San Joaquin Valley Regional Planning Agencies' Directors' Committee

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February 4, 2014

Mary Nichols
Chair
California Air Resources Board
1001 I Street
Sacramento, CA 95812

SUBJECT: San Joaquin Valley (Fresno Council of Governments, Kern Council of Governments, Kings County Association of Governments, Madera County Transportation Commission, Merced County Association of Governments, San Joaquin Council of Governments, Stanislaus Council of Governments, and Tulare County Association of Governments) Greenhouse Gas Emissions Quantification Methodology for the Development of Sustainable Communities Strategies

Ms. Nichols:

Please find enclosed the technical methodology that the eight (Fresno Council of Governments, Kern Council of Governments, Kings County Association of Governments, Madera County Transportation Commission, Merced County Association of Governments, San Joaquin Council of Governments, Stanislaus Council of Governments, Tulare County Association of Governments) San Joaquin Valley metropolitan planning organizations (MPOs) intend to use for estimating greenhouse gas (GHG) emissions for the Sustainable Communities Strategies (SCS) or Alternatives Planning Strategies (APS), if necessary, in compliance with the requirements of the Senate Bill 375 (SB 375).

The San Joaquin Valley MPOs have a long history of working together on a variety of planning issues including transportation conformity, travel model improvement and development, and SB 375.

The San Joaquin Valley MPOs intend to adopt individual SCSs that will allow them to meet the SB 375 Valley-wide emissions reduction targets set by the California Air Resources Board (ARB) in September of 2010.

Attachment 1 (San Joaquin Valley Technical Methodology) presents an overview of the SCS development process, including public participation and input, underlying data development, and technical modeling and approach used to estimate GHG emission reductions resulting from the anticipated adoption of individual SCSs by the eight Valley MPOs.

Please note, the technical methodology contained in Attachment 1 to this letter supplements the FresnoCOG methodology letter dated September 11, 2012.

Please contact Tanisha Taylor by phone at (209) 235-0600 or by email at taylor@sjcog.org should you have any questions on the technical methodology presented in this document. For specific MPO questions, please see Attachment 2 (MPO staff contacts) to this letter for the appropriate MPO staff contact.

Sincerely,

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SAN JOAQUIN VALLEY GHG QUANTIFICATION TECHNICAL METHODOLOGY

The technical methodology described in this document is consistent with the Regional Targets Advisory Committee (RTAC) target setting process. Per the RTAC's recommendation, all eight San Joaquin Valley MPOs will model 2005 as their base analysis year for the purposes of SB 375. Target years 2020 and 2035 will be modeled consistent with SB 375 analysis years.

For more information on the Fresno COG process, see Fresno COG's technical methodology for qualifying GHG emissions dated September 2012 at the following link http://www.arb.ca.gov/cc/sb375/sb375.htm.

SCS DEVELOPMENT

Background

Over the past three years, the eight San Joaquin Valley MPOs, in collaboration with each other, local jurisdictions and interested stakeholders, have been developing integrated regional transportation plans that seek to meet SB 375 targets. Due to the unique MPO travel pattern characteristics in the San Joaquin Valley, the first step of this process was to develop new travel models for each Valley MPO to better capture interregional and intraregional trips. The Model Improvement Program (MIP) funded by Proposition 84 funds was completed in 2012 and is discussed in more detail later in the document. In addition, the San Joaquin Valley planning and technical staffs have developed a consistent emission modeling methodology with ARB's emission modeling software EMFAC2011 to complete all of the SB 375-related emissions analyses. The technical methodology as well as all other elements of the forthcoming Valley MPO SCSs will be subject to public participation and outreach after the draft 2014 Regional Transportation Plans (RTPs) are released in the 1st/2nd quarter of 2014. All eight San Joaquin Valley MPOs are currently collaborating on their RTP schedules and anticipate adopting their final RTPs in a similar timeframe in the summer of 2014.

Scenario Selection Process

Each MPO within the San Joaquin Valley will have a scenario selection process unique to their MPO region. Information regarding each MPOs planning process can be located at the following links (please note when reviewing each MPO webpage, the level of information is highly dependent on where each MPO is in its planning process and the individual MPO processes may differ to meet local needs) or by contacting the appropriate MPO staff as identified in Attachment 2:

Fresno Council of Governments (FresnoCOG)
http://www.fresnocog.org/rtp
http://www.fresnocog.org/sustainable-communities-strategy-development-and-outreach

Kern Council of Governments (KernCOG)
http://www.kerncog.org/regional-transportation-plan
www.directionsto2050.com

Kings County Association of Governments (KCAG)
http://www.kingsregionalvision.com/
http://www.kingscog.org

Madera County Transportation Commission (MCTC)
http://www.maderactc.org/public.html

Merced County Association of Governments (MCAG)
http://mcagov.org/209/2014-Regional-Transportation-Plan

San Joaquin Council of Governments (SJCOG)
http://www.sjcog.org/index.aspx?nid=117

Stanislaus Council of Governments (StanCOG)
http://www.stancog.org/vvs.shtm
http://www.valleyvisionstanislaus.com/

Tulare County Association of Governments (TCAG)
http://www.tularecog.org/Index.aspx?NID=138

Public Participation

The San Joaquin Valley MPOs have developed public participation plans that comply with the requirements of SB 375. All public participation plans have been approved by the individual MPO Boards and will serve as a guide to the MPOs public participation and outreach processes designed to meet SB 375 requirements. Each MPO is anticipated to release their RTP/SCS for 55-day public comment in early 2014. The public participation plans are available on individual MPO websites at the links identified below:

FresnoCOG
http://www.fresnocog.org/fresno-cog-regional-transportation-plan-public-outreach

KernCOG
http://www.kerncog.org/images/docs/pubinfo/public_involvement_procedures_20110929.pdf

KCAG
http://www.kingscog.org/assets/Final%20Adopted%202013%20RTP-SCS%20PPP.pdf

MCTC
http://www.maderactc.org/pdf_files/PPP%202012%20Update.pdf

MCAG
http://mcagov.org/DocumentCenter/View/100

SJCOG
http://www.sjcog.org/DocumentCenter/View/54

StanCOG
http://www.stancog.org/pdf/committees/scs/RTP-SCS-PPP.pdf

TCAG
http://www.tularecog.org/DocumentCenter/View/284

In addition to the individual MPO outreach activities contained within each MPO's public participation plan, the San Joaquin Valley MPOs through a Proposition 84 Strategic Growth Council grant, have coordinated the development of additional public information through the ValleyVisions project. Additional information regarding the Valley Vision project can be found at the following link http://www.valley-visions.org/.

SOCIOECONOMIC DATA

For this effort, the eight San Joaquin Valley MPOs will use population and employment data as identified in Table 1 below.

Table 1: MPO Socioeconomic Data

MPO Name	Socioeconomic Data Source	
	Population	**Employment**
Fresno	Planning Center (2012)	Planning Center (2012)
Kern	KernCOG (2009, 2011)	Census /EDD (2010, 2012)[1]
Kings	Planning Center (2012)	Planning Center (2012)
Madera	Census (2010) Department Of Finance (DOF) Interim Projection (2012)[2]	Employment Development Department (EDD)/Info USA (2010) /DOF Interim Projection (2012)[3]
Merced	Planning Center (2012)	Planning Center 2012
San Joaquin	Planning Center (2012)	University of the Pacific (2012)
Stanislaus	Planning Center (2012)	Planning Center 2012
Tulare	TCAG (2013)	EDD (2010 Base), Planning Center 2012 (Projections)[4]

For those MPOs using the Planning Center projections as identified in the table above (Fresno, Kings, Merced, San Joaquin for population only, and Stanislaus, the Planning Center population projections identified above include three primary forecasts of population, households, and housing units. The forecasts are based on several different projections including household trend, total housing unit trend, housing construction trend, employment trend, cohort component model, population trend, average household size trend, and household income trend. Three measures evaluate the adequacy of each projection: mean absolute percentage error (MAPE), F-Test, and t-test.

The methodology and assumptions for the California Department of Finance (DOF) projections identified above can be found at the following links:

http://www.dof.ca.gov/research/demographic/reports/projections/p-1/documents/Projections_Methodology_2013.pdf Methodology and Assumptions for the State and County Population Projections July 1 2010-2060

[1] Originally adopted in 2005, the re-adopted 2009 Kern COG forecast was within 1/10th of one percent of the 2010 Census. In December 2011, the Kern COG Transportation Modeling Committee approved a forecast redistribution to incorporate observed 2010 census data. The KernCOG Employment forecasts used EDD and Census data jobs/housing ratio and distribution. The Planning Center method was used to validate the forecasts in 2012.
[2] 2010 Census data was used to develop the MCTC 2010 baseline population totals. MCTC then used the DOF Interim Projections for the projected population.
[3] EDD/Info USA data was used to develop the MCTC 2010 employment baseline. DOF Interim Projections were used to develop the projections.
[4] 2010 Census data was used to develop the TCAG 2010 baseline employment totals. TCAG then used the Planning Center forecasted employment growth rate to forecast future employment.

For MCTC, population projections from DOF Interim Projections (2012) were used as forecast year control totals. The household totals for each forecast year were estimated using the ratio of population to housing from the 2010 Census, adjusting for population in group quarters. The employment totals for each forecast year were estimated using the ratio of employment from the 2010 base year inventory.

SJCOG utilized the University of the Pacific (UOP) employment projections as the primary source for employment totals (base year and projections). The SJCOG employment forecasts are based on IHS-Global Insight regional forecasting models and prepared using IHS-Global Insight's Aremos forecasting software and are projected annually by North American Industry Classification System. SJCOG's forecast is based on UOPs San Joaquin County specific econometric model, but has drivers linked to state and national forecasts to account for macro trends. UOP also used its judgment to adjust the econometric forecasts to account for local knowledge and foreseeable short and medium-term developments, such as the opening and closing of large facilities, local real estate market trends or major infrastructure projects. For example, when the SJCOG employment forecast was prepared in early 2012, UOP adjusted the forecast to account for an anticipated growth in employment linked to the California Healthcare Facility off Arch Road in 2013 and 2014.

TCAG utilized the Planning Center study as the primary county-level forecasting reference. However, the divergence of the population projections for Tulare County between Planning Center and DOF was greater than the other valley counties. Since the DOF population forecast was very rigorous and the most recent, it was used as the base forecast. This would also provide for better compatibility with the Regional Housing Needs Allocation process. A linear growth rate was selected that fit the DOF forecast within 3% through the RTP update planning horizon of 2040. A linear growth rate for households was then determined by adjusting to a persons per household ratio that was reasonable based on Planning Center study projections. Similarly, a linear growth rate for housing units was determined by adjusting to a housing vacancy rate that was reasonable based on the Planning Center projections. Employment growth was based on the housing unit to jobs ratio projection in the Planning Center model.

Similar to TCAG, Kern used the Planning Center study as a validation reference for its forecast as well. In Kern's case the existing forecast was very close to the Planning Center study. The Kern forecast includes an assumption for increased in-migration in 2020 based on several factors including a short term increase in telecommuting, out-of-county commuting, and retirement households. The KernCOG forecast is within 3% of DOF for the horizion year of the Regional Housing Needs Allocation. Households are based on census persons per household data. Housing units were determined by applying the observed census vacancy rate to the number of households. The census vacancy rates are consistent with the Planning Center data. Employment growth is based on a jobs-household balance that varies between 1.1 and 1.2 jobs per household. The variance assumes a fluctuation in net-migration, natural increase, and conversion of second homes to primary residences. The base forecast used Caltrans County-Level Economic Forecast data, adjusted using California Employment Development Department data.

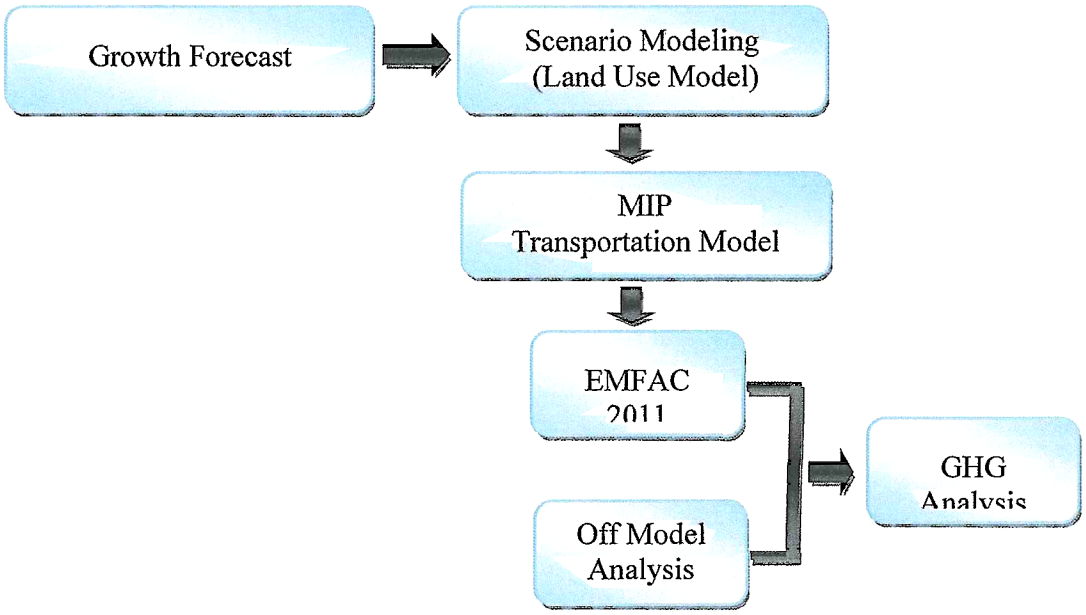
MODELS AND TOOLS:

The San Joaquin Valley MPOs will utilize three main tools to estimate GHG emissions for their 2014 RTP/SCS: A fourth tool, off model reductions, may be utilized if deemed appropriate. Documentation of any off model reduction tools used will be documented as part of the RTP/SCS documentation.

(1) Scenario Modeling – Land Use Model (varies by MPO);
(2) MIP transportation model; and
(3) EMFAC 2011emissions factor model.

The output of the scenario modeling tool forms the fundamental input to each MPO MIP transportation model (land use)[5]. The MIP transportation model utilizes the input from the scenario planning tool to form the fundamental input to the EMFAC2011 model. The EMFAC2011 model utilizes the vehicle miles traveled output from the MIP transportation model to calculate greenhouse gas emissions. Please see Figure 1 below which illustrates the relationship between these tools.

Figure 1 – Relationship Between Models and Tools



[5] Note: Each land use tool output is converted into consistent MIP inputs across the MPOs.

Each tool is described in further detail below.

Scenario Modeling - Land Use Model

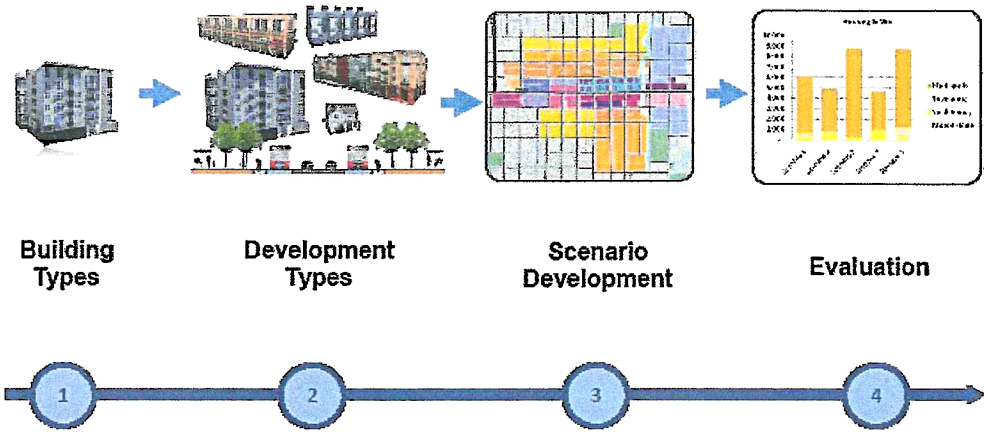
Scenario modeling allows a community to evaluate the likely outcomes of RTP/SCS policies on land use. In particular, the scenario planning approach is a way to explore what it would take to achieve adopted ARB GHG targets. Scenario modeling tools use building blocks that describe the different types of land uses that exist within each MPO region or are planned for the future.

The output of the Scenario modeling tools form the fundamental input to each MPO MIP transportation model.

The Scenario modeling tools to be used by the San Joaquin Valley MPOs in the development of their SCSs are summarized below.

Envision Tomorrow (Utilized by FresnoCOG, MCAG, SJCOG, StanCOG, and TCAG)

Figure 2 – Envision Tomorrow



Envision Tomorrow is a suite of scenario planning tools that tests different land use and transportation options. It consists of two primary tools: a Prototype Builder and a Scenario Builder, which work in unison to develop scenarios.

The Prototype Builder is a "return on investment" (ROI) spreadsheet tool that can be used to determine the physical and financial feasibility of development. This tool allows the user to examine land use regulations in relation to the current development market and consider the impact of various factors, such as parking, height requirements, construction costs, rents and subsidies. The Prototype Builder also considers inputs such as physical building characteristics, parking layout and costs, and other development costs such as landscaping, site acquisition, etc.

Stakeholder input is utilized to create building types and development types so that the scenarios reflect existing conditions as well as possible future conditions. Building and development types can be created to represent the development aspirations of the community.

The Scenario Builder is a Geographic Information Systems (GIS) based application that lets the user "paint the landscape" by allocating various, created development types across a study area to create unique land use scenarios. The tool then allows real-time evaluation of each scenario through a set of user-defined indicators. The indicators measure such things as the scenario's impact on land use, housing, sustainability, transportation and economic conditions. General plans, specific plans, community plans, zoning maps, Assessor's parcel data information, and environmental constraints, if any, are all inputs into the Scenario Builder tool. The growth forecast is allocated—by the user— to locations as desired in this tool.

Once the coordinated land use/transportation scenario is developed the output of that process will be converted into transportation model inputs and run through the MPO MIP travel demand model to estimate vehicle miles traveled attributable to the MPO scenarios.

Geographic Information Systems (GIS) (Utilized by KCAG)

The Kings County Association of Governments (KCAG) intends to utilize GIS to portray the different land use scenarios. It is anticipated KCAG will begin with General Plan GIS layers adding transit and roadway layers to develop its coordinated transportation/land use scenario for incorporation into its RTP/SCS. Once the coordinated land use/transportation scenario is developed the output of that process will be converted into transportation model inputs and run through the KCAG travel demand model to estimate vehicle miles traveled attributable to the KCAG scenarios.

UPlan (Utilized by MCTC, KernCOG, and TCAG)

The UPlan land use model uses a combination of computer based Geographic Information System, or "GIS" tools to accomplish the land use modeling tasks. The primary tool, UPlan, developed by the University of California, Davis, is a land use modeling software used to generate future growth models. The key components of UPlan modeling are projected populations, general plan land use, attraction areas, discouragement areas, and masks. UPlan is used in conjunction with ESRI's ArcGIS software, allowing the results of UPlan models to be displayed visually as easy to understand maps.

Once the coordinated land use/transportation scenario is developed the output of that process will be converted into transportation model inputs and run through the MPO MIP travel demand model to estimate vehicle miles traveled attributable to the MPO scenarios.

KernCOG: UC Davis and the Blueprint Model Steering Committee provided UPlan to KernCOG with a set of default areas and parameters. These were then modified to provide more accurate and localized inputs for the model based on comments from local jurisdictions in Kern.

The land use model for Kern County has been divided into ten eight sub areas; Greater Metro Bakersfield, Westside Kern, Greater Shafter, Greater Delano /McFarland, Greater Wasco, Greater Frazier Park, Greater Tehachapi, Southeast Kern, Lake Isabella Kern River Valley, and Indian Wells Valley. UPlan models are run to report potential effects of future growth on, or in designated general plan areas such as farmland, grazing land, public lands, habitat, military flight corridors, and others as required by SB 375.

UPlan parameters have been separated into two groups. The first group is the distribution by percentage of population among the sub areas and the distribution among the four residential densities for each sub area. Kern COG uses the locally adopted "2009 Region Growth Forecast Report" for population and employment projections including an adjustment to the 2010 census housing distribution. This forecast is within 3% of the DOF forecasted population for Kern. The second group contains the classification ranges based on dwelling units per acre for each residential density, and the distribution of employment among industrial, high density commercial, and low density commercial.

Kern COG residential classification ranges were derived in consultation with each local government member agency and are included in the Kern SB 375 Land Use Modeling Methodology documentation available online at http://www.kerncog.org/transportation-modeling. The report combines the different county and jurisdiction land use codes into similar land use categories or columns. The columns were then classified with the corresponding four residential densities used by UPlan. The report also had more relevant dwelling unit/acre figures than the default figures.

Kern COG has updated and enhanced the version of UPlan that was used in the 2008 Blueprint and the 2010 and 2012 ARB CO2 Target setting processes. The updated KernCOG UPlan is used to generate the residential and employment inputs for the new travel model developed by the MIP. KernCOG UPlan outputs are also being used to generate a number of performance measures used in scenario comparisons during the public workshop process.

Since December 2012, Kern COG has improved the accuracy of forecast distribution in Uplan by developing an enhanced post processor methodology for making adjustments to Uplan outputs, and creating additional sub regions for Uplan.

In addition to reporting future land uses, Uplan was helpful in developing a range of scenario models that varied housing mix and revitalization in transit priority areas. The scenarios, inputs, and methodology were developed with assistance and oversight from the Kern Regional Planning Advisory Committee, a variety of stakeholders, and public workshop participants. The successful Kern outreach process received input from over 8,000 participants over the past 2 years.

Once the coordinated land use/transportation scenario is developed the output of that process will be converted into transportation model inputs and run through the MPO MIP travel demand model to estimate vehicle miles traveled attributable to the MPO scenarios.

MCTC: Under the Blueprint process, MCTC developed several land use scenarios that it modeled and presented to the county's constituents. The result of the Blueprint effort was the selection of a Blueprint preferred scenario. Since the Blueprint process is now a familiar concept within the county, MCTC decided to use the Blueprint scenarios as the base for the SCS scenario development for the 2014 RTP update. Based upon this directive, Community Design and Architecture (the MCTC consultant firm) is preparing the data inputs for the MCTC updated UPLAN software, utilizing the parcel-based databases from the Blueprint process, as well as the MCTC Blueprint scenario definitions.

Table 1: MCTC UPlan GENERAL Plan Categories:

UPLAN GENERAL PLAN CATEGORIES

Residential Allocation Uses

General Plan Residential Land Use Designations	Density Range (units/acre)	Lots Size Range Gross (Sq.Ft.)	Average Lot Size Gross (Sq.Ft.) *
Very Low Density	<2	> 22,000	75,000
Low Density	2.01-6.5	6,700-22,000	10,750
Medium Density	6.51-12.00	3,600-6,700	5,500
Medium High Density	12.00-15.00	2,900 -3,600	3,200
High Density	>15.00	2,000-2,900	2,400
Mixed Use	>15.00	2,000-2,900	2,400

Employment Allocation Uses

General Plan Residential Land Use Designations	F.A.R.*	Density Range (jobs/acre)	Square Feet (building) per Employee*
High Density Commercial	0.4	36.00-48.00	400
Low Density Commercial	0.2	15.00-35.99	500
Industrial	0.2	10.65	825
Mixed Use+	0.4	36.00-48.00	400

Other Non-Allocation Uses

Urban Reserve
Government Jobs
Education
Agriculture
Public Lands and Open Space
Water Bodies

** Columns in Orange are UPLAN inputs*
+ Mixed Use General Plan Categories will receive allocations from both High Density Commercial and High/Medium High Density Residential growth

MCTC coordinated with the local jurisdictions to allocate the projected housing growth to the different jurisdictions. The UPLAN model allows for modeling growth by sub-areas within a county wherein the model will limit growth by the MCTC identified allocation for each sub-area. The sub-areas are defined as Madera City sphere of influence (SOI), Chowchilla City SOI, Southeast Madera and the remaining areas of Madera County. The land use definitions and share

for the cities reflect a greater tendency for relatively compact development in comparison to the unincorporated Madera county areas.

Once the coordinated land use/transportation scenario is developed the output of that process will be converted into transportation model inputs and run through the MPO MIP travel demand model to estimate vehicle miles traveled attributable to the MPO scenarios.

TCAG: As with MCTC, some of the scenarios studied for the Tulare region were based on the Regional Blueprint. A key principle of the Regional Blueprint was to "increase densities county-wide by 25 percent over the business as usual." Using UPlan it was possible to fix certain input parameters, such as the ratio of residential types, average lot size and commercial floor area ratio, at 25 percent above the business as usual scenario, which was developed in Envision Tomorrow.

As indicated above, TCAG utilizes two scenario modeling tools, Envision Tomorrow for the Business as Usual scenario and UPlan for alternative scenario development. Although it appears this could cause an inconsistency when quantifying the reduction of greenhouse gas emissions resulting from each scenario, this is not the case. Both the Envision Tomorrow Business as Usual and UPlan scenarios are built from the same population and employment projections. The Uplan scenarios are developed as a change from the Envision Tomorrow Business as Usual scenario. For example, a key principle of the TCAG Regional Blueprint was to increase densities county-wide by 25 percent over the business as usual densities. To achieve this, TCAG would build the Business as Usual scenario into the UPlan scenario planning tool and then adjust the densities to increase density 25 percent over the Business as Usual scenario.

In addition, TCAG utilizes conversion tools for both the Envision Tomorrow and UPlan scenario planning tools to convert the Envision Tomorrow and UPlan outputs into consistent MIP model inputs. What does this mean? Consistent land use and employment categories are modeled in the MIP travel demand model for both the Envision Tomorrow Business as Usual scenario and the UPlan alternative scenarios. This provides a consistent "apples to apples" comparison of impacts resulting from the Business as Usual and alternative scenarios.

Scenario Modeling Tool Relationship to MIP (transportation model)

It is important to acknowledge the differences in local jurisdiction land use planning processes across the eight MPO regions. As a result, land use planning tools vary across MPO regions to meet local scenario planning needs. Although, there are different scenario planning tools across the MPOs, the output of the scenario planning tool does not yield MPO vehicle miles traveled estimates. Estimated vehicle miles traveled is the output of each MPO's standardized MIP model.

As described in the MIP data input section below, the MIP created standardized input categories across all eight San Joaquin Valley MPOs. These standardized categories ensure consistent transportation modeling of household and employment types across the eight MPOs. It is this transportation modeling that yields a consistent process to estimate vehicle miles traveled for

each MPO. Additional information on the MIP can be found in the Transportation Model Improvement Program section below.

San Joaquin Valley Model Improvement Program (MIP) – travel demand models:

Model Development

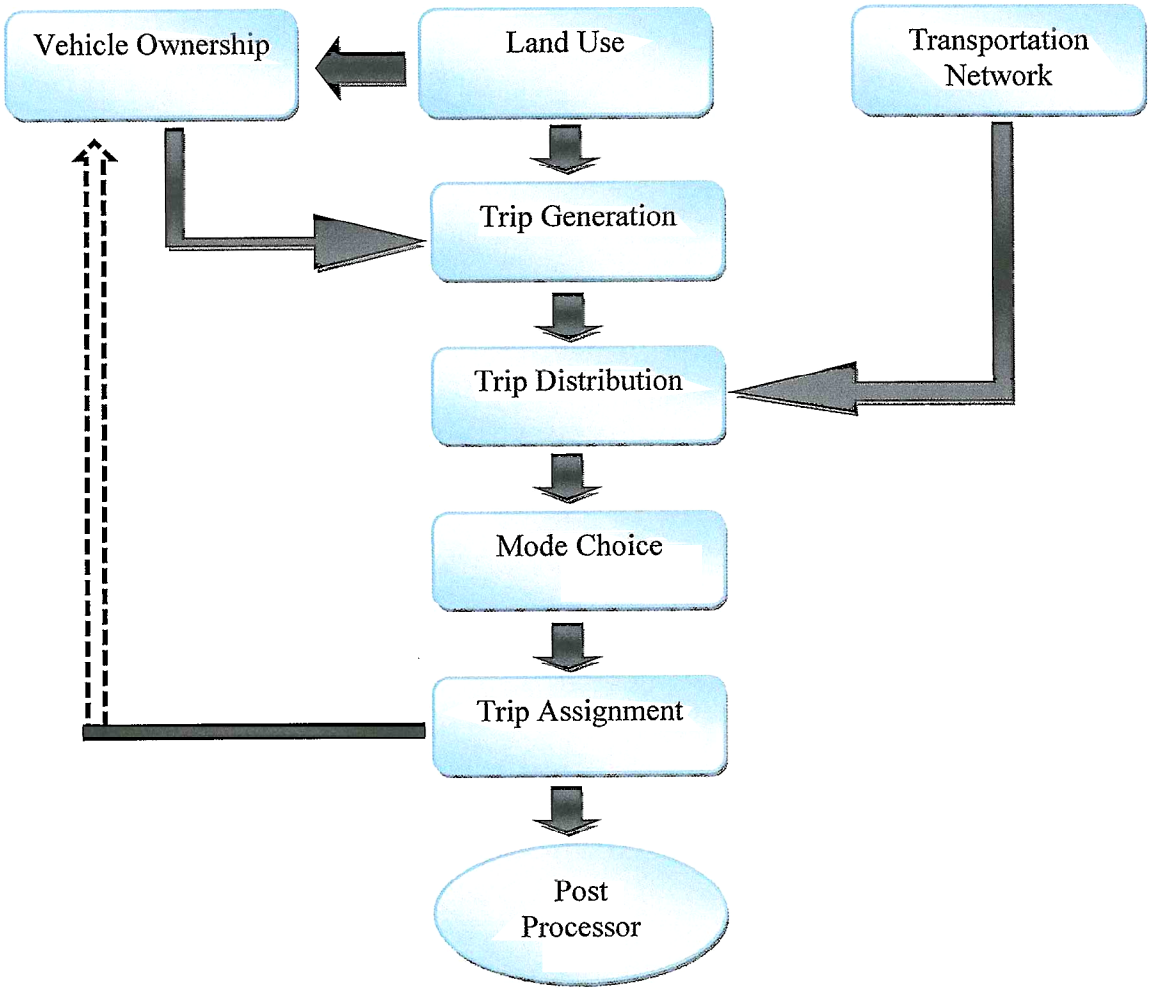
Beginning in 2010, the eight Valley MPOs undertook a joint process to improve their travel demand modeling capabilities to help meet SB 375 requirements. This process, known as the San Joaquin Valley Model Improvement Program (MIP) was funded by a $2.5 million Strategic Growth Council Proposition 84 grant. Between 2010 and 2012, staff from each of the eight MPOs participated in monthly meetings with a team of technical consultants to upgrade the models and modeling processes. To enhance coordination efforts, staff from the Air Resources Board and the University of California Berkeley listened in on the monthly MIP meetings of the MPOs and technical consultants.

The MIP effort resulted in the delivery of substantially upgraded and standardized travel demand models to the MPOs in the summer of 2012. The new travel models are designed to better evaluate the types of land use and transportation policies likely to be considered in the RTP/SCSs. Sensitivity to changes in land use and travel estimates was enhanced compared to previous models by – (i) refining each models' traffic analysis zone (TAZ) system to better capture mixed-use and transit oriented development; (ii) incorporating additional socioeconomic variables such as housing units by building type, household income, housing density, employee by detailed sector, and employment density; and (iii) adding a vehicle ownership component and improved sensitivity to travel characteristics.

In addition, the MIP resulted in the standardization of model software, inputs, and methodologies between the eight MPOs. The new models employ a common software package called CUBE, which will enhance the MPOs' ability to share data and resources with each other, as well as coordinate on model improvement and training efforts.

Improvements made to the model input data and each of the key components of the travel demand models (see Figure 3) include: vehicle ownership, trip generation, trip distribution, mode choice, and trip assignment, are discussed in more detail in the following section.

Figure 3 – San Joaquin Valley Model Improvement Program: Model Components



Data Input: The MIP models feature improved TAZ systems, socioeconomic data, land use and travel network characteristics. Improvements to the TAZ systems are designed to help the MPOs capture more detailed travel movements throughout the region, which allows for more precise analysis of land use and smart growth effects. An updated version of the trip based Caltrans statewide traffic model was developed to help forecast interregional and intraregional trips. Improvements to socioeconomic, land use and transportation network data in the models better account for differences in vehicle ownership and trip generation factors, as well as standardize categories across the eight MPOs.

Outputs from the scenario modeling tools described above (see page 6 of attachment 1), form the land use inputs utilized in the MIP model.

Vehicle Ownership: Modeling of vehicle ownership is a new component of the MPOs' MIP travel demand models. Previously the MPOs used a fixed rate of vehicle ownership. The new models now calculate the number of motor vehicles in a region based on demographic characteristics, auto operating cost, and accessibility. The output of this component is a critical input to the trip generation step, helping to capture the economic characteristics of each household.

Trip Generation: The trip generation component of the MPOs' MIP models estimates the number of person-trips for each activity, such as traveling to-and-from work, school, shops, and social/recreational events. The new models estimate person trips based on demographic and employment characteristics, increasing their capability to analyze the effect of socioeconomic factors on trip rates. Further, the new models increase the number of trip purposes from the typical three or five to eleven[6]. This change gives the MPOs the capability to distinguish the potential for alternative modes such as school and college trips. The new models also improve the trip generation step by allowing trip rates to vary by income, household size, the number of workers in a household, drivers, and vehicle ownership. This provides the MPOs with better information about regional travel patterns.

Trip Distribution: Trip distribution estimates the number of trips from one travel zone to each of the other travel zones in the county. The new models improve the sensitivity of changes to land use on trip distribution by better reflecting the attributes that influence a person's decision to travel. The MPOs models prior to the MIP, distributed trips based on one variable (e.g., auto travel time). The MIP models now provide the capability to consider additional factors such as trip purpose, person travel time by all modes, travel cost, congestion, and vehicle ownership.

Mode Choice: The number of MPOs with mode choice models has increased from two to five (Fresno, Kern, San Joaquin, Stanislaus, and Merced). This component is used to predict the probability of selecting a travel mode (e.g., auto, transit, bike and walk) for each trip in the region based on the income of the trip maker, the travel cost, time and accessibility of other modes, and improves the travel models' responsiveness to socioeconomic characteristics, land use, pricing and parking strategies. The new mode choice models include seven travel modes with a separate mode choice for walk and bike.

For those MPOs who do not require a mode choice model, a factoring process was developed allowing the models to be sensitive to land use and transportation scenarios which could reduce automobile use.

Trip Assignment: The trip assignment component estimates traffic volumes and travel times for each roadway in the network. The new models enhance the trip assignment component by including a new feedback mechanism between the trip assignment and the number of autos to enhance the MPOs' ability to address induced travel demand. The feedback mechanism inputs congested travel times into the model, which helps to account for travelers who change their travel route and mode in response to congestion.

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[6] The additional trip purposes includes home-based K-12, home-based college, highway commercial, trucks-small, trucks-medium, and truck-heavy.

Model Calibration and Validation: A calibration and validation report for the new travel models will be part of each MPO's final RTP/SCS submittal to ARB in the summer of 2014.

In model calibration, each component of the model is calibrated to ensure that it produces accurate forecasts. Calibration is an iterative process where model settings are adjusted so the output of the model matches observed travel patterns.

Static validation is that process where the model is tested to ensure that the model output matches available traffic counts and roadway speeds. As part of the static validation process, elements of trip generation, trip distribution and traffic assignment modules may be adjusted.

Dynamic model validation tests the model to determine how well it responds to change. Dynamic testing includes testing the changes to the following:

- Household location, density, diversity and other household attributes
- Employment location
- Roadway network
- Transit service

The MPOs performed calibration for each component of the model following the Federal Highway Administration and Caltrans guidelines, to ensure that the models produce reasonable forecasts. Model validation, a critical step in the development of any regional travel demand model, establishes the credibility of the model to predict future travel behavior. The MPOs performed both static and dynamic validation on the new models as recommended by Federal Highway Administration guidelines. Static validation includes – (i) trip generation rates, (ii) trip length frequency by purpose, (iii) average travel time by purpose, (iv) mode split by purpose, (v) traffic assignment by facility, and (vi) transit ridership. Dynamic validation included changing socioeconomic (household size, income, age distribution), land use (density, household location) and travel cost (auto operating cost and parking price) inputs.

Modeling Interregional Trips

The California Statewide Travel Demand Model was designed to capture the interactions of land use plans all across the State as they affect interregional travel. The model operates at a scale coarser than the SJV-MIP models. Its value is in placing local and regional travel in the context of total statewide activity.

The 2001 Statewide model was used in the development of interregional trip volumes. The base and future year land use values were updated to reflect the most recent RTPs from each MPO at the time of model development.

For the purpose of preparing the GHG emissions analysis for the eight San Joaquin Valley MPO RTP/SCSs, the San Joaquin Valley MPOs subtracted all emissions from through trips (trips without an origin and a destination in the MPO region). In addition, the portion of VMT attributable to trips that either begin or end within the region but travel to/from neighboring

regions (IX/XI) has been included for all portions of the trip within the MPO region (i.e. 100% of IX/XI VMT up to the county line).

Accounting for interregional travel, or travel that crosses MPO boundaries, continues to be a key issue for SB 375 implementation across the state. The issue is especially important when considering the area covered by the San Joaquin Valley MPOs, which in aggregate experience a higher proportion of through traffic relative to other regions (as a percent of total vehicle miles traveled). Statewide discussions to determine how to account for interregional travel across the state should continue.

It is vitally important that the current update to the Caltrans statewide model be fully completed in order for statewide conversations regarding interregional travel to continue.

MPO-Specific Off-Model Adjustments (if any)

Similar to other traditional four-step travel demand models, the San Joaquin Valley MPO models are not sensitive to the impacts of Transportation Demand Management/Transportation Systems Management (TDM/TSM) projects such as Intelligent Transportation Systems (ITS), bike and pedestrian projects, and rideshare programs. In these instances, the San Joaquin Valley will rely on "off-model" techniques based on literature reviews, collaboration with other MPOs, and consultation with ARB's Policies and Practices Guidelines. Any such "off-model" techniques applied in the MPO SCS development will be documented as part of the RTP/SCS documentation.

Emissions Modeling

The San Joaquin Valley MPOs intend to use the latest version of ARB's emissions modeling software EMFAC2011 to complete GHG emissions estimates for all possible SCS scenarios.

EMFAC2011 modeling instructions have been developed for the San Joaquin Valley MPOs in consultation with ARB. The GHG emissions modeling approach includes the San Joaquin Valley Heavy Duty Diesel Vehicle vehicle miles traveled (VMT) Recession Adjustment Methodology.

EMFAC2011 will be run using the vehicle activity and VMT outputs generated by the travel demand models. The EMFAC2011 model generates GHG emissions estimates per vehicle class, so that GHG emissions can be evaluated consistent with SB 375.

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