

Topics

- Travel Demand Models
- Forecast Exercise
The Art of Forecasting Traffic
- Quiz and Assignment
- Forecast Discussion

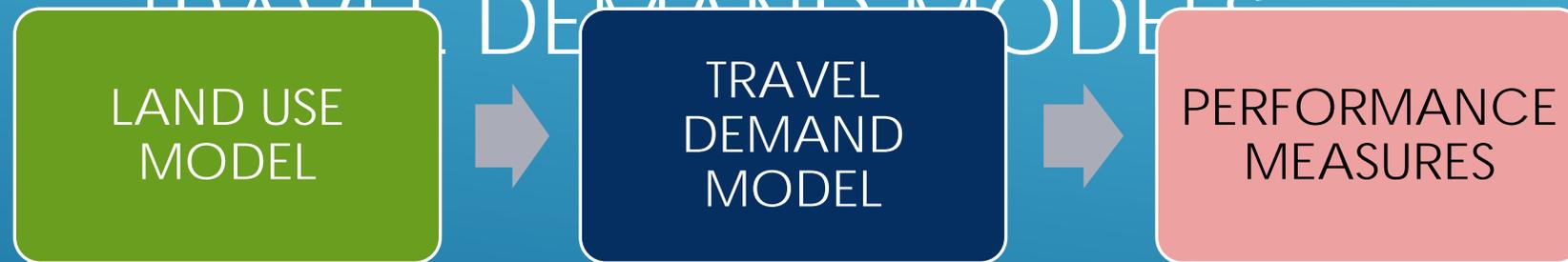
Jeff Berkman - Traffic Forecaster

FORTUNE TELLING 101



- Cities
- Counties
- MPO's SBCAG | SLOCOG | AMBAG
- Caltrans

STAGES OF DEVELOPMENT: TRAVEL DEMAND MODELS



Existing



Housing and Employment

- o Census 2010
- o American Community Survey
- o Local Governments
- o Private Companies (ESRI, Info USA)
- o Vision of future growth
- o Sets specific goals and policies



General Plans

- o Households by size, age, income...
- o Employment by type (Office, Ind..)
- o Long term Population Projections...
- o Growth Types (new infill, mixed use)
- o CA Dept of Finance
- o Other Public and Private Agencies
- o UCLA Anderson Forecast

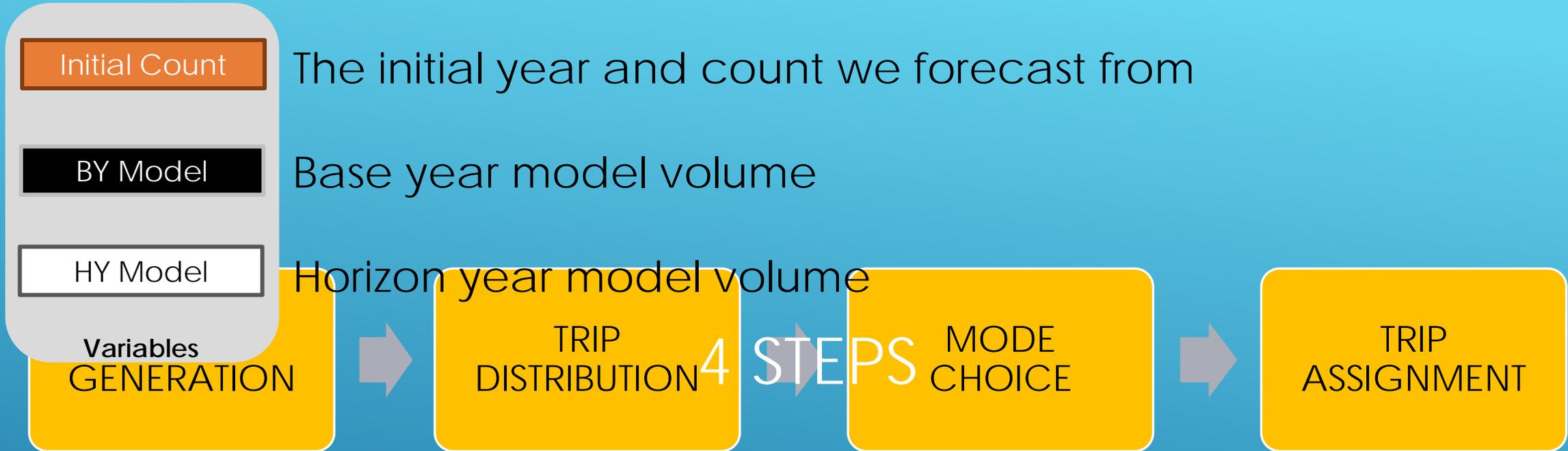


Future

LAND USE
MODEL



Housing and Employment



The initial year and count we forecast from

Base year model volume

Horizon year model volume

DEFINITIONS

LAND USE MODEL

TRAVEL DEMAND MODEL



Housing and Employment

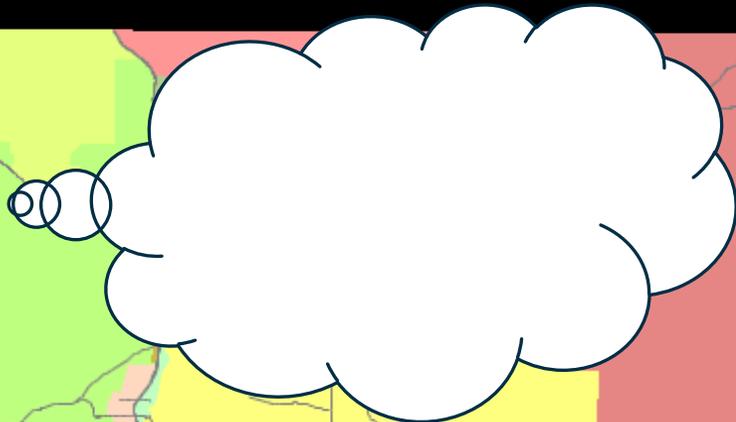


How are trips created?

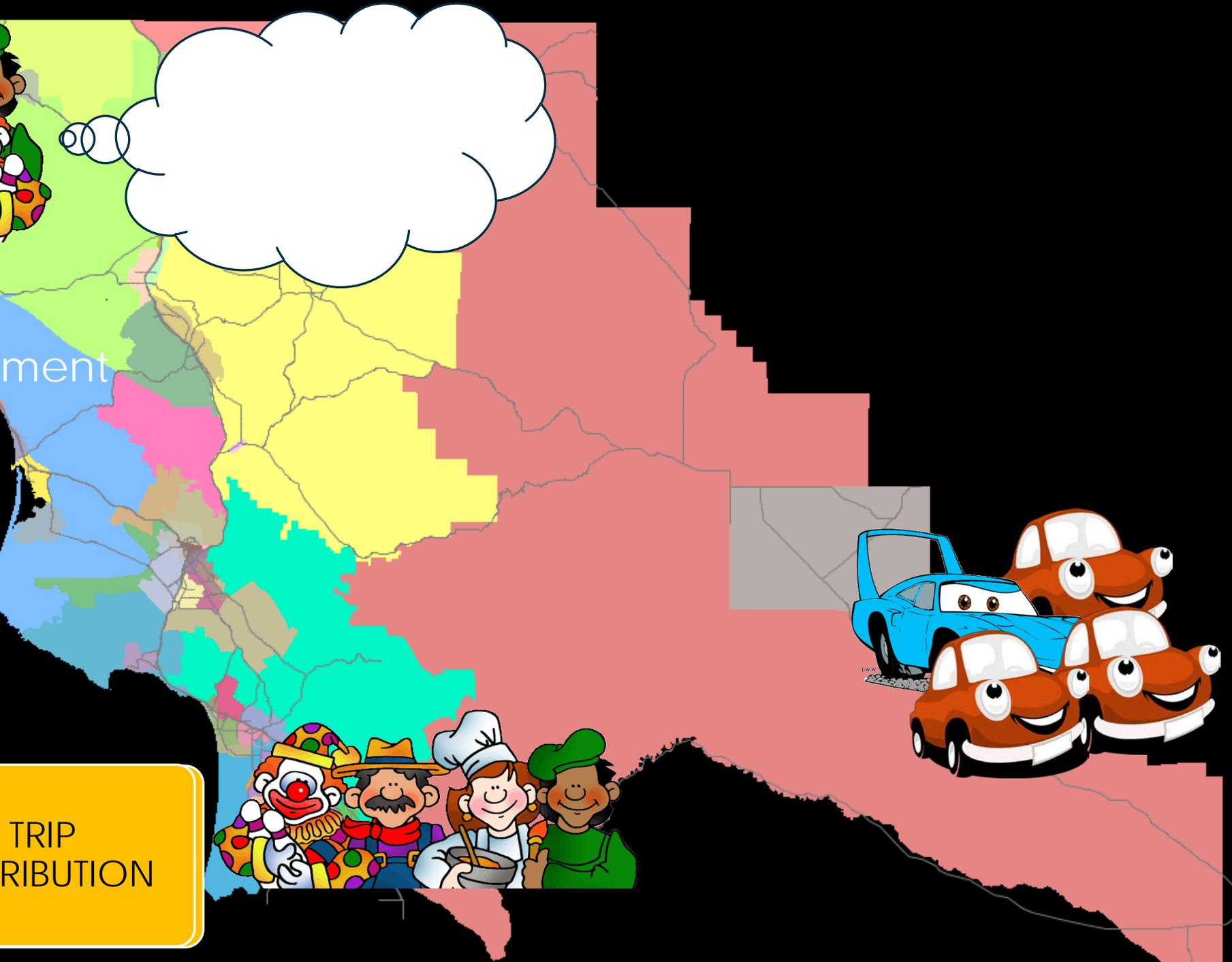
- California HH Transportation Survey
 - 42,500 Households statewide
 - 2010 – 2012
- Trip Rates
- Other Regional Models
- New Technologies
 - Uber, FB, Twitter, Cell Phone, Bluetooth

TRAVEL
DEMAND
MODEL

TRIP
GENERATION



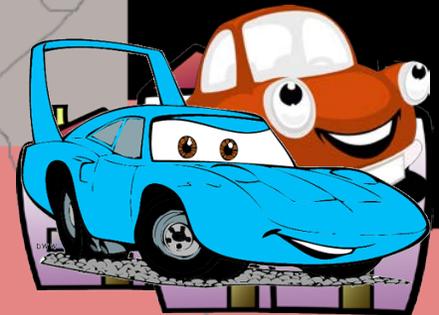
Housing and Employment



TRAVEL
DEMAND
MODEL

TRIP
DISTRIBUTION





TRIP
GENERATION

MODE
CHOICE





TRIP
GENERATION

TRIP
DISTRIBUTION

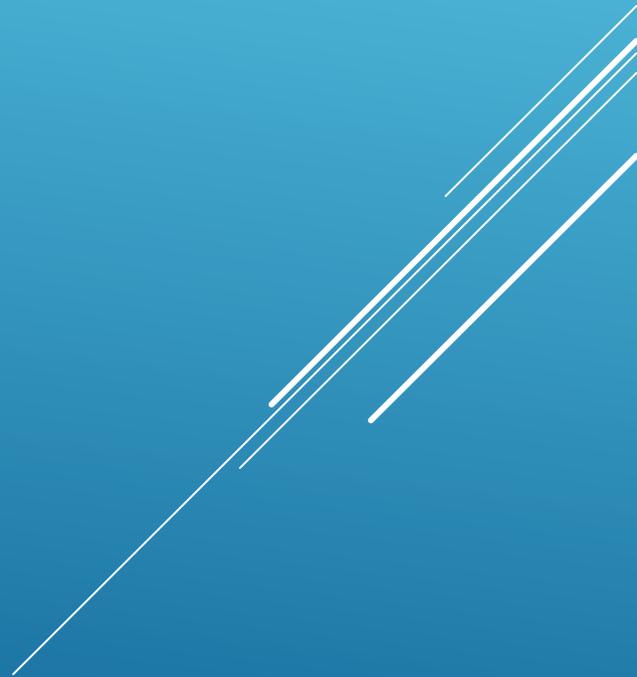
TRIP
ASSIGNMENT

Performance Measures

- Volumes
- Speeds
- Congestion (V/C)
- VMT
- VHT



ANY QUESTIONS?

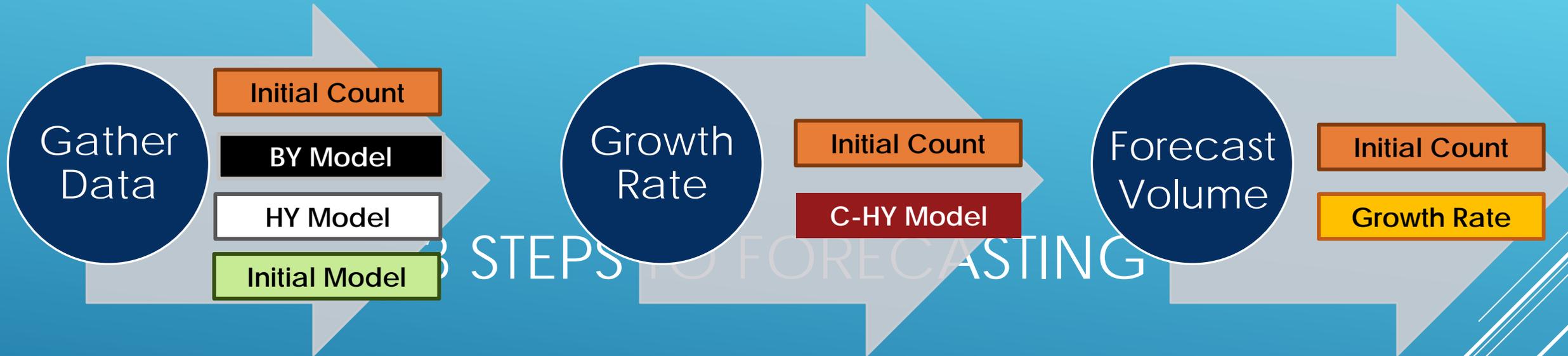


| | |
|---------------|---|
| Initial Count | The initial year and count we forecast from |
| BY Model | Base year model volume |
| HY Model | Horizon year model volume |
| Initial Model | Initial year model volume |
| C-HY Model | Count adjusted Horizon Year Model Volume |
| Growth Rate | Yearly increase of volume |

Variables

MORE DEFINITIONS

1ST STEP



Initial Year = **2013** | Forecast Year = **2040**
Daily Volumes Analyzed

Headquarters Traffic Data Branch

dot.ca.gov/hq/traffops/saferesr/trafdata/

PEMs – Performance Measures

pems.dot.ca.gov

Gather Data

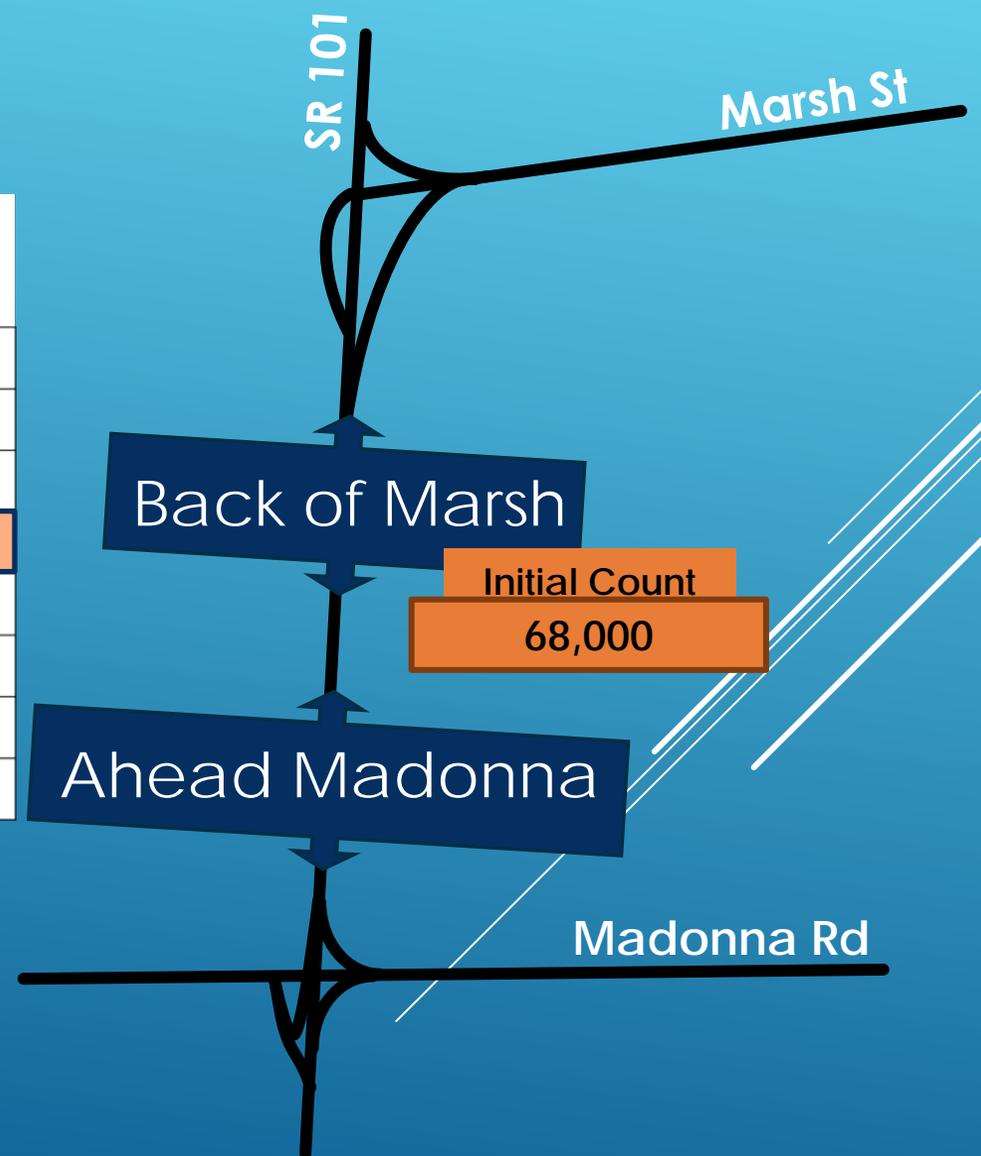
Initial Count

BY Model

HY Model

Initial Model

| | | | | Back AADT | Ahead AADT |
|------|-----|--------|--------------|-----------|------------|
| | | | Madonna Road | 58,000 | 60,000 |
| | | | Madonna Road | 59,200 | 66,000 |
| | | | Madonna Road | 57,700 | 67,100 |
| 2013 | 101 | 27.501 | Madonna Road | 58,600 | 68,000 |
| 2010 | 101 | 28.088 | Marsh Street | 60,000 | 57,000 |
| 2011 | 101 | 28.088 | Marsh Street | 66,000 | 60,500 |
| 2012 | 101 | 28.088 | Marsh Street | 67,100 | 62,300 |
| 2013 | 101 | 28.088 | Marsh Street | 68,000 | 63,100 |



BY Model

79,827

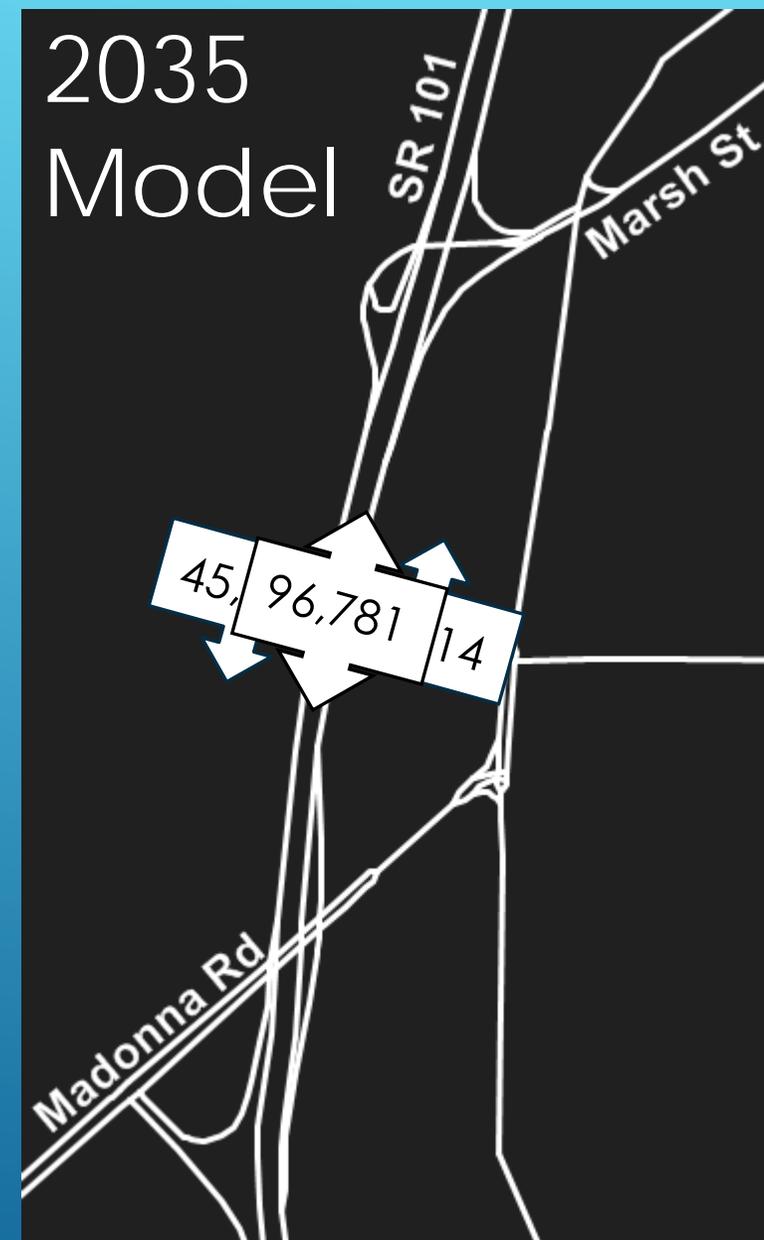
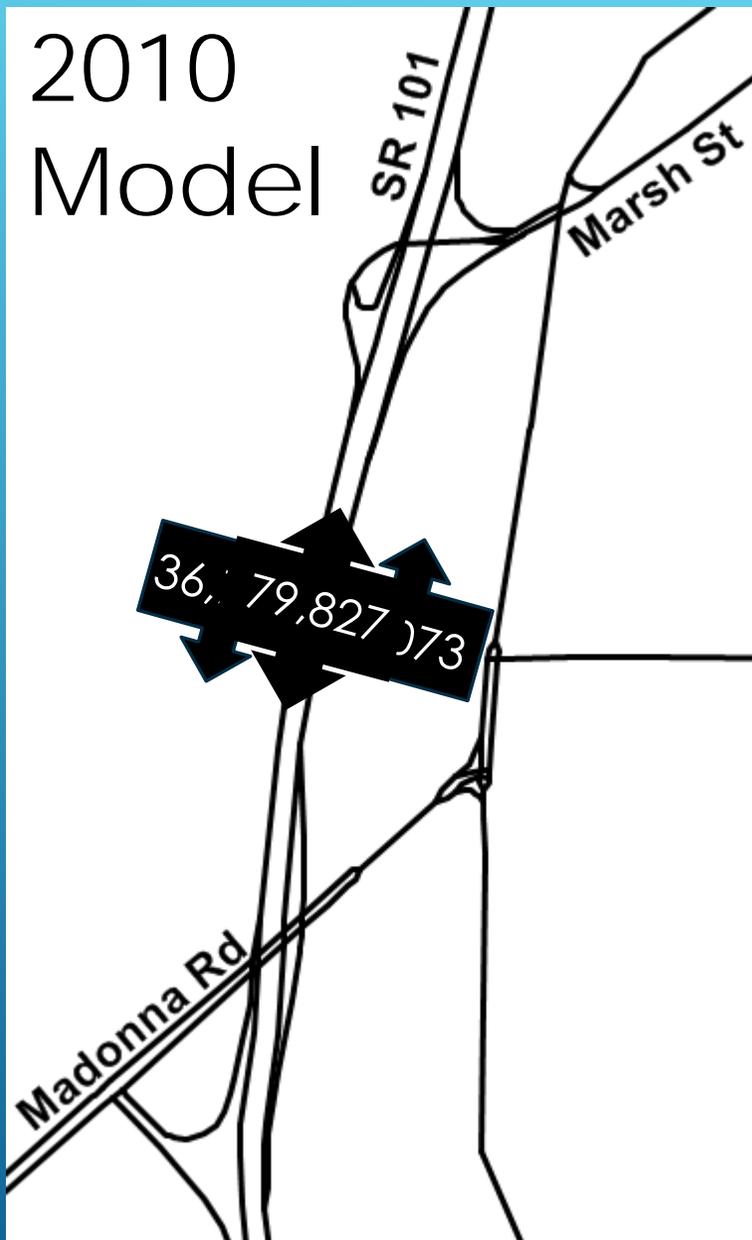
HY Model

96,781

Initial Model

Variables

Gather
Data



- Initial Count
68,000
- BY Model
79,827
- HY Model
96,781
- Initial Model
81,861

???

2013 Model

2010 Model
79,827

2035 Model
96,781

Annual Growth = $\frac{2035\text{ Model} - 2010\text{ Model}}{25\text{ years}}$
 $= \frac{96,781 - 79,827}{25\text{ years}}$
 $= 678\text{ vehicles per year}$

2013 Model = $2010\text{ Model} + (678 \times 3\text{ years})$
 $= 79,827 + (678 \times 3\text{ years})$
 $= 81,861$

Gather Data

Variables

Initial Count

68,000

BY Model

79,827

HY Model

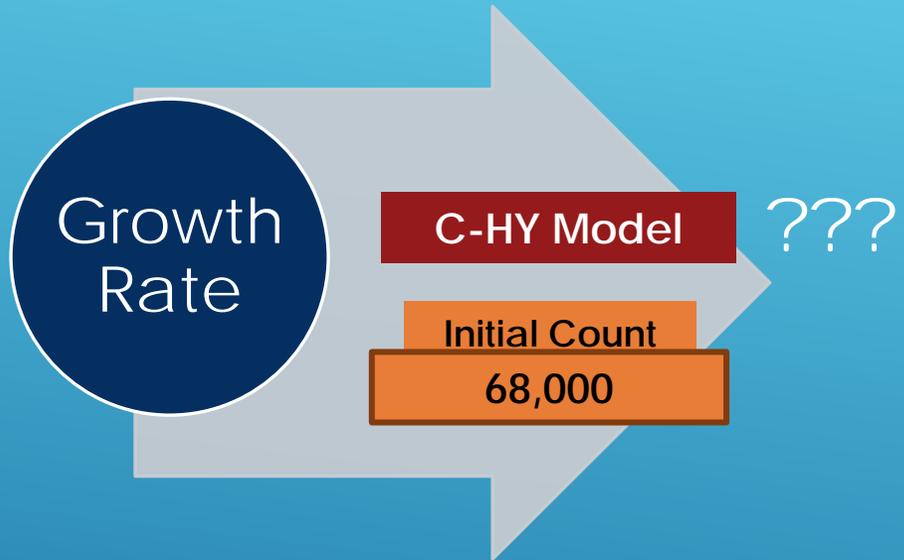
96,781

Initial Model

81,861

Growth Rate

Variables



2ND STEP

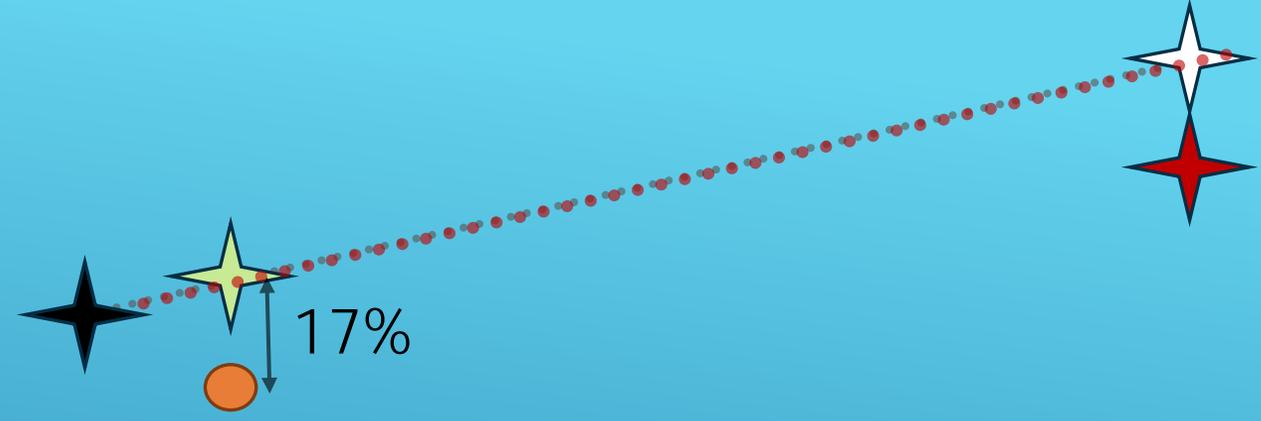
| | |
|---------------|--------|
| Initial Count | 68,000 |
| BY Model | 79,827 |
| HY Model | 96,781 |
| Initial Model | 81,861 |

C-HY Model

Growth Rate

Variables

Growth Rate



Ratio Method: **C-HY Model** = $\frac{\text{HY Model } 96,781}{\text{Initial Model } 81,861} \times \text{Initial Count } 68,000 = 80,394$

Difference Method: **C-HY Model** = $\text{HY Model } 96,781 + (\text{Initial Count } 68,000 - \text{Initial Model } 81,861) = 82,920$

C-HY Model
81,657

Initial Count

68,000

BY Model

79,827

HY Model

96,781

Initial Model

81,861

C-HY Model

Growth Rate

621

Variables

CA Growth Rate

GROWTH RATE

[Horizon 2035 - 2013 Initial Year]

= 621 vehicles

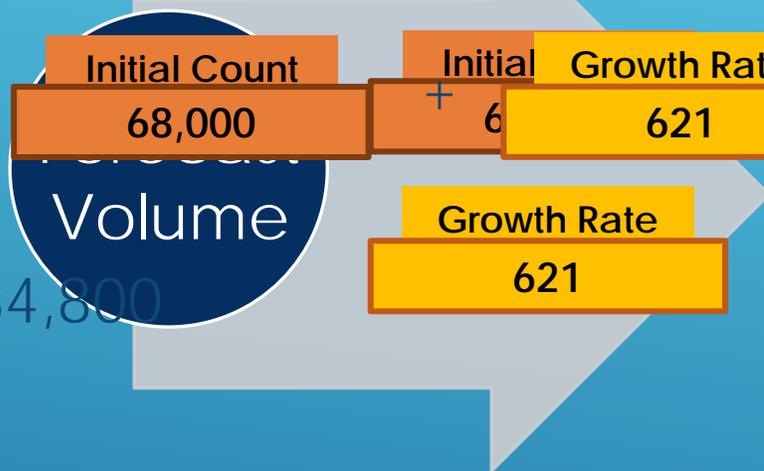
C-HY Model

81,657

Growth Rate

| | |
|---------------|--------|
| Initial Count | 68,000 |
| BY Model | 79,827 |
| HY Model | 96,781 |
| Initial Model | 81,861 |
| C-HY Model | 81,657 |
| Growth Rate | 621 |
| Variables | |

$$\begin{aligned}
 &= \text{Initial Count } 68,000 + \text{Growth Rate } 621 \times ([\text{Future Year}] - [\text{Initial Year}]) \\
 &= \text{Initial Count } 68,000 + \text{Initial } 6 + \text{Growth Rate } 621 \times (2040 - 2013) \\
 &= 84,800
 \end{aligned}$$



3RD STEP

YOU ARE NOW
A CERTIFIED
FORTUNE TELLER



Where can you find counts for State Routes?

Where can you find model volumes for State Routes?

Headquarters Traffic Data Branch

dot.ca.gov/hq/traffops/saferesr/trafdata/

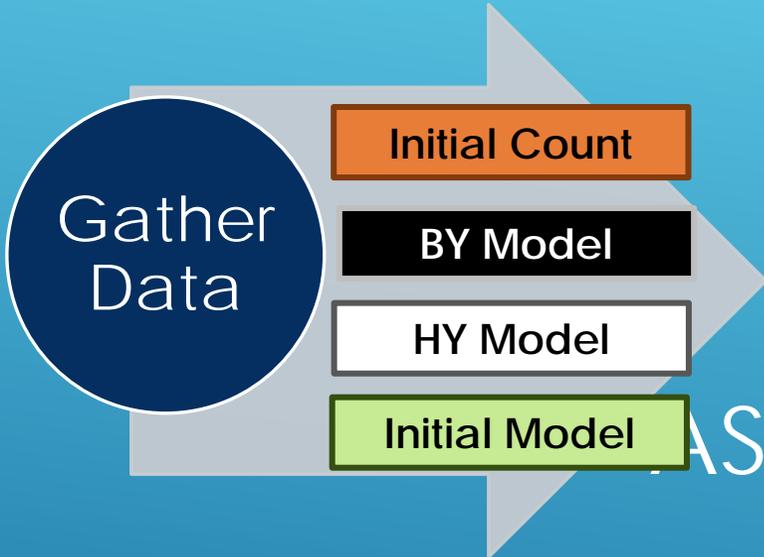
PEMs – Performance Measures **QUIZ**

pems.dot.ca.gov

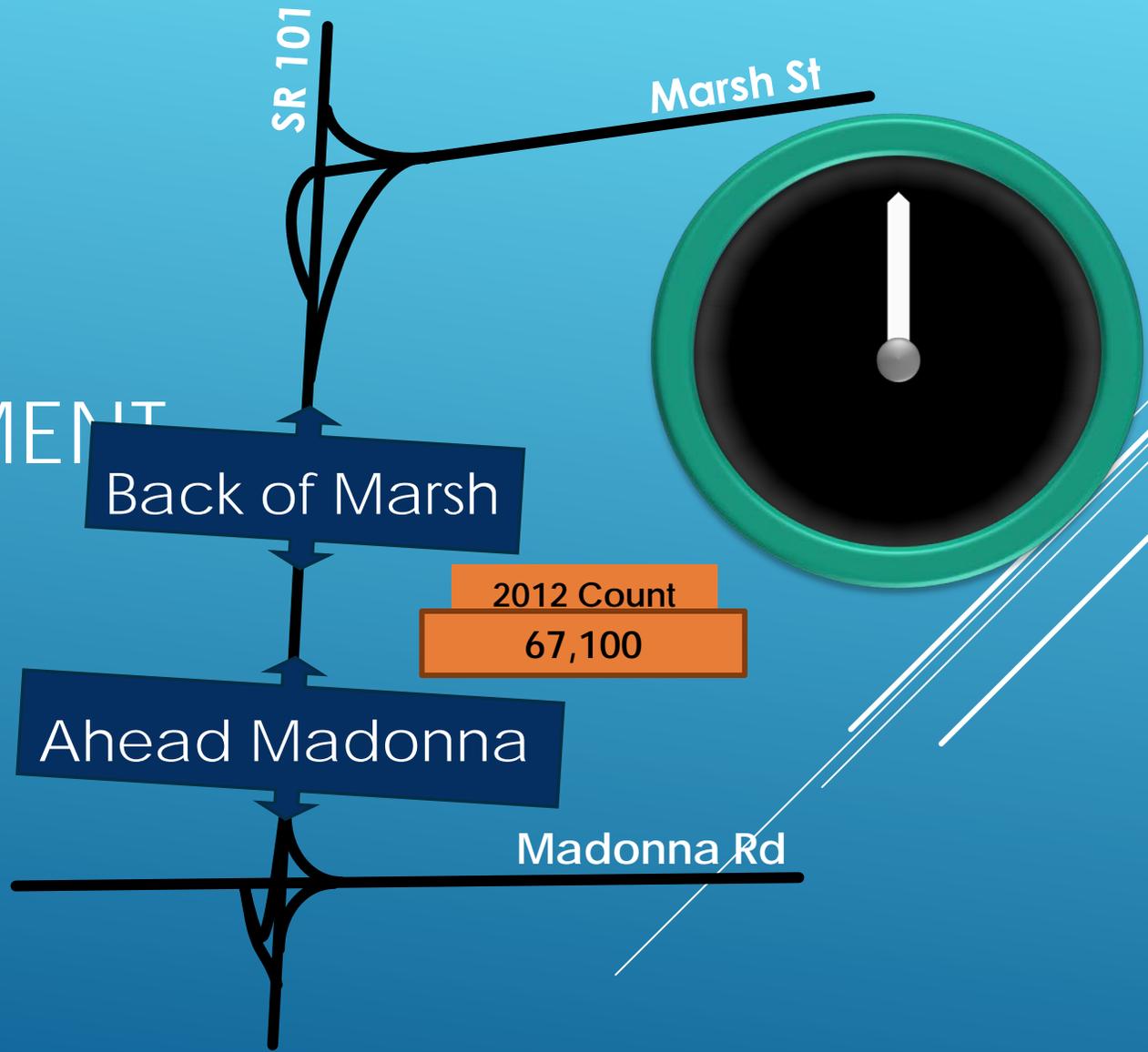
State, MPO, County or City Travel Demand Models



What is the daily volume for SR-101 between Madonna Rd and Marsh St for years 2012, 2022, and 2032?



ASSIGNMENT



| COUNTS FROM HQ | | | | Back | Ahead |
|----------------|-----|----------|--------------|--------|--------|
| Year | RTE | Postmile | Description | AADT | AADT |
| 2010 | 101 | 27.501 | Madonna Road | 58,000 | 60,000 |
| 2011 | 101 | 27.501 | Madonna Road | 59,200 | 66,000 |
| 2012 | 101 | 27.501 | Madonna Road | 57,700 | 67,100 |
| 2013 | 101 | 27.501 | Madonna Road | 58,600 | 68,000 |
| 2010 | 101 | 28.088 | Marsh Street | 60,000 | 57,000 |
| 2011 | 101 | 28.088 | Marsh Street | 66,000 | 60,500 |
| 2012 | 101 | 28.088 | Marsh Street | 67,100 | 62,300 |
| 2013 | 101 | 28.088 | Marsh Street | 68,000 | 63,100 |

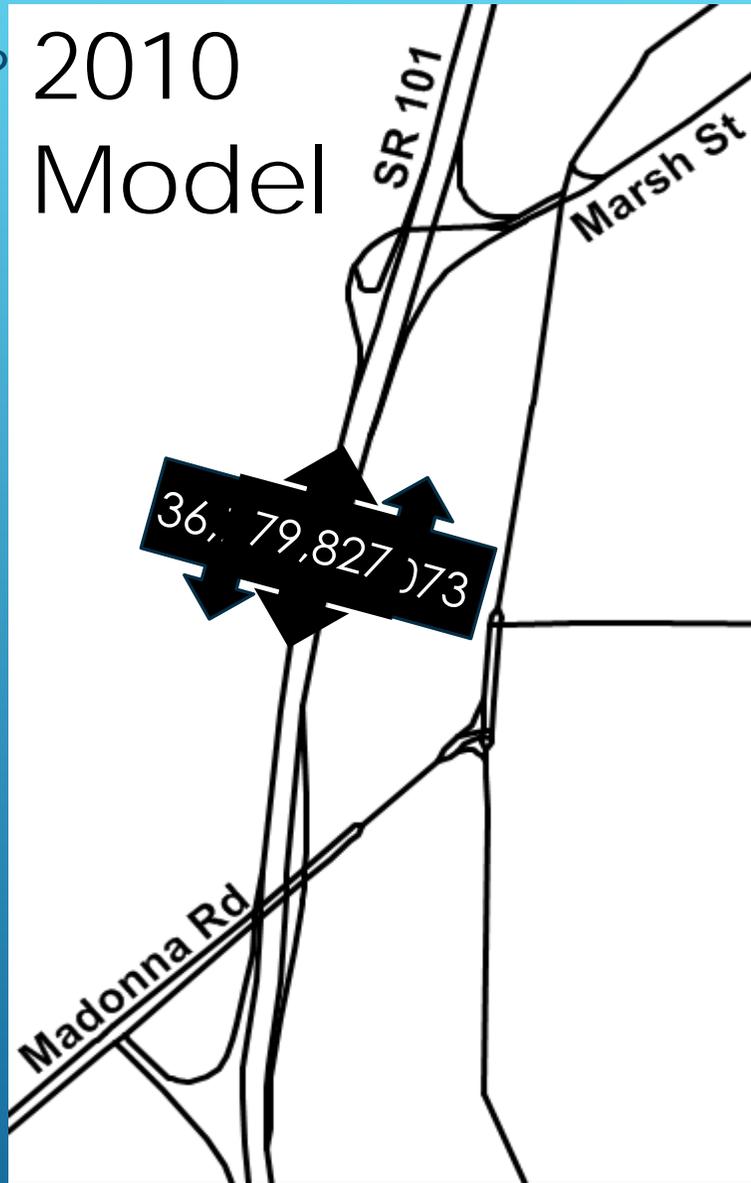
What is the daily volume for SR-101 between Madonna Rd and Marsh St for years 2012, 2022, and 2032?

Gather Data

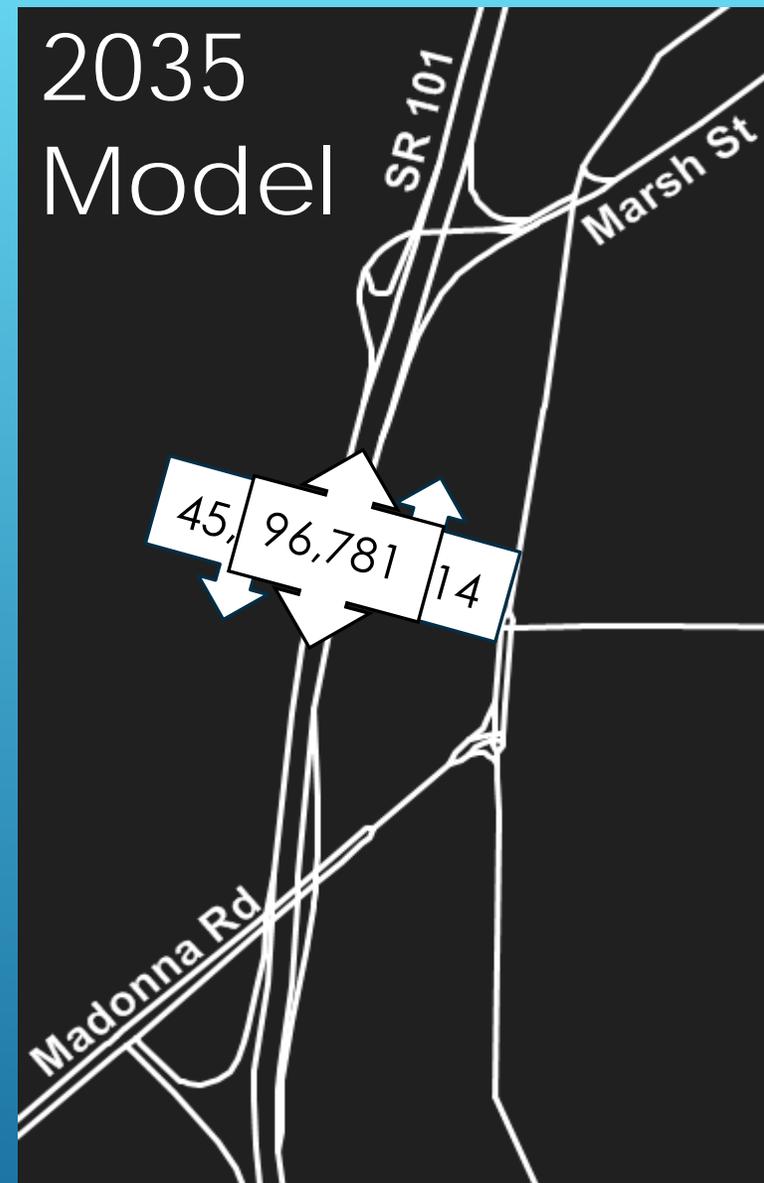
2012 Count

67,100

Initial Model



2010 Model
79,827



2035 Model
96,781

What is the daily volume for SR-101 between Madonna Rd and Marsh St for years 2012, 2022, and 2032?

Gather Data

- 2012 Count
67,100
- 2010 Model
79,827
- 2035 Model
96,781
- 2012 Model
81,183

2012 Model
81,183

Interpolate:

$$\text{Annual Growth} = \frac{\text{2035 Model } 96,781 - \text{2010 Model } 79,827}{\text{Horizon } 2035 - \text{Base Year } 2010}$$

= 678 vehicles per year



Initial Model

$$= \text{2010 Model } 79,827$$

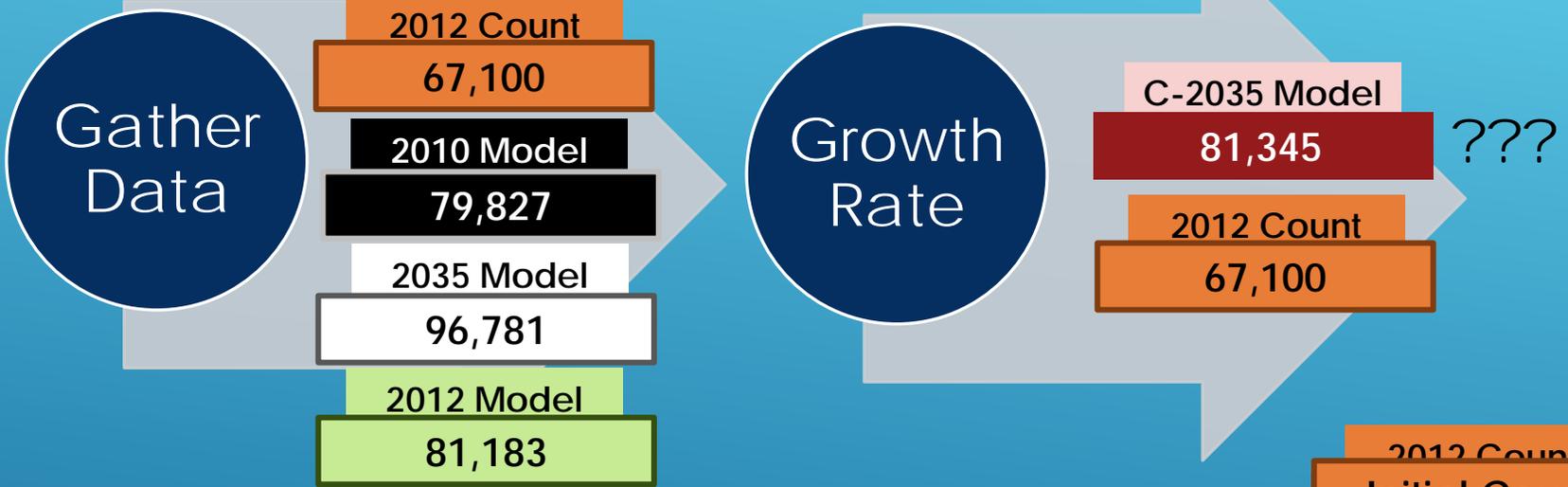
$$= 81,183$$

$$+ \text{Annual Growth} \times \text{? Years}$$

2010 Model
79,827

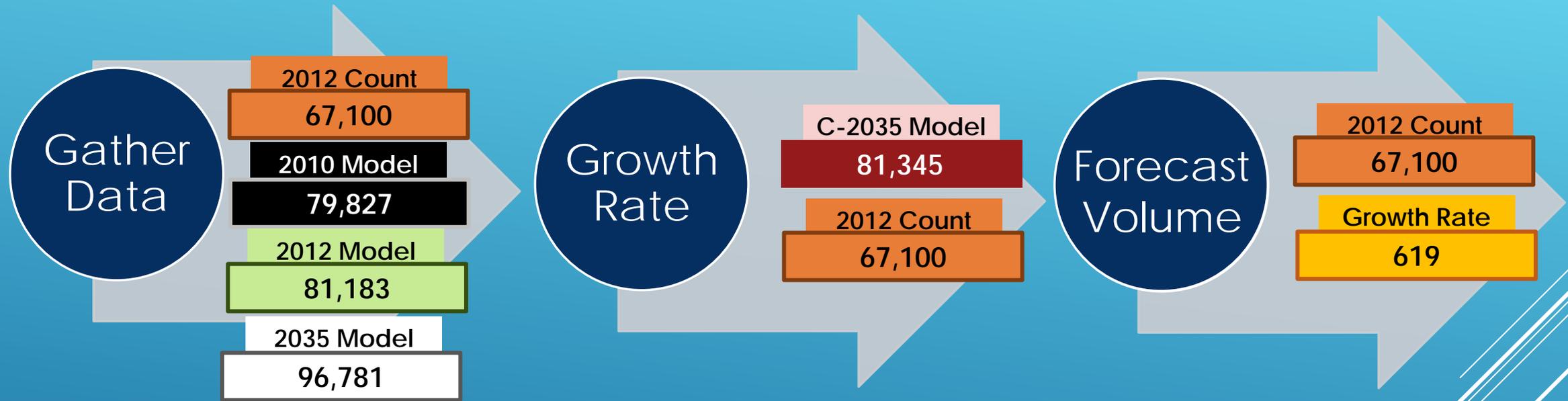
2035 Model
96,781

$$\text{Growth Rate } 619 = \frac{\text{C-2035 Model } 81,345 - \text{2012 Count } 67,100}{[\text{Horizon Year } 2035 - \text{Initial Year } 2012]} = 619$$



Ratio Method: **C-HY Model** = $\frac{\text{2035 Model } 96,781}{\text{Initial Model } 81,183} \times \frac{\text{2012 Count } 67,100}{\text{Initial Count } 67,100} = 79,992$

Difference Method: **C-HY Model** = $\text{HY Model } 79,781 + (\text{Initial Count } 67,100 - \text{Initial Model } 81,183) = 82,698$

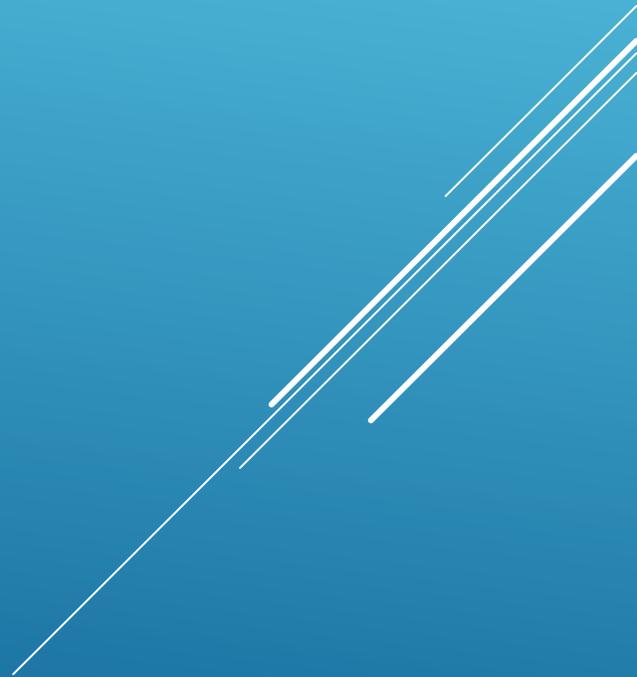


Years 2022 and 2032:

$$\begin{array}{l}
 \begin{array}{|c|} \hline 2012 \text{ Count} \\ \hline 67,100 \\ \hline \end{array} + \begin{array}{|c|} \hline \text{Growth Rate} \\ \hline 619 \\ \hline \end{array} \times (2022 - 2012) = 74,200 \text{ (Year)} \\
 \begin{array}{|c|} \hline 2012 \text{ Count} \\ \hline 67,100 \\ \hline \end{array} + \begin{array}{|c|} \hline \text{Growth Rate} \\ \hline 619 \\ \hline \end{array} \times (2032 - 2012) = 80,400
 \end{array}$$

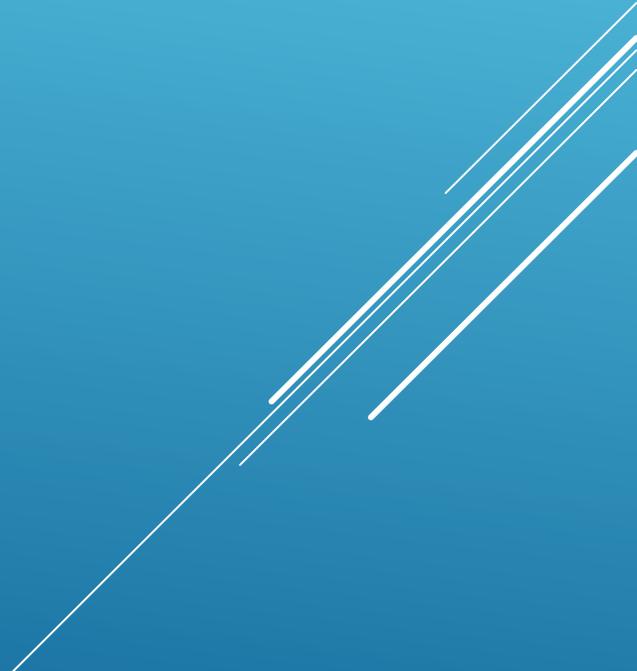


QUESTIONS?



1. Design Designations and Traffic Indexes
2. Traffic Impact Reports and Environmental Impact Reports
 - Reviewed by IGR (Intergovernment Review)
3. Project Specific Traffic Studies
4. Transportation Concept Reports (TCR)

FORECAST USES



TCR TABLES AND GRAPHS

Daily Traffic Data

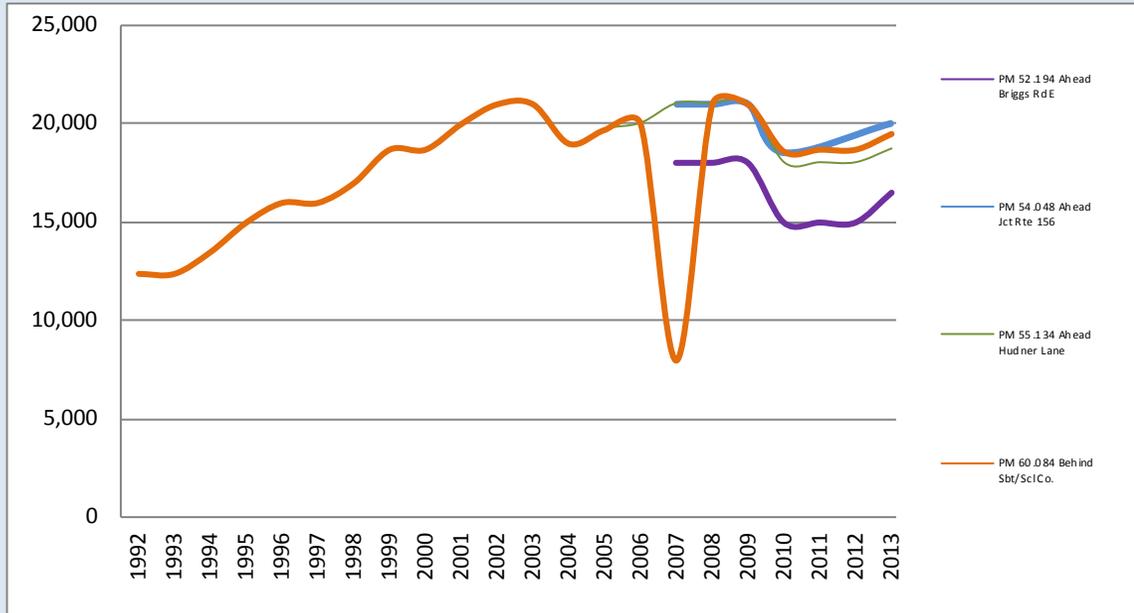
| | |
|-----------------------------------|------------------|
| AADT Base Year 2013 | 16,500 to 19,350 |
| AADT Horizon Year 2040 | 32,770 to 36,980 |
| AADT: Growth Rate (Vehicles/Year) | 600 to 660 |
| VMT Base Year 2013 | 146,150 |
| VMT Horizon Year 2040 | 283,880 |

PM Peak Hour Traffic Data

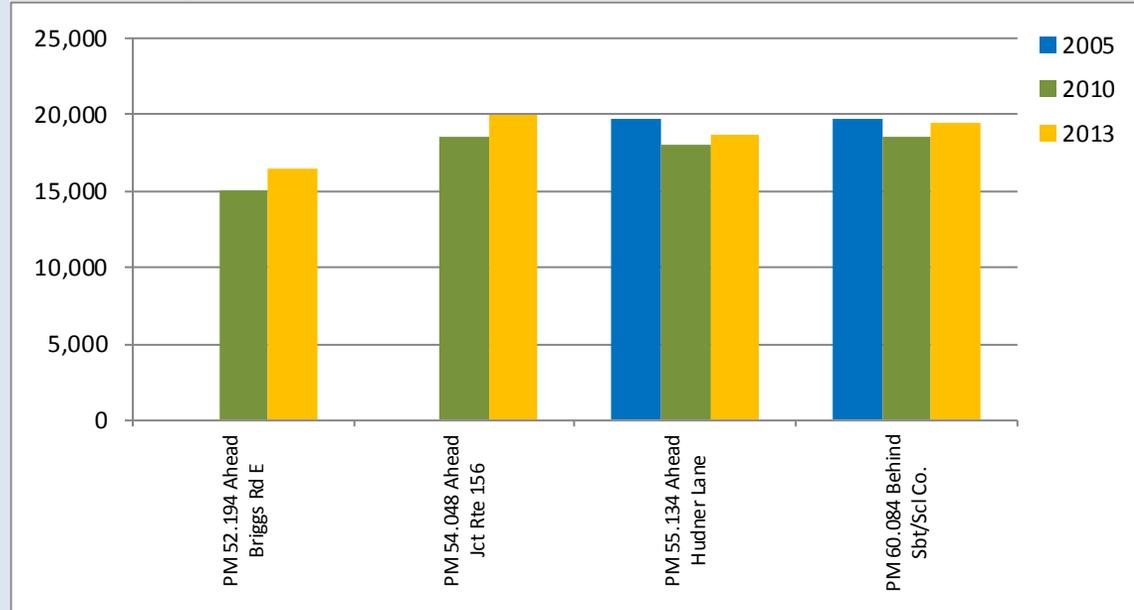
| | Northbound | Southbound |
|--|------------------|-------------------|
| Segment Length (Miles) | 7.89 | |
| PM Peak Hour Directional Split Base Year 2013 | 31.0% to 33.5% | 66.5% to 69.0% |
| PM Peak Hour Directional Split Horizon Year 2040 | 32.8% to 38.3% | 61.7% to 67.2% |
| PM Peak Hour Volume Base Year 2013 | 1,500 to 1,900 | |
| | 500 to 610 | 1,000 to 1,000 |
| PM Peak Hour Volume Horizon Year 2040 | 3,040 to 3,560 | |
| | 1,130 to 1,230 | 1,870 to 2,320 |
| PM Peak Hour Growth Rate (vehicles/year) | 57 to 61 | |
| PM Peak Hour VMT Base Year 2013 | 4,360 | 9,400 |
| PM Peak Hour VMT Horizon Year 2040 | 9,080 | 17,420 |
| PM Peak Hour VHT Base Year 2013 | 80 | 193 |
| PM Peak Hour VHT Horizon Year 2040 | 176 | more than 638* |
| PM Peak Hour V/C Base Year 2013 | 0.264 to 0.322 | 0.525 to 0.678 |
| PM Peak Hour V/C Horizon Year 2040 | 0.594 to 0.648 | 0.986 to 1.223 |
| PM Speed (mph) Base Year 2013 | 54.4 to 54.8 mph | 47.6 to 52.5 mph |
| PM Speed (mph) Horizon Year 2040* | 49.8 to 51.8 mph | 21.6* to 38.5 mph |

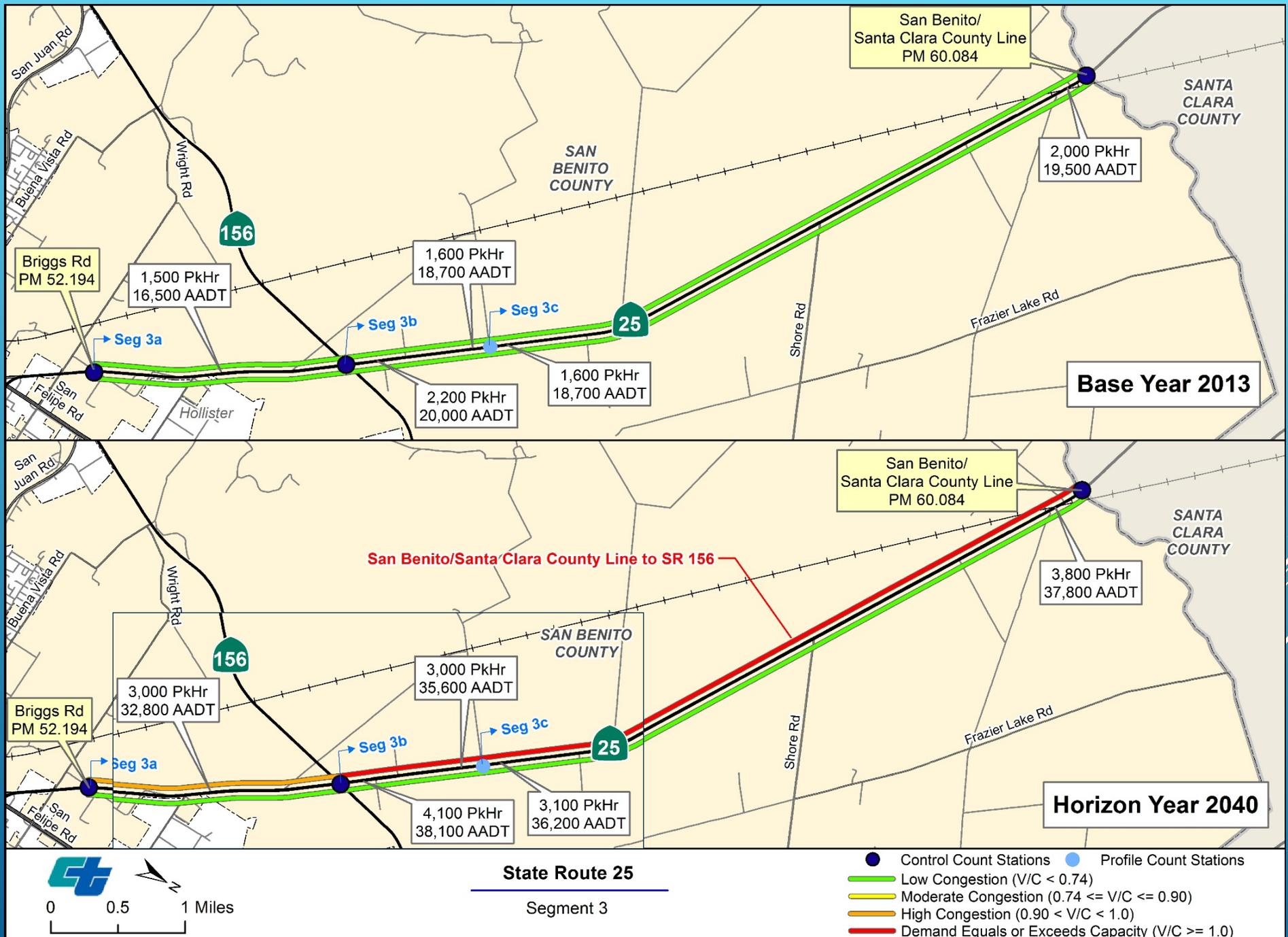
*Speeds and VHT cannot be determined for subsegments with LOS F

Historic AADT by Year



Historic AADT by Location





3 Steps to Forecasting

| | Initial Year AADT Count | Initial Year AADT model | BY AM NB V/C | BY AM SB V/C | AADT Growth Rate | HY ADT Volume | HY ADT Model Volume | HY PM NB V/C | HY PM SB V/C |
|---|----------------------------|----------------------------|--------------|--------------|------------------|---------------|------------------------|--------------|--------------|
| Step 1: Gather Counts and Raw Model Volumes | 64,100 | 61,702 | 0.79 | 0.71 | 970 | 85,438 | 82,633 | 1.09 | 1.00 |
| | 55,800 | 60,215 | 0.72 | 0.64 | 943 | 76,538 | 81,742 | 1.04 | 1.01 |
| | 55,500 | 52,457 | 0.79 | 0.56 | 1,020 | 77,940 | 74,264 | 0.94 | 1.17 |
| | 54,800 | 56,623 | 0.81 | 0.52 | 1,093 | 78,840 | 81,056 | 0.95 | 1.11 |
| Step 2: Calculate Growth Rates | 50,450 | 59,073 | 0.74 | 0.49 | 1,085 | 74,315 | 84,817 | 0.97 | 1.04 |
| | 54,400 | 64,531 | 0.79 | 0.54 | 1,032 | 77,115 | 89,181 | 1.01 | 1.13 |
| | 57,500 | 75,029 | 0.84 | 0.56 | 930 | 77,970 | 98,207 | 1.00 | 1.14 |
| | 62,900 | 81,935 | 0.93 | 0.55 | 971 | 84,273 | 106,117 | 1.16 | 1.11 |
| Step 3: Forecast Future Year Volumes | 73,350 | 85,843 | 1.00 | 0.49 | 1,107 | 97,700 | 112,104 | 1.28 | 1.12 |
| | 62,650 | 78,568 | 0.84 | 0.52 | 1,084 | 86,507 | 105,115 | 1.01 | 1.13 |
| | 66,450 | 78,329 | 0.77 | 0.50 | 1,201 | 92,878 | 106,925 | 1.187 | 1.14 |
| | 67,800 | 76,536 | 0.80 | 0.50 | 1,325 | 96,954 | 107,454 | 1.21 | 1.20 |

TCR APPENDIX TABLE

WWW.D5.DOT.CA.GOV/TRANSPLAN.HTMLS

TCR PUBLICATIONS

THE END

