



SOUTHERN CALIFORNIA ASSOCIATION of GOVERNMENTS

TECHNICAL WORKING GROUP (TWG)

Thursday, October 15, 2015: 10:00 a.m.

SCAG Offices
818 West 7th Street, 12th Floor
Board Room
Los Angeles, CA 90017
(213) 236-1800

Teleconferencing Information: Number: 1-800-832-0736 – Participant Code: 7334636

Please use for web connection: <http://scag.adobeconnect.com/twg91814/>

AGENDA

Introductions

Receive and File

1. Meeting Summary 9-17-15 (Attachment)
2. 2016 RTP/SCS Agenda Outlook (Attachment)
3. 2016 RTP/SCS Policy Committee Meetings Outlook (Attachment)

Information Items

4. Draft 2016-2040 RTP/SCS - Model/Tools, Analysis & Results (Frank Wen) (Attachment)

Note: A special TWG meeting is currently scheduled for 1:00 p.m., Thursday, October 29, 2015.



**SOUTHERN CALIFORNIA
ASSOCIATION of GOVERNMENTS**

Item 1 Attachment:
Meeting Summary



TECHNICAL WORKING GROUP (TWG)

September 17, 2015

Meeting Summary

The following is a summary of discussions at the Technical Working Group meeting of September 17, 2015.

Receive and File

- 1. Meeting Summary 8-20-15**
- 2. 2016 RTP/SCS Agenda Outlook**
- 3. 2016-2040 Potential Policy Committee Meetings Outlook**

Information Items

4. Policy Growth Forecast

Kimberly Clark, SCAG staff, noted that staff developed a policy growth forecast as a potential option for the plan that makes good use of transit investments and targets growth in high-quality transit corridors. The policy growth forecast was released in late June 2015 and input was accepted through July 31, 2015. On September 16, 2015 staff sent out the revised data sets to local jurisdictions that provided input. Ms. Clark stated that it is important to note that the small area data for the policy growth forecast is meant to be for advisory purposes only and the RTP/SCS will ultimately adopt the growth forecast at the jurisdictional level. Also, it is important to note that staff will control the TAZ level growth to each jurisdiction's general plan density limits, and the TAZ level information will not go beyond the general plan growth assumptions for each jurisdiction.

Deborah Diep, representing OCCOG, stated that existing development was not necessarily taken into consideration when the growth deltas were changed and redistributed within a jurisdiction. Ms. Clark stated that it is important to note that this type of situation is an opportunity for infill development and in some instances cities will see it as more viable than others. Ms. Clark further stated that one of the key elements that informed the policy growth forecast was the market trends happening in the region. There are more multi-family units being built now than single-family units.

Gail Shiomoto-Lohr, representing the city of Mission Viejo, inquired if there will be a separate action approving the growth forecast or will it be consolidated within the approval of the RTP/SCS. Frank Wen, SCAG staff, stated that it has not been confirmed whether or not the growth forecast will be adopted as a separate action or as part of the RTP/SCS. However, the adoption will be at the jurisdictional level.

Ms. Shiomoto-Lohr also inquired about the most aggressive scenarios and if that information will be modeled in the PEIR, and also will the TAZ level data be released to local jurisdictions. Ms. Clark stated that as she understands it, the information will be modeled in the PEIR, but the TAZ level data will be available upon request.

5. 2016 Draft RTP/SCS Public Health Strategies and Actions

Rye Baerg, SCAG staff, stated that health in all policies is a framework in which staff recognized that health departments alone cannot improve public health because they do not have jurisdiction over roads and many other aspects of public health. Consequently, this is an effort to create cross-agency collaboration and incorporate health into SCAG's planning activities. Mr. Baerg further stated that staff has identified a number of benefits to the region resulting from the focus on public health in the RTP/SCS. It is the intention of staff to improve inter-agency coordination and work with public health departments to improve the health of the region.

Wally Siembab, representing South Bay Cities COG, stated that health in all policies should be changed to health in all policies *when appropriate* and public health should be noted as a co-benefit, rather than a primary focus of the RTP/SCS. Mr. Siembab also stated that this matter should be taken to the appropriate policy committee as an action item. Sarah Jepson, SCAG staff, indicated that the framework and focus areas could be presented as an action item.

Mr. Baerg presented the proposed regional strategies and actions noting that the goal is to outline a general direction for the types of activities that would support health efforts by our local jurisdictions and others. Mr. Baerg stated that staff did not include specific module strategies because those modes will be included in the appendices.

6. 2016 Draft RTP/SCS Active Transportation Plan

Alan Thompson, SCAG staff, presented the proposed Active Transportation Plan investment framework, noting proposed improvements and preliminary cost estimates.

7. Active Transportation Program Update

Alan Thompson, SCAG staff, presented the Active Transportation Program Cycle 2 project selection process timeline.

8. OPR Proposed Updates to CEQA Guidelines

Lijin Sun, SCAG staff, provided an overview of the OPR proposed updates to the CEQA Guidelines, noting that in 2013 OPR and the Natural Resources Agency solicited suggestions from stakeholders regarding potential improvements to the CEQA Guidelines; specifically on efficiency, substantive, and technical improvements. Ms. Sun referenced an Executive Summary provided in the agenda packet, which outlines the preliminary discussion draft of amendments to the CEQA Guidelines.



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Item 2 Attachment:
2016 RTP/SCS Agenda Outlook

Agenda Outlook for the Development of the 2016 RTP/SCS

(Note: Revised to put the outlook in chronological order as suggested at the Sept. 2014 TWG)

- Strikethrough signifies item was not covered

June 2013

- Potential approach/process, coordination between various technical working groups and policy committees, and updated overall schedule for the development of the 2016 RTP/SCS

January 2014

- System Preservation and system operation focus in the 2012 RTP/SCS and our current efforts on Pavement and Bridge condition database/management

February 2014

- System Performance Measures and MAP-21 requirements under Performance Based Planning and implications of MAP-21
- Local Input Process for Growth Forecast/Land Use (Scenario Planning) for 2016 RTP/SCS, including growth forecast and technology

March 2014

- Performance Based Planning and implications of MAP-21: Safety Performance Measures
- Overview of baseline and innovative funding sources adopted in the 2012 RTP/SCS including underlying technical assumptions/methodology/analysis under Transportation Finance
- Overview of cost assumptions/cost modal for the 2012 RTP/SCS under Transportation Finance
- Model and Tools and Datasets to be used in the 2016 RTP/SCS
- Overview of Aviation program in the 2012 RTP/SCS with a focus on ground transportation improvements

May 2014

- OCTA Draft Long Range Plan Update
- System Preservation Update
- Draft Paper on TOD benefits, challenges and best practices
- Active Transportation Program Update
- Local Input Survey Update
- MAP-21 Safety NPRM Update
- CalEnviro Screen Tool

June 2014

- SCAG Active Transportation Results from the 2011 Household Travel Survey
- 2016 RTP/SCS Modeling variables matrix
- Statewide and MPO Planning Rules NPRM Update
- California Active Transportation Program Update

July 2014

- 2016 RTP/SCS Modeling Variables Matrix

September 2014

- 2016 RTP/SCS Development Agenda Outlook
- Status of Local Input for the 2016 RTP/SCS; Growth Forecast Update
- Modeling Update
- CAL LOTS Update

October 2014

- Overview of SCS in the 2012 RTP/SCS
- Current status of SCS implementation (Local Implementation survey)
- Environmental Justice (First EJ Workshop will be held on 10/23)
- Map Collaborator Database (A web based tool to collect data and develop open space plan.)

November 2014

- Discussion on existing and proposed Performance Measures
- Role of Technology in the 2016 RTP/SCS
- Development of alternative scenarios (Scenario Planning) for 2016 RTP/SCS, including growth forecast, technology
- Emerging issues/themes that could influence 2016 SCS
- ~~Zero/Near Zero/Clean Technology Applications, including Slow Speed/ Electric Vehicle programs (Nov. 2014)~~
- ~~Emerging New Technology Applications~~

December 2014

- ~~Technical assumptions/methodology/data/analysis in the 2012 RTP/SCS~~
- ~~Potential changes in the 2016 RTP/SCS to technical assumptions/methodology/data/analysis~~
- ~~Updated forecast/land use distribution for 2016 RTP/SCS~~
- ~~Updated SCS for 2016 RTP/SCS~~
- ~~Overview of Active Transportation Strategy in the 2012 RTP/SCS~~
- ~~Progress update on Active Transportation Strategy and emerging issues and their implications to the 2016 RTP/SCS~~
- **Zero/Near Zero/Clean Technology Applications, including Slow Speed/ Electric Vehicle programs (Nov. 2014)**
- **Update on 2016 RTP/SCS Schedule**
- **Update on research and analysis for RTP/SCS strategies**

January 2015

- ~~Asset Management and Infrastructure Performance Measures~~
- ~~Overview of Goods Movement (GM) Strategy in the 2012 RTP/SCS with a focus on technical assumptions (including technology assumptions)/data/analysis~~
- ~~Progress update on the GM Strategy with focus on emerging issues and implications on the 2016 RTP/SCS~~
- ~~Technical assumptions/methodology/data/analysis in the 2012 RTP/SCS~~
- ~~Potential changes in the 2016 RTP/SCS to technical assumptions/methodology/data/analysis~~

- ~~Updated forecast/land use distribution for 2016 RTP/SCS~~
- ~~Updated SCS for 2016 RTP/SCS~~
- ~~Overview of Active Transportation Strategy in the 2012 RTP/SCS~~
- ~~Progress update on Active Transportation Strategy and emerging issues and their implications to the 2016 RTP/SCS~~
- Draft 2016-2040 RTP/SCS Datasets for two Scenarios 1) Local Input 2) Updated 2012-35 RTP/SCS and analysis relative to HQTAs, TPAs and Local Specific Plans
- Preview of the Progress Report/General Framework presentation for the 2016 RTP/SCS to be given at the February 5 Joint Regional Council/Policy Committee Meeting

February 2015

- Program EIR
- Overview of RTP/SCS Transit Element
- Overview of RTP/SCS Passenger Rail Element
- **2015 Active Transportation Program**
- **Public Health Framework for 2016-2040 RTP/SCS**
- **Environmental Justice Framework**
- **Draft Scenario Planning Matrix**
- **2015 Local Profiles Status Update**
- **Best Practices Research Project Status Update**

March 2015

- **Affordable Housing Sustainable Communities Grant Criteria**
- **Draft Scenario Matrix**
- **2016 RTP/SCS Performance Measures**
- **Asset Management and Condition Overview**
- **Active Transportation Program (ATP) Regional Guidelines**
- **2016 RTP/SCS Active Transportation Progress Update**
- **California Transportation Plan 2040**
- ~~Public Participation Plan~~

April 2015

- **Progress Update on Active Transportation and the 2016 RTP/SCS**
- **Public Health Analysis Framework**
- **Scenario Planning Model**
- ~~Overview of Goods Movement (GM) Strategy in the 2012 RTP/SCS with a focus on technical assumptions (including technology assumptions)/data/analysis~~
- ~~Progress update on the GM Strategy with focus on emerging issues and implications on the 2016 RTP/SCS~~

May 2015

- Overview of Aviation Program Update in the RTP/SCS
- **2016 RTP/SCS Performance Measures**

- Scenario Planning Model- Performance Results
- Overview of Highways/Arterials in the RTP/SCS
- 2016 RTP/SCS Workshop Overview and Schedule
- Progress update on the PEIR development for the 2016 RTP/SCS

June 2015

- 2016 RTP/SCS Transportation Finance
- 2016 RTP/SCS Overview of HOV/HOT/Toll Roads/Express Lanes
- California's Active Transportation Program – Cycle 2 Update
- Governor's Climate Change Executive Order Update

July 2015

- Overview of the PEIR for the 2016 RTP/SCS
- Policy Growth Forecast: Local Review and Input Process
- Public Health Update

August 2015

- Summary of Findings from the 2016 RTP/SCS Workshops
- Local Input Coordination
- Environmental Justice Update
- PEIR Update

September 2015

- Policy Growth Forecast
- Draft 2016 RTP/SCS Public Health Strategies and Actions
- Draft 2016 RTP/SCS Active Transportation Plan
- Active Transportation Program (ATP) update
- OPR Proposed Updates to CEQA Guidelines (Preliminary Discussion Draft)

October 2015

- **Model/Tools, Assumptions and Model/Off-Model Results for Draft 2016 RTP/SCS**

October 2015 – Special Meeting

- **Performance Outcomes**
- **Draft 2016 RTP/SCS Components**

November 2015

- **Draft 2016 RTP/SCS Components**
- **Draft PEIR**
- **Transportation Conformity**

Note: The Agenda Outlook is intended as a reference for TWG and is subject to change as needed and

appropriate as things progress.

Legend:

Light Grey Font: Items already presented

Regular Grey Font: Future Agenda Items

Bold Face Fonts: New or revised Agenda Items



**SOUTHERN CALIFORNIA
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Item 3 Attachment:
2016 RTP/SCS Policy Committee Meetings Outlook

**2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS)
Policy Committee Meetings Outlook**

2015 Meeting Dates	Topic	Committee ¹			
		Joint	TC	CEHDC	EEC
March 5	Draft Scenario Planning Matrix		X	X	X
	Environmental Justice Framework		X	X	X
	Public Health Planning & Analysis Framework		X	X	X
	Release of Notice of Preparation of Program Environmental Impact Report (PEIR)				X
April 2	Focus on System Operation and Preservation	X			
May 7	Draft Scenario Planning and SCS Workshops Rollout	General Assembly			
June 4	Active Transportation		X		
	Rail and Transit		X		
	Regional Aviation		X		
	Regional Goods Movement		X		
	2016 South Coast Air Quality Management Plan				X
June 18	Goals/Objectives/Performance Measures	X			
	Scenario Results - Land Use/Urban Form Focus	X			
	Subject Matter Speaker: Jim Madaffer, CTC	X			
July 2	Highways/Arterials		X		
	HOV/HOT/Toll Roads/Express Lanes		X		
	Emerging Technology Consideration in 2016 RTP/SCS		X		
	Active Transportation			X	X
	Environmental Justice, Policy Choices & Mitigations				X
	PEIR Approaches to Mitigation Measures				X
July 23	Regional Aviation		X		
	Highways/Arterials		X		
August 6	Summary of Findings from Workshops	X			
	PEIR Approaches to Alternatives	X			
	Affordable Housing Presentation by Steve PonTell	X			
	Regional Aviation Forecasts		X		
	Highways/Arterials		X		
August 20	Transportation Finance Overview	X			
	Potential Expert Subject Matter Speakers	X			
September 3	Draft Transportation Finance Strategy		X		
	Draft Transit and Passenger Rail Strategy		X		
	Draft Highway and Arterial Framework		X		
	Growth Forecast: Local Review and Input			X	
	Environmental Justice Analysis Update				X
	PEIR Update				X
October 8	Proposed Regional Express Lane Network		X		
	Proposed Goods Movement Strategies		X		
	Proposed Active Transportation Plan Investment Framework		X		
	Proposed Regional Aviation Ground Access Improvement Framework		X		
	Proposed Air Cargo Forecast		X		
	Proposed Public Health Guiding Principles and Framework		X	X	X
	Policy Growth Forecast (PGF) Guiding Principles and Framework			X	
	PEIR: Mitigation Measures, Guiding Principles, and Performance-Based Approach				X

**2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS)
Policy Committee Meetings Outlook**

2015 Meeting Dates	Topic	Committee ¹			
		Joint	TC	CEHDC	EEC
November 5	Review and Consider Staff Recommendation on all Elements of Draft 2016 RTP/SCS	X			
	PEIR Findings, Draft Technical Studies, and Draft PEIR	X			
	Draft Transportation Conformity Determination	X			
	Transmittal of Draft 2016 South Coast Air Quality Management Plan Appendix IV-C	X			
December 3	Release the Draft 2016 RTP/SCS for a 55-Day Public Review and Comment Period	X			
	Release the Draft PEIR for the 2016 RTP/SCS for a 45-Day Public Review and Comment Period	X			
March 3	Draft 2016 RTP/SCS and Draft PEIR - Summary of Public Comments	X			
	Review Draft 2016 RTP/SCS and Draft PEIR and Consider Recommending for Regional Council Adoption	X			
April 7	Review Draft 2016 RTP/SCS and Draft PEIR and Consider Adoption	Regional Council			

¹ Committee abbreviations include (in order of appearance): Joint (Joint Policy Committee); TC (Transportation Committee); CEHDC (Community, Economic & Human Development Committee); and EEC (Energy & Environment Committee).



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Item 4 Attachment:
2016-2040 RTP/SCS - Model/Tools,
Analysis & Results

DRAFT

2016
2040 RTP SCS

MODEL/TOOLS, ANALYSIS &
RESULTS OF THE DRAFT
2016-2040 RTP/SCS FOR
TWG DISCUSSION

October 15, 2015

Model, Tools & Analyses for Draft 2016-2040 RTP/SCS

Model, Tools, Off-Model Analysis

- Trip Based Model (TBM)
- Scenario Planning Model (SPM)
- Off-Model

TBM Assumptions/Model Set-up

- Auto Operation Costs
- TDM

Off-Model Methodology

- AT/Transit
- Car Sharing/Ride Sourcing
- PEV/NEV

Output from TBM and SPM

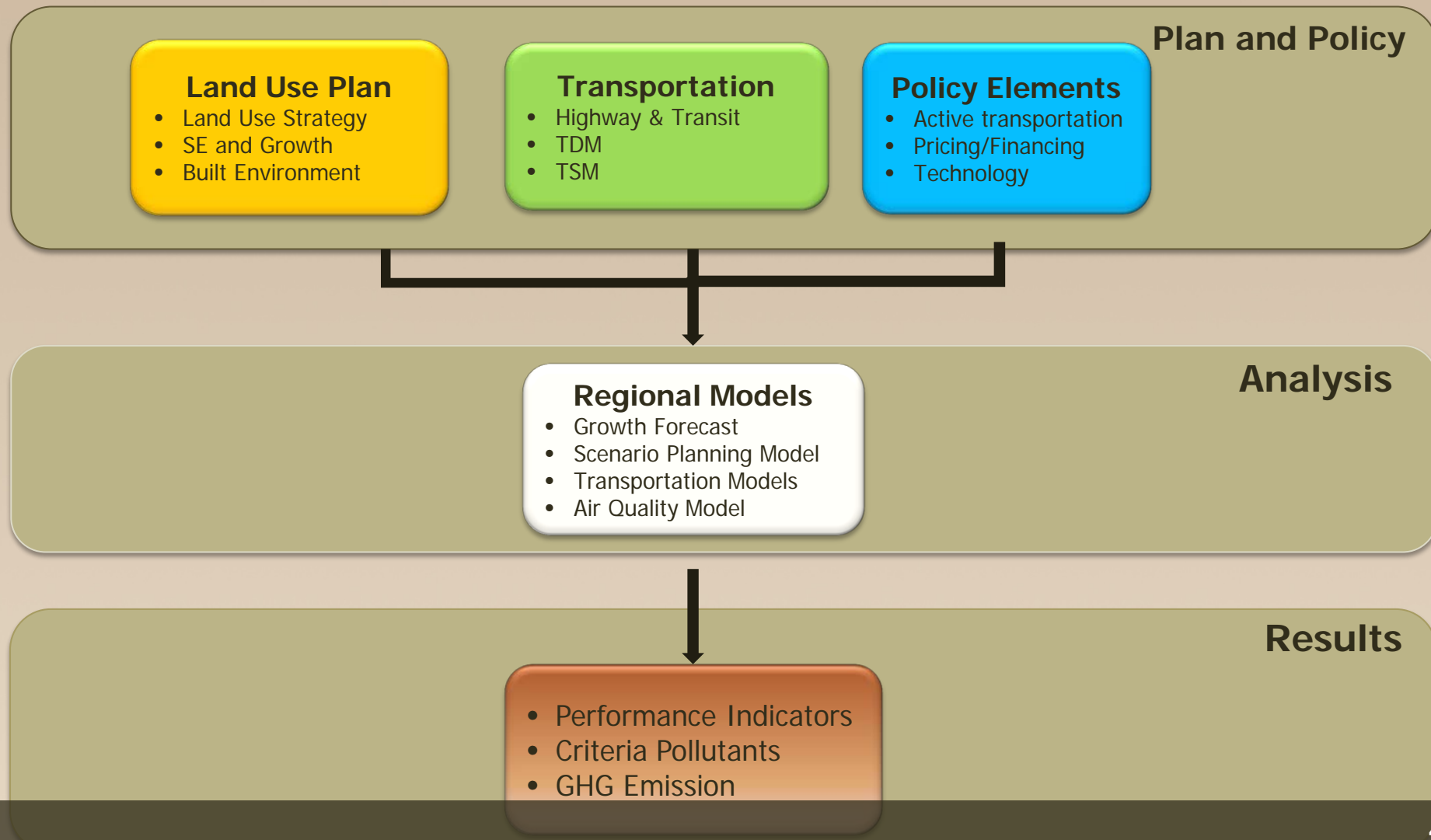
- TBM
- SPM

Draft 2016–2040 RTP/SCS Technical Tools and Assumptions

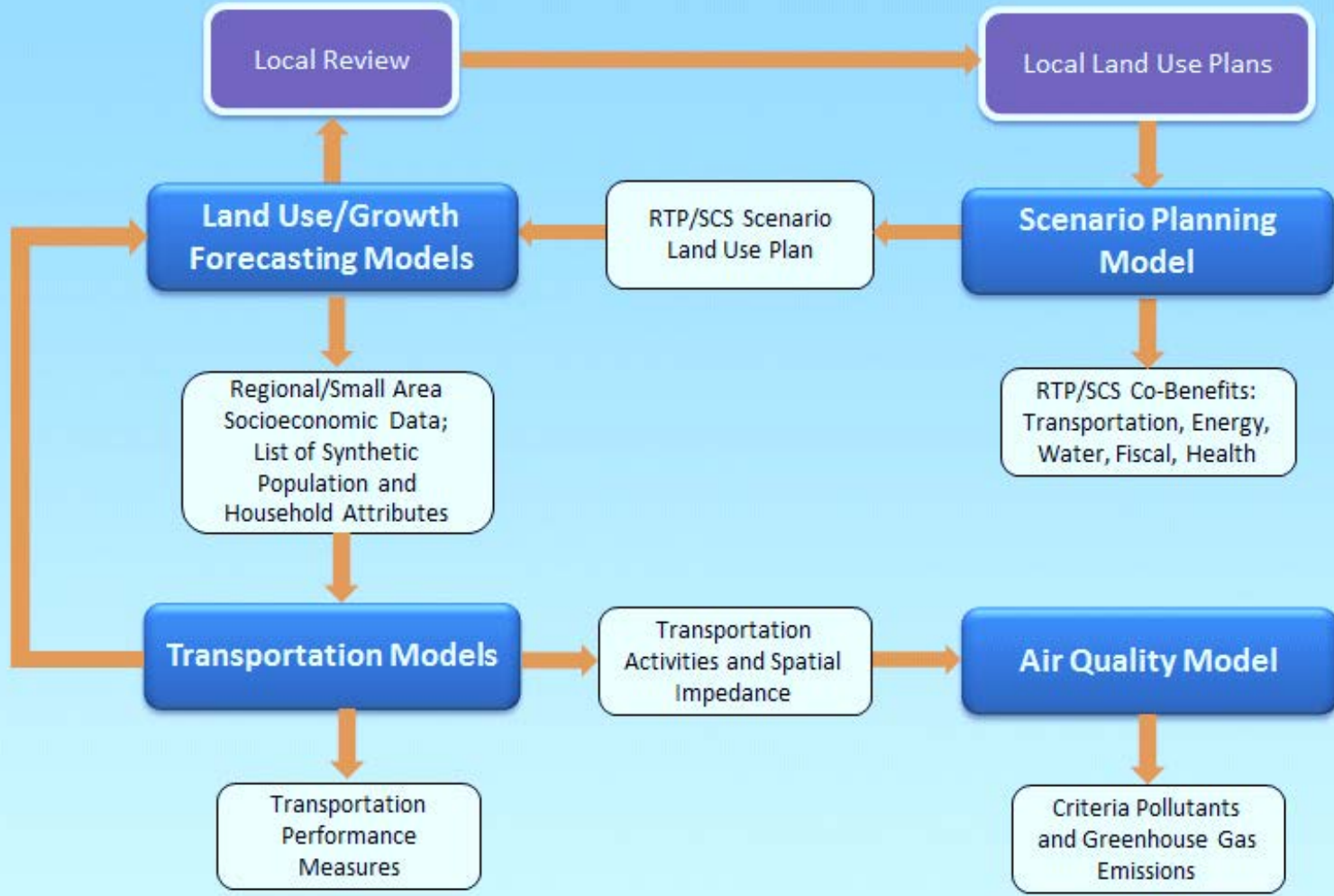
Technical Working Group – October 15, 2015



RTP/SCS Analytical Framework



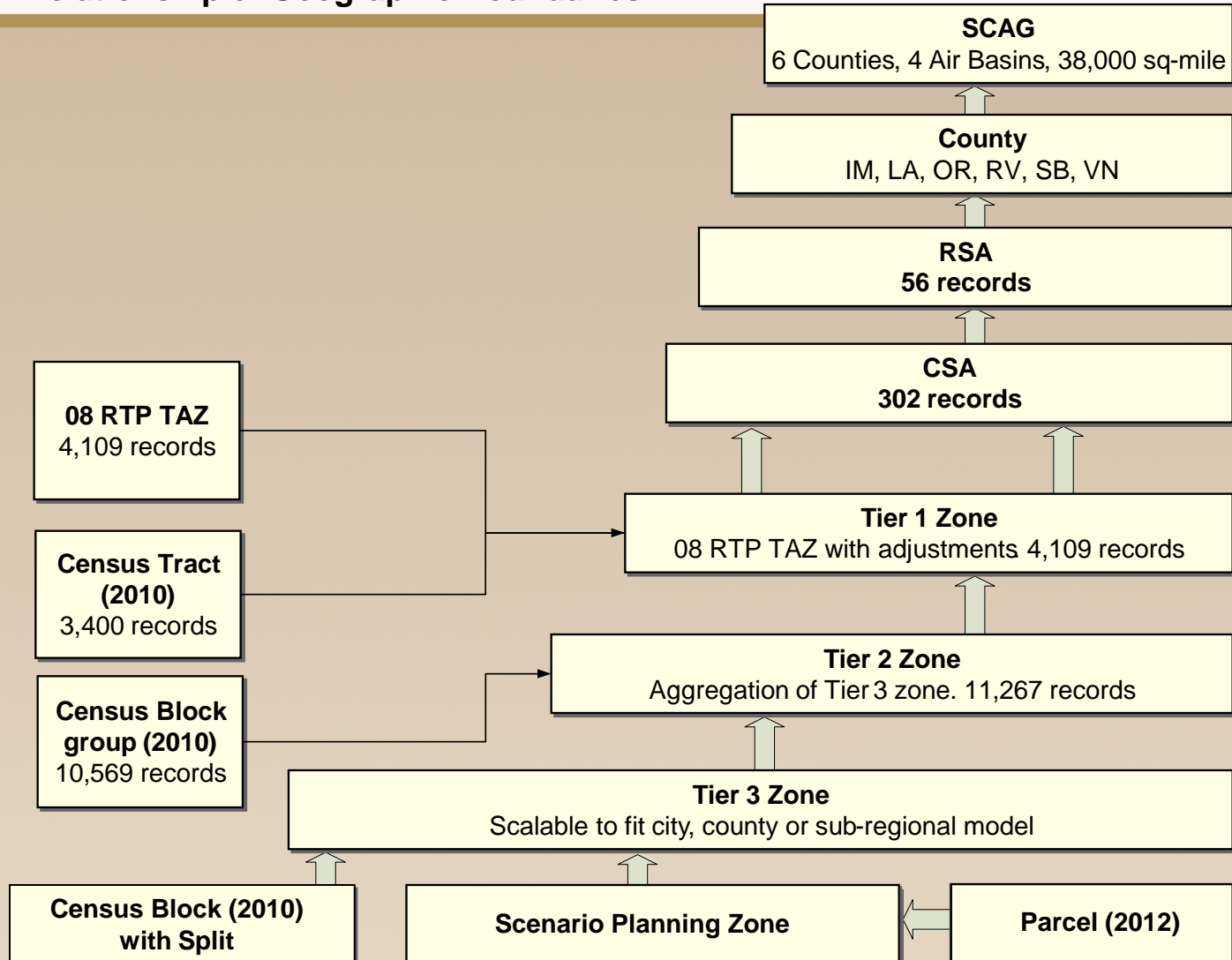
SCAG's Integrated Modeling & Forecasting Framework



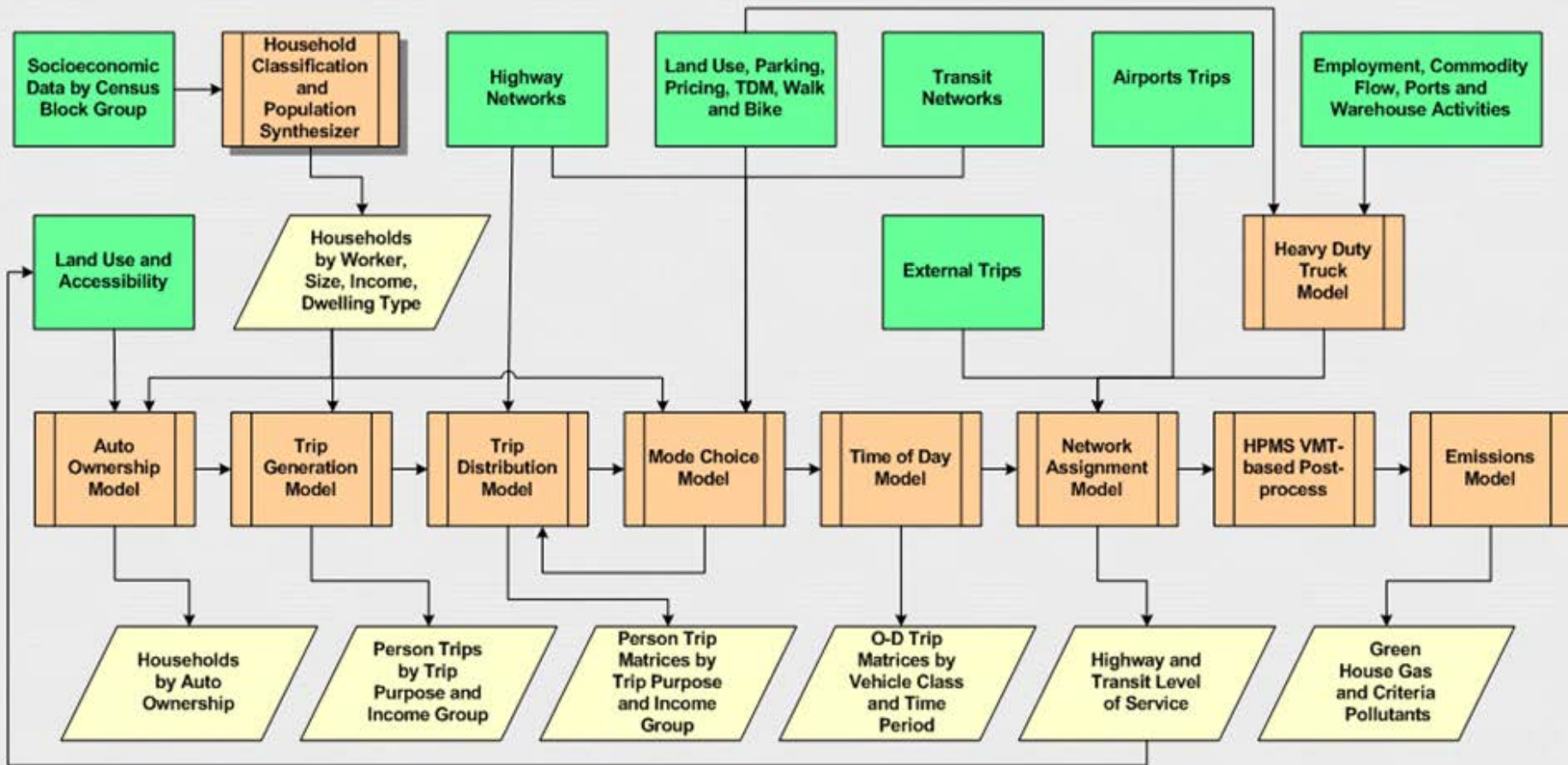
Trip-based Travel Demand Model (TBM)

SCAG Tiered Zone System for Modeling

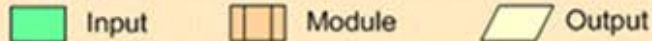
Relationship of Geographic Boundaries



SCAG Trip-based Regional Travel Demand Modeling Process



Legend



Note:

Population Synthesizer is a new component.
 All the modules and input data are updated for **2012 and 2016 RTP/SCS** analyses

Auto Availability Model

Multinomial logit model

Explanatory variables:

- ✓ Household size – 1, 2, 3, 4 or more persons
- ✓ Household income – <35K, 35-75k, 75-150K, 150K+
- ✓ Number of workers in household – 0, 1, 2, 3 or more workers
- ✓ Type of housing unit (single family detached, other)
- ✓ Transit accessibility to employment

$$TrLogsum_p = Ln \left(\sum_q \exp(-0.025 * (TransitTime_{pq} - AutoTime_{pq}) + \ln(Emp_q)) \right)$$

Where: $TransitTime_{pq}$ is total transit time including a weight of 2 on all out-of-vehicle time components

Auto Availability Model (continued)

- ✓ Mix household, employment and intersection density

$$\text{Ln} \{ [\text{Int} * (\text{Emp} * a) * (\text{HH} * b)] / [\text{Int} + (\text{Emp} * a) + (\text{HH} * b)] \},$$

Int= Number of local intersections in 1/2 mile of centroid

Emp= Employment within 1/2 mile of centroid

HH= Households within 1/2 mile of centroid

a= average Int / average Emp

b= average Int / average HH

- ✓ Non-motorized accessibility to employment - Number of jobs within a 10 minute walk.

Low accessibility (<= 500 jobs)

Medium accessibility (500 to 1,000 jobs)

High accessibility (1,000 to 5,000 jobs)

Very high accessibility (> 5,000 jobs)

Trip Generation Model

- ✓ Enhanced population synthesizer (PopSyn) for detailed joint household distributions
- ✓ HBW by “Direct” and “Strategic” trips
- ✓ Separated by Peak and Off-Peak
- ✓ Trip productions grouped by household income / car sufficiency for downstream models:
 - Zero cars, all income
 - Car competition, all income
 - Car sufficient, low income
 - Car sufficient, medium income
 - Car sufficient, high income

Trip Distribution Model

- ✓ Gravity models for HBSC and HBCU
- ✓ Destination choice models for all other purposes

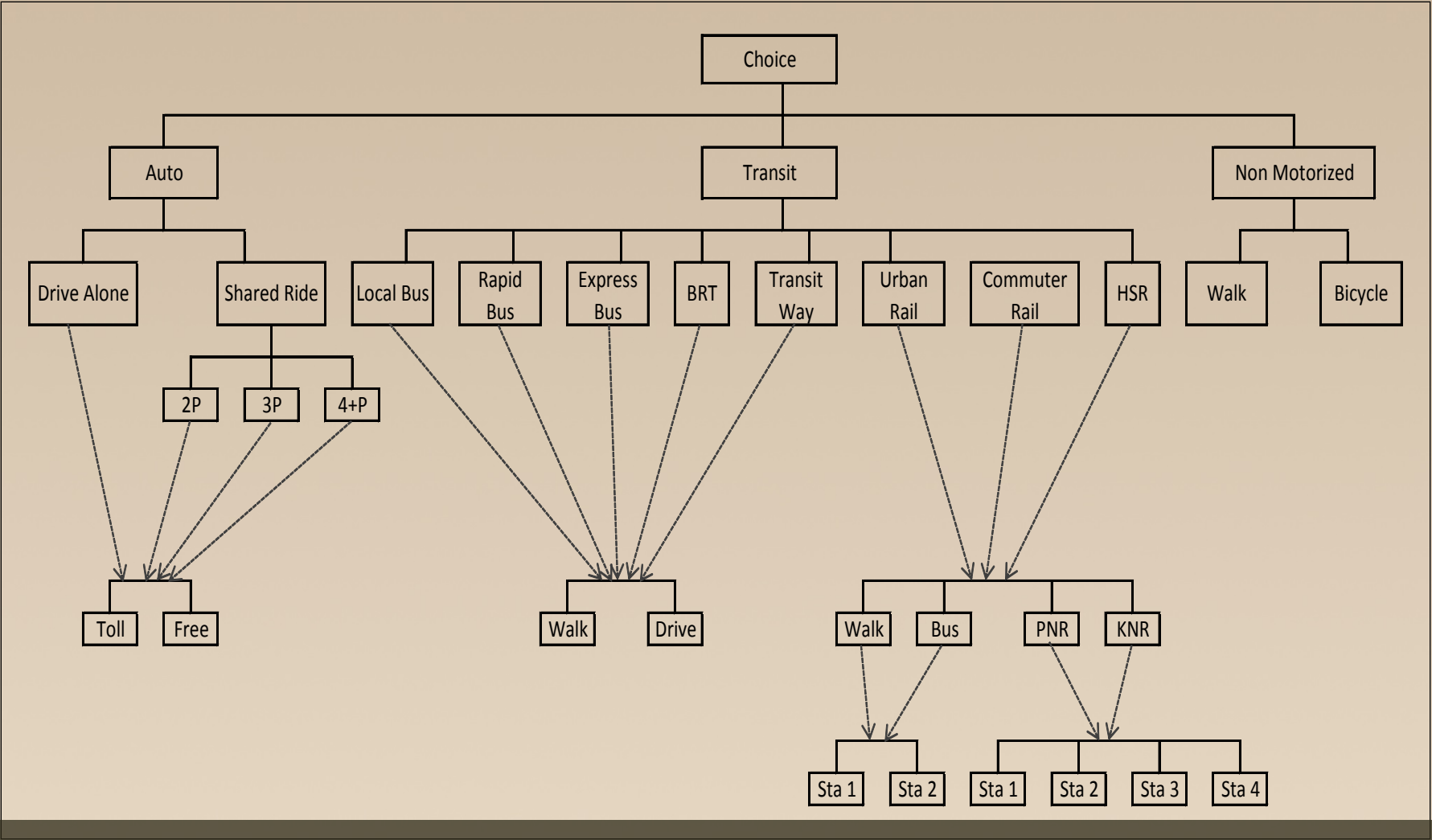
$$U_{ijm} = \theta \times L_{ijm} + \sum_k \beta^k D_{ij}^k + \sum_k \delta_m^k N_m^k D_{ij}^k + \sum_k \gamma_m^k M_i^k IZ_j + \ln(A_{jm}) + C_{jm}$$

LS = mode choice logsum; D = distance polynomial;

IZ = zonal characteristics; A = size term (attraction).

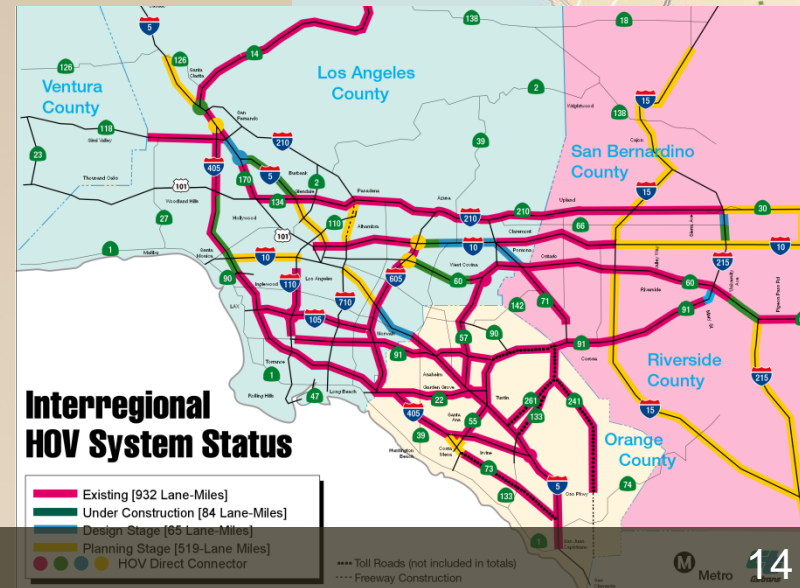
- ✓ HBW & HBNW stratified by household income /car sufficiency

Mode Choice Model - Nest Structure



Mode Choice Model – Highway Choices

- ✓ Over 11,000 lane miles of limited access roadways
- ✓ 900+ lane miles of HOV (2 & 3+ roadways)
- ✓ 2 dynamically-priced HOT lanes facilities in 2013
- ✓ Several toll roads



Mode Choice Model – Transit Options

- ✓ Over 70 different transit carriers
- ✓ Wide variety of transit technologies & operations
- ✓ Characterized by trip purpose, trip distance and type of traveler
 - Short distance local & rapid bus, mostly low income
 - Medium distance urban rail (expanding) and various types of express bus service, including transit-way buses & BRT
 - Long distance commuter rail, mostly high income, competing with express buses on some markets

Heavy Duty Truck Model

✓ HDT trip markets

- Internal HDT Trips
- Internal/External & Thru Trips
- Port Truck Trips
- Intermodal Terminal Truck Trips

✓ Weight Classes

- Light Heavy (8,500 to 14,000 lbs. GVW)
- Medium Heavy (14,001 to 33,000 lbs. GVW)
- Heavy Heavy (>33,000 lbs. GVW)



Highway Assignment

- ✓ Static biconjugate user equilibrium
- ✓ Generalized cost (time, operation cost, toll/user fee)
- ✓ VOTs stratified by vehicle class and time period
- ✓ Vehicle classes:
 - Drive alone
 - Shared Ride 2: GP lane vs HOV 2+ lane
 - Shared Ride 3+: GP lane vs HOV 3+ lane
 - Heavy Duty Trucks – Light, Medium, Heavy
- ✓ Modified BPR volume-delay functions
- ✓ Built-in HOV and Toll Diversion models

Model Convergence

Travel time feedback to trip generation

- Up to 5 feedback loops performed
- MSA applied to average volumes over loops (1/2 step size)
- User has the option of additional loops to tighten convergence
- Congested times calculated using the averaged volumes
- Peak travel times is based on combined AM & PM peak time

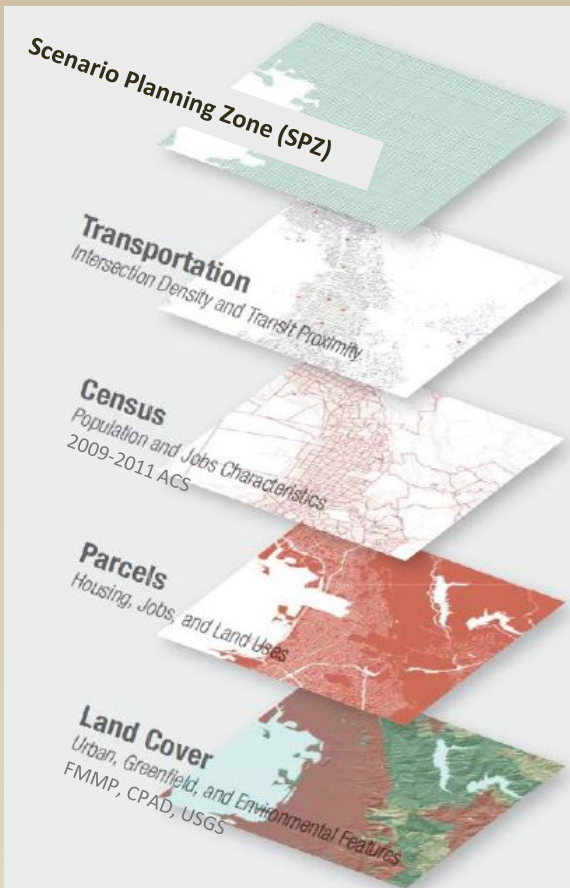
Data Acquisition

- ✓ 2012 CHTS and SCAG Add-on Travel Surveys
- ✓ Highway Network
 - Updates to the 2012 base year network will be carried over to future year networks.
- ✓ Transit Network
 - 2012 TripMaster database for use as the basis for the 2012 base year transit network developed from 2012 TripMaster database.
- ✓ Transit Level of Service Data
 - 2012 Transit LOS data from transit agencies.
- ✓ Year 2012 Screenline Count Database
 - 640 traffic counts on the arterials and 33 video traffic counts on freeways.
- ✓ HPMS Data for estimating regional and sub-air basin VMT
- ✓ HERE / Google data for real-time network speed verification
- ✓ Airsage Data for alternative source of regional travel patterns

Scenario Planning Model (SPM)

SPM database

Base Canvas



Spatial Datasets

Administrative/Statistical Unit		
1	County	US Census Bureau
2	Subregion	SCAG
3	Service Planning Areas*	County of Los Angeles
4	Sphere of Influence	County LAFCOs
5	2012 City Boundary	County LAFCOs
6	Census Tracts (2010 Census)	US Census Bureau
Regional Planning/Analysis Unit		
7	City/Tier 2 Traffic Analysis Zones (TAZ)	SCAG
8	Scenario Planning Zones (SPZ)	SCAG
2012 Parcels/Land Use		
9	2012 Existing Parcels	SCAG, City/Jurisdiction
10	General Plan Land Use	SCAG, City/Jurisdiction
Resource Areas/Farmland		
11	Endangered Species/Plants	California Natural Diversity Database (CNDDB)
12	Flood Plains	Digital Flood Insurance Rate Map (DFIRM) from FEMA
13	Natural Habitats	Natural Community Conservation Planning (NCCP) program, California Department of Fish and Wildlife
14	Open Space and Parks	California Protected Areas Database (CPAD)
15	Farmland	Farmland Mapping & Monitoring Program (FMMP), California Department of Conservation
16	Sea Level Rise	NOAA Coastal Services Center
Transportation		
17	2012 High Quality Transit Areas (HQTA)	SCAG
18	2012 Transit Priority Areas (TPAs)	SCAG
19	2040 High Quality Transit Areas (HQTA)	SCAG
20	2040 Transit Priority Areas (TPAs)	SCAG
21	Bike lane	SCAG

Scenario Building and Analysis



Scenario Analysis Outputs



“Off-Model” Analysis

Programs not Modeled with TBM

Active Transportation Programs

Neighborhood Electric Vehicle (NEV)

Carshare

Ridesourcing

Zero-Emission Vehicle (ZEV)

Walk infrastructure enhancement

Bike Infrastructure

Bike Share

Zipcar, ...

Lyft, Uber, ...

Plug-in Electric Vehicles



Analytical Process

- ✓ Review literature
- ✓ Review methodology and assumptions used by other MPOs, Caltrans, and ARB
- ✓ Acquire new data (e.g., Lyft data)
- ✓ Develop new model (AT model)
- ✓ Estimate program impacts on VMT and GHG

Model, Tools & Analyses for Draft 2016-2040 RTP/SCS

❖ Overview Model, Tools, Off-Model Analysis

- ✓ Trip Based Model (TBM)
- ✓ Scenario Planning Model (SPM)
- ✓ Off-Model

❖ TBM Assumptions/Model Set-up

- ✓ Auto Operation Costs
- ✓ TDM

❖ Off-Model Methodology in Detail

- ✓ AT/Transit
- ✓ Ride Sourcing/TNC
- ✓ Car Sharing
- ✓ PEV/NEV

❖ Output from TBM and SPM

- ✓ TBM
- ✓ SPM

Auto Operating Cost

Overview

✓ Auto Operating Cost (AOC) for Modeling

- Fuel (primarily gasoline) cost
- Other out-of-pocket costs (repairs, maintenance, tires, accessories)
- Does not include insurance and depreciation

✓ Big 4 MPO Agreement

- Base year gas price from Oil Price Information Service (OPIS)
- Future year CA fuel price based on U.S. Department of Energy's 2013 Annual Fuel Forecast (\$5.24/gal in 2040 in 2010\$)
- Non-Fuel Cost based on AAA "YourDrivingCosts" report
- Consistent escalation factors among MPOs
- Fuel Efficiency based on EMFAC 2011 default fuel efficiency for LMDV with Pavley I

Base Year 2012 AOC

AUTO OPERATING COST CALCULATION

Description	Value	Based on
2012 On-road miles/gallon	19.79	MPG for SCAG Region (SCAG Model)
Avg. Year 2012 cents/gallon	408.2	Price & volume sold by fuel grade
Converted to 2011_cents*/gallon	400.0	
Fuel Cost (2011_cents/mile)	20.21	Gallon/mile * cents/gallon
Other Costs (2011_cents/mile)	6.47	Repairs, maint., tires, accessories
Total Cost/Mile (2011 cents)	26.68	
Total Cost/Mile (2011 cents)	26.68	

Future Year AOC (2011\$)

✓ Year 2020

- Fuel price: \$4.48/gal (base fuel price + tax)
- Fleet fuel efficiency: 23.63 mile/gal
- Non-fuel cost: 7.08 cents/mile
- Total cost: 26.04 cents/mile

✓ Year 2040

- Fuel price: \$5.44/gal
- Fleet fuel efficiency: 26.4 mile/gal
- Non-fuel cost: 9.6 cents/mile
- VMT fee: 2.8 cents/mile
- Total cost: 33.0 cents/mile

Transportation Demand Management

TDM – Telecommute and Flexible Work Schedules

National Study of Employers conducted by the Families and Work Institute and the Society for Human Resource Management

“Flex time and place” affects when and/or where employees do their job, such as telecommuting, flex time, and compressed workweeks

Comparing 2008 and 2014, employers are more likely to:

- Allow compressed work week: 38% → 43%
- Allow employees to work some regular paid hours at home occasionally: 50% → 67%
- Allow employees to work some regular paid hours at home regularly: 23% → 38%

Smart Work Principles

- Work occurs at the most effective location and time
- Collaboration and connectivity can happen virtually everywhere
- Space is allocated to activities, not individuals
- Performance focuses on outcomes, not presence
- Flexibility accommodates/attracts a new generation of workers

Draft 2016-2040 RTP/SCS Strategies

Updated strategies based on the 2012-2035 RTP/SCS

Assumes continued growth in workplace flexibility, with incentives

Telecommute

- 2% of workers in 2007, up to 3% in 2014 (American Community Survey)
- RTP/SCS assumes 10% of workers will telecommute regularly in 2040
- \$200 million incentive program

Compressed workweeks

- 4% of workers on a modified schedule in 2008 (2010 Employee Commute Reduction Survey)
- RTP/SCS assumes 15% of workers on a modified schedule in 2040
- \$250 million incentive program

Parking subsidies to shift solo drivers to carpool

- Affecting 218,000 solo drivers in 2040
- \$1.2 billion per 5 years incentive program

Model, Tools & Analyses for Draft 2016-2040 RTP/SCS

1. Overview Model, Tools, Off-Model Analysis
 - ✓ Trip Based Model (TBM)
 - ✓ Scenario Planning Model (SPM)
 - ✓ Off-Model

2. TBM Assumptions/Model Set-up
 - ✓ Auto Operation Costs
 - ✓ TDM

3. Off-Model Methodology in Detail
 - ✓ Active Transportation
 - ✓ Ride Sourcing/TNC
 - ✓ Car Sharing
 - ✓ ZEV/NEV

4. Output from TBM and SPM
 - ✓ TBM
 - ✓ SPM

Presentation Outline

- Active transportation
- Ridesourcing/transportation network companies
- Car sharing
- Zero Emission Vehicle/NEV

Active Transportation

Overview

- 2012 RTP applied model-wide reduction for active transportation investment
 - Based on approach used by SANDAG
- Existing SCAG tools (SPM, Travel Model) provide auto and transit trips but not walking and biking
- SCAG commissioned an effort to develop a separate model which predicts walking and biking trips to complement SPM and Travel Model

Project Goals

- Develop methodology to augment existing SPM by:
 - Enhance sensitivity to **active transportation** investment
 - Provide means to forecast benefit **without precision of detailed network** (since many communities do not have plans)
- Ensure applicability across SCAG region
- Limited to available data **on hand**
 - SPM, Travel Model, SCAG GIS
- Develop quantitative relationships wherever possible for local conditions

Integration with SPM

- SCAG requested we work with SPM by integrating with the existing land use and demographic data
- Key variables in the SPM include:
 - Population
 - Employment
 - Placetypes
 - Intersection density
 - Transit stops

Household Travel Survey

- California Household Travel Survey (CHTS) was selected to develop a mode share model
- About 100K trip records (individual trips) for the SCAG region
- 80% are auto trips, 20% are other modes
- Trip Length by mode is also reported
- Includes trips of all types (work, non-work, social, etc)

Key Observations

- Walking makes up roughly 90% of active transportation trips.
- Significant variation in walking and biking by land use
 - Active transportation ranged from less than 10% to more than 40% of mode share
- Key transportation factors
 - Bike lanes
 - Sidewalks
 - Roadway speed
 - Transit stops
 - Intersection density (crosswalk frequency)

Grouping	Place Types	Observed AT Mode Share		
		Range	Average	Median
1	City Mixed Use, City Residential, Town Mixed Use, Urban Commercial, Urban Mixed Use, High Intensity Activity Center	25-44%	30%	27%
2	Village Commercial, Town Residential, Village Mixed Use, City Commercial, Town Commercial, Urban Residential, Industrial/Office/Residential Mixed High	18-27%	23%	24%
3	Neighborhood Residential, Village Residential, Campus Residential, Institutional, Suburban Multi-Family	14-23%	20%	20%
4	Neighborhood Low, Suburban Mixed Residential, Middle Intensity Activity Center, Industrial/Office/Residential Mixed Low, Office Focus	13-18%	15%	16%
5	Residential Subdivision, Low Intensity Retail Centered Neighborhood, Parks Open Space, Mixed Office and R&D, Low Density Employment Park	8-12%	11%	10%
6	Retail Strip Mall/Big Box, Office/Industrial, Industrial Focus, Large Lot Residential, Rural Residential, Rural Employment, Rural Ranchettes, Military	7-10%	8%	8%

Western LA Place Type Distribution

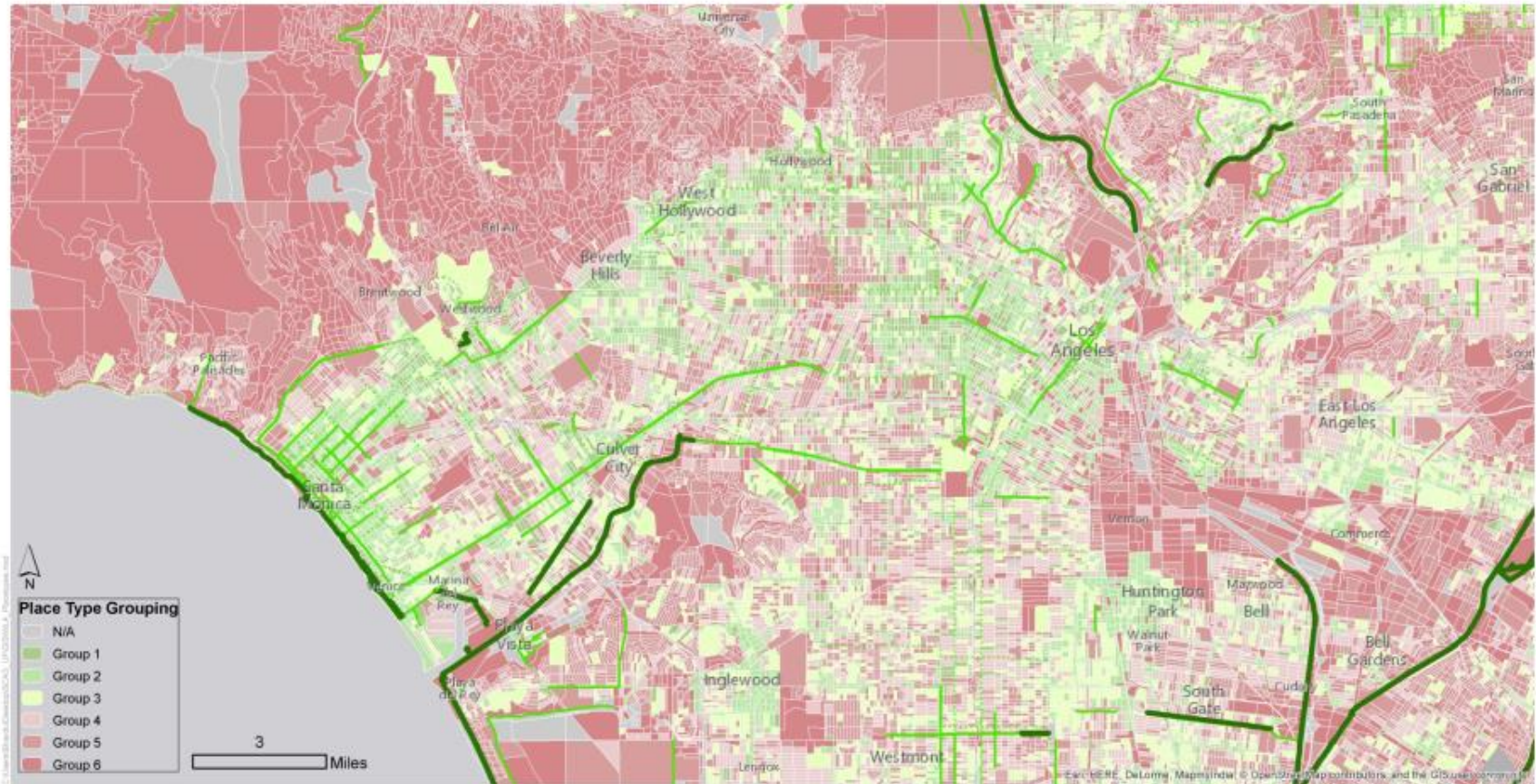


Figure 1
West Los Angeles Place Type Grouping

Pasadena Place Type Distribution

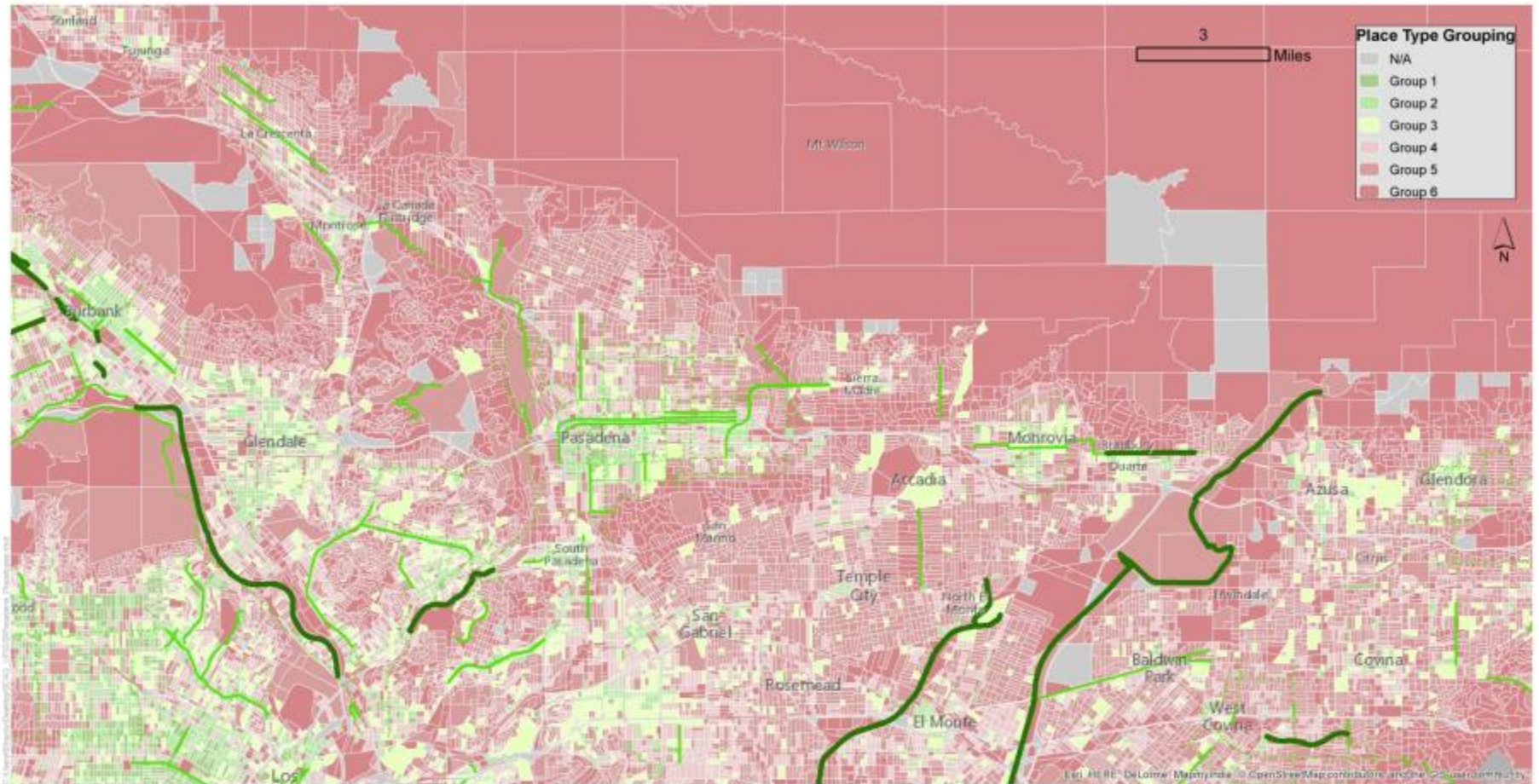


Figure 2
Pasadena Place Type Grouping

Long Beach Place Type Distribution

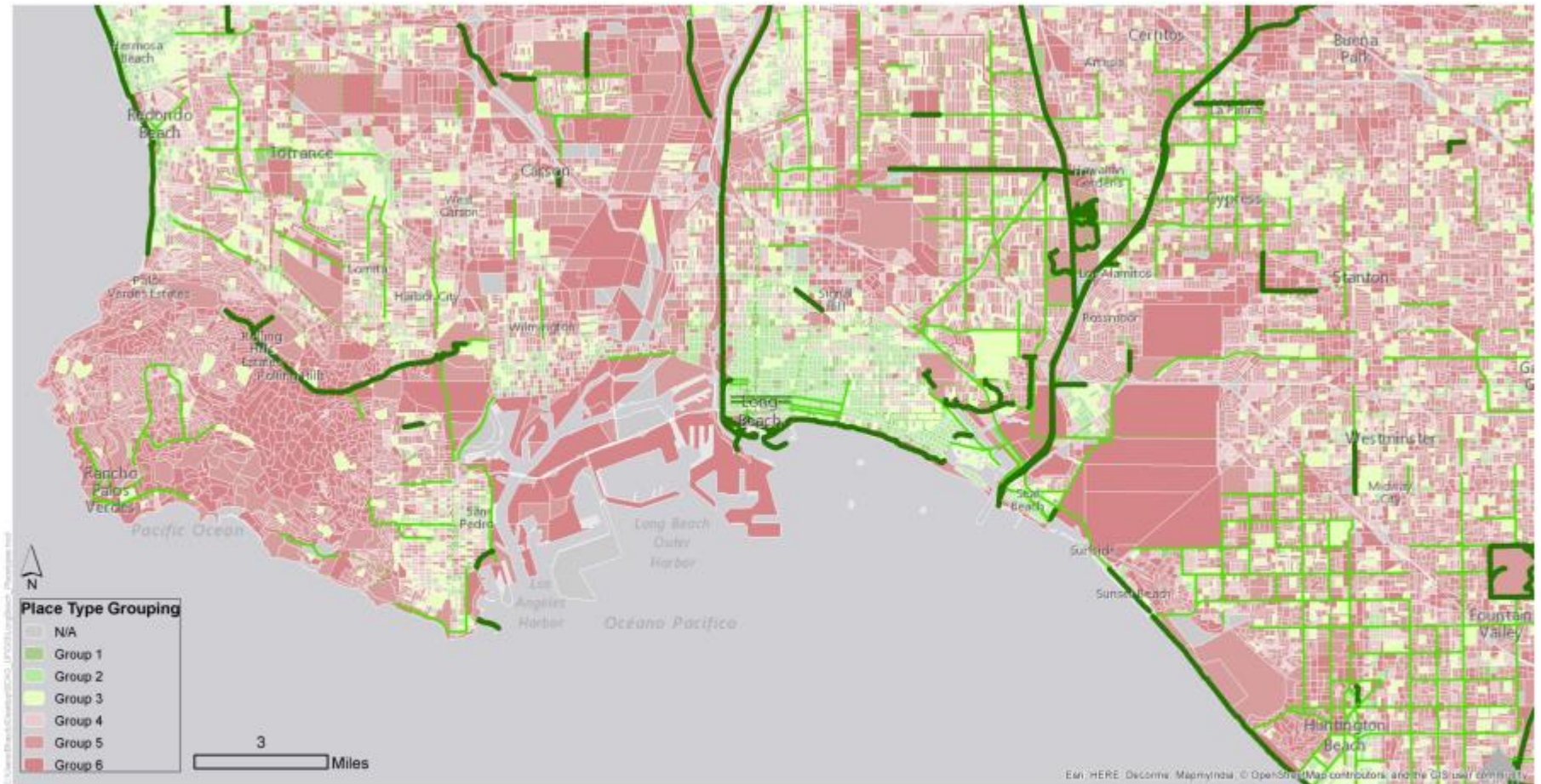


Figure 3
Long Beach Place Type Grouping



Riverside Place Type Distribution

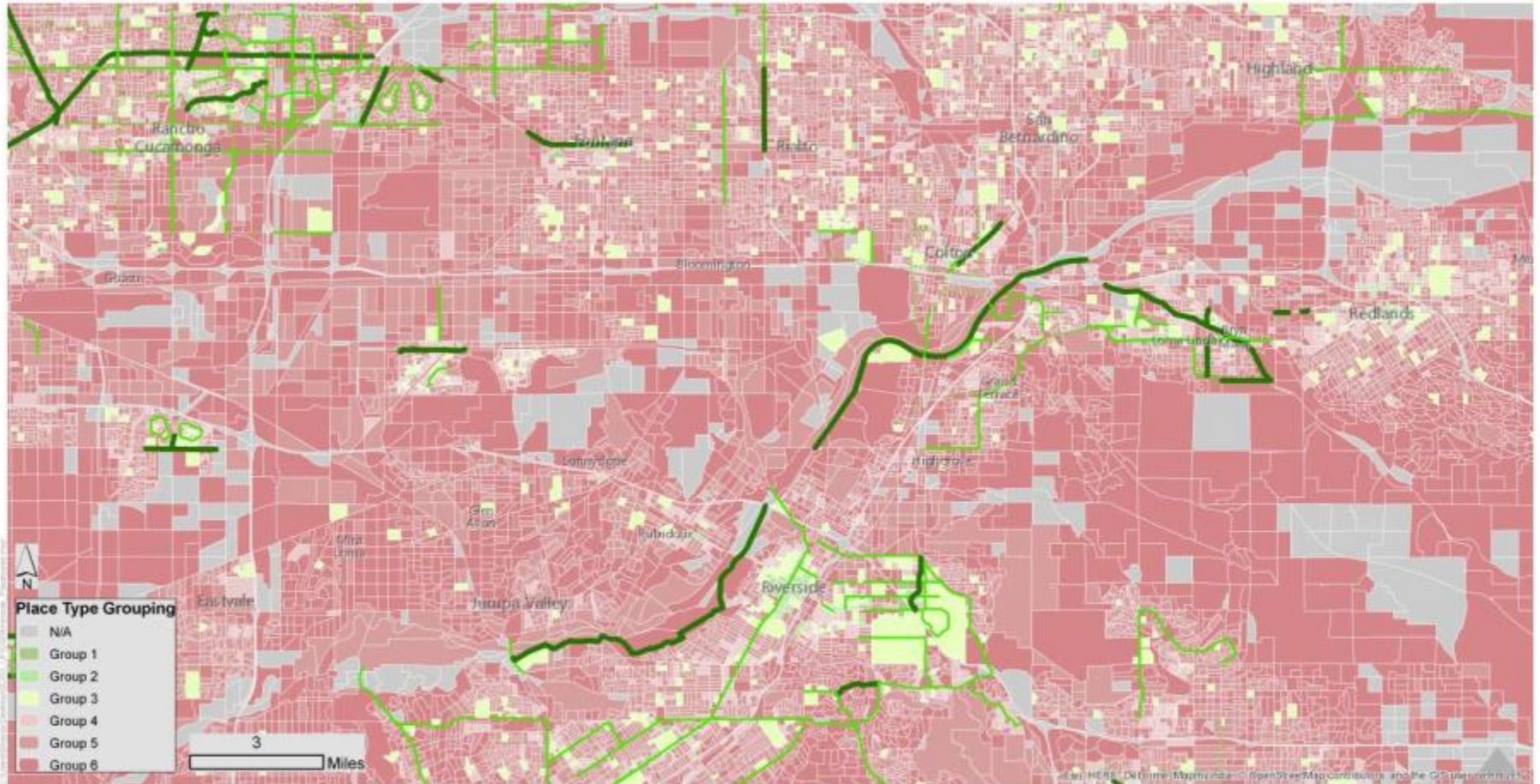


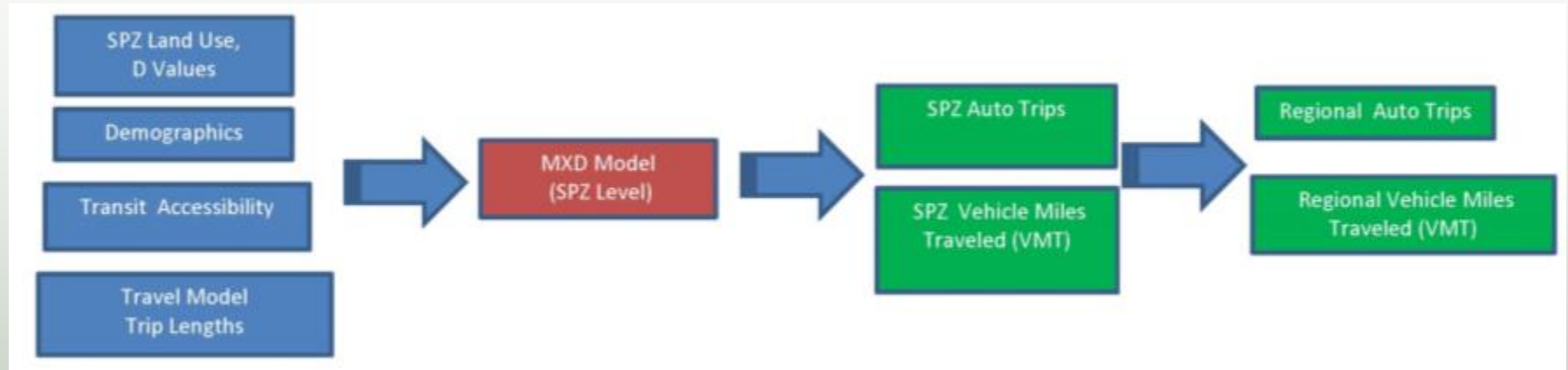
Figure 5
Riverside Place Type Grouping



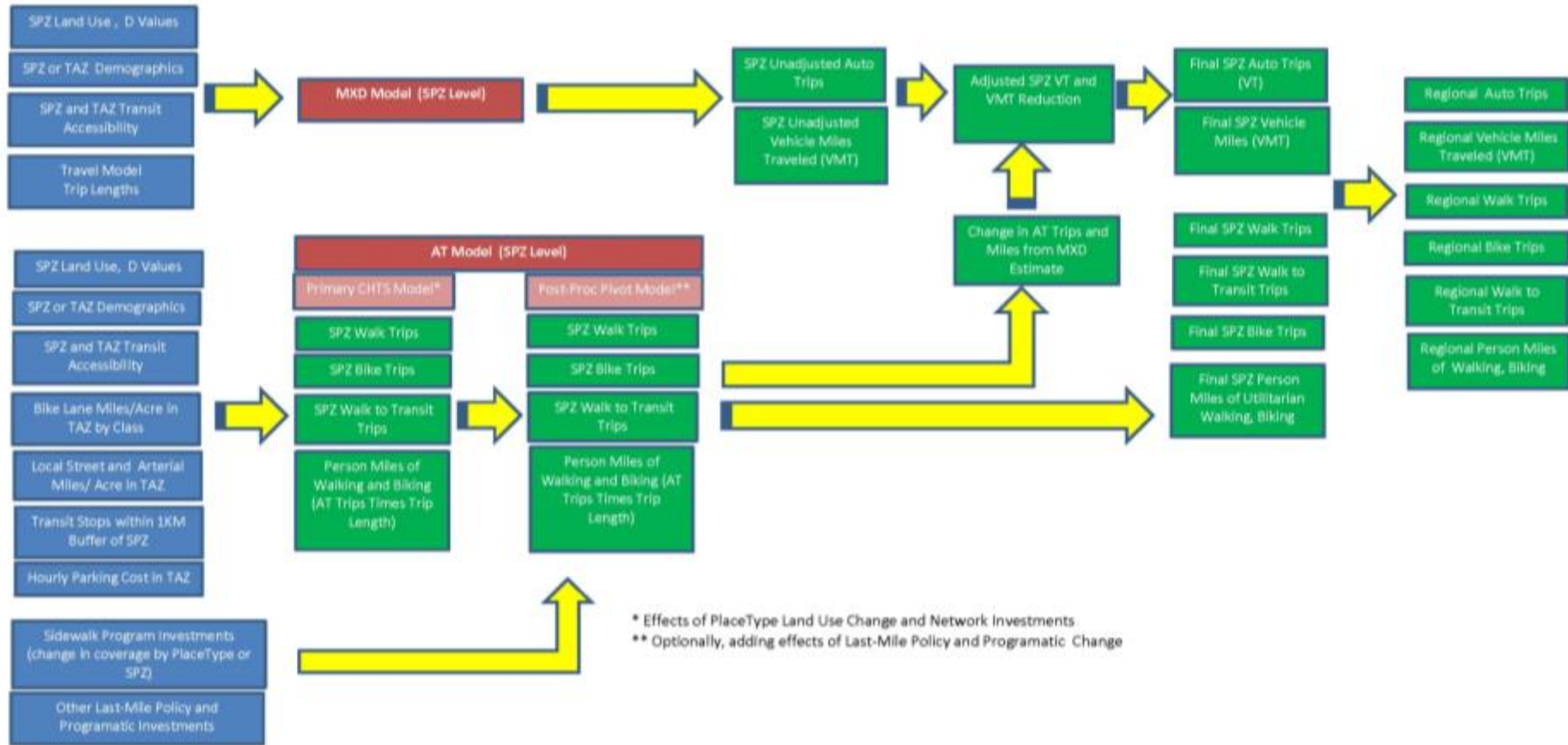
Trip Lengths

Place Type Grouping	Place Types	Walk Trip Length	Bike Trip Length
1	City Mixed Use, City Residential, Town Mixed Use, Urban Commercial, Urban Mixed Use, High Intensity Activity Center	0.5	2.5
2	Village Commercial, Town Residential, Village Mixed Use, City Commercial, Town Commercial, Urban Residential, Industrial/Office/Residential Mixed High	0.5	2
3	Neighborhood Residential, Village Residential, Campus Residential, Institutional, Suburban Multi-Family	0.5	2
4	Neighborhood Low, Suburban Mixed Residential, Middle Intensity Activity Center, Industrial/Office/Residential Mixed Low, Office Focus	0.5	3
5	Residential Subdivision, Low Intensity Retail Centered Neighborhood, Parks Open Space, Mixed Office and R&D, Low Density Employment Park	0.7	2.5
6	Retail Strip Mall/Big Box, Office/Industrial, Industrial Focus, Large Lot Residential, Rural Residential, Rural Employment, Rural Ranchettes, Military	0.7	3

Existing SPM Process



SPM Enhancement



Transportation Only Improvements

- Transportation only factors include:
 - Bike lane density
 - Percent of roadways with sidewalks
 - Transit stops
 - Intersection density
 - Network density of lower speed roads (25 mph)
 - Network density of higher speed roads (35 mph)
 - Parking costs

Implementing Transportation Only Improvements

- Change in either bike lane density or percent of roads with sidewalks or both
- First Mile/Last Mile
 - Likely both but perhaps mostly sidewalks
 - Could also be modeled through changes in transit stops or land uses
- Additional bike infrastructure
 - Will increase bike lane density directly, which will lead to increased biking trips

Proposed Approach

- Use the AT Model to directly forecast changes in active transportation behavior occurring through changes in the land use and AT investments
- Track changes in overall trips and VMT

Ridesourcing/TNC's

Ridesourcing

- Using Lyft and Uber for personal mobility
- New mode of travel
- Limited empirical data on usage and short-term/long-term effects
- No way to directly model within SPM or Travel Model

How Ridesourcing Might Reduce VMT

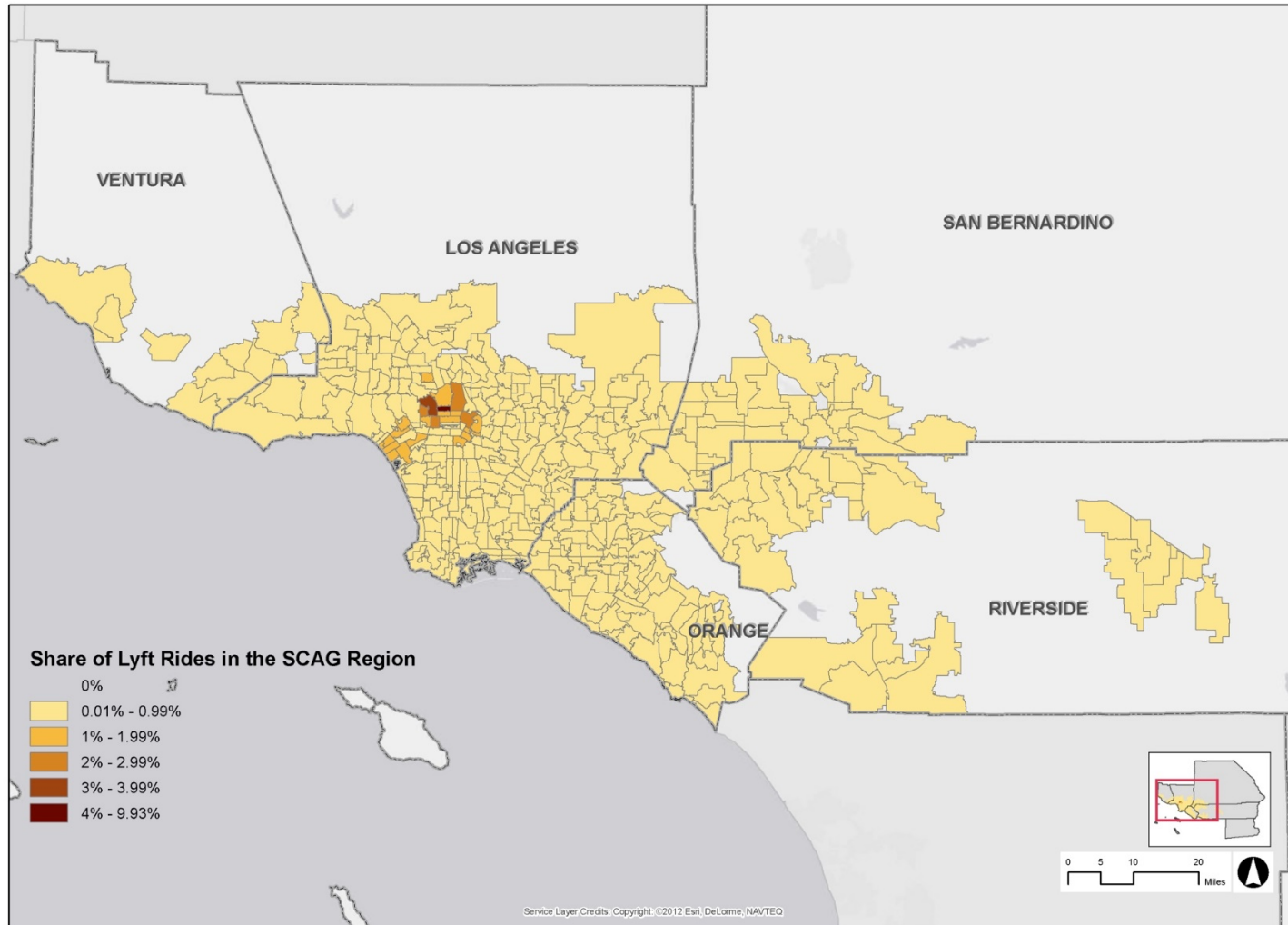
- Reducing the need to circulate for parking spaces
- Enhancing connections to transit
- Encouraging carpooling (Uber Pool, Lyft Line)
- Replacing private employer transportation system (Lyft for Work)

Local Data

- Lyft provided maps of locations where a person used their services
- Most commonly used in Western LA but some limited use throughout region

Lyft Data

Share of Lyft Rides in the SCAG Region by Zip Code from May 12 to June 10, 2015



Source: SCAG, 2015 | Date: 7/7/2015

P:\Siyuan Yin\Lyft heat map\Share of Lyft Rides in SCAG Region by Zip Code_v2.mxd

Analysis

- GIS overlay of Lyft data onto the Active Transportation Place Type Groupings (1 through 6)
 - 1 is the most dense, with the highest density and mixed use (Town Centers, Downtowns, etc.)
 - 6 are rural areas
- Over ½ of all lift rides occurred in the top 3 Place Types Groupings, which account for only 20% of all of the TAZ's in the Travel Model
- Use in suburban and rural areas is intermittent

Grouping	Place Types	% of Rides	% of TAZ's
1	City Mixed Use, City Residential, Town Mixed Use, Urban Commercial, Urban Mixed Use, High Intensity Activity Center	13%	2%
2	Village Commercial, Town Residential, Village Mixed Use, City Commercial, Town Commercial, Urban Residential, Industrial/Office/Residential Mixed High	22%	9%
3	Neighborhood Residential, Village Residential, Campus Residential, Institutional, Suburban Multi-Family	14%	12%
4	Neighborhood Low, Suburban Mixed Residential, Middle Intensity Activity Center, Industrial/Office/Residential Mixed Low, Office Focus	18%	17%
5	Residential Subdivision, Low Intensity Retail Centered Neighborhood, Parks Open Space, Mixed Office and R&D, Low Density Employment Park	20%	36%
6	Retail Strip Mall/Big Box, Office/Industrial, Industrial Focus, Large Lot Residential, Rural Residential, Rural Employment, Rural Ranchettes, Military	10%	24%

Proposed Approach

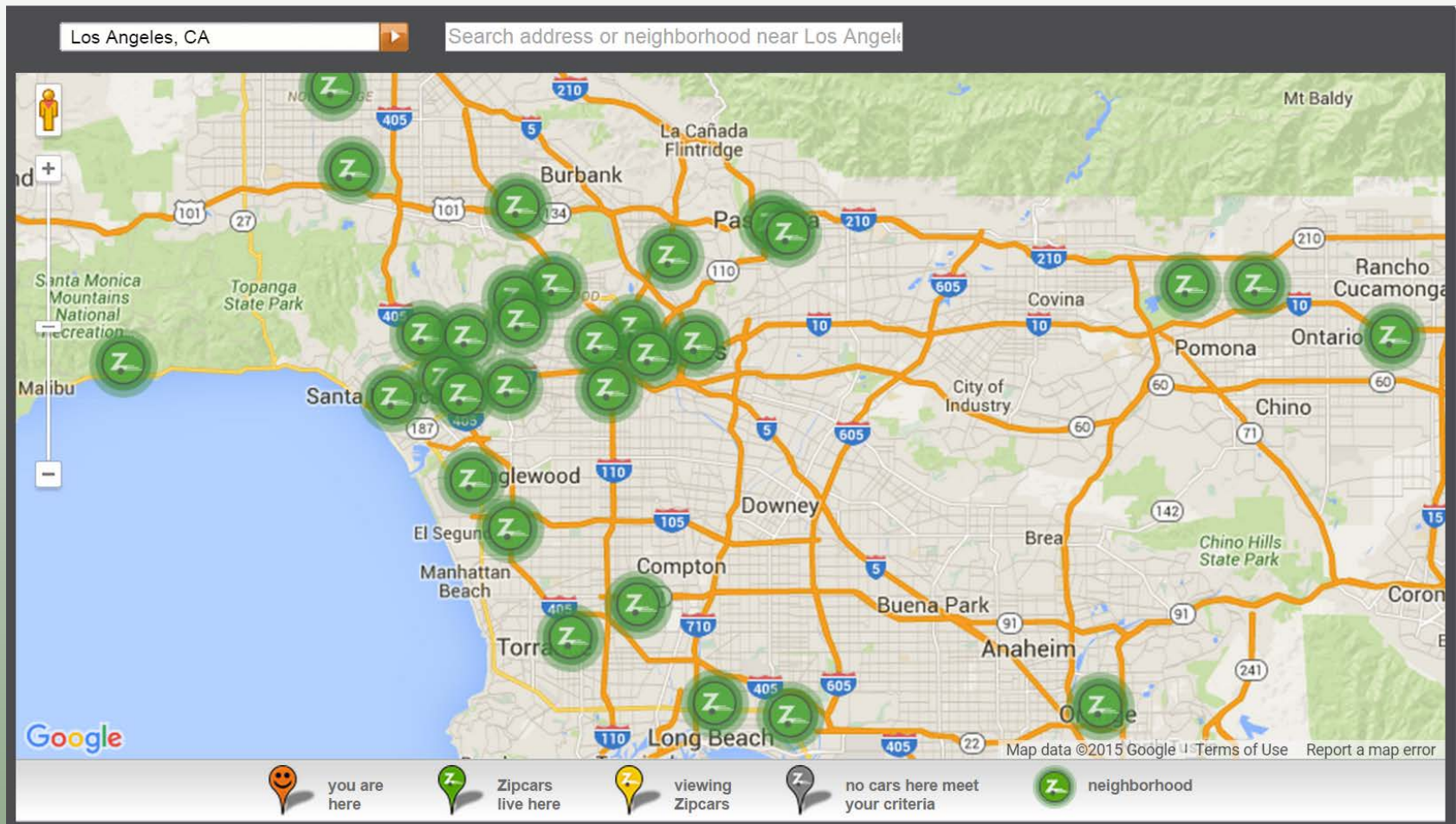
- Identify future areas with land use characteristics where TNC use is currently the highest
 - Place Types 1 through 3
- Identify a VMT reduction associated with a reduction in auto ownership
- Apply that VMT reduction only to trips generated within these Place Type areas
- No VMT reduction for suburban or rural areas

Car Sharing

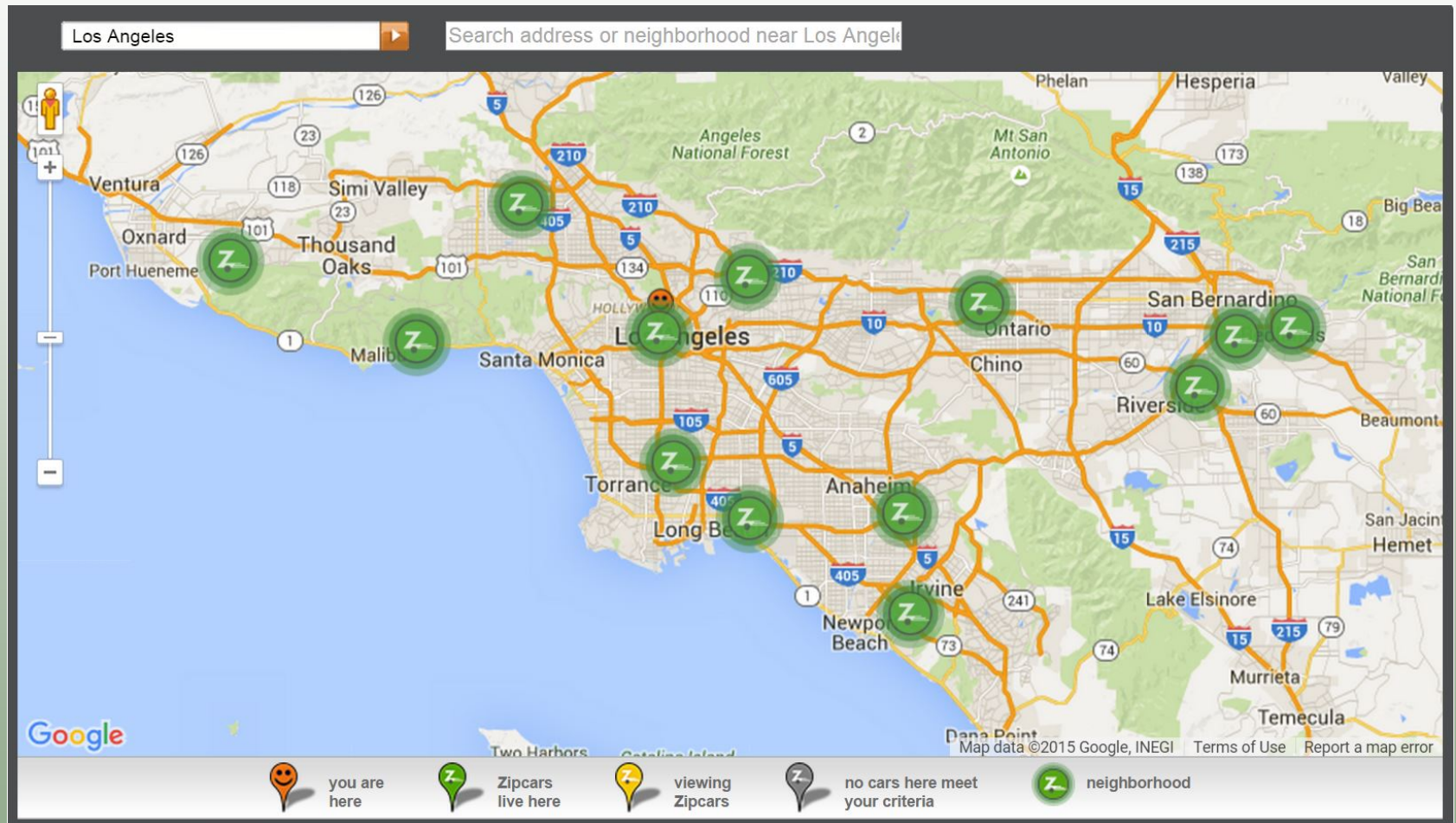
Car Sharing

- Different from TNC's
- ZipCar, Car2Go
- Use of a shared vehicle through either a formal or informal agreement
- Car sharing begin in the 2000's
- 800,000 people in the US belong to car sharing services
- 285 Cars, at 139 locations (Pods) in SCAG Region.
- Predominantly Zipcar, also includes entry of Enterprise hourly rentals

Car Sharing in LA County



Car Sharing in SCAG Region



How Car Sharing Reduces VMT

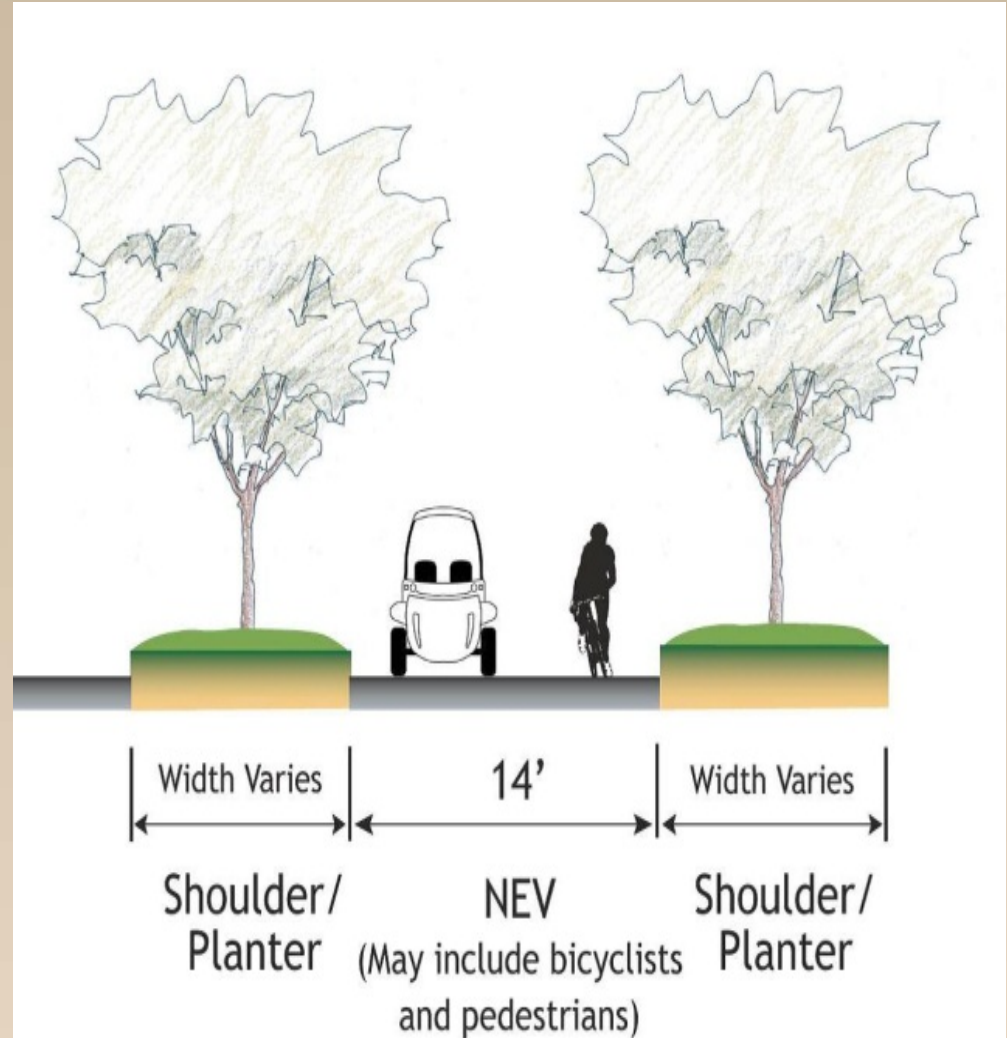
- Car sharing has been studied extensively over the past 10 years, however results often misapplied
- Car sharing reduces auto ownership within houses that participate in the program, ***within dense areas***
- 2 car households often become 1
- 1 car households transition to 0 car households
- Reduction in VMT per household that participates ranges from 20-30%
- Challenge is assessing participation rate
- May also overlap with TNC usage

Proposed Approach

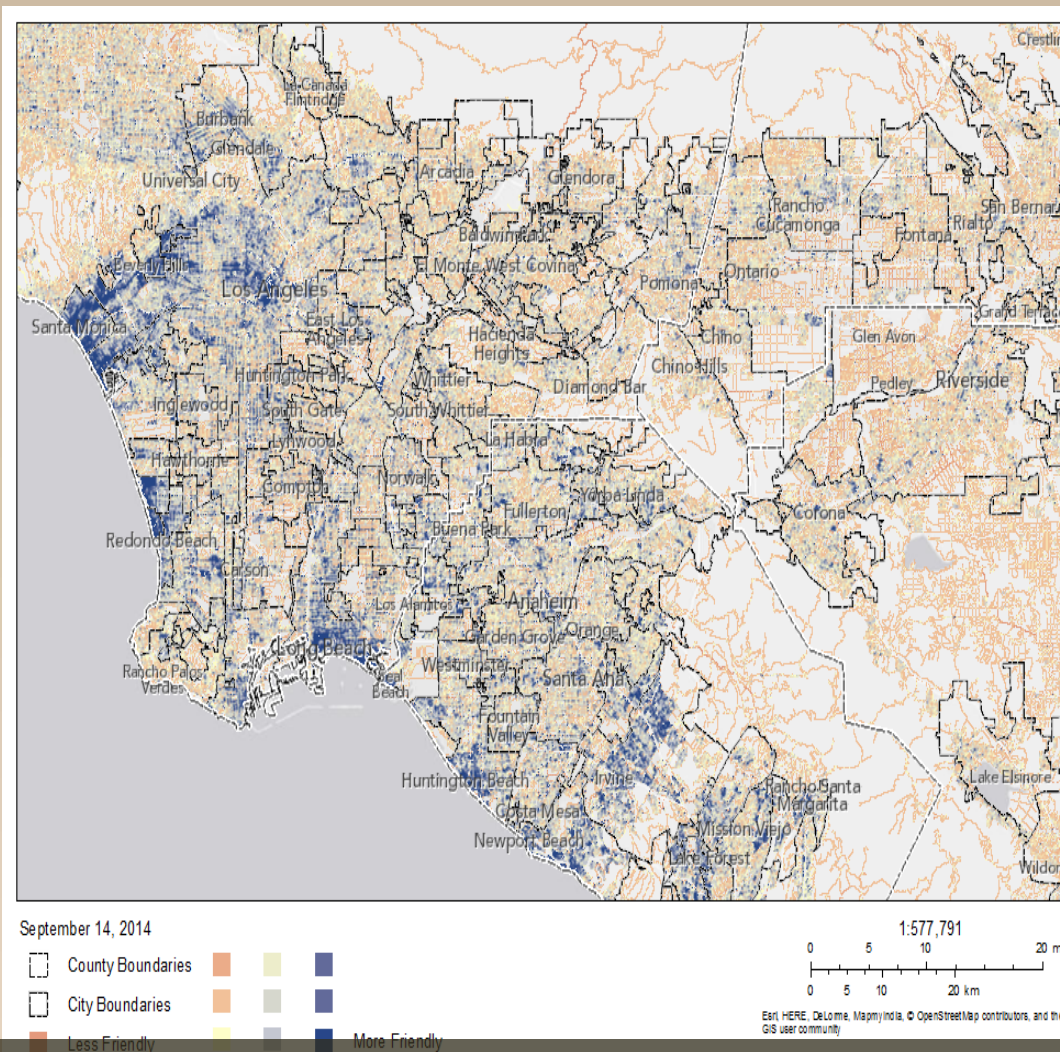
- Identify locations where car sharing may occur at the highest levels
- Would be based on similar locations or areas where TNC usage is the highest
 - More dense and mixed-use areas (Place Types 1 through 3)
- SCAG staff would estimate participation rate for each of these areas
- VMT reduction would be function of participation rate times VMT reduction

Zero Emission Vehicles (ZEV) & Neighborhood Electric Vehicles (NEV)

Neighborhood Electric Vehicles (NEVs) & Low Speed Lanes



Neighborhood Electric Vehicles (NEVs) & Low Speed Lanes



NEV Usage

- Identify those TAZ's within NEV Friendly Districts
- NEV Friendly districts occupy about 10% of the total SCAG area, mostly in LA and OC
- Estimate percentage of households using NEV's
 - Initial assumption will be modest level of penetration (1 household in 10)
- Apply VMT reduction to households using VMT
- Reduce TAZ-wide VMT by this factor

2016 RTP/SCS: Zero Emissions Vehicles & Charging Infrastructure

Goals

- Incentivize over 380,000 Level 1 & 2 Charging stations by 2040
- Increase Electric Range of Plug-in Hybrid Evs (PHEVs)
- Increase access to charging in Urban & Compact Areas from 0.1% to 7.9% of HH & Emp.



2016 RTP/SCS: Zero Emissions Vehicles & Charging Infrastructure

Assumptions

- Total EV fleet in 2035 and 2040 are based on EMFAC2014
- Only PHEV from household with 2 and 2+ vehicles claim this benefit
- % of VMT reduction = % of PHEV that eligible for benefit.

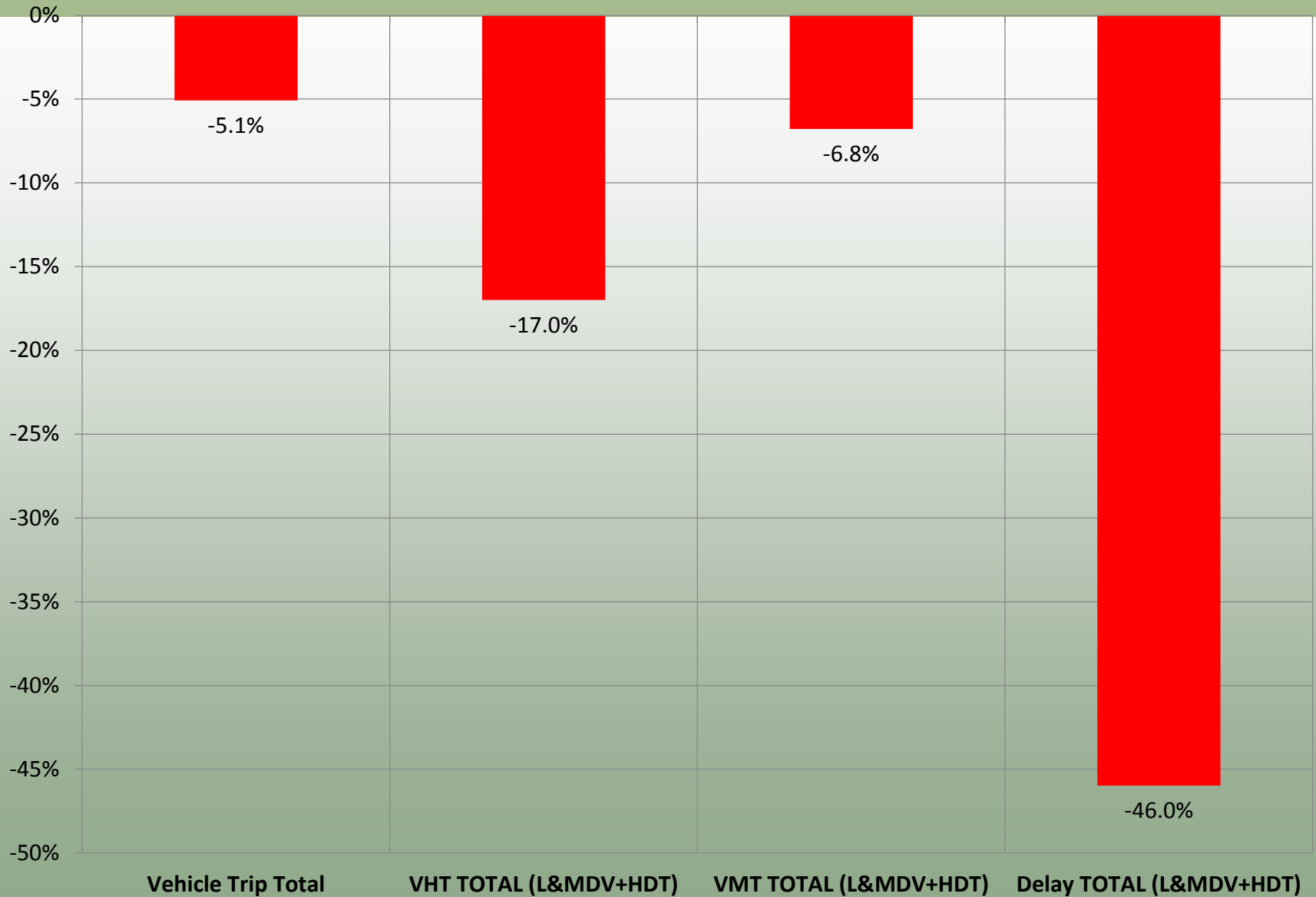
Methodology

- Estimate total annual number of EV fleet for each calendar year.
- Estimate number of household with 2 and 2+ vehicles based on the SCAG Regional Travel Demand Model output.
- Number of PHEV that eligible for additional benefit = Total annual PHEV fleet x % of Household with 2 and 2+ vehicles
- Calculate percentage of the eligible EV to the total vehicle fleet and increase by 10%

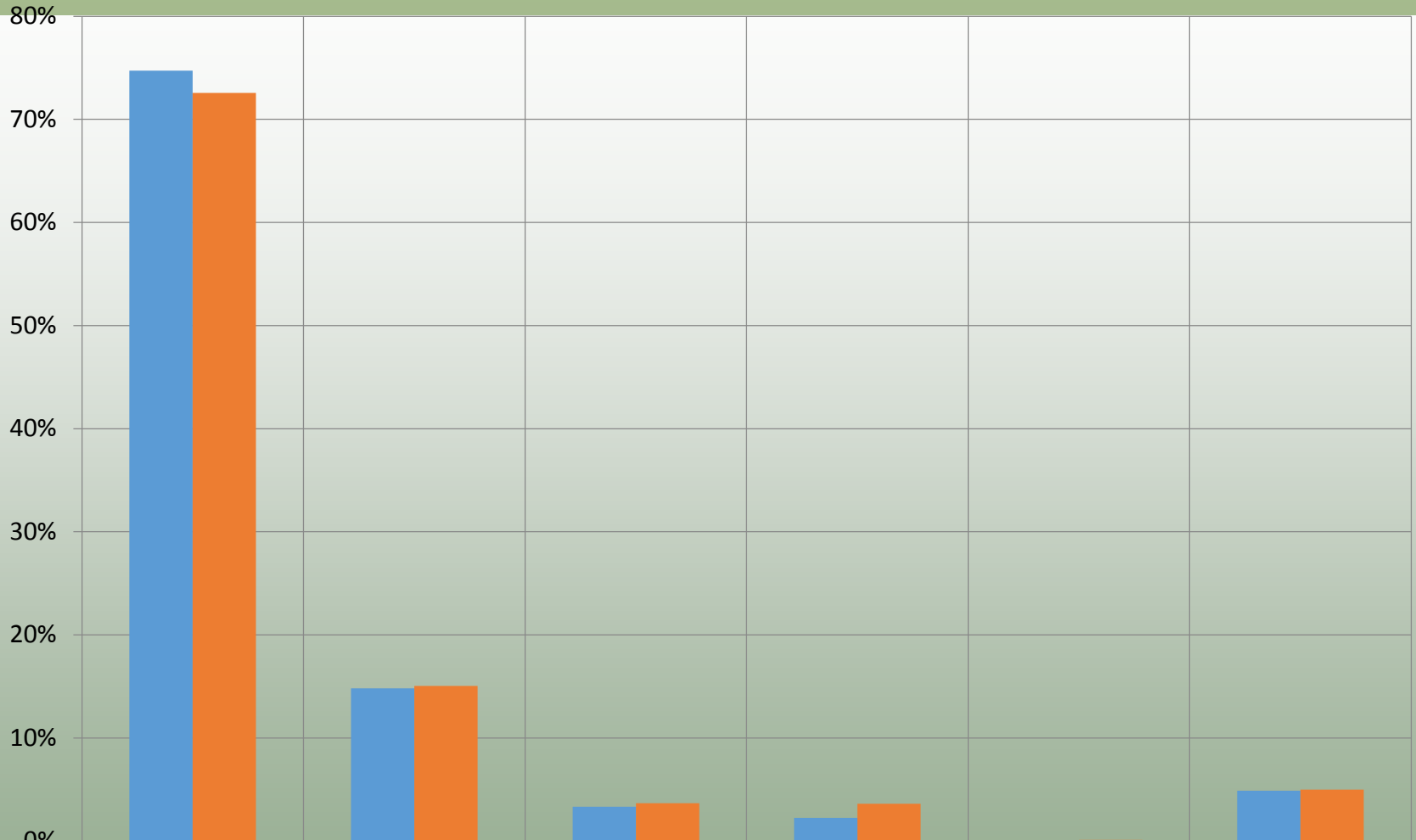
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Percent Changes - Draft 2016-2040 RTP/SCS Vs. Baseline

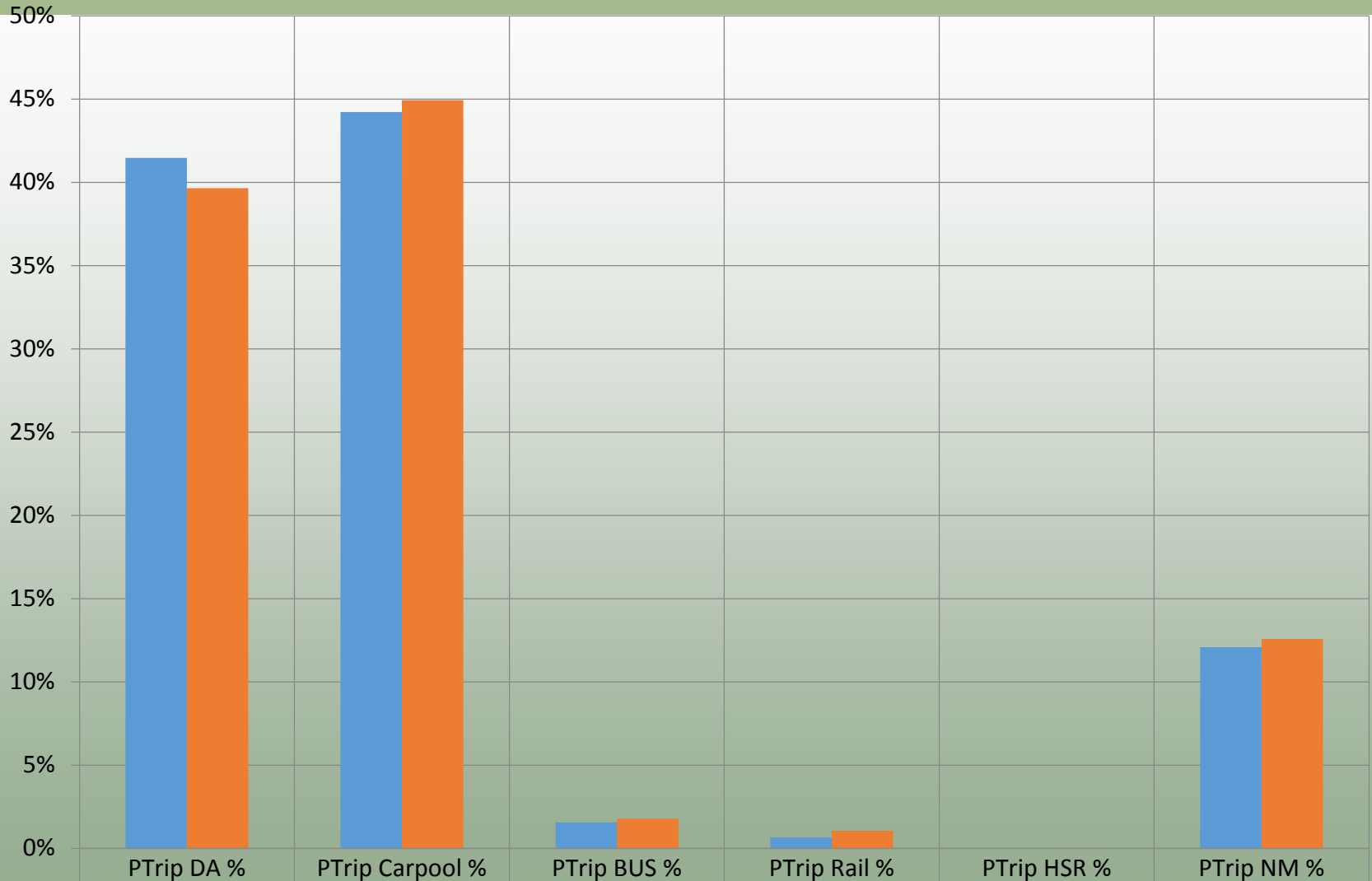


Mode Choice: Work Trip



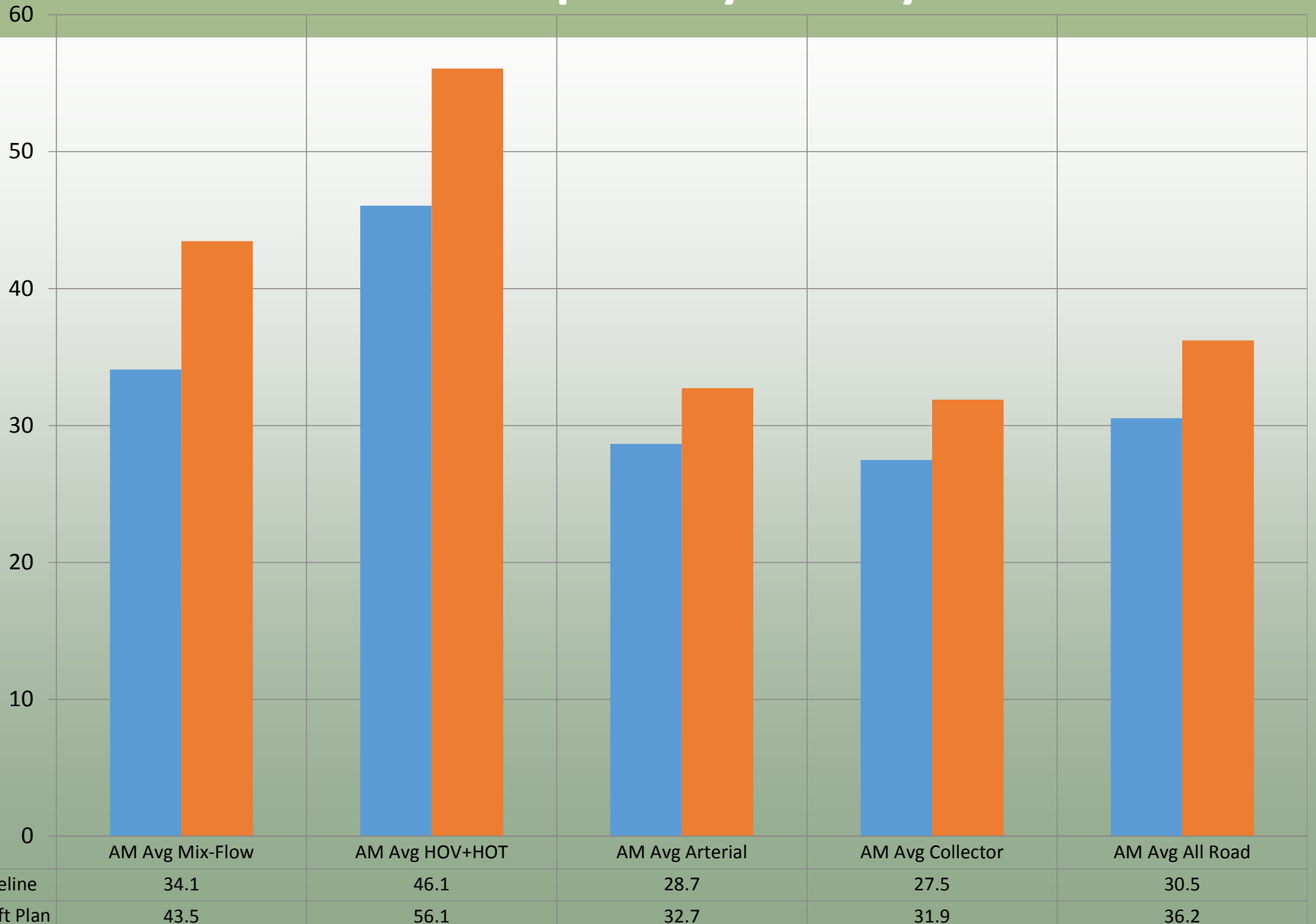
	HBW PTrip DA %	HBW PTrip Carpool %	HBW PTrip BUS %	HBW PTrip Rail %	HBW PTrip HSR %	HBW PTrip NM %
Baseline	74.7%	14.8%	3.3%	2.3%	0.0%	4.9%
Draft Plan	72.5%	15.0%	3.7%	3.6%	0.1%	5.0%

Mode Choice: All Trips

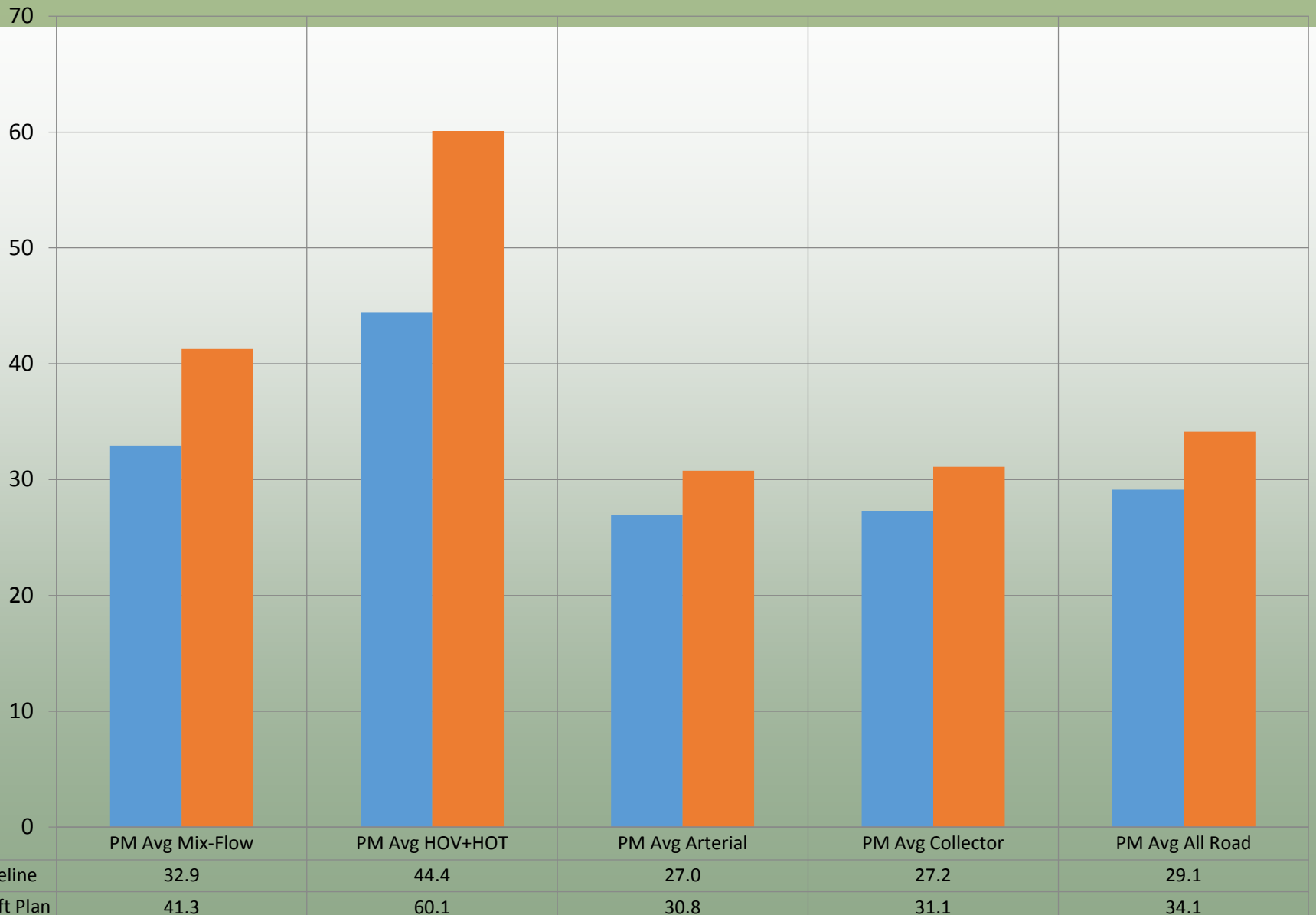


Baseline	41.5%	44.2%	1.6%	0.7%	0.0%	12.1%
Draft Plan	39.7%	44.9%	1.8%	1.1%	0.02%	12.6%

AM Peak Speed by Facility



PM Peak Speed by Facility

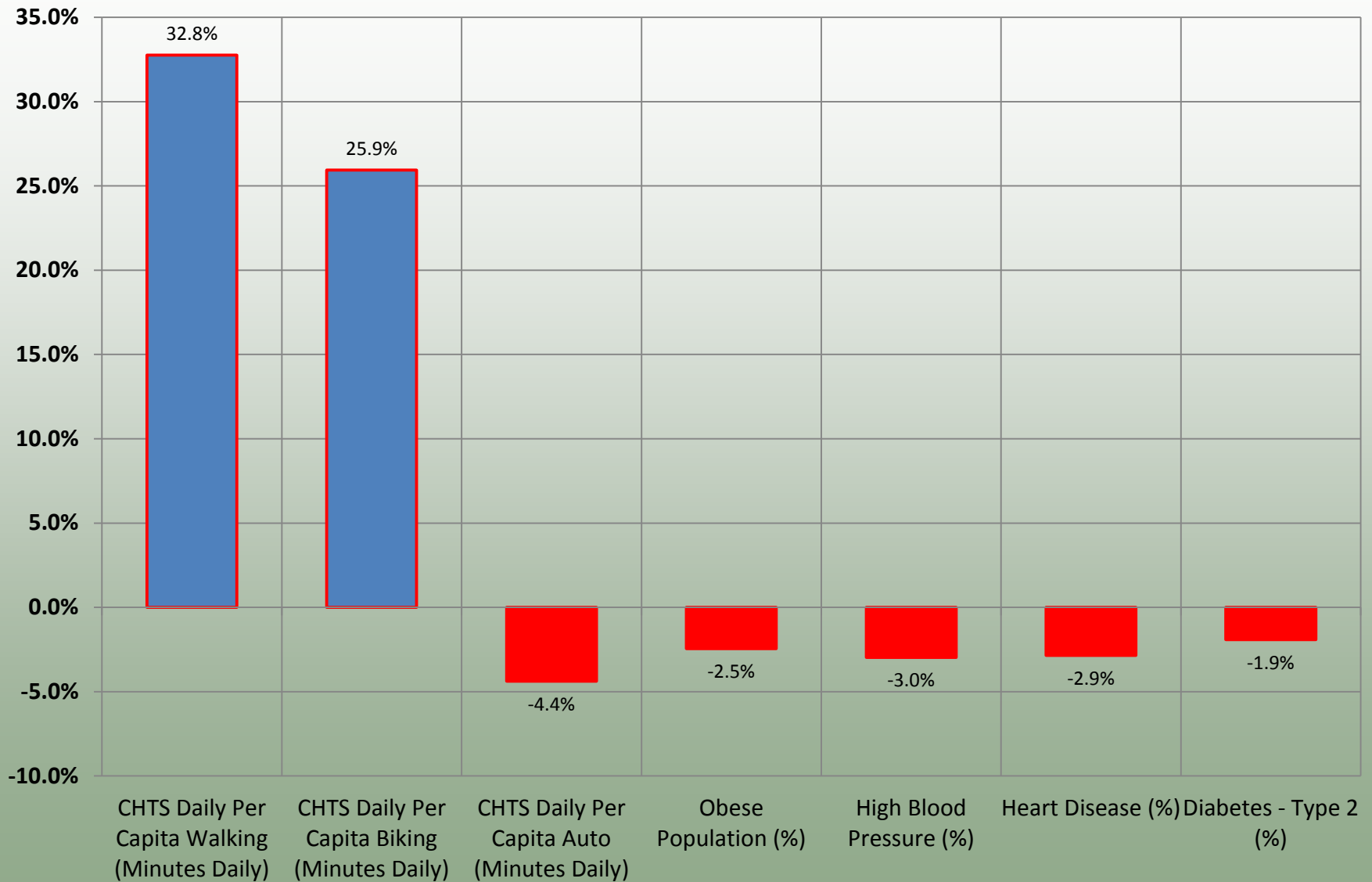


Preliminary Scenario Performance: Co-Benefits *Reduction from Baseline*

Alternative/ Co-Benefits	Baseline (S1)	S2	Draft Plan (S3)	S3B (DPEIR Right Bookend)
Land Consumption	N/A	-10 %	-23 %	-41 %
Respiratory Health Cost	N/A	-9 %	-13 %	-18 %
Fiscal Impacts (O&M+ Capital)	N/A	-6 %	-8 %	-10 %
Building Energy Use, cumulative (2012-2040)	N/A	-2 %	-4 %	-5 %
Building Water Use, cumulative (2012-2040)	N/A	-0.4 %	-0.6 %	-0.9 %
Per Household Transportation Costs (fuel + auto)	N/A	-9 %	-13 %	-18 %
Per Household Utilities Costs (energy + water)	N/A	-4 %	-9 %	-11 %

Draft 2016-2040 RTP/SCS Public Health Outcomes

Draft Plan vs. Baseline in 2040 for Adults 18-65



DRAFT

2016
2040 **RTPSCS**

QUESTIONS & DISCUSSIONS

THANK YOU

October 15, 2015

	A	B	C	D	E	F
1	Selected Trip Based Model Output					
2		2012 Base Year	2040 Baseline	2040 Draft Plan	Draft Plan change from Base Year (%)	Draft Plan Changes from Baseline (%)
3						
4	Highway Network					
5	Lane-Mile					
6	Lane-Mile FREEWAY	11,372	11,668	12,705	11.7%	8.9%
7	Lane-Mile HOT	-	91	885	na	871.9%
8	Lane-Mile HOV	938	988	872	-7.0%	-11.8%
9	Lane-Mile ARTERIAL	36,225	36,467	40,082	10.6%	9.9%
10	Lane-Mile COLLECTOR	22,354	22,481	23,997	7.3%	6.7%
11	Lane-Mile TOTAL	70,904	71,710	78,819	11.2%	9.9%
12						
13	Capacity-Mile					
14	Capacity-Mile FREEWAY	510,595,635	523,747,635	569,458,285	11.5%	8.7%
15	Capacity-Mile HOT	-	4,144,847	40,440,479	na	875.7%
16	Capacity-Mile HOV	42,926,593	45,260,230	40,055,792	-6.7%	-11.5%
17	Capacity-Mile ARTERIAL	686,719,997	692,183,511	791,582,654	15.3%	14.4%
18	Capacity-Mile COLLECTOR	450,589,271	452,332,836	481,521,378	6.9%	6.5%
19	Capacity-Mile TOTAL	1,691,479,177	1,718,316,741	1,935,779,497	14.4%	12.7%
20						
21	Transit Network					
22	Transit Route Mile					
23	RouMile Commuter Rail	861	885	913	6.0%	3.2%
24	RouMile Local Rail	80	107	203	152.7%	88.9%
25	RouMile BRT	20	20	20	0.0%	0.0%
26	RouMile MTA ExpressBus	66	66	98	48.4%	48.1%
27	RouMile LADOT Commuter Express	310	310	310	0.0%	0.0%
28	RouMile Other Express Bus	1,295	1,296	1,777	37.2%	37.1%
29	RouMile Transitway Bus	654	654	677	3.6%	3.6%
30	RouMile MTA Local Bus	2,402	2,405	2,409	0.3%	0.2%
31	RouMile Muni-Local Bus	2,378	2,378	2,382	0.2%	0.1%
32	RouMile Other Local Bus	5,409	5,410	5,412	0.0%	0.0%
33	RouMile Rapid Bus	376	412	881	134.2%	113.8%
34	RouMile TOTAL	13,851	13,943	15,130	9.2%	8.5%
35						
36	Transit Revenue Mile					
37	RvnMile Commuter Rail	13,712	16,913	29,750	117.0%	75.9%
38	RvnMile Local Rail	20,125	27,632	61,658	206.4%	123.1%
39	RvnMile BRT	6,036	6,036	6,036	0.0%	0.0%
40	RvnMile MTA ExpressBus	3,702	3,705	6,023	62.7%	62.6%
41	RvnMile LADOT Commuter Express	5,248	5,248	5,248	0.0%	0.0%
42	RvnMile Other Express Bus	28,917	28,944	51,848	79.3%	79.1%
43	RvnMile Transitway Bus	29,945	29,953	31,132	4.0%	3.9%
44	RvnMile MTA Local Bus	173,493	173,759	173,924	0.2%	0.1%
45	RvnMile Muni-Local Bus	119,519	119,529	122,717	2.7%	2.7%
46	RvnMile Other Local Bus	158,559	158,559	169,357	6.8%	6.8%
47	RvnMile Rapid Bus	43,244	50,030	175,719	306.3%	251.2%
48	RvnMile TOTAL	602,498	620,308	840,349	39.5%	35.5%
49						
50	TRIPS					

	A	B	C	D	E	F
1	Selected Trip Based Model Output					
2		2012 Base Year	2040 Baseline	2040 Draft Plan	Draft Plan change from Base Year (%)	Draft Plan Changes from Baseline (%)
51	Total Person Trips (by County)					
52	PTrip Imperial	493,220	813,816	790,282	60.2%	-2.9%
53	PTrip Los Angeles	34,700,327	39,236,510	38,282,416	10.3%	-2.4%
54	PTrip Orange	11,163,715	12,379,041	12,156,474	8.9%	-1.8%
55	PTrip Riverside	7,256,777	10,551,011	10,284,727	41.7%	-2.5%
56	PTrip San Bernardino	6,855,856	9,159,137	9,036,290	31.8%	-1.3%
57	PTrip Ventura	2,913,999	3,392,803	3,321,888	14.0%	-2.1%
58	PTrip SCAG	63,383,894	75,532,319	73,872,077	16.5%	-2.2%
59						
60	Total Person Trips (by Purpose)					
61	PTrip Home Based Work (HBW)	11,160,290	13,106,163	11,662,719	4.5%	-11.0%
62	PTrip HBSC	4,581,798	4,957,503	4,957,503	8.2%	0.0%
63	PTrip HBCU	672,584	707,729	706,744	5.1%	-0.1%
64	PTrip HBSh	4,802,997	5,817,112	5,813,247	21.0%	-0.1%
65	PTrip HBSP	6,541,442	7,734,519	7,751,372	18.5%	0.2%
66	PTrip HBSR	7,380,481	8,910,753	8,853,533	20.0%	-0.6%
67	PTrip HBO	10,456,856	12,660,832	12,590,472	20.4%	-0.6%
68	PTrip OBO	14,565,793	17,579,212	17,478,042	20.0%	-0.6%
69	PTrip WBO	3,221,653	4,058,496	4,058,444	26.0%	0.0%
70	PTrip All Purposes	63,383,894	75,532,319	73,872,077	16.5%	-2.2%
71						
72	HBW Person Trips (Work Trip by Mode)					
73	HBW PTrip Drive Alone (DA)	8,566,154	9,791,729	8,461,263	-1.2%	-13.6%
74	HBW PTrip DA %	76.8%	74.7%	72.5%	-5.5%	-2.9%
75	HBW PTrip Carpool	1,541,516	1,940,630	1,754,168	13.8%	-9.6%
76	HBW PTrip Carpool %	13.8%	14.8%	15.0%	8.9%	1.6%
77	HBW PTrip BUS	312,746	435,837	428,450	37.0%	-1.7%
78	HBW PTrip BUS %	2.8%	3.3%	3.7%	31.1%	10.5%
79	HBW PTrip Rail	221,471	296,145	422,855	90.9%	42.8%
80	HBW PTrip Rail %	2.0%	2.3%	3.6%	82.7%	60.5%
81	HBW PTrip HSR	-	-	13,886	na	na
82	HBW PTrip HSR %	0.0%	0.0%	0.1%	na	na
83	HBW PTrip Non-Motorized (NM)	518,404	641,770	582,127	12.3%	-9.3%
84	HBW PTrip NM %	4.6%	4.9%	5.0%	7.5%	1.9%
85	Total HBW Trip	11,160,291	13,106,111	11,662,749	4.5%	-11.0%
86						
87	Total Person Trips (All Trips by Mode)					
88	PTrip DA	26,598,613	31,323,943	29,291,259	10.1%	-6.5%
89	PTrip DA %	42.0%	41.5%	39.7%	-5.5%	-4.4%
90	PTrip Carpool	27,967,152	33,398,542	33,189,589	18.7%	-0.6%
91	PTrip Carpool %	44.1%	44.2%	44.9%	1.8%	1.6%
92	PTrip BUS	927,801	1,184,104	1,311,342	41.3%	10.7%
93	PTrip BUS %	1.5%	1.6%	1.8%	21.3%	13.2%
94	PTrip Rail	372,638	496,469	776,476	108.4%	56.4%
95	PTrip Rail %	0.6%	0.7%	1.1%	78.8%	59.9%
96	PTrip HSR	-	-	13,895	na	na
97	PTrip HSR %	0.0%	0.0%	0.0%	na	na
98	PTrip NM	7,517,684	9,129,199	9,289,540	23.6%	1.8%

	A	B	C	D	E	F
1	Selected Trip Based Model Output					
2		2012 Base Year	2040 Baseline	2040 Draft Plan	Draft Plan change from Base Year (%)	Draft Plan Changes from Baseline (%)
99	PTrip NM %	11.9%	12.1%	12.6%	6.0%	4.0%
100	Total Person Trip	63,383,888	75,532,257	73,872,101	16.5%	-2.2%
101						
102	Average Person Trip Length					
103	HBW (in Minutes)	27.3	28.4	25.9	-5.4%	-9.1%
104	HBW (in Miles)	15.4	15.1	15.2	-1.4%	1.0%
105	HBNW (in Minutes)	14.5	15.0	14.0	-3.2%	-6.6%
106	HBNW (in Miles)	8.2	8.1	8.2	-0.6%	0.7%
107	NHB (in Minutes)	13.9	13.7	12.6	-9.3%	-7.9%
108	NHB (in Miles)	7.6	7.2	7.0	-6.8%	-1.9%
109	All (in Minutes)	16.6	17.0	15.5	-6.7%	-8.8%
110	All Trips (in Miles)	9.3	9.1	9.0	-3.8%	-1.1%
111						
112	OD Vehicle Trip by Mode					
113	FINAL OD TRIPS (DA)	28,429,124	33,492,340	31,230,376	9.9%	-6.8%
114	FINAL OD TRIPS (SR2 HOV)	532,919	658,782	490,966	-7.9%	-25.5%
115	FINAL OD TRIPS (SR3 HOV)	733,311	909,993	657,312	-10.4%	-27.8%
116	FINAL OD TRIPS (LHDT)	337,741	443,164	446,403	32.2%	0.7%
117	FINAL OD TRIPS (MHDT)	283,557	369,233	372,576	31.4%	0.9%
118	FINAL OD TRIPS (HHDT)	506,583	772,625	776,710	53.3%	0.5%
119	FINAL OD TRIPS (SR2 NONHOV)	4,605,851	5,459,629	5,447,252	18.3%	-0.2%
120	FINAL OD TRIPS (SR3 NONHOV)	4,456,365	5,301,440	5,574,026	25.1%	5.1%
121	Total LMV Trip	38,757,571	45,822,185	43,399,933	12.0%	-5.3%
122	Total HDT Trip	1,127,881	1,585,021	1,595,689	41.5%	0.7%
123						
124	Vehicle Occupancy					
125	HBW Vehicle Persons	10,107,651	11,732,338	10,215,410	1.1%	-12.9%
126	HBW Vehicle Driver	9,177,637	10,558,705	9,150,007	-0.3%	-13.3%
127	HBW Average Vehicle Occupancy	1.1	1.1	1.1	1.4%	0.5%
128						
129	Total Vehicle Persons	54,030,572	64,138,234	61,896,589	14.6%	-3.5%
130	Total Vehicle Driver	36,466,099	43,098,434	40,938,604	12.3%	-5.0%
131	Total Average Vehicle Occupancy	1.5	1.5	1.5	2.0%	1.6%
132						
133	HIGHWAY ASSIGNMENT					
134	L&MDV Avg Speed (SCAG)					
135	Daily					
136	Daily Avg Mix-Flow	45.6	41.8	49.2	8.1%	17.8%
137	Daily Avg HOV+HOT	53.7	49.6	61.1	13.7%	23.2%
138	Daily Avg Arterial	31.1	30.2	33.3	7.1%	10.5%
139	Daily Avg Collector	31.7	29.8	32.9	3.8%	10.7%
140	Daily Avg All Road	35.8	33.8	37.9	5.6%	12.1%
141	Daily Avg All Road + IZ	35.7	33.6	37.6	5.5%	11.9%
142	AM Peak					
143	AM Avg Mix-Flow	38.5	34.1	43.5	12.9%	27.5%
144	AM Avg HOV+HOT	51.5	46.1	56.1	8.8%	21.7%
145	AM Avg Arterial	30.0	28.7	32.7	9.0%	14.2%
146	AM Avg Collector	30.4	27.5	31.9	4.8%	16.0%

	A	B	C	D	E	F
1	Selected Trip Based Model Output					
2		2012 Base Year	2040 Baseline	2040 Draft Plan	Draft Plan change from Base Year (%)	Draft Plan Changes from Baseline (%)
147	AM Avg All Road	33.2	30.5	36.2	9.2%	18.6%
148	AM Avg All Road + IZ	33.1	30.5	36.0	9.0%	18.3%
149	PM Peak					
150	PM Avg Mix-Flow	36.7	32.9	41.3	12.4%	25.3%
151	PM Avg HOV+HOT	48.3	44.4	60.1	24.5%	35.3%
152	PM Avg Arterial	28.2	27.0	30.8	9.1%	14.1%
153	PM Avg Collector	29.7	27.2	31.1	4.6%	14.1%
154	PM Avg All Road	31.3	29.1	34.1	9.0%	17.2%
155	PM Avg All Road + IZ	31.2	29.1	34.0	8.9%	17.0%
156						
157	L&MDV Avg Speed by Cnty					
158	LM SPD Imperial	53.0	50.2	50.8	-4.1%	1.1%
159	LM SPD Los Angeles	32.5	31.1	34.1	4.8%	9.5%
160	LM SPD Orange	35.9	34.8	39.1	8.8%	12.1%
161	LM SPD Riverside	43.0	37.4	42.5	-1.2%	13.7%
162	LM SPD San Bernardino	42.9	36.5	44.0	2.5%	20.4%
163	LM SPD Ventura	39.8	35.7	39.9	0.2%	11.7%
164						
165	Vehicle Miles Traveled (VMT)					
166	VMT L&MDV	417,168,641	482,788,546	445,510,718	6.8%	-7.7%
167	VMT HDT	30,425,276	57,647,166	58,293,189	91.6%	1.1%
168	VMT TOTAL (L&MDV+HDT)	447,593,917	540,435,712	503,803,907	12.6%	-6.8%
169						
170	Vehicle Hours Traveled (VHT in 1,000 Hour)					
171	VHT L&MDV	11,691	14,360	11,839	1.3%	-17.6%
172	VHT HDT	641	1,273	1,138	77.4%	-10.7%
173	VHT TOTAL (L&MDV+HDT)	12,332	15,633	12,977	5.2%	-17.0%
174						
175	Vehicle Hours Delayed (1,000 Hr)					
176	Delay L&MDV	2,321	3,427	1,837	-20.8%	-46.4%
177	Delay HDT	118	314	184	56.2%	-41.5%
178	Delay TOTAL (L&MDV+HDT)	2,439	3,741	2,021	-17.1%	-46.0%
179						
180	TRANSIT					
181	Daily Transit Boarding					
182	Commuter Rail	46,077	70,518	75,450	63.7%	7.0%
183	Local Bus	1,877,721	2,445,338	2,753,267	46.6%	12.6%
184	Local Rail	373,547	493,457	851,393	127.9%	72.5%
185	Express Bus	32,788	42,626	82,230	150.8%	92.9%
186	HSR*	-	-	13,993	na	na
187	Rapid Bus	221,674	286,401	675,538	204.7%	135.9%
188	Transitway	31,380	40,833	39,964	27.4%	-2.1%
189	Bus Rapid Transit	25,739	35,367	37,352	45.1%	5.6%
190	TOTAL (Transit)	2,608,925	3,414,539	4,529,187	73.6%	32.6%
191						
192	Note * HSR for intra-regional segment from Palmdale to Union Station.					