

# Using Big Data to Validate VMT Estimates

ITE Western District Annual Conference

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# What is VMT and why is it important?

- ▶ VMT = Vehicle Miles Traveled
- ▶ Distance traveled by all automobile trips traveling to or from a specific development (per land use)
- ▶ New transportation metric for California Environmental Quality Act (CEQA)
  - ▶ Replaces LOS as of today
  - ▶ Utilizing ratios to negate affect of project size (e.g., VMT per capita and VMT per employee)
- ▶ Key input into Air Quality and Greenhouse Gas (GHG) evaluations

# How is VMT typically calculated?

- ▶ Manual calculations
  - ▶ Total of all vehicle trips x average trip length
- ▶ Sketch models
  - ▶ Accounts for demographics/project characteristics/project location
- ▶ Travel demand models
  - ▶ Based on mode split and origin/destination projections; calculated trip lengths between O/D pairs

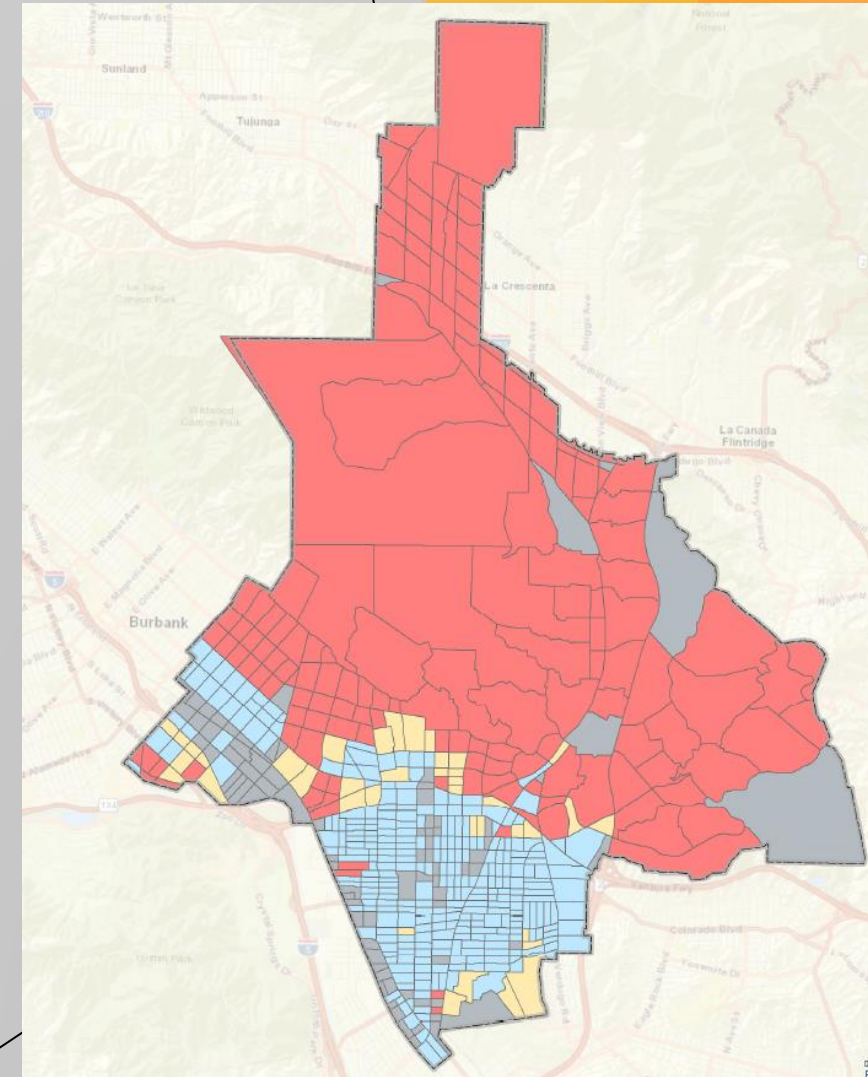
# How accurate are VMT calculations using a model?

- ▶ City model
  - ▶ Typically does not contain all zones in the travel shed
  - ▶ Need to average/approximate trip percentage and trip lengths for external trips
- ▶ County/regional model
  - ▶ Many not have complete local roadway network
  - ▶ Generally larger zones which minimizes localized land use patterns
- ▶ All models
  - ▶ Cannot account for project-specific design features
  - ▶ Cannot account for location and surrounding land use context



# Why do VMT calculations need to be accurate?

- ▶ CEQA purposes
  - ▶ Impacts are based on whether a project's VMT is under the applicable significance threshold
  - ▶ VMT over the threshold triggers additional environmental review and need for mitigation
  - ▶ Mitigation typically done by implementation of TDM measures, measured in terms of trip reduction (number of vehicle trips)
- ▶ Used to determine the applicable VMT thresholds, calculating VMT for individual projects, and assessing benefit of mitigations



# What can be done to improve accuracy?

- ▶ Utilize Big Data to refine modeling process
  - ▶ Include within model to improve validation
  - ▶ Apply outside model as part of post-processing process
- ▶ Requires review and selection of most appropriate datasets
  - ▶ Cost/schedule
  - ▶ Ease of use
  - ▶ Black box processes
  - ▶ Validation targets
  - ▶ Sampling size

# Can you provide a case study?

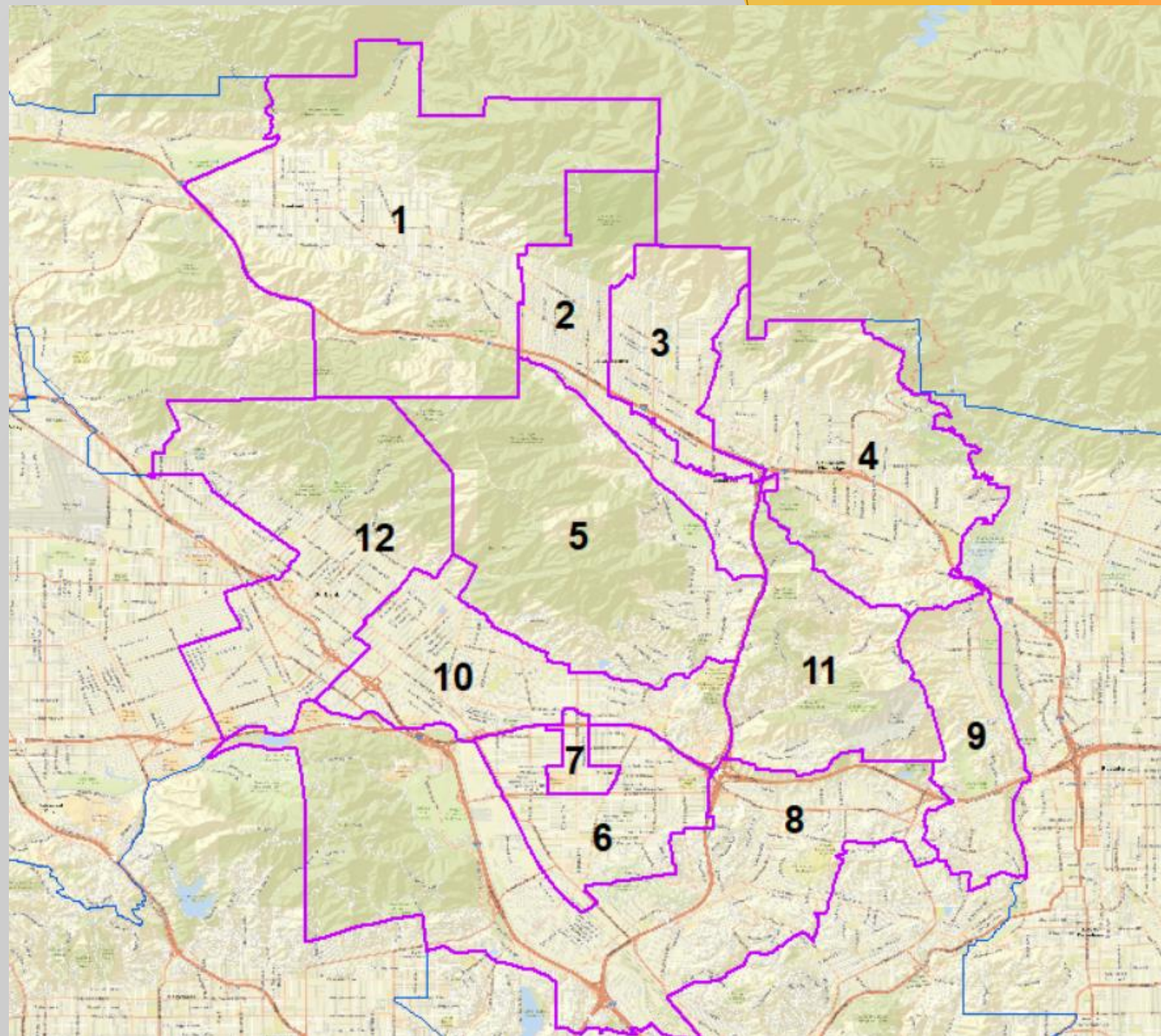
- ▶ City of Glendale citywide travel demand model
- ▶ City model based on larger regional model
- ▶ Identified series of internal, border and external zones
- ▶ Internal and border zones had modeled trip lengths
- ▶ External zones had estimated trip distances (centroid to centroid)
- ▶ City wanted to ensure that trip lengths were validated, especially for trips to/from border and external zones
- ▶ Used Streetlight Data to review distribution of trips and average trip lengths

# What was the validation process?

- ▶ Established a series of 12 internal/border origin/destination zones, plus 18 external zones
- ▶ Obtained origin/destination data for weekdays for one calendar year
- ▶ Established 20 key gateways (main access roadways)
- ▶ Used Streetlight Data parameters to determine residential and employment trip ends
- ▶ Calculated average distance between O/D zones from actual point-to-point lengths from individual trips

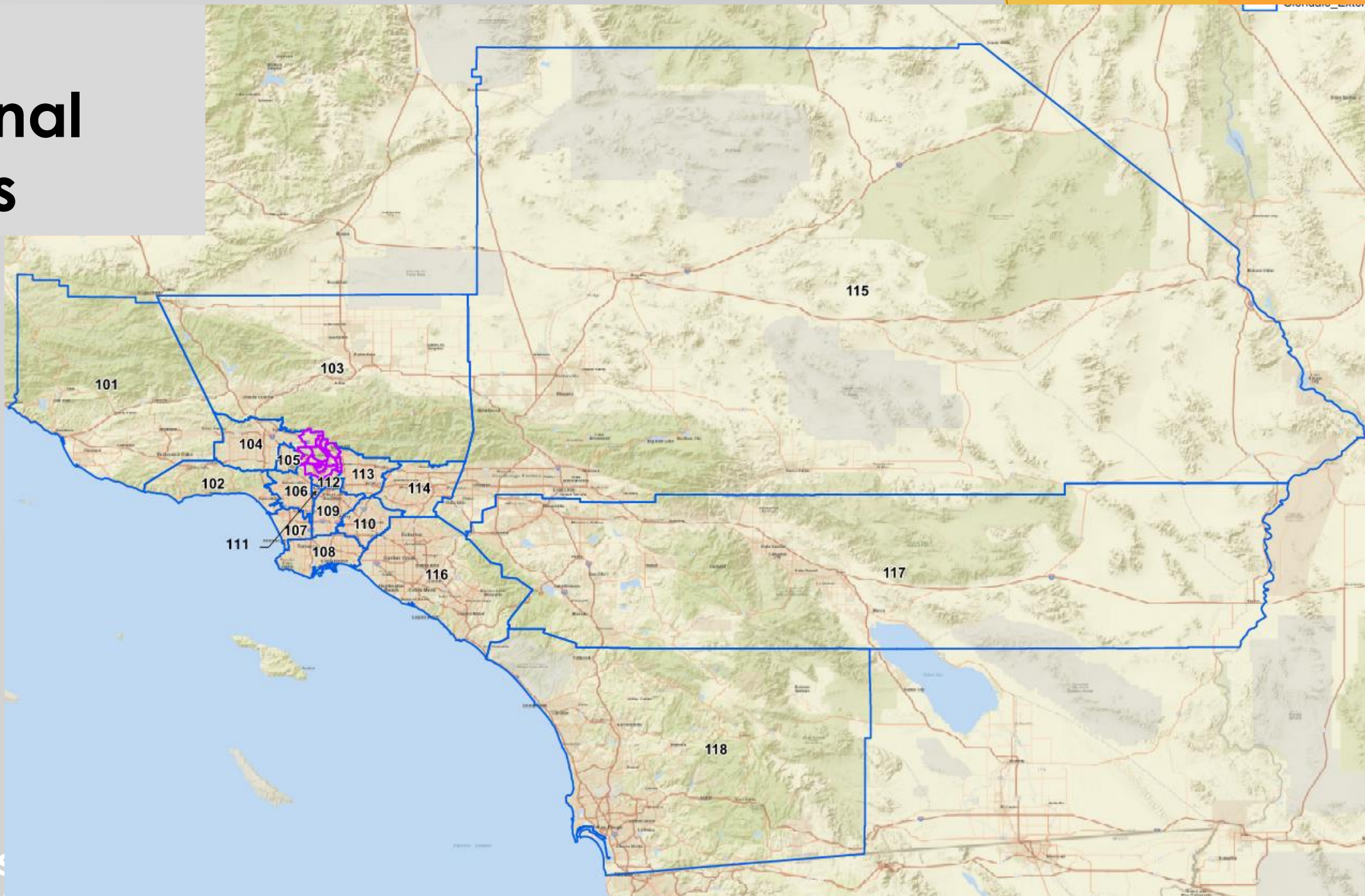


# Internal/border zones





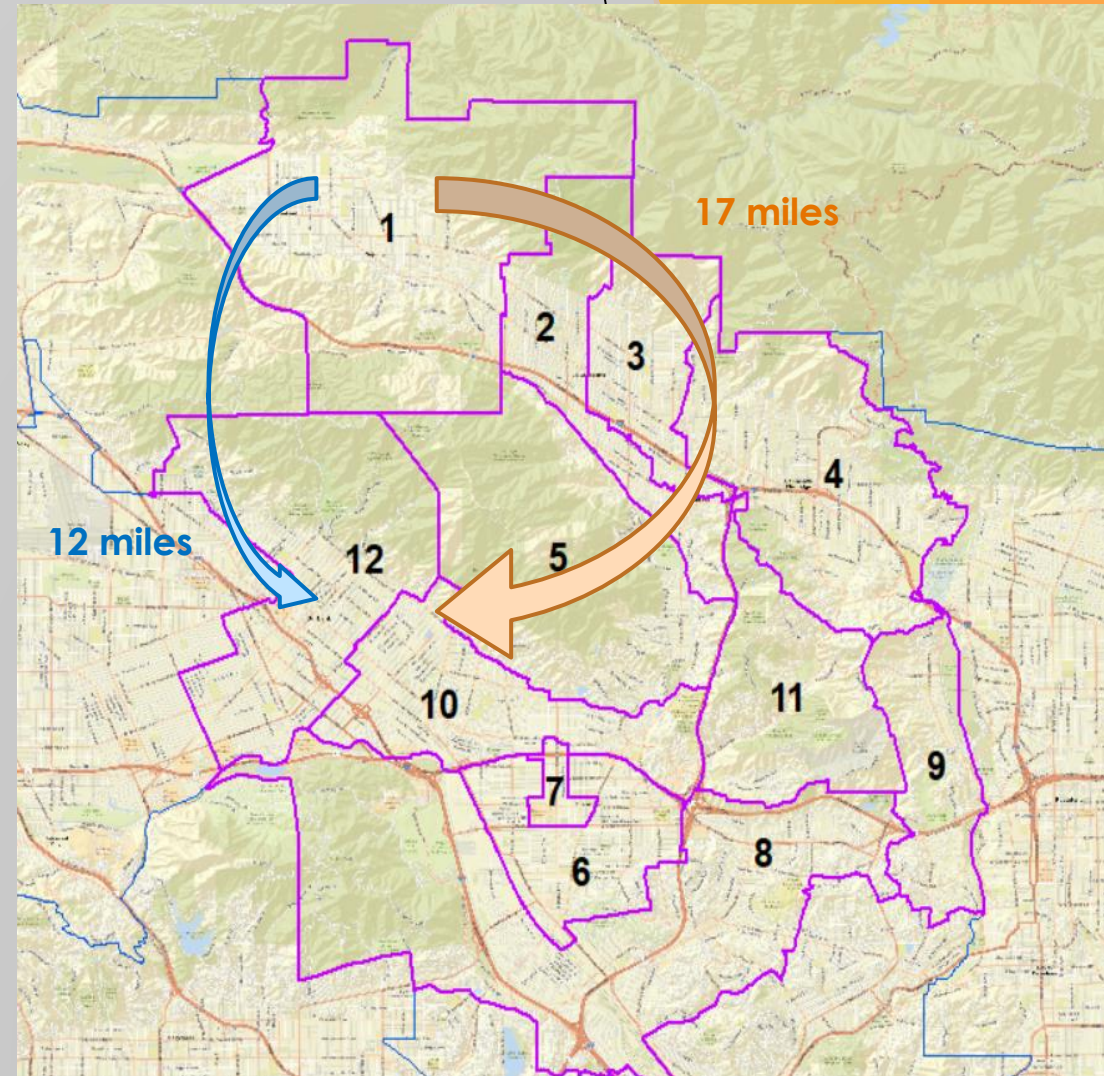
# External zones





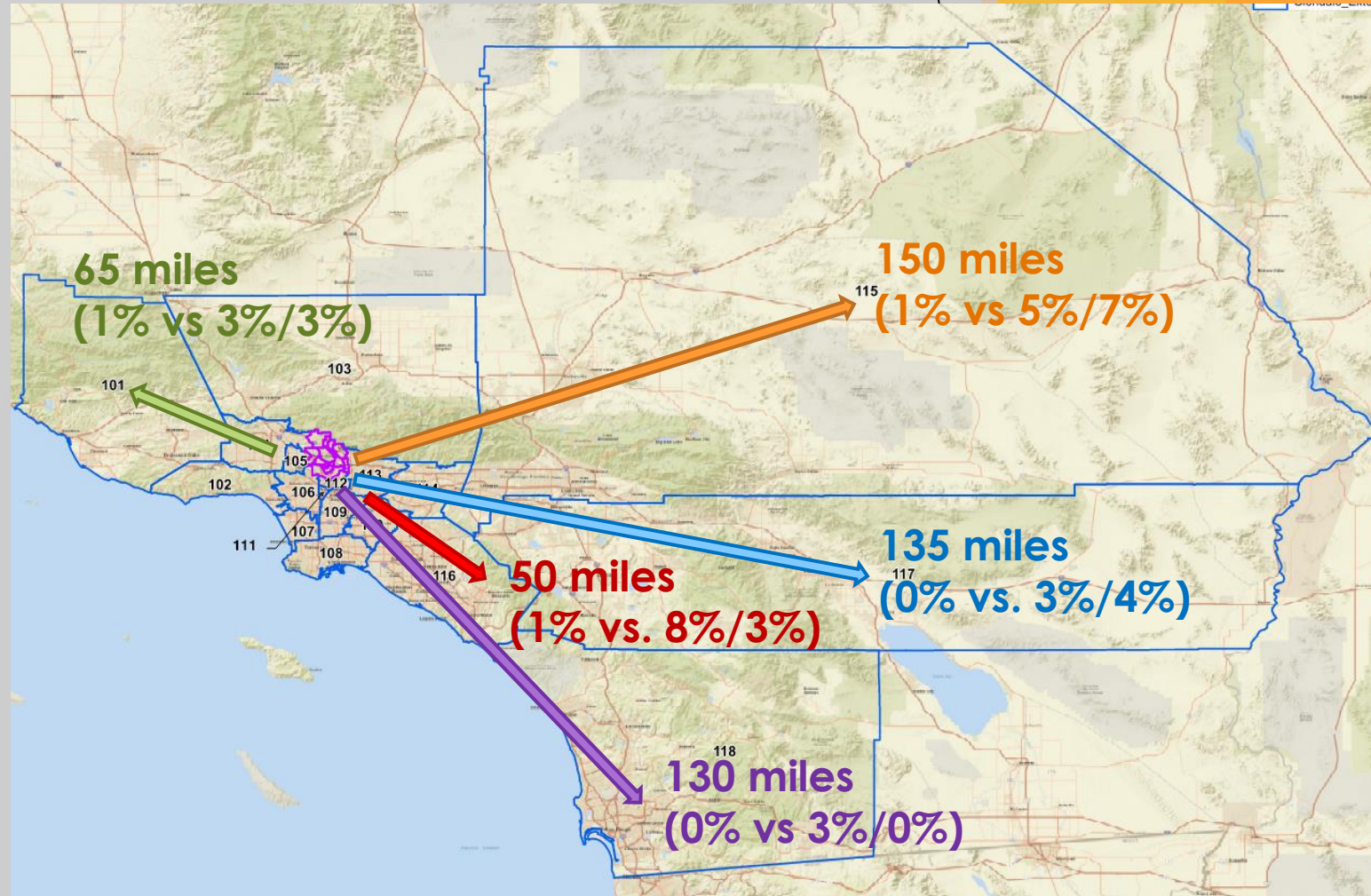
# What were the results of the local validation test?

- ▶ Compared to current city model:
- ▶ Trips at northwest (1) and southwest (12) corners of the city had trips shorter than projected
  - ▶ Model = 17 miles
  - ▶ Streetlight = 12 miles
  - ▶ Difference of 5 miles = ~30% too high
  - ▶ Likely a result of missing roadways in the network



# What were the results of the regional validation test?

- ▶ Compared to regional model and employer-household Census data:
- ▶ Home-based work trips were concentrated locally instead of spread throughout region
  - ▶ Local employment centers:  
64% of trips compared to 45% /26%
  - ▶ Regional (external zones):  
3% of trips compared to 17%/17%





# What else can be done with these types of data sources?

- ▶ Model validation
  - ▶ Trip distribution (percentage of trips between O/Ds)
  - ▶ Better approximation of “typical” conditions
- ▶ Post-processing model results
  - ▶ Seasonality
  - ▶ Hourly distribution
- ▶ Refine VMT for special cases
  - ▶ Unique uses/special generators
  - ▶ Synergistic uses
  - ▶ Concentrated uses within large zones



# What is Big Data best used for?

- ▶ Improve the validation of travel demand models
  - ▶ Refined OD data
  - ▶ More accurate VMT information
  - ▶ Determination of impacts
  - ▶ Level of mitigation required
- ▶ Develop post-processing factors
- ▶ Refine VMT estimates for “unique” uses or special cases
- ▶ Increase the robustness of the validation counts
- ▶ Verify conditions between model updates

# What about lessons learned or things to look out for?

- ▶ Chained trips are not broken up (e.g., drive-thru or drop-off/pick-up)
  - ▶ Stops less than a given duration (4 min) are not a separate trip
- ▶ “Hidden” regional uses are overestimated
  - ▶ May project longer than anticipated trip lengths for underserved markets (e.g., markets near resorts)
- ▶ Can have high margins of errors at a site-specific level
  - ▶ Not all driveways/turn-restrictions accounted for
  - ▶ Small roads have lower volumes/smaller sample size

# What do I do if I have questions?

- ▶ Ask them now
- ▶ Contact:
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