Local Government Training

May 1, 2014

Quantifying the Effect of Local Government Actions on VMT

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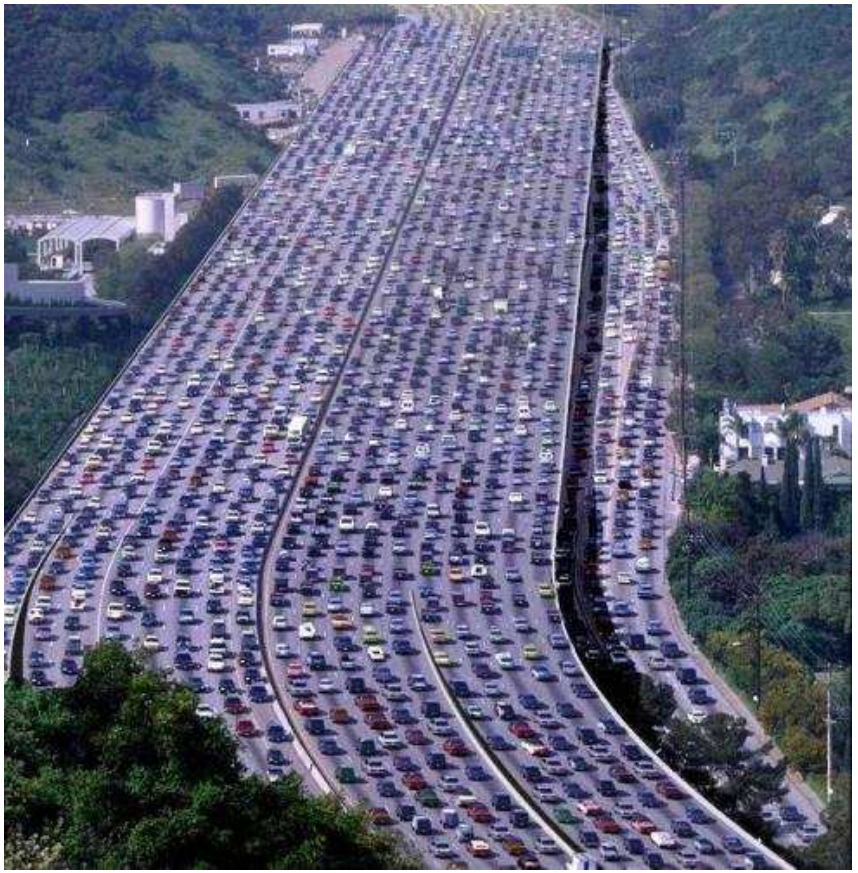
Research Division
California Air Resources Board

Background

- On-road vehicles generate more than one-third of GHG emissions in CA
- Reduction in VMT is critical to achieve climate goals in 2020 and beyond



ARB Funded Research Study

- Provide guidance to develop targeted policies
- Local estimates were needed because policies do not have the same impact across all neighborhood types
- Research study quantifies how changes in land use and transportation variables effect VMT in each California neighborhood type

VMT Impact Tool

- Estimates changes in VMT due to changes in land use and transportation variables
  - Selected city, county, or region
  - Individual neighborhood types
  - Census tracts
- Does not estimate travel demand or VMT
- Not a Scenario Planning Tool

Introduction of Presenter

- Deborah Salon, Principal Investigator
  - Provide an overview of the project's methods, results, and key findings
  - Demonstrate how to use the VMT Impact Tool and interpret the results
- Cities, counties, and regions can use this tool to prioritize local actions to reduce VMT

VMT Impact Tool
Local Government Training

Deborah Salon, PhD

May 2014

Institute of Transportation Studies, UC Davis

Presentation at the Air Resources Board

California Senate Bill 375

- Requires each Metropolitan Planning Organization (MPO) to create a Sustainable Communities Strategy (SCS) as part of their Regional Transportation Plan (RTP)
- The SCS is a coordinated set of land use, housing, and transportation strategies that – if implemented – would reduce Vehicle Miles Traveled (VMT) in the region, allowing the region to meet specific targets for passenger vehicle greenhouse gas emissions for 2020 and 2035

In other words … California has a law that says metropolitan regions need to come up with formal plans for how they will reduce car use.


HOLLYWOOD

Research Questions

1. How much can changes in the transport-land use system reduce how much we drive?
2. Is the answer different in different types of neighborhoods?

Homogeneous Effects on VMT???

	Gas Price	Local Job Access	Regional Job Access	Transit Use
Urban High Transit Use	?	?	?	?
Suburb Single-Family Homes	?	?	?	?
Rural	?	?	?	?

Overview of Project Findings

- At a basic level, there are large VMT differences between people living in different neighborhood types in California.
- The effects of land use and transport system characteristics on VMT do depend on neighborhood type, in ways that are intuitive but had not previously been estimated.

METHODOLOGY

- Classify census tracts into neighborhood types
- Merge data from five CA household travel surveys to increase sample size
- Estimate an econometric model to explain household VMT
- Calculate the effect on VMT of key policy-sensitive variables
- Create a spreadsheet tool to share results

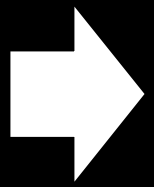
Data Sources

- Five California travel surveys (3 metro-level & 2 statewide surveys)
- ESRI US and Canada Detailed Streets
- MapQuest Route + Point of Interest data
- 2000 Decennial Census
- 2003 Longitudinal Employer-Household Dynamics (LEHD) data

Classifying Census Tracts

- Walk Accessibility
- Car Accessibility
- Road Density
- Jobs Within 5 Miles
- Population Density
- Transit Accessibility
- Vacant Housing
- Single-Family Housing
- Housing Value
- New Housing
- Old Housing

FIVE FACTORS

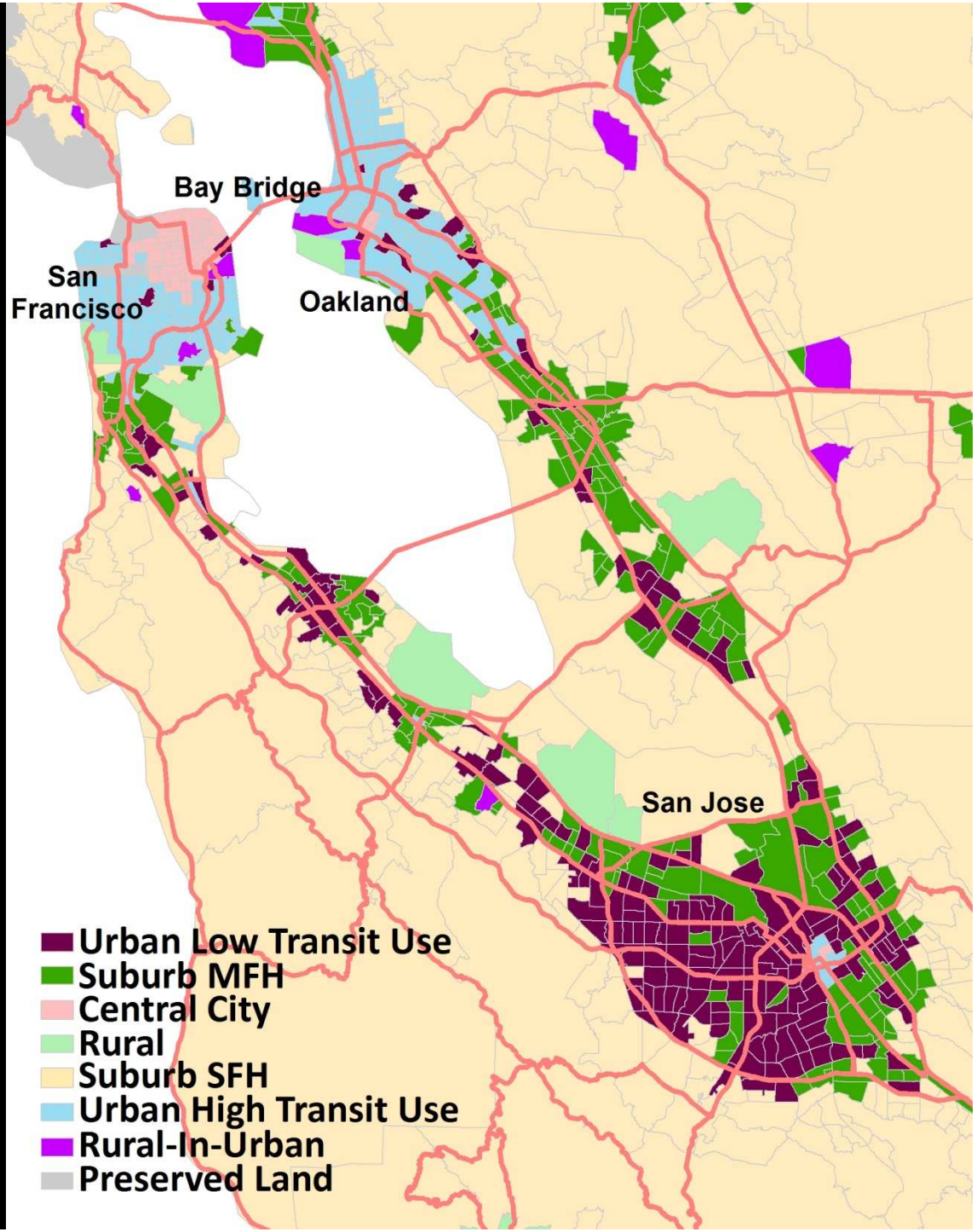


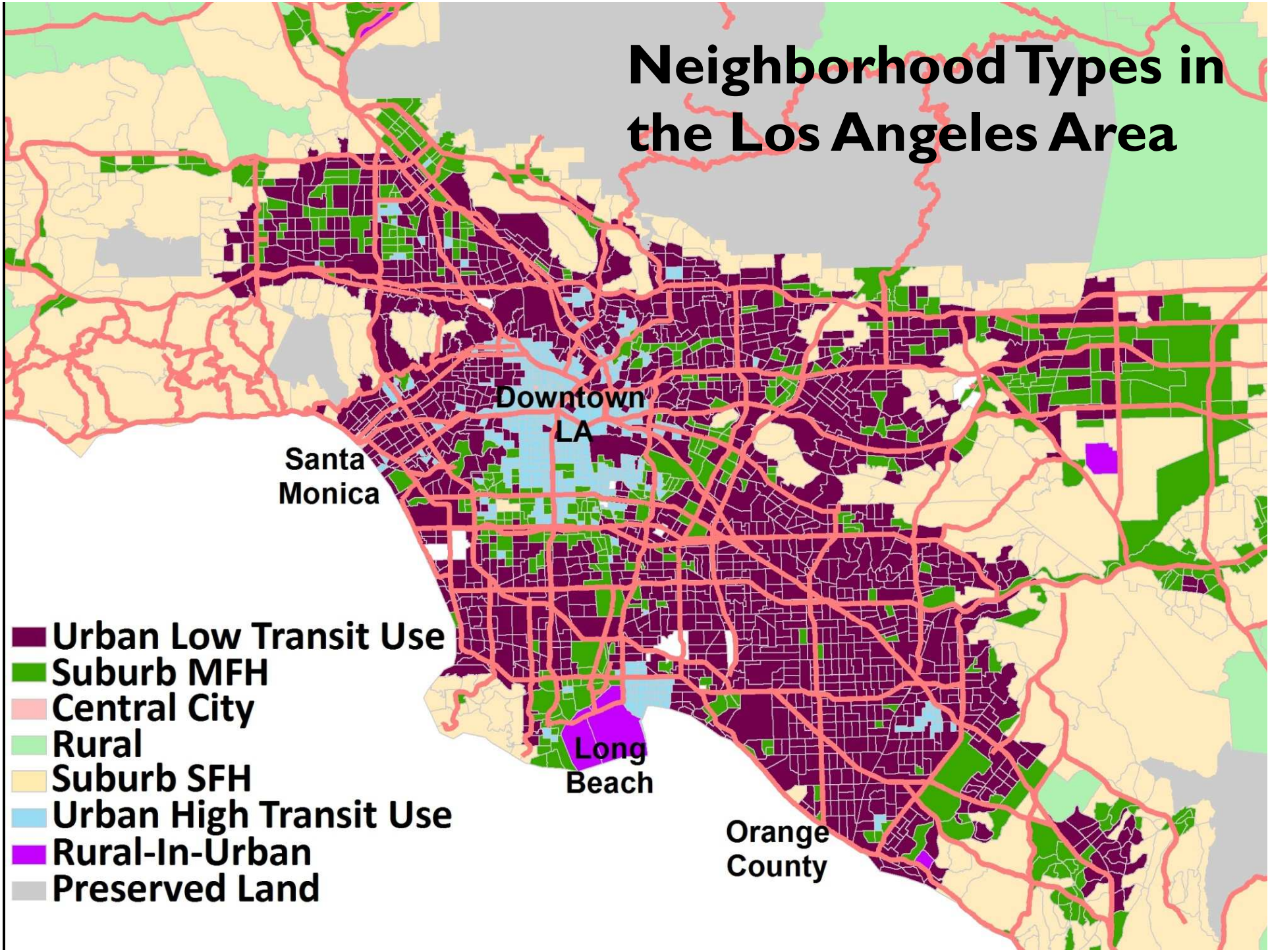
- Central City
- Urban High Transit
- Urban Low Transit
- Suburban MFH
- Suburban SFH
- Rural
  - Rural
  - Rural-In-Urban

+ Preserved Land

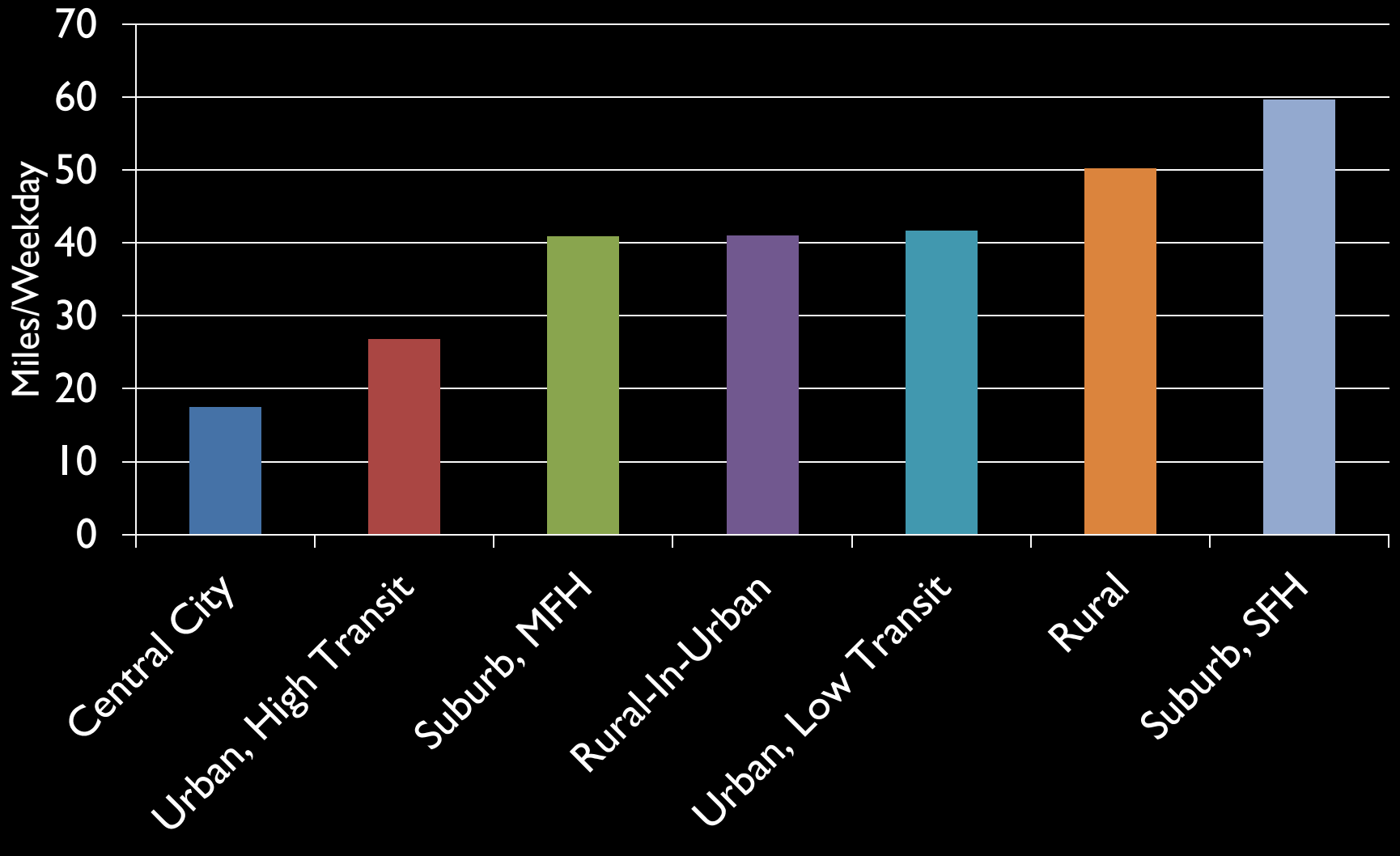
Neighborhood Types in the San Francisco Bay Area

Note that neighborhood types cluster spatially.




Neighborhood Types in the Los Angeles Area
Downtown LA
Santa Monica
Long Beach
Orange County
Urban Low Transit Use
Suburb MFH
Central City
Rural
Suburb SFH
Urban High Transit Use
Rural-In-Urban
Preserved Land

AVERAGE HOUSEHOLD DAILY VMT (WEEKDAY)



Variable	Example Actions
Gasoline Price	• Road pricing, parking pricing
Percent Riding Transit to Work	• Add transit routes, increase service frequency • Add real-time transit information to stations and stops • Add premium service for an additional charge
Measures of Job Access	• Incentivize development that brings housing to job centers and/or brings jobs to housing centers
Activity mix	• Implement mixed-use zoning
Percent Walking/Biking to Work	• Sidewalk and bike lane path construction and maintenance • Create bicycle boulevards • Implement road diets and traffic calming measures • Incentivize infill development
Road Density	• Improve connected-ness of road network
Percent Single Family Homes	• Allow multifamily housing development

Marginal Effect: Change in VMT when an independent variable increases by one unit.

Elasticity: Change in VMT when an independent variable increases by one percent.

Local Job Access

	Mean VMT (miles)	Mean Local Job Access	Marg. Effect (miles for 10K jobs)	Elasticity
Central City	17.4	35.55	NS	NS
Urban High Transit Use	26.8	14.72	NS	NS
Urban Low Transit Use	41.7	9.55	-0.5	-0.13
Suburb Multi-Family	40.1	4.61	-1.0	-0.13
Rural In Urban	41.1	1.23	-1.2	-0.05
Suburb Single-Family	59.7	2.07	-2.4	-0.12
Rural	50.3	0.39	-2.3	-0.03
Overall	44.9	5.97	-0.4	-0.07

Regional Job Access

	Mean VMT (miles)	Mean Regional Job Access	Marg. Effect (miles for 10K jobs)	Elasticity
Central City	17.4	12.70	NS	NS
Urban High Transit Use	26.8	26.31	NS	NS
Urban Low Transit Use	41.7	27.52	-0.3	-0.19
Suburb Multi-Family	40.1	13.55	0.2	0.07
Rural In Urban	41.1	3.33	1.6	0.13
Suburb Single-Family	59.7	10.22	0.2	0.03
Rural	50.3	2.69	1.9	0.10
Overall	44.9	16.02	0.06	0.02

Gasoline Price

	Mean VMT (miles)	Mean Gas Price	Marg. Effect (miles for $1)	Elasticity (% change for 1% increase)
Central City	17.4	$1.95	NS	NS
Urban High Transit Use	26.8	$1.91	-2.2	-0.20
Urban Low Transit Use	41.7	$1.89	-1.8	-0.11
Suburb Multi-Family	40.1	$1.88	-1.6	-0.10
Rural In Urban	41.1	$1.92	NS	NS
Suburb Single-Family	59.7	$1.89	-2.1	-0.10
Rural	50.3	$1.94	NS	NS
Overall	44.9	$1.90	-1.8	-0.10

Percent Transit Commuters

	Mean VMT (miles)	Mean Percent Transit	Marg. Effect (miles for 1 pct point)	Elasticity
Central City	17.4	35%	-0.22	-0.58
Urban High Transit Use	26.8	21%	-0.24	-0.20
Urban Low Transit Use	41.7	4%	NS	NS
Suburb Multi-Family	40.1	5%	-0.45	-0.06
Rural In Urban	41.1	2%	-0.99	-0.05
Suburb Single-Family	59.7	2%	-0.35	-0.02
Rural	50.3	1%	NS	NS
Overall	44.9	5%	-0.26	-0.04

Percent Ped/Bike Commuters

	Mean VMT (miles)	Mean Percent Ped/Bike	Marg. Effect (miles for 1 pct point)	Elasticity
Central City	17.4	20%	NS	NS
Urban High Transit Use	26.8	6%	-0.22	-0.07
Urban Low Transit Use	41.7	3%	NS	NS
Suburb Multi-Family	40.1	4%	NS	NS
Rural In Urban	41.1	6%	NS	NS
Suburb Single-Family	59.7	2%	-0.50	-0.02
Rural	50.3	4%	NS	NS
Overall	44.9	4%	-0.20	-0.02

Percent Single Family Homes

	Mean VMT (miles)	Mean Percent SFH	Marg. Effect (miles for 1 pct point)	Elasticity
Central City	17.4	5%	NS	NS
Urban High Transit Use	26.8	29%	NS	NS
Urban Low Transit Use	41.7	59%	NS	NS
Suburb Multi-Family	40.1	47%	NS	NS
Rural In Urban	41.1	52%	0.10	0.12
Suburb Single-Family	59.7	81%	0.06	0.08
Rural	50.3	65%	0.14	0.19
Overall	44.9	58%	0.02	0.03

Road Density

	Mean VMT (miles)	Mean Road Density	Marg. Effect (miles for 1 km/km2)	Elasticity
Central City	17.4	19.1	NS	NS
Urban High Transit Use	26.8	17.1	NS	NS
Urban Low Transit Use	41.7	14.8	-0.20	-0.07
Suburb Multi-Family	40.1	13.1	-0.47	-0.15
Rural In Urban	41.1	7.3	NS	NS
Suburb Single-Family	59.7	7.8	-0.42	-0.06
Rural	50.3	2.6	-1.17	-0.06
Overall	44.9	11.5	-0.67	-0.17

Activity Mix

	Mean VMT (miles)	Mean Activity Mix	Marg. Effect (miles for 0.1 increase)	Elasticity
Central City	17.4	0.53	NS	NS
Urban High Transit Use	26.8	0.28	NS	NS
Urban Low Transit Use	41.7	0.41	NS	NS
Suburb Multi-Family	40.1	0.39	NS	NS
Rural In Urban	41.1	0.46	NS	NS
Suburb Single-Family	59.7	0.37	NS	NS
Rural	50.3	0.43	-0.97	-0.09
Overall	44.9	0.39	-0.31	-0.03

Marginal Effect Comparison

	Gas Price ($1)	Local Job Access (10K jobs)	Regional Job Access (10K jobs)	Transit Use (1 pct point)
Urban High Transit Use	-2.2	NS	NS	-0.24
Suburb Single-Family	-2.1	-2.4	0.2	-0.35
Rural	NS	-2.3	1.9	NS
Overall	-1.8	-0.4	0.06	-0.26

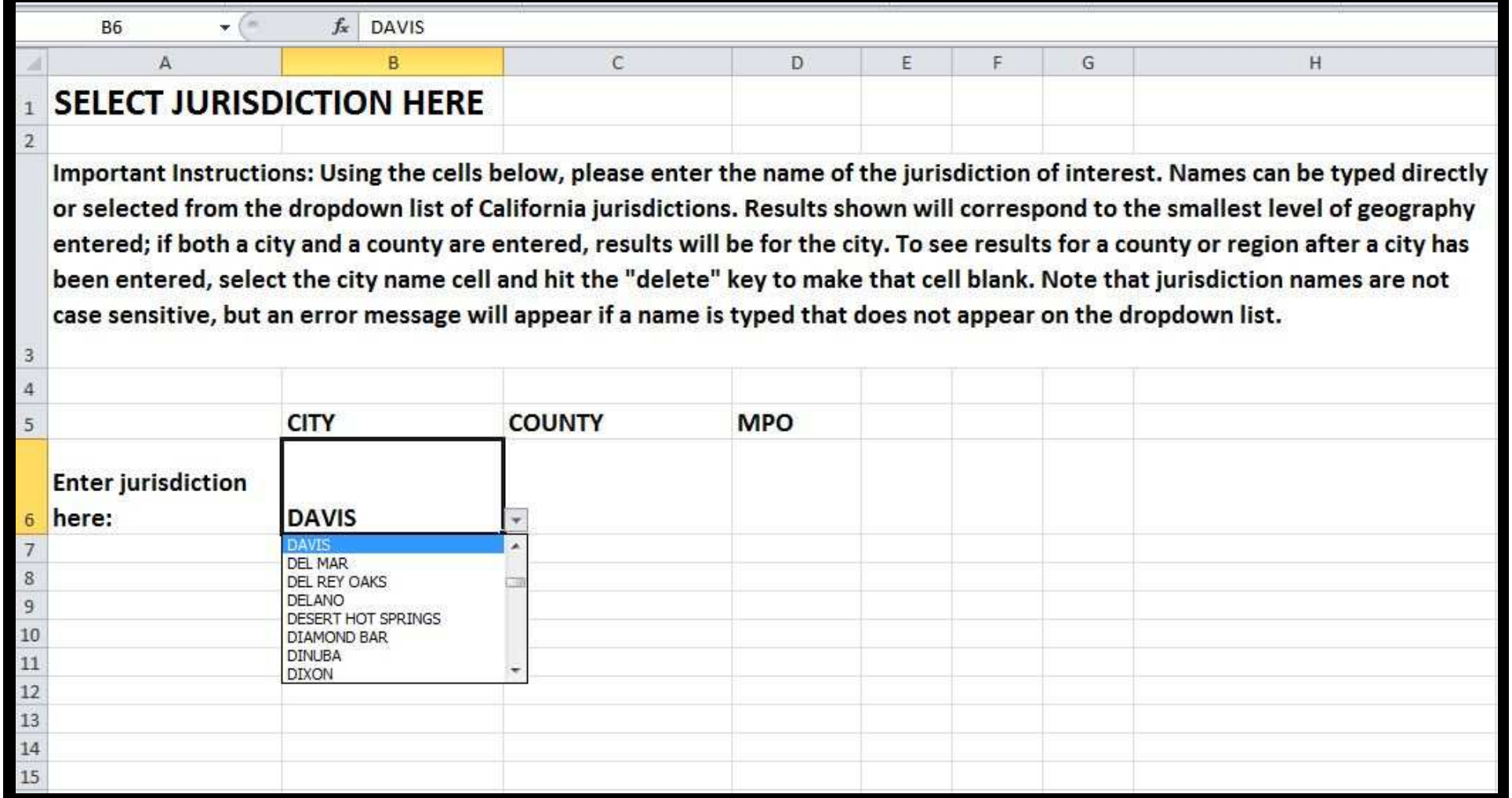
VMT Impact Spreadsheet Tool

- Tool that makes the results of this project easily accessible to practicing planners
- Microsoft Excel-based
- Easy to use (just choose a jurisdiction to see results)
- Not a "black box" tool
- Can export results to GIS to visualize spatial relationships

How it works

- Includes all relevant data for all California census tracts in the spreadsheet itself
- Uses this data with the elasticity and marginal effect results that we just discussed for each neighborhood type
- Reports a population-weighted average set of effects for user-specified jurisdictions.

VMT Impact Jurisdiction Selection



VMT Impact Main Results Display

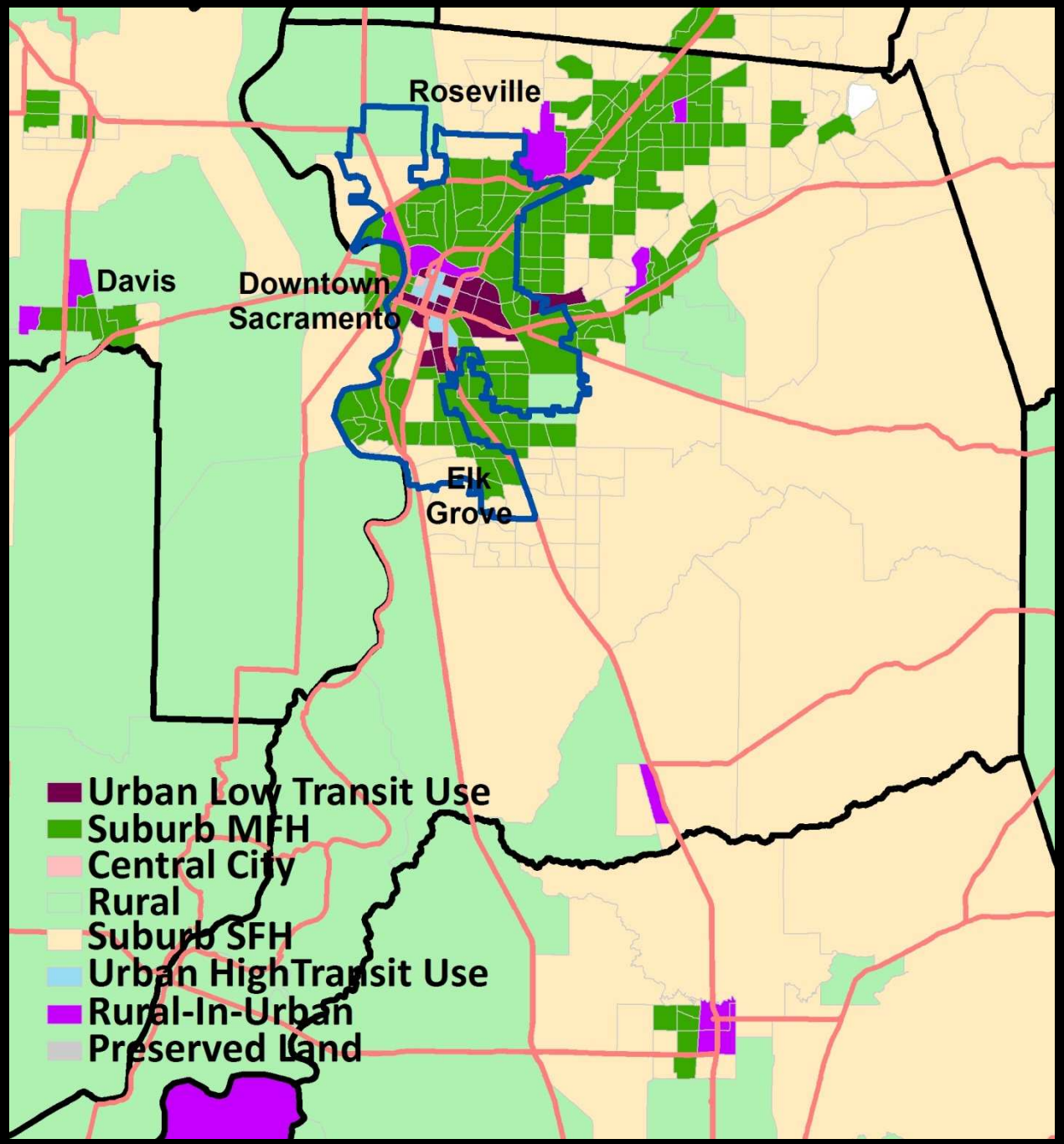
A3

	A	B	C	D	E	F	G	H
1	HOUSEHOLD VMT RESULTS							
2	JURISDICTION:	DAVIS						
3								
4		POPULATION	PERCENT OF COMMUTERS USING TRANSIT	PERCENT SINGLE FAMILY HOMES (OF HOUSING UNITS)	ROAD DENSITY	ACTIVITY MIX	REGIONAL JOB ACCESS (GRAVITY FORMULATION BETWEEN 5 AND 50 MILES)	LOCAL ACCES (GRAVI FORMULA BETWEEN 0 MILES
5	Jurisdiction-Level Variable Averages, original (c. 2000)	49,983	6.86	45.51	12.67	0.36	5.30	
6								
7	Jurisdiction-Level Marginal Effect: LOWER BOUND		-0.73	0.00	-0.68	-5.53	0.12	
8	Jurisdiction-Level Marginal Effect: UPPER BOUND		-0.23	0.02	-0.19	0.47	0.51	
9								
10	Jurisdiction-Level Elasticity: LOWER BOUND		-0.08	0.00	-0.21	0.00	0.02	
11	Jurisdiction-Level Elasticity: UPPER BOUND		-0.03	0.03	-0.06	0.00	0.11	

VMT Impact Tract Results Display

	A	B	C	D	E	F	G	H	I	J	K	L
1	**HOUSEHOLD VMT RESULTS**											
2	**JURISDICTION:**	**DAVIS**										
3												
4												
5	**CENSUS TRACT LEVEL MARGINAL EFFECTS**											
6												
7	**Note: To view the current jurisdiction selection, the pivot table below must be "refreshed". To do this, right click anywhere in the table and choose "Refresh".**											
9												
10	**CENSUS TRACT FIPS CODE**	**NH TYPE**	**POPULATION IN JURISDICTION**	**PERCENT OF COMMUTERS USING TRANSIT**	**PERCENT SINGLE FAMILY HOMES (OF HOUSING UNITS)**	**ROAD DENSITY**	**ACTIVITY MIX**	**REGIONAL JOB ACCESS (GRAVITY FORMULATION BETWEEN 5 AND 50 MILES)**	**LOCAL JOB ACCESS (GRAVITY FORMULATION BETWEEN 0 AND 5 MILES)**	**PERCENT OF COMMUTERS USING NONMOTORIZED MODES**	**AVERAGE GASOLINE PRICE 2000 (IN 2013 DOLLARS)**	**TRANSIT LOWER ME**
11	6113010501	4	33	2.95	7.88	3.74	0.43	5.24	1.93	54.83	$2.21	0
12	6113010505	4	63	3.17	58.91	1.27	0.55	6.02	0.30	7.42	$2.21	0
13	6113010506	4	31	6.01	56.43	1.03	0.37	6.25	0.51	1.84	$2.20	0
14	6113010507	2	8573	8.38	39.40	12.81	0.17	5.04	2.60	16.22	$2.21	-0.674
15	6113010508	7	951	4.19	41.77	5.23	0.09	5.00	2.10	8.87	$2.21	-1.673
16	6113010509	2	3518	9.01	41.69	15.17	0.08	5.21	1.79	16.59	$2.21	-0.674
17	6113010510	7	2156	12.86	43.80	6.49	0.37	5.22	1.49	10.30	$2.21	-1.673
18	6113010602	2	4547	4.45	25.00	10.90	0.49	5.36	2.03	34.67	$2.21	-0.674
19	6113010605	5	2619	2.35	75.10	10.50	0.09	5.73	1.11	6.01	$2.21	-0.574
20	6113010606	2	7648	6.26	65.98	13.59	0.38	5.41	1.87	12.29	$2.21	-0.674
21	6113010607	5	1835	1.43	66.89	6.51	0.25	5.71	1.07	4.99	$2.21	-0.574
22	6113010608	2	4677	10.15	38.79	16.01	0.48	5.52	1.49	12.43	$2.21	-0.674
23	6113010701	2	4549	2.93	36.34	12.93	0.81	5.31	2.45	40.73	$2.21	-0.674
24	6113010703	2	6584	8.85	36.76	14.45	0.37	5.15	2.33	39.61	$2.21	-0.674

Sacramento, City and County



Thanks for your attention!

QUESTIONS? COMMENTS?

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