

Transportation to What Ends?

Chris Ganson

Governor's Office of Planning and Research



Old metric:

Transportation impact = **Level of Service (LOS)**

LOS	Signalized Intersection	Unsignalized Intersection
A	≤10 sec	≤10 sec
B	10–20 sec	10–15 sec
C	20–35 sec	15–25 sec
D	35–55 sec	25–35 sec
E	55–80 sec	35–50 sec
F	≥80 sec	≥50 sec



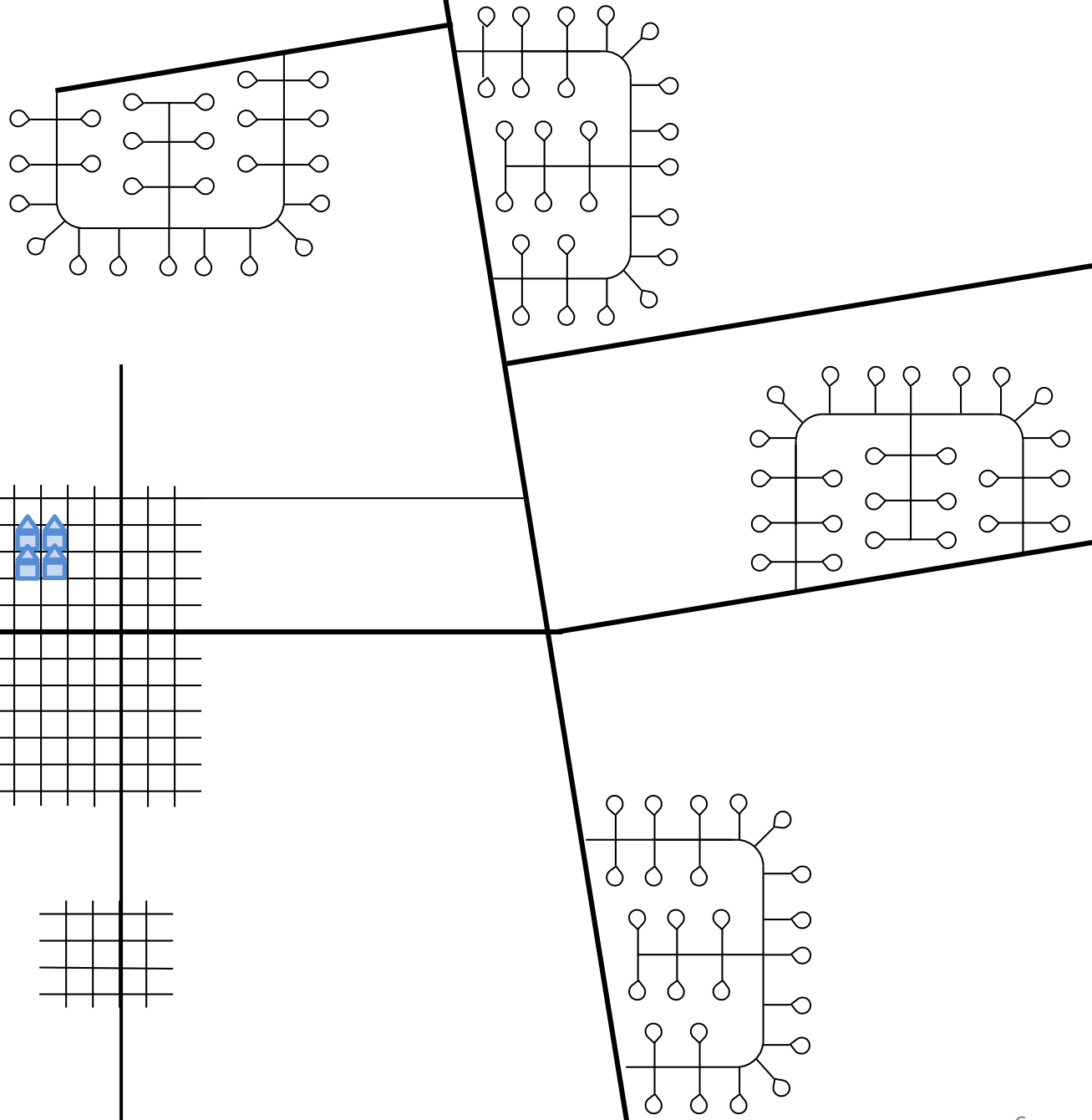
Level of Service A

June 2017



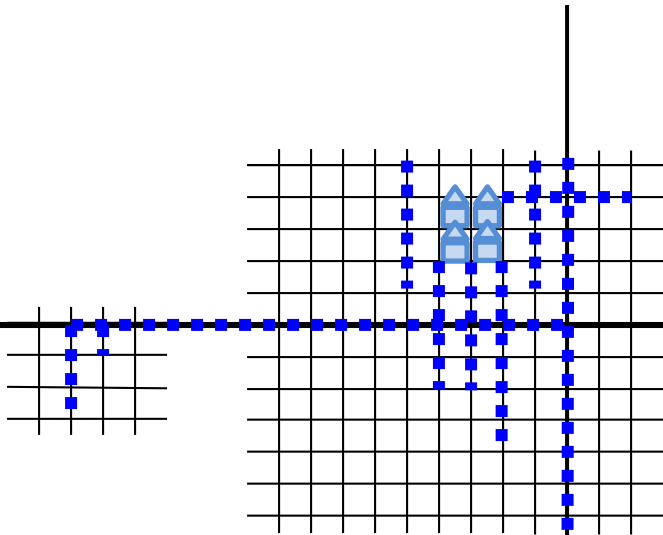
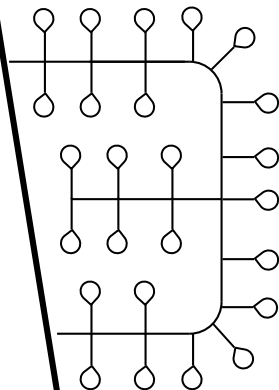
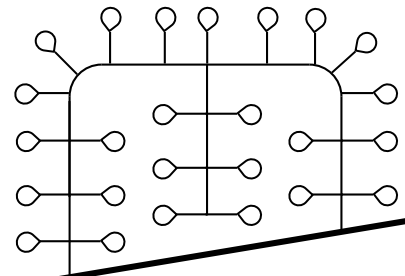
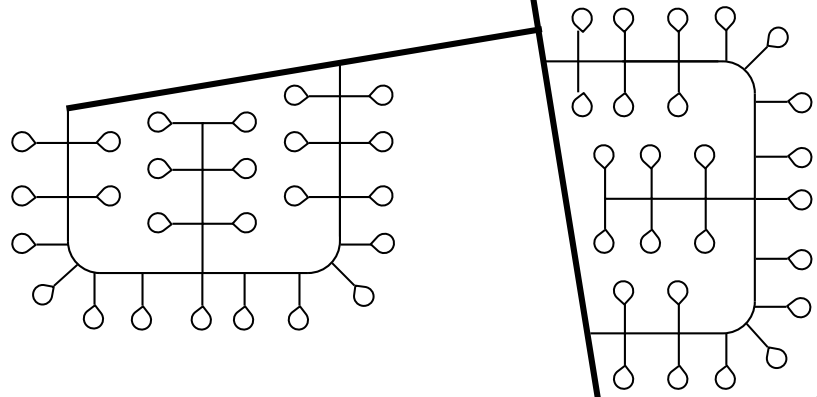
June 2017
Level of Service F

Analysis of **infill** development using LOS



Analysis of infill development using LOS

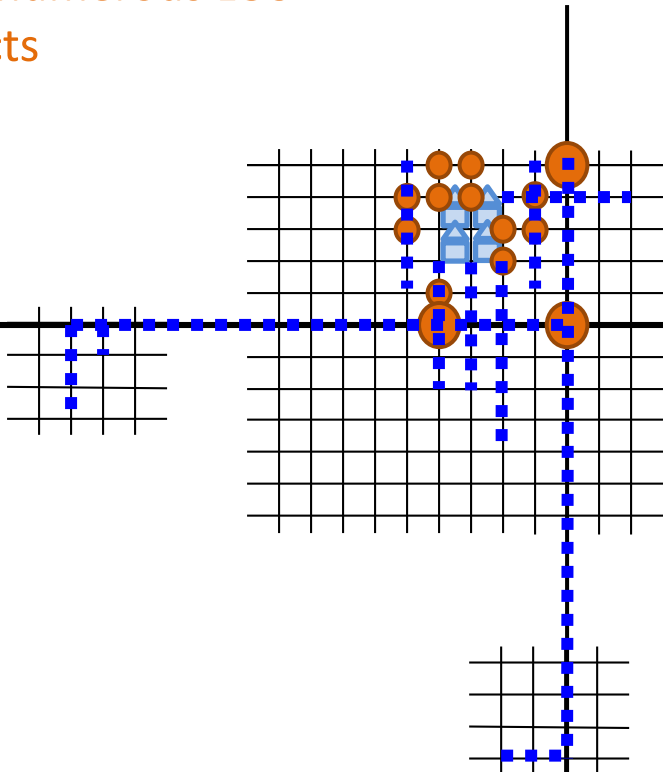
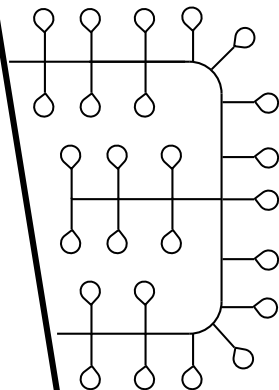
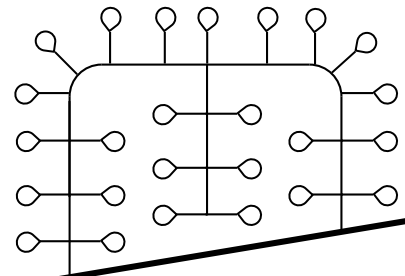
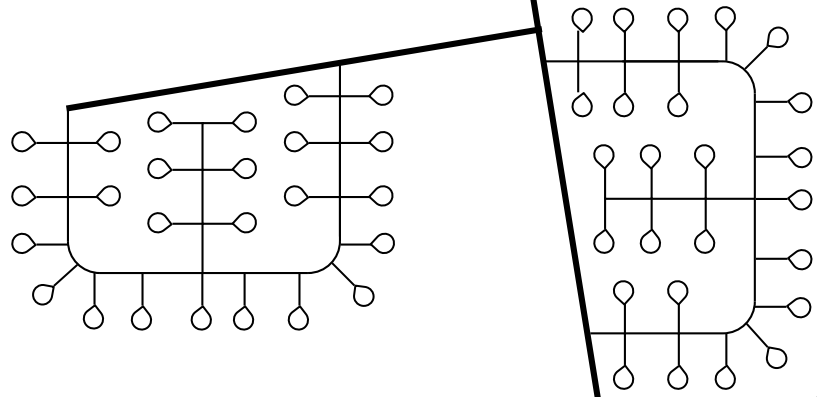
Relatively little vehicle travel loaded onto the network



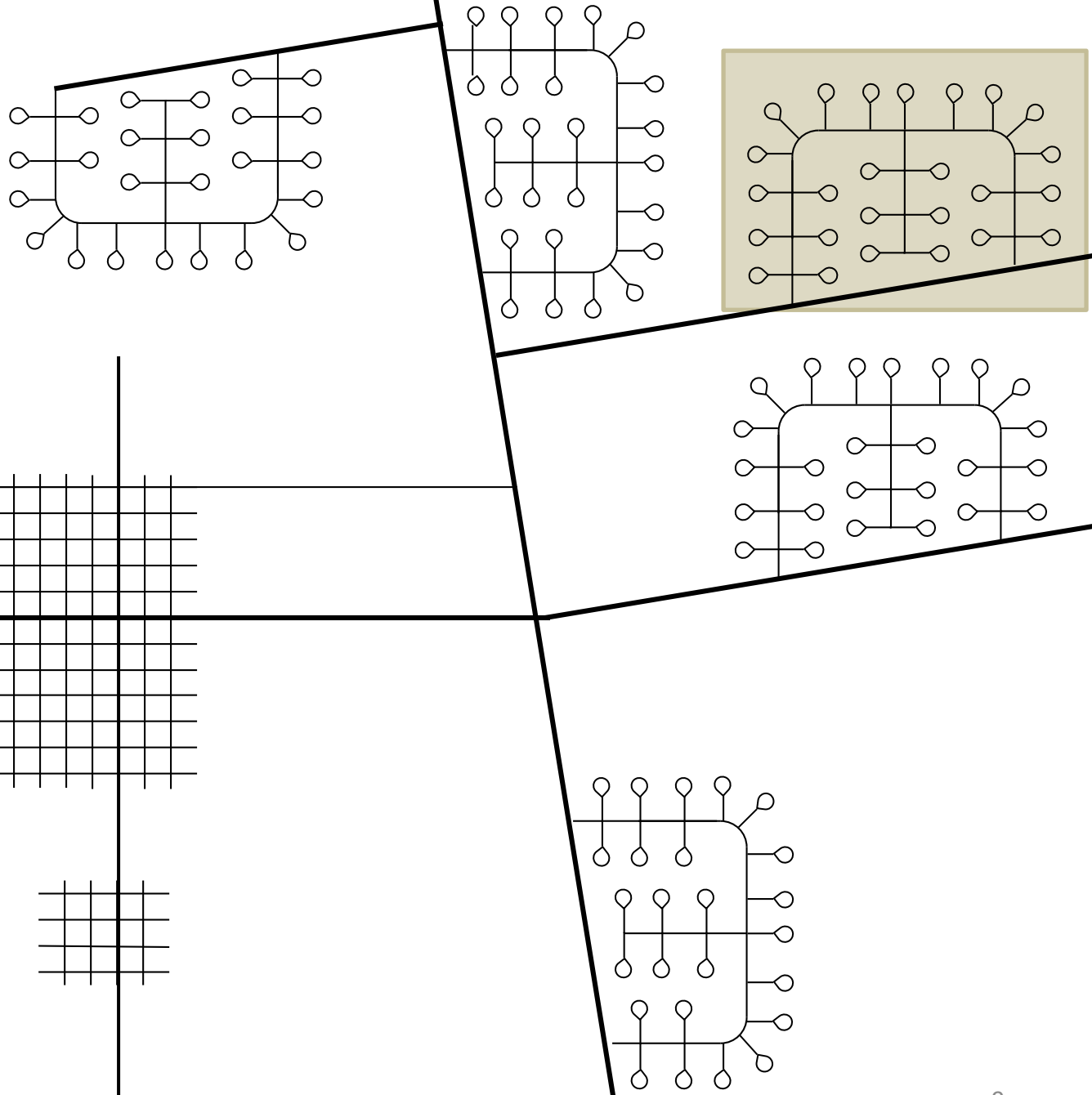
Analysis of infill development using LOS

Relatively little vehicle travel loaded onto the network

...but numerous LOS impacts

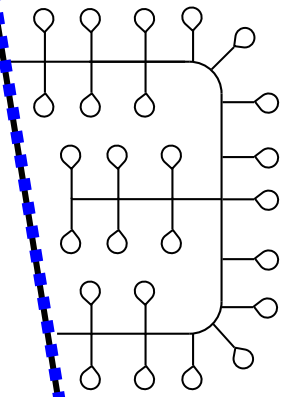
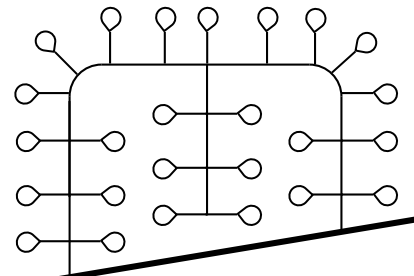
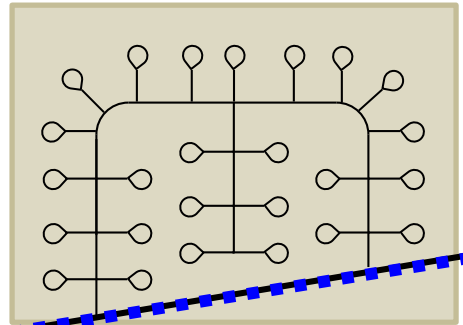
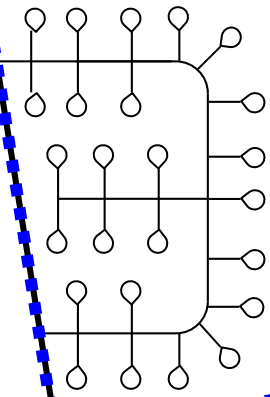
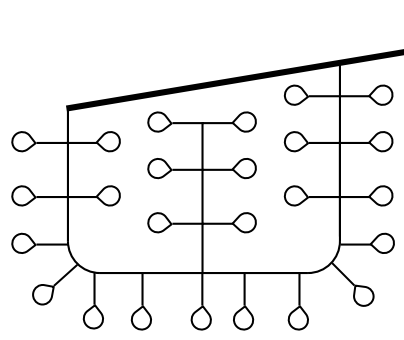
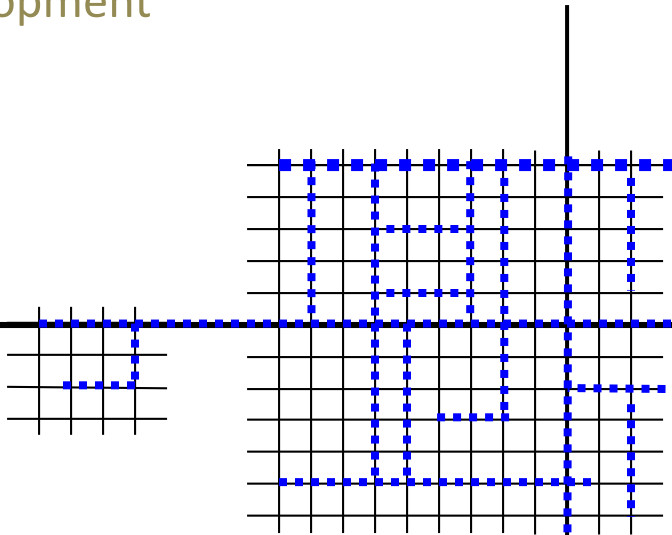


Analysis of greenfield development using LOS



Analysis of greenfield development using LOS

Typically three to four times the vehicle travel loaded onto the network relative to infill development

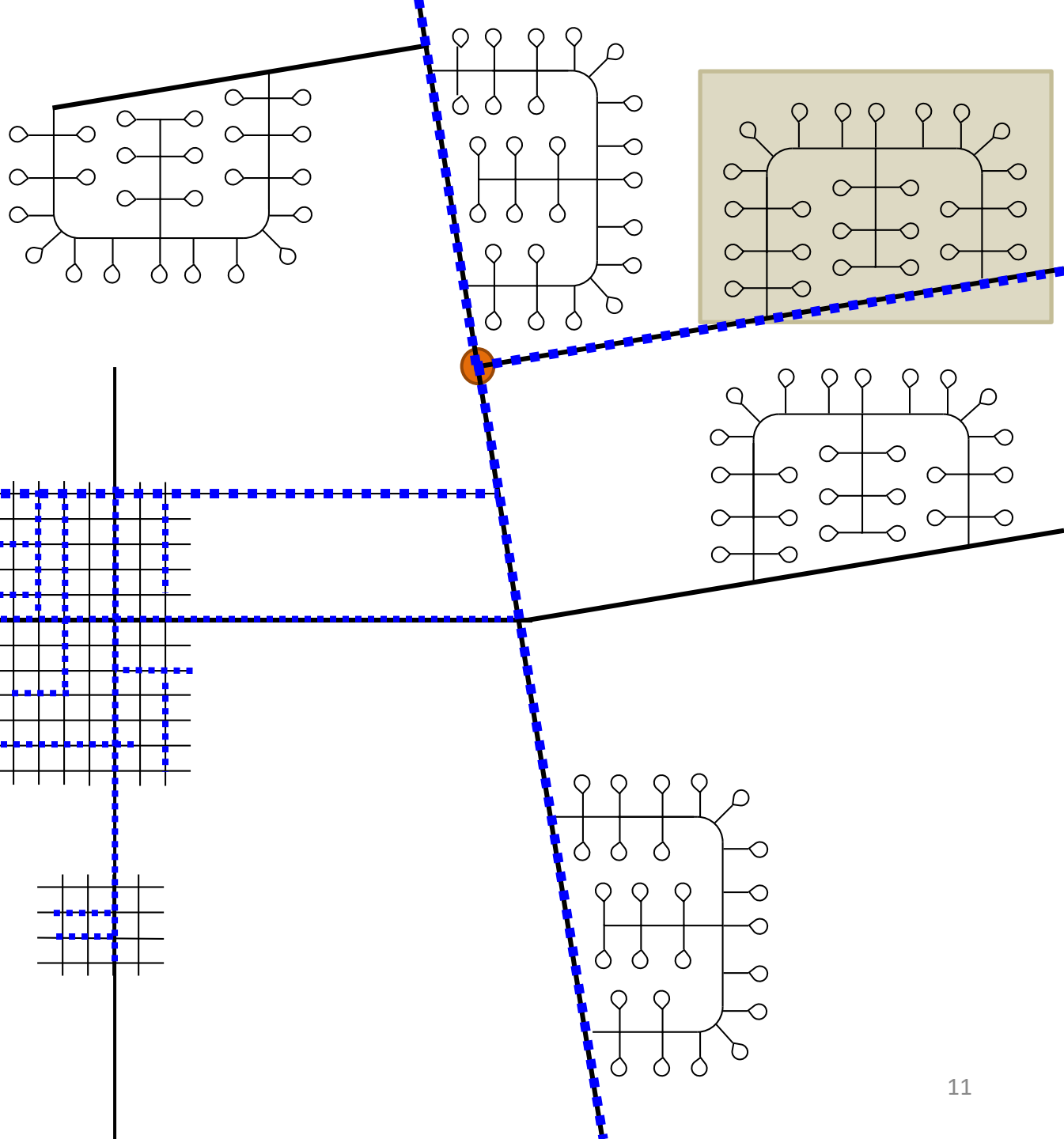


Analysis of greenfield development using LOS

Typically three to four times the vehicle travel loaded onto the network relative to infill development

...but relatively few LOS impacts

Traffic generated by the project is disperse enough by the time it reaches congested areas that it doesn't trigger LOS thresholds, even though it contributes broadly to regional congestion.



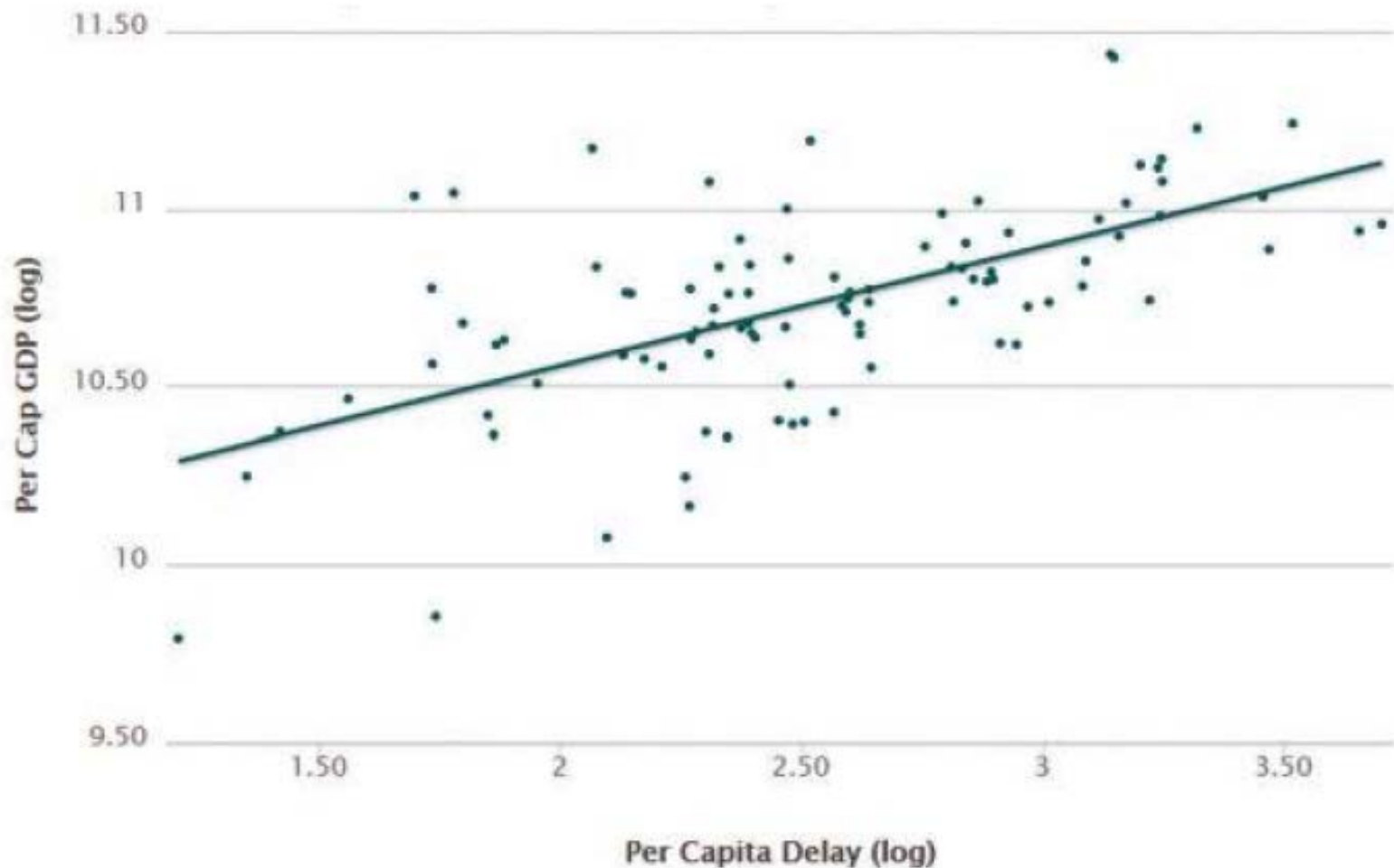


Figure 1: The Relationship between Traffic Delay and GDP in American Metros⁶

Dumbaugh et al., [Decisions, Values, and Data: Understanding Bias in Transportation Performance Measures](#) (ITE Journal, August 2014)

Which is better?

**45 min commute,
including 5 min from
congestion**



Good LOS Grade

Bad Accessibility

**20 min commute,
including 10 min from
congestion**



Bad LOS Grade

Good Accessibility

Transportation Impact Analysis Today: Problems

1. Good grade in LOS \neq Success in Transportation

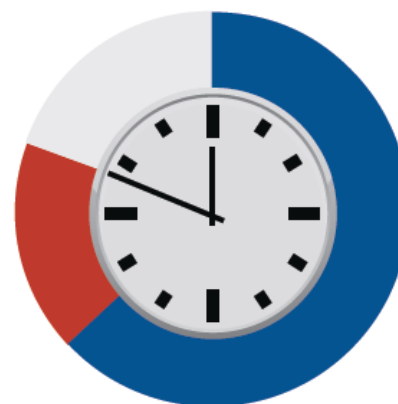
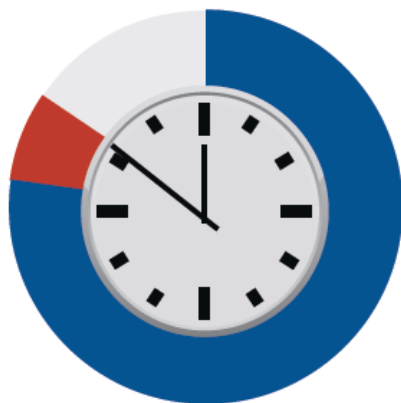
Denver 1982

1.09
50.6 minutes
46.4 mins
4.2 mins

Travel Time Index
Average travel time
Travel time without traffic
Extra rush hour delay

Denver 2007

1.31
49.6 minutes
37.9 minutes
11.7 minutes



<http://t4america.org/2012/10/29/telling-only-half-the-story-of-congestion-travel-time-and-the-quality-of-our-metro-areas/>

Transportation Impact Analysis Today: Problems

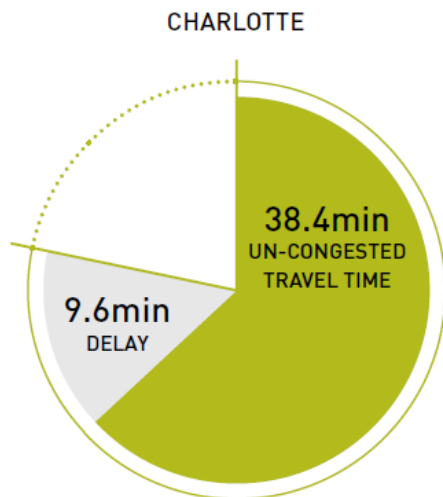
1. Good grade in LOS \neq Success in Transportation

A COMPARISON OF CHARLOTTE AND CHICAGO

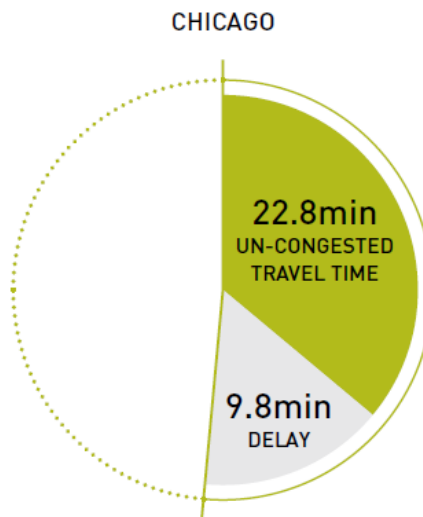
AVERAGE TRIP



TRAVEL TIME



48.0min
Total Travel Time



32.6min
Total Travel Time

Driven Apart: How sprawl is lengthening our commutes and why misleading mobility measures are making things worse

Executive Summary:

http://www.opr.ca.gov/docs/Driven_Apart-How_Spral_Is_Legthening_Our_Communities.pdf

Technical Report:

http://www.opr.ca.gov/docs/Driven_Apart-Technical_Report.pdf

Transportation Impact Analysis Today: Problems

1. Good grade in LOS \neq Success in Transportation

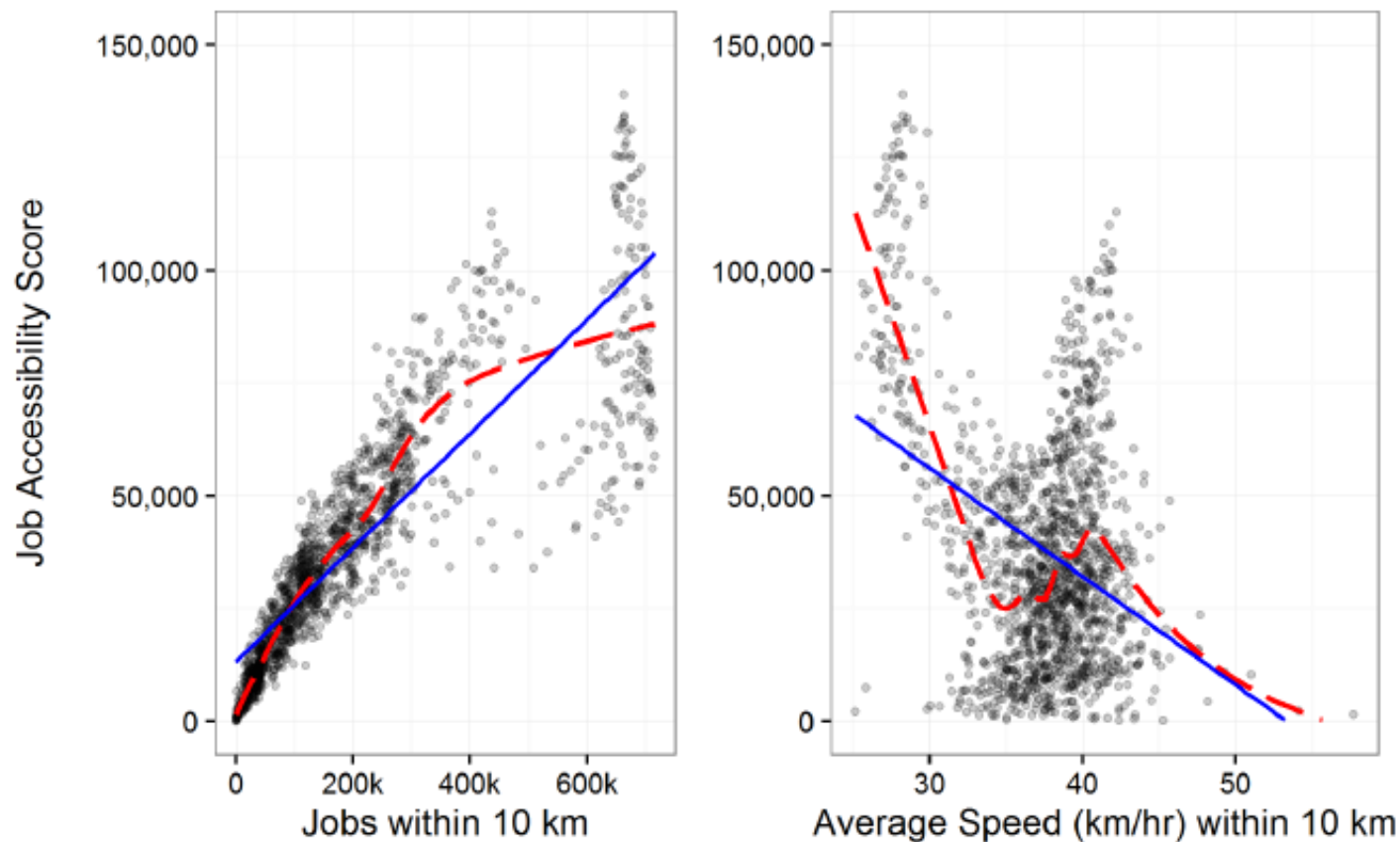


Figure 1 The Relationship between Proximity to Jobs and Job Accessibility (left) and Local Area Traffic Speeds and Job Accessibility (right) in the San Francisco Bay Area

Transportation Impact Analysis Today: Problems

1. Good grade in LOS \neq Success in Transportation

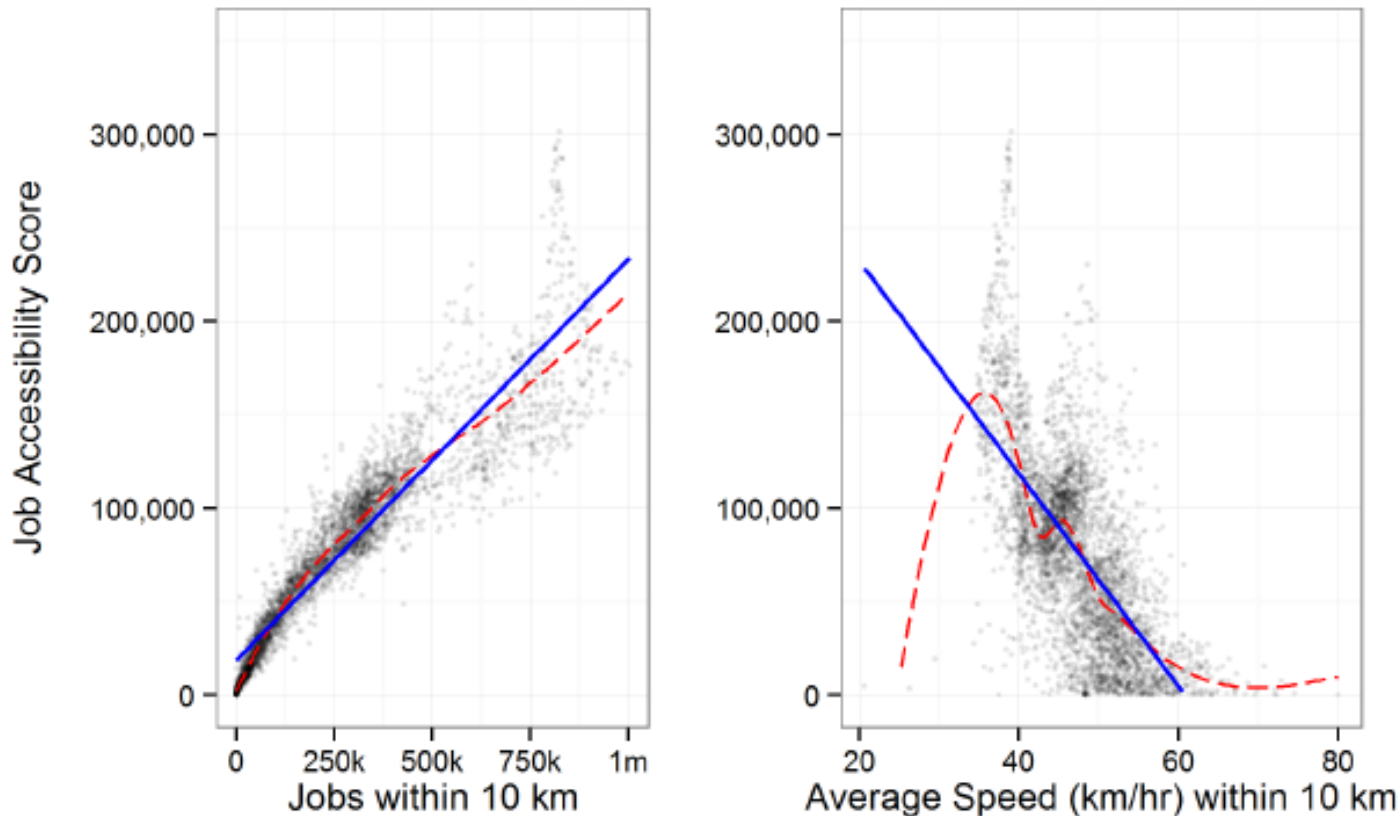


Figure 1 The Relationship Between Proximity To Jobs And Job Accessibility (left) and Local Area Traffic Speeds And Job Accessibility (right)

Transportation Impact Analysis Today: Problems

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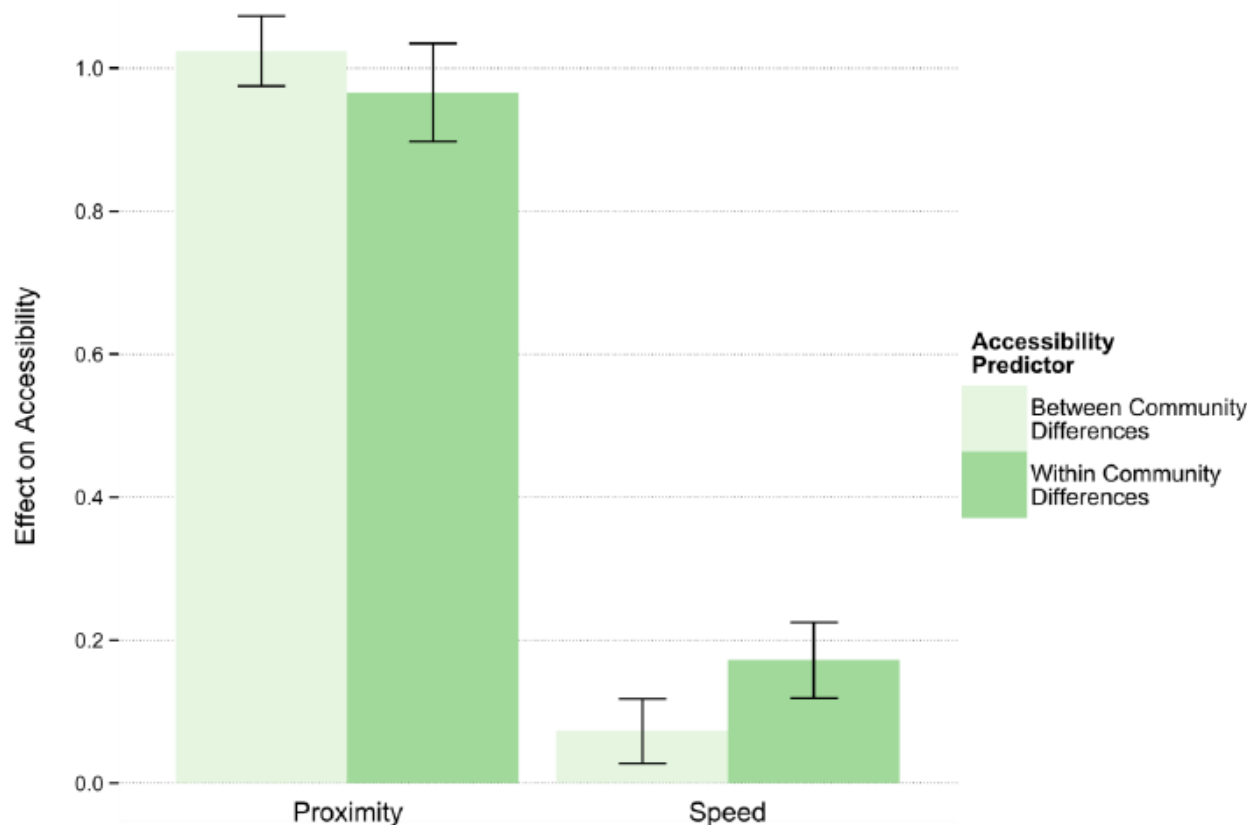


Figure 2 The Relative Effects of Differences in Proximity and Speed on Overall Job Accessibility Metropolitan Los Angeles.

Note: Error bars display 95% confidence interval for proximity and speed effect sizes.

Speed and proximity included as predictors in a multi-factor statistical model to simultaneously account for effects within and between communities.

The effects of proximity (i.e. nearby jobs) on overall job accessibility are far greater than the effects of faster travel speeds due to lower levels of congestion.

Transportation Impact Analysis Today: Problems

1. Good grade in LOS ≠ Success in Transportation

“...time lost to commuter traffic delays is more than off-set by the greater opportunities to reach destinations over shorter distances to which high development densities gives rise.”

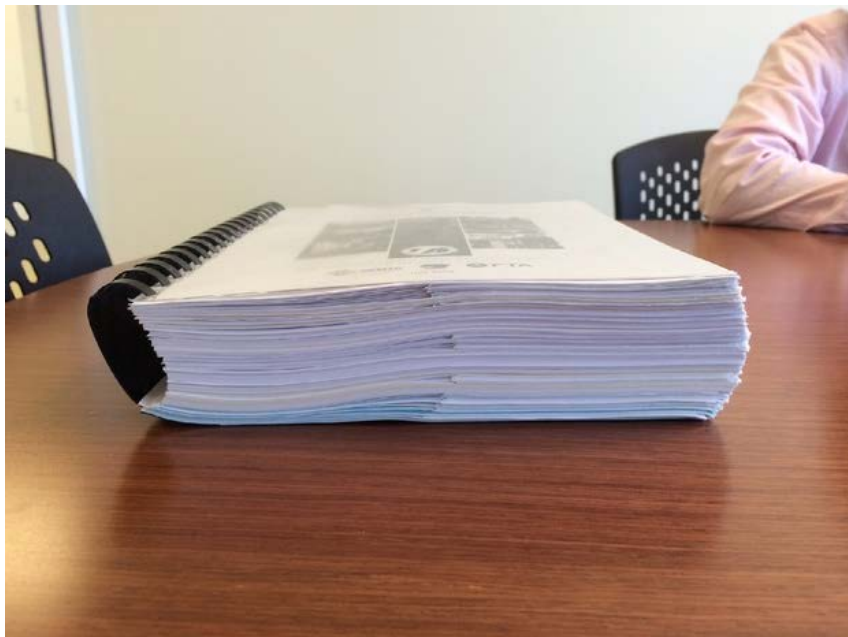
“...myopic focus on the traffic impacts of new developments is misguided and may actually decrease accessibility and economic activity in an effort to protect traffic flows.”

Mondschein, Osman, Taylor, Thomas

(http://www.its.ucla.edu/wp-content/uploads/sites/6/2015/11/Haynes_Congested-Development_1-Oct-2015_final.pdf)

Transportation Impact Analysis Today: Problems

1. Good grade in LOS \neq Success in Transportation
2. Calculating LOS is expensive and inaccurate



[Van Ness BRT analysis](#) (28MB)

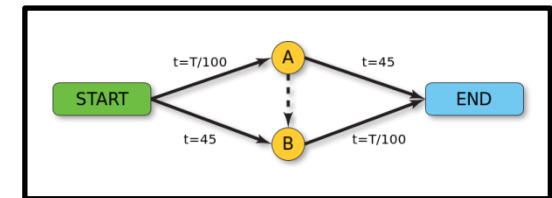
Table V.M-13
Intersection Critical Movement Analysis (CMA) and Level of Service (LOS) Summary
Existing (2001) and Future (2005) Conditions

No.	Intersection	Peak Hour	Existing		Without Project		With Project			With Project + Mitigation		
			CMA	LOS	CMA	LOS	CMA	LOS	Impact	CMA	LOS	Impact
1.	Sunset Boulevard & Beverly Glen Boulevard (E.)	AM	0.894	D	1.038	F	1.037	F	-0.001	1.036	F	-0.002
		PM	1.023	F	1.225	F	1.216	F	-0.009	1.215	F	-0.010
2.	Sunset Boulevard & Beverly Glen Boulevard (W.)	AM	1.189	F	1.385	F	1.388	F	0.003	1.385	F	0.000
		PM	1.062	F	1.254	F	1.251	F	-0.013	1.249	F	-0.015
3.	Wilshire Boulevard & Beverly Glen Boulevard	AM	0.868	D	1.030	F	1.030	F	0.000	1.029	F	-0.001
		PM	0.864	D	1.140	F	1.133	F	-0.007	1.133	F	-0.007
4.	Santa Monica Boulevard (N.) & Overland Avenue	AM	0.861	D	1.076	F	1.080	F	0.004	1.078	F	0.002
		PM	0.814	D	1.082	F	1.054	F	-0.028	1.054	F	-0.028
5.	Santa Monica Boulevard (S.) & Overland Avenue	AM	0.478	A	0.358	A	0.358	A	0.000	0.358	A	0.000
		PM	0.428	A	0.465	A	0.465	A	0.000	0.465	A	0.000
6.	Santa Monica Boulevard (N.) & Beverly Glen Boulevard	AM	0.849	D	1.099	F	1.107	F	0.008	1.104	F	0.005
		PM	0.823	D	1.139	F	1.130	F	-0.009	1.128	F	-0.011
7.	Santa Monica Boulevard (S.) & Beverly Glen Boulevard	AM	0.849	D	0.464	A	0.464	A	0.000	0.464	A	0.000
		PM	0.864	D	0.575	A	0.575	A	0.000	0.575	A	0.000
8.	Santa Monica Boulevard (S.) & Century Park West	AM	0.325	A	1.006	F	1.007	F	0.001	1.005	F	-0.001
		PM	0.397	A	0.584	E	0.969	E	-0.015	0.966	E	-0.018
9.	Santa Monica Boulevard (N.) & Club View Drive	AM	0.613	B	0.213	A	0.213	A	0.000	0.213	A	0.000
		PM	0.707	C	0.408	A	0.408	A	0.000	0.408	A	0.000
10.	Santa Monica Boulevard (N.) & Avenue Of The Stars	AM	0.825	D	1.191	F	1.205	F	0.014	1.199	F	0.008
		PM	0.755	C	0.967	E	0.956	E	-0.011	0.955	E	-0.012
11.	Santa Monica Boulevard (S.) & Avenue Of The Stars	AM	0.508	A	NA		NA			NA		
		PM	0.544	A	NA		NA			NA		
12.	Santa Monica Boulevard (N.) & Century Park East	AM	0.759	C	0.950	E	0.955	E	0.005	0.953	E	0.003
		PM	0.666	B	0.846	D	0.805	D	-0.041	0.804	D	-0.042
13.	Santa Monica Boulevard (S.) & Century Park East	AM	0.771	C	NA		NA			NA		
		PM	0.648	B	NA		NA			NA		
14.	Santa Monica Boulevard (N.) & Wilshire Boulevard	AM	1.056	F	1.261	F	1.263	F	0.002	1.263	F	0.002
		PM	1.046	F	1.294	F	1.288	F	-0.006	1.287	F	-0.007

Transportation Impact Analysis Today: Problems

1. Good grade in LOS \neq Success in Transportation
2. Calculating LOS is expensive and inaccurate
3. **“Fixing” LOS simply moves congestion elsewhere**

[http://www.opr.ca.gov/docs/ITE_Journal_Article - Decisions Values and Data.pdf](http://www.opr.ca.gov/docs/ITE_Journal_Article_-_Decisions_Values_and_Data.pdf)

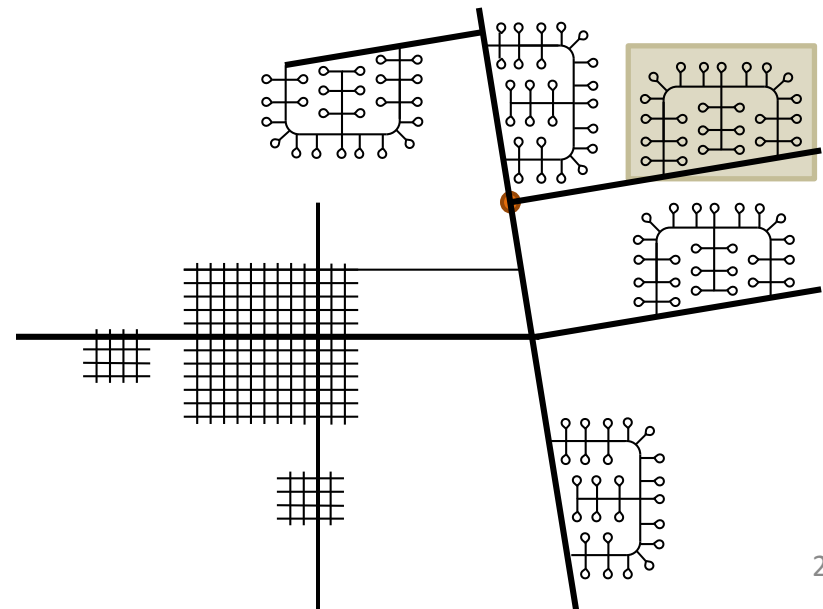
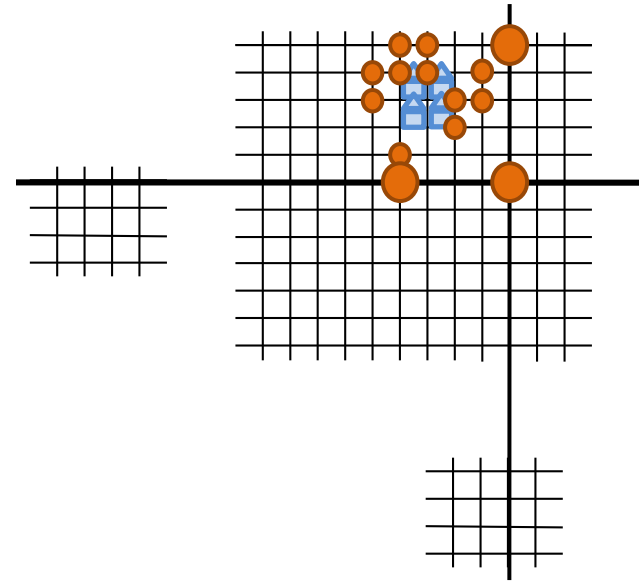


Braess's Paradox

Transportation Impact Analysis Today: Problems

1. Punishes last-in, inhibits infill, pushes development outward

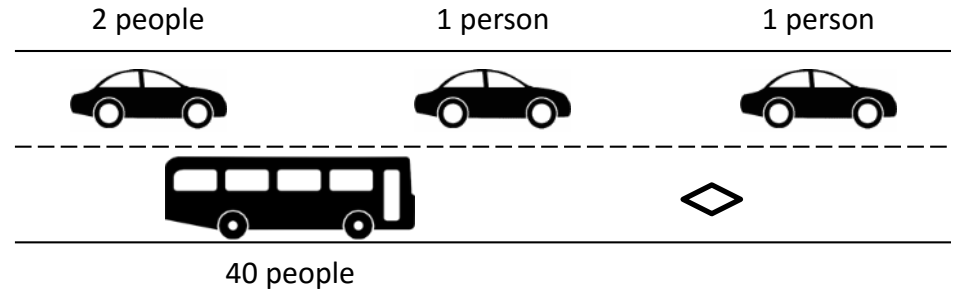
[http://www.opr.ca.gov/docs/ITE Journal Article - Decisions Values and Data.pdf](http://www.opr.ca.gov/docs/ITE_Journal_Article_-_Decisions_Values_and_Data.pdf)



Transportation Impact Analysis Today: Problems

1. Punishes last-in, inhibits infill, pushes development outward
- 2. Inhibits transit and active transportation**

http://www.opr.ca.gov/docs/ITE_Journal_Article_-_Decisions_Values_and_Data.pdf



Transportation Impact Analysis Today: Problems

1. Punishes last-in, inhibits infill, pushes development outward
2. Inhibits transit and active transportation
- 3. Forces more road construction than we can afford to maintain**

http://lgc.org/wordpress/docs/events/first_thursday_dinners/ftd_2013_Protecting_Transportation-june.pdf



Transportation Impact Analysis Today: Problems

1. Punishes last-in, inhibits infill, pushes development outward
2. Inhibits transit and active transportation
3. Forces more road construction than we can afford to maintain
4. **Generates an array of environmental impacts**

<https://ncst.ucdavis.edu/white-paper/cutting-greenhouse-gas-emissions-is-only-the-beginning-a-literature-review-of-the-co-benefits-of-reducing-vehicle-miles-traveled/>

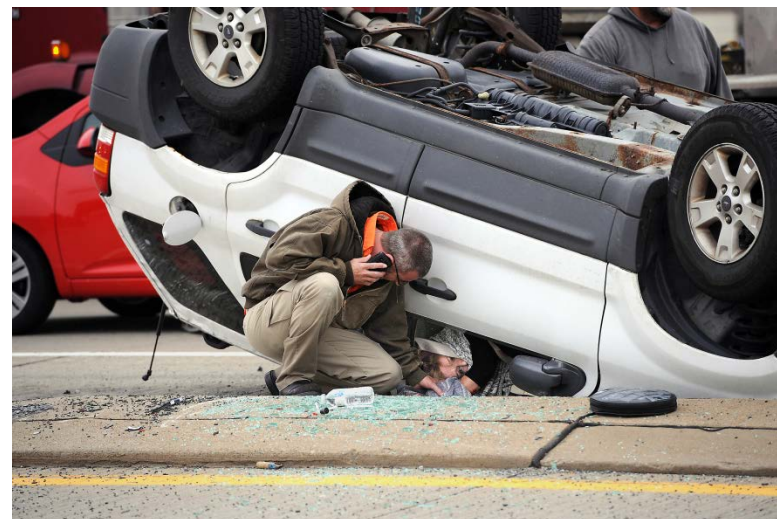
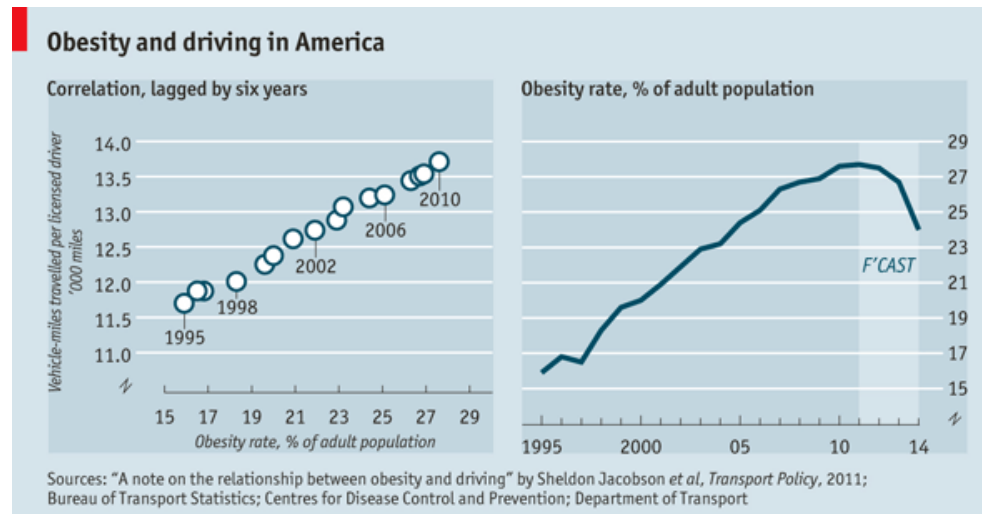
Peer-reviewed research on environmental impacts from high VMT projects:

- Emissions
 - GHG
 - Regional pollutants
- Energy use
 - Transportation energy
 - Building energy
- Water
 - Water use
 - Runoff – flooding
 - Runoff – pollution
- Consumption of open space
 - Sensitive habitat
 - Agricultural land

Transportation Impact Analysis Today: Problems

1. Punishes last-in, inhibits infill, pushes development outward
2. Inhibits transit and active transportation
3. Forces more road construction than we can afford to maintain
4. Generates an array of environmental impacts
5. **Worsens public health and safety**

<https://ncst.ucdavis.edu/white-paper/cutting-greenhouse-gas-emissions-is-only-the-beginning-a-literature-review-of-the-co-benefits-of-reducing-vehicle-miles-traveled/>



Transportation Impact Analysis Today: Problems

Auto-mobility remains of fundamental importance to transportation for the foreseeable future.

Our current approach—centered on improving auto mobility rather than access to destinations—slows development, harms the economy, renders other modes unviable, harms health, harms the environment, is unaffordable...and fails to deliver auto mobility.

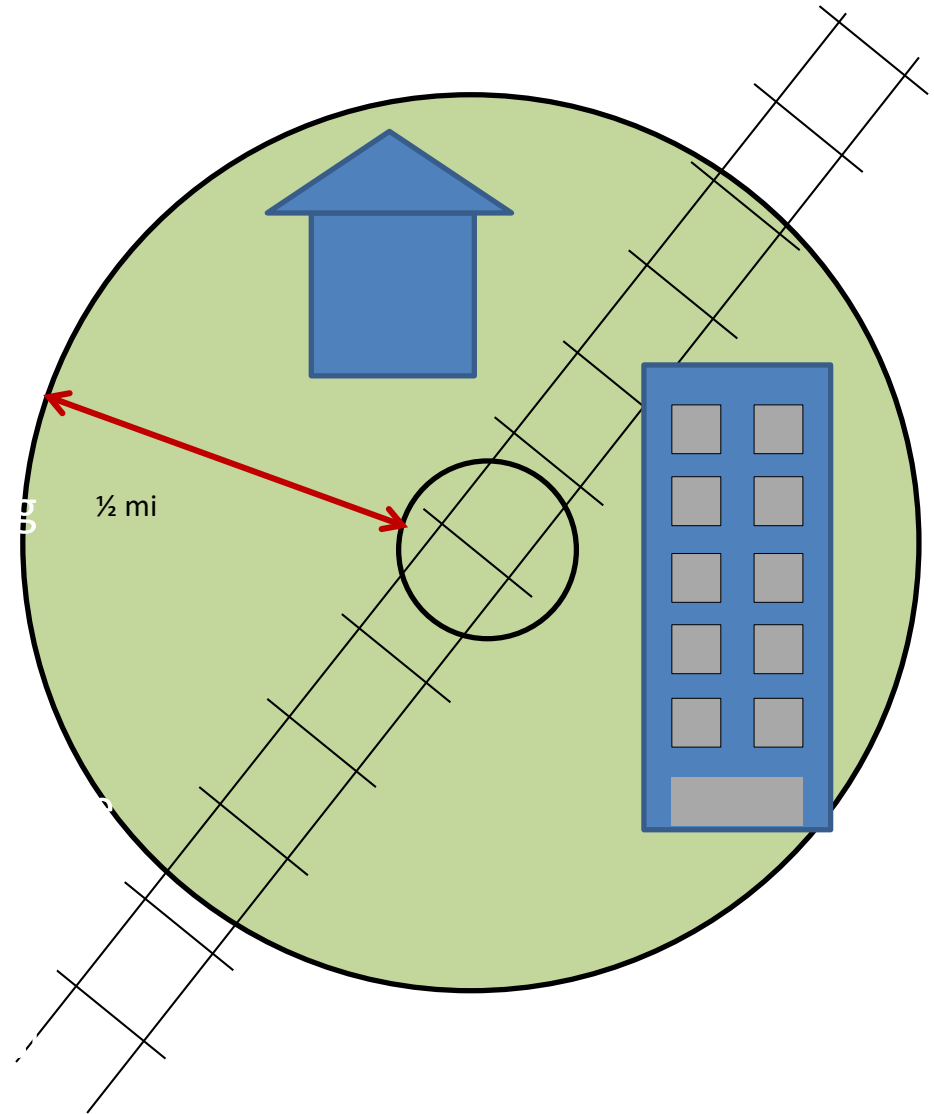


New Metric:

Transportation impact = **Vehicle Miles Traveled (VMT)**

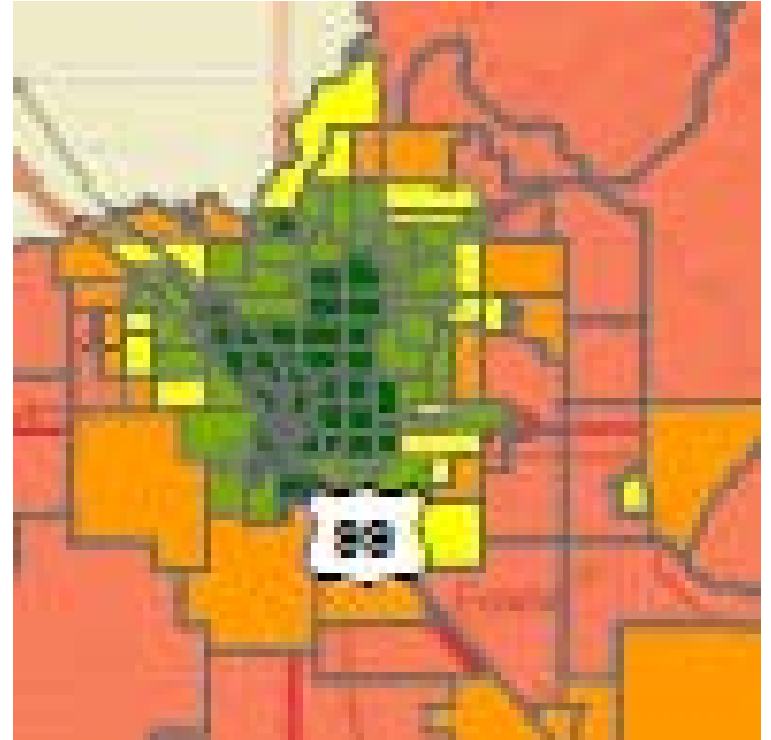
Benefits of VMT as a Measures of Transportation Impact

1. Streamline TOD



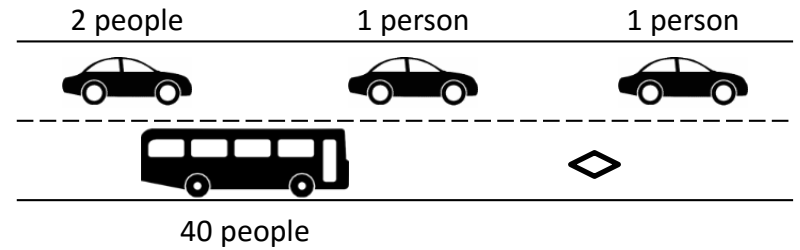
Benefits of VMT as a Measures of Transportation Impact

1. Streamline TOD
2. **Streamline infill**



Benefits of VMT as a Measures of Transportation Impact

1. Streamline TOD
2. Streamline infill
3. **Streamline transit projects**



Benefits of VMT as a Measures of Transportation Impact

1. Streamline TOD
2. Streamline infill
3. Streamline transit projects
4. **Streamline active transportation projects**



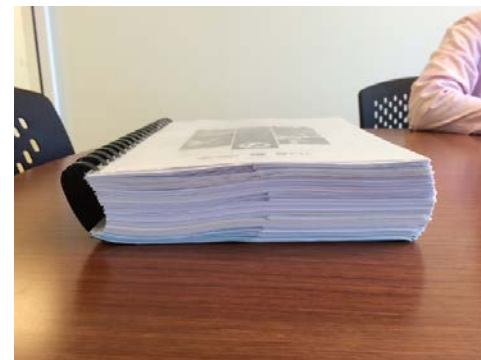
Benefits of VMT as a Measures of Transportation Impact

1. Streamline TOD
2. Streamline infill
3. Streamline transit projects
4. Streamline active transportation projects
5. **Streamline locally-serving retail**



Benefits of VMT as a Measures of Transportation Impact

1. Streamline TOD
2. Streamline infill
3. Streamline transit projects
4. Streamline active transportation projects
5. Streamline locally-serving retail
6. Streamline modeling for remaining projects



Level of Service (LOS) Summary
Conditions

Project	LOS	With Project	With Project + Mitigation
F	1.007	F -0.001	F -0.001
F	1.246	F -0.006	F -0.006
F	1.368	F 0.303	F 0.303
F	1.281	F -0.013	F -0.013
F	1.000	F 0.000	F 0.000
F	1.133	F -0.007	F -0.007
F	1.080	F 0.004	F 0.004
F	1.064	F -0.028	F -0.028
A	0.308	A 0.000	A 0.308
A	0.465	A 0.000	A 0.465
F	1.107	F 0.008	F 1.107
F	1.130	F -0.009	F 1.130
A	0.404	A 0.000	A 0.404
A	0.291	A 0.000	A 0.291
F	1.007	F 0.001	F 1.007
E	0.969	E -0.015	E 0.969
A	0.213	A 0.000	A 0.213
A	0.408	A 0.000	A 0.408
D	1.191	F 1.205	F 0.014
E	0.755	C 0.967	E 0.956
A	0.856	A NA	A NA
A	0.844	A NA	A NA
E	0.759	C 0.930	E 0.905
E	0.996	E 0.946	D 0.905
C	0.771	C NA	C NA
R	0.668	R NA	R NA
F	1.056	F 1.261	F 1.261
F	1.040	F 1.254	F 1.254

<http://www.caleemod.com/>

CalEEMod.2013.2.2

Construction Traffic Area Energy Water Solid Waste

Land Use & Site Enhancement Commute

Project Setting: Urban

Land Use

- Increase Density [LUT-1] 0 Dwelling Units/acre
- Increase Diversity [LUT-3] 0 Jobs/Job acre
- Improve Walkability Design [LUT-9] 147 Intersections/Square Miles
- Improve Destination Accessibility [LUT-4] 0 Distance to Dwnwn/Job Ctr (Miles)
- Increase Transit Accessibility [LUT-5] 0.17 Distance to Transit Station (Miles)
- Integrate Below Market Rate Housing [LUT-6] 98 #Dwelling Units Below Market Rate

Neighborhood Enhancements

- Improve Pedestrian Network [SDT-1] Project Site and Connecting Off-Site
- Provide Traffic Calming Measures [SDT-2]
 - % Streets with Improvement
 - % Intersections with Improvement
- Implement NEV Network [SDT-3] 0

Parking Policy/Pricing

- Limit Parking Supply [PDT-1] 17 % Reduction in Spaces
- Unbundle Parking Costs [PDT-2] 0 Monthly Parking Cost (\$)
- On-Street Market Pricing [PDT-3] 0 % Increase in Price

Transit Improvement

- Provide BRT System [TST-1] 0 % Lines BRT
- Expand Transit Network [TST-3] 0 % Increase Transit Coverage
- Increase Transit Frequency [TST-4] % Reduction in Headways

*The mitigation should be applicable to land use project evaluated.
*Remarks" box should contain percent reduction justification.

Import csv

<< Previous Next >>

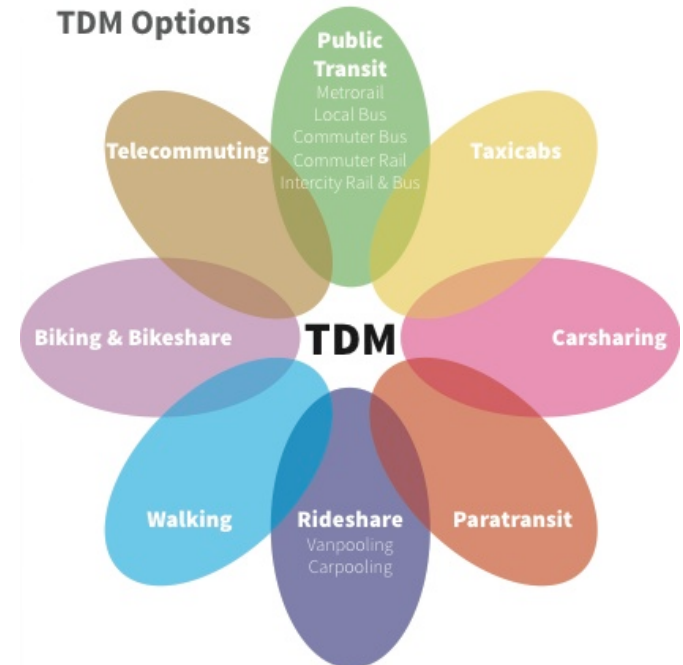
Benefits of VMT as a Measures of Transportation Impact

1. Streamline TOD
2. Streamline infill
3. Streamline transit projects
4. Streamline active transportation projects
5. Streamline locally-serving retail
6. Streamline modeling for remaining projects
7. **Attack regional congestion more effectively**

http://www.opr.ca.gov/docs/ITE_Journal_Article_-_Decisions_Values_and_Data.pdf



David Paul Morris / SFC



Benefits of VMT as a Measures of Transportation Impact

1. Streamline TOD
2. Streamline infill
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5. Streamline locally-serving retail
6. Streamline modeling for remaining projects
7. Attack regional congestion more effectively
8. **Reduce future pavement maintenance deficits**

http://lgc.org/wordpress/docs/events/first_thursday_diagnosers/ftd_2013_Protecting_Transportation-june.pdf



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1. Streamline TOD
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6. Streamline modeling for remaining projects
7. Attack regional congestion more effectively
8. Reduce future pavement maintenance deficits
9. **Massive public health improvements**



> 23,000 deaths/y attributable to physical inactivity in California

Achieving CA's mode share targets:

- **2,095 fewer deaths annually**
- **\$1 billion-\$15 billion/y prevented premature deaths and disability**

Maizlish N. *Increasing Walking, Cycling, and Transit: Improving Californians' Health, Saving Costs, and Reducing Greenhouse Gases. Final Technical Report to the California Department of Public Health (CDPH). Berkeley, CA; 2016.*
<https://www.cdph.ca.gov/programs/Documents/IncreasingWalkingCyclingTransitFinalReport2016rev2017-01-28.pdf>

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6. Streamline modeling for remaining projects
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8. Reduce future pavement maintenance deficits
9. Massive public health improvements
- 10. Reduction in GHG and other emissions**



Benefits of VMT as a Measures of Transportation Impact

Picturing a low-VMT future



Image Credits- Urban Advantage, Roma Design Group, City of Dana Point

Benefits of VMT as a Measures of Transportation Impact

Picturing a low-VMT future



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Plan Transportation for the Wellbeing of Your City (Not Vice Versa)

Stop using LOS for
Transportation Impact Studies



Thinking/Visioning : what kind of
city (region, etc.) do we want?



What transportation
infrastructure forwards that
vision?

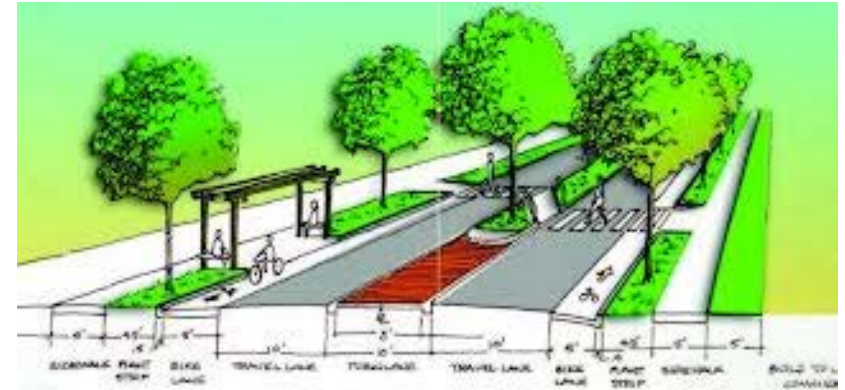


Replace Ad-hoc, LOS-based
charges with impact fee program
based on VMT



Plan Transportation for the Wellbeing of Your City (Not Vice Versa)

What transportation infrastructure forwards that vision?



Direct measures of access, e.g.

- [Sugar Access](#) (Citilabs) tool
- Rails to Trails Low-Stress Bikeways tool

Use LOS as a stopgap metric to inform planning, *not to assess project impacts*

Weigh your jurisdiction's transportation interests with livability, safety for vulnerable road users, long-term fiscal viability, land consumption, energy/water use, GHG emissions, etc.



Inconvenient Truth #2: Induced VMT

Roadway expansion reduces travel time, which leads to:

1. Longer trips (↑ VMT)
2. Mode shift toward automobile (↑ VMT)
3. Newly generated trips (↑ VMT)
4. Route changes (can ↑ or ↓ or VMT)
5. More disperse land use development (↑ VMT)

We would expect each of these effects as a result of basic supply and demand.

Inconvenient Truth #2: Induced VMT

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National Center
for Sustainable
Transportation

Increasing Highway Capacity Unlikely to Relieve Traffic Congestion

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BRIEF

Issue

Reducing traffic congestion is often proposed as a solution for improving fuel efficiency and reducing greenhouse gas (GHG) emissions. Traffic congestion has traditionally been addressed by adding additional roadway capacity via constructing entirely new roadways, adding additional lanes to existing roadways, or upgrading existing highways to controlled-access freeways. Numerous studies have examined the effectiveness of this approach and consistently show that adding capacity to roadways fails to alleviate congestion for long because it actually increases vehicle miles traveled (VMT).

An increase in VMT attributable to increases in roadway capacity where congestion is present is called “induced travel”. The basic economic principles of supply and demand explain this phenomenon: adding capacity decreases travel time, in effect

Increased roadway capacity induces additional VMT in the short-run and even more VMT in the long-run. A capacity expansion of 10% is likely to increase VMT by 3% to 6% in the short-run and 6% to 10% in the long-run. Increased capacity can lead to increased VMT in the short-run in several ways: if people shift from other modes to driving, if drivers make longer trips (by choosing longer routes and/or more distant destinations), or if drivers make more frequent trips.^{3,4,5} Longer-term effects may also occur if households and businesses move to more distant locations or if development patterns become more dispersed in response to the capacity increase. One study concludes that the full impact of capacity expansion on VMT materializes within five years⁶ and another concludes that the full effect takes as long as 10 years.⁷

Inconvenient Truth #2: Induced VMT

- Adding highway capacity induces VMT
- The Quality of evidence on this phenomenon is high
- For each 1% increase in lane miles, VMT goes up by 0.6 to 1.0%
- The added VMT is truly new, not shifted from elsewhere
- The new VMT increases GHGs
- The new highway capacity does not increase overall employment or economic activity
- California resources on induced VMT:
 - Caltrans brief: http://www.dot.ca.gov/newtech/researchreports/reports/2015/10-12-2015-NCST_Brief_InducedTravel_CS6_v3.pdf
 - ARB brief: http://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_brief.pdf
 - ARB Technical Background: http://www.arb.ca.gov/cc/sb375/policies/hwycapacity/highway_capacity_bkgd.pdf
 - “You can’t build your way out of congestion.” – Or can you? A Century of Highway Plans and Induced Traffic: http://www.opr.ca.gov/docs/You_can't_build_your_way_out_of_congestion_-_or_can_you.pdf

“You can’t build your way out of congestion.” – Or can you?

A Century of Highway Plans and Induced Traffic

Brian Ladd

Brian Ladd is a Research Associate in history at the University at Albany, State University of New York, and the author of books on German urban history as well as *Autophobia: Love and Hate in the Automotive Age* (University of Chicago Press, 2008).

Abstract: The phenomenon of induced traffic was recognized (if rarely measured) even before the automotive age. Its existence calls into question the effectiveness of road construction

to street traffic is used to designate almost every type of undesirable condition.” His attempt at a useful definition was only a little more specific: “a condition resulting from a retardation

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“The phenomenon of induced traffic was recognized (if rarely measured) even before the automotive age. Its existence calls into question the effectiveness of road construction as a solution to traffic congestion. Why, then, has it rarely been factored into highway investment decisions? An examination of references to induced traffic suggests that it posed an inconvenient complication to a consensus that had emerged by the 1920s. That consensus endorsed automotive mobility along with a commitment to keep building road space as long as traffic grew to fill it. Recent research challenges the factual assumptions underlying that consensus, but has not yet overturned the deeper beliefs upon which it rests.”

Resources:

https://www.opr.ca.gov/docs/Key_Publications_on_VMT.pdf

- Disadvantages of using LOS/Auto Delay metrics
- Impacts of VMT & high VMT development
- VMT reduction strategies
- Research of induced VMT from added highway capacity
- Automated vehicles and VMT
- Tools for measuring VMT and access to destinations
- Housing affordability and VMT
- VMT reduction in rural areas
- Roadway pricing and equity

Thanks!

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