing excessive delays for the left-turn volumes.

3.5 INTERSECTION GENERAL PLAN CONSISTENCY REQUIREMENTS

The City's General Plan Circulation Element requires a minimum of LOS E to be maintained at study intersections on weekends during peak season. At all other times of the year, a minimum of LOS D needs to be maintained. As such, operational improvements would be required at study intersections under either of the following conditions:

a) Addition of project traffic causes the intersection LOS to degrade from an acceptable LOS or better to an unacceptable LOS.

b) Addition of project traffic causes the peak hour delay to increase as follows:

   - LOS E by 2 seconds; or
   - LOS F by 1 second

If either of the above conditions is satisfied, improvements should be identified that achieve the following:

- Improving traffic operations to an acceptable LOS or better for case a, above.
- Improving traffic operations to offset the increase in delay for case b, above.

3.6 SITE ACCESS, SAFETY, AND OTHER ANALYSES

An LTA should analyze site access and safety around the project site and on adjacent streets. The guidelines for such analyses are as follows:

a) Intersection Sight Distance: All on-site intersections, project driveways, or streets to public roadways should provide adequate sight distance. The intersection sight distance should be evaluated using the latest edition of the Caltrans *Highway Design Manual (HDM)* or locally developed standards.

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 up into the public street system.

c) Limit Driveway Impacts: Driveways and local street accesses on arterial streets should be limited to minimize the impacts on arterial streets. Driveways should be located to maintain a reasonable distance from an adjacent intersection and/or driveway. Whenever possible, driveways should be consolidated with adjacent properties.

d) Corner Clearance: A driveway should be located at a sufficient distance from a signalized intersection so that right-turn egress movements do not interfere with the right-turn queue at the intersection. Additionally, right-turn egress movements should be provided with sufficient distance to enter the left-turn pocket at the adjacent intersection.

e) Right-Turn Lanes at Driveways: The requirement and length of the right-turn lane should be reviewed and approved by the City based on engineering criteria. It should generally be sufficient to allow a vehicle traveling at the posted speed to decelerate before entering the driveway.

f) Adequacy of pedestrian facilities to/from the project site providing convenient and direct access for pedestrians.

g) Bicycle accessibility from bike routes near the project site.

h) Accessibility from adjacent transit stops to/from the project site providing convenient and direct access for transit users.

3.7 TRAFFIC SIGNAL WARRANT ANALYSIS

A traffic signal warrant analysis should be performed for unsignalized study intersections under opening year, cumulative, and horizon year conditions, where operational deficiencies are identified under plus project conditions. The traffic signal warrant analysis should be performed using the latest edition of the *California Manual on Uniform Traffic Control Devices (CAMUTCD).* The warrant analysis should be included in the LTA appendices.

To determine the location of a new traffic signal on an arterial street or approaching an arterial street, traffic progression and simulation analysis may be required using the Synchro, SimTraffic, or any equivalent software, as directed by City staff.

3.8 CEQA ASSESSMENT: ACTIVE TRANSPORTATION AND PUBLIC TRANSIT ANALYSIS

The LTA should include an analysis of potential project impacts on pedestrian, bicycle, and transit facilities. The analysis should be based on the following criterion:

- A significant impact will occur if the project conflicts with any adopted policies, plans, or programs related to pedestrian, bicycle, or transit facilities, or otherwise decreases the performance or safety of such facilities.

Therefore, the analysis should examine if the project is inconsistent with adopted policies, plans, or programs regarding active transportation or public transit facilities, or otherwise interfere with or impede the use or safety of such facilities, and determine as to whether it has the potential to conflict with existing or proposed facilities supporting these travel modes.

3.9 IMPROVEMENTS FOR OPERATIONAL DEFICIENCIES

As part of the final acceptance of the LTA, City staff will review the proposed improvements and/or fair-share contributions necessary to improve the operational deficiencies caused by the proposed development. Improvements could consist of signalization of an intersection, signal timing

improvements, lane restriping, or adding new lanes to study facilities. The project applicant can also revisit the project description in an effort to reduce the project impacts, if viable.

Improvements required for deficiencies solely created by the project may be included as part of the conditions of approval for the project. The project may be required to make a full contribution toward the implementation of these improvements. However, in cases where the project contributes to an existing or forecast deficiency, the project is required to pay only its fair-share contribution toward the proposed improvement. The fair-share amount should be calculated using the following formula: Fair share percentage = project trips ÷ (project trips + future development trips). If a project degrades operations during both peak hours, then the analysis should identify the peak hour that has the highest project burden for fair-share assessment purposes.

Payment for these improvements will be in addition to any other fees related to the existing fee programs (unless the recommended improvement is already included in an existing fee program (such as the SBCTA Measure I/Nexus Study Program or the City's Development Impact Fee (DIF) Program). Fair-share contributions identified in the LTA and subsequently listed in the conditions of approval shall be required before a building permit is issued. Improvements identified in the LTA and subsequently listed in the conditions of approval must be completed prior to occupancy.

Costs for various improvements shall be developed based on an engineer's estimate of the overall costs for the required improvements adjusted to a project's opening year.

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4.0 LOCAL TRANSPORTATION ANALYSIS REPORT FORMAT

The recommended LTA report format is as follows:

1. **Executive Summary**
    a. Project description including location, project size, site land use and zoning, etc.
    b. Project trip generation summary.
    c. Summary of LOS results for each analysis scenario.
    d. Table summarizing operational deficiencies and recommended improvements.
2. **Introduction**
    a. Purpose of the LTA 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 for the proposed project (Exhibit).
    f. Proposed project opening year and analysis scenarios.
3. **LOS Analysis Methodology and Standards**
4. **Existing Conditions**
    a. Existing circulation network.
    b. Existing study intersection geometrics and traffic control (Exhibit).
    c. Existing peak hour turning movements and ADT (Exhibit).
    d. Existing intersection LOS (Table).
    e. Existing bicycle facilities (Exhibit).
    f. Existing transit facilities (Exhibit).
    g. Existing pedestrian facilities (Exhibit).
5. **Project Traffic**
    a. Trip generation (Table).
    b. Trip distribution and assignment (Exhibit).
    c. Project peak hour turning movements and ADT (Exhibit).
6. **Opening Year Conditions**
    a. No Project analysis.
        i. Committed (funded) roadway improvements.

ii. Opening year without project peak hour turning movements and ADT (Exhibit).

iii. Opening year without project intersection LOS (Table).

b. Plus Project analysis.

i. Opening year plus project peak turning movements and ADT (Exhibit).

ii. Opening year plus project intersection LOS (Table).

iii. Identification of intersection deficiencies.

7. Cumulative Conditions

a. No Project analysis.

i. Committed (funded) roadway improvements.

ii. Approved and pending projects trip generation. (Table)

iii. Approved and pending projects trip assignment (Exhibit).

iv. Cumulative conditions peak hour turning movements and ADT (Exhibit).

v. Cumulative conditions intersection LOS (Table).

b. Plus Project analysis.

i. Cumulative plus project peak turning movement and ADT (Exhibit).

ii. Cumulative plus project intersection LOS (Table).

iii. Identification of intersection deficiencies.

8. Horizon Year Conditions (if Required)

a. No Project analysis.

i. Committed (funded) roadway improvements.

ii. Verification of whether approved and pending development projects are included in the travel demand forecasting model.

iii. Horizon year conditions peak hour turning movements and ADT (Exhibit).

iv. Horizon year conditions intersection LOS (Table).

b. Plus Project analysis.

i. Horizon year plus project peak turning movement and ADT (Exhibit).

ii. Horizon year plus project intersection LOS (Table).

iii. Identification of intersection deficiencies.

9. Traffic Signal Warrant Analysis

10. Site Access, Safety, and Other Analyses

11. CEQA Assessment: Active Transportation and Public Transit Analysis

12. Improvements and Recommendations

a. Proposed improvements at intersections.

b. Recommended Improvements categorized by whether they are included in fee programs or not. (Identify if these improvements are included in an adopted fee program.)

c. Fair-share calculations and cost estimates (as required).

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5.0 CEQA ASSESSMENT: VMT ANALYSIS

Based on the substantial evidence provided in the City's *VMT Analysis Guide,* the following guidelines establish the framework for completing a CEQA-level VMT transportation analysis for proposed projects in the City. As such, the major steps involved in the CEQA VMT Analysis are as follows:

- Screening criteria under which projects are not required to submit a detailed VMT analysis.
- VMT analysis methodologies.
- Significance thresholds.
- Mitigation measures for significant and unavoidable impacts.

5.1 SCREENING CRITERIA

5.1.1 Land Development Projects

Certain conditions may exist that would presume that a proposed land development project has a less than significant VMT impact. Land development projects that have one or more of the following attributes may be presumed to have a less than significant VMT impact.

- The project is located within half mile of a Transit Priority Area or a High-Quality Transit Area and the project is consistent with the City's General Plan and zoning, has a floor-to-area ratio (FAR) greater than 0.75, provides parking less than or equal to the City's Municipal Code requirements, and does not replace any affordable residential units with moderate- or high-income residential units.

  However, it is to be noted that each project may be required to discuss with City staff whether it qualifies for this screening criteria because of the varying commute patterns that the City experiences on weekdays and weekends throughout the year.
- Projects located in areas with low VMT will be eligible to be screened out as long as they are consistent with the City's General Plan. The City of Big Bear Lake VMT Screening Tool[1] can be used to determine whether a land use development project may be screened from a detailed VMT analysis. Proposed residential, office, industrial, or mixed-use projects, which are located within the low VMT zones identified after applying appropriate VMT analysis thresholds (provided later in this chapter) in the screening too, and which do not require a GPA or COZ involving a land use/zoning map change that results in an increase in VMT, would be deemed to have less than significant impact. VMT screening maps extracted from this tool are included in Appendix B.
- Local-serving neighborhood retail space of less than 50,000 square feet. Local-serving retail would include projects that serve the local community and visitors within the Big Bear Valley region. Local-serving retail projects would include projects such as grocery stores, restaurants, or any other commercial development.

[1] City of Big Bear Lake Screening Tool Link: https://gis1.lsa.net/BBVMT/

- Redevelopment projects that result in equal or a net reduction in VMT. A net reduction in VMT would occur if the land use proposed by the project would generate less VMT than the existing land use.
- Local parks, daycare centers, student housing projects on or adjacent to a college campus, local-serving gas stations, banks, and K–12 public schools.
- Institutional/government and public service uses such as police stations, fire stations, community centers, landfills, transfer stations, and recycling centers.
- The project has 100 percent affordable housing units.
- Projects generating fewer than 500 daily vehicle trips. The following table summarizes the maximum sizes of certain land use projects that can be exempt from a detailed VMT analysis based on the daily trip generation criteria:

Land Use	Size of Projects
Single Family Residential	52 DU
Low-Rise Multifamily Residential	68 DU
Mid-Rise Multifamily Residential	91 DU
Office	51.334 TSF
Hotel	59 Rooms
Hospital	46.641 TSF/22 Beds
Medical Office Building	14.367 TSF
Light Industrial	100.806 TSF
Warehousing	287.356 TSF

Notes: DU = Dwelling Units; TSF = Thousand Square Feet
Project sizes have been determined based on trip generation rates obtained from the ITE *Trip Generation Manual* (10th Edition).

5.1.2 Transportation Projects

The primary attribute to consider with transportation projects is the potential to increase vehicle travel. Following is a series of transportation projects that would not likely lead to a substantial or measurable increase in vehicle travel and would not require a detailed VMT analysis:

- Rehabilitation, maintenance, replacement, safety, and repair projects designed to improve the condition of existing transportation assets (e.g., highways; roadways; bridges; culverts; Transportation Management System field elements such as cameras, message signs, detection, or signals; tunnels; transit systems; and assets that serve bicycle and pedestrian facilities) and that do not create additional motor vehicle capacity.
- Roadside safety devices or hardware such as median barriers or guardrails.
- Roadway shoulder enhancements to provide “breakdown space,” dedicated space for use only by transit vehicles, to provide bicycle access, or to otherwise improve safety, but which will not be used as automobile travel lanes.
- Addition of an auxiliary lane of less than 1 mile in length designed to improve roadway safety.

- Installation, removal, or reconfiguration of traffic lanes that are not for through traffic, such as left-, right-, and U-turn pockets, two-way left-turn lanes, or emergency breakdown lanes that are not utilized as through lanes.
- Addition of roadway capacity on local or collector streets, provided the project also substantially improves conditions for pedestrians, cyclists, and, if applicable, transit.
- Conversion of existing general-purpose lanes (including ramps) to managed lanes or transit lanes, or changing lane management in a manner that would not substantially increase vehicle travel.
- Addition of a new lane that is permanently restricted to use only by transit vehicles.
- Reduction in the number of through lanes.
- Grade separation to separate vehicles from rail, transit, pedestrians, or bicycles, or to replace a lane in order to separate preferential vehicles (e.g., high-occupancy vehicles [HOVs], high-occupancy toll [HOT] lane traffic, or trucks) from general vehicles.
- Installation, removal, or reconfiguration of traffic control devices, including Transit Signal Priority features.
- Installation of traffic metering systems, detection systems, cameras, changeable message signs, and other electronics designed to optimize vehicle, bicycle, or pedestrian flow.
- Timing of signals to optimize vehicle, bicycle, or pedestrian flow.
- Installation of roundabouts or traffic circles.
- Installation or reconfiguration of traffic calming devices.
- Adoption of or increase in tolls.
- Addition of tolled lanes, where tolls are sufficient to mitigate VMT increase.
- Initiation of a new transit service.
- Conversion of streets from one-way to two-way operation with no net increase in the number of traffic lanes.
- Removal or relocation of off-street or on-street parking spaces.
- Adoption or modification of on-street parking or loading restrictions (including meters, time limits, accessible spaces, and preferential/reserved parking permit programs).
- Addition of traffic wayfinding signage.
- Rehabilitation and maintenance projects that do not add motor vehicle capacity.
- Addition of new or enhanced bike or pedestrian facilities on existing streets/highways or within existing public rights-of-way.
- Addition of Class I bike paths, trails, multi-use paths, or other off-road facilities that serve non-motorized travel.
- Installation of publicly available alternative fuel/charging infrastructure.

- Addition of passing lanes, truck climbing lanes, or truck brake-check lanes in rural areas that do not increase overall vehicle capacity along the corridor.

Additionally, transit and active transportation projects generally reduce VMT and, therefore, are presumed to cause a less than significant impact on transportation. This criterion will apply to all passenger rail projects, bus and bus rapid-transit projects, and bicycle and pedestrian infrastructure projects.

5.2 VMT ANALYSIS METHODOLOGIES

5.2.1 Land Development Projects

For all projects that do not meet the Project Screening criteria, a detailed VMT impact analysis will be required. In outlining the project thresholds, the primary type of trips used in the VMT calculation for residential, office, and retail uses are defined as "home-based trips." The metric used is VMT per capita for residential projects, VMT per employee for office projects, total VMT for retail projects, and VMT per service population for hotels, hospitals, medical office buildings (MOBs), campgrounds, and resort projects. For other non-residential land uses, VMT per employee shall be used.

For mixed-use projects, the VMT should be evaluated separately for each component of the project using the most appropriate metric (VMT per capita, VMT per employee, total VMT, or VMT per service population). The method of VMT analysis should be determined based on discussion with City staff. Credits for internal trip capture should be made.

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

5.2.2 Transportation Projects

The City should be required to consider the effects of transportation projects on vehicle travel. Additional vehicle travel generated by transportation projects is referred to as "induced vehicle travel." Projects may be required to analyze the growth impacts under CEQA. However, if a proposed transportation project meets the screening criteria previously outlined, then a detailed VMT analysis will not be required. More details on VMT analysis for transportation projects is outlined in the *VMT Analysis Guide*.

Induced VMT or VMT attributable to the project needs to be calculated by evaluating no project and with project conditions under the horizon scenario using SBTAM. A graphic representation of the VMT attributable to a transportation project is provided in Figure 6 of the *VMT Analysis Guide*.

5.2.3 Land Use Plans

Existing VMT per service population for the region and expected horizon year VMT per service population for the land use plan must be determined using SBTAM. For land use plans with a specific land use, existing VMT per capita or VMT per employee, as appropriate, for the region and expected horizon year VMT per capita or VMT per employee should be determined using SBTAM.

5.3 VMT THRESHOLDS

5.3.1 Land Development Projects

SB 743 follows the State goals set by the California Air Resources Board (CARB) in SB 375 for reducing greenhouse gas emissions by 15 percent below existing conditions by 2035. Accordingly, the City has determined the thresholds for land use development projects. The defined City VMT Thresholds are as follows:

- A proposed residential project exceeding 85 percent of the existing Big Bear Valley regional average VMT per capita would indicate a significant VMT impact.
- A proposed office project exceeding 85 percent of the existing Big Bear Valley regional average VMT per employee would indicate a significant VMT impact.
- For proposed retail projects, any net increase in total VMT for the Big Bear Valley region with the addition of the proposed project would indicate a significant impact.
- A proposed hotel, hospital, or MOB project exceeding 85 percent of the existing Big Bear Valley regional average VMT per service population would indicate a significant VMT impact.
- For all other land uses, any net increase in VMT per employee would indicate a significant impact for uses consistent with the General Plan. For projects seeking a GPA, a project exceeding 85 percent of the existing Big Bear Valley regional average VMT per employee would indicate a significant VMT impact.
- A mixed-use project exceeding the respective VMT thresholds for its different land use components.

As obtained from SBTAM, the average VMT per capita in the Big Bear Valley region is 20.4. The average VMT per employee is 14.6. The average VMT per service population is 35.5. Based on the goal of 15 percent reduction below the Big Bear Valley regional average, the City's thresholds would be:

- **Residential:** 17.3 VMT per capita.
- **Office:** 12.4 VMT per employee.
- **Retail:** No net change in total VMT.
- **Hotel, Hospital, MOB, Campground, or Resort:** 30.2 VMT per service population.
- **Other Land Uses:** Any net increase in VMT per employee for uses consistent with the General Plan. For projects seeking a GPA, a project exceeding 12.4 VMT per employee would indicate a significant VMT impact.
- **Mixed-Use Projects:** Respective VMT thresholds for its different land use components.

5.3.2 Transportation Projects

Net increase in induced VMT will result in a significant impact for a proposed transportation project. The increase in VMT needs to be calculated by comparing the horizon year no-build VMT with the

horizon year build VMT. Model adjustment may be necessary to account for induced growth and potential increases in future land use as a result of the capacity-enhancing transportation project.

5.3.3 Land Use Plans

The existing VMT per service population for the region must be compared with the horizon year VMT per service population for the land use plan. For land use plans with a specific land use, existing VMT per capita or VMT per employee, as appropriate, for the region and expected horizon year VMT per capita or VMT per employee should be determined using SBTAM. If there is a net increase in the metrics under horizon year conditions, then the project will have a significant impact.

5.4 DETAILED VMT FORECASTING METHODOLOGY

For non-screened VMT projects, SBTAM should be used for VMT calculations. Land use projects should use the model base scenario for the VMT analysis. For transportation projects and land use plans, the model horizon year scenario must be used to calculate project VMT.

For all analyses purposes, the following steps summarize the recommended VMT forecasting methodology:

- A separate traffic analysis zone (TAZ) or zones must be created within the model to isolate project land uses and corresponding socioeconomic data (SED). In the case of the horizon year scenario, SED equivalent to the project land uses should be subtracted from the project location (parent) zone. The appropriate project SED should then be added to the newly created TAZ/TAZs for the project.
- Once the model runs are completed, VMT should be calculated using either the Production-Attraction (PA) or Origin-Destination (OD) trip matrices. For residential, office, and other projects where VMT per capita or VMT per employee are the suitable metrics, VMT should be calculated using PA trip matrices. For mixed-use projects and land use plans, where VMT per service population is the suitable metric, OD trip matrices should be used for VMT calculation. For retail projects, link-level VMT within the Big Bear Valley region from the “no project” model run should be compared with “with project” model run.
- The following steps provide guidance on the calculations:
    - Use of PA matrices:
        - Keep the trip purposes, time of day periods (peak and off peak), and modes separate.
        - Use distance core from skim matrices by mode and time of day periods.
        - Convert person trips to vehicle trips using the auto occupancy factors.
        - Multiply the appropriate vehicle trip cores (by purpose) with distance cores from skim matrices by mode and time period.
        - Aggregate the vehicle VMT matrices by time period into daily VMT.

- Calculate vehicle VMT by TAZ using the matrix marginal: Row sum for all home-based trip purposes for VMT per capita and Column sum for home-based work trip purposes for VMT per employee.

- Use of OD matrices:
  - Combine AM and PM OD matrices into peak and MD and NT OD matrices into off-peak vehicle matrices retaining the vehicular modes.
  - Use distance matrix/core from peak and off-peak skim matrices by mode.
  - Multiply the vehicle OD matrices by mode with distance cores from skim matrices by mode for both peak and off-peak periods.
  - Aggregate the peak and off-peak VMT matrices into daily OD VMT.
  - Calculate OD VMT by TAZ using the matrix marginal: Add both Row and Column sums for TAZs to calculate OD VMT per service population.

5.5 MITIGATION MEASURES

When the VMT analysis determines that a project has a significant impact, the applicant is required to identify feasible mitigation measures to avoid or substantially reduce the impact created by the project. The mitigation measures can be either strategies outlined in the *VMT Analysis Guide* or others selected by the applicant. For the latter, the applicant needs to provide substantial evidence while identifying project-specific values. All mitigation measures and reduction percentages will be finalized based on discussions with City staff.

If the mitigation measures fully mitigate the project impact, the project is presumed to have an impact mitigated to a less than significant level. No further analysis is required. If the project's VMT impact cannot be fully mitigated, the City may (1) request the project be redesigned to reduce the VMT impact, or (2) prepare a Statement of Overriding Considerations (SOC) for the transportation impacts associated with the project. All feasible mitigation measures must be assigned to and carried out by the project even if an SOC is prepared.

Appendix C of this document provides a summary of various VMT mitigation measures and project alternatives presented in the *CAPCOA Green Book* (only those strategies directly attributed to transportation) and the Office of Planning and Research Technical Advisory (OPR TA) for development projects. It also refers to mitigation measures listed in other sources such as the VMT Measurement Calculator for the City of Los Angeles, the Transportation Analysis Guidelines for the City of San Jose and for the San Diego Region, and the Memorandum Analysis of VMT Mitigation Measures Pursuant to SB 743, prepared by Iteris, Inc., for the Los Angeles County Metropolitan Transportation Authority (LA Metro).

Appendix D of this document provides a list of mitigations applicable to development projects based on research performed by Deborah Salon, Marlon G. Boarnet, Susan Handy, Steven Spears, and Gil Tal with the support of CARB.

As for land use plans, the potential VMT mitigation measures for community/general plans are similar to those available for development projects, with certain modifications. The OPR TA does not specifically identify any VMT mitigations for land use plans. However, Appendix E of this document summarizes a set of land use VMT mitigation measures, along with the corresponding VMT reduction percentages obtained from CAPCOA.

6.0 VEHICLE MILES TRAVELED ANALYSIS REPORT FORMAT

The recommended VMT report format is as follows:

1. **Project Description**
2. **VMT Screening Methodology (if applicable)**
3. **Project VMT Analysis Methodology (for non-screened projects)**
4. **Project VMT Thresholds**
5. **Identification of VMT Impacts (if any)**
6. **Mitigation Measures (if required)**

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APPENDIX A

TIA SCOPING FORM

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TIA SCOPING FORM

This completed Scoping Form must be submitted to City staff for review before initiation of the TIA:

Project Identification:

Case Number:	
Related Cases:	
SP No.	
EIR No.	
GPA No.	
CZ No.	
Project Name:	
Project Opening Year:	
Project Description:	

	Consultant	Developer
Name:		
Address:		
Telephone:		
Fax/Email:		

Trip Generation Information:

Source of Trip Generation Data: _____

Current General Plan Land Use	Proposed General Plan Land Use
Current Zoning	**Proposed Zoning**

	Existing Trip Generation			Proposed Trip Generation		
	In	Out	Total	In	Out	Total
AM Peak Hour:						
PM Peak Hour:						

Trip Internalization: ☐ Yes ☐ No	Percentage (if Yes)
Pass-By Allowance: ☐ Yes ☐ No	Percentage (if Yes)
Diverted Trips Allowance: ☐ Yes ☐ No	Percentage (if Yes)

Potential Screening Checks:

Is your project screened from a Local Transportation Analysis (LTA), pursuant to the criteria in Section 2.1 of the guidelines?

☐ Yes ☐ No

LTA Screening Justification:

Is your project screened from a VMT analysis, as per the criteria in Section 2.2 of the guidelines?

☐ Yes ☐ No

VMT Screening Justification:

Level of Service Analysis Scoping:

Project Trip Distribution Percentages (Attach exhibit for detailed distribution):

North	South	East	West

- Attach list of Approved and Pending Projects that need to be considered (provided by City staff and adjacent jurisdictions)
- Attach list of study intersections
- Attach site plan
- Note other specific items to be addressed:
  a. Site access
  b. On-site circulation
  c. Parking
  d. Consistency with Plans supporting Bikes/Pedestrians/Transit
  e. Other _____
- Date of Traffic Counts _____
- Attach proposed analysis scenarios (years plus proposed forecasting approach)
- Attach proposed phasing approach (if the project is phased)

Vehicle Miles Traveled Analysis Scoping:

For projects that are not screened, identify the following:

- Travel Demand Forecasting Model Used: _____
- Attach City of Big Bear Lake VMT Screening Assessment output or describe why it is not appropriate for use
- Attach proposed Model Land Use Inputs and Assumed Conversion Factors (attach)

Any other specific issues to be addressed in the LTA or VMT analysis, apart from those stated in the Guidelines?

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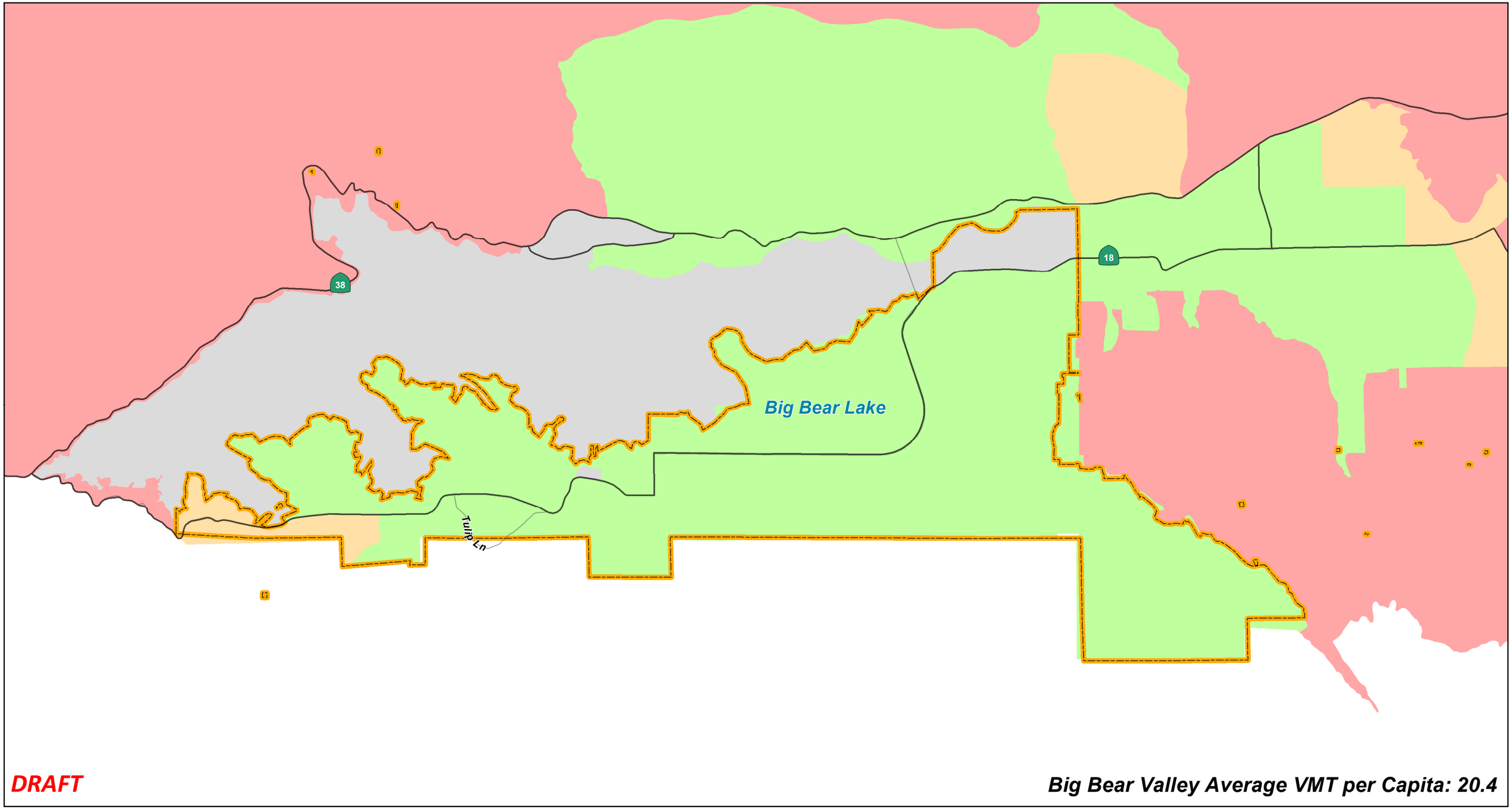
APPENDIX B

VEHICLE MILES TRAVELED SCREENING MAPS



LSA

LEGEND

City of Big Bear Lake

VMT per Capita

No Population

Less than 17.3

17.3 - 20.4

Greater than 20.4

0 1500 3000

FEET

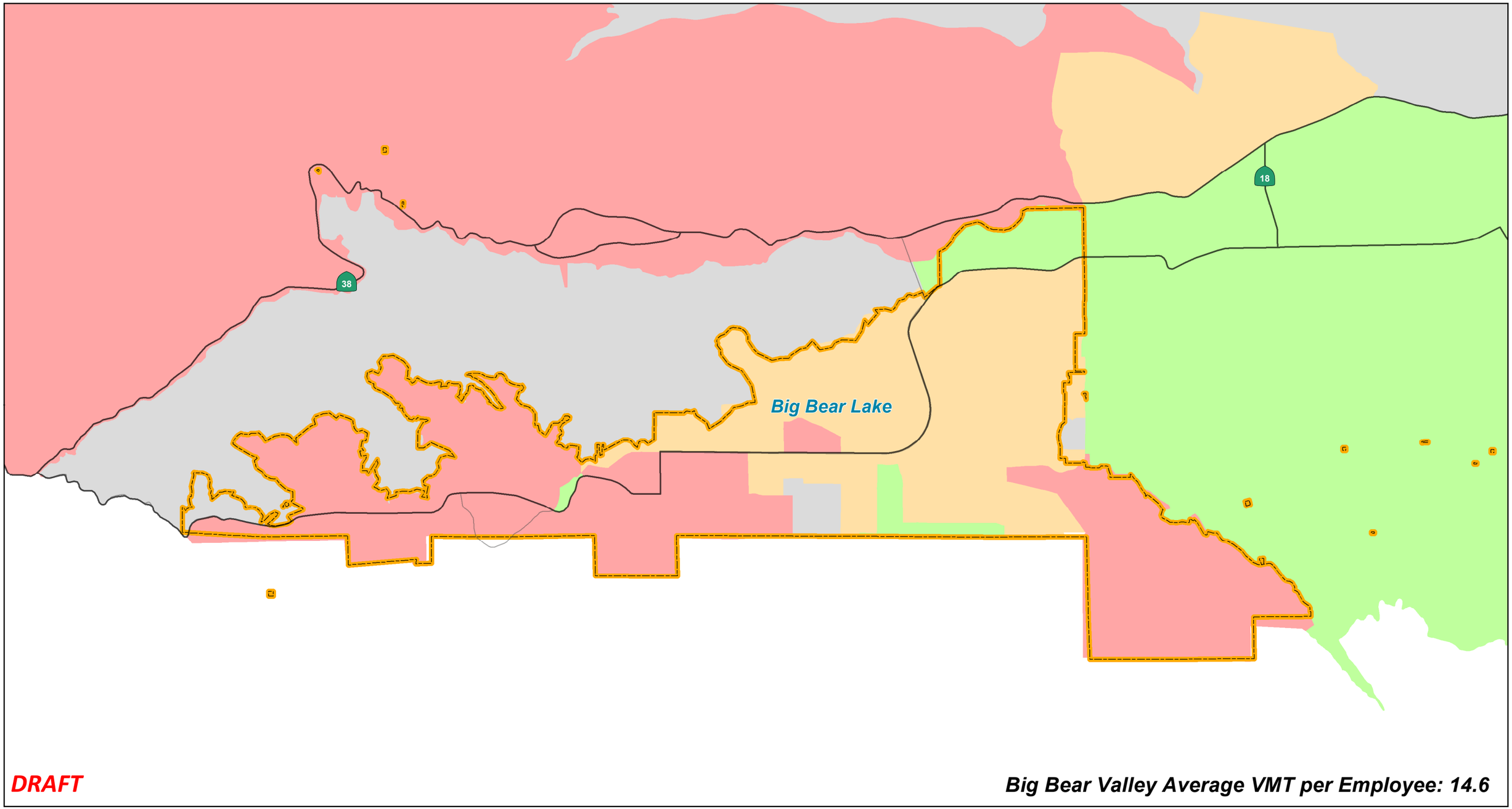
SOURCE: SBTAM 2016; ESRI Streetmap, 2013.

R:\GBL2101\Graphics\GIS\Reports\figA4_VMT_Capita_City.mxd (10/15/2021)

FIGURE B-1

City of Big Bear Lake Traffic Impact Analysis Guidelines for Local Transportation Analysis and Vehicle Miles Traveled Analysis

City of Big Bear Lake Existing VMT per Capita



DRAFT

Big Bear Valley Average VMT per Employee: 14.6

LSA

LEGEND

City of Big Bear Lake

VMT per Employee

No Employment

Less than 12.4

12.4 - 14.6

Greater than 14.6

0 1500 3000

FEET

SOURCE: SBTAM 2016; ESRI Streetmap, 2013.

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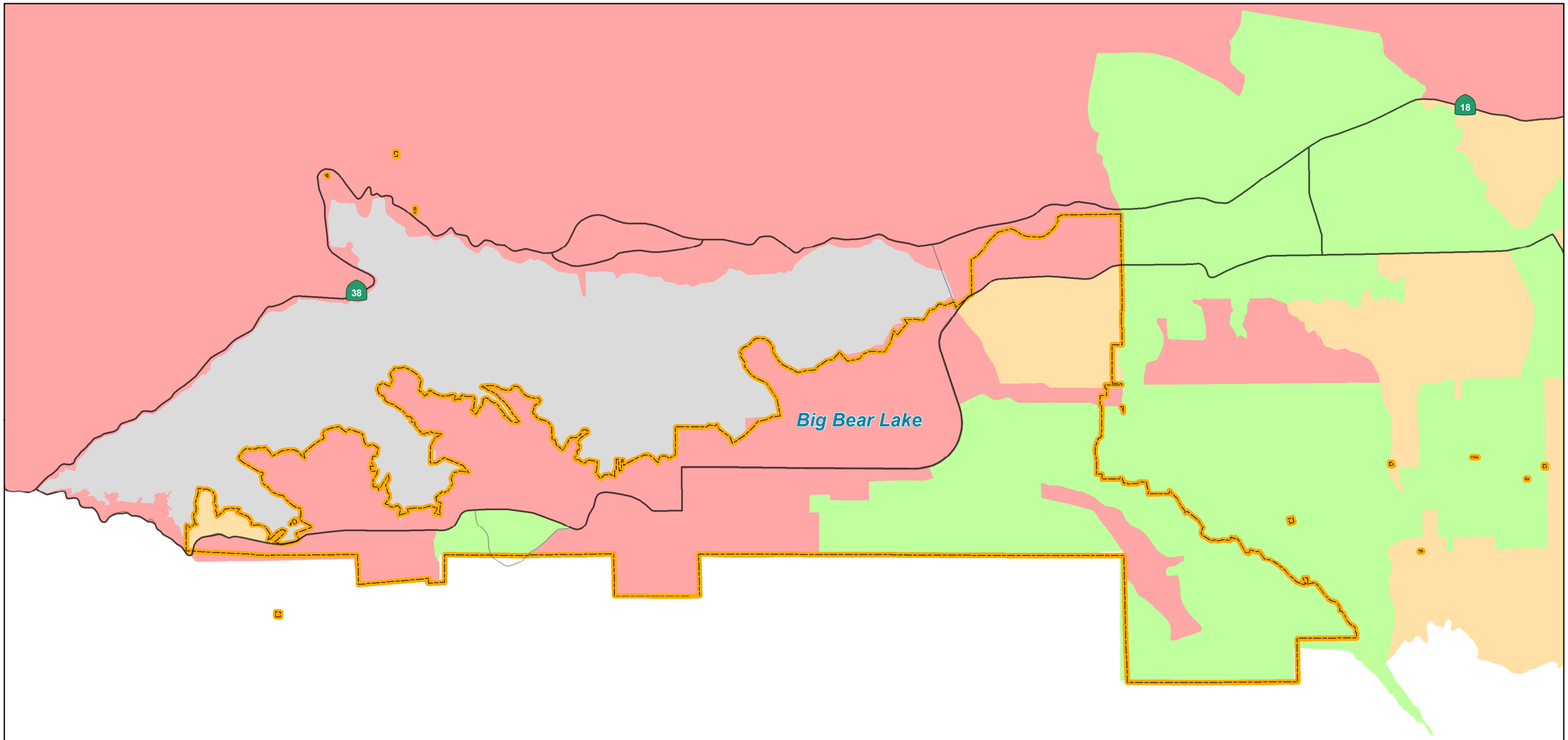
FIGURE B-2

City of Big Bear Lake Traffic Impact Analysis Guidelines for Local Transportation Analysis and Vehicle Miles Traveled Analysis

City of Big Bear Lake Existing VMT per Employee



DRAFT

Big Bear Valley Average VMT per Service Population: 35.5

LSA

LEGEND

City of Big Bear Lake

VMT per Service Population

- No Population or Employment
- Less than 30.2
- 30.2 - 35.5
- Greater than 35.5

N

0 1500 3000

FEET

FIGURE B-3

City of Big Bear Lake Traffic Impact Analysis Guidelines for Local Transportation Analysis and Vehicle Miles Traveled Analysis

City of Big Bear Lake Existing VMT per Service Population

SOURCE: SBTAM 2016; ESRI Streetmap, 2013.

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APPENDIX C

VEHICLE MILES TRAVELED MITIGATION MEASURES FOR DEVELOPMENT PROJECTS (CAPCOA)

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

#	Mitigation Measure	VMT Reduction[1]	Notes
1	Improve or increase access to transit	CAPCOA TST-2: Not quantified alone, grouped strategy with TST-3 'Expand transit network' and TST-4 'Increase transit service frequency/speed'; CAPCOA LUT-5: 0.50% - 24.60%	Notes: CAPCOA TST-2: Implement Transit Access Improvements (applicable in urban and suburban context, and appropriate for residential, retail, office, mixed use, and industrial projects); CAPCOA LUT-5: Increase Transit Accessibility [May be grouped with CAPCOA measures LUT-3 (mixed use development), SDT-2 (traffic calmed streets with good connectivity), and PPT-1 through PPT-7 (parking management strategies); measures are applicable in urban and suburban contexts; appropriate in rural context if development site is adjacent to a commuter rail station with convenient rail service to a major employment center; appropriate for residential, retail, office, industrial, and mixed-use projects]
2	Increase access to common goods and services, such as groceries, schools, and daycare	Similar to CAPCOA LUT-3 (Increase Diversity of Urban and Suburban Developments (Mixed Use)): 9.00% 30.00% VMT reduction and CAPCOA LUT-4 (Increase Destination Accessibility): 6.70% - 20.00% VMT reduction	Notes: Similar to CAPCOA LUT-3 (Increase Diversity of Urban and Suburban Developments (Mixed Use) - Applicable in urban and suburban context; negligible in rural context (unless the project is a master-planned community; appropriate for mixed-use projects) and CAPCOA LUT-4 (Applicable in urban and suburban context, negligible in rural context, appropriate for residential, retail, office, industrial, and mixed-use projects)
3	Incorporate affordable housing into the project	0.04% - 1.20%	Notes: Similar measure is CAPCOA LUT-6 [Integrate Affordable and Below Market Rate Housing] - [Applicable in urban and suburban contexts; negligible impact in a rural context unless transit availability and proximity to jobs/services are existing characteristics; appropriate for residential and mixed-use projects]
4	Incorporate neighborhood electric vehicle network	0.50% - 12.70%	Notes: CAPCOA SDT-3 [Neighborhood electric vehicles (NEV) would result in a mode shift and therefore reduce the traditional vehicle VMT and GHG emissions. Range depends on the available NEV network and support facilities, NEV ownership levels, and the degree of shift from traditional; measure is applicable in urban, suburban, and rural context, for small citywide or large multi-use developments, and appropriate for mixed-use projects]

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

#	Mitigation Measure	VMT Reduction[1]	Notes
5	Orient project towards transit, bicycle, and pedestrian facilities	1) 0.25% - 0.5% (0.25% reduction is attributed for a project oriented towards a planned corridor and 0.5% reduction is attributed for a project oriented towards an existing corridor) (as per the Sacramento Metropolitan Air Quality Management District (SMAQMD) *Recommended Guidance for Land Use Emission Reductions*), 2) 0.5% reduction in VMT per 1% increase in transit frequency and per 10% increase in transit ridership (as per the Center for Clean Air Policy (CCAP) *Transportation Emission Guidebook*)	Notes: CAPCOA LUT-7 [Orient project toward non-auto corridor]; Grouped strategy with LUT-3 (Increase Diversity of Urban and Suburban Developments (Mixed Use) ; there is no sufficient evidence that the measures results in non-negotiable trip reduction unless combined with other measures, including neighborhood design, density and diversity of development, transit accessibility and pedestrian and bicycle network improvements; the measure is applicable for urban or suburban context (may be applicable in a master-planned rural community) and is appropriate for residential, retail, office, industrial, and mixed use projects
6	Provide pedestrian network improvements	0.00% - 2.00%	Notes: CAPCOA SDT-1 [applicable in urban, suburban, and rural context; appropriate for residential, retail, office, industrial, and mixed-use projects; reduction benefit only occurs if the project has both pedestrian network improvements on site and connections to the larger off-site network]. This can be considered under Technical Advisory Measure 'Improve pedestrian or bicycle networks, or transit service'
7	Incorporate bike lane street design (on-site)	1% increase in share of workers commuting by bicycle (for each additional mile of bike lanes per square mile) (*Bicycle Commuting and Facilities in Major U.S. Cities: If You Build Them, Commuters Will Use Them – Another Look* by Dill and Carr (2003)); 258% - 830% increase in bicycle community (*Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions* by Cambridge Systematics); 0.075% increase in bicycle commuting with each mile of bikeway per 100,000 residents (*If You Build Them, Commuters Will Use Them; Cross-Sectional Analysis of Commuters and Bicycle Facilities* by Nelson and Allen (1997))	Notes: CAPCOA SDT-5 [Grouped strategy, benefits of Bike Lane Street Design are small and should be grouped with the LUT-9 (Improve Design of Development) strategy to strengthen street network characteristics and enhance multi-modal environments], the measure is applicable in urban and suburban contexts and is appropriate for residential, retail, office, industrial, and mixed-use projects. This can be considered under Technical Advisory Measure 'Improve pedestrian or bicycle networks, or transit service'

LSA

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

#	Mitigation Measure	VMT Reduction[1]	Notes
8	Expand transit network	0.10% – 8.20%	Notes: CAPCOA TST-3; Measure applicable in urban and suburban context, maybe applicable in rural context but no literature documentation available, appropriate for specific or general plans. This can be considered under Technical Advisory Measure 'Improve pedestrian or bicycle networks, or transit service'
9	Increase transit service frequency/speed	0.02% – 2.50%	Notes: CAPCOA TST-4, applicable in urban and suburban context, maybe applicable in rural context but no literature documentation available, appropriate for specific or general plans. This can be considered under Technical Advisory Measure 'Improve pedestrian or bicycle networks, or transit service'
10	Provide a Bus Rapid Transit System	0.02% – 3.20%	Notes: CAPCOA TST-1 (Applicable in urban and suburban context; negligible in rural context; appropriate for specific or general plans). This can be considered under Technical Advisory Measure 'Improve pedestrian or bicycle networks, or transit service.'
11	Required project contributions to transportation infrastructure improvement projects	Not Quantified: Grouped strategy (with RPT-2 and TST-1 through 7)	Notes: CAPCOA RPT-3 (Applicable in urban, suburban and rural context; appropriate for residential, retail, office, mixed use, and industrial projects); measure similar to some of the measures discussed above. This can be considered under Technical Advisory Measure 'Improve pedestrian or bicycle networks, or transit service.'
12	Increase destination accessibility	6.70% – 20.00%	Notes: CAPCOA LUT-4 [Destination accessibility measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be the highest at central locations and lowest at peripheral ones; the location of the project also increases the potential for pedestrians to walk and bike to these destinations and therefore reduces VMT; applicable for urban and suburban contexts, negligible impact in a rural context; appropriate for residential, retail, office, industrial, and mixed-use projects]. This can be considered under Technical Advisory Measure 'Improve pedestrian or bicycle networks, or transit service'
13	Provide traffic calming measures	0.25% – 1.00%	Notes: CAPCOA SDT-2 [applicable in urban, suburban, and rural contexts; appropriate for residential, retail, office, industrial, and mixed-use projects]

LSA

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

#	Mitigation Measure	VMT Reduction[1]	Notes
14	Provide bike parking in non-residential projects	0.625% (as per the Center for Clean Air Policy (CCAP) *Transportation Emission Guidebook*) and 258% - 830% increase in bicycle community (*Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions* by Cambridge Systematics)	Notes: CAPCOA SDT-6 [Bike Parking in Non-Residential projects has minimal impacts as a standalone strategy and should be grouped with the LUT-9 (Improve Design of Development) strategy to encourage bicycling by providing strengthened street network characteristics and bicycle facilities]; the measure is applicable in urban, suburban, and rural contexts; appropriate for retail, office, industrial, and mixed-use projects
15	Provide bike parking with multi-unit residential projects	Not Quantified	Notes: CAPCOA SDT-7 [Grouped Strategy; the benefits of Bike Parking with Multi-Unit Residential Projects have no quantified impacts and should be grouped with the LUT-9 (Improve Design of Development) strategy to encourage bicycling by providing strengthened street network characteristics and bicycle facilities. The measure is applicable in urban, suburban, or rural contexts. It is appropriate for residential projects.]
16	Limit or eliminate parking supply	5.00% - 12.50%	Notes: CAPCOA PDT-1 (applicable in urban and suburban context, negligible in rural context, appropriate for residential, retail, office, industrial, and mixed-use projects); reduction can be counted only if spillover parking is controlled (via residential permits and on-street market parking); follow multi-faceted strategy including 1) elimination/reduction of minimum parking requirements, 2) creation of maximum parking requirements, and 3) provision of shared parking
17	Unbundle parking costs from property costs	2.60% - 13.00%	Notes: CAPCOA PDT-2 (applicable in urban and suburban context, negligible in rural context, appropriate for residential, retail, office, industrial and mixed-use projects; complimentary strategies include workplace parking pricing)
18	Provide parking cash-out programs	0.60% – 7.70% commute VMT	Notes: CAPCOA TRT-15 [Implement employee parking "cash-out"; the term “cash out” is used to describe the employer providing employees with a choice of forgoing their current subsidized/free parking for a cash payment equivalent to the cost of the parking space to the employer. The measure is applicable in urban and suburban context; it is not applicable in rural context; it is appropriate for retail, office, industrial, and mixed-use projects. Restrictions are applied only if complementary strategies are in place: a) Residential parking permits and market rate public on-street parking to prevent spill over parking; b) Unbundled parking - is not required but provides a market signal to employers to forgo paying for parking spaces and “cash-out” the employee instead. In addition, unbundling parking provides a price with which employers can utilize as a means of establishing “cash-out” prices.

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

#	Mitigation Measure	VMT Reduction[1]	Notes
19	Implement or provide access to a commute reduction program - Voluntary	1.00% - 6.20% commute VMT	Notes: CAPCOA TRT-1: Commute Trip Reduction Program – Voluntary, is a multi-strategy program that encompasses a combination of individual measures described CAPCOA measures TRT-3 through TRT-9. It is presented as a means of preventing double-counting of reductions for individual measures that are included in this strategy. It does so by setting a maximum level of reductions that should be permitted for a combined set of strategies within a voluntary program. The main difference between a voluntary and a required program is: A) Monitoring and reporting is not required B) No established performance standards (i.e. no trip reduction requirements). The measure is applicable in urban and suburban contexts, negligible in a rural context, unless large employers exist and suite of strategies implemented are relevant in rural settings. The measure is appropriate for retail, office, industrial, and mixed-use projects.
20	Implement or provide access to Commute Trip Reduction Program – Required implementation/monitoring	4.2% – 21.0% commute VMT	Notes: CAPCOA TRT-2 (Commute Trip Reduction Program is a multi-strategy program that encompasses a combination of individual measures from TRT-3 through TRT-9. It is presented as a means of preventing double-counting of reductions for individual measures that are included in this strategy. It does so by setting a maximum level of reduction that should be permitted for a combined set of strategies within a program that is contractually required of the development sponsors and managers and accompanied by a regular performance monitoring and reporting program. Check examples of Tucson, Arizona and South San Francisco, CA from CAPCOA. The measure is applicable in urban and suburban contexts; it is negligible in rural context, unless large employees exist, and suite of strategies implemented are relevant in rural settings; jurisdiction level only)
21	Provide ride-sharing program	1.00% – 15.00% commute VMT	Notes: CAPCOA TRT-3 [Provide Ride-Sharing Programs: applicable in urban and suburban context; Negligible impact in many rural contexts, but can be effective when a large employer in a rural area draws from a workforce in an urban or suburban area, such as when a major employer moves from an urban location to a rural location; appropriate for residential, retail, office, industrial, and mixed-use projects]
22	Implement car-sharing program	0.40% – 0.70%	Notes: CAPCOA TRT-9 [urban and suburban context, negligible in rural context, and appropriate for residential, retail, office, industrial, and mixed-use projects]

LSA

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

#	Mitigation Measure	VMT Reduction[1]	Notes
23	Implement bike-sharing program	Taking evidence from the literature, a 135-300% increase in bicycling (of which roughly 7% are shifting from vehicle travel) results in a negligible impact (around 0.03% VMT reduction)	Notes: CAPCOA TRT-12 [This measure has minimal impacts when implemented alone. The strategy's effectiveness is heavily dependent on the location and context. Bike-sharing programs have worked well in densely populated areas (examples in Barcelona, London, Lyon, and Paris) with existing infrastructure for bicycling. Bike sharing programs should be combined with Bike Lane Street Design (SDT-5) and Improve Design of Development (LUT-9). The measure is applicable in urban and suburban-center context only; it is negligible in a rural context; appropriate for residential, retail, office, industrial, and mixed-use projects
24	Provide transit passes	Similar to CAPCOA TRT-4 [Implement Subsidized or Discounted Transit Program]; for TRT-4, commute VMT reduction is 0.30% - 20.00%	Notes: Similar to CAPCOA TRT-4 [Implement Subsidized or Discounted Transit Program]
25	Shifting single occupancy vehicle trips to carpooling or vanpooling, for example providing ride-matching or shuttle services	0.30% - 13.40% commute VMT reduction (for CAPCOA TRT-11: Provide Employer-Sponsored Vanpool/Shuttle); 7.20% - 15.80% school VMT reduction (for CAPCOA TRT-10: Implement a School Pool Program)	Notes: Similar to CAPCOA TRT-11 (Provide employer-sponsored vanpool/shuttle) - the measure is applicable for urban, suburban, and rural context, and is appropriate for office, industrial, and mixed-use projects; Similar measure is CAPCOA TRT-10 (Implement a School Pool Program: Applicable for urban, suburban, and rural context and appropriate for residential and mixed-use projects)
26	Implement a school pool program	7.20% - 15.80% school VMT reduction	Notes: CAPCOA TRT-10 [This project will create a ridesharing program for school children. Most school districts provide bussing services to public schools only. School Pool helps match parents to transport students to private schools, or to schools where students cannot walk or bike but do not meet the requirements for bussing. The measure is applicable in urban, suburban, and rural context and is appropriate for residential and mixed-use projects.]
27	Operate free direct shuttle service	CAPCOA TST-6 (Provide Local Shuttles): Not Quantified; 0.30% - 13.40% commute VMT reduction (for CAPCOA TRT-11: Provide Employer-Sponsored Vanpool/Shuttle)	Notes: CAPCOA TST-6 (Provide Local Shuttles - grouped strategy with TST-5 'Provide Bike Parking Near Transit' and TST-4 'Increase Transit Service Frequency/Speed') - Applicable in urban/suburban context; appropriate for large residential, retail, office, mixed use, and industrial projects; solves the "first mile/last mile" problem; CAPCOA TRT-11 (Provide employer-sponsored vanpool/shuttle) - the measure is applicable for urban, suburban, and rural context, and is appropriate for office, industrial, and mixed-use projects. This measure can be considered under the Technical Advisory Measure 'Shifting single occupancy vehicle trips to carpooling or vanpooling, for example providing ride matching services.'

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

#	Mitigation Measure	VMT Reduction[1]	Notes
28	Provide teleworking options	0.07% - 5.50% commute VMT	Notes: CAPCOA TRT-6 [Applicable in urban, rural, and suburban contexts; appropriate for retail, office, industrial, and mixed-use projects]
29	Subsidize public transit service upgrades	Not Quantified	Notes: Similar to CAPCOA TST-2 through TST-4
30	Implement subsidized or discounted transit program	0.30% – 20.00% commute VMT	Notes: CAPCOA TRT-4 [Implement subsidized or discounted transit program (the measure is applicable in urban and suburban context, negligible in a rural context, appropriate for residential, retail, office, industrial, and mixed-use projects); The project will provide subsidized/discounted daily or monthly public transit passes. The project may also provide free transfers between all shuttles and transit to participants. These passes can be partially or wholly subsidized by the employer, school, or development. Many entities use revenue from parking to offset the cost of such a project. The measure is included under the Technical Advisory Measure 'Provide incentives or subsidies that increase the use of modes other than single-occupancy vehicle.'
31	Subsidize vanpool	0.30% - 13.40% commute VMT	Notes: Similar to CAPCOA TRT-11 (Provide Employer-Sponsored Vanpool/Shuttle: applicable in urban, suburban, and rural context; appropriate for office, industrial, and mixed-use projects). The measure is included under the Technical Advisory Measure 'Provide incentives or subsidies that increase the use of modes other than single-occupancy vehicle.'
32	Providing on-site amenities at places of work, such as priority parking for carpools and vanpools, secure bike parking, and showers and locker rooms	22% increase in bicycle mode share (UK National Travel Survey)/2%-5% reduction in commute vehicle trips (*Transportation Demand Management Encyclopedia*)/0.625% reduction in VMT (*Center for Clean Air Policy (CCAP) Emission Guidebook*)	Notes: CAPCOA TRT-5 [Provide End of Trip Facilities]: End-of-trip facilities have minimal impacts when implemented alone. This strategy's effectiveness in reducing vehicle miles traveled (VMT) depends heavily on the suite of other transit, pedestrian/bicycle, and demand management measures offered. End-of trip facilities should be grouped with Commute Trip Reduction (CTR) Programs (TRT-1: Implement Commute Trip Reduction Program - Voluntary through TRT-2: Implement Commute Trip Reduction Program – Required Implementation/Monitoring) and TRT-3 (Provide Ride-Sharing Programs)
33	Provide employee transportation coordinators at employment sites	Not Quantified	Included as part of CAPCOA TRT-1 (Implement Commute Trip Reduction Program - Voluntary)
34	Provide a guaranteed ride home service to users of non-auto modes	Not Quantified	-
35	Locate project in an area of the region that already exhibits low VMT	10.00% - 65.00%	Notes: CAPCOA LUT-2 (Applicable in urban and suburban contexts; negligible in rural contexts; appropriate for residential, retail, office, industrial, and mixed-use projects)

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

#	Mitigation Measure	VMT Reduction[1]	Notes
36	Locate project near transit	0.50% - 24.60%	Notes: CAPCOA LUT-5 [May be grouped with CAPCOA measures LUT-3 (mixed use development), SDT-2 (traffic calmed streets with good connectivity), and PPT-1 through PPT-7 (parking management strategies); measures are applicable in urban and suburban contexts; appropriate in rural context if development site is adjacent to a commuter rail station with convenient rail service to a major employment center; appropriate for residential, retail, office, industrial, and mixed-use projects]
37	Increase project/development density	1.50% - 30.00%	Notes: CAPCOA LUT-1 (Applicable in urban and suburban contexts only; negligible in rural context; appropriate for residential, retail, office, industrial, and mixed-use projects)
38	Increase the mix of uses within the project or within the project's surroundings	9.00% - 30.00%	Notes: CAPCOA LUT-3: Increase Diversity of Urban and Suburban Developments (Mixed Use) [Applicable in urban and suburban context, negligible in rural context, and appropriate for mixed-use projects]
39	Improve network connectivity and/or increase intersection density on the project site	Similar measure is CAPCOA LUT-9 [Improve Design of Development]: 3.0% - 21.3% reduction in VMT	Notes: Similar measure to CAPCOA LUT-9 (Improve Design of Development)
40	Deploy management strategies (e.g., pricing, vehicle occupancy requirements) on roadways or roadway lanes.	CAPCOA RPT-1: 7.90% - 22.00%	Notes: Similar CAPCOA measure is RPT-1 (Road Pricing/Management: Implement Area or Cordon Pricing)
41	Price workplace parking	0.10% - 19.70% commute VMT	Notes: CAPCOA TRT-14 [Urban and suburban context; Negligible impact in a rural context; Appropriate for retail, office, industrial, and mixed-use projects; Reductions applied only if complementary strategies are in place: o Residential parking permits and market rate public on-street parking - to prevent spill-over parking o Unbundled parking - is not required but provides a market signal to employers to transfer over the, now explicit, cost of parking to the employees. In addition, unbundling parking provides a price with which employers can utilize as a means of establishing workplace parking prices
42	Require residential area (on-street) parking permits	0.09% - 0.36%	Notes: CAPCOA PDT-4 (applicable for urban context and appropriate for residential, retail, office, mixed use, and industrial projects); the project will require the purchase of residential parking permits (RPPs) for long-term use of on-street parking in residential areas; permits reduce the impact of spillover parking in residential areas adjacent to commercial areas, transit stations, or other locations where parking may be limited and/or priced; Grouped strategy (with measures PDT-1 'Limit parking supply', PDT-2 'Unbundle parking costs from property cost' and PDT-3 'Implement market price public parking (on-street)')

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

#	Mitigation Measure	VMT Reduction[1]	Notes
43	Locate project near bike path/bike lane	0.625%	Notes: CAPCOA LUT-8 (Grouped strategy with 'Increase Destination Accessibility'; the measure is most effective when applied in combination of multiple design elements that encourage this use; strategy should be grouped with 'Increase Destination Accessibility' strategy to increase the opportunities for multi-modal travel; measure is applicable in urban or suburban context, may be applicable in a rural master planned community; appropriate for residential, retail, office, industrial, and mixed-use projects
44	Implement Commute Trip Reduction Marketing	0.80% - 4.00% commute VMT	Notes: CAPCOA TRT-7 (applicable in urban and suburban context; negligible in rural context; appropriate for residential, retail, office, industrial, and mixed-use projects)
45	Education and encouragement - Voluntary travel behavior change program	1.00% - 6.20% commute VMT	Notes: Similar to CAPCOA TRT-1 (Implement Commute Reduction Program - Voluntary)
46	Education and encouragement - Promotions and marketing	0.80% - 4.00% commute VMT	Notes: Similar to CAPCOA TRT-7 [Implement Commute Reduction Marketing]
47	Implement neighborhood shuttle	Not Quantified	Notes: CAPCOA TST-6 (Provide Local Shuttles - grouped strategy with TST-5 'Provide Bike Parking Near Transit' and TST-4 'Increase Transit Service Frequency/Speed') - Applicable in urban/suburban context; appropriate for large residential, retail, office, mixed use, and industrial projects; solves the "first mile/last mile" problem
48	Trip cap	Not Quantified	-
49	Implement market price public parking (On-street)	2.80% – 5.50%	CAPCOA PDT-3 (applicable in urban and suburban context; negligible in rural context; appropriate for retail, office, and mixed-use projects; applicable in a specific or general plan context only, reduction can be counted only if spillover parking is controlled (via residential permits); studies conducted in downtown areas, and thus should be applied carefully if project is not in a central business/activity center
50	Implement area or cordon pricing	7.90%- 22.00%	Notes: CAPCOA RPT-1; Applicable in Central Business District or urban center only
51	Create urban non-motorized zones	0.01% – 0.20% annual VMT reduction	Notes: CAPCOA SDT-4 [The project, if located in a CBD or major activity center, will convert a percentage of its roadway miles to transit malls, linear parks, or other nonmotorized zones. These features encourage non-motorized travel and thus a reduction in VMT. This measure is most effective when applied with multiple design elements that encourage this use. The benefits of Urban Non-Motorized Zones alone have not been shown to be significant. (considered grouped strategy with SDT-1 (provide pedestrian network improvements); this is applicable in urban context only and appropriate for residential, retail, office, industrial, and mixed-use projects]

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

#	Mitigation Measure	VMT Reduction[1]	Notes
52	Install park-and-ride lots	Two sources: 0.1% - 0.5% VMT reduction (as per 2005 Federal Highway Administration (FHWA) study) and 0.50% VMT reduction per day (as per Washington State Department of Transportation (WSDOT))	Notes: CAPCOA RPT-4 (Applicable in suburban and rural context; appropriate for residential, retail, office, mixed use, and industrial projects); Grouped strategy with RPT-1, TRT-11, TRT-3, and TRT-1 through 6
53	Electrify loading docks and/or require idling-reduction systems	26% - 71% reduction in Truck refrigeration units (TRU) idling GHG emissions	Notes: CAPCOA VT-1 (Measure applicability: Truck refrigeration units (TRU))
54	Utilize alternative fueled vehicles	Reduction in GHG emissions varies depending on vehicle type, year, and associated fuel economy	Notes: CAPCOA VT-2 (Measure applicability: vehicles)
55	Utilize electric or hybrid vehicles	0.40% - 20.30% reduction in GHG emissions	Notes: CAPCOA VT-3 (Measure applicability: vehicles)
56	Provide bike parking near transit	Not Quantified	Notes: CAPCOA TST-5 (should be implemented with other two measures as mentioned to encourage multi-modal use in the area and provide ease of access to nearby transit for bicyclists (measure applicable in urban and suburban context; appropriate for residential, retail, office, mixed use, and industrial projects); Grouped strategy (with measures TST-3 'Expand transit network' and TST-4 'Increase transit service frequency/speed')
57	Improve design of development	3.00% - 21.30%	Notes: CAPCOA LUT-9 (Include design elements to enhance walkability and connectivity; improved street network characteristics within a neighborhood such as street accessibility; design also measured in terms of sidewalk coverage, building setbacks, street widths, pedestrians crossings, presence of street trees, and a host of other physical variables that differentiate pedestrian-oriented environments from auto-oriented environments); measure is applicable in the urban and suburban contexts, negligible impact in rural context; appropriate for residential, retail, office, industrial, and mixed-use projects
58	Provide electric vehicle parking	Not Quantified	Notes: CAPCOA SDT-8 [This is a grouped strategy and the benefits of electric vehicle parking may be quantified when grouped with the use of electric vehicles and or SDT-3 (Implement a Neighborhood Electric Vehicle (NEV) Network). This measure is applicable in urban or suburban contexts and is appropriate for residential, retail, office, mixed use, and industrial projects.]

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

#	Mitigation Measure	VMT Reduction[1]	Notes
59	Dedicated land for bike trails	Not Quantified	Notes: CAPCOA SDT-9 [Larger projects may be required to provide for, contribute to, or dedicate land for the provision of off-site bicycle trails linking the project to designated bicycle commuting routes in accordance with an adopted citywide or countywide bikeway plan. The benefits of Land Dedication for Bike Trails have not been quantified and should be grouped with the LUT-9 (Improve Design of Development) strategy to strengthen street network characteristics and improve connectivity to off-site bicycle networks. The measure is applicable in urban, suburban, or rural contexts and is appropriate for large residential, retail, office, mixed use, and industrial projects.]
60	Implement school bus program	38.00% - 63.00% school VMT reduction	Notes: CAPCOA TRT-13 [Applicable in urban, suburban, and rural context; appropriate for residential and mixed-use projects]
61	Implement preferential parking permit program	Not Quantified	Notes: CAPCOA TRT-8 [The project will provide preferential parking in convenient locations (such as near public transportation or building front doors) in terms of free or reduced parking fees, priority parking, or reserved parking for commuters who carpool, vanpool, ride-share or use alternatively fueled vehicles. The project will provide wide parking spaces to accommodate vanpool vehicles. The impact of preferential parking permit programs has not been quantified by the literature and is likely to have negligible impacts when implemented alone. This strategy should be grouped with Commute Trip Reduction (CTR) Programs (TRT-1 and TRT-2) and TRT-3 (Provide Ride-Sharing Programs) as a complementary strategy for encouraging non-single occupant vehicle travel. This measure is applicable in urban and suburban contexts and is appropriate for residential, retail, office, mixed use, and industrial projects.]

Notes:

VMT = Vehicle Miles Traveled; CAPCOA = California Air Pollution Control Officers Association; OPR = Office of Planning and Research; TA = Technical Advisory; HOV = High Occup

CAPCOA Transportation Mitigation Categories (LU = Land Use/Location, SD = Neighborhood/Site Enhancements, PD = Parking Policy/Pricing, TR = Commute Trip Reduction Prog

[1] VMT reduction numbers obtained from *Quantifying Greenhouse Gas Mitigation Measures* published by the California Air Pollution Control Officers Association in August 2010.

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APPENDIX D

VEHICLE MILES TRAVELED MITIGATION MEASURES FOR DEVELOPMENT PROJECTS (CARB PAPERS)

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Table D - Vehicle Miles Traveled Mitigation Measures[1]

#	Mitigation Measure	VMT Reduction[2]	Notes
1	Improve or increase access to transit	1.3% - 5.8%	Variable: Various factors associated with proximity to transit stop (please refer to *How do Local Actions Affect CMT? A Critical Review of the Emperical Evidence* (Salon, D., Boarnet, M.G., Handy, S., Spears, S., and Tal, G.)
2	Land Use Mix	Elasticity: 0.02 - 0.10	Variable: Entropy - variety and balance of land-use types within a neighborhood
3	Regional Accessibility	Elasticity: 0.05 - 0.25	Variable: Various factors associated with job accessibility and distance to CBD (please refer to *How do Local Actions Affect CMT? A Critical Review of the Emperical Evidence* (Salon, D., Boarnet, M.G., Handy, S., Spears, S., and Tal, G.)
4	Job-Housing Balance	Elasticity: 0.06 - 0.31 for commute VMT	Variable: Various factors associated with job accessibility (please refer to *How do Local Actions Affect CMT? A Critical Review of the Emperical Evidence* (Salon, D., Boarnet, M.G., Handy, S., Spears, S., and Tal, G.)
5	Provide Pedestrian Network Improvements	Elasticity: 0.00 - 0.02 for sidewalk length, 0.19 for Pedestrian Environment Factor	
6	Provide Bicycling Network Improvements	No effect on VMT	
7	Implement Transit Improvements	No effect on VMT	
8	Voluntary Travel Behavior Change (VTBC) Program	5% - 12%	
9	Implement Employer-Based Trip Reduction (EBTR) Program	1.33% - 6% of commute VMT	
10	Provide telecommuting options	Home-based telecommuting: 48.1% for household VMT, 66.5% - 76.6% for all personal VMT, and 90.3% for commute VMT only; Center-based telecommuting: 53.7% - 64.8% for all personal VMT and 62.0% - 77.2% for commute VMT only	
11	Increase Project/Development Density	Elasticity: <=0.07 - 0.19	Variable: residential density
12	Improve network connectivity and/or increase intersection density on the project site	Elasticity: -0.46 - 0.59	Variable: Various factors associated with intersection or street density (please refer to *How do Local Actions Affect CMT? A Critical Review of the Emperical Evidence* (Salon, D., Boarnet, M.G., Handy, S., Spears, S., and Tal, G.)
13	Implement Road Pricing	10% - 14.6%	Variable: Different road prices in various parts of the US (please refer to How do Local Actions Affect CMT? A Critical Review of the Emperical Evidence (Salon, D., Boarnet, M.G., Handy, S., Spears, S., and Tal, G.)
14	Implement Parking Cash-out Programs or Workplace Parking Pricing	12% of commute VMT (parking cashout); 2.3% - 2.9% for $3 per day workplace parking price; 2.8% for price increase equivalent to 60% hourly value of commuter travel time cost	

Notes:

VMT = Vehicle Miles Traveled

[1] All mitigation measures have been obtained from *How do Local Actions Affect VMT? A Critical Review of the Emperical Evidence* (Salon, D., Boarnet, M.G., Handy, S., Spears, S., and Tal, G.).

[2] All VMT reduction numbers have been obtained from *How do Local Actions Affect VMT? A Critical Review of the Emperical Evidence* (Salon, D., Boarnet, M.G., Handy, S., Spears, S., and Tal, G.).

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APPENDIX E

VEHICLE MILES TRAVELED MITIGATION MEASURES FOR COMMUNITY PLANS AND GENERAL PLANS

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Table E - Vehicle Miles Traveled Mitigation Measures for Community Plans and General Plans[1]

#	Mitigation Measure	VMT Reduction[2]
1	Modify land use plan to increase development in areas with low VMT/capita characteristics and/or decrease development in areas with high VMT/capita characteristics	Not quantified in CAPCOA
2	Provide enhanced bicycle and/or pedestrian facilities	0.00% - 2.00% (for pedestrian network improvements); Multiple measures for bike facilities, refer to Table A for VMT reduction percentages
3	Add roadways to the street network if those roadways would provide shorter travel paths for existing and/or future trips	Not quantified in CAPCOA
4	Improve or increase access to transit	CAPCOA TST-2 (Implement transit access improvements): Not quantified alone, grouped strategy with TST-3 (Expand transit network) and TST-4 (Increase transit service frequency/speed); CAPCOA LUT-5 (Increase transit accessibility): 0.50% - 24.60%
5	Increase access to common goods and services, such as groceries, schools, and daycare	Similar to CAPCOA LUT-3 (Increase Diversity of Urban and Suburban Developments (Mixed Use)): 9.00% - 30.00% VMT reduction and CAPCOA LUT-4 (Increase Destination Accessibility): 6.70% - 20.00% VMT reduction
6	Incorporate a neighborhood electric vehicle network	0.50% - 12.70%
7	Provide traffic calming	0.25% – 1.00%
8	Limit or eliminate parking supply	5.00% - 12.50%
9	Unbundle parking costs	2.60% - 13.00%
10	Provide parking or roadway pricing or cash-out programs	0.10% - 19.70% commute VMT (for pricing workplace parking); 7.90% - 22.00% (for CAPCOA RPT-1 (Road Pricing/Management: Implement Area or Cordon Pricing)); 0.60% – 7.70% commute VMT (for cash-out programs)
11	Implement or provide access to a commute reduction program	1.0% – 6.2% commute VMT % (for voluntary programs); 4.2% – 21.0% commute VMT reduction (for programs with required implementation/monitoring)
12	Provide car-sharing, bike sharing, and ride-sharing programs	0.40% - 0.70% VMT reduction (for car sharing); 1.00% - 15.00% commute VMT reduction (for ride-sharing); a 135% - 300% increase in biking (of which roughly 7% are shifting from vehicle travel) results in a negligible impact (around 0.03% VMT reduction)
13	Provide partially or fully subsidized transit passes	Similar to CAPCOA TRT-4 [Implement Subsidized or Discounted Transit Program]; for TRT-4, commute VMT reduction is 0.30% - 20.00%

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Table E - Vehicle Miles Traveled Mitigation Measures for Community Plans and General Plans[1]

#	Mitigation Measure	VMT Reduction[2]
14	Shift single occupancy vehicle trips to carpooling or vanpooling by providing ride-matching services or shuttle services	0.30% - 13.40% commute VMT reduction (for CAPCOA TRT-11: (Provide Employer-Sponsored Vanpool/Shuttle)); Grouped strategy (for CAPCOA TST-6 (Provide Local Shuttles))
15	Provide telework options	0.07% - 5.50% commute VMT
16	Provide incentives or subsidies that increase the use of modes other than a single-occupancy vehicle	0.30% - 13.40% commute VMT reduction (for CAPCOA TRT-11: (Provide Employer-Sponsored Vanpool/Shuttle)); Grouped strategy (for CAPCOA TST-6 (Provide Local Shuttles)); 0.30% - 20.00% commute VMT reduction (for CAPCOA TRT-4 (Implement Subsidized or Discounted Transit Program))
17	Provide employee transportation coordinators at employment sites	Not quantified in CAPCOA
18	Provide a guarenteed ride home sevice to users of non-auto modes	Not quantified in CAPCOA

Notes:

VMT = Vehicle Miles Traveled; CAPCOA = California Air Pollution Control Officers Association

CAPCOA Transportation Mitigation Categories (LU = Land Use/Location, SD = Neighborhood/Site Enhancements, PD = Parking Policy/Pricing, TR = Commute Trip Reduction Programs, TS = Transit System Improvements, RP = Road Pricing/Management; V = Vehicles)

[1] All mitigation measures have been obtained from the *Guidelines for Transportation Impact Studies in the San Diego Region* developed by San Diego Section of the Institute of Transportation Engineers (ITE) and the San Diego Traffic Engineers Council (SANTEC) in January 2019.

[2] VMT reduction numbers obtained from *Quantifying Greenhouse Gas Mitigation Measures* published by the California Air Pollution Control Officers Association in August 2010.

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