



- 260 North San Antonio Road, Suite B ■ Santa Barbara, CA ■ 93110
- Phone: 805/961-8900 ■ Fax: 805/961-8901 ■ [www.sbcag.org](http://www.sbcag.org)

# **TECHNICAL METHODOLOGY FOR ESTIMATING GREENHOUSE GAS EMISSIONS IN THE SUSTAINABLE COMMUNITIES STRATEGY**

**JUNE 2016**

#### *Member Agencies*

Buellton ■ Carpinteria ■ Goleta ■ Guadalupe ■ Lompoc ■ Santa Barbara ■ Santa Maria ■ Solvang ■ Santa Barbara County



## Table of Contents

<b>Key Components of the SCS</b> .....	1
<i>Public Participation Plan</i> .....	1
<i>RTP and SCS Goals, Objectives and Performance Measures</i> .....	2
<i>FAST Act/MAP-21 Requirements</i> .....	2
<i>Regional Growth Forecast</i> .....	3
<i>Travel Demand Modeling</i> .....	4
<i>Sensitivity Analysis</i> .....	10
<i>Model Improvements and Current Limitations</i> .....	11

## Figures and Tables

Figure 1 <i>Interaction between UPlan Land Use Model and SBCAG Travel Demand Model</i> .....	9
Table 1 <i>SBCAG Capacity to Evaluate GHG Policy Variables and Reduction Measures in the SCS Sensitivity Analysis</i> .....	10
Table 2 <i>SBCAG Recommended Goals and Performance Measures (Revised as of September, 2015)</i> .....	18
Table 3 <i>SCS Scenario Comparison</i> .....	21



This memorandum describes the general approach to estimating greenhouse gas emissions which the Santa Barbara County Association of Governments (SBCAG) will follow in the pending update of its Regional Transportation Plan (RTP) and Sustainable Communities Strategy (SCS). SB 375 provides:

Prior to starting the public participation process adopted pursuant to subparagraph (F) of paragraph (2) of subdivision (b) of Section 65080, the MPO shall submit a description to the state board of the technical methodology it intends to use to estimate the greenhouse gas emissions from its sustainable communities strategy and, if appropriate, its alternative planning strategy.

Government Code Section 65080(b)(2)(J)(i).

In accordance with the requirements of SB 375, this memorandum was prepared for submission to the California Air Resources Board (CARB) to describe SBCAG's intended approach to SCS preparation, and to supply the information needed for CARB's review. In describing the technical approach to development of the SCS, this memorandum is also intended to garner CARB's acceptance and endorsement of the SBCAG approach early in the process.

The approach described in the memorandum is based on SBCAG's Overall Work Program, as well as available tools and information. Staff has increased its familiarity with these tools since the completion of the first round of the RTP-SCS, but some inputs and other relevant information are still under development. Due to these possible changes in inputs, this approach may change as SBCAG staff refines its understanding. Also, certain details, such as specific performance measures, are based on SBCAG's current adopted RTP-SCS, but the final list may still change.

## **Key Components of the SCS**

### *Public Participation Plan*

Public outreach and input will be crucial in developing scenarios for the SCS. SB 375 requires that each MPO adopt a public participation plan for the development of the SCS. The RTP & SCS Public Participation Plan serves as an addendum to SBCAG's agency-wide Public Participation Plan, which fulfills the federal requirements for public participation. The SBCAG Public Participation Plan identifies a public outreach process for the RTP and SCS that will be carried out over three phases:

1. *Scoping Phase.* This phase is intended to seek public input on the scope of the SCS and the various land use and transportation scenarios to be considered. SBCAG staff will seek public input by directly contacting and engaging a wide range of stakeholder groups and the general public. SBCAG will convene meetings with interested stakeholder groups and the general public as well as advisory committees. During the meetings, staff will describe the planning process, explain the significance of SB 375, and outline the general planning "problem" (how to meet the targets for reduction of greenhouse gases, accommodate forecast growth and provide housing required by the Regional Housing Needs Assessment), explain what types of land use and transportation methods the region could use to meet the targets, and provide example scenarios with rough estimates of how much greenhouse gas reduction and appropriate housing provision such examples would provide. (Fall/Winter 2015)
2. *Alternative Transportation/Land Use Scenarios Phase.* Through a series of public workshops, SBCAG will involve interested parties in evaluating various possible future development patterns and alternative transportation/land use scenarios for the region. Workshops will allow participants

to compare the performance of scenarios considered based on the input received in the RTP/SCS scoping phase and select between the scenarios. This will include an explanation of the results of the travel and land use model analysis of each scenario, and how well the scenarios achieve the greenhouse gas and housing targets, as well as the adopted performance measures. Visual representations from UPlan will be used to help participants visualize various alternatives. (Spring/Summer 2016)

3. *Draft RTP/SCS and Preferred Transportation/Land Use Scenario Phase.* During this phase, SBCAG will provide the draft RTP, including the SCS and, if applicable, Alternative Planning Strategy (APS), for review and comment. The draft documents will identify the preferred alternative, based on and taking into account information received as part of the previous phases. (Fall/Winter 2016)

The Public Participation Plan was adopted by the SBCAG Board in September 2015. The RTP and SCS alternative transportation/land use scenarios will be developed by SBCAG staff with input from member agencies and the Joint Technical Advisory Committee (JTAC) following the scoping public outreach phase in winter 2015. Based on technical analysis of the scenarios and input from the public, SBCAG's advisory committees, Board of Directors, local City Councils and the County Board of Supervisors, the preferred transportation/land use alternative will be selected in summer/fall 2016, and the preferred alternative will ultimately be incorporated into the draft RTP and evaluated in the associated Environmental Impact Report (EIR), along with the alternative scenarios. The RTP and EIR are scheduled to be released in spring 2017.

#### *RTP and SCS Goals, Objectives and Performance Measures*

SBCAG staff worked with SBCAG member agencies to develop a set of policy goals and objectives for the RTP and SCS in conjunction with the adopted RTP-SCS. The planning goals served as the overall vision for the direction of the RTP, while the objectives served as concise strategies for accomplishing the goals. Once the goals and objectives were finalized, performance measures were selected corresponding to each goal area to allow decision-makers and the public to evaluate differences between the alternative planning scenarios in the RTP and the SCS. SBCAG staff anticipates that the RTP and SCS goals, objectives, and performance measures adopted by the SBCAG Board of Directors will not substantively change, with the exception of the addition of new FAST Act/MAP-21 performance measures and targets. Table 2, at the end of this document, shows the current, tentative list of goals and performance measures to be applied as part of the update.

#### *FAST Act/MAP-21 Requirements*

The most recent federal transportation legislation, Fixing America's Surface Transportation Act (FAST Act), was signed into law in December 2015, replacing the earlier Moving Ahead for Progress in the 21<sup>st</sup> Century Act (MAP-21), but preserving MAP-21's performance-based approach and changes it made to metropolitan planning requirements. As described on the Federal Highway Administration (FHWA) website, some of the changes to the metropolitan planning process included:<sup>1</sup>

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<sup>1</sup> <http://www.fhwa.dot.gov/map21/qandas/qaplanning.cfm>

- MPOs and States must establish performance targets that address national performance measures established by the Secretary that are based on the national goals outlined in the legislation.
- MPOs may elect to develop multiple scenarios for consideration in development of the metropolitan transportation plan. If the MPO chooses to develop these scenarios, it is encouraged to consider a number of factors, including, among other items, potential regional investment strategies and assumed distribution of population and employment.

Most importantly, the FHWA is required to establish performance measures (bullet point one above) through a series of rulemakings to assess performance in twelve areas generalized as follows:

1. Serious injuries per VMT;
2. fatalities per VMT;
3. number of serious injuries;
4. number of fatalities;
5. pavement condition on the Interstate System;
6. pavement condition on the non-Interstate NHS;
7. bridge condition on the NHS;
8. traffic congestion;
9. on-road mobile source emissions;
10. freight movement on the Interstate System;
11. performance of the Interstate System; and
12. performance of the non-Interstate NHS.

The adopted RTP-SCS embraces a performance-based approach involving the development and comparison of multiple, alternative planning scenarios, as recommended by the FHWA. However, the previously adopted RTP-SCS did not explicitly establish performance measures and targets related to the numbered measures above, due to the final rules not being released in time. SBCAG staff expects that the rulemakings, when final, will allow integration of the new federal performance measures and targets into the RTP-SCS. These new performance measures and targets will need to be integrated into the RTP-SCS in a way that is consistent with the requirements of SB 375 and the State's mandated GHG targets. Any targets specified for the new federal performance measures will need to allow SBCAG to simultaneously meet its SB 375 GHG targets. So, for example, federal congestion reduction targets may not be achieved at the expense of GHG reduction. It is also possible that the need to balance these new federal requirements with State requirements may constrain SBCAG's ability to achieve greater GHG reductions, if only due to fiscal constraints and competing demands.

#### *Regional Growth Forecast*

The Regional Growth Forecast (RGF) provides a countywide forecast for population and employment growth to the year 2040 in five-year increments covering the SB 375 target years of 2020 and 2035 for use in long-range regional planning. The forecast serves as an input towards the development of future land use and transportation scenarios considered by the SCS, travel forecasts, air quality impact analysis, regional housing needs, and demand estimates for sewer treatment plants and other facilities. The forecast contains an overview of future population, employment, and household growth to 2040. The final RGF was adopted by the Board in December 2012.

## *Travel Demand Modeling*

### Current Status

SBCAG currently maintains a countywide regional travel demand model that runs on the TransCAD platform. Staff applies and maintains the model in-house and works in close cooperation with State, regional and local agencies to forecast traffic growth, assess demand for transportation infrastructure improvements, and evaluate corridor alignment alternatives.

The SBCAG model is a 4-step travel demand model that performs the following classical modeling steps: trip generation, trip distribution, mode choice, and assignment. The mode choice model is a nested logit model that is employed to analyze and predict choices of travel mode. Mode choice outputs include auto (including drive-alone and carpool), transit, bike, and walk trips. Once transit trips are estimated, they are assigned to the transit route network. The 2001 Caltrans Household Survey for Santa Barbara County provides crucial travel information on trip purpose, modes, trip lengths, frequency, and other travel characteristics including time-of-day distributions for model calibration and validation. From the peak and off-peak mode choice models, the time of day models split the trips into 7 distinct time periods: AM (7-9 AM), Late AM (9 AM-12 PM), Lunch (12-2 PM), Early PM (2-4 PM), PM (4-6 PM), Evening (6-8 PM), Late Evening (8 PM-12 AM), and Night (12-7 AM).

The travel demand model was improved using Strategic Growth Council-awarded Proposition 84 funds. Staff worked with a consultant to make upgrades to the model to comply with the requirements of SB 375 and to ensure consistency with the updated RTP Guidelines. These upgrades were finalized in 2012 and included:

- TAZs and demographics data were developed based on 2010 Census block geography and data. Other datasets used include ACS block group 2005-2009 demographics, 2010 InfoUSA employment data, ACS Public Use Micro Sample (PUMS) data and 2009 Longitudinal Employment Dynamics (LEHD) data.
- A “4D” variable was added-on to the regional travel demand model that takes each of the four “D’s” (Density, Diversity, Design, and Destination) into account during the model runs. This addition allowed SBCAG’s regional model to respond to changes to various land use scenarios. For example, the model accounts for the various mix of land use types within traffic analysis zones (diversity). Also, the model is sensitive to transportation improvements that have traditionally not been accounted for in the past, including walkability factors into the trip generation model. To model the 4D variables correctly, the number of TAZs in the model was expanded from 281 to 1188 zones.
- Times, speeds, capacities and other network attributes were re-estimated for the model update to better reflect existing conditions. TAZ-to-TAZ highway and transit network skims were estimated from the networks.
- Trip generation models were updated to generate individual persons and households within the county. Population synthesis was used to generate persons and households in a manner similar to the process in activity-based models. An auto ownership model was then estimated for each individual household based upon the household size, and included 4D variables.



- The ability to perform sensitivity tests on the model parameters and variables, such as local and system-wide housing and employment growth, income variations, changing transit frequencies, value of time, auto operating costs, and gas prices.

#### Base and Forecast Years for Modeling

During the original SB 375 target-setting process, CARB set the year 2005 as the base year for which all MPOs would measure their net change in greenhouse gas emission emissions per capita. Consistent with the base year used for the regional target setting and per ARB staff's direction, SCBAG will continue to use 2005 as the base year for modeling purposes. In the adopted RTP-SCS, 2005 data was derived from more current 2010 data, backcast to 2005. The SBCAG model employs, as an input, the socioeconomic data produced by the RGF. A number of factors led to the selection of the year 2010 as the basis for updated base year calculations. One of the major features of the adopted RGF is its use of available 2010 Census data.

SBCAG also completed a regional traffic data collection program at over 200 roadways throughout the County in April 2010. The sample sites selected directly correspond with the sites that are monitored by the State Department of Transportation as part of the Highway Performance Monitoring System program. The data collected from the regional count program is placed within the GIS module of the TransCAD platform and was used for the model's base year calibration process.

Forecast years to be modeled in the RTP and SCS will include years 2020 and 2035, consistent with SB 375, and 2040 (the plan horizon year). The RTP will also consider 2030 (to meet the federal requirements of 40 CFR Section 93.106 that not more than a 10-year gap may exist between model years).

#### Inter-regional and External-to-External Trip and VMT Assumptions

"Inter-regional" (IX-XI) and "external-to-external" (X-X) trips are currently defined within SBCAG's adopted SCS as presented in ARB's *Recommendations to the Regional Targets Advisory Committee (RTAC) Pursuant to SB 375*, as follows:<sup>2</sup>

Inter-regional trips begin in one MPO region and end in another MPO region after crossing their shared boundary.

External-to-external trips begin outside of an MPO region, travel across some portion of the region, and end outside of the region (through trips).

In the adopted RTP-SCS, SBCAG utilized the RTAC methodology for external and inter-regional trips during the target-setting process. The methodology, as described in the RTAC report, is outlined below:

For the first trip type (inter-regional trips), the Committee recommends that the travel associated with an MPO-to-MPO trip generally be split equally between the two MPOs. In most cases, each region has an equal opportunity to affect emissions from trips that regularly cross over their shared boundary and therefore should equally share responsibility

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<sup>2</sup> [Recommendations of the Regional Targets Advisory Committee \(RTAC\) Pursuant to Senate Bill 375, http://www.arb.ca.gov/cc/sb375/rtac/report/092909/finalreport.pdf](http://www.arb.ca.gov/cc/sb375/rtac/report/092909/finalreport.pdf)

for reducing those emissions. However, ARB may adjust trip assignments in extraordinary cases based on consultation with affected MPOs.

In general, however, the Committee recommends that an MPO should not be responsible for through trips and should take responsibility for half of the trip that has either an origin or destination with the MPO region.

SBCAG previously worked with its neighboring MPOs (SLOCOG and SCAG) to determine the fair share of inter-regional trips and VMT to include in the SCS according to the guidelines adopted by the RTAC. While this effort was successful, new methodologies have been discussed regarding inter-regional travel estimation.

#### Updated Methodology

Two alternative estimation methodologies have been considered and presented by the Inter-Regional Travel (IRT) Technical Group jointly headed by the California Department of Transportation (Caltrans) and California Air Resources Board (ARB). These two methodologies involve estimating inter-regional travel by using:

1. Existing GPS data: a summary of GPS records used for augmenting origin-destination, travel speed data, and as a source of observed VMT; or
2. California Statewide Travel Demand Model outputs: statewide IX-XI VMT outputs aggregated to the county level.

The second of these two options has received the most attention up to this point. The CSTDM is a calibrated and validated model using large survey samples for the state, whereas GPS data does not provide key trip mode or purpose information.

#### Recent Data Collection Efforts

Although SBCAG is not able to recalibrate the travel demand model in advance of the 2017 RTP-SCS update due to time, funding and available data constraints, SBCAG is collecting data to supplement the limited sample set from the most California Household Travel Demand Survey in anticipation of a future model recalibration or model upgrade. Recent data collection efforts include:

- Central Coast Origin-Destination (O-D) Survey: SBCAG, in partnership with the San Luis Obispo Council of Governments (SLOCOG) and the Ventura County Transportation Commission (VCTC), conducted the O-D survey to gather information on the travel behavior of people who make regional and inter-regional trips on U.S. 101 in and between Ventura, Santa Barbara and San Luis Obispo counties. In mid-2015, data collection focused on origin-destination, demographic, frequency, trip purpose, and other information about the travel patterns of U.S. 101 users to assist in model calibration. The O-D survey utilized four data collection methods:
  - Vehicle Classification Counts: Direct measure of total traffic volumes and vehicle types passing through a count location.
  - License Plate Analysis: Provides location where vehicle is registered, which is likely the home location and trip purpose can be inferred.

- Mail Survey: Provides detailed information regarding trip purpose, occupancy, frequency of travel, demographics, class of vehicle, and other travel characteristics
- Mobile Device Data: Provides a very large sample size able to provide information regarding all types of trips that occur within the regions and provides true origin-destination data rather than observed or vehicle registration location.
- Census Transportation Planning Products (CTPP): The 2006-2010 CTPP, using 5 years of American Community Survey (ACS) data, includes small geographic units such as census tracts and Transportation Analysis Zones (TAZs). The CTPP tabulations are unique because they include three geographies that will help model calibration:
  - Part 1: Residence-based tabulations summarizing worker and household characteristics
  - Part 2: Workplace-based tabulations summarizing worker characteristics
  - Part 3: Worker flows between home and work, including travel mode
- Longitudinal Employer-Household Dynamics (LEHD): A program within the U.S. Census Bureau that uses modern statistical and computing techniques to combine federal and state administrative data on employers and employees with core Census Bureau censuses and surveys while protecting the confidentiality of people and firms that provide the data. LEHD is potentially an alternate/additional source of place of work and flow data.
- The National Household Travel Survey (NHTS): Federal Highway Administration (FHWA) program to collect data on daily travel by the American public and launched on March 31, 2016. Data collection will continue for a full year and will end in April of 2017. An estimated sample size of 129,000 households across the U.S. will be included in the survey. Thirteen add-on partners, including California, have joined the 2016 survey effort. The 2016 NHTS has been redesigned to include an address-based sampling frame and an updated questionnaire has maintained the core set of questions but will also capture new trends in transportation like car-sharing, ridesharing, bike-sharing, teleworking, electric vehicle ownership, vehicle dependency, internet shopping and active transportation for health analysis.

### California Statewide Travel Demand Model

The California Statewide Travel Demand Model (CSTDM) Version 2.0 is a multimodal, tour-based travel demand model that can forecast all types of travel as well as interregional trips. It incorporates statewide networks for roads, rail, bus, and air travel. It used the 2012 California Household Travel Survey, the 2010 United States Census and incorporated regional data and projects consistent with adopted RTP-SCSs for zonal land use, employment, and population for model calibration and base year assignment.<sup>3</sup>

The CSTDM 2.0 is designed to bring a better estimate of interregional trips to regional travel demand models and to provide long distance travel estimates across multiple regions. The CSTDM 2.0 provides model travel behavior for every resident of California as well as trip volumes and trip length distribution by trip purpose. The CSTDM 2.0 has been updated to provide future year datasets for 2015, 2020, 2035,

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<sup>3</sup> [http://www.dot.ca.gov/hq/tpp/offices/omsp/statewide\\_modeling/cstmd.html](http://www.dot.ca.gov/hq/tpp/offices/omsp/statewide_modeling/cstmd.html)

2040 and 2050. It has also been updated to a 2010 base year to take advantage of 2012 household travel survey data regarding interregional travel, census data and updated population and jobs forecasts post the 2008 recession.

SBCAG staff has received CSTDM total and interregional VMT estimates and has compared them with the SBCAG regional model VMT outputs as well as the Highway Performance Monitoring System (HPMS) VMT estimates. Due to across the board under-calculation of VMT by the CSTDM, staff does not find the use of the raw CSTDM VMT for inter-regional travel estimation to be methodologically defensible at this time. SBCAG instead proposes to continue the use of the prior RTAC 50-50 methodology given its successful integration into its adopted 2040 RTP-SCS.

#### Interaction with the Land Use Model

As noted above, in September 2009, SBCAG submitted an application for Proposition 84 funding to the Strategic Growth Council for improvements to the regional travel demand model. Within the application, one of the major data gaps identified by SBCAG was a lack of modeling capacity in addressing land uses at the micro-level, particularly on issues related to land use alternatives, transit-oriented development, density, mixed use, and the pedestrian environment. To address these gaps, with the support of Prop 84 funding, SBCAG and its consultant developed a land use model which allows for evaluation of alternative future land use planning scenarios on the transportation network.

Under the scope of work approved by the SBCAG Board, the consultant integrated the land use model (UPlan) with the travel demand model by writing software to connect the two software products seamlessly through the model interface. The UPlan model database was built and integrated with the UPlan software and will be run as part of the travel demand model stream. A flow chart illustrating the interaction between the land use model and the travel demand model is shown in Figure 2.

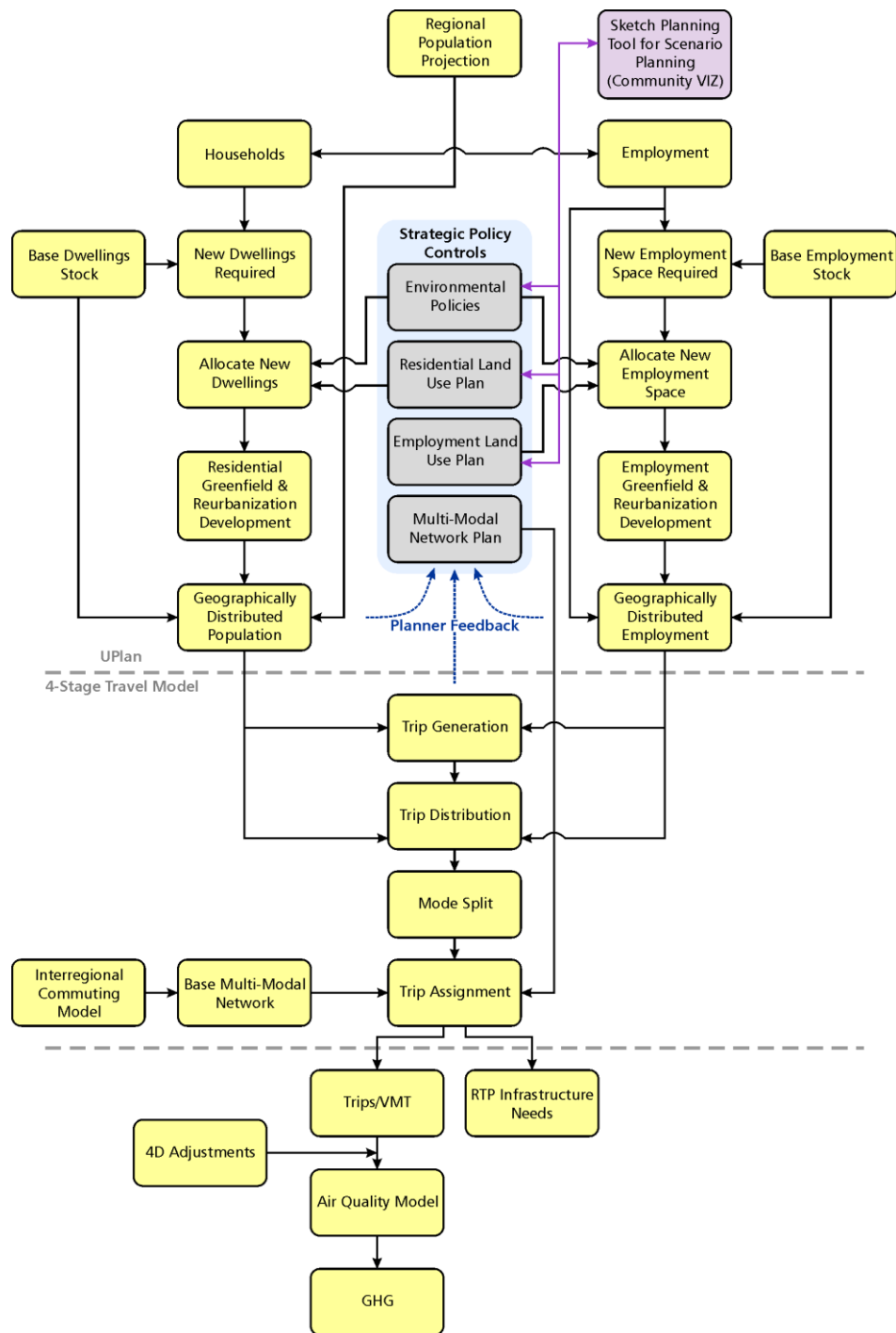
#### *Off-Model Methodologies to Measure Greenhouse Gas Emissions*

SBCAG's land use model and regional travel demand model are fully integrated and SBCAG does not need to rely on off-model methodologies for scenario analysis and comparison. However, to calculate project-specific emission reductions, we have the ability to use off-model tools to estimate emissions reductions on a project-specific level. Examples of documents from which SBCAG staff have utilized methodologies in the past include the following:

- Multi-Pollutant Emissions Benefits of Transportation Strategies, Federal Highway Administration & ICF International, November 2006.
- Benefits Estimates for Selected TCM Programs, U.S. Environmental Protection Agency, March 1999.
- Carl Moyer Program Guidelines-Cost Effectiveness Calculation Methodologies (Appendix C), California Air Resources Board, April 2011.
- Land Use Impacts on Transport, How Land Use Factors Affect Travel Behavior, Victoria Transport Policy Institute, July 2011.

As noted above, since the land use and regional travel demand models are fully integrated and include transportation demand management and other measures, SBCAG does not intend to rely on off-model adjustments to SCS strategies.

**Figure 2 Interaction between UPlan Land Use Model and SBCAG Travel Demand Model<sup>4</sup>**



<sup>4</sup> Final 2040 Regional Transportation Plan and Sustainable Communities Strategy, Appendix D-11; Adopted August 15, 2013. <http://www.sbcag.org/Meetings/SBCAG/2011/03%20March/approved%20March%20mins.pdf>

## Sensitivity Analysis

As mentioned in ARB's document, *Description of Methodology for ARB Staff Review of Greenhouse Gas Reductions from SCS Pursuant to SB 375*, "Sensitivity analyses examine the effect that specific changes within a model have on model outputs. It involves systematically changing one model input variable at a time to see how sensitive the model outputs, such as VMT, are to changes in the variable."<sup>5</sup> The ARB review methodology states that:

In performing its review, ARB staff will determine the most relevant variables or groups of variables to provide information on the resulting elasticities, and request that each MPO conduct sensitivity analyses. Depending on the SCS and the capabilities of the MPO model, ARB staff may request MPO-specific sensitivity tests of either individual strategies or groups of strategies. Staff will then review the model sensitivity results, and compare them with available empirical literature or other pertinent information to determine if the MPO's elasticities fall within a reasonable range.

Table 1 below shows policy categories and associated land use and transportation factors that are known to reduce greenhouse gas emissions. The table also shows SBCAG's capacity to analyze each land use and transportation strategy within the SCS.

**Table 1 SBCAG Capacity to Evaluate GHG Policy Variables and Reduction Measures in the SCS Sensitivity Analysis**

Policy Category	Potential GHG Reduction Measure	Analysis Methodology Tool
Land Use Measures	Modify distribution of households, population, or jobs	UPlan / TransCAD
	Rebalance the mix of land uses	UPlan
	Increase the level of density	UPlan
	Improve the pedestrian environment	TransCAD
Road Projects	Add high occupancy vehicle (HOV) lanes	TransCAD
Transit Improvements	Construct new transit lines	TransCAD
	Increase service (e.g., increase transit headways, increase network connectivity)	TransCAD
Pricing Measures	Change in transit fares	TransCAD
	Change in auto operation cost	TransCAD

SBCAG coordinated with ARB staff during the previous SCS round in order to determine which measures to include in the sensitivity analysis and was able to complete the analysis. Additionally, SBCAG supplied ARB modeling staff with the updated regional travel demand model, which allowed for an evaluation of the model parameters directly by them. Since GHG emissions are not a direct output of the travel demand model, the main indicator of output during the sensitivity analysis will be VMT. SBCAG staff anticipates continued collaboration with ARB staff to determine whether any new or additional sensitivity tests will need to be run for ARB's evaluation of the 2017 SCS.

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<sup>5</sup> Description of Methodology for ARB Staff Review of Greenhouse Gas Reductions from Sustainable Communities Strategies Pursuant to SB 375, California Air Resources Board, July 2011.

## *Model Improvements and Current Limitations*

### Emissions Modeling

Using the outputs from the regional travel demand model (e.g., vehicle miles traveled [VMT], trips, VMT by speed class), SBCAG staff will utilize the California Air Resources Board's 2014 Emission Factors (EMFAC) model to estimate greenhouse gas emissions for the RTP and SCS. The greenhouse gas emissions will be represented as tons of carbon dioxide (CO<sub>2</sub>) per day. The two emissions modeling components are described below in greater detail.

### ARB's Emissions Factor (EMFAC) Model

Two basic quantities are required to calculate a given emissions estimate: an emission factor and an activity factor. In general, the emission factor is the amount of emissions generated by a certain amount of motor vehicle activity. A countywide on-road mobile source emission estimate is calculated by summing the product of the vehicle activity (VMT and trips) and the emissions factors contained in the EMFAC emissions model developed by ARB.

The EMFAC model generates an output of carbon dioxide (CO<sub>2</sub>) emissions, which will be used as the overall indicator of greenhouse gas emissions. In order to calculate the CO<sub>2</sub> emissions within EMFAC, VMT, vehicle trips, and VMT by speed class distributions will be extracted from the travel demand model for the baseline and each of the target years (2005, 2010, 2020, 2030, 2035 and 2040) and alternative transportation/land use scenarios within the future years. This extracted information will then be input into the EMFAC model. The CO<sub>2</sub> emissions associated with vehicle starts are accounted for in the EMFAC model based on the distribution of vehicle starts by vehicle classification, vehicle technology class, and operating mode. EMFAC adds these vehicle starts to the running emissions to compute total on-road mobile source emissions. Then the CO<sub>2</sub> emissions for the four vehicle classes that meet the passenger vehicle definition can be extracted from the EMFAC output and reported:

1. Light-duty autos (LDA)
2. Light-duty trucks (LDT1) (less than 3,750 lbs.)
3. Light-duty trucks (LDT2) (3,751-5,750 lbs.)
4. Medium-duty trucks (MDT) (5,751-8,500 lbs.)

The most recently adopted version of EMFAC is the EMFAC 2014. This version will replace the older version (EMFAC 2011-SG) used to complete the emissions analysis for SBCAG's currently adopted 2040 Regional Transportation Plan-Sustainable Communities Strategy. Based on our review of model documentation and initial testing, model outputs from the new EMFAC 2014 for SCS purposes do not appear to include reductions for either Advanced Clean Cars/Pavley or Low Carbon Fuel Standards.

### **Demonstrating Compliance with the Regional GHG Target**

The critical analysis of the SCS will be to demonstrate compliance with the regional GHG targets set by CARB. SBCAG will incorporate a regional GHG targets analysis into the second phase of the public participation/outreach phase of the RTP/SCS process. Compliance with the regional GHG targets will be a key factor in determining the preferred transportation and land use alternative during this phase. If a transportation/land use scenario does not meet the regional GHG target, it would need to be adjusted or removed from consideration.

Note that the analysis will only include the years for which the regional targets are required (base year, 2020, and 2035). The RTP will include additional scenario years (2030, 2040) to comply with federal law. It should also be noted that the RTP will also include estimates of CO<sub>2</sub> per capita for each of the scenario years for the preferred alternative.

CARB staff provided an EMFAC adjustment factor last year to account for differences between EMFAC 2014 and earlier EMFAC versions and has indicated its intention to make adjustments for other, similar technical factors, as warranted. MPOs would apply these factors to model outputs to demonstrate SB 375 target compliance.

### **Scenarios to be Evaluated**

The following scenarios were selected in consultation with JTAC and generally track the scenarios in the adopted 2040 RTP-SCS. Not included, per JTAC's recommendation, are scenarios considered as part of the 2040 RTP-SCS that did not meet the SB 375 GHG targets (Scenarios 4 and 8). The draft scenarios include varying land use assumptions and growth allocations as well as fiscally constrained transportation and transit projects. Table 3, below, shows a comparison of all scenarios considered. Scenarios modeled and analyzed include the following:

#### Scenario 1: Future Baseline

The future baseline scenario is based on existing, adopted General Plan land uses. This alternative also assumes that current sub-regional growth trends will continue, consistent with the 2012 Regional Growth Forecast.

#### Scenario 2: No Project

Scenario 2 is identical to Scenario 1, with the exception that planned transportation projects are not included. (Programmed projects are included because they are already funded and assumed to be part of the baseline.) This scenario was included in the previous RTP for CEQA purposes as the "no project" alternative, which CEQA requires SBCAG to evaluate (14 CCR Section 15126.6(e)).

#### Scenario 2a: No Build

Similar to the previous two scenarios, this scenario does not consider any transportation projects, planned or programmed, in the analysis. This scenario was included in the previous RTP for CEQA purposes as the current baseline condition. Per counsel's advice, we will continue to apply a current baseline condition as well as a future baseline consistent with the approach of the EIR for the adopted 2040 RTP-SCS.

#### Scenario 3: TOD/Infill with Enhanced Transit Strategy

This alternative is essentially the preferred scenario in the adopted 2040 RTP-SCS. This scenario selectively increases residential and commercial land use capacity within existing transit corridors. Land use change assumptions are made based on the location of existing transit routes and service in consultation with SBCAG member agencies. Assumed changes in land use capacity reflect local planning discussions about possible future land use and General Plan and Community Plan updates. This scenario also addresses jobs/housing balance issues by emphasizing job growth in the North County and housing growth in the South County.



#### Scenario 5: Blended Infill/Expansion

This scenario has future growth occurring on land contiguous with and adjacent to the urban edge in a low-density pattern. This scenario also distributes growth based on increased residential and commercial land use capacity both in core urban areas along transit lines as in Scenario 3.

#### Scenario 6: North County-Weighted Jobs, South County-Weighted Housing

This scenario begins with existing, adopted land uses, but applies weights to make specific growth distribution assumptions, emphasizing job growth in the North County and housing growth in the South County, within existing available land use capacity. It does not continue past trends, but also does not focus on infill along transit corridors. Infill occurs only as supported by local plans.

#### Scenario 7: TOD/Infill and Maximum Enhanced Transit

Based on the land use pattern from the TOD/Infill scenario, this scenario enhances transit by maximizing alternative mode projects using all available flexible funding sources for transit and assumes possible new funding sources for transit. It makes specific transit enhancements, and generally doubles bus frequencies along existing local transit routes during peak periods.

### **Completing the SBCAG SCS**

Work tasks for completing the SCS were taken directly from the requirements for Sustainable Communities Strategies as contained in Government Code Section 65080(b)(2)(B).

#### ***Task 1: Identify the general location of uses, residential densities, and building intensities within the region***

- a. Forecast future population, employment and households for the SBCAG region as a whole for the 2020 and 2035 target years based on the Regional Growth Forecast (RGF) adopted in December 2012. In the next RTP-SCS, SBCAG will continue to rely on the socioeconomic projections in the 2012 RGF that were applied in SBCAG's adopted 2040 RTP-SCS. The 2012 RGF is based on 2010 decennial Census information and has not changed.
- b. Populate UPlan regional land use model with the socioeconomic and land use data from the 2012 RGF for the Base Year 2010 scenario of existing land uses, residential densities and building intensities within the Santa Barbara County region. The land use model will replicate existing General Plan land uses using generalized land use categories corresponding to major use categorizations and specifying allowable densities and intensities of development.

Completion of this work task will paint a picture of existing land uses and possible future land use scenarios within the Santa Barbara County region and will help to inform the public during the public outreach phase. This work task will rely heavily on the base year estimates in the 2012 RGF, as well as the regional land use and travel demand models currently in use by SBCAG.

#### ***Task 2: Identify areas within the region sufficient to house all the population of the region, including all economic segments of the population, over the course of the planning period of the regional transportation plan taking into account net migration into the region, population growth, household formation and employment growth***

- a. The UPlan land use model will be used to allocate forecasted growth to future land use scenarios. Since the development of these scenarios will begin with the model allocation of forecasted growth, all future scenarios considered will accommodate the forecasted population and employment in all target years.
- b. Using the UPlan land use model to allocate growth forecasted in the RGF, staff will build on the range of future land use scenarios developed previously, which were based on public input, and considered the forecasted population and employment for all target years. Each land use scenario provides for residential, commercial and industrial land use capacity sufficient to accommodate forecasted population and employment growth, beginning with existing base year land uses and re-designating land as may be needed to accommodate forecasted growth and future needs.
- c. Select a preferred alternative from among the range of future scenarios developed as described above.

SBCAG's RGF contains estimates of population and employment growth out to the year 2040, which will remain the planning horizon for the RTP. The RGF also accounts for net migration, household formation, and employment growth factors. Forecast years corresponding to SB 375 target years 2020 and 2035 will be included.

***Task 3: Identify areas within the region sufficient to house an eight-year projection of the regional housing need for the region***

The allocation of the eight-year projection of the regional housing need for the region is one of the key requirements that will be included in each of the future alternative transportation/land use scenarios of the SCS. In its role as the MPO for the region, SBCAG received its Regional Housing Needs Assessment (RHNA) determination from the State's Department of Housing and Community Development (HCD) in late 2011, and subsequently adopted the 2014–2022 Regional Housing Needs Allocation Plan in July 2013. Whereas the SCS is updated on a four-year cycle, the RHNA is updated on an eight-year cycle corresponding to every other SCS update. Since there is no new RHNA in this SCS cycle, this SCS update will continue to apply on the adopted RHNA plan currently in effect, which was also applied in the adopted 2040 RTP-SCS.

***Task 4: Identify a transportation network to service the transportation needs of the region***

- a. SBCAG's RTP will include development of a fiscally constrained transportation network. The sub-tasks involved in developing the transportation network within the RTP are outlined below:
  - i. Refinement of the previous RTP's set of goals, objectives, and performance measures which are used to evaluate the performance of various scenarios. Performance measures will be amended to include, in particular, new Moving Ahead for Progress in the 21<sup>st</sup> Century Act (MAP-21) performance measures and targets.
  - ii. Incorporate recommendations from relevant regional, corridor and subregional studies to update multi-modal highway, rail, and transit networks. Update regional arterial network as needed to reflect changes

from local general plans. Compile a fiscally unconstrained, unranked list of projects by category.

- iii. Establish project evaluation criteria category type (highway, transit, rail, etc.).
  - iv. Develop or revise cost estimates for all projects, including those projects on local streets and roads.
  - v. Apply project evaluation criteria from sub-task iii to projects identified in sub task ii to produce listing of ranked projects by category.
  - vi. Use ranked projects list from sub task v to prepare a fiscally unconstrained integrated transportation network and identify future transportation system management and monitoring systems to be included in the RTP scenarios.
  - vii. Develop updated revenue projections for local, state and federal funding sources.
  - viii. Prepare a fiscally constrained RTP network, incorporating ranked projects from sub-task vi that can be funded based on the projected funding identified in sub-task vii.
- b. As needed, develop and analyze additional multi-modal (transit, HOV, managed lanes, bicycle, pedestrian, etc.) network alternatives in the future network scenarios described in Task 1 above.

The transportation network developed within the RTP will serve as the primary indicator of the transportation needs of the Santa Barbara County region.

While the SCS requirements for the RTP do not change the process used to establish the transportation needs for the region, the SCS forecasted development pattern and transportation network, measures, and policies should complement one another to reduce regional GHG emissions from light duty trucks and automobiles. Decisions to expand or modify the transportation system should be made in recognition of the effects of transportation on development location and density, and also in recognition of the following relationships between land use and transportation:

- Transit investments need supporting levels of land use density and intensity.
- The speed of the network and the cost of travel may influence the location choices of new development.
- Placing land uses closer together and minimizing unnecessary barriers to circulation increases travel choices such that transit, walking, and bicycling become viable while also reducing transportation sector energy use and GHG emissions.

**Task 5: *Gather and consider the best practically available scientific information regarding resource areas and farmland in the region***

Continue to incorporate the Regional Greenprint into scenario analyses. The Regional Greenprint includes areas of sensitive species, habitat conservation, state parks, historic sites, flood zones, forests, and farms subject to Williamson Act restrictions, ground water basins, septic system problem areas, Local Agency Formation Commission Spheres of Influence, and other areas.

The Regional Greenprint serves as a GIS-based visual aid and mapping tool to define constraints to future development. The definition of such constraints accordingly shapes the development of the future alternative land use scenarios by serving as critical discouragements to land use development in the UPlan land use model.

**Task 6: Set forth a forecasted development pattern for the region, which, when integrated with the transportation network, and other transportation measures and policies, will reduce GHG emissions from automobiles and light trucks to achieve, if there is a feasible way to do so, the GHG emission reduction targets approved by ARB**

- a. Alternative land use/transportation network scenarios will be defined by the UPlan land use model in conjunction with the TransCAD regional travel demand model and EMFAC 2014 air quality model to determine scenario performance using predetermined performance measures and targets. The Regional Greenprint layers will be applied as a constraint to new development and allocation of growth in the development of the scenarios, in order to protect resources identified by the Regional Greenprint. Performance measures will be used to compare the base year scenario with each of the future scenarios for each target year to determine attainment of ARB's GHG emissions reduction targets and applicable FAST Act/MAP-21 performance targets.
- b. Staff will prepare a summary of the results of the scenario performance analysis for public workshops in the second phase of public outreach to focus the discussion on reaching consensus on a preferred transportation/land use alternative.
- c. With decision-maker input and feedback from public outreach, a preferred scenario will be selected by the SBCAG Board from among the range of scenarios studied, taking into account scenario performance, including FAST Act/MAP-21 performance measures and targets and GHG emissions relative to ARB's SB 375 targets.

**Task 7: Ensure regional transportation plan compliance with Section 176 of the Federal Clean Air Act**

- a. The updated RTP-SCS is expected to be adopted in 2017 and will plan to a horizon year of 2040. This horizon year has been selected to meet the 20-year forecast requirement stipulated by federal transportation regulations and emissions standards.
- b. For purposes of establishing an ozone emissions budget, the RTP will include an "action-baseline" test utilizing "no build" scenarios for the future target years (2020, 2030, 2035, and 2040). By regulation, the future scenario years may contain no gaps exceeding 10 years.
- c. Staff will review the transportation control measures (TCMs) in the State Implementation Plan to determine their current status with respect to the RTP.

According to local County Air Pollution Control District (SBAPCD) staff, possible changes in the federal ozone attainment standard could affect the SBCAG region's attainment status. However, these changes

may not occur within the time period of the current RTP/SCS. SBCAG staff will formulate the RTP to anticipate possible new, more stringent ozone standards.

### Project Schedule

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Spring/Summer 2015	<ul style="list-style-type: none"><li>○ Update RTP-SCS Technical Methodology</li><li>○ Update Public Participation Plan</li></ul>
Fall/Winter 2015	<ul style="list-style-type: none"><li>○ Update RTP-SCS Goals, Objectives and Performance Measures</li><li>○ Integrate MAP-21 Performance Measures</li><li>○ Phase 1 stakeholder outreach, scenario scoping</li></ul>
Spring/Summer 2016	<ul style="list-style-type: none"><li>○ Update land use assumptions and growth allocations</li><li>○ Develop unconstrained RTP projects list</li><li>○ Develop fiscally constrained RTP projects list</li><li>○ Analyze Alternative Scenarios</li><li>○ Coordination with JTAC and ARB staff on SB 375 GHG target update</li><li>○ Alternative Scenario public workshops</li><li>○ ARB publishes draft updated SB 375 targets</li></ul>
Fall/Winter 2016	<ul style="list-style-type: none"><li>○ SBCAG Board selects Preferred Scenario</li><li>○ Draft RTP-SCS</li><li>○ Draft EIR/SEIR</li><li>○ ARB adopts final SB 375 targets</li></ul>
Spring/Summer 2017	<ul style="list-style-type: none"><li>○ SBCAG adopts RTP-SCS</li></ul>

**Table 2 SBCAG Recommended Goals and Performance Measures** (Revised as of September, 2015)

GOAL	OBJECTIVES	PERFORMANCE MEASURES (2013 RTP/SCS)	PERFORMANCE MEASURES (recommended)	TYPE	GUIDANCE
<b>Environment</b>					
Foster patterns of growth, development and transportation that protect natural resources and lead to a healthy environment.	<ul style="list-style-type: none"> <li>-Reduce GHG emissions in compliance with CARB Regional Targets</li> <li>-Reduce criteria pollutant emissions</li> <li>-Encourage affordable and workforce housing and mixed-use development within urban boundaries</li> <li>-Promote transit use and alternative transportation</li> <li>-Reduce vehicle miles traveled</li> <li>-Preserve open space and agricultural land</li> </ul>	GHG emissions per capita	GHG emissions per capita (lbs./day)	Prospective	SB 375
		Passenger vehicle CO2 emissions per capita	Passenger vehicle CO2 emissions per capita (tons/day)	Prospective	SB 375
		VMT per capita	VMT per capita	Prospective	SB 375 (desired)
		On-road reactive organic gas (ROG) emissions	On-road reactive organic gas (ROG) emissions (tons/day)	Prospective	Clean Air Act
		On-road oxides of nitrogen (NOx) emissions	On-road oxides of nitrogen (NOx) emissions (tons/day)	Prospective	Clean Air Act
		Criteria pollutant emissions per capita	Criteria pollutant emissions per capita (lbs./day)	Prospective	Clean Air Act
		On-road motor vehicle fuel consumption per capita			
		% of agricultural land and open space retained per year in unincorporated areas	Acres of new development on agricultural land or open space (total and %)	Prospective	
		% of agricultural land and open space retained per year in incorporated areas			
		% alternative transportation trips (no school bus)	Transit mode share (%)	Prospective	
		% alternative transportation trips (includes school bus)	Active transportation mode share (%)	Prospective	
		New zoning capacity $\geq 20$ du/acre within $\frac{1}{4}$ mile of frequent and reliable transit corridor	New housing capacity within high-quality transit corridors (du)		
		% of new housing unit capacity accommodated by infill development		Prospective	
Total (remaining) acreage available for new development					

**Table 2: SBCAG Recommended Goals and Performance Measures (Continued)**

GOAL	OBJECTIVES	PERFORMANCE MEASURES (2013 RTP/SCS)	PERFORMANCE MEASURES (recommended)	TYPE	GUIDANCE
<b>Mobility &amp; System Reliability</b>					
Optimize the transportation system to improve accessibility to jobs, schools, and services, allow the unimpeded movement of people and goods, and ensure the reliability of travel by all modes.	<ul style="list-style-type: none"> <li>-Reduce travel times for all modes</li> <li>-Reduce congestion</li> <li>-Increase bike, walk and transit mode share</li> <li>-Employ best available transportation system management (TSM) technologies to make travel reliable and convenient</li> <li>-Work cooperatively with schools and school districts to reduce congestion in surrounding neighborhoods</li> </ul>	ADT (millions)	VHD by Jurisdiction	Prospective	
		Total day VMT (millions)	ADT for select highway segments	Prospective	
		Total day VHT (millions)	SB 743 guided PM (TBD)	TBD	SB 743
		Congested VMT (millions)	Map-21 guided PM (TBD)	TBD	MAP-21
		Congested lane miles			
		V/C (maps)			
		Average travel distance (all trips)[miles]			
		Average travel time (all trips)[minutes]	Average trip time (all trips)[minutes]		
		Average commute time (workers)[minutes]			
		Transit ridership	Transit Ridership	Prospective	
		Transit accessibility (% of jobs within 1/2 mile of bus stop with 15 minute or less headways)	Transit accessibility (% of jobs and post-secondary education students [place of schooling] within a high-quality transit corridor)	Prospective	
		Transit accessibility (% of population within 1/2 mile of bus stop with 15 minute or less headways)	Transit accessibility (% of population within of a high-quality transit corridor)	Prospective	
		% drive-alone mode share (all trips)			
		% drive-alone mode share (workers)			
	Bridge condition on the NHS	TBD	MAP 21		
	Pavement condition on the non-Interstate NHS	TBD	MAP 21		

**Table 2: SBCAG Recommended Goals and Performance Measures (Continued)**

GOAL	OBJECTIVES	PERFORMANCE MEASURES (2013 RTP/SCS)	PERFORMANCE MEASURES (recommended)	TYPE	GUIDANCE
<b>Equity</b>					
Improve public health and ensure the safety of the regional transportation system.	–Comply with HCD/Regional Housing Needs Assessment –Support the development of affordable and workforce housing near jobs and educational institutions		New affordable and workforce housing (indicated by density) [units within 20 du/acre zones]	Prospective	
		Transit accessibility for low incomes (% of population within 1/2 mile of bus stop with 15 minute or less headways)	Transit accessibility for low incomes (% of population within of a high-quality transit corridor)	Prospective	
		Transit accessibility for low incomes (% of jobs within 1/2 mile of bus stop with 15 minute or less headways)	Transit accessibility for low incomes (% of jobs within a high-quality transit corridor)	Prospective	
		Average trip time for low income and minority communities	Average trip time for low income communities (minutes)	Prospective	
<b>Health and Safety</b>					
Improve public health and ensure the safety of the regional transportation system.	–Reduce the frequency and severity of collisions on the transportation network –Support active transportation as a means of encouraging increased physical fitness –Increase public outreach and education		Serious injuries (number and rate)	Retrospective	MAP 21
			Fatalities (number and rate)	Retrospective	MAP 21
		% bike and walk mode share (all trips)	Active transportation mode share (%)	Prospective	
		% bike and walk mode share (workers)			
<b>Prosperous Economy</b>					
Achieve economically efficient transportation patterns and promote regional prosperity and economic growth.	–Reduce congestion	Net commuter savings (time)[minutes]	Net commuter savings (time)[minutes]	Prospective	
		Net travel savings (time)	Net travel savings (time)	Prospective	
		Net cost avoided (money)	Net cost avoided (money)	Prospective	
	–Optimize network performance to reduce time lost to commuting		Average work commute distance (miles)	Prospective	
		–Encourage measures that bring worker housing closer to job sites	% agricultural land and open space retained per year in unincorporated areas		
		–Promote a mix of land uses responsive to the needs of businesses, including agriculture and tourism	% agricultural land and open space retained per year in incorporated areas		
		Freight (hours of delay on NHS)	TBD		



Table 3 SCS Scenario Comparison

2040 RTP-SCS Scenarios											
	NAME	REGIONAL ALLOCATIONS	LAND USE	SUB-REGIONAL ALLOCATIONS		TRANSPORTATION	SB 375?				
							2020	2035			
Scenario 1	FUTURE BASELINE ("Business as Usual")	Applies the region-wide population, employment, and housing projects from the 2012 RGF.	Assumes existing, adopted General Plan land uses.	Assumes current sub-regional growth trends (allocation of population, households, and jobs) continue consistent with 2012 RGF (population growth occurring predominantly in the North County and City of Santa Maria).		all programmed and planned projects	yes	no			
Scenario 2	NO PROJECT					programmed projects ONLY	no	no			
Scenario 2a	NO BUILD					no projects	--	--			
Scenario 3	TOD / INFILL		Selectively increases residential and commercial land use capacity within existing transit corridors. Land use change assumptions were made based on location of existing transit routes and service in consultation with SBCAG member agencies. Proposed changes in land use capacity reflect local planning discussions about possible future land use and General Plan and Community Plan updates presently under discussion at the local level.	Future growth allocation directly addresses jobs-housing balance issues by emphasizing job growth in North County and housing growth in south County through model weightings.	Shifts a greater share of future growth to transit corridors due to land use changes.	all programmed and planned projects	yes	yes			
Scenario 3+	TOD / INFILL + ENHANCED TRANSIT STRATEGY (the RTP-SCS, the preferred scenario, the EIR's proposed project)					all programmed and planned projects, plus a strategy for additional transit service	--	--			
Scenario 5	BLENDED INFILL / EXPANSION					Combines the land use elements of both Scenario 3 TOD/INFILL and Scenario 4 URBAN AREA EXPANSION.	Addresses jobs-housing balance somewhat.	Growth allocation occurs based on increased residential and commercial land use capacity both in core urban areas along transit lines as in Scenario 3 and at the urban edge as for Scenario 4.	all programmed and planned projects	yes	yes
Scenario 6	NORTH COUNTY-WEIGHTED JOBS, SOUTH COUNTY-WEIGHTED HOUSING					Assumes existing, adopted General Plan land uses.			all programmed and planned projects	yes	yes
Scenario 7	TOD / INFILL + ENHANCED TRANSIT	Selectively increases residential and commercial land use capacity within existing transit corridors. Land use change assumptions were made based on location of existing transit routes and service in consultation with SBCAG member agencies. Proposed changes in land use capacity reflect local planning discussions about possible future land use and General Plan and Community Plan updates presently under discussion at the local level.	Future growth allocation directly addresses jobs-housing balance issues by emphasizing job growth in North County and housing growth in south County through model weightings.	Shifts a greater share of future growth to transit corridors due to land use changes.	all programmed and planned projects, plus additional transit service	yes	Yes				