

**Butte County Association of Governments
Sustainable Communities Strategy**

***Passenger Vehicle
Greenhouse Gas Emissions Target Setting***

-Methodology and Scenario Results-

DRAFT

Purpose

The passenger vehicle greenhouse gas emissions target modeling results for the Butte County region has been developed by the Butte County Association of Governments (BCAG) in coordination with BCAG's City/Town/County Planning Directors Working Group and Transportation Advisory Committee (TAC) in response to the California Air Resources Board (ARB) – Regional Targets Advisory Committee (RTAC) recommendation and final report.

The RTAC report recognizes that various regions of the state represented by metropolitan planning organizations (MPOs), such as BCAG, are unique in both their transportation characteristics and travel modeling capabilities, therefore they have provided the opportunity for MPOs to provide their own target methodology and modeling results for consideration by ARB. It is BCAG's desire that ARB utilize the modeling results for the purpose of setting an ambitious but achievable target for the Butte County region.

Background

In September 2008 the Governor signed Senate Bill 375 (SB 375) which prompts regions to reduce greenhouse gas (GHG) emissions from passenger vehicles through coordinated planning for long range transportation plans. This new legislation requires all MPOs in California to develop a Sustainable Communities Strategy (SCS), which meets regional passenger vehicle GHG emissions targets, as an additional element of their regional transportation plans (RTP). If the SCS is unable to meet the regional GHG target, then an Alternative Planning Strategy (APS) is to be prepared by the MPO which does. BCAG's next scheduled RTP update is to be completed by December 2012.

In September 2009, as directed by SB 375, the Regional Target Advisory Committee (RTAC) adopted a report of recommendations on how the target setting process would be conducted. The RTAC report details a seven (7) step process in which ARB, MPOs, and the local jurisdictions exchange assumptions regarding current and projected land use and transportation in the affected region. As part of this process, MPOs have been provided the opportunity to develop and submit a set of modeled scenarios to ARB for use in establishing a target. ARB is scheduled to release draft regional targets by June 30th, 2010. ARB will receive comments on the draft targets and make any adjustments prior to final adoption on September 30th, 2010.

As described in SB 375, the SCS will be an integrated transportation and land use plan which is intended to meet the regional GHG target while also accommodating the region's forecasted growth. If the SCS is unable to meet the regional GHG target within the required state and federal constraints for RTP development, then an Alternative Planning Strategy (APS) must be prepared. The APS will identify how GHG targets would be achieved through alternative development patterns, infrastructure, or additional transportation measures or policies.

Methodology

BCAG staff modeled three (3) scenarios using the BCAG Travel Demand Forecasting Model, ARB's EMFAC 2007 V2.3 emissions model and the recently available Pavley 1 + Low Carbon Fuel Standard (LCFS) post processor. As prescribed by the RTAC report, all results include the emissions for passenger vehicles (EMFAC categories LDA, LDT1, LDT2, and MDV) and exclude all through trips (trips which both originate and end outside the region but travel across some portion of the region).

Travel Demand Model

The BCAG Travel Demand Model has been validated to the 2006 base year and is consistent in form and function with the standard traffic forecasting models used in the transportation planning profession. The model is a three step travel demand forecasting model consisting of Trip Generation, Trip Distribution, and Trip Assignment and produces forecasts for daily, AM peak hour, and PM peak hour conditions. The model utilizes 20 land use categories for which 6 are residential in nature. The model does not include specific inputs for jobs rather it includes the existing and forecasted square footage of non-residential land uses (retail, industrial, office, etc.) in order to generate trip attractions. For more information regarding the existing BCAG Travel Demand Model, a complete copy of the model development report can be viewed at the following website: <http://www.bcag.org/Planning/Transportation-Forecasting/index.html> .

The existing model does not have the ability to model transit or other alternative modes of transportation such as walking or bicycling. Therefore, these have not been analyzed in any of the scenarios. It is anticipated that the BCAG travel model will have some capability to model these alternative modes during the development of the 2012 RTP – SCS.

Each scenario is run within the BCAG Travel Demand Model. Once ran for each scenario, the travel model generates the vehicle miles traveled (VMT) for the base and horizon analysis years (2006 and 2035) as well as divides the VMT into 13 separate speed bins set at 5 mile per hour intervals. The 2018 interim year is generated via interpolation from a post processing spreadsheet.

EMFAC 2007

ARB's EMFAC 2007 emissions model is then used to calculate the greenhouse gas, carbon dioxide (CO₂), emissions output based on the provided VMT and speed bin classification. For the purposed of this analysis, BCAG utilized the annual option for CO₂ output as suggested by the RTAC report.

Pavley 1 + LCFS

The ARB Pavley 1 + LCFS post processor reads the final outputs from the EMFAC 2007 model and applies the greenhouse gas emission benefits from the ARB adopted

Pavley clean-car standards and Low Carbon Fuel Standards that reduce the carbon intensity of vehicle fuel.

Interregional Travel

For the purpose of this analysis, BCAG staff has subtracted all emissions from through trips (X-X trips) based on the relative percentage of VMT from 2006, 2018, and 2035. In addition, the portion of VMT from trips that either begin or end within the region but travel to/from neighboring regions (X-I, I-X trips) has been included for all portions of the trip within the BCAG region. See Appendix A for a summary of the calculated interregional VMT and CO₂.

Target Metric

As directed by the RTAC report, BCAG staff quantified the outputs from the Pavley 1 + LCFS post processor using the target metric in terms of a percent reduction in per capita greenhouse gas emissions (CO₂) from base year levels.

Analysis Years

The RTAC has chosen the base year of 2005, but BCAG has quantified the results based off the year 2006 since this is the earliest year available within the BCAG travel model. In addition, the RTAC has selected the years 2020 and 2035 as the interim and horizon years. The closest existing interim year to 2020 established for the 2008 BCAG RTP Air Quality Conformity Determination was 2018. Therefore, BCAG has utilized the following years for reporting 2006, 2018, and 2035.

Scenarios

As part of the target setting process, the RTAC report recommends that each MPO prepare an analysis of their adopted fiscally constrained RTP for both the Build and No-Build scenarios along with any alternative scenarios. The purpose of the scenarios preparation and analysis is to gauge the effectiveness of various approaches and to assist in identifying the most ambitious and achievable greenhouse gas reduction strategy for the region.

Each scenario described below was prepared utilizing the same regional growth projections (population, housing, and employment) established for BCAG's 2008 RTP. See Appendix B for a summary of the regional growth projections. In addition, both the '08 RTP Build and the Conceptual SCS scenarios utilize the same forecasted, capacity increasing, transportation network improvements approved in the '08 BCAG RTP and '09 Federal Transportation Improvement Program (FTIP). See Appendix C for a summary of the capacity increasing transportation network improvements.

'08 RTP Build

BCAG's 2008 RTP Build scenario is the existing fiscally constrained land use and transportation network prepared for the region's adopted 2008 RTP. The transportation model's future year land use data was developed with the assistance of the local jurisdictions and represents build-out of existing adopted general plans and development of recognized future land use plan study areas, as of June 30th, 2008. At the time the land use base was prepared, four (4) of the six (6) local jurisdictions in Butte County were at various stages of updating their local land use plans and general plans. These general plan and specific plan development activities occurring in the county by the local jurisdictions were reflected in the future year land use assumptions.

'08 RTP No-Build

The '08 RTP No-Build scenario is the '08 RTP Build scenario minus the transportation network improvements. This scenario contains the same land use and growth forecasts as the '08 RTP Build scenario, but, in theory, is generally representative of what would occur without any regional transportation improvements. The No-Build scenario is different than the "No-Project" alternative contained in BCAG's 2008 RTP – Environmental Impact Report, in that it does not contain the build-out of the previously adopted BCAG 2004 RTP. Typically with a modeled No-Build scenario, VMT is reduced based on the reduction of lane miles, but increases are seen in vehicle hours of delay which result in additional long term air quality emissions.

Conceptual SCS

The Conceptual SCS scenario incorporates the local jurisdictions newly approved preferred general plan land use scenarios and housing elements, as of January 2010. This scenario is strictly land use based and makes no modifications to the adopted 2008 BCAG RTP transportation network. In addition, the scenario utilizes the same regional growth forecasts as the previous two scenarios. The Conceptual SCS scenario is generally representative of the latest land use assumptions taking into consideration the new state requirements included in Senate Bill 375.

This scenario was developed in coordination with the local jurisdictions through the City/Town/County Planning Directors Group. Each jurisdiction's land use was reviewed from the 2008 RTP Build scenario and revised to include the latest planning assumptions. The majority of changes occurred within the Chico sphere of influence, the most populated sphere within the county, in which the City of Chico's 2030 General Plan Preferred Land Use Alternative was incorporated. With the inclusion of the recently developed housing elements, all jurisdictions saw some portion of larger lot single family housing transfer to smaller lot multi-family units.

The Conceptual SCS scenario analysis does not fully include the benefits from the increased mixes of land use with the jurisdictions new general plans and housing elements. Nor does the analysis include benefits from alternative modes of travel (bike,

pedestrian, and transit). Currently, the BCAG Travel Demand Model does not include these capabilities. For the purposes of this analysis, the assumption is the percentage of travel by alternative mode is unchanged from 2006 through the RTP horizon year 2035.

Modeling Results

Each of the three (3) scenarios modeling results has been included in the table below. The average 2018 reduction in per capita passenger vehicle CO2 emissions is 20.1% with an average 2035 reduction of 36.2%, from the 2006 base year. The Conceptual SCS scenario shows the greatest per capita CO2 reductions for the year 2018 and 2035 while the existing 2008 BCAG RTP Build scenario shows the least.

| 2008 BCAG RTP Build | | | |
|-------------------------------------|-------------------------|----------------------------|----------------------------|
| | 2006 Base Yr | 2018 Interim Yr | 2035 Horizon Yr |
| Passenger Vehicle Weekday VMT | 3,485 | 4,410 | 5,732 |
| Population | 217,209 | 267,599 | 346,818 |
| Weekday CO2 (tons) | 1,678 | 1,640 | 1,720 |
| Per Capita CO2 (lbs) | 15.45 | 12.26 | 9.92 |
| % Reduction CO2 Per Capita from '06 | | 20.7% | 35.8% |

| 2008 BCAG RTP No-Build | | | |
|-------------------------------------|-------------------------|----------------------------|----------------------------|
| | 2006 Base Yr | 2018 Interim Yr | 2035 Horizon Yr |
| Passenger Vehicle Weekday VMT | 3,485 | 4,384 | 5,672 |
| Population | 217,209 | 267,599 | 346,818 |
| Weekday CO2 (tons) | 1,678 | 1,633 | 1,706 |
| Per Capita CO2 (lbs) | 15.45 | 12.20 | 9.84 |
| % Reduction CO2 Per Capita from '06 | | 21.0% | 36.3% |

| Concept SCS | | | |
|-------------------------------------|-------------------------|----------------------------|----------------------------|
| | 2006 Base Yr | 2018 Interim Yr | 2035 Horizon Yr |
| Passenger Vehicle Weekday VMT | 3,485 | 4,379 | 5,672 |
| Population | 217,209 | 267,599 | 346,818 |
| Weekday CO2 (tons) | 1,678 | 1,629 | 1,698 |
| Per Capita CO2 (lbs) | 15.45 | 12.17 | 9.79 |
| % Reduction CO2 Per Capita from '06 | | 21.2% | 36.6% |

Notes:

- VMT and CO2 from passenger vehicles (LDA, LDT1, LDT2, and MDV);
- Trips based on intra-regional and inter-regional travel (no through trips);
- Growth based on 2008 BCAG Regional Growth Projections 2006-2035

Points of Concern

The following three (3) factors have been identified as points of concern based on their potential to have a significant effect on the results of the modeled scenarios.

- **Regional Growth Projections:** BCAG is scheduled to update the regional growth projections prior to the preparation of the 2012 RTP. Given the amount of growth that has occurred since the 2006 base year and considering the current economy and housing market, it would be reasonable to assume that future projections will be less aggressive than what has been used for this particular analysis. In addition, the current observed trend would suggest that the region will be experiencing smaller household sizes, therefore requiring more homes to house the same number of residents for the region. Either of these factors could significantly decrease the amount of reduction using the current modeling and target metric.
- **Travel Models Sensitivity to Smart Growth:** The current BCAG Travel Forecasting Model is not capable of fully quantifying the travel benefits of mixed land use and smart growth principles contained in the regions newly developed land use plans. These capabilities are expected to be available prior to the development of the BCAG's 2012 RTP – SCS (see Modeling Improvements section). Given the current model results, we can assume that overall VMT would decrease, therefore, the overall per capita CO2 percentage reduction would increase.
- **Interregional Trips:** BCAG has yet to fully re-assess the amount of travel between the BCAG region and our neighboring MPO, Sacramento Area Council of Governments, and the four rural county transportation commissions (Colusa, Glenn, Plumas, and Tehama). Current discussions among ARB and the states MPO's have concluded that 50% of all interregional trips will be included in the region's analysis. Dependent upon the outcome of BCAG's reassessment of interregional trips, the modeling results could move in either an upward or downward direction.

Modeling Improvements

The Butte County region has aggressively pursued grant funding opportunities for the purpose of making the necessary improvements to accurately model regional travel as it relates to smart growth land use strategies and alternative modes of travel. Over the course of the next 3 years, BCAG will implementing the approved Proposition 84 Model Improvement Plan (MIP) and the Caltrans 5304 modeling grants. At the completion of both grant funded projects, BCAG will be equipped with the necessary data and tools to more accurately develop and model the regions SCS.

APPENDIX A

INTERREGIONAL TRAVEL TABLES

| Vehicle Miles Traveled (VMT) Calculations | | | | | | |
|---|----------------|--------|--------------------|--------|--------------------|--------|
| Trip Type | Base Year 2006 | | '08 RTP Build 2018 | | '08 RTP Build 2035 | |
| | VMT | % | VMT | % | VMT | % |
| All Trips | 3,587 | 100% | 4,566 | 100% | 5,987 | 100% |
| Internal (I-I) | 2,726 | 75.99% | 3,440 | 75.34% | 4,456 | 74.43% |
| Interregional (X-I,I-X) | 759 | 21.17% | 970 | 21.24% | 1,276 | 21.32% |
| Through (X-X) | 102 | 2.83% | 156 | 3.42% | 254 | 4.25% |

| Trip Type | Base Year 2006 | | '08 RTP No-Build 2018 | | '08 RTP No-Build 2035 | |
|-------------------------|----------------|--------|-----------------------|--------|-----------------------|--------|
| | VMT | % | VMT | % | VMT | % |
| All Trips | 3,587 | 100% | 4,539 | 100% | 5,922 | 100% |
| Internal (I-I) | 2,726 | 75.99% | 3,420 | 75.34% | 4,409 | 74.45% |
| Interregional (X-I,I-X) | 759 | 21.17% | 964 | 21.24% | 1,263 | 21.33% |
| Through (X-X) | 102 | 2.83% | 155 | 3.42% | 252 | 4.25% |

| Trip Type | Base Year 2006 | | Concept SCS 2018 | | Concept SCS 2035 | |
|-------------------------|----------------|--------|------------------|--------|------------------|--------|
| | VMT | % | VMT | % | VMT | % |
| All Trips | 3,587 | 100% | 4,534 | 100% | 5,924 | 100% |
| Internal (I-I) | 2,726 | 75.99% | 3,416 | 75.35% | 4,409 | 74.43% |
| Interregional (X-I,I-X) | 759 | 21.17% | 963 | 21.23% | 1,263 | 21.32% |
| Through (X-X) | 102 | 2.83% | 155 | 3.42% | 252 | 4.25% |

| CO2 Tons (includes Pavely1 + LCFS reduction) | | | | | | |
|--|----------------|--------|--------------------|--------|--------------------|--------|
| Trip Type | Base Year 2006 | | '08 RTP Build 2018 | | '08 RTP Build 2035 | |
| | CO2 | % | CO2 | % | CO2 | % |
| All Trips | 1,727 | 100% | 1,698 | 100% | 1,796 | 100% |
| Internal (I-I) | 1,312 | 75.99% | 1,279 | 75.34% | 1,337 | 74.43% |
| Interregional (X-I,I-X) | 366 | 21.17% | 361 | 21.24% | 383 | 21.32% |
| Through (X-X) | 49 | 2.83% | 58 | 3.42% | 76 | 4.25% |

| Trip Type | Base Year 2006 | | '08 RTP No-Build 2018 | | '08 RTP No-Build 2035 | |
|-------------------------|----------------|--------|-----------------------|--------|-----------------------|--------|
| | CO2 | % | CO2 | % | CO2 | % |
| All Trips | 1,727 | 100% | 1,691 | 100% | 1,781 | 100% |
| Internal (I-I) | 1,312 | 75.99% | 1,274 | 75.34% | 1,326 | 74.45% |
| Interregional (X-I,I-X) | 366 | 21.17% | 359 | 21.24% | 380 | 21.33% |
| Through (X-X) | 49 | 2.83% | 58 | 3.42% | 76 | 4.25% |

| Trip Type | Base Year 2006 | | Concept SCS 2018 | | Concept SCS 2035 | |
|-------------------------|----------------|--------|------------------|--------|------------------|--------|
| | CO2 | % | CO2 | % | CO2 | % |
| All Trips | 1,727 | 100% | 1,687 | 100% | 1,773 | 100% |
| Internal (I-I) | 1,312 | 75.99% | 1,271 | 75.35% | 1,320 | 74.43% |
| Interregional (X-I,I-X) | 366 | 21.17% | 358 | 21.23% | 378 | 21.32% |
| Through (X-X) | 49 | 2.83% | 58 | 3.42% | 75 | 4.25% |

APPENDIX B

REGIONAL GROWTH PROJECTIONS 2006-2035

Regional Housing Unit Projections 2006 - 2035

| Jurisdiction | 2006* | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Total Increase 2006-2035 | Percent Increase 2006-2035 | Average Annual Growth Rate (Compound) |
|----------------|--------|--------|---------|---------|---------|---------|---------|--------------------------|----------------------------|---------------------------------------|
| Biggs | 622 | 683 | 807 | 1,070 | 1,234 | 1,397 | 1,580 | 958 | 154% | 3.3% |
| Chico | 32,864 | 35,573 | 39,276 | 43,363 | 47,877 | 52,860 | 58,361 | 25,497 | 78% | 2.0% |
| Gridley | 2,224 | 2,703 | 3,417 | 4,039 | 4,459 | 4,923 | 5,436 | 3,212 | 144% | 3.1% |
| Oroville | 5,785 | 6,701 | 8,553 | 10,010 | 11,052 | 12,203 | 13,473 | 7,688 | 133% | 3.0% |
| Paradise | 12,707 | 13,223 | 14,105 | 14,751 | 15,427 | 16,134 | 16,873 | 4,166 | 33% | 1.0% |
| Unincorporated | 39,181 | 40,772 | 42,852 | 45,038 | 47,335 | 49,749 | 52,287 | 13,106 | 33% | 1.0% |
| Total County | 93,383 | 99,655 | 109,010 | 118,271 | 127,384 | 137,266 | 148,010 | 54,627 | 58% | 1.6% |

Source: Department of Finance 1-1-06

Regional Population Projections 2006 - 2035

| Jurisdiction | 2006* | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | Total Increase 2006-2035 | Percent Increase 2006-2035 | Average Annual Growth Rate (Compound) |
|----------------|---------|---------|---------|---------|---------|---------|---------|--------------------------|----------------------------|---------------------------------------|
| Biggs | 1,780 | 1,955 | 2,311 | 3,062 | 3,533 | 3,997 | 4,522 | 2,742 | 154% | 3.3% |
| Chico | 79,091 | 85,610 | 94,520 | 104,358 | 115,220 | 127,212 | 140,452 | 61,361 | 78% | 2.0% |
| Gridley | 5,949 | 7,231 | 9,141 | 10,804 | 11,928 | 13,170 | 14,540 | 8,591 | 144% | 3.1% |
| Oroville | 13,550 | 15,696 | 20,033 | 23,447 | 25,888 | 28,582 | 31,557 | 18,007 | 133% | 3.0% |
| Paradise | 26,516 | 27,592 | 29,433 | 30,781 | 32,192 | 33,667 | 35,209 | 8,693 | 33% | 1.0% |
| Unincorporated | 90,323 | 93,991 | 98,786 | 103,825 | 109,121 | 114,687 | 120,538 | 30,215 | 33% | 1.0% |
| Total County | 217,209 | 232,075 | 254,224 | 276,277 | 297,882 | 321,315 | 346,818 | 129,609 | 60% | 1.6% |

Source: Department of Finance 1-1-06

Employment Projections

| Jurisdiction | 2006 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 |
|--------------|--------|--------|--------|---------|---------|---------|---------|
| Countywide | 88,714 | 92,181 | 98,109 | 103,487 | 114,646 | 123,539 | 133,209 |

Note: Population, housing, and employment projections were developed through the BCAG City/Town/County Planning Directors Group which includes representatives from all BCAG member jurisdictions as well as Local Agency Formation Commission (LAFCO) staff. BCAG used the Department of Finance (DOF) 2006 population estimates as the basis for the forecasts. In addition, 2002 Annual Business Inquiry (ABI) jobs data was incorporated for employment projections. The group met numerous times in order to reach consensus on the projections. The projections were summarized in the Butte Regional Growth Projections 2006-2030 which was adopted by BCAG in 2006. The projections were later extrapolated to 2035, the horizon year of the RTP.

APPENDIX C

TRANSPORTATION NETWORK IMPROVEMENTS (CAPACITY INCREASING)

Table 1. Capacity-increasing Projects Included in 2018 Analysis

| Jurisdiction | Roadway | Segment | Proposed Improvement |
|--------------|------------------------|--|--------------------------|
| Butte County | SR 149 | SR 99 to SR 70 | Widen to 4 lanes |
| Butte County | SR 70 | Cox Ln to East Gridley Rd | Widen to 4 lanes |
| Butte County | SR 70 | SR 162 to Ophir Rd | Widen to 4 lanes |
| Chico | SR 99 | SR 32 to E. 1st Ave | Auxiliary lanes |
| Chico | Notre Dame | E. 20 th St to Little Chico Creek | Construct 2 lane roadway |
| Chico | Cohasset Rd | Two Oaks Dr to Thorntree Dr | Widen to 4 lanes |
| Chico | Eaton Rd | Floral Ave to Manzanita Ave | Construct 4 lane roadway |
| Butte County | SR 70 | Ophir Rd to Palermo Rd | Widen to 4 lanes |
| Chico | Fair St | Fair St (end) to Entler Ave | Construct 2 lane roadway |
| Chico | E. 20 th St | Forest Ave to Bruce Rd | Widen to 4 lanes |
| Chico | Bruce Rd | Skyway to SR 32 | Widen to 4 lanes |
| Chico | SR 32 | SR 99 to Yosemite Dr | Widen to 4 lanes |
| Chico | SR 99 | Skyway to SR 32 | Auxiliary lanes |
| Chico | Notre Dame | Comanche Creek to Southgate Ln | Construct 2 lane roadway |
| Chico | Cohasset Rd | Airport Blvd to Eaton Rd (remainder) | Widen to 4 lanes |
| Chico | Eaton Rd | SR 99 to Cohasset Rd | Widen to 4 lanes |
| Chico | W. Eaton Rd | SR 32 to W Eaton Rd (end) | Construct 2 lane roadway |
| Chico | W. Eaton Rd | Rogue River Dr to Esplanade | Widen to 4 lanes |
| Chico | Midway | Hegan Ln to E. Park Ave | Widen to 4 lanes |

Table 2. Capacity-increasing Projects Included in 2035 Analysis*

| Jurisdiction | Roadway | Segment | Proposed Improvement |
|--------------|---------------|--|--------------------------|
| Butte County | SR 70 | Palermo Rd to Cox Ln | Widen to 4 lanes |
| Chico | Manzanita Ave | E. 8 th St to Wildwood Ave | Widen to 4 lanes |
| Chico | Esplanade | Eaton Rd to Nord Hwy | Widen to 4 lanes |
| Chico | Southgate | Midway to Skyway & Entler Ave to Player Ln | Construct 2 lane roadway |
| Butte County | SR 70 | Central House Rd to Yuba County | Widen to 4 lanes |

*Also includes all projects listed in Table 1.