Executive Summary for the

EIGHT SAN JOAQUIN VALLEY MPO TRAFFIC MODELS TO MEET THE REQUIREMENTS OF SB 375

Submitted by:

Fehr & Peers
Dowling Associates
RSG Inc.
Cambridge Systematics
Bowman-Bradley
McCoy-Roth
Cari Anderson Consulting
Citilabs

August 30, 2012

The preparation of this report has been financed in part through grants from the United Stated Department of Transportation.

FEHR & PEERS | DOWLING ASSOCIATES | RSG | CS |
BOWMAN-BRADLEY | MCCOY-ROTH | CAC | CITILABS

WC10-2778

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IMPORTANT NOTICE

The electronic documents included in the model files and documentation are the tools developed based on the data provided and the associated standard items for the *Traffic Model Improvements for each of the Eight San Joaquin Valley MPO Traffic Models to meet the Requirements of SB 375* (SJV MIP) (Fehr & Peers, November 2010). The data, analysis, and results presented herein have been prepared for the sole purpose of this project. The model scenarios were developed based on consultation with the San Joaquin Valley MPO staff. Post processing functions were based on the translation of the intent of the pre-MIP scripts to the MIP models and Fehr & Peers may not agree with the method or assumptions.

We have relied on scenario data and other information provided to us by the San Joaquin Valley MPOS as well as data from publicly available information sources. The opinions presented as a result of our analysis cannot be taken as an endorsement or inducement for any financial transaction. Fehr & Peers does not make any warranty, guarantee, certification or other representation with respect to the information contained herein if applied to any other project or for any other purpose without the prior written consent of Fehr & Peers, which expressly denies any and all liability for damages or losses of any kind resulting from use of the information contained herein for any purposes other than this project. We do not accept any responsibility for damages, if any, that may result from decisions made or actions taken by any third parties based on its analysis. Any use that a third party makes of our analysis and opinions will be the sole responsibility of such third party.

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Table of Contents

Appendices

List of Figures

List of Tables

OVERVIEW

This document provides a brief high-level summary of the overall San Joaquin Valley Model Improvement Plan (SJV MIP), including a summary of the model specifications used in developing the components for the standard model and highlighting the improvements to address the requirements of California Transportation Commission (CTC) Guidelines for Regional Transportation Plans in response to SB375.

PURPOSE

CALIFORNIA TRANSPORTATION COMMISSION REGIONAL TRANSPORTATION PLAN GUIDELINES

The CTC publishes and periodically updates guidelines for the development of long range transportation plans. Pursuant to Government Code Section 65080(d), each regional transportation planning agency (RTPA) is required to adopt and submit an updated regional transportation plan (RTP) to the California Transportation Commission (CTC) and the Department of Transportation (Caltrans) every four years.

Under Government Code Section 14522, the CTC is authorized to prepare guidelines to assist in the preparation of RTPs. The CTC's RTP guidelines suggest that projections used in the development of an RTP should be based upon available data (such as from the Bureau of the Census), use acceptable forecasting methodologies, and be consistent with the Department of Finance baseline projections for the region. The guidelines further state that the RTP should identify and discuss any differences between the agency projections and those of the Department of Finance.

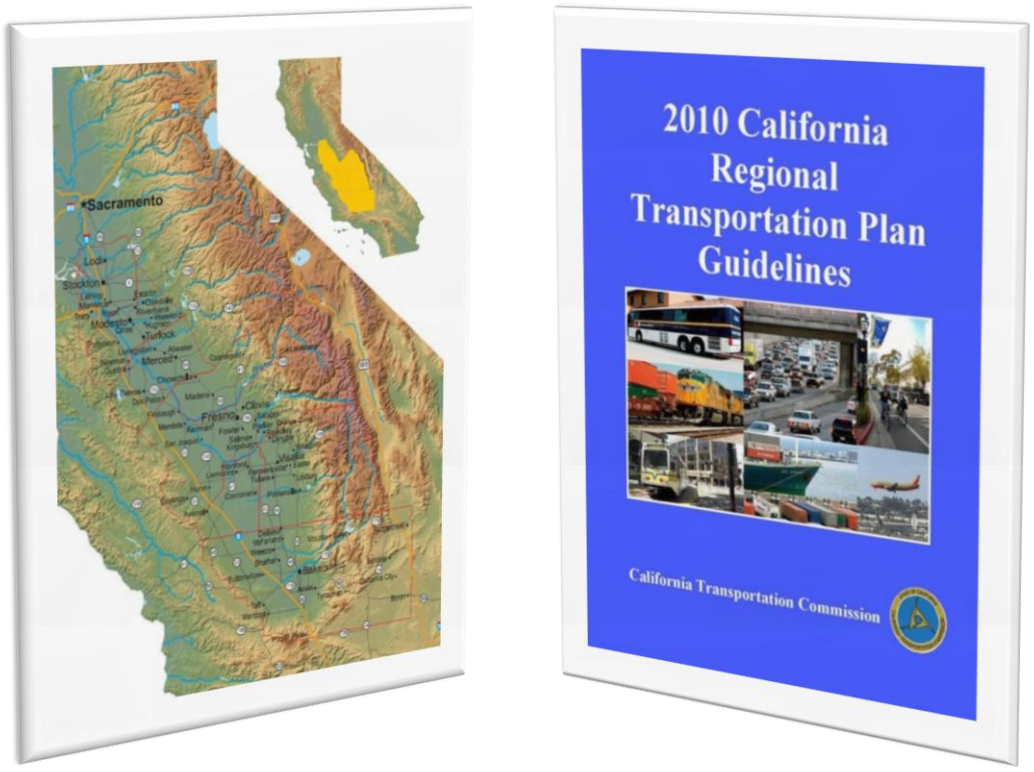
The most recent update to the RTP guidelines was published in 2010, and includes new provisions for complying with Senate Bill 375 (see below), as well as new guidelines for regional travel demand modeling. The regional travel demand model guidelines are "scaled" to different sizes of MPO's.

SENATE BILL 375

Sen. Bill No. 375 (Stats. 2008, ch. 728) (SB 375) requires MPOs to prepare a Sustainable Communities Strategy (SCS) that demonstrates how the region will meet its greenhouse gas (GHG) reduction targets through integrated land use, housing and transportation planning.

Specifically, the SCS must identify a transportation network that is integrated with the forecasted development pattern for the plan area and will reduce GHG emissions from automobiles and light trucks in accordance with targets set by the California Air Resources Board.

In the CTC guidelines, each of the San Joaquin Valley Metropolitan Planning Organizations (SJV MPOs) is grouped with similar MPOs based on population, growth, and other factors and has specific requirements, recommendations, and areas for potential future improvements based on the grouping.



The SJV MPOs are grouped as follows:

- Group B – Kings, Merced, Madera
- Group C – Tulare
- Group D – Fresno, Kern, San Joaquin, Stanislaus

Tables summarizing the requirements, recommendations, and the Pre-MIP and Post-MIP models for each MPO can be found in Appendix A.

- **Tables E-A1 and E-A2** summarize for each MPO the RTP Requirements and Recommendations, respectively.
- **Table E-A3** contains side-by-side detail for all Pre-MIP MPO models.

SJ VALLEY RESPONSE TO SB 375 AND RTP GUIDELINES

The San Joaquin Valley Model Improvements Project (SJV MIP) includes a number of model upgrades that respond directly to the requirements of the CTC guidelines:

- Land Use – demographic characteristics that influence travel behavior
- Geographic scale – land use and transportation system refinements in transit oriented developments, central business districts, and mixed-use developments (TODs/CBDs/MXDs)
- Sensitivity to mode – person trips, auto availability, mode choice/split, transit assignment
- Pricing – auto operations (fuel, maintenance, etc), parking, toll, transit fare
- Sensitivity to congestion – time of day refinements, influence on auto availability and distribution
- Air Quality/Greenhouse Gas – speed, trucks, interregional travel
- Best Management Practices – sensitivity to smart growth, demand and/or system management within model or as quick-response tools
- Validation – formal static and dynamic tests
- Documentation – Clear and fully documented for executive/public and technical staff including limitations and potential ways to overcome limitations

BEYOND SB 375 AND RTP GUIDELINES

In addition to the addressing the CTC requirements, the SJV MIP includes a number of other model enhancements:

- Standardized Process – knowledge, data, parameter, documentation/graphics/reports, and other processes
- Coordination – 8 counties sharing resources and information with parallel studies

- Ease of Use – Development and Application modes, Graphical User Interface, Geographic Information Systems (GIS) and Excel
- Three-County Activity Based Model (ABM) – Transportation Analysis Zone (TAZ) level for San Joaquin, Stanislaus, and Merced Counties
- Three-County Origin-Destination (OD) Survey – Cell phone data, speed/classification counts, and roadside surveys for San Joaquin, Stanislaus, and Merced Counties
- Single County Activity Based Model – Parcel level for Fresno County
- Integrated GI- Based Land Use/Transportation Model – UPlan/Cube Land for Kern County
- Transferability – ABM, OD survey method, Integrated Model and supporting processes and data developed for transferability
- Software – Enterprise license of software, and Integrated Model developed and delivered in Cube Application for all 8 counties

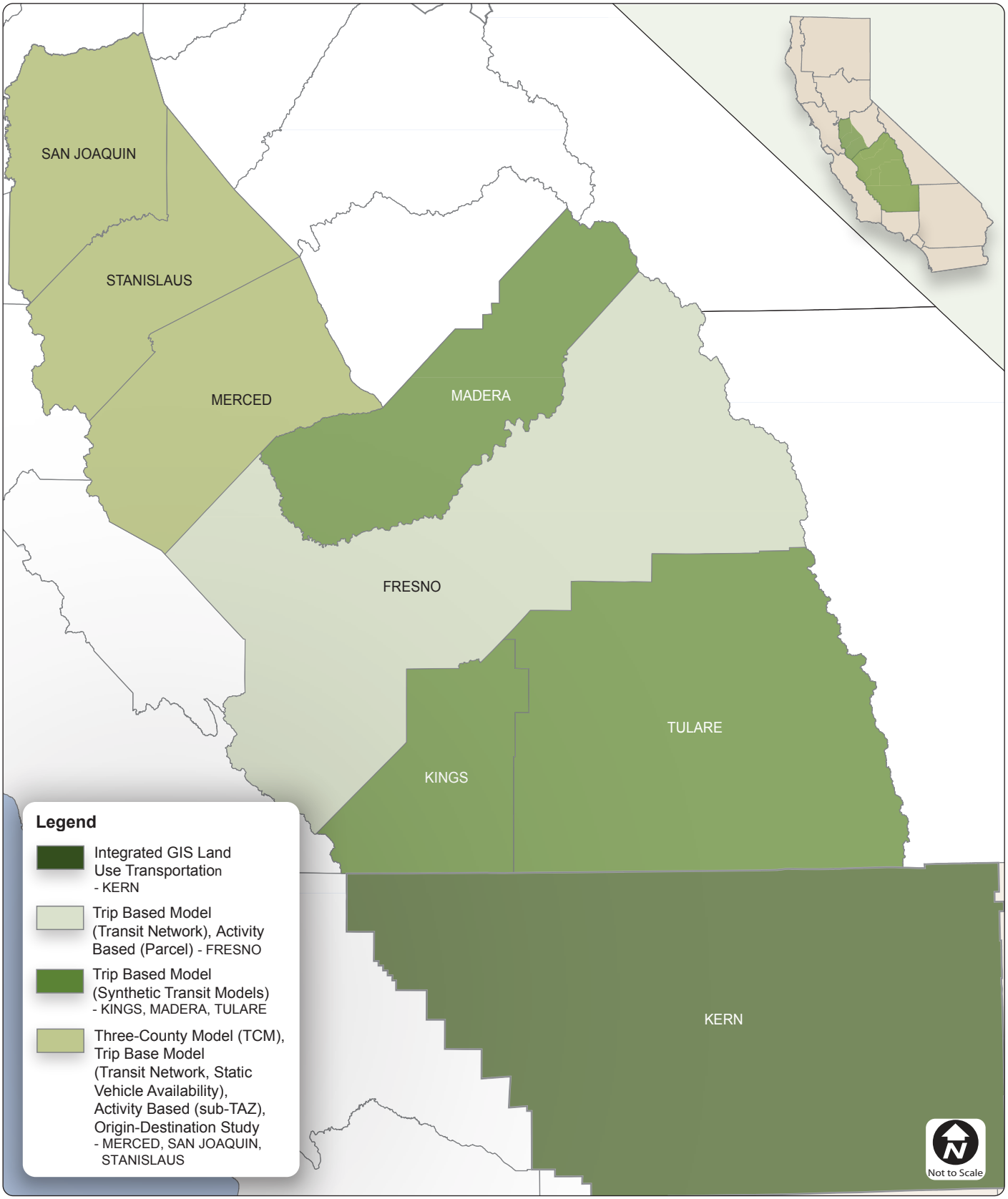
Figure E-1 summarizes the model functionality by MPO.

SB 375 and RTP Guidelines	
Land Use	Demographic characteristics that influence travel behavior
Geographic scale	Land use and transportation system refinements in TOD/CBD/MXD
Sensitivity to mode	Person trips, auto availability, mode choice/split, transit assignment
Pricing	Auto operations (fuel, maintenance, etc), parking, toll, transit fare
Sensitivity to congestion	Time of day refinements, influence on auto availability and distribution
Air Quality/Greenhouse Gas	Speed, trucks, interregional travel
BMPs	Within model or as quick-response tools
Documentation	Clear and fully documented for executive/public and technical staff including limitations and potential ways to overcome limitations
Beyond (SB 375 and RTP Guidelines)	
Standardized process	Knowledge, data, parameter, documentation/graphics/reports, and other processes
Coordination	8 counties sharing resources and information with parallel studies
Ease of use	Development and Application modes, Graphical User Interface, utilize GIS and Excel
Three-County Activity Base Model	TAZ level for San Joaquin, Stanislaus, and Merced
Three-County Origin-Destination Survey	Cell phone data, speed/classification counts, and roadside surveys for San Joaquin, Stanislaus, and Merced
Single County Activity Based Model	Parcel level for Fresno
Integrated GIS Based Land Use/Transportation Model	UPlan/Cube Land for Kern
Transferability	ABM, OD survey method, Integrated Model and supporting processes and data developed to easily transfer
Software	Enterprise license of software for all 8 counties, and Integrated Model developed and delivered in Cube Application to all counties

ORGANIZATION OF DOCUMENTATION

The remainder of this document describes the model improvements for each MPO and highlights their functions and, capabilities including how they relate to the Required, Recommended, or Potential Future Enhancement as identified in the 2010 RTP Guidelines on implementation of SB 375. They are grouped into the two major model types: trip based models and activity based models. The study area and type of model for the SJV MIP models is shown on **Figure E-1.**

The detailed functions, parameters, calibration procedures, static and dynamic validation results, and other technical summaries are referenced in this document and contained in the *Technical Summary for the Eight San Joaquin Valley MPO Travel Models to Meet the Requirements of SB 375*.



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Study Area and Model Type

FIGURE E-1

TRIP BASED MODEL SUMMARY

The SJV MIP models are sophisticated travel model demand forecasting models that are similar in structure to most other current area-wide models used for traffic forecasting. They use land use, socioeconomic, cost, and transportation system data to estimate travel patterns, roadway traffic volumes and transit volumes.

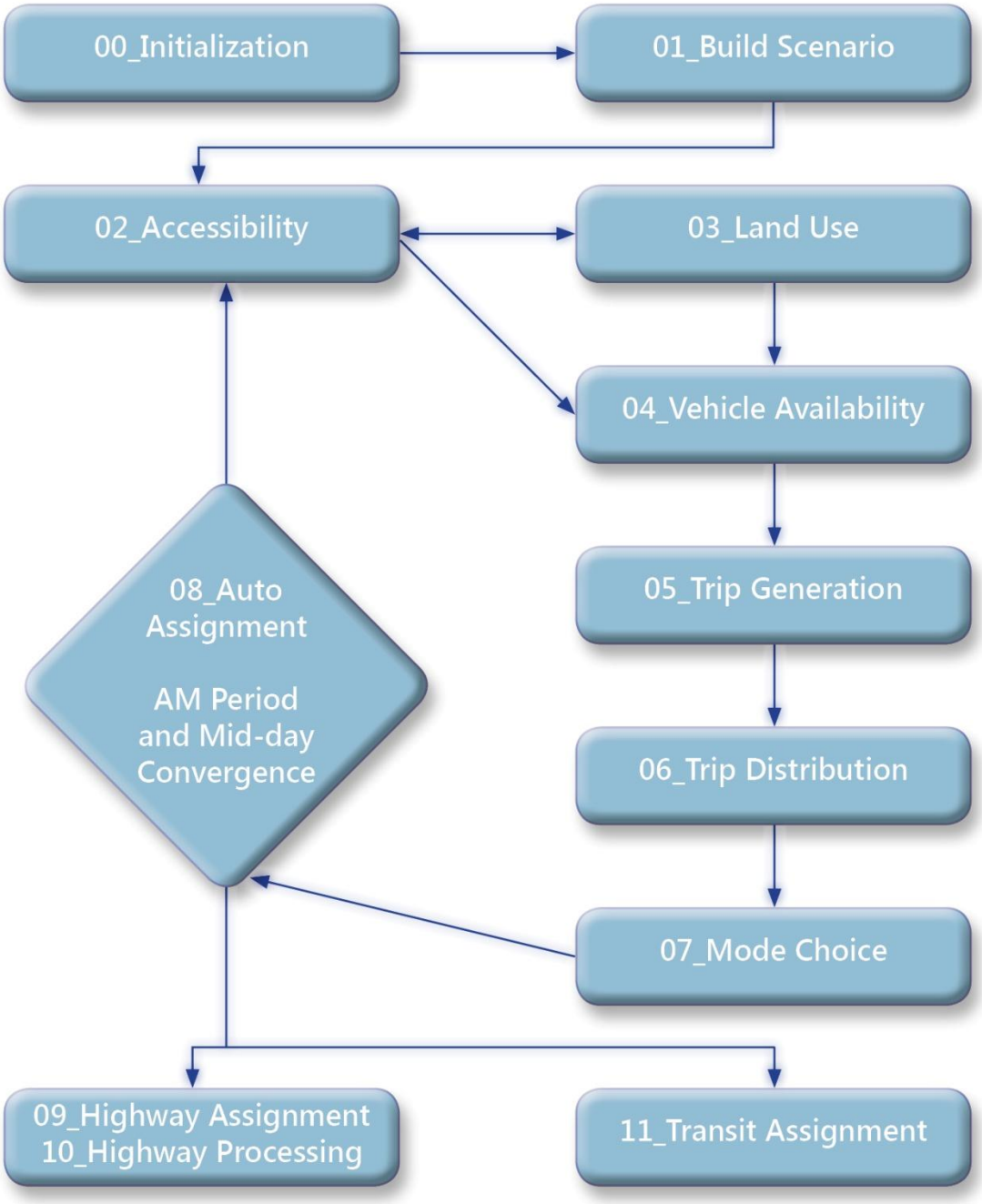
The SJV MIP models differ from a basic trip model through the integration of the components.

FORECASTING PROCESS

Four primary sub-models are involved in the travel demand forecasting process:

1) **Trip Generation**. This initial step calculates person or truck trip ends using trip generation rates established during model calibration, cross-classified residential data, employment, and student enrolment. This step also uses the demographics to determine the household passenger vehicle availability. For models with an integrated land use component, the land use forecast is implemented prior to trip generation.
2) **Trip Distribution**. The second general step estimates how many trips travel from one zone to any other zone. The distribution is based on the number of trip ends generated in each of the two zones, and on factors that relate the likelihood of travel between any two zones to the travel time between the two zones such as distance, cost, time, and varies by accessibility to passenger vehicles, transit, and walking or biking.
3) **Mode Choice**. This step uses demographics and the comparison of distance, time, cost, and access between modes to estimate the proportions of the total person trips using drive-alone or shared-ride passenger auto, transit, walk or bike modes for travel between each pair of zones.
4) **Trip Assignment**. In this final step, vehicle trips or transit trips from one zone to another are assigned to specific travel routes between the zones. Congested travel information is used to influence each of the steps described above starting with vehicle availability for all models, and starting with land use location for integrated land use transportation models.

A flow chart of the travel model process is shown in **Figure E-2**. Detailed descriptions of each step and sub-step, standard and calibrated parameters, static and dynamic validation results, and detailed summaries for each MPO can be found in the *Technical Summary* document.



Notes: Solid lines represent standard processes for all 8 MPOs. Dashed lines represent optional processes such as Cube Land or Transit Assignment that vary by MPO.

MODEL COVERAGE AND TRANSPORTATION ANALYSIS ZONES (TAZS)

The model area is divided into transportation analysis zones (TAZs) representing land use within the model area, and by gateway zones at major road crossings of the model boundary. To allow for maximum flexibility in the future and through coordination of each SJV MIP model and parallel projects such as the Air Resources Board Eight-County SJV Model, the following gateway, TAZ, and screenline numbering process was developed:

- Gateways external to SJV: Gateways 1-60
- Gateways within the SJV: Gateways 61-100
- TAZs within a model: 101-10,000
    - TAZs allocated alphabetically within each model first by County, then by sphere of influence
    - Gaps in numbering sequence allow for additional zone detail in the future
- Screenline numbering identical for models that share a boundary and unique number range
    - Hundreds place designates screenline
    - Tens place designates location
        - Odd number: North or East
        - Even number: South or West

The concept used for distinguishing and coordination between the models covering the SJV and areas outside the SJV model study areas is shown on Exhibit E2-1. Detailed tables and maps for individual models can be found in the *Technical Summary* document.

SOCIOECONOMIC INPUTS

The travel demand model includes socioeconomic inputs aggregated by TAZ. Previous models relied on land use data while the updated models have been expanded to include additional socioeconomic variables. Population-related inputs include numbers of housing units stratified by structure type, household income, age of population in households, and housing density. Employment-related inputs are employee by detailed sector and employment density.

In addition to employees, schools are represented by student enrolment. "Special Generators," primarily for unique uses not covered specifically by a standard land use category, are represented as total person trips by purpose. Similarly, interaction with land uses outside the model area are represented by total person productions and attractions by purpose based on the California Statewide Travel Demand Model.

The enriched set of land use descriptors address two model improvement objectives: to make the models more sensitive to socio-demographic and urban form characteristics that influence travel behavior, and to expand and refine the range of regional growth scenarios and policies that regions are able to consider in developing their SB 375 Sustainable Communities Strategies.

- Residential: increase from 2 to 10 categories
  - Aggregated to 3 residential unit types and cross-classified by
    - Household Size (5 group)
    - Household Income (5 groups)
    - Age of Head of Household (7 groups)
  - Default cross-classification values based on block group level data
  - User can adjust parameters as needed (can also review County specific parameters against others to identify outliers)
- Employment: increase from 3 to 20 categories
- Enrolment: Elementary, High School, College/University
- Optional reallocation during integrated land use/transportation system planning\

New or Expanded Sensitivity	Policy or Scenario Evaluation
Household Variables: Unit Type matches Census, Income, Size, Age of Head of Household	Dwelling Unit Types and Densities
Population: Age Range	Household Income
Employment Categories: Increase to 21 based on North American Industrial Classification System	Population Age Distribution
Enrolment: Increase from 0 categories to 3	Retirement Age
	Mix of employment categories
	Unique travel characteristics by employment type

New or expanded sensitivities

- Household Variables: Unit Type matches Census, Income, Size, Age of Head of household
- Population: Age Range of head of household
- Employment Categories: Increase from 3 to 21 based on North American Industrial Classification System
- Enrolment: Increase from 0 to 3 categories

Scenario testing

- Dwelling Unit Types and Densities
- Household Income
- Population Age Distribution
- Retirement Age
- Mix of employment categories
- Unique travel characteristics by employment type
- Magnet vs. local school

Required Land Use Sensitivities	Recommended Land Use Sensitivities
Fresno	Kings
Kern	Madera
San Joaquin	Merced
Stanislaus	Tulare

NETWORK CHARACTERISTICS

The model roadway network includes nodes and links. Link types include freeway, highway, expressway, arterial, collector, local, and freeway ramps. The model distinguishes roadways by adjacent development (central business district, fringe, urban, suburban, or rural) and terrain (flat, rolling or mountainous).

For models with transit networks, links have been coded to represent walk/bike access, drive access, park-and-ride lots, highway based (i.e. local bus) and non-highway based (i.e. rail) transit in the model area.

For models without transit networks, transit headway indicators for TAZs with access to transit and the highway network serve as the "synthetic transit network" and have only walk/bike access to transit.

The North American Datum (NAD) 83 State Plane California (feet) coordinate projection is used so that the model network can be viewed together with other GIS data such as street centerlines, TAZ boundaries and Census information.

New or Expanded Network Sensitivity	Policy or Scenario Evaluation
Operational Characteristics (Facility Type, Adjacent Development)	Pricing at roadway segment (i.e. toll, VMT tax) or point (i.e. parking)
Mixed-flow lanes	Easily add/remove lanes or facilities
HOV (2+ or 3+), Toll lanes	Implement HOV/managed lanes
Transit (drive, Park-in-Ride, walk/bike)	Change transit availability in TAZ
Walk or Bike	Adjust frequency or type of transit service
Truck prohibitions	
Sensitive to non-highway for walk/bike trips	

New/Expanded Network Features

- Operational Characteristics (Facility Type, Terrain, Adjacent Development)
- Mixed-flow lanes not reserved for high occupancy vehicle (HOV)
- HOV (2+ or 3+), Toll
- Transit (drive, Park-in-Ride, walk/bike access)
- Walk or Bike
- Truck prohibitions
- Sensitive to non-highway for walk/bike trips

Policy Evaluation Capabilities

- Highway Network
  - Pricing at roadway segment (i.e. toll, VMT tax) or point (i.e. parking)
  - Easily add/remove lanes or facilities
  - Implement HOV/managed lanes
- Transit Network
  - Change routes
  - Adjust frequency or type of service

Required Network Sensitivities	Recommended Network Sensitivities
Fresno	Kings
Kern	Madera
San Joaquin	Merced
Stanislaus	Tulare

TRAVEL CHARACTERISTICS

Much of the new model structure is interactive and dynamic. The accessibility, vehicle availability, transportation system (highway, transit, walk or bike networks), pricing, and socio-economic factors are used in multiple components of the model. An overview of the model functions relating to travel characteristics is presented first, followed by details on each component.

New or Expanded Sensitivity	Policy or Scenario Evaluation
Fuel, maintenance, user fees	Influence of changing socio-economic or employment distributions
Refined sensitivity to travel characteristics	Attractiveness of various modes
Accessibility to goods/services/jobs	Vehicle availability
Comparison of driver, passenger, transit, walk, bike	Destinations and travel distance
Available modes to select destination	Mode of travel
Destination and mode vary by purpose	Route of travel, speed, and GHG

New/Expanded Travel Sensitivities

- Fuel, maintenance, user fees
- Refined sensitivity to travel characteristics
- Accessibility to goods/services/jobs
- Comparison of driver, passenger, transit, walk, bike
- Available modes to select destinations
- Destination and mode vary by purpose

Policy Evaluation Capabilities

- Influence of changing socio-economic or employment distributions
- Attractiveness of various modes

- Vehicle availability
- Destinations and travel distance
- Mode of travel
- Route of travel, speed, and GHG

Recommended	Recommended
Fresno	Kings
Kern	Madera
San Joaquin	Merced
Stanislaus	Tulare

Beyond the general modeling capabilities mentioned above, the new SJV MIP models have improved functionality and sensitivities in their treatment of individual travel influences: vehicle availability, trip generation, trip distribution, mode choice, and travel route assignment, as described below..

Vehicle Availability

- Dynamically influenced by demographics and accessibility
- Auto operating cost (fuel, toll, congestion, parking)

Trip Generation

- Person trip generation rather than vehicle trip generation, allowing travelers to select modes based on competitive performance and costs among the available modes.
- Survey-estimated trip rates with reasonableness checks and transparent adjustments to allow easy review and identification of outliers
- Trip purposes expanded from typical 3 or 5 to 11 (**bold** indicates new purposes for all models)
  - Home-Work
  - Home-Shop
  - **Home-K12**
  - **Home-College**

- Home-Other
- Work-Other
- Other-Other
- **Highway Commercial**
- **Trucks-Small**
- **Trucks-Medium**
- **Trucks-Heavy**

Trip Distribution

- Sensitive to congestion and vehicle availability

Mode Choice

- Models with Transit Networks – influenced by demographics, purpose, accessibility to transit stop and line, transit system variables (transfers, fares, time), and vehicle availability
  - Drive Alone
  - Shared Ride 2 people per vehicle
  - Shared Ride 3+ people per vehicle
  - Transit with Walk Access
  - Transit with Drive Access
  - Bicycle
  - Walk
- Models without Transit Networks – influenced by trip purpose, accessibility of zone, scheduled frequency of transit service, time, and vehicle availability
  - Drive Alone
  - Shared Ride 2
  - Shared Ride 3+
  - Transit
  - Walk
  - Bike

Pricing

New/Enhanced

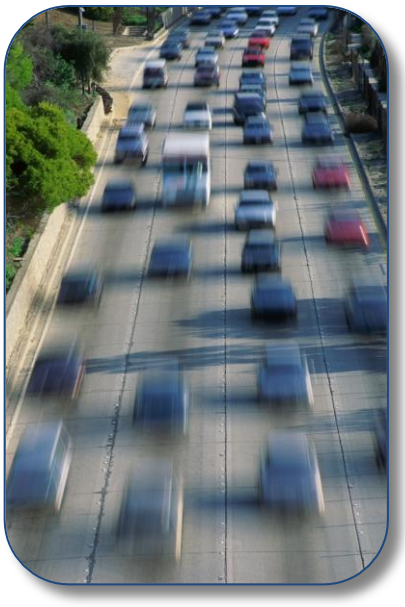
- Parking (employee and non-employee)
- Toll road/plaza
- User fee (fuel, VMT, or other usage fee)
- Induced/Suppressed Demand

Policy/Sensitivity

- Pricing strategies
- Parking charge/cash-out, transit subsidy
- Toll, express, HOT, user fees

Required	Recommended
Fresno	Kings
Kern	Madera
San Joaquin	Merced
Stanislaus	Tulare

PERSON AND VEHICLE ASSIGNMENT



The model distributes trips for each of eleven trip purposes at the person level for passenger trips and at the vehicle level for truck trips. For transportation route choice and network assignment, the model converts persons to vehicles for automobile driver and passenger trips, while persons are assigned individually for transit. Route assignment of walk or bike trips is not included in the model.

Highway Vehicle Assignment

- Drive Alone
- Drive Alone Toll

- Shared Ride 2
- Shared Ride 3+
- Trucks
  - Small, Medium, Heavy
  - Long and short haul
- Medium Truck
- Heavy Truck

Transit Assignment

- Utilize newest software to increase flexibility and ease of implementation and reporting

FORECAST TIME PERIODS

The SJV MIP travel models estimate travel demand and traffic and transit volumes for the average weekday (Monday through Friday). The daily roadway volumes are aggregated from AM and PM peak period, and Mid-day and Evening off-peak periods. The daily transit volumes are aggregated from a peak period and an off-peak period. In addition, AM and PM peak one-hour traffic volume estimates are available for roadways.

FEEDBACK LOOPS

The SJV MIP models include a feedback loop that uses the congested speeds estimated from traffic assignment to recalculate the accessibility among regional trip generators. Accessibility influences all steps except land use allocation. In the Kern COG model, where an integrated land use transportation model is used, all components of the model are sensitive to congestion.

SMART GROWTH AND AIR QUALITY

Local and national research indicates that travel generation levels are sensitive to a series of "D" factors that describe urban form and accessibility:

- Density
- Diversity
- Design
- Destinations
- Distance to Transit
- Development Scale
- Demographics
- Demand Management

These factors are most influential when considered at a fine grained level of analysis, but affect aggregate amounts of vehicle miles travelled (VMT) within a region. In accordance with the CTC guidelines, the SJV MIP models are equipped with adjustments to the basic model calculations that account for research-based sensitivities to the "D" variables.

Recommended	Recommended
Fresno	Kings
Kern	Madera
San Joaquin	Merced
Stanislaus	Tulare

LAND USE AND TRANSPORTATION

Reallocation of Land Use

- Geographic and/or Socio-Economic
- Willingness to pay
- Supply/demand
- Accessibility and other factors

Dynamic Response to Transportation Changes

- Congestion
- Transit/walk/bike access

Recommended	Potential Future Enhancement
Fresno	Kings
Kern	Madera
San Joaquin	Merced
Stanislaus	Tulare

MODEL VALIDATION

The summary table below shows the high level summary of each model by category. It should be noted that the household survey data being compared to is from 2001 and other data (land use, traffic and transit counts, etc) are for the base year of the model, so the model may perform better than the static validation shows since not all criteria can be met simultaneously. Category B and C MPOs are not required to meet all the same criteria as the Category D MPOs; in those cases the validation topic is labeled as Met / Not Required.

TABLE E-1: SUMMARY OF MODEL PERFORMANCE – STATIC VALIDATION

Validation Topic	County							
	Fresno	Kern	Kings	Madera	Merced[1]	San Joaquin[1]	Stanislaus[1]	Tulare
Land Use	◑	●	○	◑		◑		◑
Trip Generation	●	●	◑	◑		●		◑
Trip Distribution	●	●	○	◑		●		●
Mode Choice	●	●	◑	●	●	◑	◑	◑
Traffic Assignment	◑	◑	○	◑	○	◑	◑	◑
Transit Assignment	○	●	N/A	N/A	●	●	●	N/A

Notes:
● = Met / Not Required
◑ = Partially Met
○ = Not Met

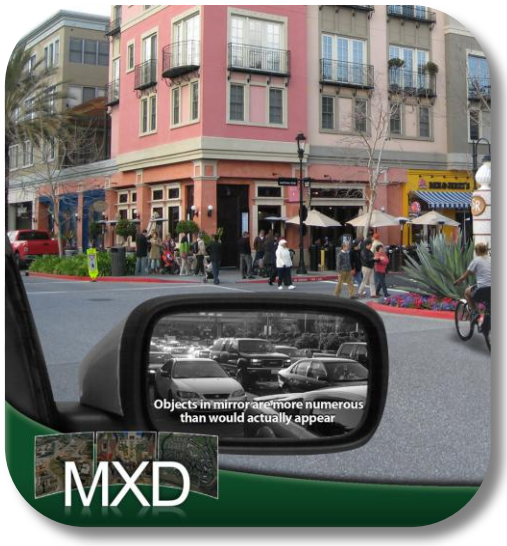
TABLE E-2: SUMMARY OF MODEL PERFORMANCE – DYNAMIC VALIDATION

Validation Topic	County							
	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Land Use	●	●	●	●	●	●	●	●
Traffic Assignment	◑	◑	●	◑	○	○	○	◑
Travel Cost	○	○	●	●	●	○	○	●
Induced Demand	●	○	●	●	●	○	○	●

Notes:
● = Met / Not Required
◑ = Partially Met
○ = Not Met

QUICK-RESPONSE AND VISIONING TOOLS

- Useful in Coordinating with Local Jurisdictions
- Project Scale
- Utilizes Details from Regionally Valid Model
- Test Variety of Demand Management Strategies
- Spreadsheet Based
- Minutes vs. Hours



Land Inputs

Project level, development scale and units

Much information derived from COG model (e.g., trip lengths by purpose for VMT)

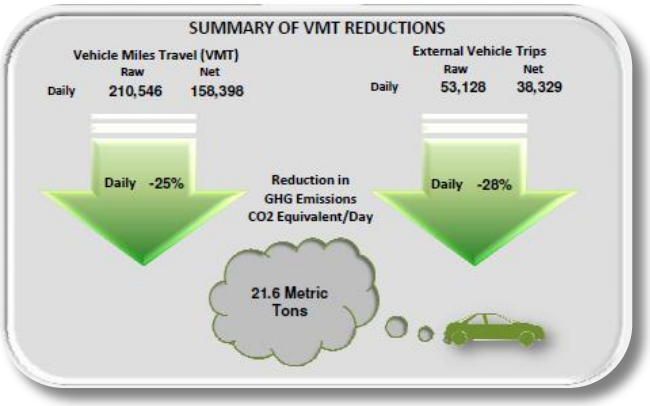
Travel Demand Management Inputs

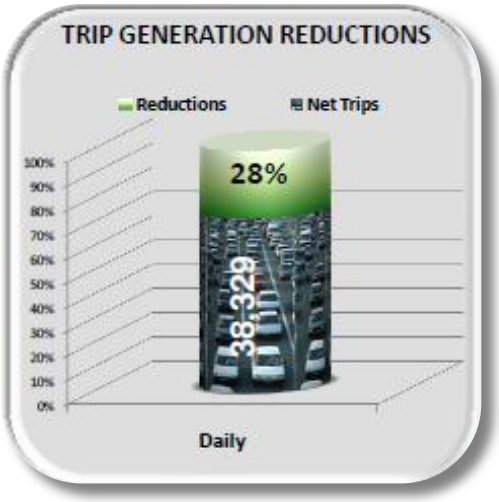
Air District Rule – reduction determined and outcome evaluated

Other TDM Measures – influence and participation determined independently and outcome evaluated

Reductions in Vehicle Trips, VMT, GHG shown instantly

Results from RT designed to closely match full model results

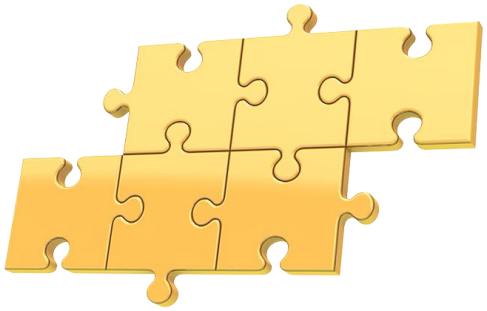




Recommended	Recommended
Fresno	Kings
Kern	Madera
San Joaquin	Merced
Stanislaus	Tulare

INTERREGIONAL COORDINATION

- Land Use Based on Best Available Data
- Travel Sensitive to Interregional Economic Activity
- Distance of Travel Based on Statewide Model
- Coordination with ARB 8-County Model
- Captures Through, Imported, Exported Travel
- Consistent between all 8 MPOs
- Conformity, Target Setting, Multi-Regional Projects



Required	Required
Fresno	Kings
Kern	Madera
San Joaquin	Merced
Stanislaus	Tulare

APPENDIX A:
2010 RTP REQUIREMENTS AND RECOMMENDATIONS

Topic Area	2010 RTP Requirement	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Travel Model Group	3.2	D	D	B	B	B	D	D	C
Scenarios/Policy Analysis	B-1 Range of alternatives based on policy goals and input from public	◑	◑	◑	◑	◑	◑	◑	◑
	B-2 At least 20 years in future	●	●	●	●	●	●	●	●
Forecast	B-6 Projected transportation demand of persons and goods in the metropolitan planning area over the period of the transportation plan	◑	◑	◑	◑	◑	◑	◑	◑
	B-3 Model criteria pollutants for on-road vehicles using EPA approved software	●	●	●	●	●	●	●	●
	B-4 Quantify GHG reduction of SCS	◑	◑				◑		
Conformity/GHG	D-2 Achieve the requirements of the Transportation Conformity Regulations of Title 40 CFR Part 93	◑	◑	●	●	●	◑	◑	●
	D-6 Emissions estimates shall be based on a methodology which differentiates between peak- and off-peak link volumes and speeds and uses speeds based on final assigned volumes	◑	◑	●	●	●	◑	◑	●
	D-5 Consistent with transportation system which emissions are being estimated. Reasonable distribution of employment and residences for different transportation options	◑	◑	●	●	●	◑	◑	●
Land Use Forecast	3.3-1 Socioeconomic models shall include capabilities to measure the impacts of transportation investments on low income and minority communities as required under federal and state law	◑	◑	◑	◑	◑	◑	◑	◑

Topic Area	2010 RTP Requirement	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Model Process	D-8 Reasonably sensitive to change in time, cost, and other factors affecting travel choice	◑	◑	●	●	●	◑	◑	●
Distribution	D-7 Reasonable agreement impedances used to distribute trips and estimates from final assigned volumes	◑	◑	●	●	●	◑	◑	●
Assignment	D-6 A capacity-sensitive assignment methodology shall be used	◑	◑	●	●	●	◑	◑	●
	D-9 Estimates of speed and delay sensitive to estimated volume on each roadway in model network	◑	◑	●	●	●	◑	◑	●
Calibration	All current steps	◑	◑	◑	◑	◑	◑	◑	◑
	All current steps static	◑	◑	◑	◑	◑	◑	◑	◑
	All current steps dynamic	◑	◑	◑	◑	◑	◑	◑	◑
	B-5 Population, land use, travel, employment, congestion, and economic activity	◑	◑	◑	◑	◑	◑	◑	◑
Validation	D-3 Peak and off-peak base year counts not more than 10 years prior to date of conformity determination. Check forecasts for reasonableness and compare to historic trends, and document results	◑	◑	●	●	●	◑	◑	●
	D-10 HPMS is primary source of VMT estimate by functional class, factored to reconcile network coverage differences	◑	◑	●	●	●	◑	◑	●

Topic Area	2010 RTP Requirement	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Data Collection	D-4 Land use, population, employment, and other network-based travel model assumptions shall be documented and based on the best available information	◑	◑	●	●	●	◑	◑	●

Notes:
● = Met / Not Required
◑ = Partially Met
○ = Not Met

Topic Area	2010 RTP Recommendation	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Travel Model Group	3.2	D	D	B	B	B	D	D	C
Scenarios/Policy Analysis	PB-1 Agencies can define and evaluate trend forecast, combined general plans, and preferred RTP	◑	◑	◑	◑	◑	◑	◑	◑
	PB-2 These models can be used to evaluate increased density and mix, urban growth limits, and improved neighborhood walkability and bikeability	◑	◑	◑	○	○	◑	○	◑
	C-12 The urban development footprint in GIS should be used to calculate environmental impacts on terrestrial and aquatic ecosystems and/or inform the land use model of areas to be avoided in order to help locate alternative development	○	○	●	●	●	○	○	○
	PC-1 One or more transit improvement proposals, as well as demand management, pricing strategies, and housing affordability should be included	○	○	○	○	○	○	○	○
	PC-2 Effects on lower-income households, as required by Federal and State law. This can be done by evaluating traveler welfare measures based on the mode choice log sums for each household income class, or based on travel costs for them	○	◑	○	○	○	◑	○	○

Topic Area	2010 RTP Recommendation	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
	D-10 Simple Environmental Justice analyses should be done using travel costs or mode choice log sums, as in Group C. Examples of such analyses include the effects of transportation and development scenarios on low-income or transit-dependent households, the combined housing/transportation cost burden on these households, and the jobs/housing fit	○	○	●	●	●	○	○	●
	PD-1 A full range of performance and impact measures could be developed, for economic, environmental, and equity effects, as required by SAFETEA-LU, National Environmental Policy Act, CEQA, and other laws. Traveler welfare could be measured and, if possible, locator welfare. Various measures of economic development could also be created, such as wages, jobs, production, and exports	○	○	○	○	○	○	○	○
Conformity/GHG	B-8 Use current model for conformity, and other generally accepted analytical tools to determine impacts of SCS	○	○	○	○	○	○	○	○
	B-4 Address change in regional demographics	○	○	○	○	○	○	○	○
Land Use Forecast	B-5 Develop GIS capabilities, leading to simple land use model in a few years	◑	◑	◑	◑	◑	◑	◑	◑
	B-6 All natural resource data included in GIS	○	○	○	○	○	○	○	○

Topic Area	2010 RTP Recommendation	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
	B-7 Parcel data for existing land use developed in next few years	○	○	○	○	○	○	○	○
	C-4 Simple land use models should be used, such as GIS rule-based ones, in the short term	◑	◑	●	●	●	◑	◑	◑
	C-5 Economic, market-based land use models that recognize the effects of transportation on development location should be developed within a few years	○	◑	●	●	●	○	○	○
	C-6 Parcel data for existing land use developed as soon as possible	◑	◑	●	●	●	◑	◑	◑
	C-7 A digital general plan layer should be developed in the short-term	◑	◑	●	●	●	◑	◑	◑
	D-8 The regions should implement simple land use models that recognize the effects of transportation on development location and density for the next RTP and develop formal economic land use models in the next few years	○	◑	●	●	●	○	○	●
	3.3-1 Microeconomic land use models should be developed for use with activity-based travel demand models	○	○	○	○	○	○	○	○
	3.3-2 Regional models should consider population growth based on birth and mortality and international and domestic migration	○	○	○	○	○	○	○	○

Topic Area	2010 RTP Recommendation	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Model Process	3.3-3 Socioeconomic models should provide projections on future employment indicators including jobs by sector and income	○	◑	○	○	○	○	○	○
	3.3-4 Land use models should be sensitive to transportation scenarios such that the effects of land use and transportation policies can interact with feedback in an integrated transportation and land use model	○	◑	○	○	○	○	○	○
	B-1 The use of three-step models can continue for the next few years.	◑	◑	◑	◑	◑	◑	◑	◑
	B-2 account for the effects of land use characteristics on travel, either by incorporating effects into the model process or by post-processing.	◑	◑	◑	◑	○	◑	◑	◑
	B-3 While developing more sophisticated/detailed models, "Ds" or other post-processors may be needed for policy evaluation.	◑	◑	○	○	○	◑	○	◑
	C-2 Develop four-step travel models as soon as is possible. In the near-term, post-processing should be used	◑	◑	◑	◑	○	◑	◑	◑
	C-3 The travel model set should be run to a reasonable convergence towards equilibrium across all model steps	◑	◑	◑	◑	◑	◑	◑	◑
	C-10 Sufficient temporal resolution to adequately model peak and off-peak periods	◑	◑	◑	○	◑	◑	◑	◑

Topic Area	2010 RTP Recommendation	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
	D-2 four-step travel models with full feedback across travel model steps, including land use modeling	◑	◑	◑	◑	○	◑	◑	◑
	D-3 Auto ownership/trip generation/mode choice sensitive to transit, walking and bicycling, land use variables, and transit accessibility	◑	◑	◑	○	○	○	◑	◑
	D-5 Small Traffic Analysis Zones (TAZ) should be used, to increase sensitivity to infill potential near to rail stations and in Bus Rapid Transit (BRT) corridors. Parking quantity and cost should be represented in the travel model	○	○	●	●	●	◑	○	●
	D-7 Feedback loops should be used and take into account the effects of corridor capacity, congestion and bottlenecks on mode choice, induced demand, induced growth, travel speed and emissions	◑	◑	◑	◑	●	◑	◑	◑
	D-11 Agencies should develop models that test joint (or simultaneous)-choice of mode and destination	○	○	●	●	●	○	○	●
Generation	C-9 Several employment types should be used, along with several trip purposes	◑	◑	◑	◑	◑	◑	◑	◑
Mode Choice	B-9 Should include work and non-work for SOV, MOV, carpool, transit, walking, and bicycling	◑	◑	◑	◑	○	◑	○	◑

Topic Area	2010 RTP Recommendation	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
	B-12 If a mode choice model is included but walk and bicycle are not included, another means to estimate should be used	◑	◑	◑	◑	○	○	○	◑
	B-13 Transit speed, frequency, days, hours of operation should be included if transit is included in mode choice	◑	◑	○	○	○	○	○	○
	B-14 When transit is modeled, the entire transit network within the region should be represented	○	○	○	○	○	○	○	○
	C-8 Simplified freight model should be developed and used	○	◑	●	●	●	○	○	○
	D-4 Walk and bike modes should be explicitly represented	○	○	●	●	●	○	○	●
	D-6 The carpool mode should be included, along with access-to-transit sub modes	◑	◑	●	●	●	◑	○	●
	D-9 Freight models should be implemented in the short term and commodity flows models within a few years	○	◑	●	●	●	○	○	●
	D-15 Where use of transit currently is anticipated to be a significant factor in satisfying transportation demand, the travel times that are estimated from final assigned traffic volumes times should also be used for modeling mode splits	◑	◑	●	●	●	○	○	●

Topic Area	2010 RTP Recommendation	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Assignment	B-1 The models should be run to a reasonable convergence towards equilibrium.	◑	◑	◑	◑	◑	◑	◑	◑
	C-11 Agencies should investigate their model's volume-delay function and ensure that speeds outputted from the model are reasonable	◑	◑	●	●	●	◑	◑	◑
Calibration	B-10 To extent practical, use of most recently observed household survey, traffic counts, gas, receipts, HPMS, transit survey, passenger counts	◑	◑	◑	◑	◑	◑	◑	◑
Validation	C-11 Road capacities and speeds should be validated with surveys	◑	◑	●	●	●	◑	◑	◑
MIP	B-11 Ongoing MIP to focus on increasing accuracy and policy sensitivity, including data development and acquisition to support model calibration and validation	◑	◑	◑	◑	◑	◑	◑	◑
	B-16 Work closely with state and federal agencies to secure funding to research and implement land use and activity based modeling methods	◑	◑	○	○	◑	◑	◑	○
	D-13 The next household travel survey should include activities and tours	○	○	●	●	●	○	○	●
	D-14 Floor space rent data should be collected in the case where an agency is anticipating development of an integrated economic/land use (or microeconomic land use) model	○	○	●	●	●	○	○	●

Topic Area	2010 RTP Recommendation	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
CIA Modeling Forum	B-15 Agencies are encouraged to participate to share ideas and help ensure they are informed and keep current on trends and requirements	◑	◑	◑	◑	◑	◑	◑	◑
	D12 Monitor large RTPAs/MPOs in Group E as they develop tour/activity-based models	◑	◑	◑	◑	◑	◑	◑	◑
Co-Benefits	MPOs should quantify, to the extent possible, the co-benefits associated with the achievement of their greenhouse gas reduction targets, as a means of increasing public understanding and support.	○	○	○	○	○	○	○	○
Sketch Models	Agencies should develop fast-turnaround sketch modeling tools for testing scenarios in public workshops.	◑	◑	○	○	○	○	○	○
	Agencies should disclose the level of detail or "capability" of the sketch model being used so that stakeholder expectations will be set appropriately.	○	○	○	○	○	○	○	○
Interregional Travel	The Statewide Travel Demand Model (STDM), when updated and fully implemented, will provide interregional trip data to be considered in MPO regional models	◑	◑	◑	◑	◑	◑	◑	◑
Consistency of RTP Modeling	3.4-1 No Action alternative for the RTP should only include those projects that could advance to implementation if a new RTP is not adopted	◑	◑	◑	◑	◑	◑	◑	◑

Topic Area	2010 RTP Recommendation	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
	3.4-2 Agencies that use MPO models for purposes other than regional planning should ensure that the model provides the appropriate scale and sensitivity for applications at a sub-regional level such as corridor, sub-area, or local planning studies	○	○	○	○	○	○	○	○
	3.4-3 Modeling practices should be consistent between California Department of Transportation (Caltrans) District Offices, MPOs, RTPAs, cities, counties, and Congestion Management Agencies (CMA) as appropriate given recommendation 2 above	○	○	○	○	○	○	○	○
	3.4-4 Post-processing of model results should be accompanied by an explanation of what model limitations are being overcome and how the limitations were identified. Sensitivity testing should generally be the basis for justifying post-processing	○	○	○	○	○	○	○	○

Notes:

● = Met / Not Required

◑ = Partially Met

○ = Not Met

TABLE E-A3:
SUMMARY OF PRE-MIP TRAVEL MODELS FOR SAN JOAQUIN VALLEY METROPOLITAN PLANNING ORGANIZATIONS

Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Model Use								
Current Use	• Air quality conformity • RTP • Corridor studies • Development studies • Caltrans projects • Transit studies • Blueprint studies • Traffic fee studies • SB 375 target setting • No individual city models	• Air quality conformity • RTP • Corridor studies • Development studies • Caltrans projects • Transit studies • Blueprint studies • Traffic fee studies • SB 375 target setting • Some individual city models	• Air quality conformity • RTP • Corridor studies • Development studies • Caltrans projects • Blueprint studies • Traffic fee studies • No individual city models	• Air quality conformity • RTP • Corridor studies • Development studies • Caltrans projects • Blueprint studies • Traffic fee studies • Development of Measure T • No individual city models	• Air quality conformity • RTP • Corridor studies • Development studies • Caltrans projects • Blueprint studies • Traffic fee studies • One individual city model	• Air quality conformity • RTP • CMP • Corridor studies • Development studies • Caltrans projects • Blueprint studies • Traffic fee studies • SB 375 target setting • Many individual city models	• Air quality conformity • RTP • CMP • Corridor studies • Development studies • Caltrans projects • Traffic fee studies • General/Specific Plans • Some individual city models	• Air quality conformity • RTP • Corridor studies • Development studies • Caltrans projects • Blueprint studies
Who Uses	• COG staff • Consultants are charged a fee for model applications by COG staff • It is occasionally made available to member agencies and consultants	• COG staff • Consultants • It is occasionally made available to member agencies • Caltrans	• CAG staff • Occasionally member agencies or consultants	• MCTC staff • Occasionally member agencies or consultants	• COG staff • Consultants • It is occasionally made available to member agencies • Caltrans	• COG staff • Consultants • Member agencies • Caltrans	• The model is most frequently applied by StanCOG staff • It is also made available to member agencies and consultants for studies • Modesto uses TPPG zonal data (version prior to recent land use updates by StanCOG)	• The model is most frequently applied by TCAG staff • It is occasionally made available to consultants
Study Area	Fresno County	Kern County	Kings County	• AQ Version: Madera, Fresno, Merced, Stanislaus • BluePrint version: Madera	Merced County as well as the southern portion of Stanislaus County (roughly to Turlock/Patterson)	San Joaquin County as well as SACOG, MTC, StanCOG, and portions of the foothills	Stanislaus County as well as parts of northern Merced and parts of southern San Joaquin	Tulare County
Land Use & SE Inputs								

LU Types	• Population
	• Housing units:
	  ○ SF, MF
	  ○ Vehicle ownership: 0, 1, 2+
	• Employment:
	  ○ Retail
	  ○ Service
	  ○ Government
	  ○ Education
	  ○ Other
		• Housing units:
		  ○ Income
		  ○ Size
		• Non-Residential:
		  ○ Basic Production
		  ○ Basic Warehouse
		  ○ Retail High
		  ○ Retail Medium
		  ○ Service Office
		  ○ Service Commercial
		  ○ Elementary/Middle School Enrollment
		  ○ High School Enrollment
		  ○ College Enrollment
			• Population
			• Housing units:
			  ○ SF, MF
			  ○ Vehicle ownership: 0, 1, 2+
			• Employment:
			  ○ Retail
			  ○ Office
			  ○ Industrial
			  ○ Agriculture
			  ○ Government
			  ○ Education
			  ○ Other
				• Housing units:
				  ○ SF, MF
				• Employment:
				  ○ Retail
				  ○ Office
				  ○ Manufacturing
				  ○ Government
				  ○ Education
				  ○ Other
					• Housing units:
					  ○ SF, MF
					• Non-Residential:
					  ○ Agricultural
					  ○ Industrial
					  ○ Retail
					  ○ Office
					  ○ School
					  ○ Students
						• Housing units:
						  ○ SF, MF
						• Employment:
						  ○ Retail
						  ○ Service
						  ○ Other
							• Housing units:
							  ○ SF, MF
							  ○ Household size: 1, 2, 3, 4, 5+
							  ○ Vehicle ownership: 0, 1, 2, 3, 4+
							• Employment:
							  ○ Retail
							  ○ Service
							  ○ Government
							  ○ Education
							  ○ Other
								• Population
								• Housing units:
								  ○ SF, MF
								  ○ Vehicle ownership: 0, 1, 2+
								• Employment:
								  ○ Retail
								  ○ Office
								  ○ Service
								  ○ Industrial
								  ○ Agriculture
								  ○ Government
								  ○ Education

Base Year Inventory	• 2003 inventory • 2006 update	• 2000 inventory • 2006 update	2005 inventory	2000 inventory	2000 inventory	• 2000 inventory • 2006 update	• 2000 inventory • 2006 update	• 2000 inventory • 2007 update

Housing Inventory	• 2000 Census blocks
	  ○ Median HH income
	  ○ Vehicle ownership
	• 2003: Building permits
	• 2006: Approved projects
		• 2000 Census blocks
		• 2006: dwelling unit counts
			• 2000 Census
			• California DOF
				• 2000 Census
				• California DOF
					2000 Census	• UOP Business Force
						• Census
							• 2000 Census
							• California DOF
								• 2000 Census blocks, County Assessor parcels, DOF
								• 2007: building permits

TABLE E-A3:
SUMMARY OF PRE-MIP TRAVEL MODELS FOR SAN JOAQUIN VALLEY METROPOLITAN PLANNING ORGANIZATIONS

Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare

Employment Inventory	• 2003 InfoUSA/EDD
	  ○ Geocoded address
	  ○ reviewed and corrected
	• 2003 factored to match EDD
	• 2006: Approved projects
	• Conversion factors for Fresno and Clovis GP
		• 2006 EDD	• CA EDD
			• InfoUSA
				• CA EDD
				• Review of existing parcel database
					InfoUSA	EHD	• 2006 EDD	• CA EDD
								• InfoUSA
								• GP to model using conversion factors
								• Government:: County Human Resources Department
								• Employment: County Department of Education

Future scenarios	• Individual years from 2003-2035 • "Buildout" unspecified year • Several 2050 Blueprint	• Conformity: Years from 2006-2035 typically in 5 year increments • Cumulative • 2050 Blueprint • SB 375 target setting	• 2035 • Every 5 year increment between 2005-2035 with the ability to create every year using interpolation. • BluePrint 2050	• 2025 • 2035 (with and without Rio Mesa) • 2050 Blueprint	2002, 2005, 2010, 2020, 2025, 2030, 2035	• Years from 2006-2035 in 5 year increments • 2050 Blueprint	• Conformity: Years from 2006-2035 • Multiple 2050 Blueprint scenarios	• 2035 • Every 5 year increment between 2005-2035 with the ability to create every year using interpolation. • BluePrint 2050
Forecasting process	• Central California Futures Institute (CCFI) 2025, extrapolated to 2035 • GIS map of vacant parcels, GP zoning, coordination with locals to match jurisdictional & County control totals • Allocation to TAZs based on development projects then GP zoning	• Employment data developed based on growth rates from Regional Econometric, Inc (REMI) projections, local knowledge, and expected developments • Control totals by Regional Statistical Areas (RSAs) without detail on specific development timing	• DOF County Population, EDD labor market data (2 digit SIC), County Business Patterns Surveys, GP assumptions and trends in population, housing and employment relationships and input from local jurisdictions. • GIS map of vacant parcels, GP zoning, coordination with locals to match jurisdictional & County control totals • Allocation to TAZs based on development projects then GP zoning	• DOF County Population, EDD labor market data (2 digit SIC), County Business Patterns Surveys, GP assumptions and trends in population, housing and employment relationships and input from local jurisdictions. • GIS map of vacant parcels, GP zoning, coordination with locals to match jurisdictional & County control totals • Allocation to TAZs based on development projects then GP zoning	• Population/Households control total based on DOF • Employment total based on Caltrans Division of Economics • General Plan maps, historical growth, capacity for each jurisdiction • Check employee/HH ratios • Proximity to existing land use and transportation system • Local planning comities help get into more accurate location and TAZ level	• UOP population model (short term and long term) differ significantly from DOF • Blueprint based on DOF • SACOG, MTC, etc for land use outside of County	• Population growth based on StanCOG regression analysis (lower than current DOF population forecasts) • Population to households using ratios from the 2006 • Employment projections are based on jobs/housing ratios form the 2006 base year inventory • Land uses are based primarily on General Plans for the incorporated areas. • StanCOG was able to accommodate all incorporated General Plan residential development up to 2030 • Measure M puts a cap on growth in the unincorporated areas	• DOF County Population, EDD labor market data (2 digit SIC), County Business Patterns Surveys, GP assumptions and trends in population, housing and employment relationships and input from local jurisdictions. • GIS map of vacant parcels, GP zoning, coordination with locals to match jurisdictional & County control totals • Allocation to TAZs based on development projects then GP zoning (2 digit SIC)

TABLE E-A3:
SUMMARY OF PRE-MIP TRAVEL MODELS FOR SAN JOAQUIN VALLEY METROPOLITAN PLANNING ORGANIZATIONS

Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Land use modeling	UPLAN used for 2050 Blueprint, but does not consider land use development proposals so is inconsistent with 2035 and Buildout	• UPlan forecast controlled by 8 RSAs to obtain 4 density categories, rather than 16 RSAs in spreadsheet method. • Evaluating Cube Land to provide feedback between land use and transportation models	UPLAN used for 2050 Blueprint, but does not consider land use development proposals so is inconsistent with 2035 and Buildout	• A cumulative scenario has been developed solely for CEQA purposes and is not intended to replace any ongoing projections currently in use by MCTC for southern Madera County. • A UPLAN process was set up to develop 2050 scenarios for the Blueprint process. The UPLAN process does not consider all of the detailed development proposals included in the manual process, and therefore the 2050 UPLAN forecasts are not consistent with the manual forecasts to 2035 and Buildout.	• UPlan for BluePrint process, but used afterwards • SIC/NICS/General Plan aggregation levels/equivalence tables • Parcel level data for base year • Future GP equivalencies done manually and not documented	Uplan for 2020, 2035, 2050	UPLAN used for 2050 Blueprint, but does not consider land use development proposals so is inconsistent with 2035	• A UPLAN process was set up to develop 2050 scenarios for the Blueprint process. • TCAG staff modified this process to develop their 2035 scenario. • Agriculture was looked at in detail in terms of crop type and employees/acre
TAZs								
Number	• 1,600 internal • 29 gateway • 1,852 highest	• 1,692 internal • 34 gateway • 1,726 highest	• 700 internal • 31 gateway • 1,000 highest	• 430 internal • 3 gateway • 3,129 highest	• 588 internal • 17 gateway • 637 highest	• 1,066 internal to County • N/A gateway • 1,100 highest	• 2,300 internal to County • 58 gateway • 3,200 highest	• 1,300 internal to County • 45 gateway • 4,000 highest
Average Size	• Smallest in larger cities • Largest in rural areas	• Smallest in larger cities • Largest in rural areas	• Smallest in larger cities • Largest in rural areas	• Smallest in larger cities • Largest in rural areas	• Smallest in larger cities • Largest in rural areas	• Smallest in larger cities • Largest in rural areas • Super zones outside of County	• Smallest in larger cities • Largest in rural areas	• Smallest in larger cities • Largest in rural areas
Average Trip Ends	Roughly proportional based on size and area	Roughly proportional based on size and area	Roughly proportional based on size and area	Roughly proportionate but would like smaller zones in urbanized/urbanizing areas	Roughly proportionate but would like smaller zones in urbanized/urbanizing areas	• Roughly proportional based on size and area within County • Very large difference between internal and external to County	Roughly proportional based on size and area	Roughly proportional based on size and area
Data Collection								
Traffic Counts	• Approx. 1,300 directional • Daily and hourly • 2003 from locals and Caltrans	• Approx. 1,000 locations • Approx. 250 classification • Quarterly AADT (HPMS, etc) • Counts use link ID for quick validation • State data from Caltrans	2005 Daily counts from locals and Caltrans	• 10 screenlines and 1 cordon • 1998 Caltrans counts and 1999-2000 counts on non-state routes	• 2000, 2005 counts • Some counts from locals • Would like to have count data system for 8 counties and looking for recommendations on type of data and how often to collect	• Bi-annual for CMP on regionally significant routes • Vehicle occupancy sometimes • Caltrans • Would like to have count data system/interface to model	• 2005 validation year from local jurisdictions and Caltrans for approximately 2,200 peak hour and 580 daily traffic counts • For 2006 validation, counts replaced Caltrans Traffic Volumes estimates used for 2005 • Traffic counts are stored in a DBF link file	Approximately 108 directional 2007 daily and hourly counts from locals and Caltrans
Transit Ridership	• 2003 daily transit ridership by operator and route	• Original mode choice model validation • System/route from transit agencies	• Vanpool real time GPS, with ridership will be provided monthly (rural, prison) • Valleywide (5 COGS) JPA to take over operation	N/A	N/A	• Member agencies recently updated SRTPs and the data can be collected from those reports • Can use passenger miles and relate to VMT • Maybe RTD has data	• Transit counts are not used as input to current model • MAX has ridership by line, hard-copy maps of boardings by individual stops • START has ridership data	N/A

TABLE E-A3:
SUMMARY OF PRE-MIP TRAVEL MODELS FOR SAN JOAQUIN VALLEY METROPOLITAN PLANNING ORGANIZATIONS

Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Travel Time Survey	• 2005 floating car on sample roadways by area type • Used to calibrate free-flow and congested speeds relative to speed limits	• 50 car speed surveys in Bakersfield and parts of County • Caltrans speed flow on 99 and 58	N/A	N/A	N/A	N/A	• Speed surveys were last done in 1994 (by Jim Schoeffling) • Caltrans District 10 may have floating car surveys	N/A
Household Survey	• 2000/2001 Statewide HH Survey • Trip generation rates, trip lengths from Fresno, Kern, Kings, Tulare (2,200 surveys) • Mode choice percentages based on 550 Fresno surveys	N/A	• 2000/2001 Statewide HH Survey • Trip generation rates, trip lengths from Fresno, Kern, Kings, Tulare (2,200 surveys)	2000/2001 Statewide HH Survey	N/A	• 2000/2001 Statewide HH Survey • NHTS	• 2000/2001 Statewide HH Survey • Trip generation rates, trip lengths	• 2000/2001 Statewide HH Survey • Trip generation rates, trip lengths from Fresno, Kern, Kings, Tulare (2,200 surveys)
Transit Survey	N/A	N/A	N/A	N/A	Boarding/alighting surveys	N/A	A market study of origins and destinations using an on-board survey was conducted a number of years ago	N/A
External Survey	• Detailed O-D survey done in mid-1990s • Used for reasonableness checking for current model	• Information from the statewide model was used to obtain station weights for the county lines, as identified in the model documentation. • Main focus on trucks, not passenger vehicles	N/A	N/A	N/A	2005 Altamont Pass study	• StanCOG is very interested in acquiring these data • Caltrans District 10 has done project-level O-D surveys	N/A
Data Collection Program	Periodic update of traffic counts from member agencies	Regional annual and quarterly counts	Periodic update of traffic counts from member agencies	N/A	N/A	Bi-annual CMP	• StanCOG would only have done the minimum required for HPMS • Local jurisdictions do a good job of collecting traffic counts	• TCAG periodically updates the traffic count database, relying on information provided by member jurisdictions
Other	N/A	Network surveys sent to member agencies to keep regionally significant projects coded in correct year/attributes	Will soon get Vanpool OD by time of day	N/A	N/A	Vehicle occupancy surveys in 2003 and 2005	The rideshare program for Stanislaus County is run from SJCCOG, and they may have vanpool data collected via GPS	N/A
Networks								

Non-typical Highway Link Attributes	• ProjectID
	• Adjusted distance (gateways and curved roads)
	• Area type (Urban, Small Urban, Rural)
	• CAPCLASS (26 facility types)
	• Script LOS E capacity/lanes
	• Master network
	  ○ Base/Future facility type, lanes and speed
	  ○ Improve/delete year
		• CMP designation and Air basin designation
		• DTIM (Signal spacing, cycle length, and approach to green cycle)
		• Delay adjustment factor and calibration term
		• Metro and environmental justice designation
		• Traffic counts (AM, PM, MD, OP, Daily) and count year
		• Truck counts by time of day
			N/A	• COST1
				• COST2
				• PROJECTNAME
				• PROJECTDESC
					Project ID	Region	N/A	• Improvement year
								• Aux lane
								• Heavy vehicle percentage
								• Direction of flow
								• Modified by
								• Modified date

TABLE E-A3:
SUMMARY OF PRE-MIP TRAVEL MODELS FOR SAN JOAQUIN VALLEY METROPOLITAN PLANNING ORGANIZATIONS

Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare

Non-typical Highway Node Attributes	• For TAZ nodes
	  ○ Flag if trips allowed to specific gateways
	  ○ Land use added to node during model run
		N/A	• City SOI Code	Land use added to node during model run	N/A	• TAZ_RGN: (SJ or null)
						• Parking: parking time equivalent implemented in distribution using value of time from PSRC. Currently not calibrated or used
							• Land uses
							• Trips by purpose
							• Area type (CMP analysis)
							• Jurisdiction
								• For TAZ nodes
								  ○ Flag if trips allowed to specific gateways
								  ○ Land use added to node during model run

Transit Attributes	• Line name • Mode (operator/fee structure) • Peak/off-peak headways • Time factor (relative to highway speed) • Stop/non-stop nodes	• Frequency • Paths • Route numbers • Delays • BRT on highway, LRT separate lines	N/A	N/A	N/A	N/A	N/A	N/A
Non-motorized	Created from highway network by excluding freeways.	Interested in MMLOS. Maybe as post/GIS process to be detailed like DTIM.	N/A	N/A	N/A	N/A	N/A	N/A
Model vs. actual detail	• Urban areas ½ mile grid, local streets 1/8 to 1/16 apart • Most streets in CBD • Rural areas 1-2 mile grid, local roads ½ spacing	N/A	N/A	N/A	N/A	• Within San Joaquin County, the model network generally includes all freeways, Central Business District roadways, arterials, and collectors. • Outside of San Joaquin County (Sacramento, Bay Area), the roadway network is much less detailed and limited to freeways	N/A	• In urban areas, model generally represents 0.5 mile grid while local streets are spaced 1/8 to 1/16 mile apart • Most streets in CBD are included in model • In rural areas, model generally represents 1 to 2 mile grid while local roads are ½ mile spacing • Model network vs. centerline inventory: • 100% of freeway • 90% of highway • 90% of arterial • 95% of collector • 95% of local roads
Vehicle Ownership								
Categories	Households are split into 0, 1, 2+ vehicles	N/A	Households are split into 0, 1, 2+ vehicles	N/A	N/A	N/A	Households are split into 0, 1, 2, 3, 4+ vehicles	Households are split into 0, 1, 2+ vehicles

Method	• Static
	  ○ Base: 2000 Census Block Group
	  ○ Future: comparable TAZ
		Currently use static HH size and income as proxy	• Static
			  ○ Base: 2000 Census Block Group
			  ○ Future: comparable TAZ
				N/A	N/A	N/A	Static	• Static
								  ○ Base: 2000 Census Block Group
								  ○ Future: comparable TAZ

Variables	Lookup block group	N/A	Lookup block group	N/A	N/A	N/A	Lookup TAZ	Lookup block group
Calibration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Trip Generation								
Method	• Excel spreadsheet • Person cross-classification rates	• Voyager script • Person cross-classification rates	• Excel spreadsheet • Person cross-classification rates	• Excel spreadsheet • Person cross-classification rates	• Voyager script • Vehicle cross-classification rates	• Voyager script • Applies static vehicle cross-classification rates for all zones	• Voyager script • Person cross-classification rates	• Excel spreadsheet • Person cross-classification rates
Input Variables	Population, Households, and Employment	Households and Employment	Population, Households, and Employment	Households and Employment	Households and Employment	Households and Employment	Households and Employment	Households and Employment

TABLE E-A3:
SUMMARY OF PRE-MIP TRAVEL MODELS FOR SAN JOAQUIN VALLEY METROPOLITAN PLANNING ORGANIZATIONS

Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Rates	• HH rates from 2000/2001 Statewide Survey • Attraction rates from ITE vehicle • NCHRP 365 for purpose splits	HH rates from 2000/2001 Statewide Survey	• HH rates from 2000/2001 Statewide Survey • Attraction rates from ITE vehicle • NCHRP 365 for purpose splits	HH rates from 2000/2001 Statewide Survey	ITE	HH rates from 2000/2001 Statewide Survey	• Household production rates from 2000/2001 Statewide Survey • Attraction rates set to approximate ITE vehicle trip generation • NCHRP 365 used as guide for trip purpose splits	• HH rates from 2000/2001 Statewide Survey • Attraction rates from ITE vehicle • NCHRP 365 for purpose splits
Purposes	• Home-Work • Home-Shop • Home-Other (includes school) • Work-Other • Other-Other • External trips in 5 purposes above • Trucks in Work/Other-Other	• Home-based work • Home-based school • Home-based shop • Home-based other • Non-home-based work—Other • Non-home-based other—Other • Truck trips	• Home-Work • Home-Shop • Home-Other • Home- School • Non-Home • Trucks in Work/Other-Other	• Home-Work • Home-Shop • Home-Other (includes school) • Non-Home	• Home-Work • Home-Shop • Home-Other (includes school) • Non-Home • IX/XI	• Home-Work • Home-Shop • Home-Other (includes school) • Work-Other • Other-Other • Trucks in Work/Other-Other	• Home-Work • Home-School • Home-Shop • Home-Other • Work-Other • Other-Other • Truck trips are assumed to be included in Work-Other or Other-Other	• Home-Work • Home-Shop • Home-Other (includes school) • Work-Other • Other-Other • Trucks in Work/Other-Other
Special Generators	• Separate list of special generators (mostly recreational areas) • Trip generation manually input	Special trip rates are used for the China Lake Naval Weapons Testing and Edwards Air Force Base are included as special generators	• Separate list of special generators (military, prisons, casinos, etc) • Trip generation manually input	Separate list when Fresno is included; directly from Fresno	UC Merced	N/A	• Costco • Beckwith Dakota CPD • Hospitals should also be in list • Trip generation manually input for each generator	• Separate list of special generators (mostly recreational areas) • Trip generation manually input
Balancing	• Trips in Fresno County held constant • Balance P/A by purpose at externals	Balance P/A by purpose	• Trips in Kings County held constant • Balance P/A by purpose at externals	• Trips in Madera County held constant • Balance P/A by purpose at externals	Balance P/A by purpose	Factors applied to trip ends depending on location prior to typical P/A balance	• Balance P/A by purpose at externals • Balancing is accomplished by increasing or decreasing both productions and attractions by half the difference between them for each purpose	• Trips in Tulare County held constant • Balance P/A by purpose at externals
Sensitivity to local factors	Included as "Ds" vehicle adjustment after mode choice.	Included as "Ds" vehicle adjustment after mode choice	Local factors assumed to influence distribution and mode choice	Local factors assumed to influence distribution and mode choice	N/A	Included as "Ds" vehicle adjustment	Local factors assumed to influence distribution and mode choice	• Local factors assumed to influence distribution and mode choice • Included as "Ds" vehicle adjustment
Trip Distribution								
Method	Gravity by purpose	Gravity by purpose	Gravity by purpose	Gravity by purpose	• Gravity by purpose • Static station weights	Gravity by purpose	Gravity by purpose	Gravity by purpose

TABLE E-A3:
SUMMARY OF PRE-MIP TRAVEL MODELS FOR SAN JOAQUIN VALLEY METROPOLITAN PLANNING ORGANIZATIONS

Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Parameters	• Travel time for Home-work from AM 3hr congested period form prior iteration • Travel time for remaining purposes from Off-peak 18hr average congested times from prior iteration • Terminal times at production and attraction (higher for CBD and college zones)	Travel time	Travel time with 1 minute terminal time	Travel time	Travel time	• Cost is time, with parking cost converted to time equivalent but not currently used • Includes terminal times	• Travel times for Home-Work and Home-School are from the A.M. 1-hour peak period congested times from the prior model iteration • Travel times for the other 4 purposes are from the Off-Peak 22-hour period average congested times from the prior model iteration • Travel time only – costs and distances not considered in distribution • Terminal times – 2 minutes each at production and attraction – gateways excluded	• Travel time for Home-work from AM 3hr congested period form prior iteration • Travel time for remaining purposes from Off-peak 18hr average congested times from prior iteration • Terminal times
Friction/K Factors	• Friction factors were calibrated to surveyed trip length frequencies, starting with default values from NCHRP 365 • K-factors are used to prevent illogical trips between certain TAZs and gateways	• Friction factors by purpose • K-factors by purpose (currently set to 1.0)	• Friction factors were calibrated to surveyed trip length frequencies, starting with default values from NCHRP 365 • K-factors are used to prevent illogical trips between certain TAZs and gateways	• Friction factors by purpose • K-factors by purpose	Friction factors by purpose	Friction factors by purpose	• Friction factors were calibrated to surveyed trip length frequencies, adjusted for validation • K-factors are set up to be applied by district – 2006 validation update set all K-factors to 1.0	• Friction factors were calibrated to surveyed trip length frequencies, starting with default values from NCHRP 365 • K-factors are used to prevent illogical trips between certain TAZs and gateways
External Traffic	• IX and XI trips are distributed with internal trips using the gravity model. • A representative average distance is estimated for each gateway to represent travel times to and from that external area. • XX trips are derived from the California Statewide Model (2003 version with local updates) and added when the assignable vehicle trip tables are prepared	• IX and XI trips by purpose are distributed with internal trips using the gravity model. • XX trips are base on Statewide HH Survey and fratared to 2003 counts and added when the assignable vehicle trip tables are prepared	• IX and XI trips are distributed with internal trips using the gravity model. • A representative average distance is estimated for each gateway to represent travel times to and from that external area. • XX trips are derived from the California Statewide Model (2003 version with local updates) and added when the assignable vehicle trip tables are prepared	• IX and XI trips are distributed with internal trips using the gravity model. • A representative average distance is estimated for each gateway to represent travel times to and from that external area. • XX trips are derived from the California Statewide Model (2003 version with local updates) and added when the assignable vehicle trip tables are prepared	• IX and XI trips are distributed with internal trips using the gravity model. • XX trips are derived from the California Statewide Model (2003 version with local updates) and added when the assignable vehicle trip tables are prepared	N/A	• IX and XI trips are distributed with internal trips using the gravity model. A representative average distance is estimated for each gateway to represent travel times to and from that external area. • XX trips are derived from the California Statewide Model (2003 version with local updates) and added when the assignable vehicle trip tables are prepared	• IX and XI trips are distributed with internal trips using the gravity model. • A representative average distance is estimated for each gateway to represent travel times to and from that external area. • XX trips are derived from the California Statewide Model (2003 version with local updates) and added when the assignable vehicle trip tables are prepared
Convergence	• Default TP+ convergence criteria • Maximum of 50 iterations	N/A	Max RMSE =1, Maximum iterations =30	Default TP+ convergence criteria	Default TP+ convergence criteria	Maxiters=30, maxrmse=0.1	• Default TP+ convergence criteria • Maximum of 30 iterations	• Default TP+ convergence criteria • Maximum of 25 iterations

TABLE E-A3:
SUMMARY OF PRE-MIP TRAVEL MODELS FOR SAN JOAQUIN VALLEY METROPOLITAN PLANNING ORGANIZATIONS

Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Calibration and validation	• Observed trip lengths were obtained from the California Statewide Travel Survey • Travel time records were cross-checked against geocoded origin and destination points and travel times from the model road network • The NCHRP 365 used as starting point and iterative methodology used to calibrate the gamma function • Validated to distribution of trip lengths rather than matching mean trip lengths	Model validation for the trip distribution step was validated to 2001 Caltrans Statewide Travel survey for average trip length in minutes	• Observed trip lengths were obtained from the California Statewide Travel Survey • Travel time records were cross-checked against geocoded origin and destination points and travel times from the model road network • The NCHRP 365 used as starting point and iterative methodology used to calibrate the gamma function • Validated to distribution of trip lengths rather than matching mean trip lengths	N/A	N/A	N/A	• Observed trip lengths were obtained from the California Statewide Travel Survey • Final calibration was not based on matching mean trip lengths but rather on visual comparison of trip length frequency graphs and on aggregate results of traffic validation	• Observed trip lengths were obtained from the California Statewide Travel Survey • Travel time records were cross-checked against geocoded origin and destination points and travel times from the model road network • The NCHRP 365 used as starting point and iterative methodology used to calibrate the gamma function • Validated to distribution of trip lengths rather than matching mean trip lengths
Modal Choice								
Method	• Multinomial logit mode choice model for 2 purposes, Home-Work and Non-Commute (all other 4 purposes) • Each purpose run separately for peak and off-peak periods • Mode choice model is calibrated separately for 0, 1 and 2+ vehicle households	• Multinomial logit mode choice model • Each purpose run separately for peak and off-peak periods	Mode split factors have been incorporated into an Urban Form version of the model	Mode split factors have been incorporated into an Urban Form version of the model	N/A	• Factors vehicle trips down by 1% to account for trips by transit, bicycling, and walking • Splits remaining vehicles into occupancy by purpose	• Factoring process based on Caltrans 2000/2001 Household Survey • Additional transit factors based on use input transit service quality ratings	• Multinomial logit mode choice model • Each purpose run separately for peak and off-peak periods
Parameters	• In-vehicle travel times • Out of vehicle travel times • Auto operating cost (distance times cost per mile) • Parking costs • Transit fares	• In-vehicle travel times • Out of vehicle travel times • Auto operating cost (distance times cost per mile) • Transit fares	Distance by mode and purpose	Distance by mode and purpose	N/A	Trip purpose	User input transit service quality ratings	Zone to zone travel time and distance
Modes	• Drive alone • Shared ride 2-person • Shared ride 3+ persons • Transit walk access • Transit drive access • Bicycle • Walk • Walk/drive to transit estimated separately	• Drive alone • Shared ride 2-person • Shared ride 3-persons • Shared ride 4+-persons • Zero Emissions Vehicle • Transit walk access • Transit drive access • Bicycle • Walk • Walk/drive to transit/premium transit estimated separately	• Auto • Transit • Walk • Bike	• Auto • Transit • Walk • Bike	Vehicle trips only	• Drive alone • Shared ride 2-person • Shared ride 3+ persons • Transit, bicycling, and walking combined into one mode	Vehicle trips only	• Auto • Transit • Walk • Bike

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Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Calibration and validation	• Standard coefficients used for time and cost • Constants were iteratively adjusted to match target percentages	N/A	Static splits based on Household Survey data	Static splits based on Household Survey data	N/A	Mode split factors based on Statewide Travel Survey by purpose	Factors derived from survey	Mode split factors based on Statewide Travel Survey by purpose
Trip Assignment								
Highway method and parameters	• TP+ equilibrium assignment • 50 maximum iterations for peak hours • 20 maximum iterations for other periods • Assignment based on time	• Voyager equilibrium • COST =((TIME/2)+(LI.DISTANCE*DISTFACTOR)) , Distfactor varies by time of day	• TP+ equilibrium assignment 20 maximum iterations • Assignment based on time	TP+ user equilibrium method with a max of 20 iterations	TP+ user equilibrium method for daily, incremental for peak	• TP+ equilibrium assignment • Assignment based on time • HOV facility/assignment	• TP+ equilibrium assignment 20 maximum iterations • Assignment based on time	• TP+ equilibrium assignment 50 maximum iterations • Assignment based on time
Transit method and parameters	Best path assignment for each of 4 path sets (peak and off-peak, walk access and drive access)	All-or-nothing	N/A	N/A	N/A	N/A	N/A	N/A
Capacity/speed/volume-delay	• Akcelik curves used for uncontrolled roads (freeways and rural highways) • Modfied BPR curves (from 2000 HCM) used for controlled roads	• Six volume-delay functions based on facility types (HCM, BPR, etc) • Direct travel impact model (DTIM)	Modified BPR curves (from 1985 HCM) used for controlled roads	Modified BPR curves (from 1985 HCM) used for controlled roads	BPR curves	Capacities based on LOS D/E threshold and double for areas outside of SJCOG to reflect network detail differences	Modified BPR curves	Modified BPR curves (from 1985 HCM) used for controlled roads
Convergence	• TP+ defaults adjusted to 0.00001 for GAP and RAAD	Max iterations=15	TP+ defaults adjusted to 0.0001 for GAP	Defaults with RMSE =0.01	TP+ defaults	GAP=0.0, AAD=0.0, RAAD=0.0, PDIFF=1, PDIFFVALUE=0, RMSE=0.0 MAXITERS=50	TP+ defaults	GAP=0.00005, AAD=0.5, RAAD=0.005 , PDIFF=1, RMSE=0.1, PDIFFVALUE=0, RELATIVEGAP=0
Calibration and validation	• Traffic validation based on FHWA and Fresno COG targets for VMT and road type • Fresno COG targets for RMSE and screenlines • Transit validation based on overall total daily transit ridership; results are also reported by operator and route	• Comparison of model traffic volumes to observed counts across screenlines by percent volume deviation (max desirable by 10%) • Comparison of modeled VMT to estimates obtained from Caltrans HPMS (max dev 3%) • Total volumes and RMSE (less than 40%) • Percent links falling within FHWA validation curve (75% of freeway/arterial, 65% of all links), all screenlines. • Comparison of observed transit boardings to model boardings.	• Traffic validation based on FHWA and KCAG targets for VMT and road type • KCAG targets for RMSE and screenlines	• Did not meet 10% target for all screenlines • Overall traffic on screenlines within 1% • Major locations are within reasonable tolerance	Meets Caltrans targets for daily, not for peak	• Comparison of modeled VMT to estimates obtained from Caltrans HPMS (max dev 3%) • OD matrix adjustment used for AM and PM 1hour based on 2006 calibrated matrices	Traffic validation based on FHWA targets for VMT, road type and screenlines	• Traffic validation based on FHWA and TCAG targets for VMT and road type • TCAG targets for RMSE and screenlines
Pricing								
Consideration	Costs are included in mode choice only	Costs are included in mode choice only	N/A	N/A	N/A	Trip distribution only, but not currently active	N/A	N/A

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Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Auto Operating Cost	• Average cost per mile adapted from MTC RTP analysis • In the past, auto operating cost was held constant for forecast years, but newer forecasts will use increasing gas costs	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Parking Cost	• Average base year parking costs for CBD and colleges based on information compiled by Fresno COG staff • Future parking cost increases estimated based on employment density using a model adapted from PSRC	N/A	N/A	N/A	N/A	Node attribute currently set to 0 until calibrated	N/A	N/A
Transit fare	• Average transit fares (2000$) from published Transit Plan documents. The average fare is annual revenue divided by annual boardings and is therefore lower than the cash fare due to passes and discount fares. • Rural transit fares are estimated based on a distance formula	Fares are included in mode choice only	N/A	N/A	N/A	N/A	N/A	N/A
Toll	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time of Day								
Periods	• A.M. peak 3-hour • P.M. peak 3-hour • Off-peak 18 hour • A.M. peak 1 hour • P.M. peak 1 hour • Daily (daily traffic is sum of A.M. 3, P.M. 3 and Off-peak 18 hour periods)	• A.M. peak 3-hour • P.M. peak 3-hour • Off-peak 18 hour • Daily (daily traffic is sum of A.M. 3, P.M. 3 and Off-peak 18 hour periods)	• A.M. peak 1 hour • P.M. peak 1 hour • Daily	Daily	• Daily • P.M. peak 1 hour	• A.M. peak 3-hour • P.M. peak 3-hour • Off-peak 18 hour • A.M. peak 1 hour • P.M. peak 1 hour • Daily (daily traffic is sum of A.M. 3, P.M. 3 and Off-peak 18 hour periods)	• A.M. peak 1 hour • P.M. peak 1 hour • Off-peak 22 hour • Daily (daily traffic is sum of A.M. 1, P.M. 1 and Off-peak 22 hour periods) • StanCOG does not believe that longer peak periods are needed for analysis	• A.M. peak 3-hour • P.M. peak 3-hour • Off-peak 18 hour • A.M. peak 1 hour • P.M. peak 1 hour • Daily (daily traffic is sum of A.M. 3, P.M. 3 and Off-peak 18 hour periods)
Peaking factors	• Peaking factors by trip purpose from the Statewide Travel Survey • Adjusted during validation	• Peaking factors by trip purpose from the Statewide Travel Survey • Adjusted during validation	• Peaking factors by trip purpose from the Statewide Travel Survey • Adjusted during validation	N/A	• Peaking factors by trip purpose from the Statewide Travel Survey • Adjusted during validation	• Peaking factors by trip purpose from the Statewide Travel Survey • Adjusted during validation	• Peaking factors by trip purpose from the Statewide Travel Survey • Adjusted during validation	• Peaking factors by trip purpose from the Statewide Travel Survey • Adjusted during validation
Peak spreading	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Feedback Mechanisms								

TABLE E-A3:
SUMMARY OF PRE-MIP TRAVEL MODELS FOR SAN JOAQUIN VALLEY METROPOLITAN PLANNING ORGANIZATIONS

Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Feedback Process	• Congested travel times from the A.M. 3-hour peak period and off-peak 18-hour period are fed back to trip distribution and mode choice • The Method of Successive Averaging is used to adjust the travel times for the next iteration	Congested travel times from the A.M. 3-hour peak period and off-peak 18-hour period are fed back to trip distribution and mode choice	• Congested travel times from the daily period are fed back to trip distribution • The Method of Successive Averaging is used to adjust the travel times for the next iteration	• Congested travel times from the daily period are fed back to trip distribution • The Method of Successive Averaging is used to adjust the travel times for the next iteration	N/A	Congested travel times from the A.M. 1-hour peak are fed back to trip distribution	• Congested travel times from the A.M. 1-hour peak period and off-peak 22-hour period are fed back to trip distribution and mode choice • The Method of Successive Averaging is used to adjust the travel times for the next iteration	• Congested travel times from the A.M. 1-hour peak period and off-peak 22-hour period are fed back to trip distribution and mode choice • The Method of Successive Averaging is used to adjust the travel times for the next iteration
Convergence	• Less than 5% of the origin-destination pairs have A.M. peak three-hour period congested travel times that change by more than 5% between iterations; and • The weighted average change in A.M. peak three-hour period link traffic volumes is less than 5% between iterations (the average percent change is weighted by the link volume). • The weighted average change in A.M. peak three-hour period congested travel times between origin-destination pairs is less than 5% between iterations (average weighted by number of origin-destination trips); and • The weighted average change in A.M. peak three-hour period congested travel times between origin-destination pairs is less than 5% between iterations (average weighted by vehicle-miles of travel); and • The weighted average change in A.M. peak three-hour period link traffic volumes is less than 5% between iterations (the average percent change is weighted by the link volume). • The feedback loop nearly always converges between 3 and 5 iterations	• Weighted percent change in link volumes is < 5% • Average i,j change in impedance < 5% • Average i,j change in impedance (weighted by VMT) < 5%GOODS MOVEMENT • 10 iterations max	• Less than 5% of the origin-destination pairs have A.M. peak three-hour period congested travel times that change by more than 5% between iterations; and • The weighted average change in A.M. peak three-hour period link traffic volumes is less than 5% between iterations (the average percent change is weighted by the link volume). • The weighted average change in A.M. peak three-hour period congested travel times between origin-destination pairs is less than 5% between iterations (average weighted by number of origin-destination trips); and • The weighted average change in A.M. peak three-hour period congested travel times between origin-destination pairs is less than 5% between iterations (average weighted by vehicle-miles of travel); and • The weighted average change in A.M. peak three-hour period link traffic volumes is less than 5% between iterations (the average percent change is weighted by the link volume). • The feedback loop nearly always converges between 3 and 5 iterations	N/A	N/A	Maximum number of iterations set by user	• Less than 5% of the origin-destination pairs have A.M. peak three-hour period congested travel times that change by more than 5% between iterations; and • The weighted average change in A.M. peak three-hour period link traffic volumes is less than 5% between iterations (the average percent change is weighted by the link volume). • The weighted average change in A.M. peak three-hour period congested travel times between origin-destination pairs is less than 5% between iterations (average weighted by number of origin-destination trips); and • The weighted average change in A.M. peak three-hour period congested travel times between origin-destination pairs is less than 5% between iterations (average weighted by vehicle-miles of travel); and • The weighted average change in A.M. peak three-hour period link traffic volumes is less than 5% between iterations (the average percent change is weighted by the link volume). • Max 7 iterations	• Less than 5% of the origin-destination pairs have A.M. peak three-hour period congested travel times that change by more than 5% between iterations; and • The weighted average change in A.M. peak three-hour period link traffic volumes is less than 5% between iterations (the average percent change is weighted by the link volume). • The weighted average change in A.M. peak three-hour period congested travel times between origin-destination pairs is less than 5% between iterations (average weighted by number of origin-destination trips); and • The weighted average change in A.M. peak three-hour period congested travel times between origin-destination pairs is less than 5% between iterations (average weighted by vehicle-miles of travel); and • The weighted average change in A.M. peak three-hour period link traffic volumes is less than 5% between iterations (the average percent change is weighted by the link volume). • Max 3 iterations

TABLE E-A3:
SUMMARY OF PRE-MIP TRAVEL MODELS FOR SAN JOAQUIN VALLEY METROPOLITAN PLANNING ORGANIZATIONS

Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Goods Movement								
Incorporation	N/A	Truck trip generation explicitly by land use category by axle types	N/A	N/A	N/A	• Would like to have ability to have STAA truck routes and truck trips tied to land use • Trucks could be forecasted to influence truck percent on roadway, GHG, and AQ analysis	N/A	N/A
Truck traffic	N/A	Truck trips are included in the trip generation script and are then estimated as PCEs by number of axles	N/A	N/A	N/A	N/A	Truck traffic is an important issue in Stanislaus County – 25% of traffic on some roads	N/A
Model Administration								
Development/User Report	• A draft model report is dated March 1, 2010 • A final model report and user guide are currently being finalized	Website has model development report	• A draft model report is dated November 6, 2009 • A final model report and user guide are currently being finalized	• A draft model report is dated November 1, 2001 • A final model report and user guide are currently being finalized	• Development Report • User Guide	N/A	• A draft model report is dated June, 2007 • The model has been modified since the draft report but documentation has not been updated • Replacement of 2005 TPPG land use with corrected 2006 base year land use • Complete update of land use forecasts • Extension of model into adjacent counties • Revalidation to 2006 base year with real traffic counts	Currently being prepared
Model Working Group	• Fresno COG convenes a Model Steering Committee as needed to discuss modeling issues and policies	Kern COG model committee/climate change task force	N/A	Valleywide Working Group		N/A	• Stanislaus County does not have a standing modeling group • Use CMP Steering Committee as needed	N/A
User Agreement	N/A	N/A	N/A	No formal process. Would like to have process to provide model files in return for a detailed scope of work	Update/implement use agreement as non-profit	Potentially charge for private developers to use model?	• Have not had a formal user agreement in the past • Now starting to use an agreement for current uses of the model	N/A
Model Interface/Presentation	• Interested in more visualization of model results • Easier access to presentation quality charts, maps, etc	• Posting model validation networks, GIS maps, etc on internet and developing MINT or something similar • A simplified model that is easier to run for conformity but is integrated with the model detailed model. • Version control/management	N/A	• Interested in more visualization of model results • Easier access to presentation quality charts, maps, etc	• Interested in more visualization of model results • Easier access to presentation quality charts, maps, etc	• Would like to have true shape output • Commute flows • Standardized outputs	• Current staff is comfortable producing required displays using GIS • No specific interest in Cube-based display products	N/A

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Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Ongoing/anticipated improvements	• The Fresno PTIS study is providing enhancements to the transit analysis capabilities • The SB 375 target setting included an implementation of a 4D processor • Adjustments to mode choice are used to represent AD9410 ridesharing rules	• Transit study has a task for F&P to re-validate transit model and mode choice. • Next big update when Census, HH travel survey data are available	N/A	Created master network, incorporated feedback loop, implemented equilibrium assignment procedures as part of the BluePrint model development	N/A	N/A	• StanCOG staff have expanded the model network and TAZs • StanCOG intends to gather data on external stations and update other assumptions • Consideration of including all of San Joaquin and Merced counties • Add transit network and mode choice	• The SB 375 target setting included an implementation of a 4D processor
Industry Groups	Central Valley Citilabs, etc	TMIP, CIA, large MPO conference at ESRI, Citilabs Futura and training	N/A	N/A	Citilabs, SB 375, Valleywide, planners group, land use/forecassting	• County GIS Group • Statewide HH Survey group • CIA	CIA, RTAC and other regional modeling discussions	N/A
Peer-review	Model has been reviewed by FHWA	Considered but other MPOs in valley discouraged MIP is peer review	N/A	N/A	Look to others for peer review	N/A	Peer group reviewed the model for the RTP	N/A
Knowledge sharing	San Joaquin Valley Model Users Group	Training as part of contract with member agencies	N/A	N/A	Email groups, big planning efforts like SB 375/BluePrint/etc	Coordinate with locals on input data	San Joaquin Valley Model Users Group	N/A
Technical Information								
GIS Software	ArcGIS	ArcGIS	2 licenses for ArcGIS	ArcGIS	ArcGIS	ArcGIS	Currently 1 ArcGIS – purchasing another	3 licenses 1 spatial analyst
GIS Staff	• Kristine Cai does most data analysis • FAX staff provide GIS for transit routes	• Mike – lead GIS • Troy – Uplan • Ed – Transit	Rachel Audino, Chris Lehn	Dylan Stone, Richard Poythress	3 staff, Matt Fell sometimes	Kim A	Jim Schoeffling	Mark, Marvin, Roberto, Mike Hickey
GIS Data	• Parcel datasets for multiple years with a detailed land use classification system. • Historic versions of the data can be reconstructed, but may need manual validation. • Many public and quasi-public land use types are not coded into the dataset. • City of Fresno has good existing land use layer • In other areas – Clovis, small cities – have to use aerial photos for land use information	• Detailed land use coding for the current year, but limited historical availability • Would like to have bike/sidewalks and update transit layer, include future school sites • Discrepancy between existing parcels having right-of-way for roads/etc but future parcels do not	Joanna Walker at County maintains library of GIS files	Need to work with Resources group	• Lots of data and sometimes uses data as background in model • Aerials • Some demographics that are used in the model • Transit information is included but slightly older than other data • HH information link to model for EJ: size, auto availability, income, etc	County has parcels with roughly 100 attributes but obtaining data is expensive	• County has excellent GIS layers available • Cities do not have much useful information in GIS format	N/A
LU Model Software	• UPLAN • IPlaces training starting soon	Spreadsheet model us used while developing UPlan or other land use forecasting model	N/A	UPLAN	• UPLAN • Interested in IPlaces	• Output from UPlan to master land use for model • Interested in Kern's evaluation of Cube Land	• UPLAN was run by UC Davis • IPlaces training starting soon	UPlan
LU Model Staff	N/A	Troy Hightower runs the UPlan model	N/A	Interested in Cube Land	Rich and Nate from UCD	Kim A	No staff designated for land use modeling	Roberto

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Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
LU Model Run time	N/A	1.5 h rs	N/A	N/A	• Difficult to setup and run so only used 1 time • Would like to use for SCS if not difficult •	30-35 minutes, but data preparation is more time intensive than run	N/A	45 Minutes
TDF Model Software	3 licenses for Cube/Voyager/TP+	Cube/Voyager	1 license for Cube/Voyager/TP+	1 license for Cube/Voyager/TP+	TP+, Cube Base with Application Manager	Cube/Voyager	1 license for Cube/Voyager	2 license for Cube/Voyager
TDF Model Staff	2 COG staff run the model (Mike Bitner, Kristine Cai)	Vincent is the most familiar in-house with the model. Troy Hightower and Rob Ball are also familiar with the travel demand model	Rachel Audino	Richard Poythress	Matt Fell	Kim Kloeb	Jim Schoeffling	Mark Hays, Roberto Brady, Marvin Demmers
TDF Model Run Time	N/A	• Varies between 2-3 hours depending on scenario and if we use the D enhancements. • About 300 runs per year	N/A	3-5 minutes	Less than 1 hr	Depends on the number of scenario years run but about 3 hrs	2 hours	1-2 hours
TDF Model Zone/Expansion	• Few adjustments needed • There are many gaps in TAZ numbering system which can be used without expanding the maximum TAZ number above 1,852 • TAZ must be added in network and in trip generation workbook • Copy node attributes from a nearby TAZ to get the correct gateway restrictions • Confirm zonal attributes in the trip generation workbook such as parking cost and area type	• Few adjustments needed • Update Socioeconomic file to include the correct district/income levels	• Few adjustments needed • There are many gaps in TAZ numbering system which can be used without expanding the maximum TAZ number • TAZ must be added in network and in trip generation workbook • Copy node attributes from a nearby TAZ to get the correct gateway restrictions • Confirm zonal attributes in the trip generation workbook such as parking cost and area type	• Few adjustments needed • There are many gaps in TAZ numbering system which can be used without expanding the maximum TAZ number • TAZ must be added in network and in trip generation workbook • Confirm zonal attributes in the trip generation workbook such as parking cost and area type	• Few adjustments needed • There are many gaps in TAZ numbering system which can be used without expanding the maximum TAZ number • TAZ must be added in network and in trip generation workbook • Confirm zonal attributes in the trip generation zone range	• Few adjustments needed • There are many gaps in TAZ numbering system which can be used without expanding the maximum TAZ number • TAZ must be added in network and in trip generation workbook • Confirm zonal attributes in the zone range for PA adjustment	• Few adjustments needed • There are many gaps in TAZ numbering system which can be used without expanding the maximum TAZ number above 3,200 • Copy node attributes from a nearby TAZ	• Few adjustments needed • There are many gaps in TAZ numbering system which can be used without expanding the maximum TAZ number • Copy node attributes from a nearby TAZ
TDF Model Scenarios	• Each scenario is run in a separate subdirectory • The model is set up so that each scenario can use a different 4-character prefix to identify files • Folder Structure • Inputs and outputs in the scenario directory • Subdirectories are created for travel time matrices, trip matrices, mode choice matrices, road networks and transit assignments	• The folder structure has a separate folder for TG and for the master network (run both of these scripts before the full model run). Some outputs from these two runs are then input into the 3rd folder – full model run. • The model was recently converted to Cube Application Manager and Catalog format.	• Each scenario is run in a separate subdirectory • The model is set up so that each scenario can use a different 4-character prefix to identify files	• Each scenario is run in a separate subdirectory • The model is set up so that each scenario can use a different 4-character prefix to identify files	Cube Application manager	• Each scenario is run in a separate subdirectory • The model is set up so that each scenario uses a different 4-character prefix to identify files	Inputs and outputs in the scenario directory	• Each scenario is run in a separate subdirectory • The model is set up so that each scenario can use a different 4-character prefix to identify files • Folder Structure • Inputs and outputs in the scenario directory • Subdirectories are created for travel time matrices, trip matrices, mode choice matrices, road networks and transit assignments

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Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Master Network	• The master road network can create scenario networks for any year • There is no master network system for the transit networks	• The master road network can create scenario networks for any year • Creation of the scenario network was previously a separate process, but may be included in the Cube Application Manager now.	The master road network can create scenario networks for any year	The master road network can create scenario networks for any year	The master road network can create scenario networks for any year	Master network and master land use file are kept in the "Master" folder along with other model inputs	StanCOG staff may prefer to maintain networks without using the Master	The master road network can create scenario networks for any year
Compatible with GIS	TP+ networks are consistent with the NAD 27 California Zone 4 projection	TP+ networks are consistent with the NAD 27 California Zone 5 projection	TP+ networks are consistent with the State Plane 1983 California Zone 4 coordinates, with measurement in feet	N/A	"Stick network" and TAZs are geocoded and correspond with the following projection: NAD_1983_StatePlane_California_III_FIPS_0403_Feet	TAZ boundary layer is available	TP+ networks are consistent with the NAD 83 California Zone 3 projection	TP+ networks are consistent with the NAD 27 California Zone 4 projection
Other tools	• ITE Trip Generation Fratar adjustment for development studies • Performance measure reporting • Eventually IPlaces	• Scripts for developing VMT, VT outputs. • Environmental Justice	• ITE Trip Generation Fratar adjustment for development studies	Scripts for developing VMT	N/A	• VMT/VHD/LOS summary scripts • ITE trip generation fratar • LOS by segment based on FDOT tables • Select zone • XX trips • Scenario management and efficiencies • Streamline inputs/outputs • Checking of inputs	• LOS by segment based on FDOT tables • Incremental adjustment from validation for link and intersection forecasts • HCS software used for capacity analysis • Interest in Cube Sugar	• ITE Trip Generation Fratar adjustment for development studies • Eventually IPlaces

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Topic Area	Fresno	Kern	Kings	Madera	Merced	San Joaquin	Stanislaus	Tulare
Miscellaneous								
Induced Travel	• No additional calculations for induced travel • Due to the feedback loop to trip distribution, the model will show increases in travel demand and traffic assignment where road capacity is increased	• No additional calculations for induced travel • Due to the feedback loop to trip distribution, the model will show increases in travel demand and traffic assignment where road capacity is increased	• No additional calculations for induced travel • Due to the feedback loop to trip distribution, the model will show increases in travel demand and traffic assignment where road capacity is increased	N/A	N/A	• No additional calculations for induced travel • Due to the feedback loop to trip distribution, the model will show increases in travel demand and traffic assignment where road capacity is increased	• No additional calculations for induced travel • Due to the feedback loop to trip distribution, the model will show increases in travel demand and traffic assignment where road capacity is increased	• No additional calculations for induced travel • Due to the feedback loop to trip distribution, the model will show increases in travel demand and traffic assignment where road capacity is increased
Other Prop 84 Focus Areas	• Sensitivity to TSM and TDM measures • Sensitivity testing to parking cost, transit fares	N/A	• Sensitivity to policy measures	N/A	N/A	N/A	• Staff is concerned about appropriateness of 4D process for Stanislaus County • Staff is concerned that ARB wants the MPOs to be consistent with the Statewide Model, but they first need a well-validated Statewide Model	• Would like TDM/TSM, parking cost, transit fares • Would like performance measure reporting, transit/ridership, light rail

Source: