

Congestion

Presentation Outline

Evolution of Congestion

Definition of Congestion

Measurement of Congestion

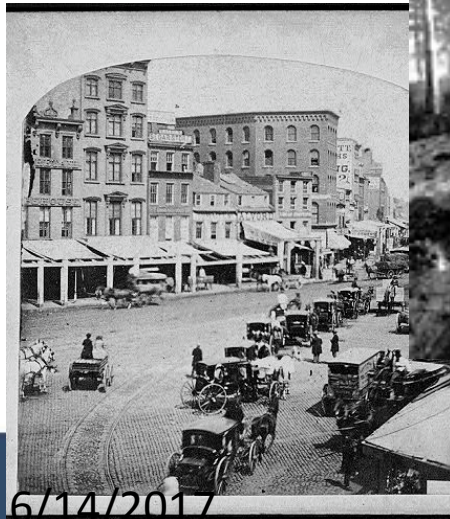
Metric Examples

Influence of Metrics



The Evolution of Congestion

- The Pendulum Effect
- Role of Speed and Cost
- Role of Growth



Source: Strategic Economics



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Definition of Congestion

- What is being measured?
 - Network performance



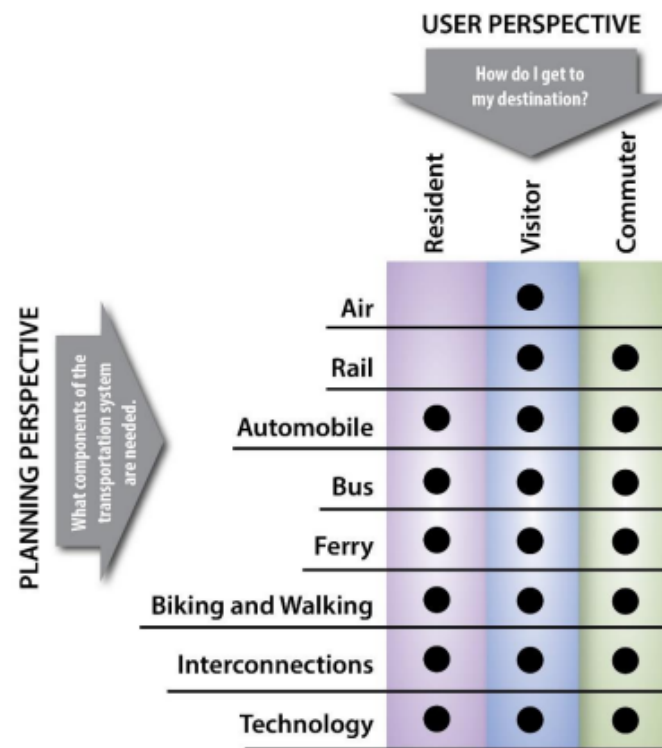
Definition of Congestion

Who is measuring it?	Focus
Public (drivers)	travel time and reliability
Planners and engineers	delay, speeds, or vehicle LOS
Economists	underpricing travel and public ownership of the network
Urban Economists	cost of proximity and density
Strategic Planners	access to destinations, travel choices, and livability

Definition of Congestion

- Perspectives, Preferences, and Priorities

- Freight
 - Time-Sensitive
- People
 - Resident
 - Visitor
 - Commuter
- Modes
- Environment
- Economy
- Safety
- Equity



Source: TRPA RTP/SCS



Measurement of Congestion

- How is it being measured?

- Vehicles

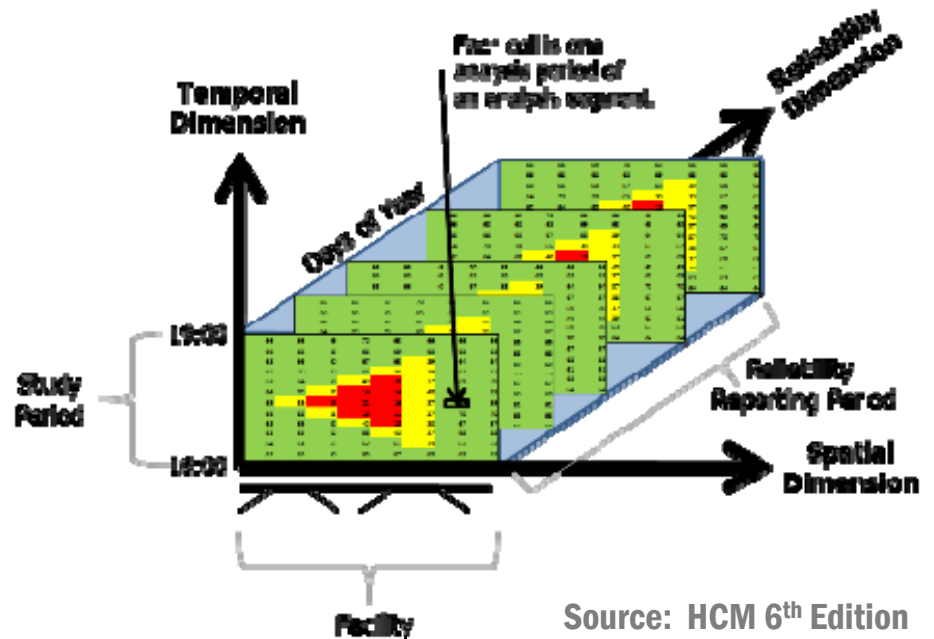
- Vehicle speeds compared to free-flow
- Vehicle volume compared to capacity
- Vehicle delay

- Seats

- Vehicle occupancy
- Seat utilization

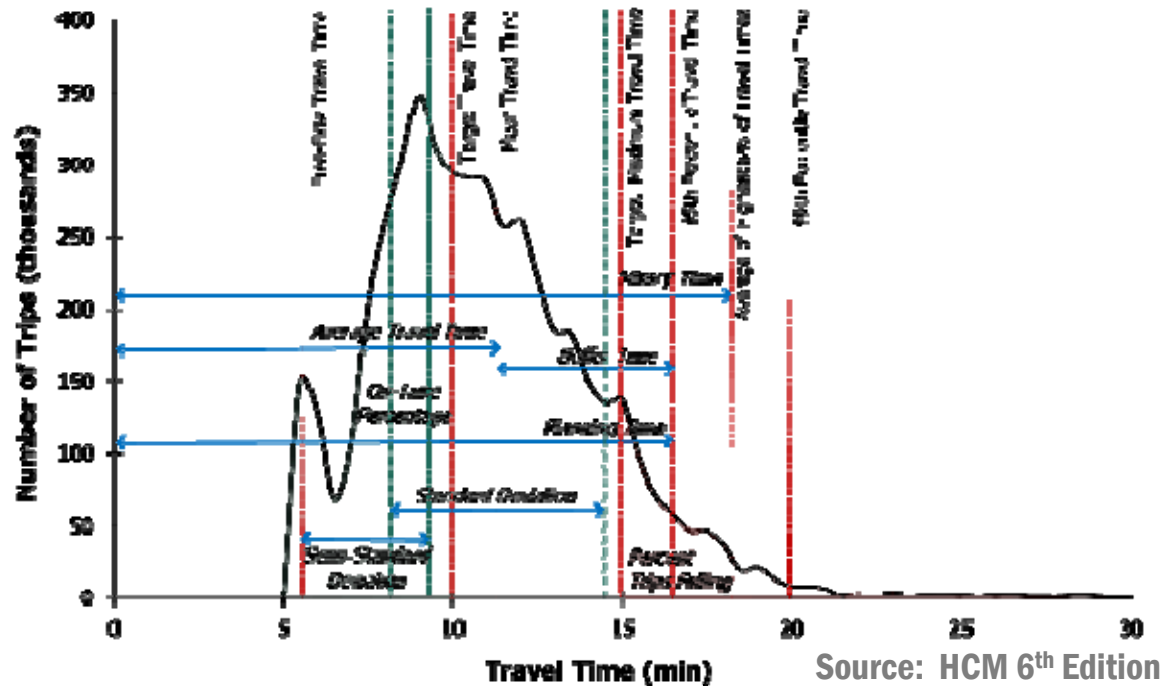
- Persons

- Person throughput
- Person miles per lane mile
- Person delay



Metric Examples

- Travel Time
- Speeds
- LOS/Delay
- Seat Utilization
- VMT



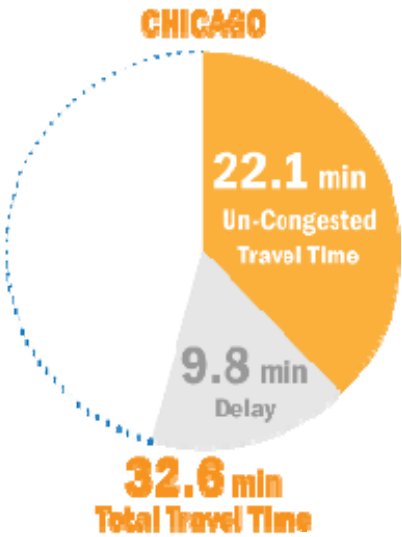
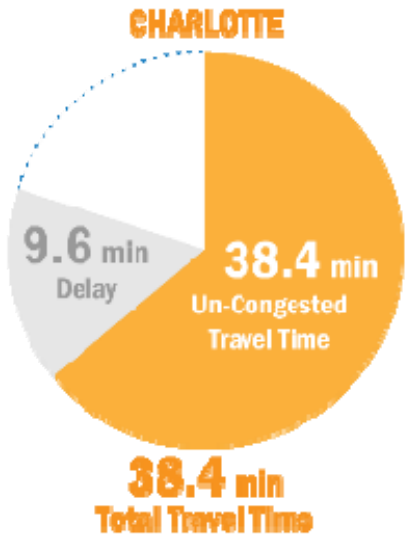
Travel Time - Aggregate

AVERAGE TRIP

CHICAGO 13.5 miles

CHARLOTTE 19.0 miles

TRAVEL TIME



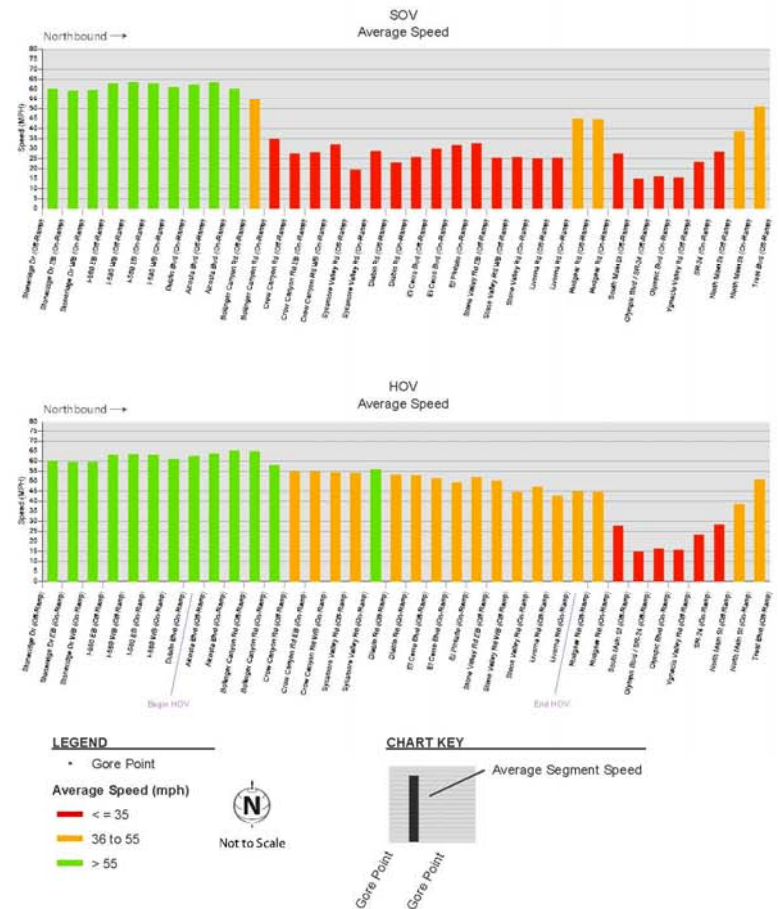
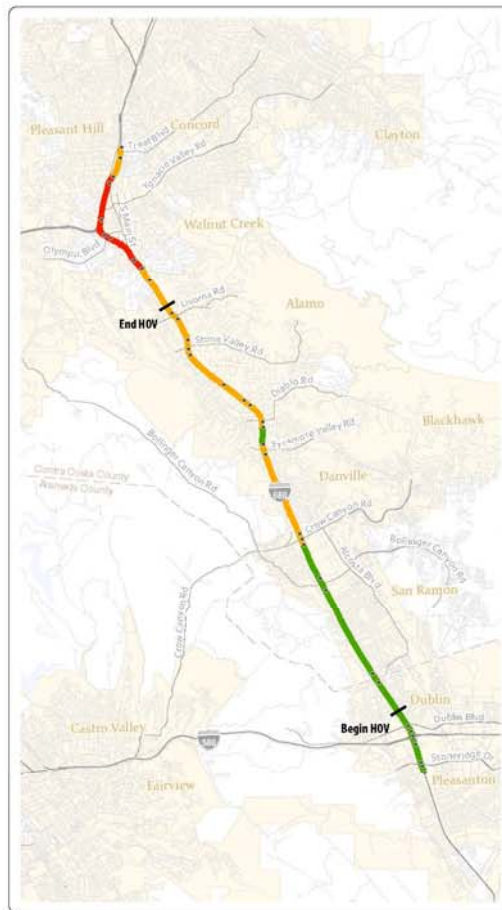
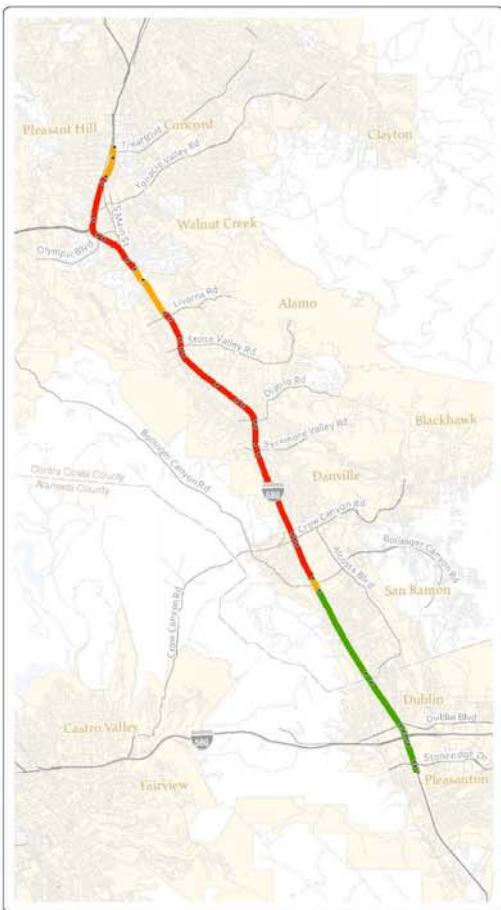
http://www.opr.ca.gov/docs/Driven_Apart_-_Technical_Report.pdf



Travel Time – Corridor

Single Occupancy Vehicles (SOV)

High Occupancy Vehicles (HOV)

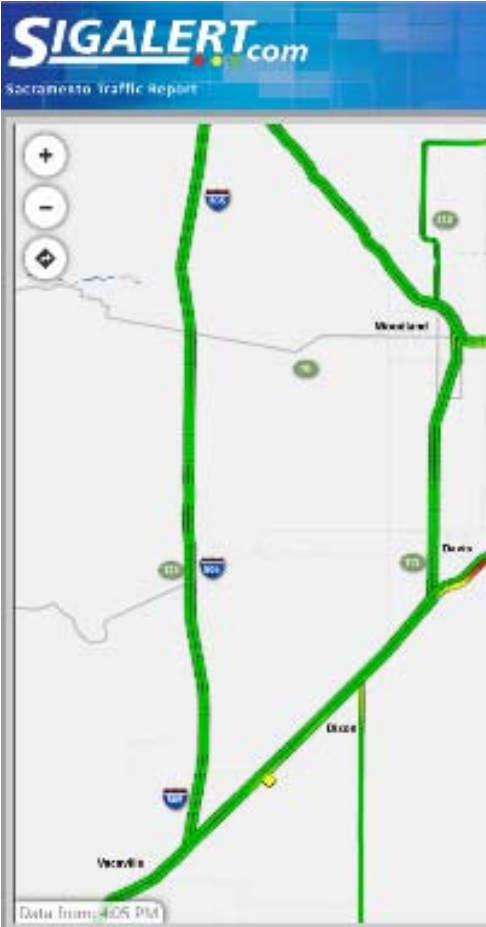


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Speeds



INRIX® XD™ Traffic x The INRIX Analytics 1 x

https://inrix.ritis.org/analytics/region-explorer/#/lat=38.59892955504341;lon=-121.388

INRIX Analytics Tools

Region Explorer

Map showing traffic data for Sacramento, CA, with various road segments highlighted in green, yellow, and red. Includes filters for Congestion, Bottlenecks, Traffic events, and Weather. A legend and scale bar (0-4 miles) are also visible.

Export to CSV Nest bottlenecks and events Show only bottlenecks Show only events

Type	Description	Duration	Length (miles)	State
Bottleneck	1-80 E @ MARYSVILLE BLVD/RALEY BLVD	43 m	4.27	CA
Bottleneck	1-80 BUS E @ EXPOSITION BLVD	2 h 59 m	4.05	CA
Bottleneck	HOWE AVE S @ FOLSOM BLVD	25 m	1.92	CA
Bottleneck	SUNRISE BLVD S @ US-50	1 h 15 m	1.84	CA
Bottleneck	SUNRISE BLVD N @ GOLD COUNTRY BLVD	52 m	1.55	CA
Bottleneck	1-80 BUS W @ EXPOSITION BLVD	1 h 56 m	1.52	CA
Bottleneck	GOLD COUNTRY BLVD @ AVENUEWAY	1 h 4 m	1.52	CA

You're looking at real-time data and you have some filters applied. There are 29 bottlenecks and 10 events.

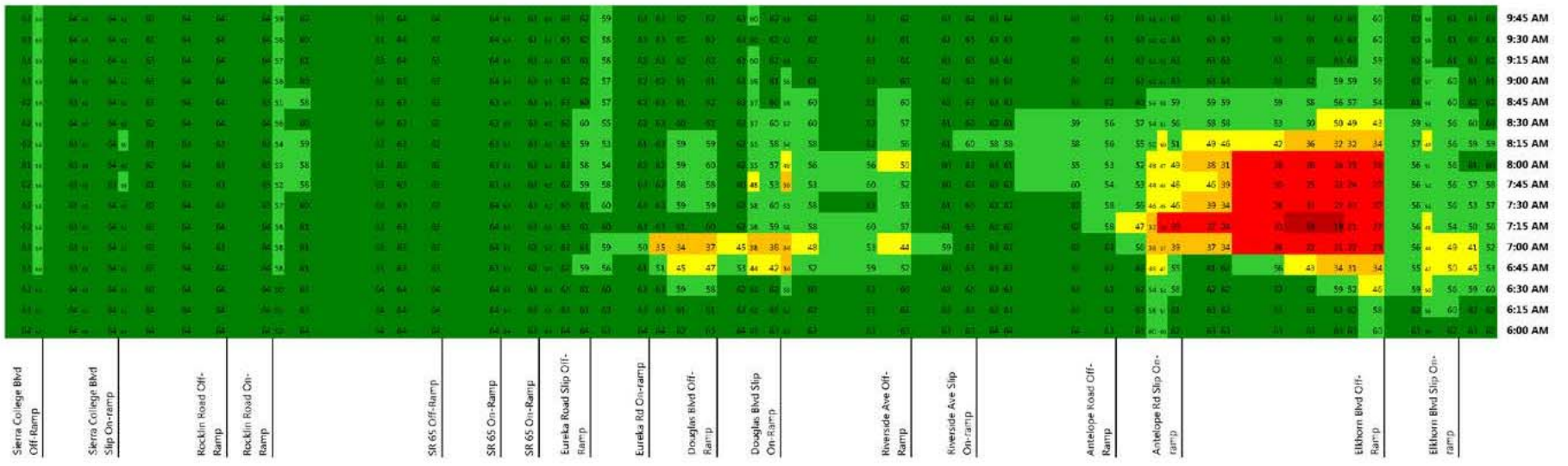
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Speeds

FIGURE 14 – I-80 WESTBOUND EXISTING CONDITIONS SPEED CONTOUR MAPS

AM PEAK PERIOD



LOS

To a driver: LOS A

To an economist: LOS F



To a driver: LOS F

To an economist: LOS A



LOS

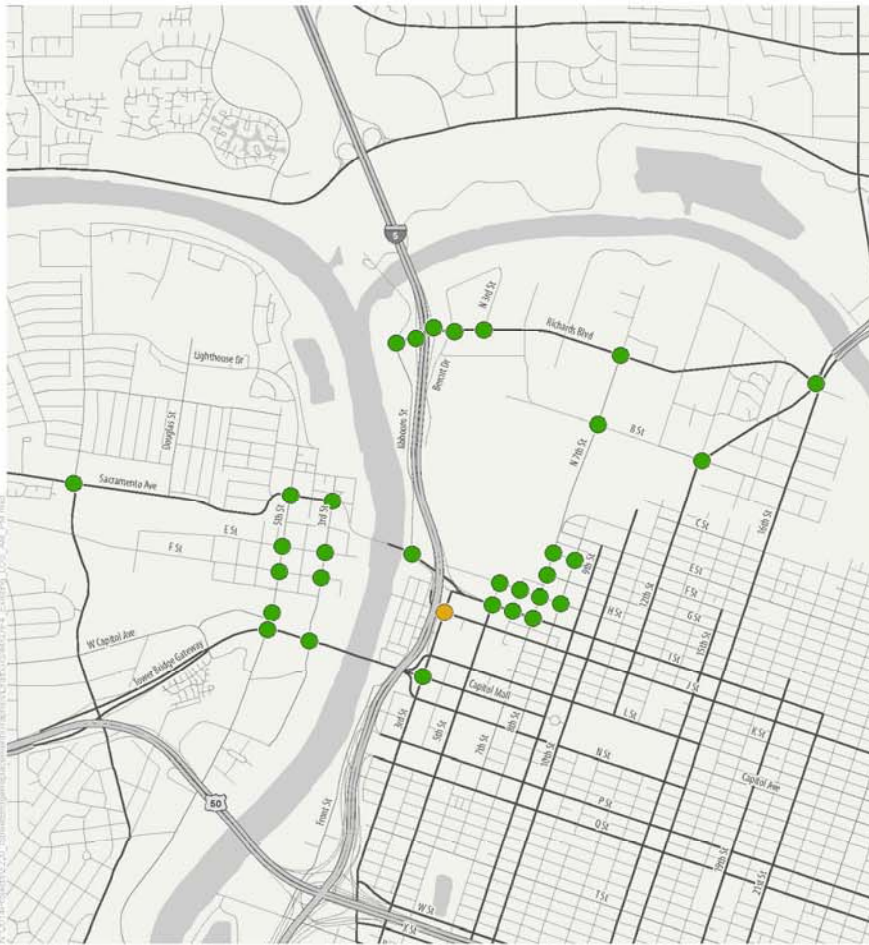
TABLE 4: SIGNALIZED INTERSECTION LOS THRESHOLDS

LOS	Average Delay (sec/veh)	Description
A	< 10	Very low delay occurs with favorable progression and/or short cycle length.
B	> 10 to 20	Low delay occurs with good progression and/or short cycle lengths.
C	> 20 to 35	Average delays result from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.
D	> 35 to 55	Longer delays occur due to a combination of unfavorable progression, long cycle lengths, or high volume-to-capacity ratios. Many vehicles stop and individual cycle failures are noticeable.
E	> 55 to 80	High delay values indicate poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.
F	> 80	Delays are unacceptable to most drivers due to over-saturation, poor progression, or very long cycle lengths.

Notes: sec/veh = seconds per vehicle
 Source: Fehr & Peers, 2014



LOS



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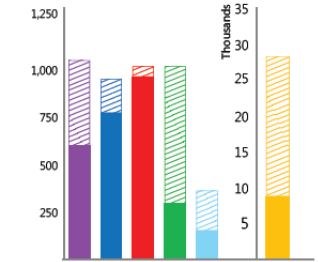
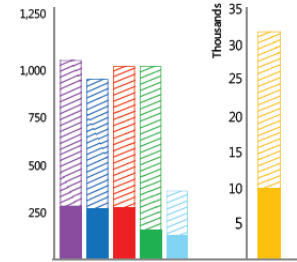
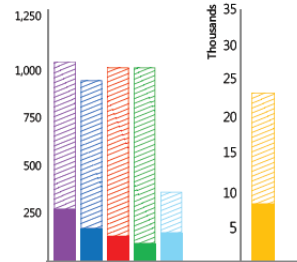
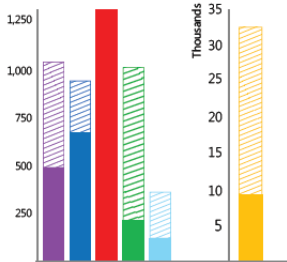
Seat Utilization



●●● FrontRunner
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Metric	AM PEAK HOUR		PM PEAK HOUR	
	Northbound	Southbound	Northbound	Southbound

Occupied Seats
Available Seats



Occupied Available
FrontRunner

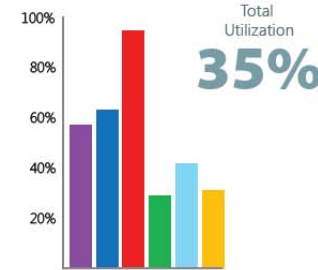
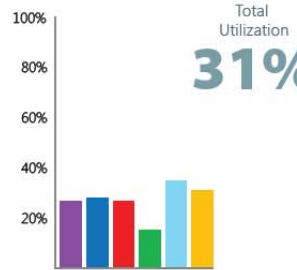
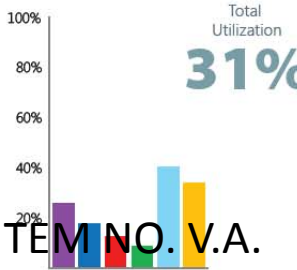
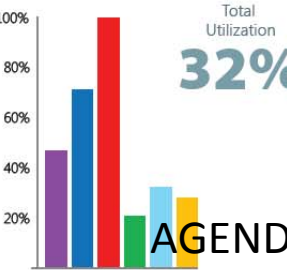
Occupied Available
TRAX Blue

Occupied Available
TRAX Green

Occupied Available
Local Bus

Occupied Available
I-15

Person Capacity
Utilization



Total Utilization
32%

Total Utilization
31%

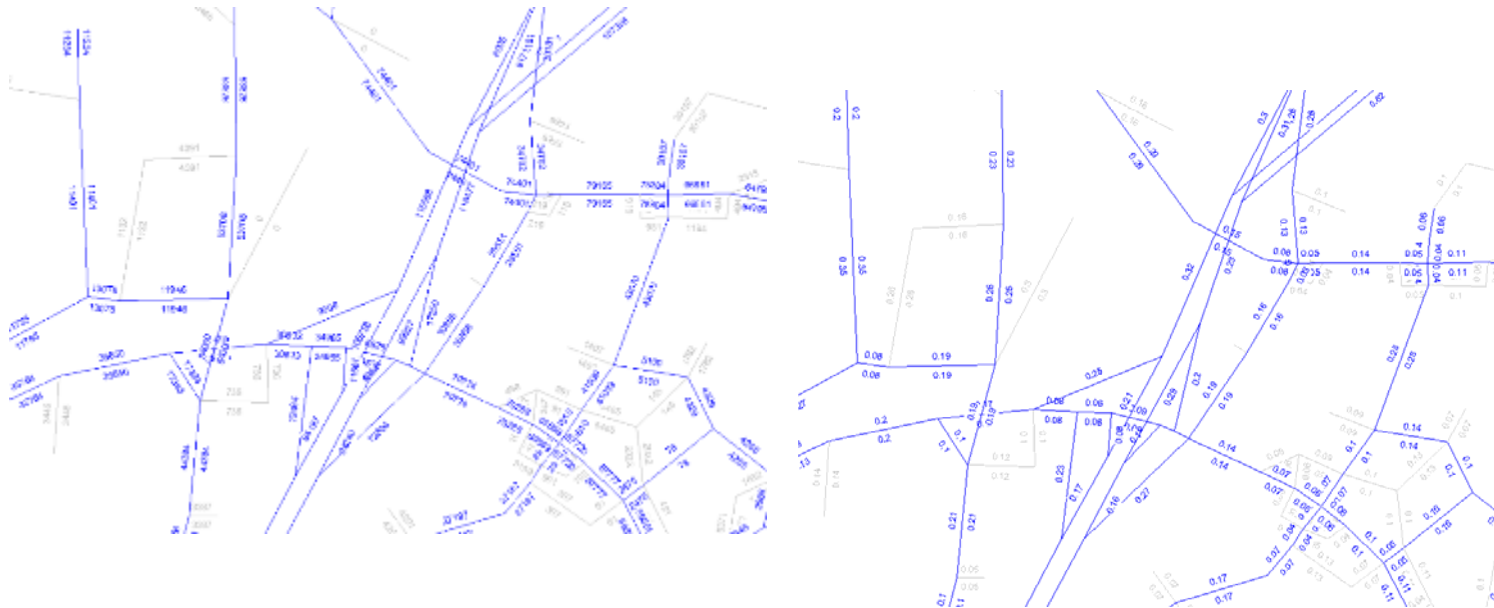
Total Utilization
31%

Total Utilization
35%

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VMT

- **VMT = volume x distance or vehicle trips x trip length**
- **Proxy for fuel consumption and emissions**
- **Travel and land use efficiency metric**



TAHOE
Regional Planning
Agency

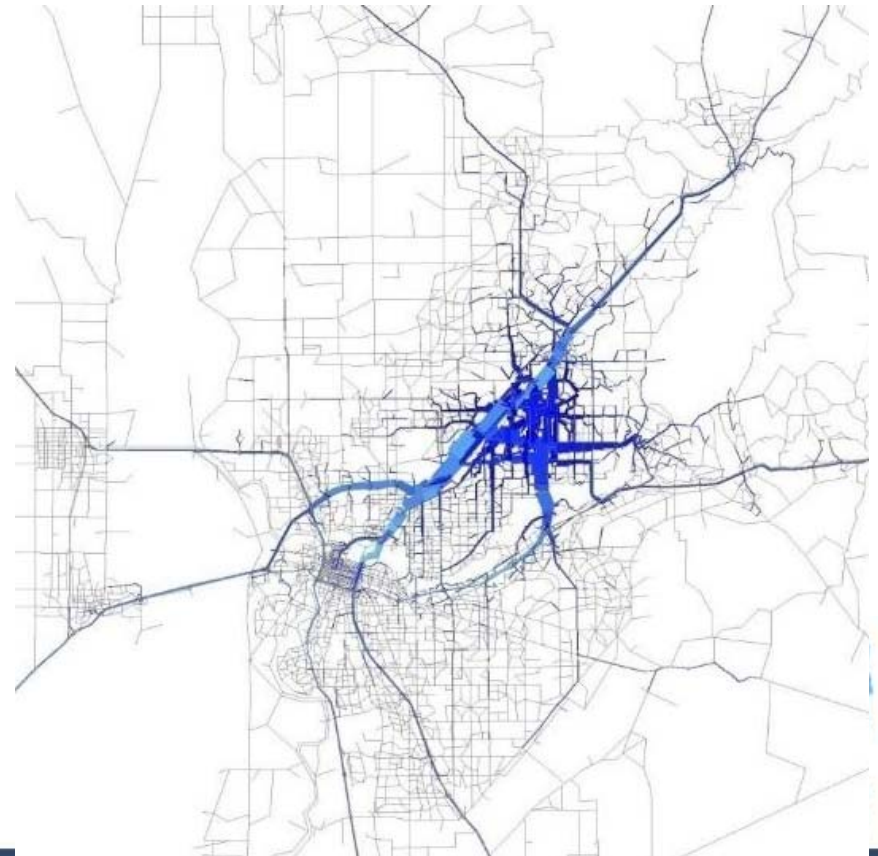
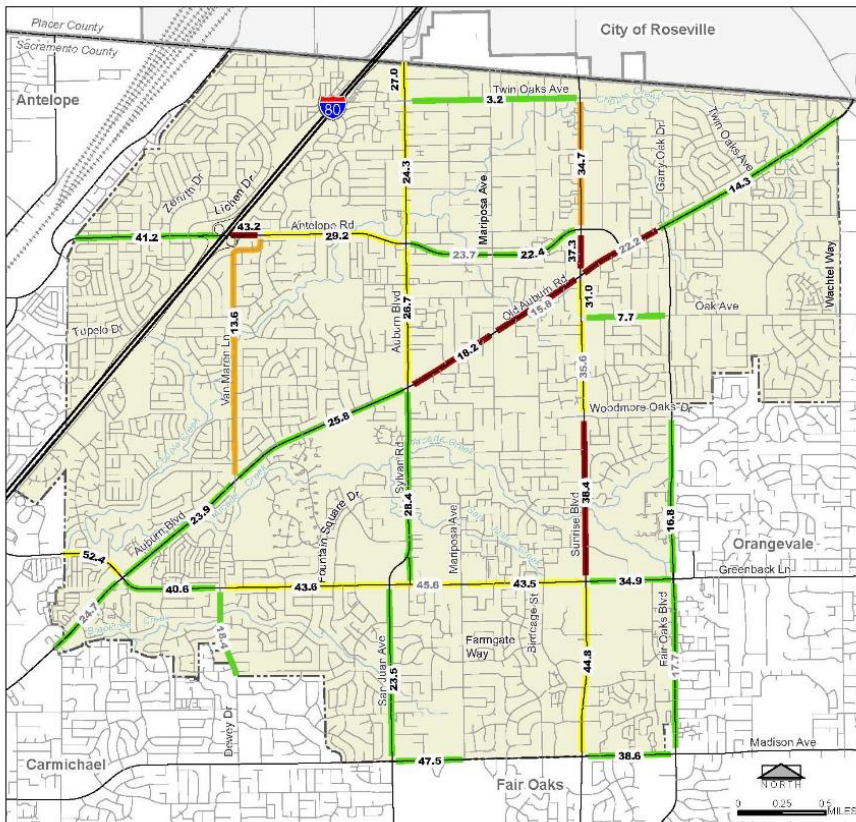
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VMT

- Type of VMT Matters



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Influence of Metrics



- **Manage demand**
 - **Physical**
 - **Operational**
 - **Behavioral**
- **Increase supply**
 - **Shrink the vehicles**
 - **Expand the network**



Metric Influence Example

Traditional Vehicle Mix
(loading video)

100% SmartCars
(loading video)

	0% Traditional Vehicles			100% Smart Car	
# of Vehicles	(5,223)		5,931		+14%
Delay (sec)	(175)		31		-82%
LOS	(F)		C		
Fuel (gal)	(422)		187		-56%
CO (g)	(29,524)		13,091		-56%
NOx (g)	(5,744)		3,547		-56%
VOC (g)	(6,842)		3,034		-56%



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Thank You

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