

# Fresno Activity-Based Model

Introduction and Overview

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# Section 1

## Model Capabilities

Old Model (VMIP<sub>2</sub>) vs. New Model (Fresno ABM)

# Travel Demand Modeling (TDM)

- Represents a computer-simulated “day in the life”, given land-use and transportation system characteristics
- Allows modelers to test land-use and transportation policies against future growth

# Travel Demand Modeling (cont)

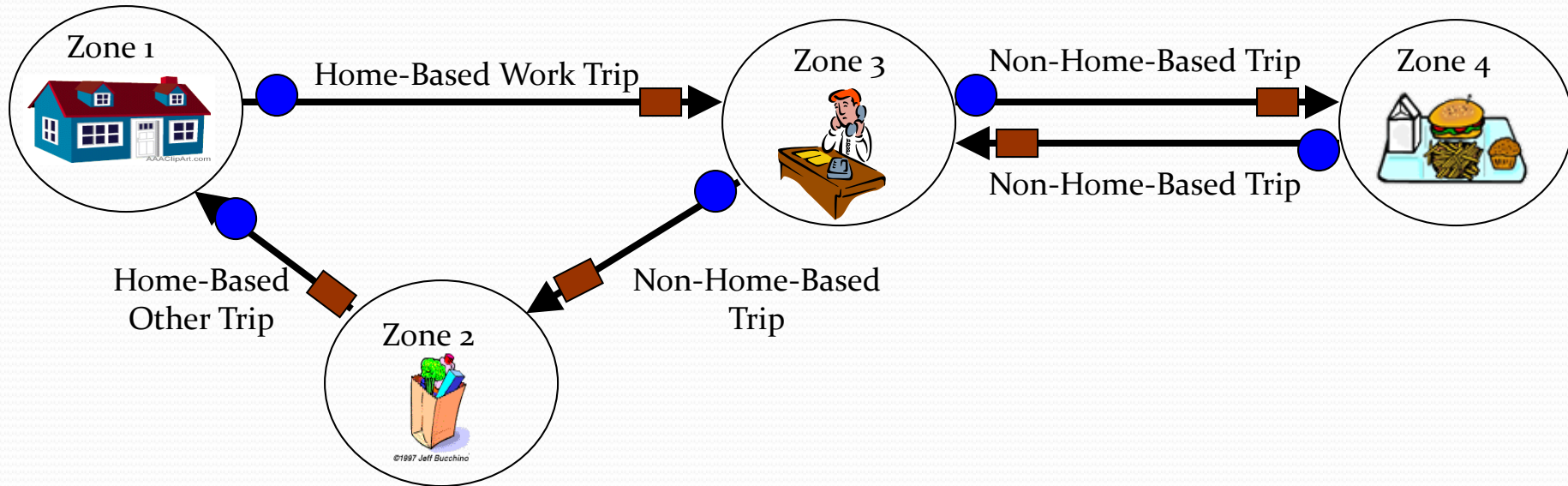
- TDMs are calibrated to a base year, where the model's performance is validated against survey data and observed characteristics (e.g. traffic counts)
- Future year runs account for planned transportation improvement projects as well as projected demographic growth
- Multiple scenarios can be modeled to test possible futures (Sustainable Communities Strategy, or SCS)

# Fresno ABM: A Big Improvement

## The Old Model: VMIP<sub>2</sub>

- Four-step model
- Trip-based
- Trips are generated in aggregate and assigned to the traffic network
- Limited in many ways

# Trip-Based Model Overview (I)



Production & Attraction Table

Zone	Home-Based Work (HBW)		Home-Based Other (HBO)		Non-Home-Based (NHB)	
	Prod.	Attract.	Prod.	Attract.	Prod.	Attract.
1	1		1			
2						1
3		1			2	1
4					1	1
<b>Total</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>3</b>

# Criticisms of Trip-Based Models

- Lack of Behavioral Fidelity
  - The only model based on actual decision-making theory is mode choice
- "Curse of Dimensionality"
  - Adding many (micro)zones, demographic segments, trip purposes, time of day period, etc. makes run times infeasible
- Aggregation Bias
  - No information on where non-home-based trips originate
  - Temporal, spatial, socio-economic
- Insensitivities
  - Time-of-day shifts
  - Accessibility



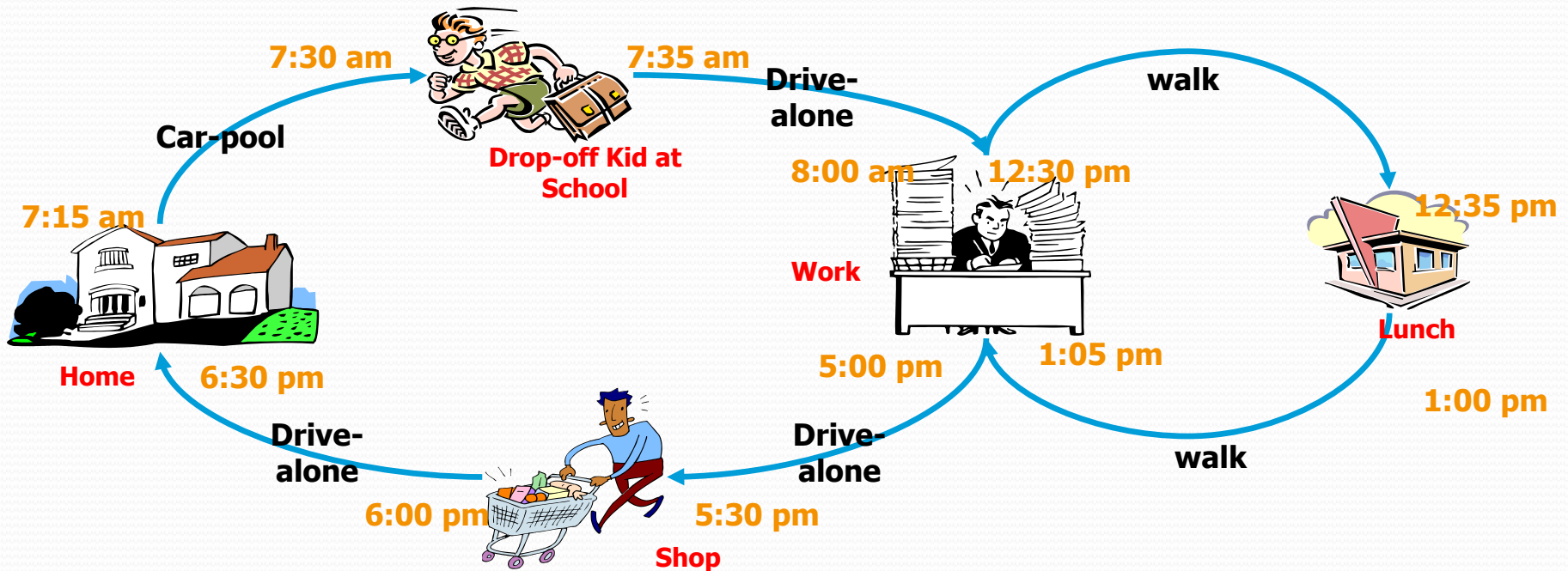
# Fresno ABM: A Big Improvement

## The New Model: Fresno ABM

- Activity-based model
- Tour-based
- Trips are generated by individuals in a synthetic population
- Allows for much more robust analysis
- Model is much more sensitive to inputs

# Activity-Based Model

## How do Activity-Based Models view Travel?



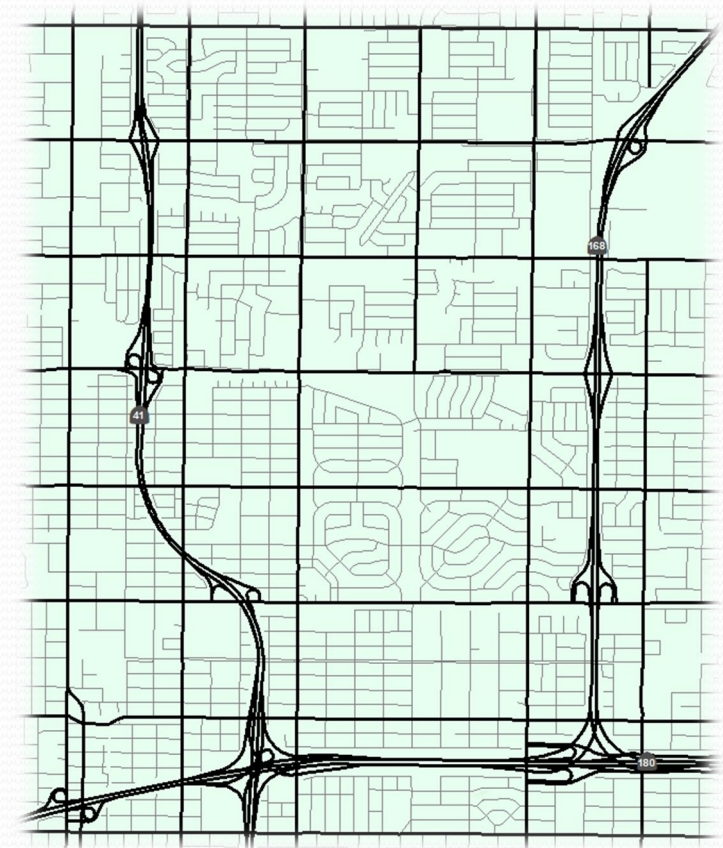
A set of inter-dependent trips!

# What Makes ABM an Improvement?

- Connects travel throughout the day, similar to how decisions are made
- Is sensitive to cost, time, demographics, policies, land-use characteristics, etc.
- Allows for greater spatial and temporal detail, more types of analysis available (e.g. EJ)
- Allows greater household/person attribute detail.
- Tracks individual's travel behavior (not averages)
- Bike and walk trips are assigned to the network rather than estimated at the regional level
- Less aggregation of trip purposes

# TAZs vs. MAZs

	TAZ	MAZ
<b>Total Number</b>	1,963	23,451
<b>Average # of Households</b>	149	12
<b>Median Area</b>	159 acres	9 acres



# Synthetic Population Benefits

- Future populations can be analyzed at the person level rather than relying on aggregated zone-level data
- Each synthesized person has unique characteristics that inform travel options and choices
- Tour-based modeling provides more robust and coherent travel patterns for each person
- No edge-related problems (e.g. communities of concern, EJ analysis, etc)

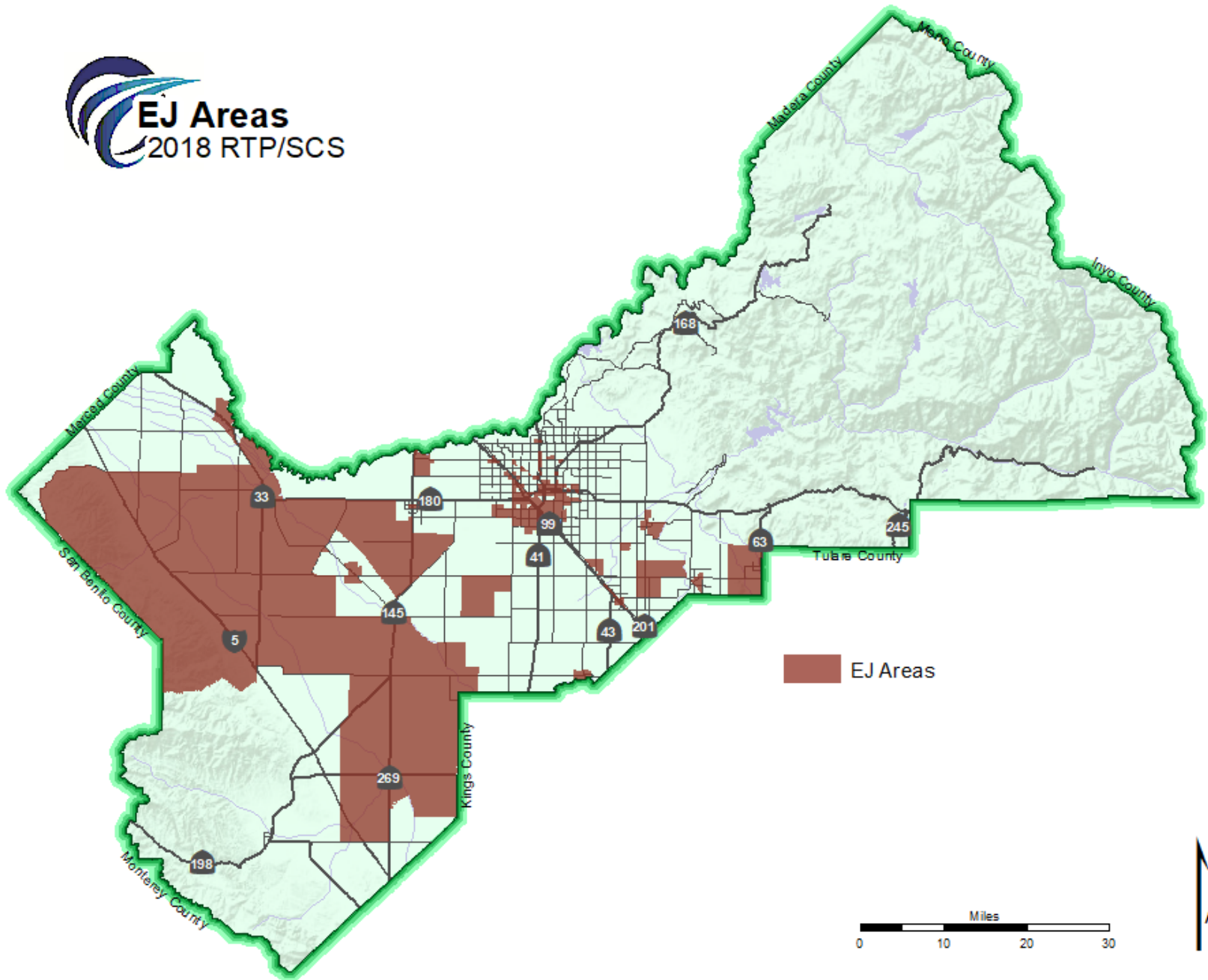
# Specific Benefits to EJ Analysis

- We are no longer limited to traffic analysis zones
- We can assign EJ status to individual households, rather to entire zones
- Characteristics, choices, etc. of EJ individuals can be analyzed individually, such as:
  - Home/work location
  - Tours/trips by purpose
  - Access to services
  - Etc.



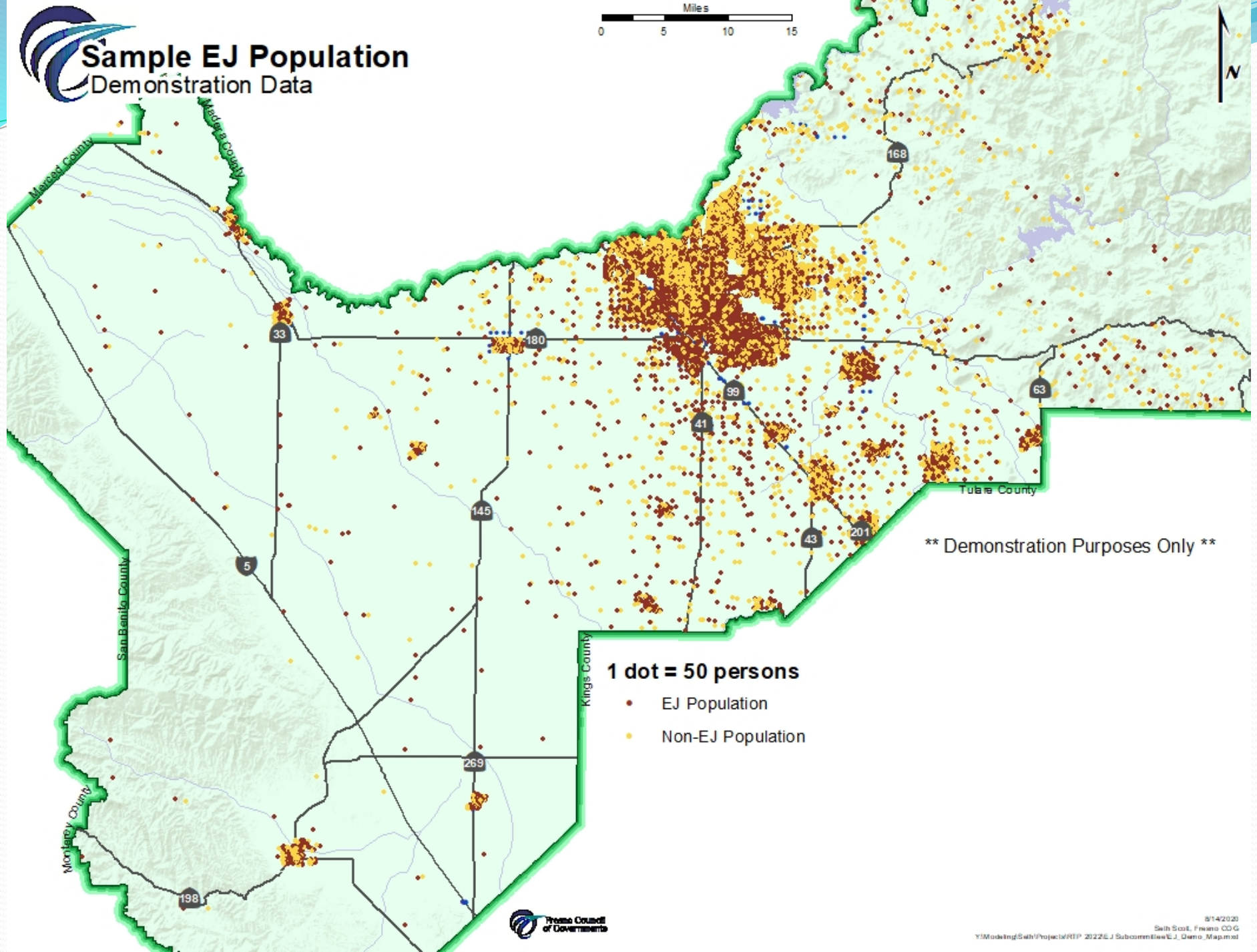
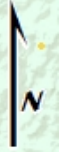
# EJ Areas

2018 RTP/SCS





# Sample EJ Population Demonstration Data



\*\* Demonstration Purposes Only \*\*

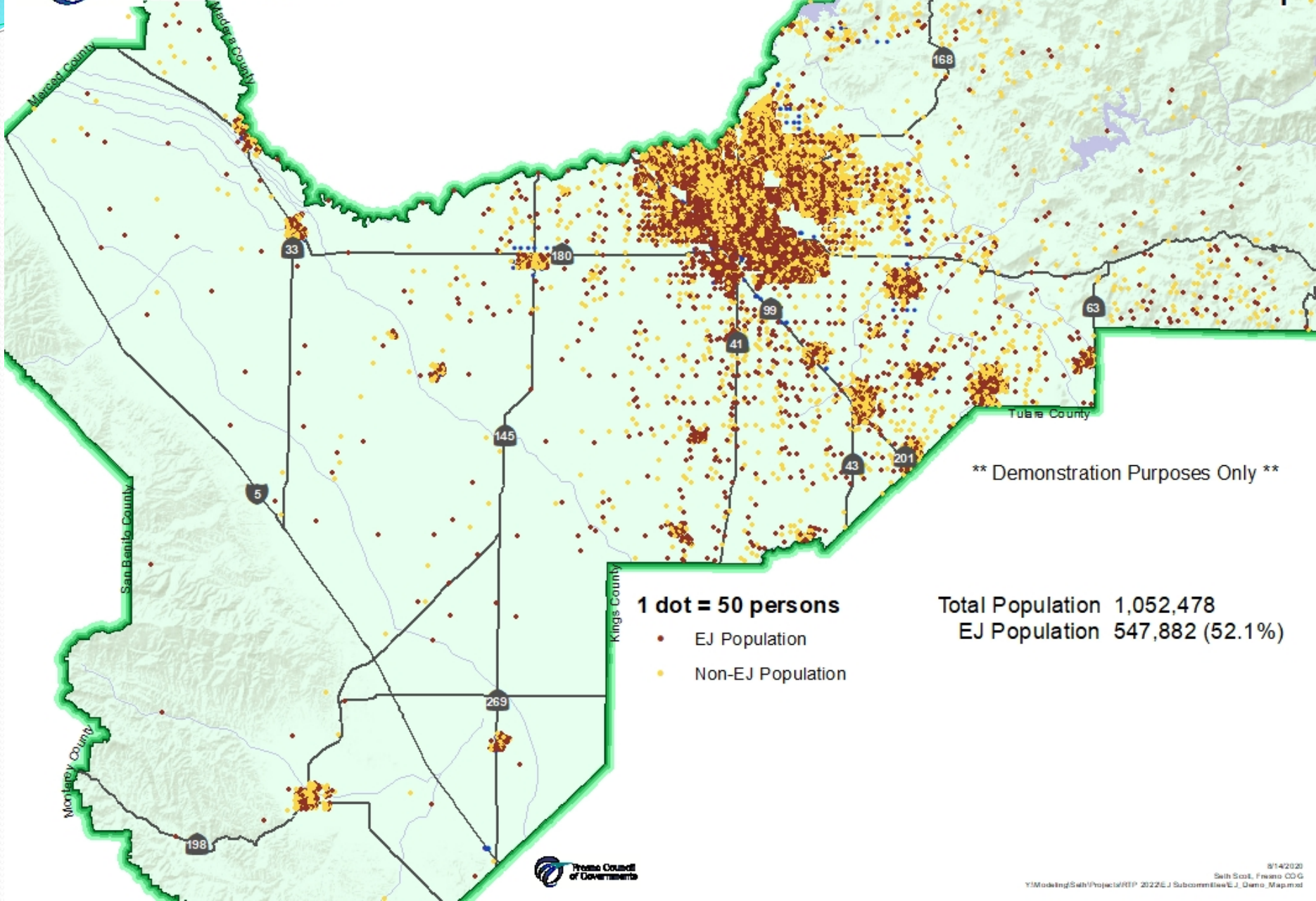
**1 dot = 50 persons**

- EJ Population
- Non-EJ Population





# Sample EJ Population Demonstration Data



\*\* Demonstration Purposes Only \*\*

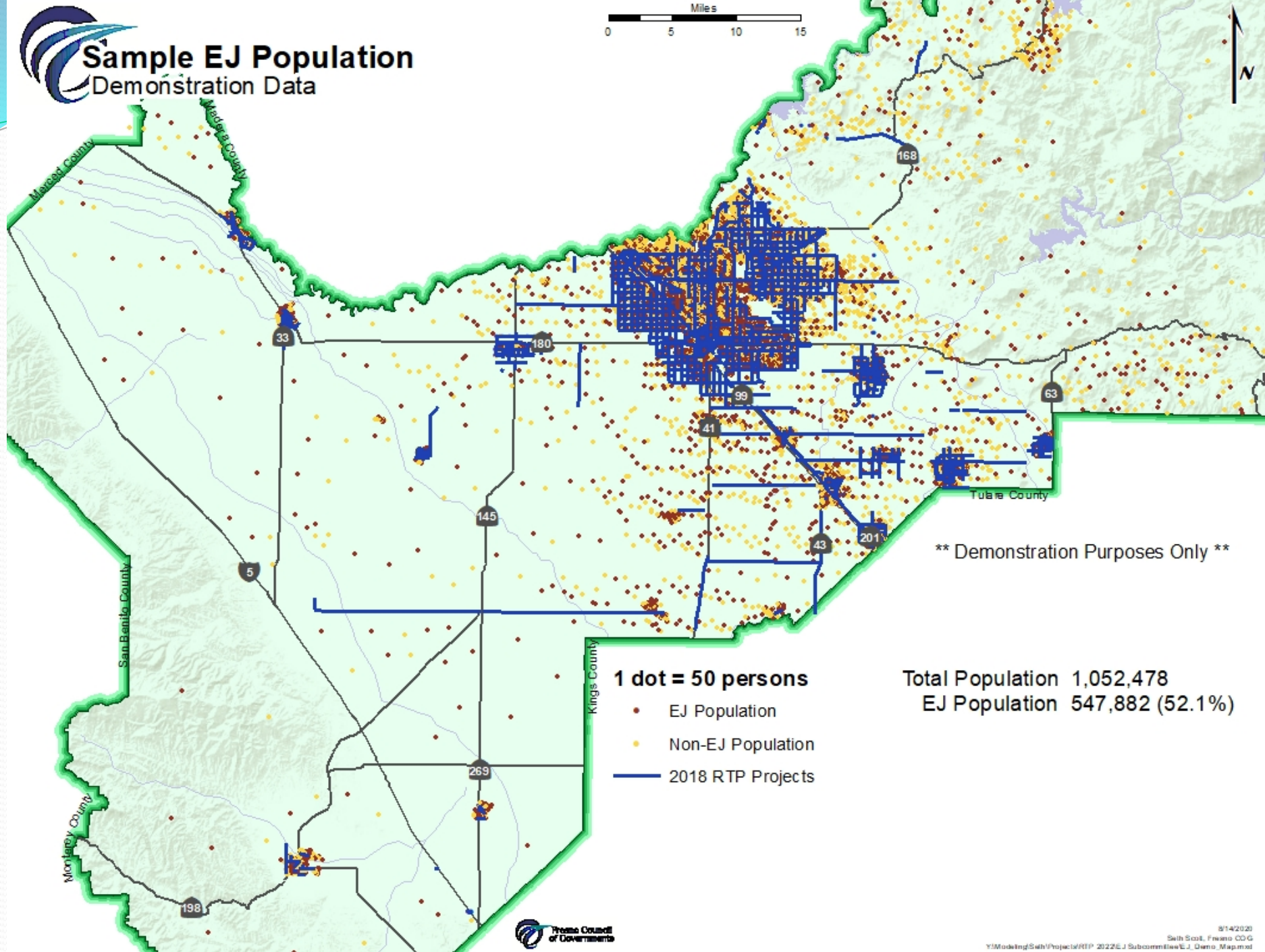
**1 dot = 50 persons**

- EJ Population
- Non-EJ Population

**Total Population 1,052,478  
EJ Population 547,882 (52.1%)**



# Sample EJ Population Demonstration Data



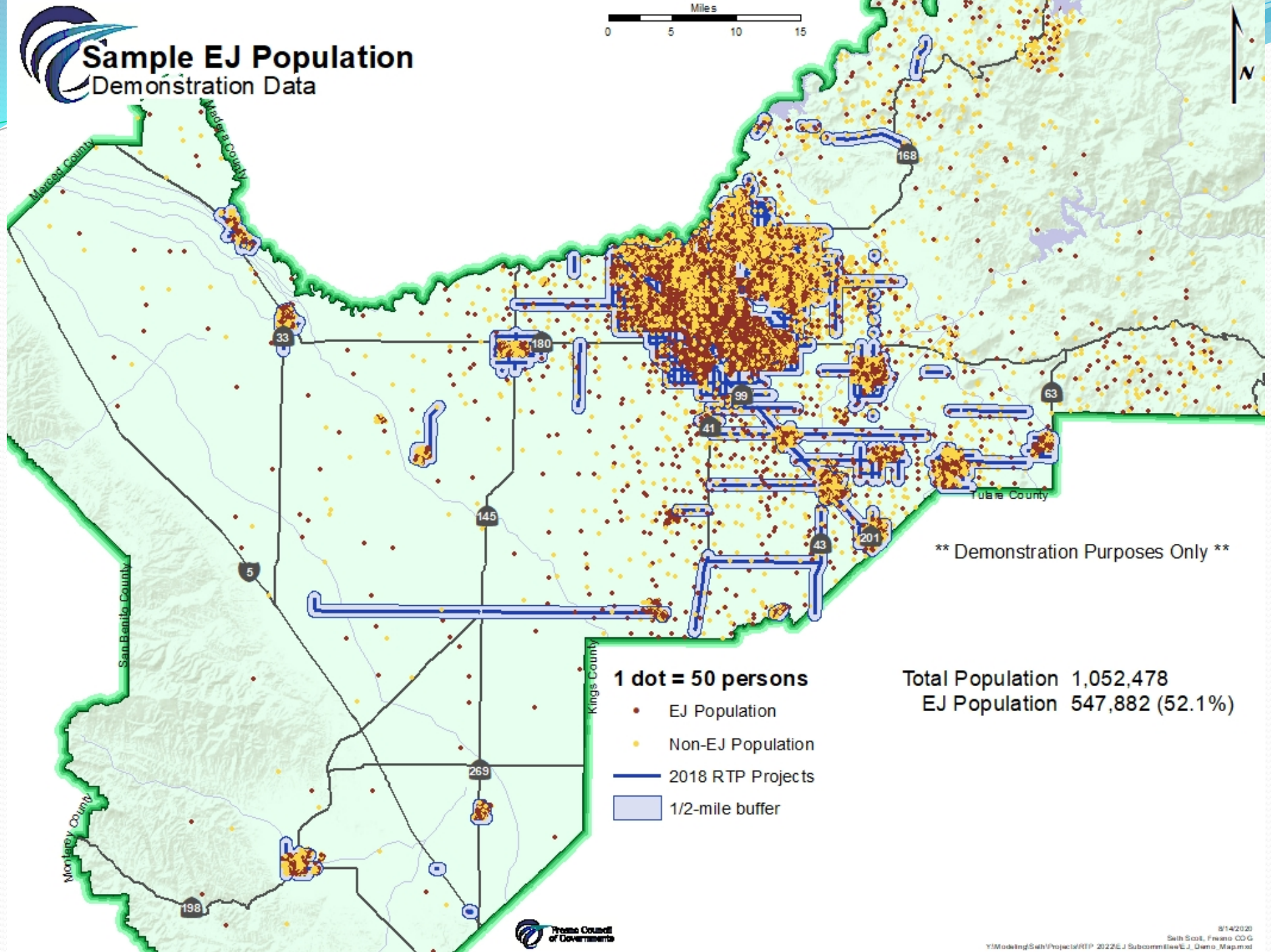
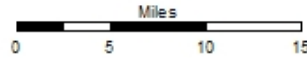
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- 1 dot = 50 persons**
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- 2018 RTP Projects

**Total Population 1,052,478**  
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# Sample EJ Population Demonstration Data



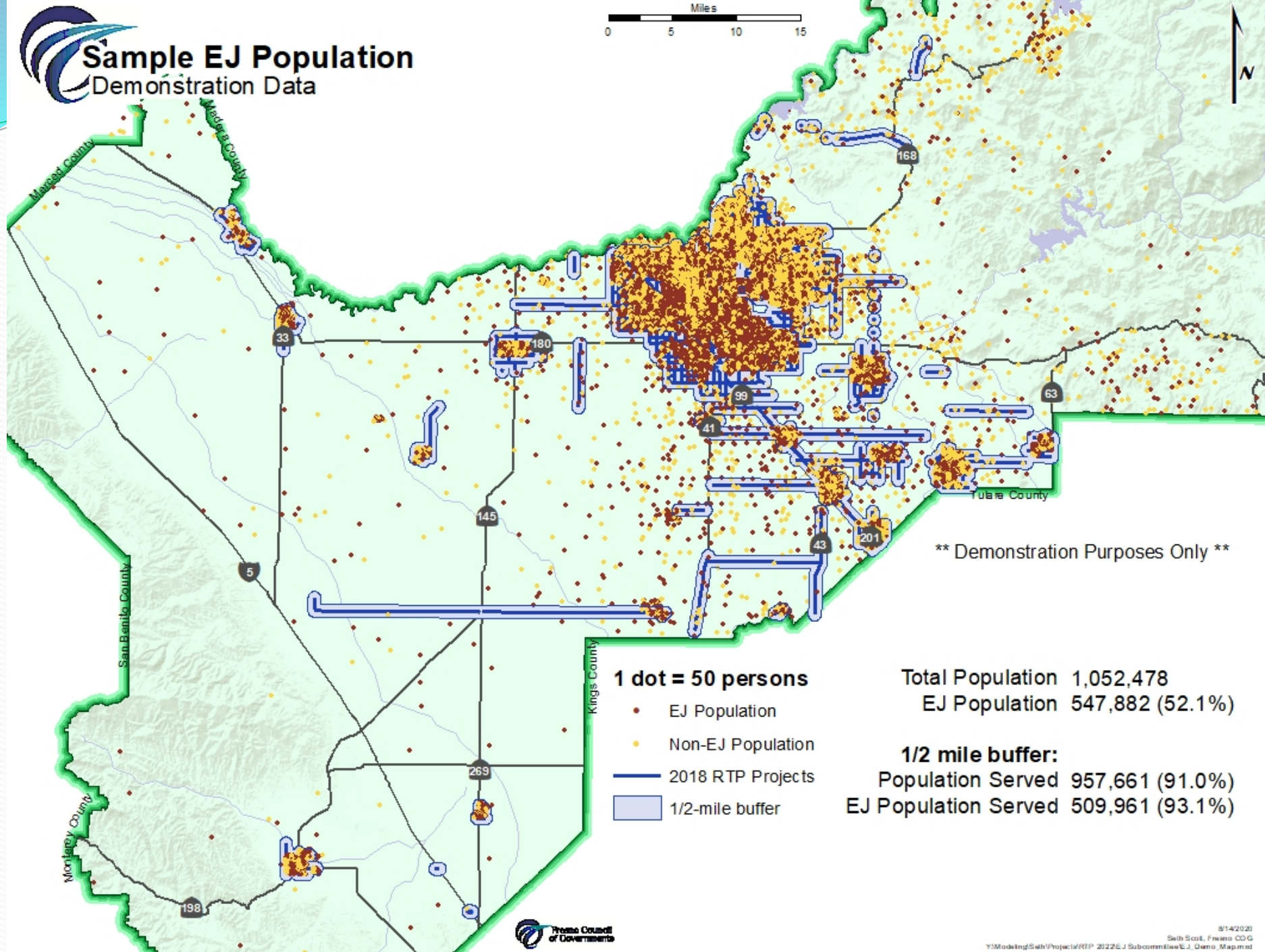
\*\* Demonstration Purposes Only \*\*

- 1 dot = 50 persons**
- EJ Population
- Non-EJ Population
- 2018 RTP Projects
- 1/2-mile buffer

Total Population 1,052,478  
EJ Population 547,882 (52.1%)



# Sample EJ Population Demonstration Data



\*\* Demonstration Purposes Only \*\*

- 1 dot = 50 persons**
- EJ Population
- Non-EJ Population
- 2018 RTP Projects
- 1/2-mile buffer

**Total Population** 1,052,478  
**EJ Population** 547,882 (52.1%)

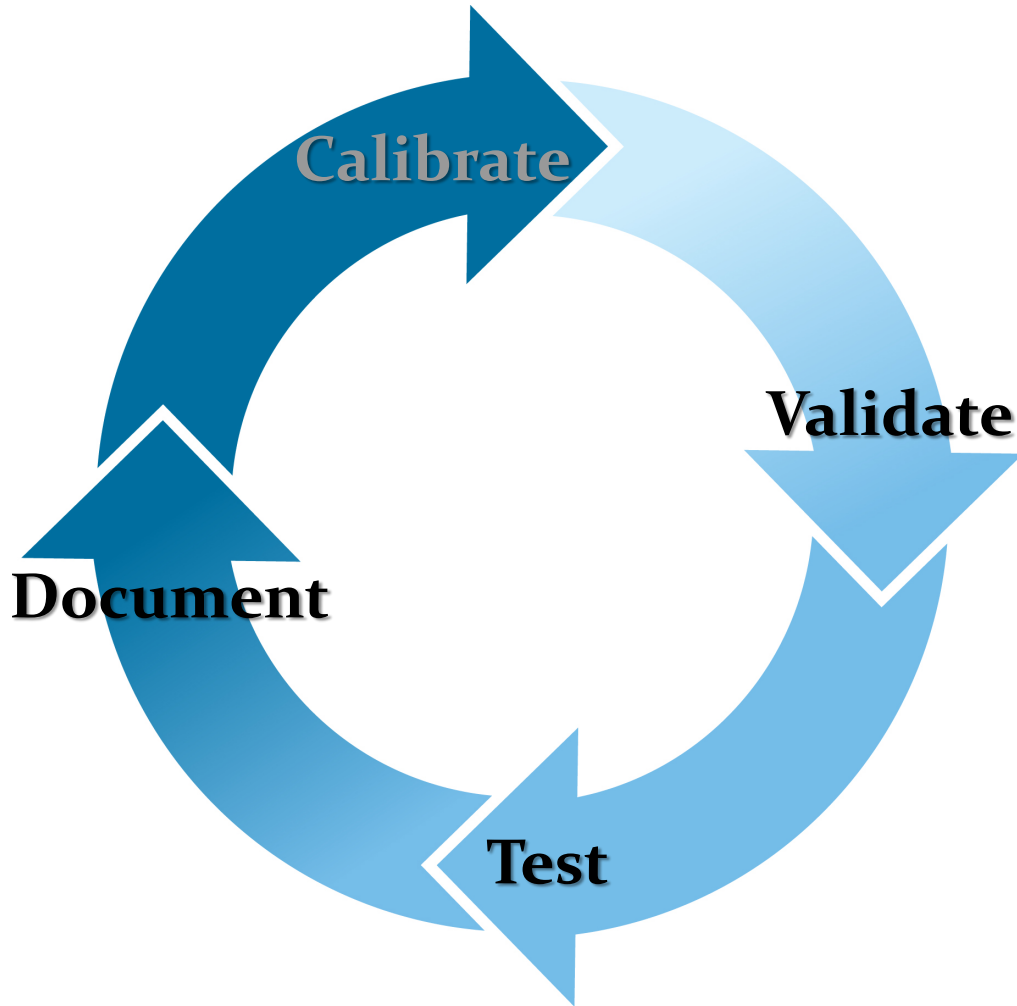
**1/2 mile buffer:**  
**Population Served** 957,661 (91.0%)  
**EJ Population Served** 509,961 (93.1%)

# Section 2

## Model Calibration and Validation

How Do We Know the Model Is Accurate?

# Iterative Model Development



- Understand strengths and weaknesses quickly
- Manage project resources effectively
- Fresno COG staff involved in process

# Model Calibration

Model Base Year

2014

Starting Model Coefficients

Sacramento (SACOG)

DATASET	YEAR	SOURCE	PURPOSE
California Household Travel Survey (CHTS)	2012		Fresno – Tour Destination, SJV – Other Sub-models
National Household Travel Survey (NHTS)	2009		Fresno - Tour Destination
Transit On-Board Survey	2014	Transit On-Board Survey Program	Transit Tours/Trips
Census Transportation Planning Product (CTPP)	2010	Census	Workers Flow
Longitudinal Employer Household Dynamics (LEHD)	2014		Workers Flow
Streetlight	2014	Streetlight	Internal-External Trips

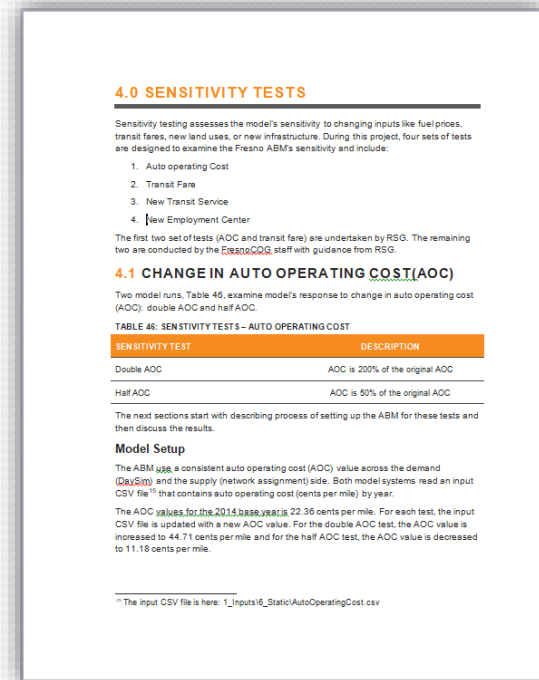
# Network Validation

DATASET	YEAR	SOURCE	PURPOSE
Traffic Counts	2014	CalTrans and FresnoCOG	Highway Validation
Vehicle Miles Travelled (VMT)	2014	Highway Performance Management System (HPMS)	Highway Validation
Transit Ridership	2014	FAX, Clovis, and FCRTA	Transit Validation
Transit On-Board Survey	2014	Transit On-Board Survey Program	Transit Validation



# ABM Sensitivity Tests Performed:

- Change in Auto Operation Costs
- Change in Transit Fare
- New Transit Service
- New Employment Center



*More information in the Fresno ABM Report*

# Fresno ABM GitHub Repository

- The Fresno ABM is versioned on a private GitHub repository

<https://github.com/RSGInc/FresnoABM>

- Require authorization to access

- Contact [Nagendra.Dhakar@rsginc.com](mailto:Nagendra.Dhakar@rsginc.com)

The screenshot shows the GitHub repository page for 'RSGInc / FresnoABM'. The repository is private and has 17 commits, 1 branch, 0 releases, and 2 contributors. The commit history is as follows:

Commit	Description	Time
nsdhakar and nsdhakar	add daysim summaries setup. Issue #8.	Latest commit b3b0085 9 minutes ago
1_Inputs	Posting complete DaySim setup, including outputs. Close #6.	8 days ago
App	Updated MAZ and highway network. Also, updated DaySim. Close #7.	8 days ago
GIS	Initial inputs. Close #2.	2 months ago
PopSynll	add PopSynll setup. Close #10.	20 minutes ago
Scenarios/FC14_BASE	Posting complete DaySim setup, including outputs. Close #6.	8 days ago
daysim_summaries	add daysim summaries setup. Issue #8.	9 minutes ago
.gitattributes	Update .gitattributes	an hour ago
Fresno_ABM.cat	Updated MAZ and highway network. Also, updated DaySim. Close #7.	8 days ago
README.md	fix typo	7 days ago

Questions?

# Thanks for Participating!

Feel welcome to contact me...

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