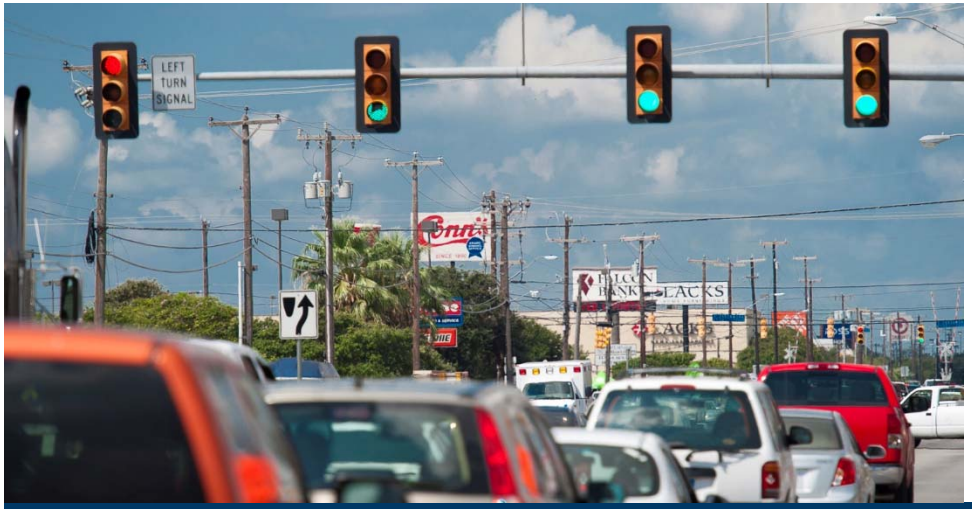


StreetLight Data Pilot: Using Big Data to Save Big Dollars

TAC Funding and Programming

Thursday, November 16, 2017

Michael Corbett – State Program Administrator

MnDOT Metro Planning

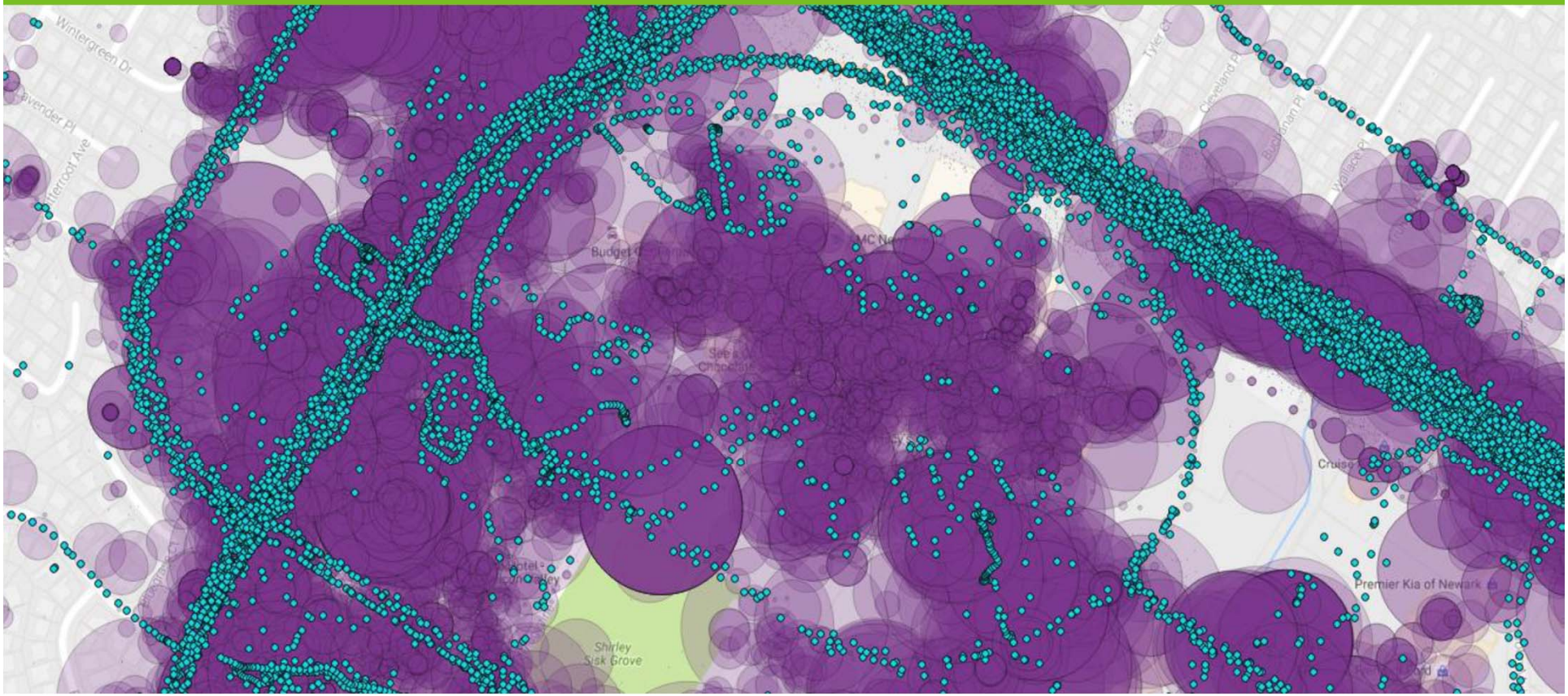
Agenda

	Topic
1	StreetLight Insight *Pilot* Basics
2	Background – What's in the data
3	Uses
4	Previous Experience with Big Data
5	Examples: Arterials, Maryland 4-3 lane conversion, License Plate Study, Public Outreach: West 7th Street
6	Upcoming Analyses
7	Upcoming Trainings
8	Tracking Pilot Subscription

StreetLight Basics

- ***Pilot*** Subscription service that uses a cloud-based, online software tool to generate analytics (metrics) about trends in transportation behavior.
- Transportation metrics derived from both navigation-GPS records and location-based services records.
- Transportation data collection tool that allows authorized users:
  - To run an unlimited number of transportation studies and analyses including Origin-Destination.
  - To run these studies and generate analytics directly from a computer with only an internet connection, no software is required.

StreetLight Basics



- Blue dots – GPS data
- Purple circles – mobile device data

Selected Uses for the Data

- Measure congestion and delay
- Origin-Destination analyses
- Speed Limit studies
- Freight analyses (large and medium size trucks)
- Construction impacts, detour analyses
- Turning Movement Counts

Previous Experience with Big Data (2013)

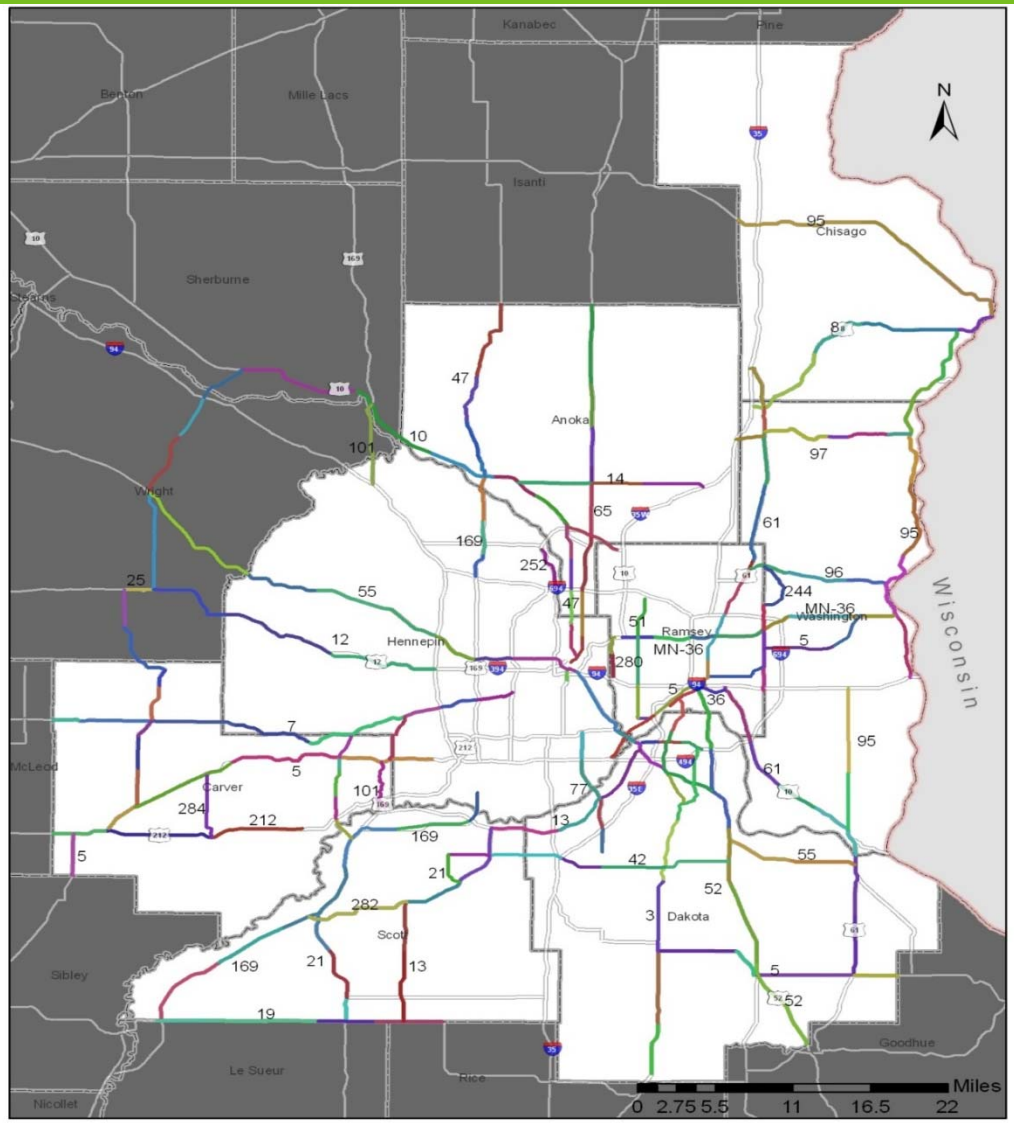
Background

- MnDOT partnered with the Texas A&M Transportation Institute (TTI) in a study for "Developing Twin Cities Arterial Mobility Performance Measures Using GPS Speed Data"
- Travel speed data from INRIX was acquired for all MnDOT non-freeway arterials in the Metro (2011 data)
  - included roadway location reference information (street names, cross streets, length of links, latitude/longitude of endpoints
  - included time/date ranges (hour-of-the-day and day-of-week averages)
  - Average speed, reference speed, and distribution percentiles of speed
  - Roadway segments ranked by annual delay per mile

2013 Arterial Speed Analysis

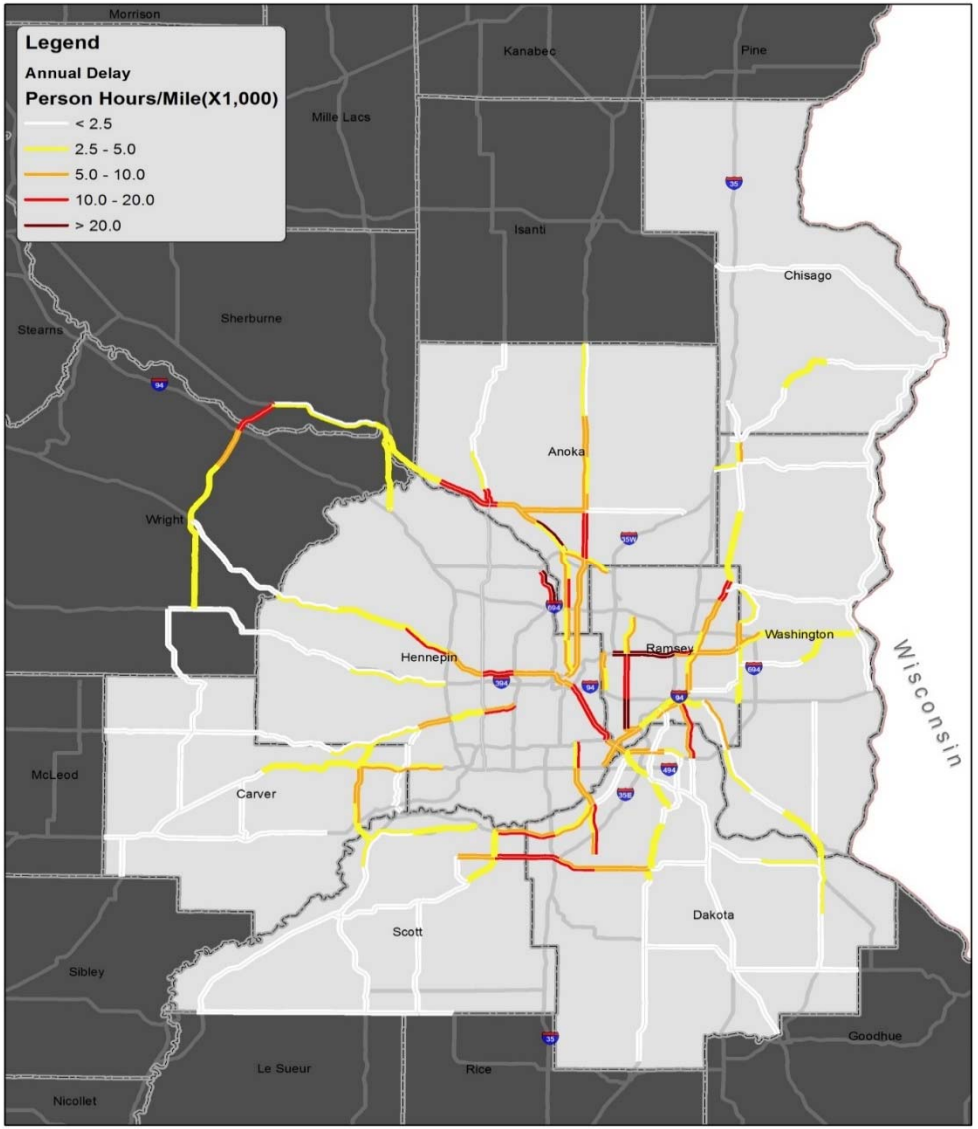
Defined

Segments



2013 Arterial Speed Analysis

Arterial Segments by Annual Delay Per Mile



Total effort =
6-9 months
$125,000

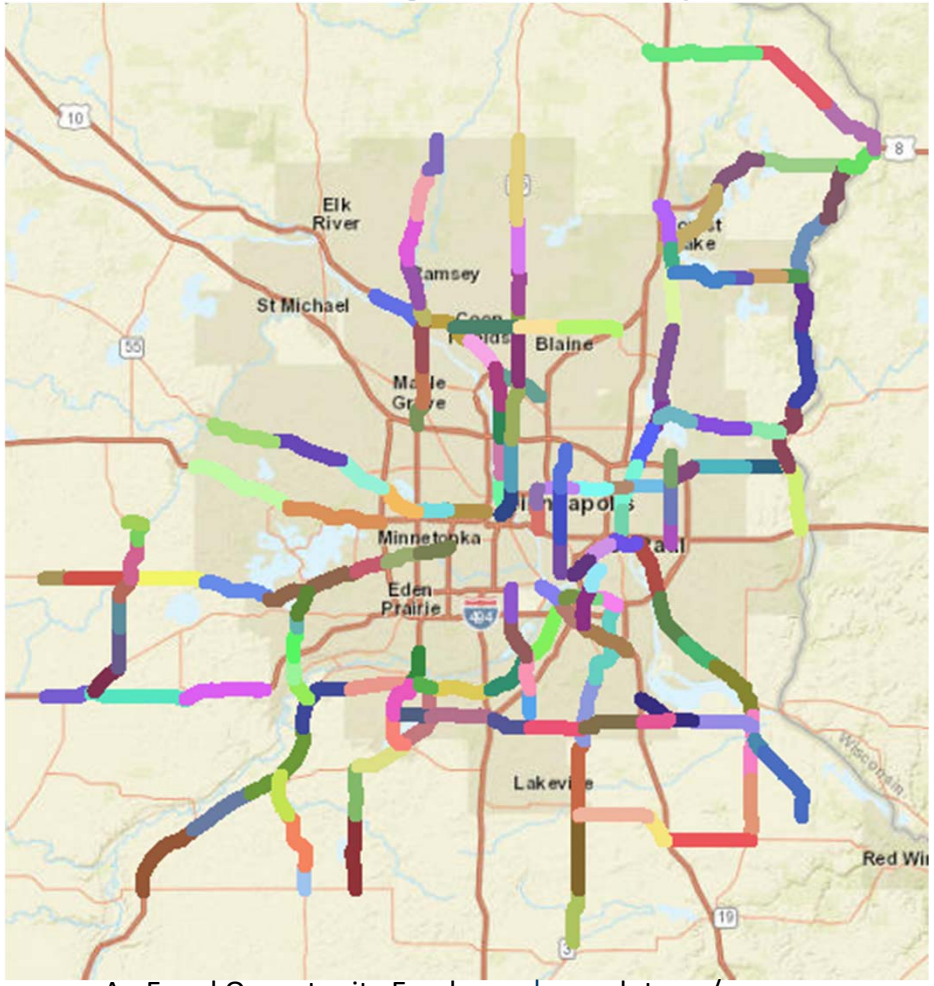
2017 MnDOT Arterial Speed Analysis

StreetLight Analysis of arterials

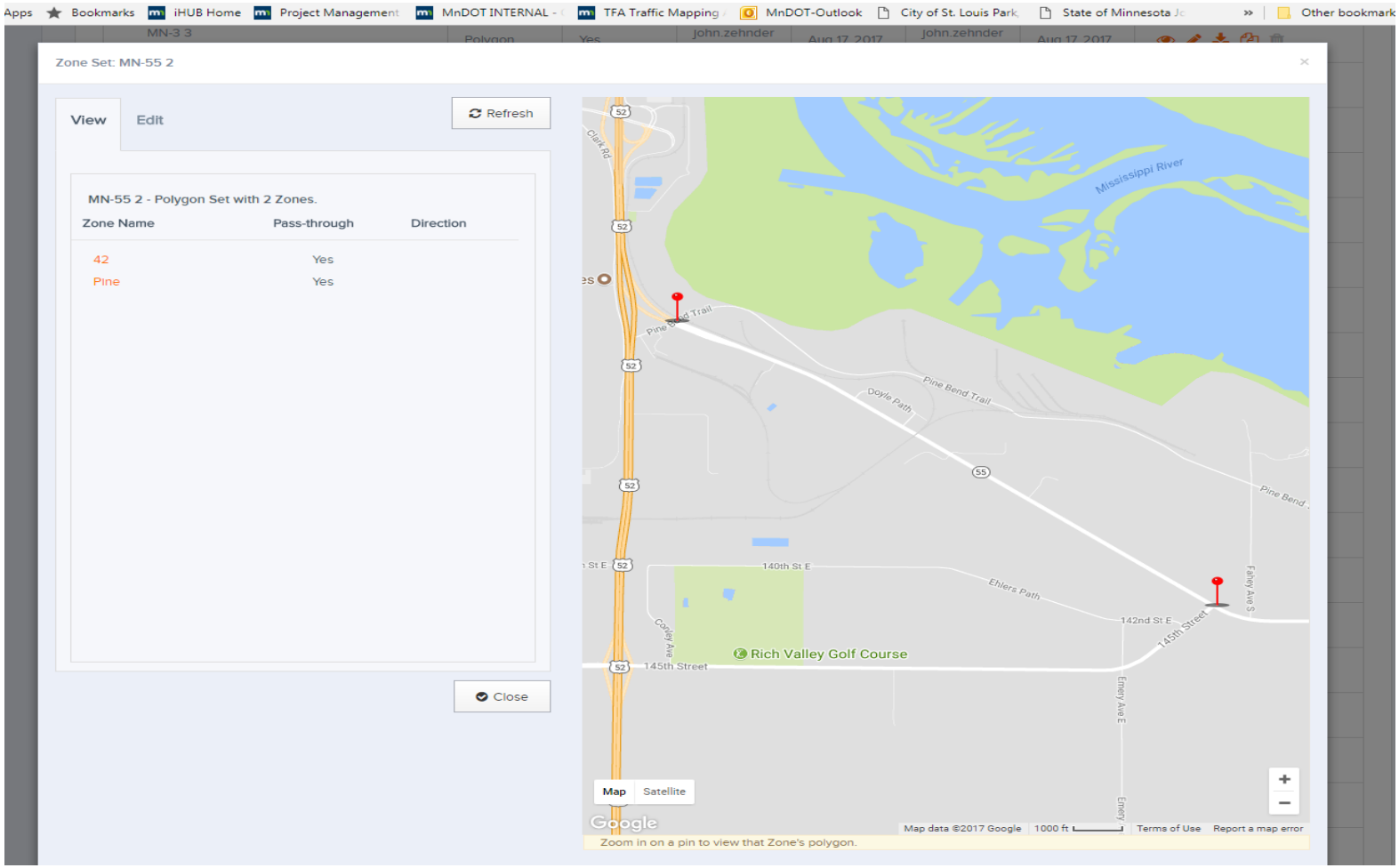
- Same roadway segments from 2013 study were used
- Gateways were drawn at segment endpoints
- Reference speed (free flow) was overnight period (9pm to 6am)
  - *Determining Reference Speed from Probe-based Travel Speed Data*, Technical Memorandum Prepared for the Mobility Measurement in Urban Transportation (MMUT) Pooled Fund Study, Texas A&M Transportation Institute (TTI) - May 2017
- Congestion formulas set up to report “speed as % of reference speed”

2017 MnDOT Arterial Speed Analysis

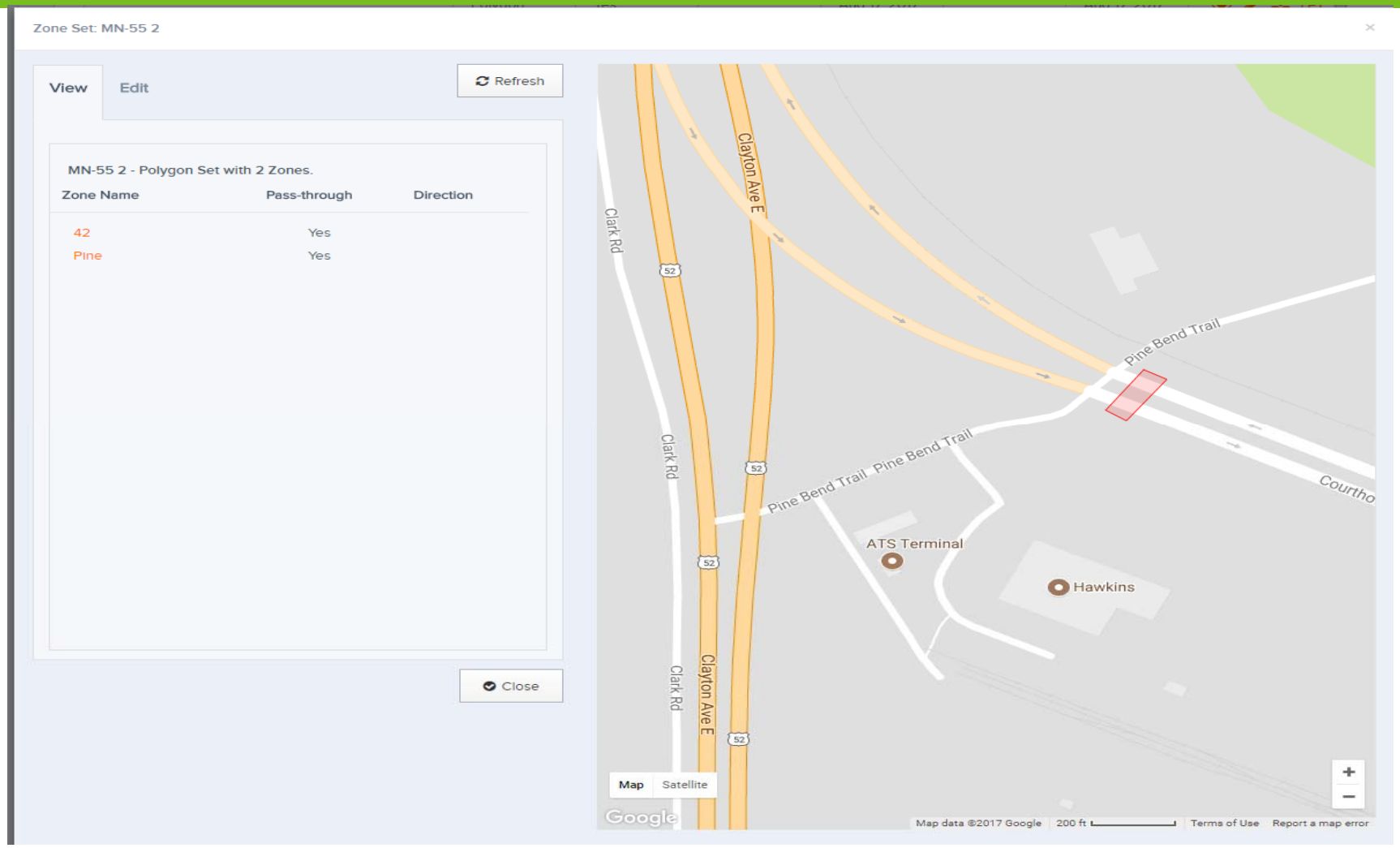
Segments used in StreetLight analysis



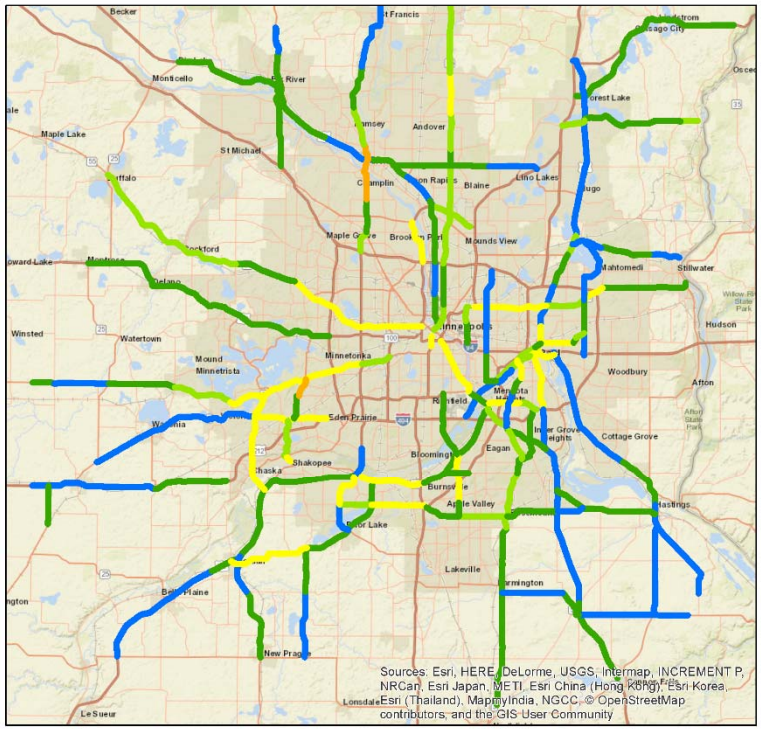
Segment Example: Arterial Speed Analysis



Segment Example: Arterial Speed Analysis



Twin Cities Artierial Corridor Morning Congestion



John Zehnder

Legend

Percent of Reference Speed

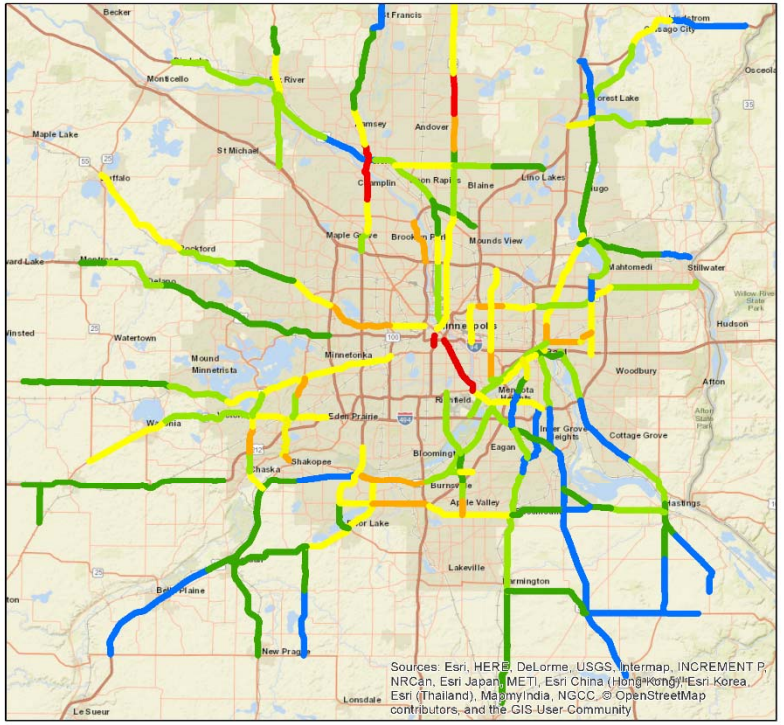
AM_index

- Less than 80%
- 80 to 90%
- 90 to 95%
- 95% to 100%
- Over 100%

N

0 3.75 7.5 15 22.5 30 Miles

Twin Cities Arterial Corridor Afternoon Congestion



John Zehnder

Legend

Percent of Reference Speed

PM_index

- Less than 70%
- 70% to 80%
- 80% to 90%
- 90% to 95%
- 95% to 100%
- Over 100%

N

0 3.75 7.5 15 22.5 30 Miles

2017 MnDOT Arterial Speed Analysis

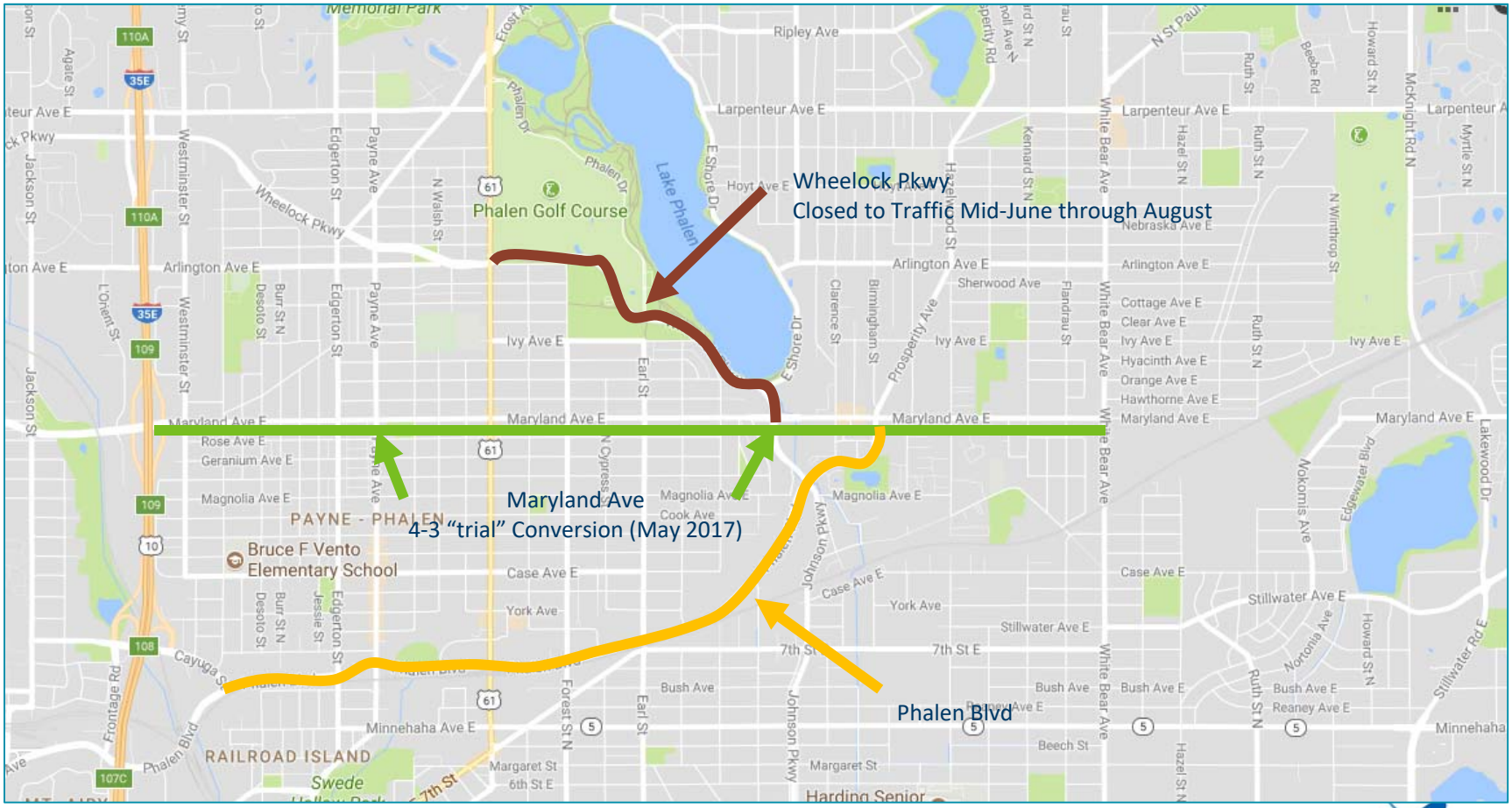
StreetLight Analysis of MnDOT Non-Freeway Arterials

- Additional segments are being analyzed
  - All-traffic
  - Freight (truck) traffic
  - Reporting and displaying both direction
- Idea is to report this annually, much like the Twin Cities Freeway Congestion report
- Compliance with MAP-21 performance measure reporting
- Augment the Congestion Management Process

Maryland 4 to 3 lane roadway conversion

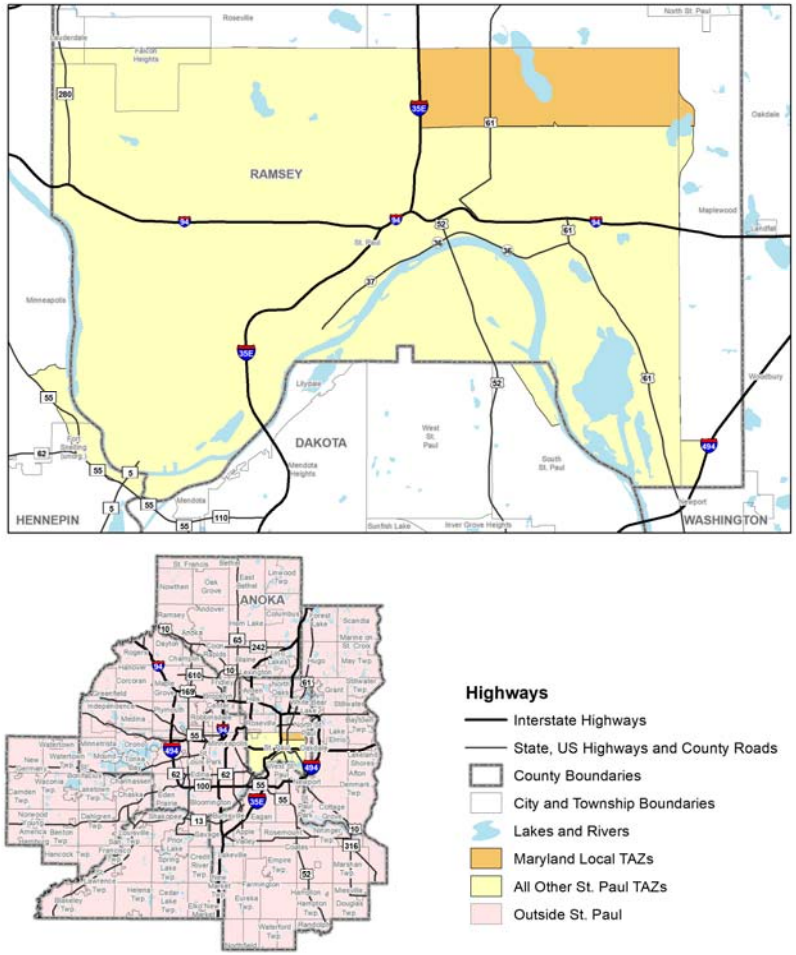
StreetLight Insight in Action: Analyzing Users and the Impacts of a 4 to 3 Conversion in St. Paul

- Staff was interested in answering three primary questions regarding the Maryland Avenue corridor
  - Is Maryland Avenue being used more by the surrounding residents for local trips, or as a gateway for commuters to access I-35E?
  - What were the effects of the 4-to-3 lane conversion on traffic patterns, trip length, and speed along Maryland Avenue?
  - How were adjacent roadways affected by the closure of Wheelock Parkway? Did traffic volumes substantially increase along other roadways due to the Wheelock closure?
  - Impacts to area roadways (e.g. US 61)
  - Comparison to other 4-to-3 lane conversions



METROPOLITAN COUNCIL

Title: Maryland Avenue Neighborhoods



METROPOLITAN COUNCIL

Maryland Avenue: Corridor Usage (O/D Analysis)

Origin	Destination		
	Local Maryland Area	St. Paul	Outside St. Paul
Local Maryland Area	**14%**	**15%**	**15%**
St. Paul	**16%**	**9%**	**8%**
Outside St. Paul	**12%**	**7%**	**4%**

What were the effects of the 4-to-3 lane conversion and Wheelock closure on traffic patterns, speed, and travel time?

- Before and After Analysis: July 2016 and July 2017

Location	Average Speed - 2016	Average Speed - 2017
Maryland	22	24
Phalen	22	22
Wheelock	27	N/A

- A typical analysis would take several months and $100,000

Maryland 4 to 3 lane roadway conversion - Conclusions

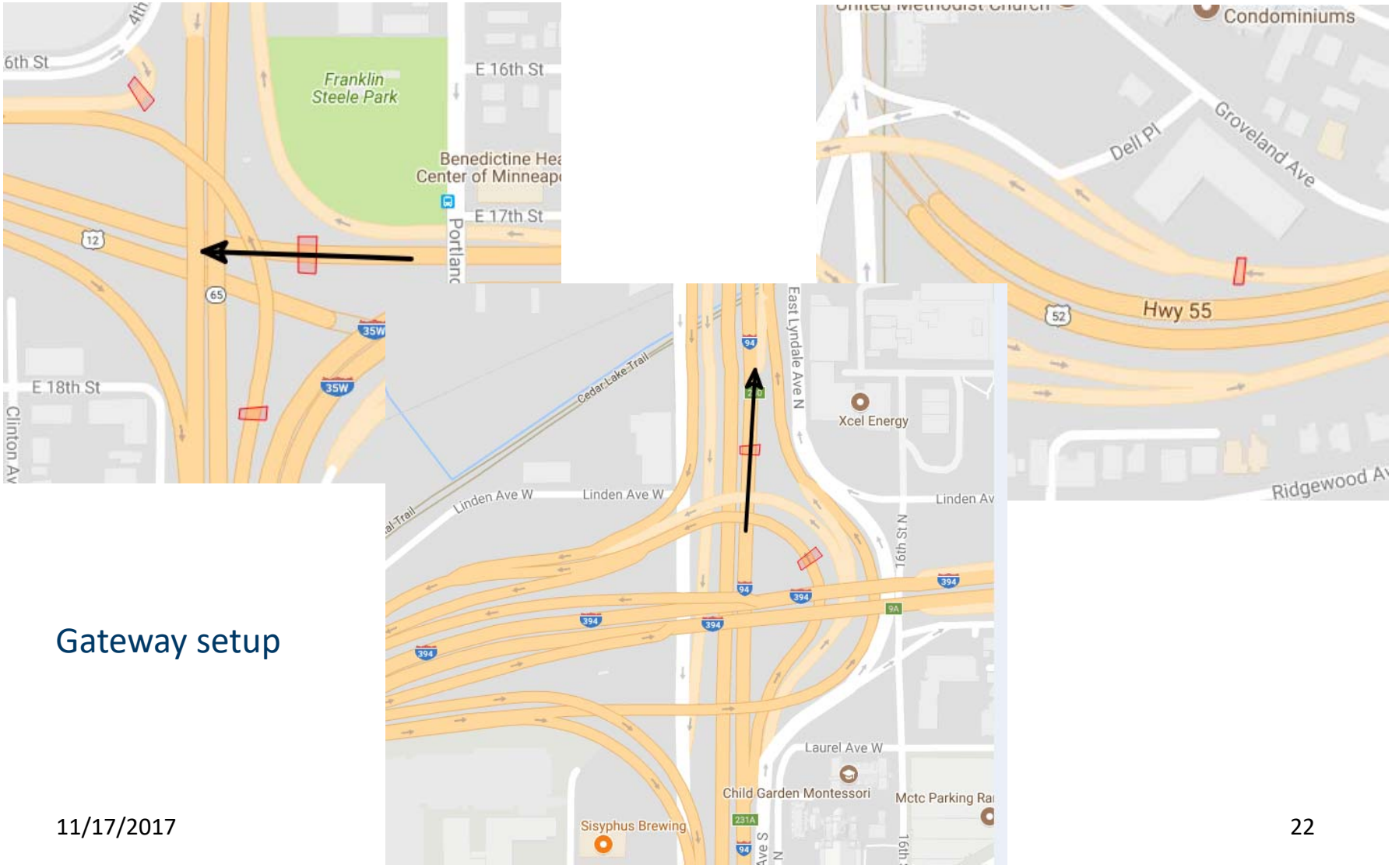
- By utilizing the StreetLight Insight tool, staff was able to determine:
  - The majority of trips along Maryland Avenue had their origin, destination, or both origin and destination within the immediate neighborhood. Most other trips had an origin and/or destination within St. Paul. Very few non-St. Paul residents were using the corridor as a "pass through" to connect to I-35E.
  - The closure of Wheelock Parkway led to an increase of traffic along adjacent corridors.
  - Travel time and trip duration increased along Maryland Avenue and Phalen Blvd from July 2016 to July 2017; however, it is unclear if this was more an effect of the closure of Wheelock, the 4-to-3 lane conversion, or a combination of both.
- StreetLight provides a powerful and easy-to-use mechanism for evaluating the users and function of a corridor as well as a picture of the effects of roadway reconstruction on speed, traffic patterns, and trip duration.

Flyover Analysis: I-35W NB to I-94

Background

- 2011 Study looked at impacts of moving the I-35W NB and 4th Avenue flyover from the right side of I-94 to the left side
- Consultant selected to analyze license plate data to determine origins and destinations of vehicles using the NB I-35W ramp
- Video cameras captured license plates for two days in May
- StreetLight analysis used monthly data over the last few years

Flyover Analysis: I-35W to I-94



Gateway setup

Flyover Analysis : I-35W to I-94

Results

Table 1: AM Peak Period O-D Summary for Personal Vehicles (7am-9am)

*Original ("Conventional") O-D study Percentages

Origin-Destination Table Personal Vehicles		Destinations		
		Hennepin/Lyndale	WB I-394	WB I-94 Through
Origins	NB I-35W Flyover Entrance	20% *11%	18.4% *28%	61.5% *61%
	4th Avenue Entrance	19.6% *2%	26.7% *35%	53.8% *63%
	WB I-94 Mainline	38.7% *16%	36% *51%	25.2% *33%

Flyover Analysis : I-35W to I-94

Table 2: AM Peak Period O-D Summary for Commercial Vehicles (7am-9am)

*Original ("Conventional") O-D study Percentages

*Medium and Heavy Duty Commercial Vehicles were not broken out in the original study.

Origin-Destination Table All Commercial Vehicles		Destinations		
		Hennepin/Lyndale	WB I-394	WB I-94 Through
Origins	NB I-35W Flyover Entrance	13% *6%	5.6% *3%	81.2% *91%
	4th Avenue Entrance	20.1% *3%	28.8% *8%	50% *89%
	WB I-94 Mainline	27% *31%	37.5% *69%	35.3% *0%
Origin-Destination Table Medium Duty Commercial Vehicles*		Commercial-Medium	Commercial-Medium	Commercial-Medium
Origins	NB I-35W Flyover Entrance	16.4%	8.4%	75%
	4th Avenue Entrance	24.1%	27.7%	47.1%
	WB I-94 Mainline	33.5%	33.2%	33.1%
Origin-Destination Table Heavy Duty Commercial Vehicles*		Commercial-Heavy	Commercial-Heavy	Commercial-Heavy
Origins	NB I-35W Flyover Entrance	9.2%	2.4%	88%
	4th Avenue Entrance	11.5%	31%	56.3%
	WB I-94 Mainline	15.8%	44.9%	39%

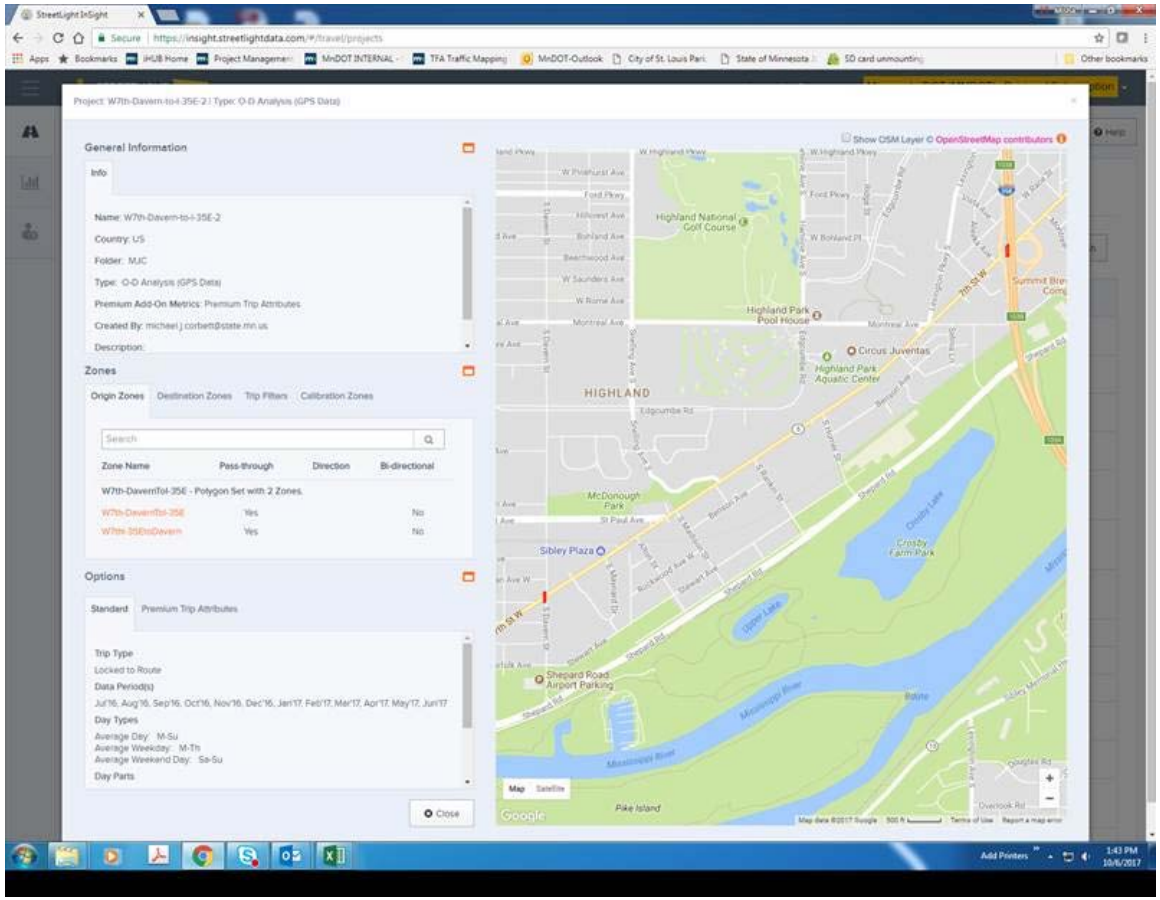
Flyover Analysis: I-35W to I-94

Conclusions

- StreetLight effort took much less time and effort than the original study ($100,000 and several months vs 11 hours (less than $800).
- StreetLight Data provided substantially larger sample size
- Accuracy likely better since data not subject to human error (vs reading license capture images)

West 7th Street (MN -5) speed analysis

Speed analysis requested for public meeting



West 7th Street (MN -5) speed analysis

Speed analysis requested for public meeting with State Reps and Councilmembers

	EB (mph)	WB (mph)	EB (data pts)	WB (data pts)	EB+WB data pts	EB&WB avg speed (mph)
Peak AM (6am-10am)	30	27	1832	315	2147	**30**
Peak PM (3pm-7pm)	29	25	1803	445	2248	**28**
Off Peak (9pm-6am)	34	32	708	252	960	**33**

Typical speed analysis would have taken weeks and $5,000-$10,000

Turning Movement Count Comparison

Turning Movement Count: StreetLight vs. Video count

- One-day turning movement counts (6/12/2017) compared to StreetLight Data (annual average from August 2016 to July 2017)

Figure 1: Origin & Destination Gates—*Streetlight Insight* Analysis

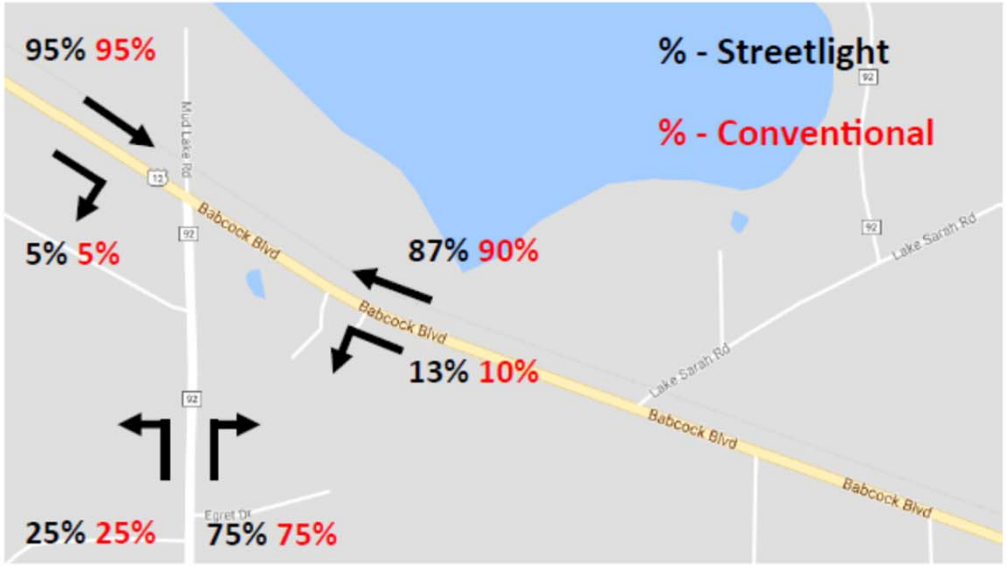
Star indicates location of 06/12/2017 Turn Movement Count.

1a. NB CSAH 92 (West Intersection)

1b. SB CSAH 92 (East Intersection)

Turning Movement Count Comparison

Figure 2: Streetlight vs. Conventional Turn Movement Counts (All-Day)



West Intersection (USTH 12 and CSAH 92)

Turn Movement Count (06/12/2017). Streetlight Insight (Aug 2016 -Jul 2017).

A typical turning movement count would take about a week and $1,000

Upcoming StreetLight Analyses

MnDOT and Met Council are working on additional analyses

- Some analyses are validations of previous studies
- Some projects are new analyses that were not feasible before

List of upcoming and potential uses include:

- US 10 Origin-Destination and speed study validation
- St. Croix River bridge affects on speeds and routes
- US 169 Nine-mile creek bridge closure and reopening

Upcoming StreetLight Analyses

List of upcoming and potential uses (continued)

- Origin-Destination analysis in District 8 (Glencoe area)
- Snelling Ave (TH 51) project
- I-35W and Lake Street Project
- I-35/I-535 and Blatnik Bridge in District 1
- TH 60 expansion from 2-4 lanes – effects on I-90, I-35 & TH169 (District 7)

- Special events analysis
  - State Fair
  - Super Bowl

Tracking Pilot Subscription

StreetLight Subscription Cost and *Estimated* Savings/Value*

***2017* StreetLight Subscription Cost:**		**- $725,000**
2017 I-35W/I-94 O/D Validation Study		+ $100,000
2017 Maryland Ave 4-3 Analysis (Met Council)		+$100,000
2017 Metro District Arterial Speed Analysis		+ $400,000
Speed studies	$ 7,500 x 10	+ $ 75,000
Turning movement counts	$ 1,000 x 100	+ $100,000
Estimated SL Subscription Balance		**$50,000**

* The project cost savings are estimates. Note that several other analyses are being conducted using the SL tool. This table will be updated periodically.

Thank you!

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