ENHANCING ANALYSIS WITH PROBE-BASED DATA

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Kimley-Horn and Associates, Inc.

May 11th, 2018

TexITE DFW May 2018 Joint Meeting


GLOBE LIFE PARK
Always One of a Kind
Budweiser
GRAB SOME BUDS
Coca-Cola
FOX
CHOLULA
Southwest.com
GEICO
Samsung GALAXY
LG
State Farm
Gulf
TEXAS
RANGERS
OPENING WEEK


Kimley-Horn
TexITE DFW May 2018 Joint Meeting

INTRODUCTION

BIG DATA

- There's a lot of data out there now
  - Supplement the traditional data used in traffic signal timing projects
  - Increase statistical significance, reliability, and usability for future applications
- Specifically, crowd-sourced probe-based data
  - Collected from anonymized GPS data from millions of sources,
  - Used to calculate performance metrics
- Cities can monitor, evaluate, and adjust their operations.

BACKGROUND

AUSTIN TMC

- Kimley-Horn staffs and operates the Austin TMC
  - Provide daily staffing
  - Detect and respond to equipment malfunctions
  - Work daily with signal timing engineers
  - Support the effort to track and report on system performance

By The Numbers:

AS OF JANUARY 2017

140 Travel Time Detection Units

998 Traffic Signals

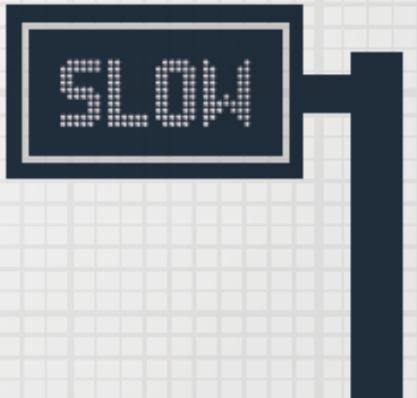
City of Austin Traffic Management Center

576 School Zone Flashers

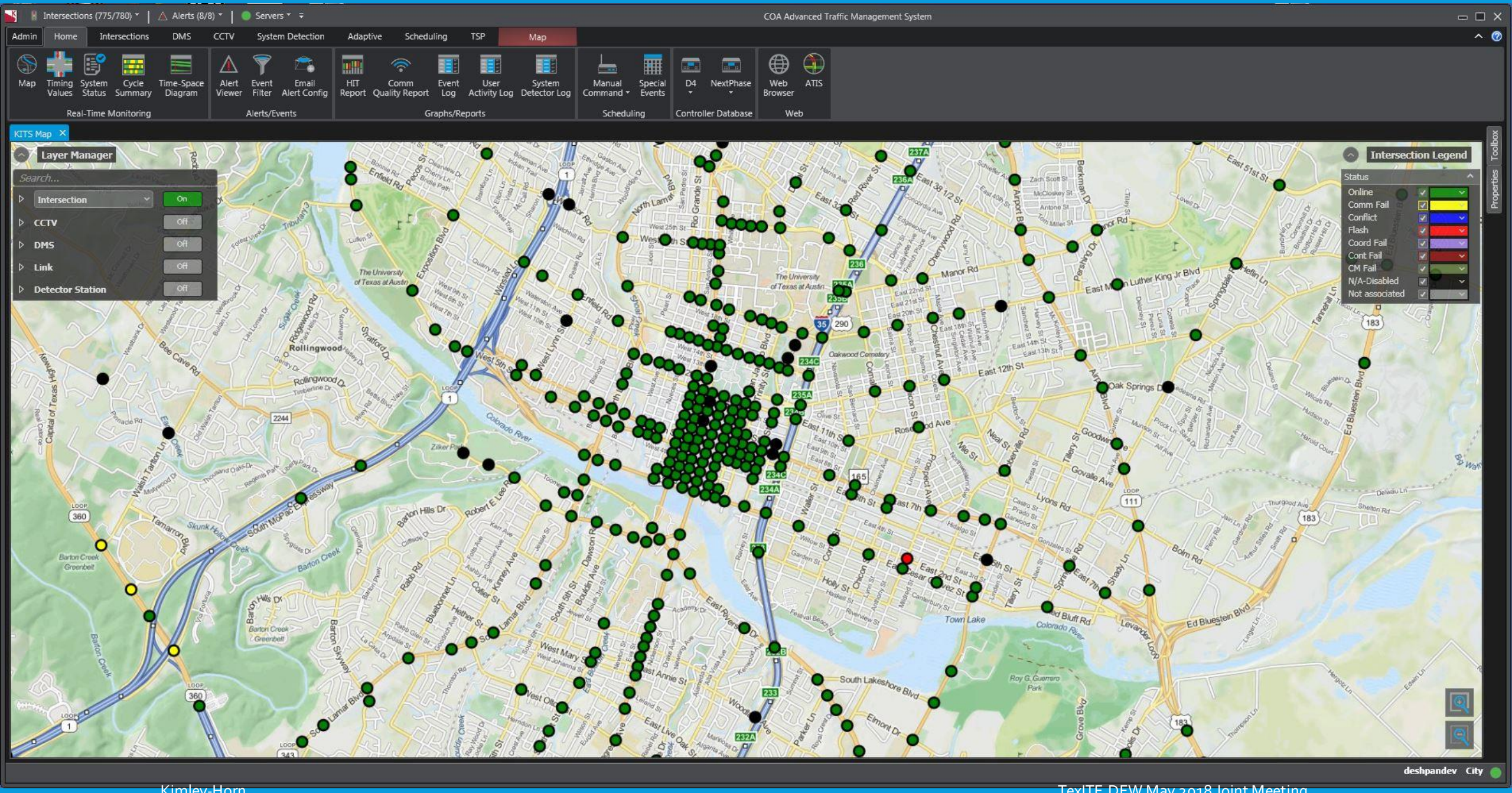
53 Pedestrian Hybrid Beacons

291 Monitoring Cameras

13 Dynamic Message Boards




FOR LEASE 682-5500
CESAR CHAVEZ
W-ST-E
100
ONE WAY
LEFT TURN YIELD ON GREEN
E. CESAR CHAVEZ ST
WATER ST
100


Intersections (775/780)
Alerts (8/8)
Servers
COA Advanced Traffic Management System
Admin
Home
Intersections
DMS
CCTV
System Detection
Adaptive
Scheduling
TSP
Map
Map
Timing Values
System Status
Cycle Summary
Time-Space Diagram
Real-Time Monitoring
Alert Viewer
Event Filter
Email Alert Config
Alerts/Events
HIT Report
Comm Quality Report
Event Log
User Activity Log
System Detector Log
Graphs/Reports
Manual Command
Special Events
Scheduling
D4
NextPhase
Controller Database
Web Browser
ATIS
Web
KITS Map
Layer Manager
Search...
Intersection
On
CCTV
Off
DMS
Off
Link
Off
Detector Station
Off
Intersection Legend
Status
Online
Comm Fail
Conflict
Flash
Coord Fail
Cont Fail
CM Fail
N/A-Disabled
Not associated
Toolbox
Properties
deshpandev
City

AUSTIN TMC

- The TMC enables staff to monitor traffic flow and conditions constantly and during incidents, special events, and construction.
- Utilization of the TMC has increased productivity, reduced response time, and improved the operation of traffic signals.
- The TMC utilizes the KITS Advanced Traffic Management System (ATMS), developed and deployed by Kimley-Horn.

AUSTIN TMC

- Contract directs Kimley-Horn to collect, analyze, and report performance measure data relative to the operations of the TMC and operations of the roadway networks.
- As such, Kimley-Horn procured crowd-sourced probe-based data in the City of Austin.

OBJECTIVES

- Analyzing travel-related information along City of Austin arterials.
- Identifying trends in traffic flow along arterials using historical data.
- Collecting and analyze traffic volume data.
- Using data to report performance.
- Supporting freeways and arterial traffic operations.

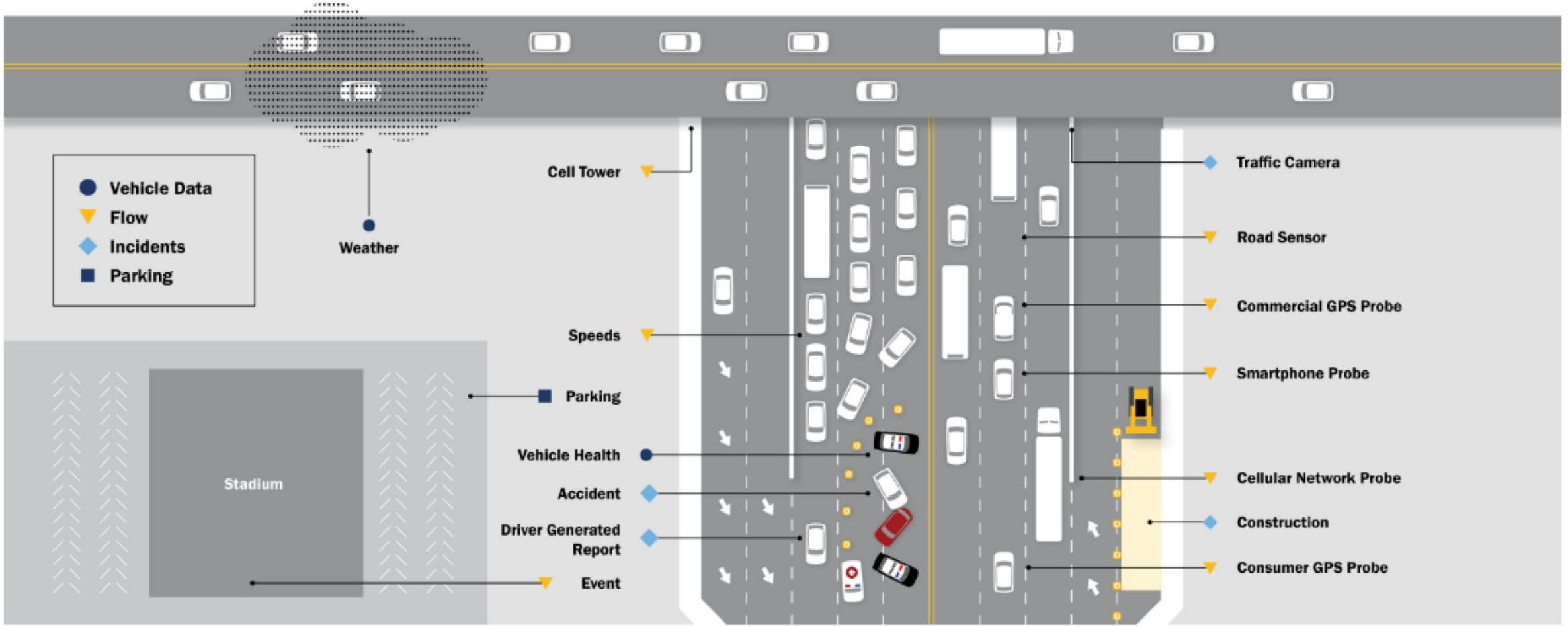
INRIX

Leading Global Provider of Connected Car Services & Transportation Analytics

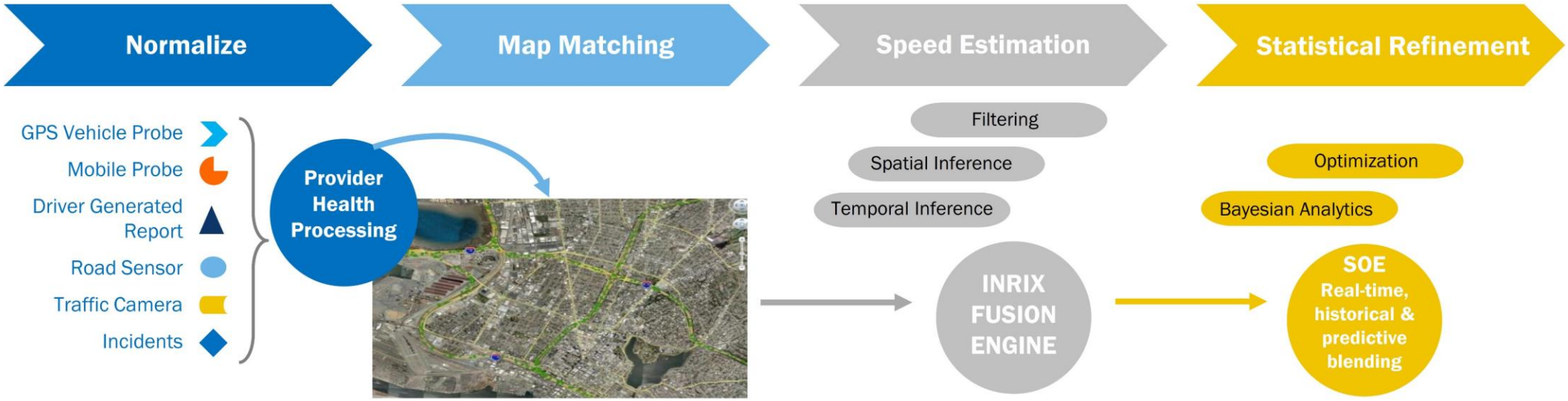
- **World's Largest Driver Network**
  - Majority of connected cars in the world powered by INRIX services
  - Crowd-sourcing data from 275M+ real-time vehicles and devices
- **Live with services in 60+ countries**
- **Delivering breakthrough connected car services & transportation analytics**
  - Traffic, Parking, EV, Multi-Modal, Fuel; Transportation & Population Analytics
- **Serving 450+ B2B customers worldwide**

Mining Data On The Road

We use a connected network of sensors, devices, car and drivers to develop robust insights



INRIX Data Process



Aggregate Speed Data from Probes & Sensors

- Collect data from 400+ sources
- Monitor to ensure proper data point – timely and valid
- Place valid data points on a specific road
- Sensor and Provider Health Processing

Snap Probe Data to Road Network

- Filter points based on location, heading, speed
- Locate points within a road segment

Compute Speed Value Based on Data from Over 15 Mins

- Outlier detection to remove statistical anomalies
- Weight data based on source and latency
- Apply "Adaptive Spatial Resolution" to optimize accuracy and relevance

Enhance Precision of Result & Calculate Confidence Factor

- Leverage real-time where possible
- Enhance data to leverage road closures
- Process less than ideal real-time estimates with typical and predictive forecasts

INRIX Traffic

Accurate and granular traffic globally

Goals

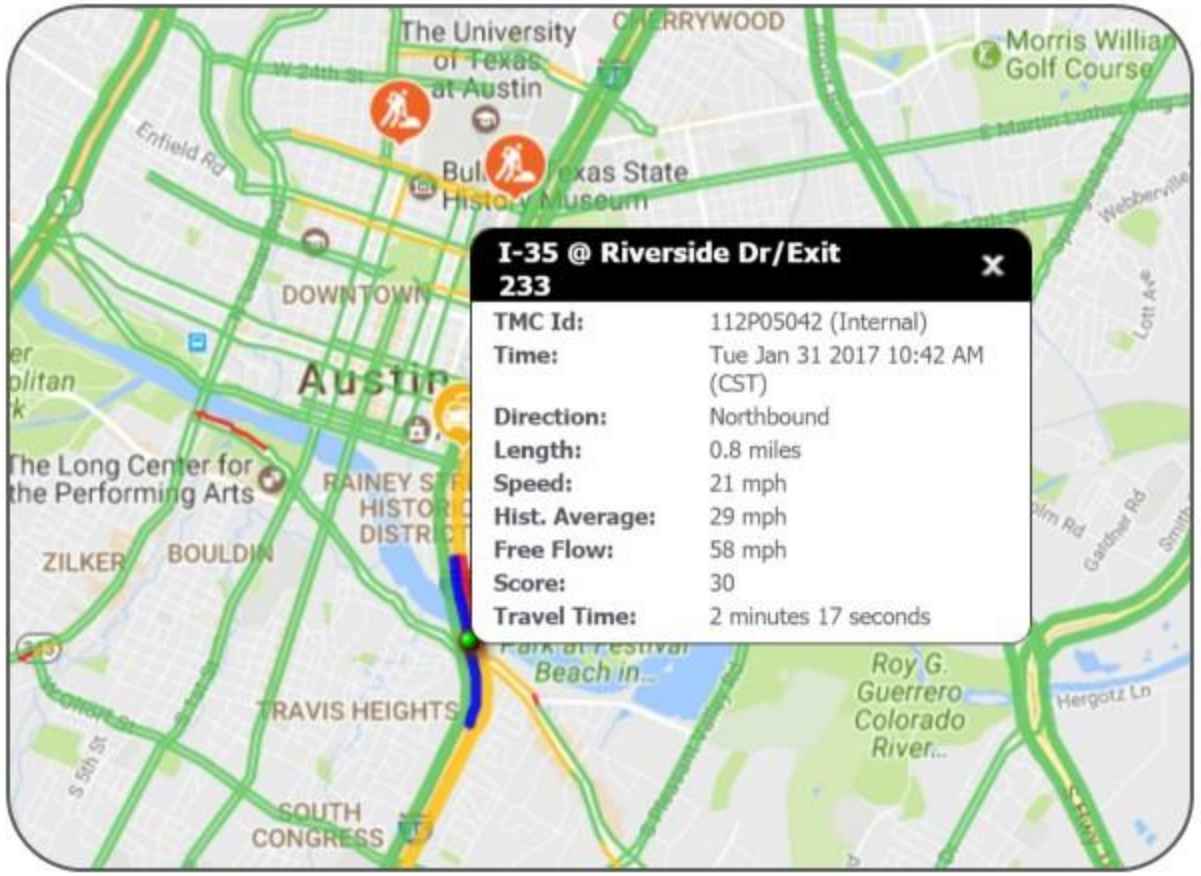
- Deliver the best routes to drivers
- Deliver better insights to transportation agencies

Description

- Real-time traffic information for nearly 5M miles of road in 47 countries
- Over 130k directional miles of coverage in Texas, reported on over 200k individual segments
- Immediate detection of incidents and road closures through anomalies in traffic flows
- Based on crowd-sourced, public, and proprietary data

Differentiation

- Highest quality traffic and highest resolution/granularity
- Map agnostic (e.g. TomTom, HERE, OSM, Google, Apple, etc.)
- Support for sub-segment speed reporting



AVAILABLE DATA & METRICS

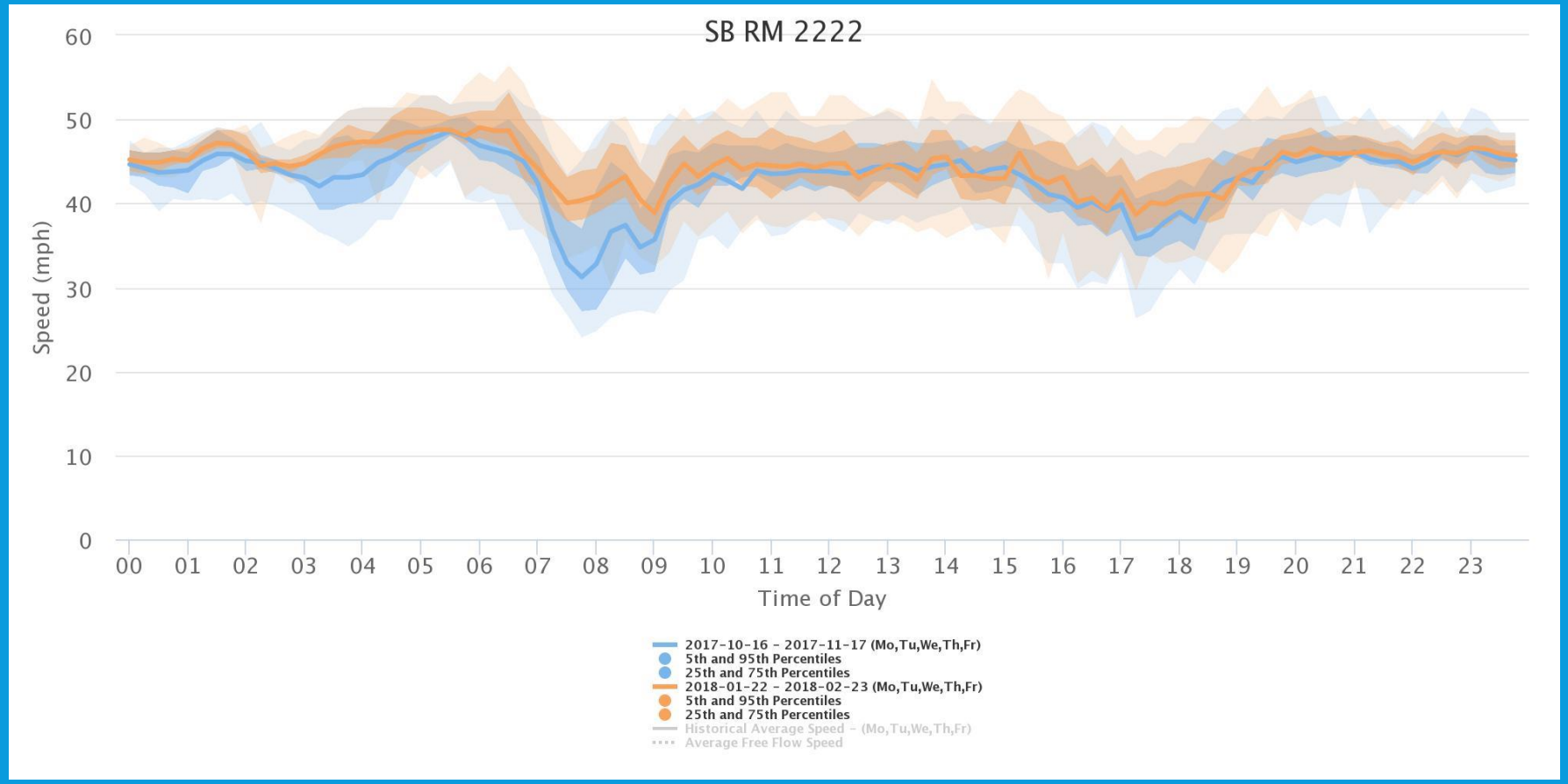
Data

- Speed
- Travel Time
- Reference Speed
- Historic Average Speed
- Comparative Speed
- Congestion
- Historic Average Congestion

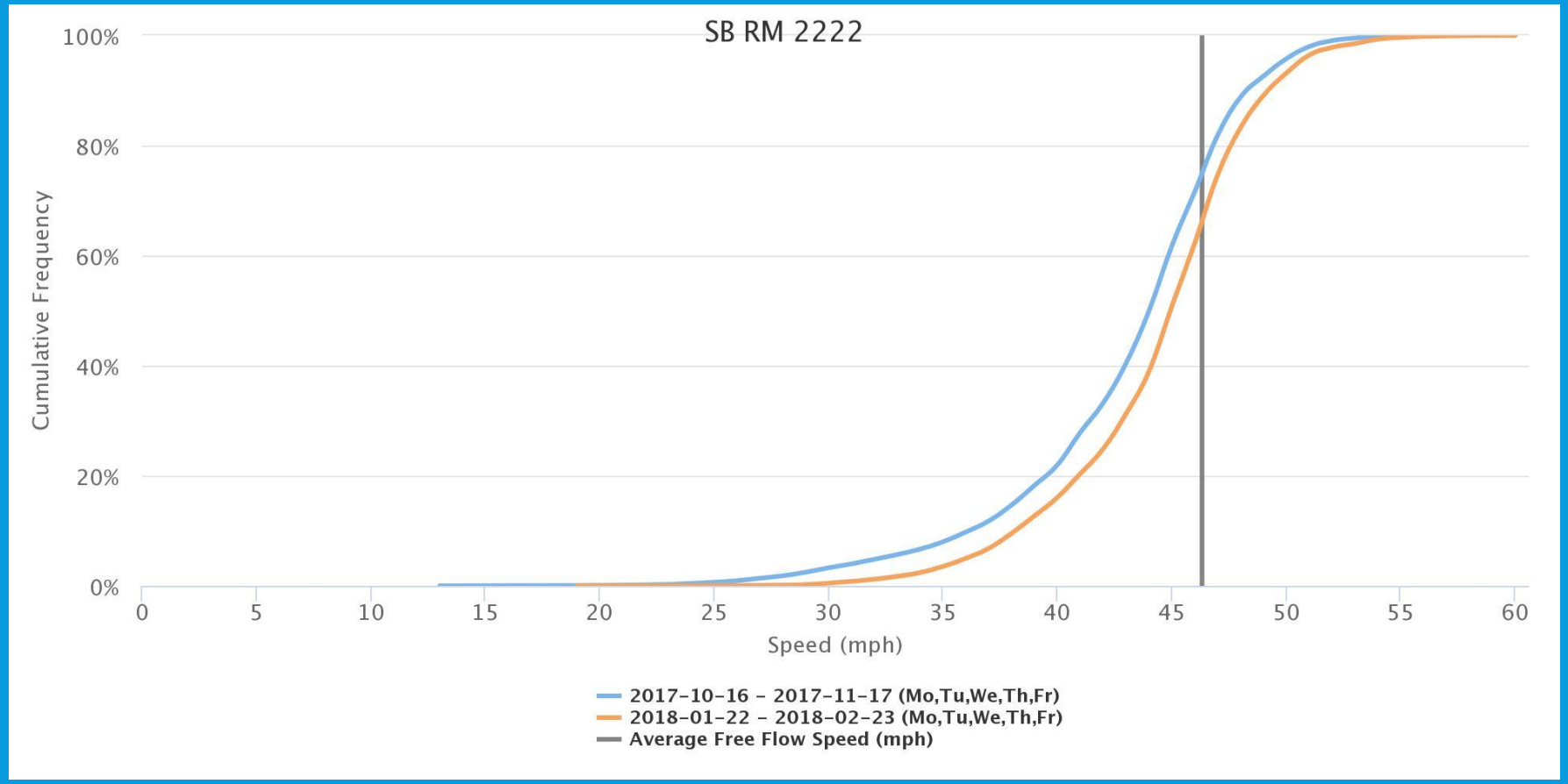
Metrics

- Speed
- Travel Time
- Travel Time index
- Buffer Time
- Buffer Index
- Planning Time
- Planning Time Index
- User Delay Cost

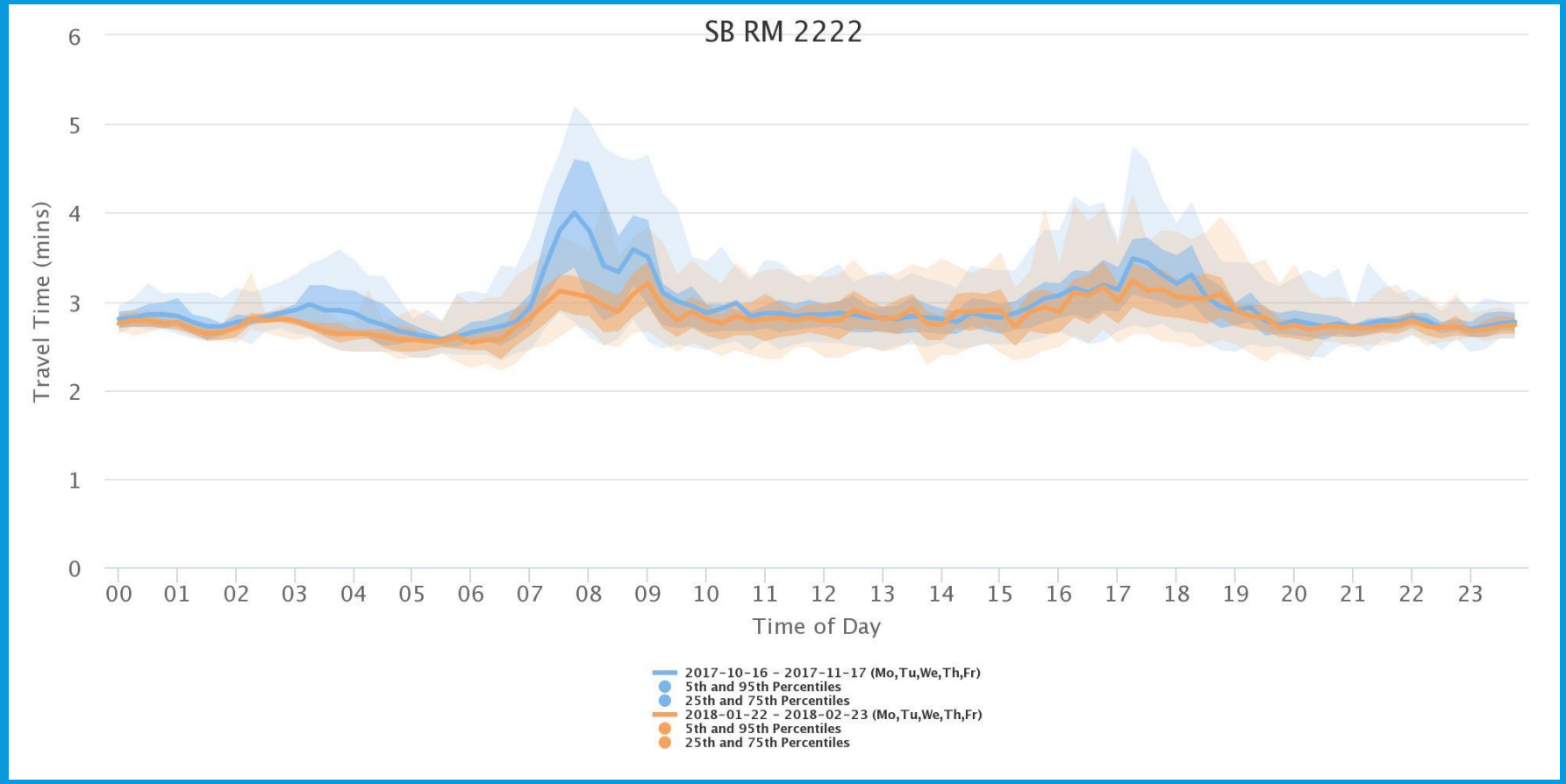
SPEED


SB RM 2222
60
50
40
30
20
10
0
Speed (mph)
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Time of Day
2017-10-16 - 2017-11-17 (Mo,Tu,We,Th,Fr)
5th and 95th Percentiles
25th and 75th Percentiles
2018-01-22 - 2018-02-23 (Mo,Tu,We,Th,Fr)
5th and 95th Percentiles
25th and 75th Percentiles
Historical Average Speed - (Mo,Tu,We,Th,Fr)
Average Free Flow Speed

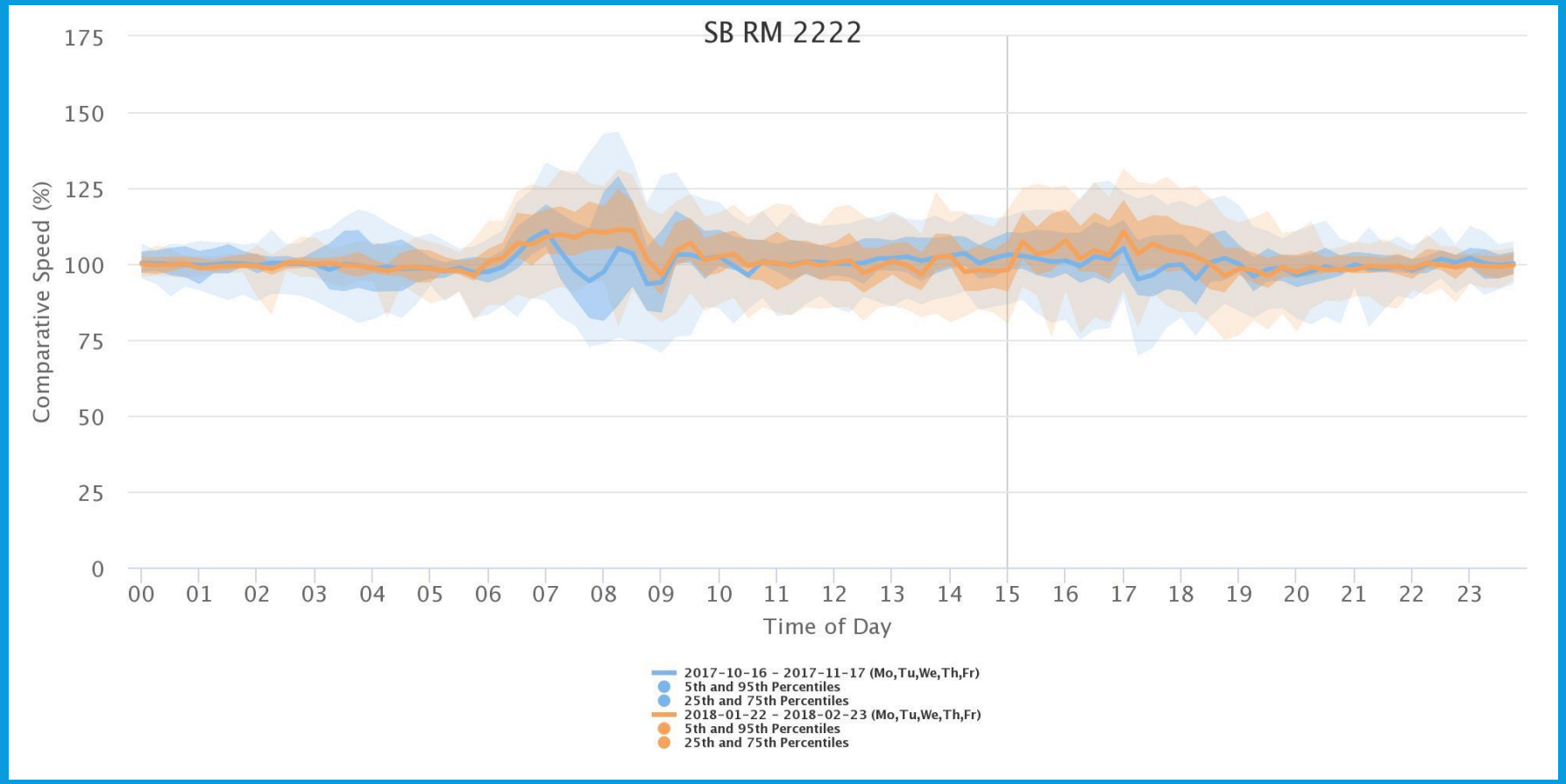
SPEED


SB RM 2222
100%
80%
60%
40%
20%
0%
Cumulative Frequency
0
5
10
15
20
25
30
35
40
45
50
55
60
Speed (mph)
2017-10-16 - 2017-11-17 (Mo,Tu,We,Th,Fr)
2018-01-22 - 2018-02-23 (Mo,Tu,We,Th,Fr)
Average Free Flow Speed (mph)

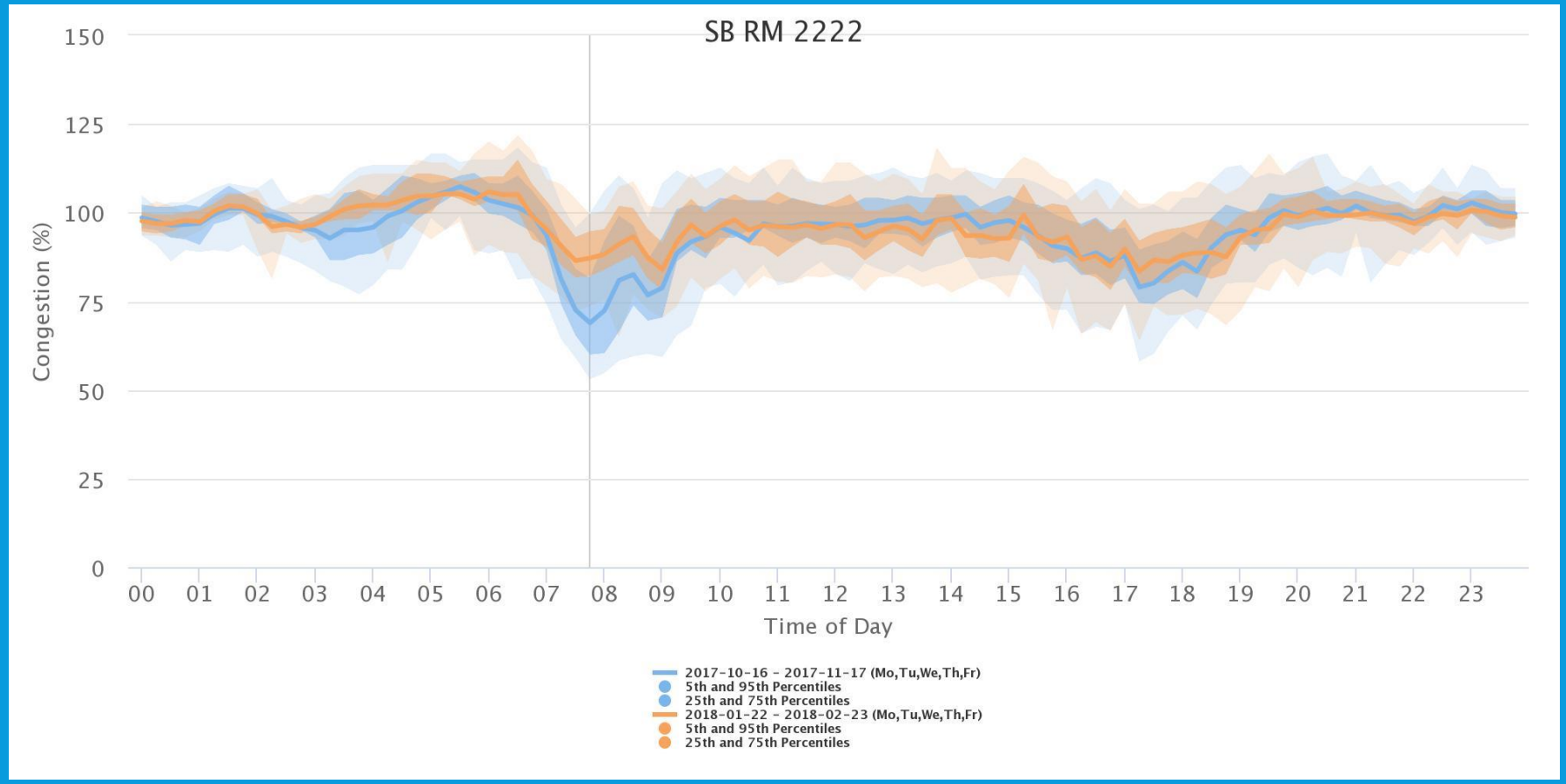
TRAVEL TIME


SB RM 2222
Travel Time (mins)
0
1
2
3
4
5
6
00
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Time of Day
2017-10-16 - 2017-11-17 (Mo,Tu,We,Th,Fr)
5th and 95th Percentiles
25th and 75th Percentiles
2018-01-22 - 2018-02-23 (Mo,Tu,We,Th,Fr)
5th and 95th Percentiles
25th and 75th Percentiles

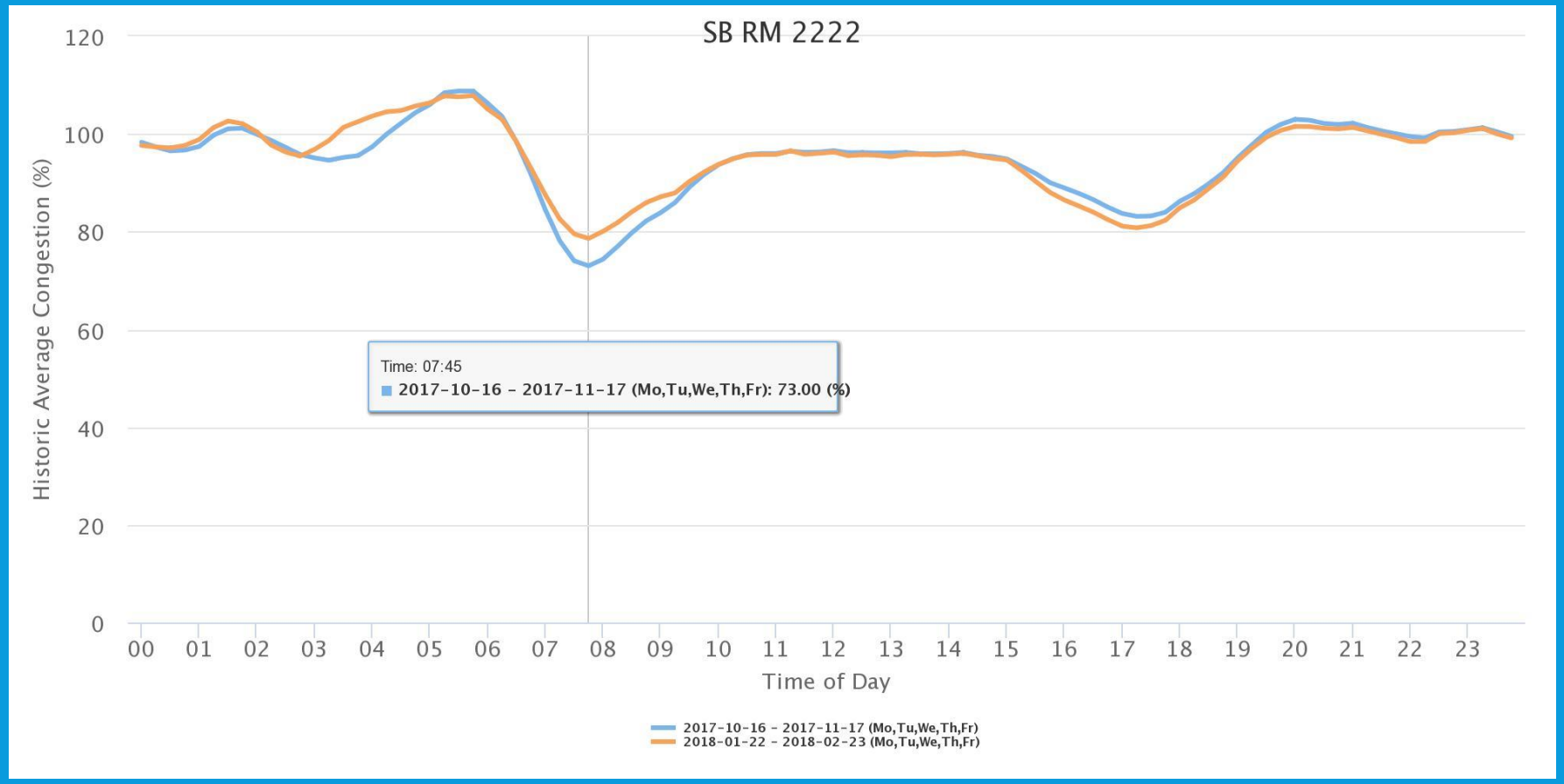
COMPARATIVE SPEED



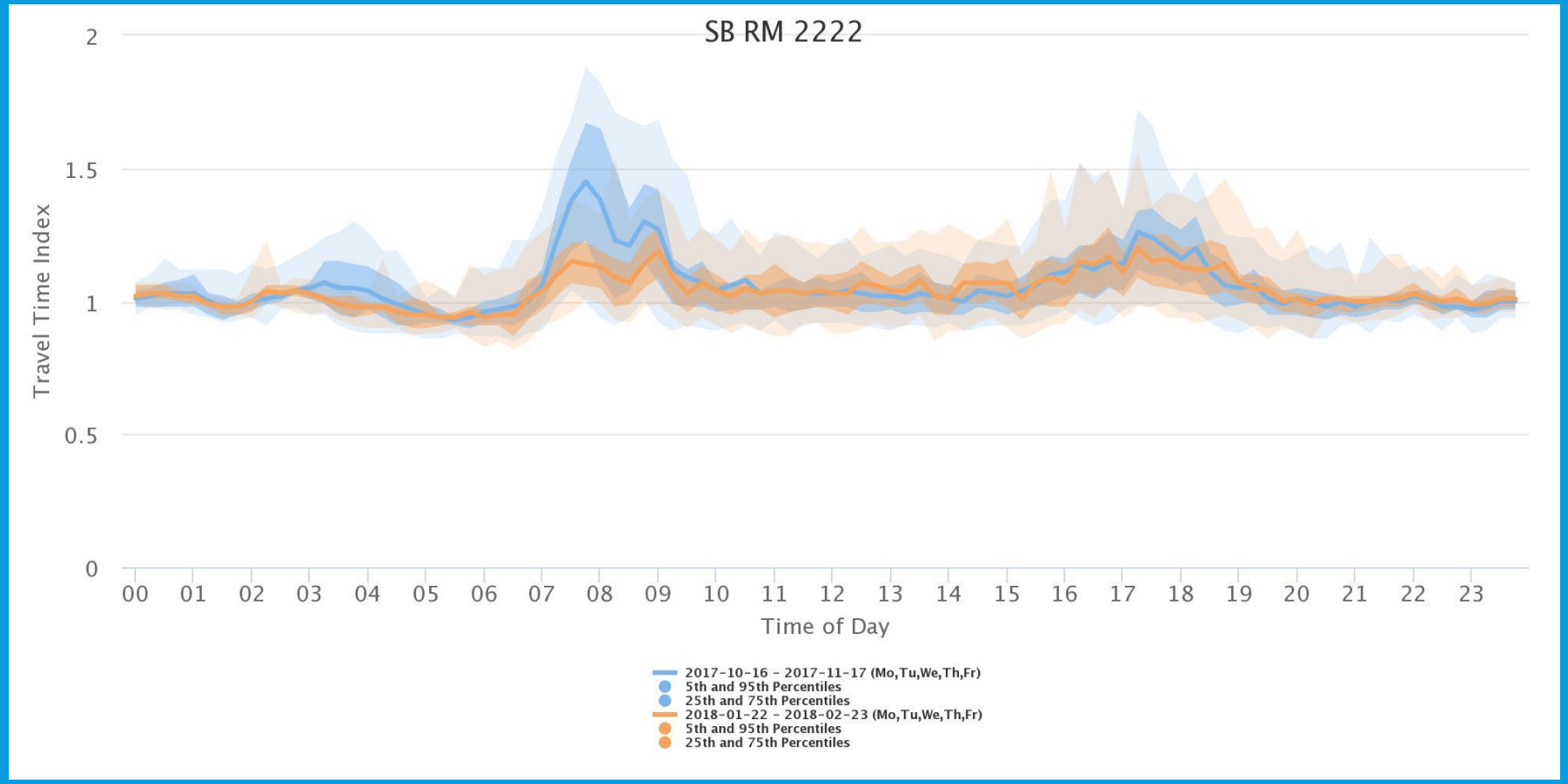
CONGESTION


SB RM 2222
150
125
100
75
50
25
0
Congestion (%)
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Time of Day
2017-10-16 - 2017-11-17 (Mo,Tu,We,Th,Fr)
5th and 95th Percentiles
25th and 75th Percentiles
2018-01-22 - 2018-02-23 (Mo,Tu,We,Th,Fr)
5th and 95th Percentiles
25th and 75th Percentiles

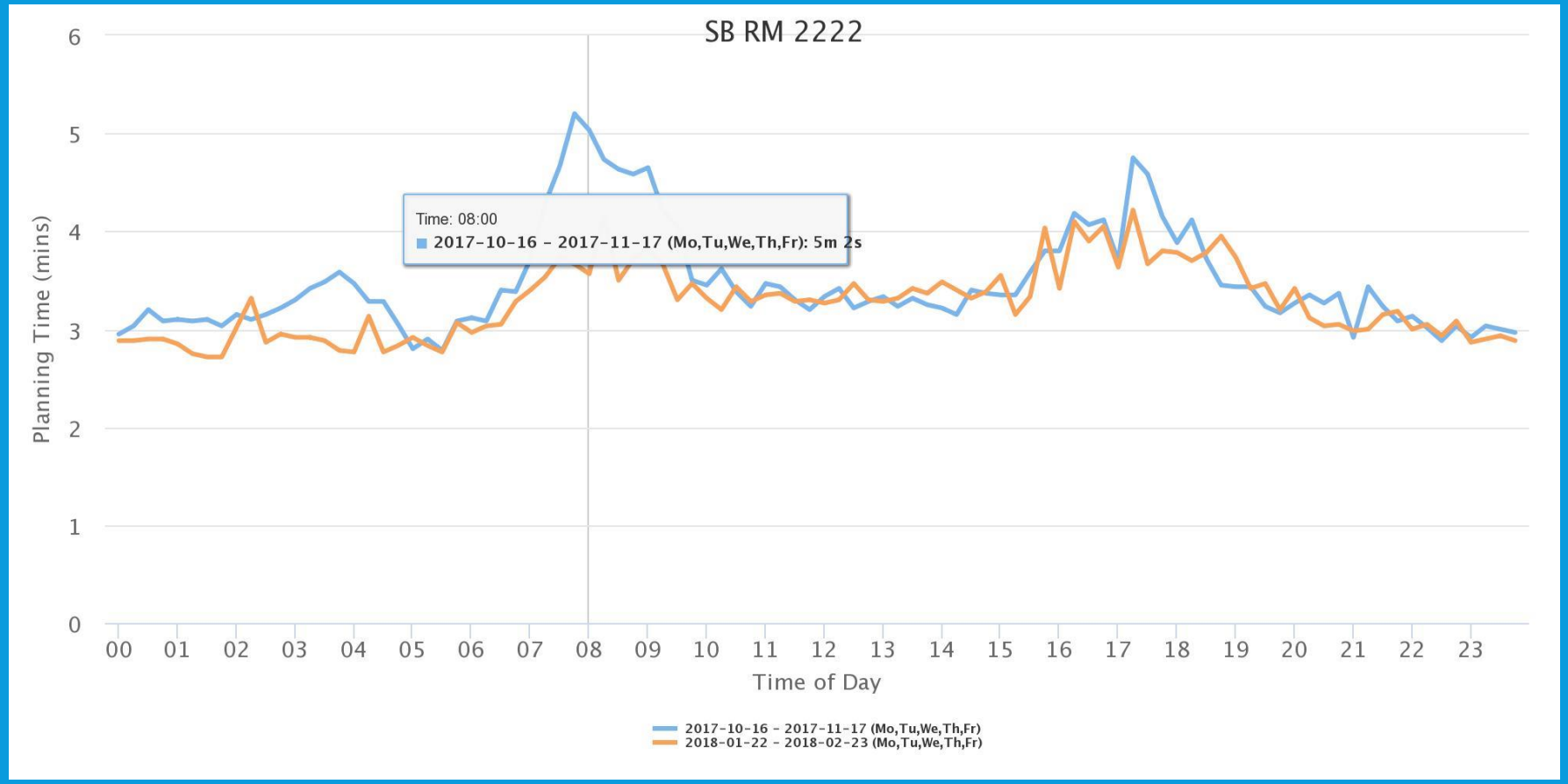
HISTORIC AVERAGE CONGESTION



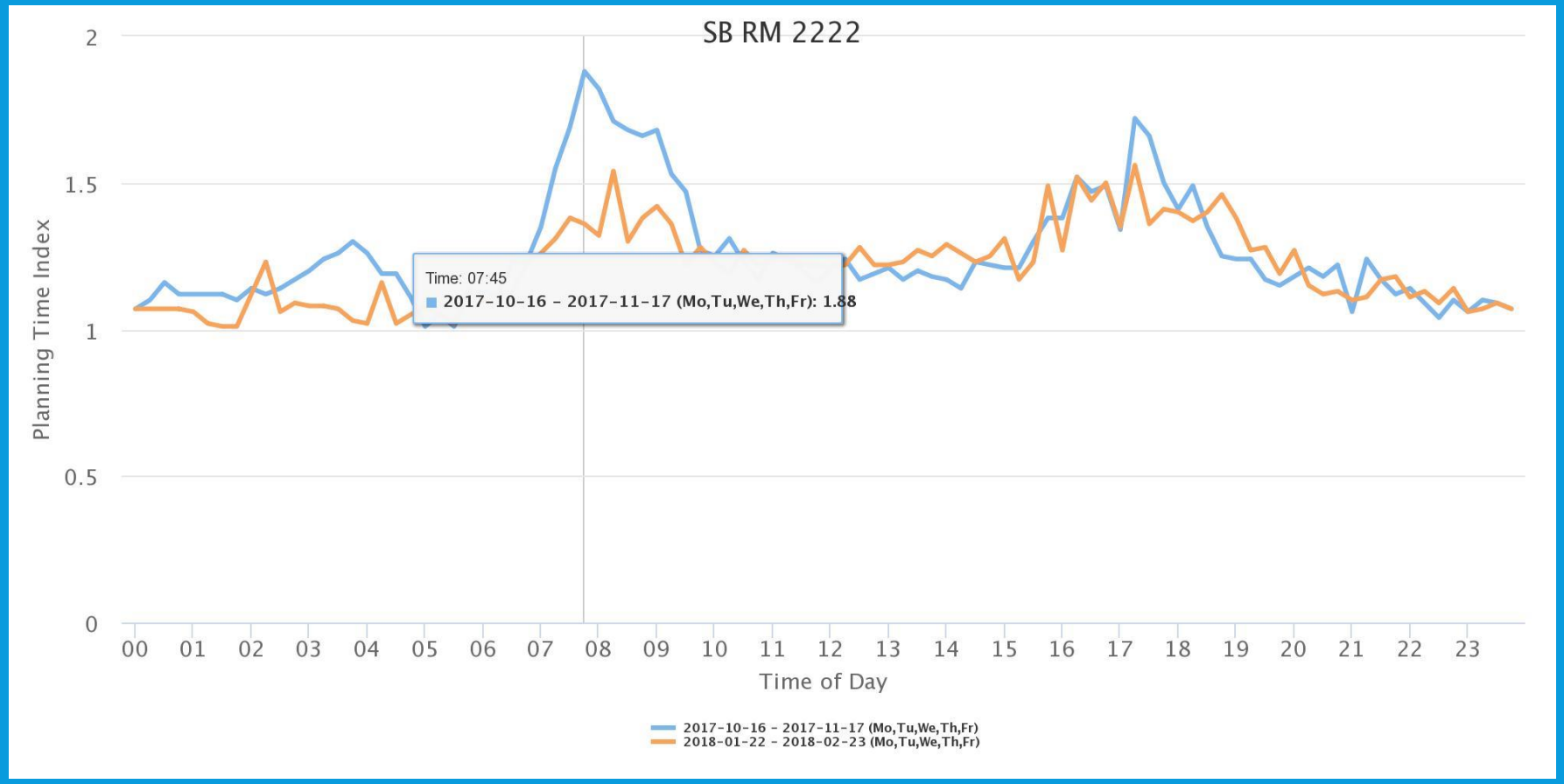
TRAVEL TIME INDEX



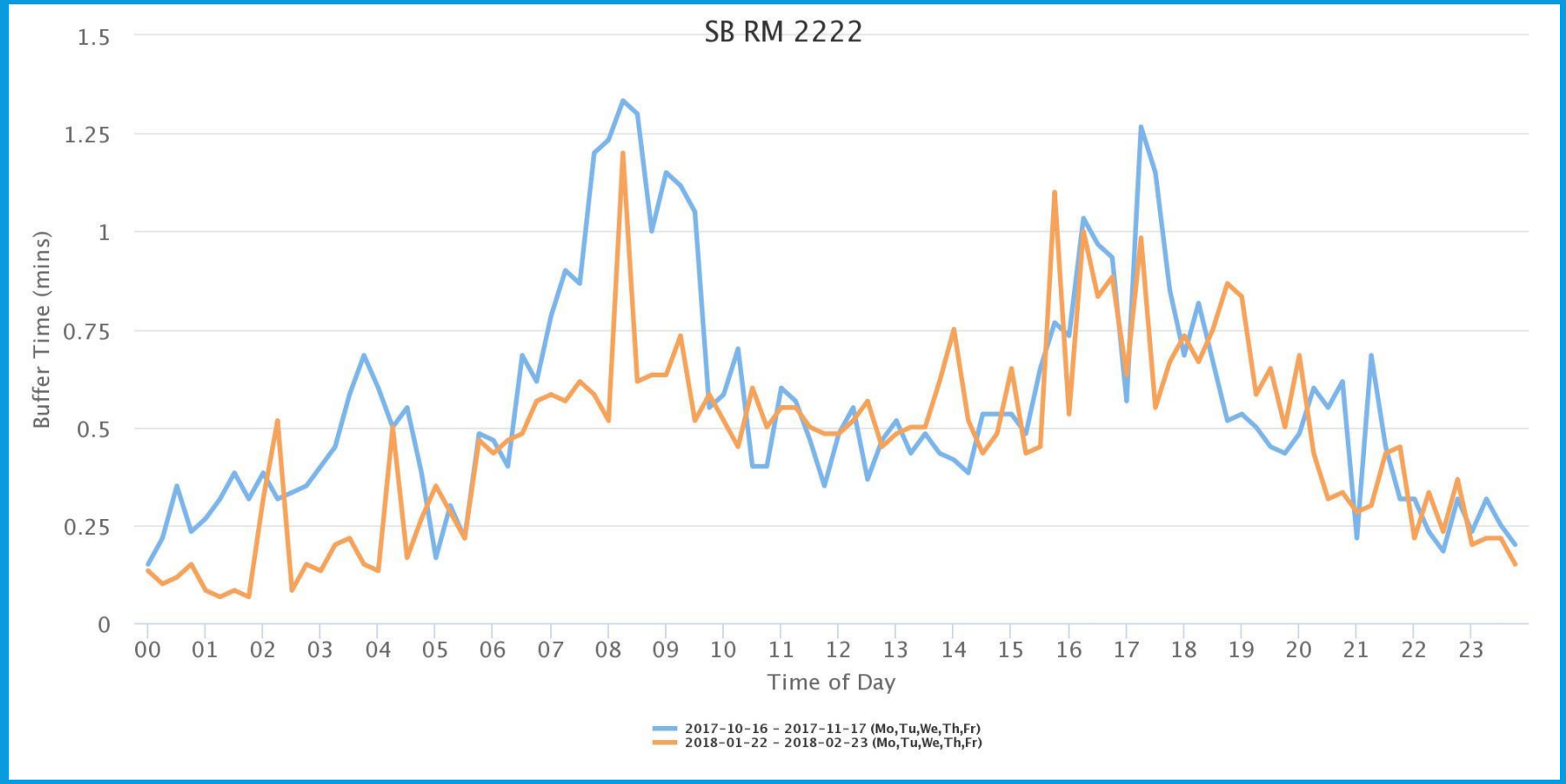
PLANNING TIME



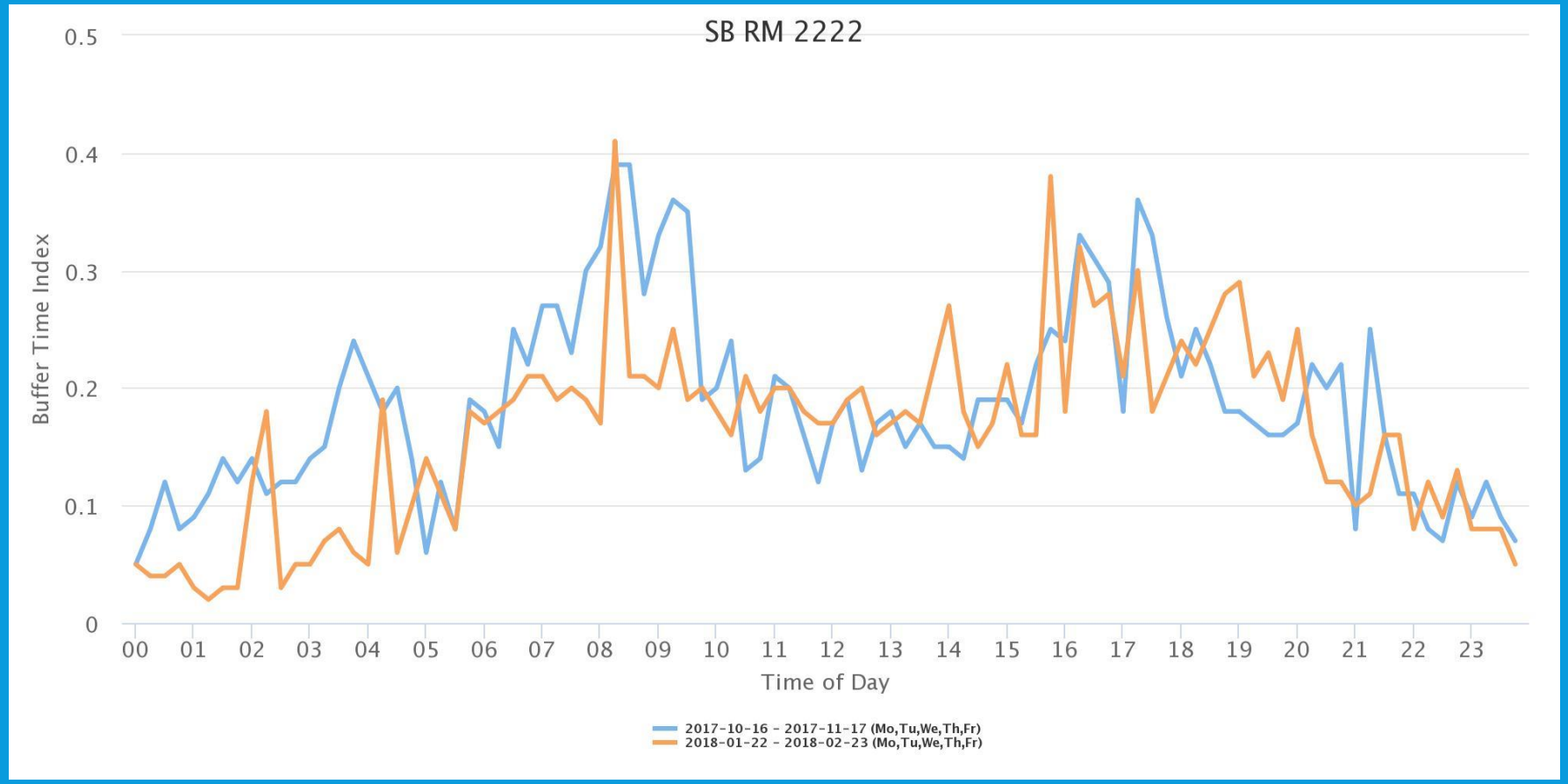
PLANNING TIME INDEX



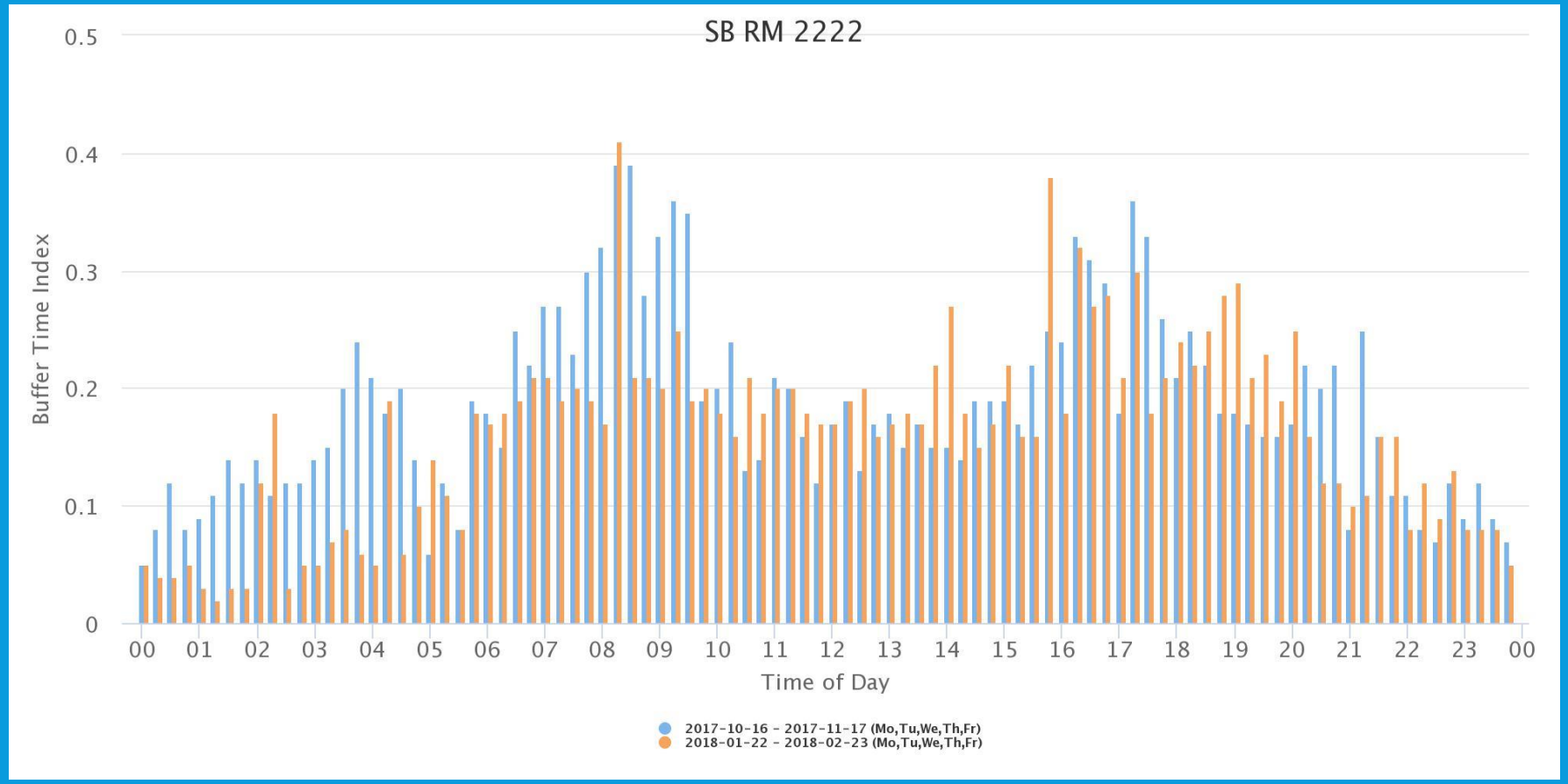
BUFFER TIME


SB RM 2222
Buffer Time (mins)
1.5
1.25
1
0.75
0.5
0.25
0
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Time of Day
2017-10-16 - 2017-11-17 (Mo,Tu,We,Th,Fr)
2018-01-22 - 2018-02-23 (Mo,Tu,We,Th,Fr)

BUFFER TIME INDEX



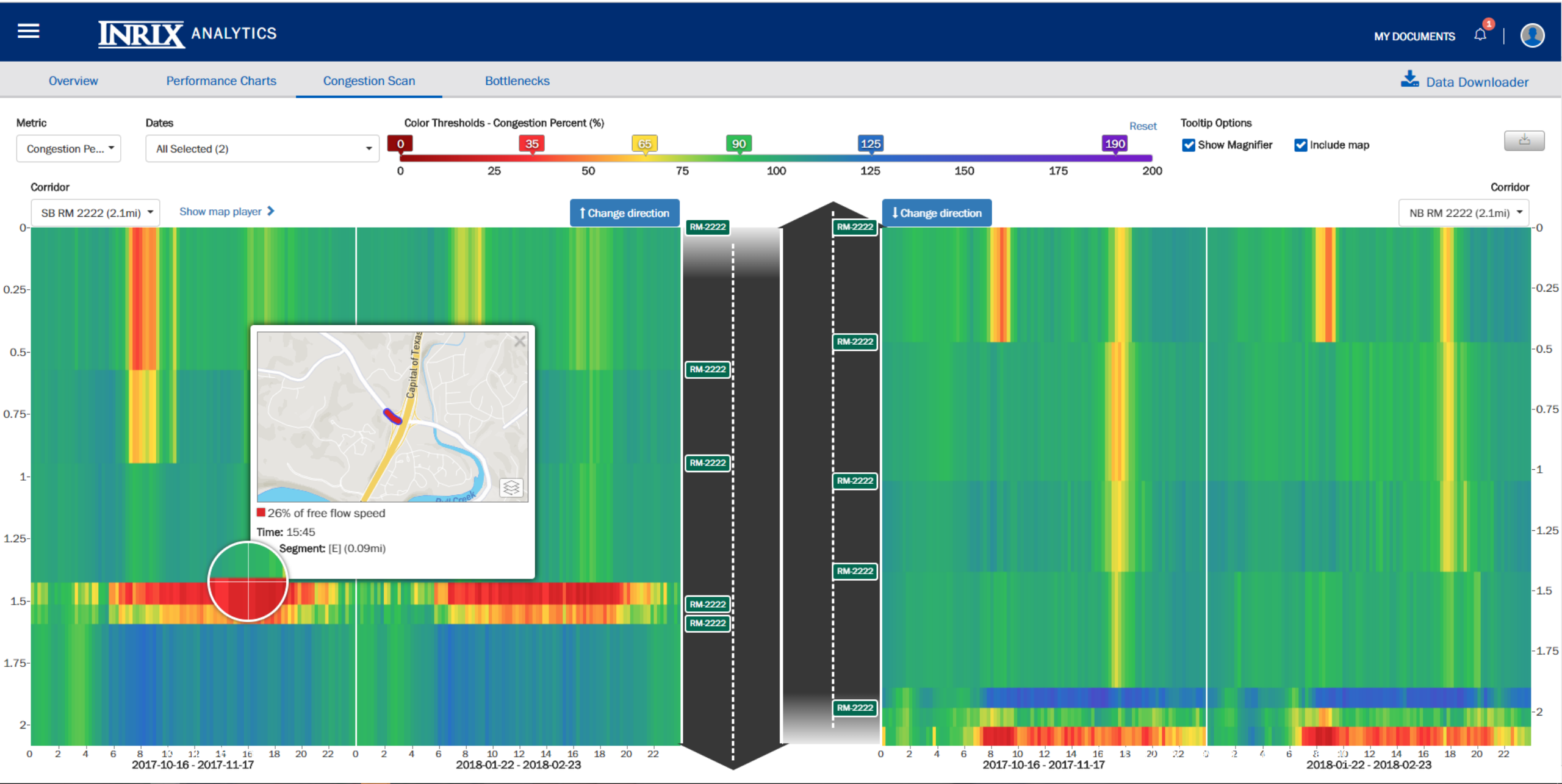
BUFFER TIME INDEX



AVAILABLE TOOLS

- Congestion Scan
- Bottleneck Ranking
- User Delay Cost Analysis

CONGESTION SCAN



BOTTLENECKS

Bottleneck Location for "RM 2222 B/A v3": 2017-10-16 - 2017-11-17

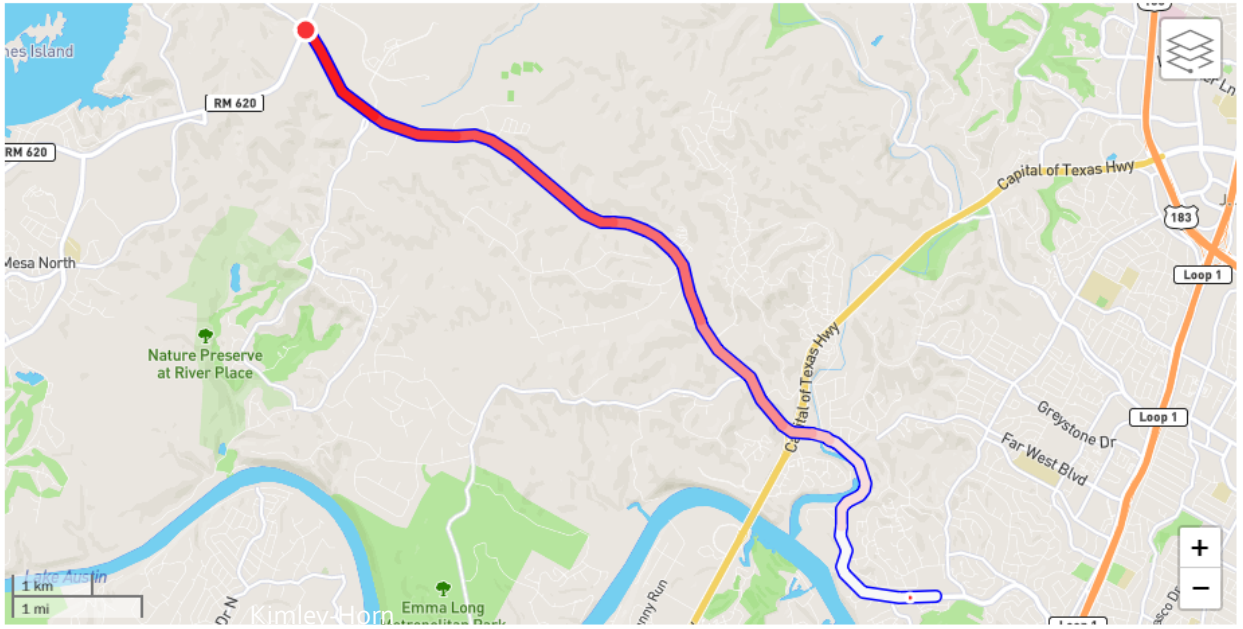
Summary Table

Corridor	Road Name	Intersection	Direction	Impact Factor	Occurrences	Avg Max Duration (min)	Average Max Length (miles)
NB RM 2222	RM-2222 / Ranch Road 2222 / RM 2222 / W Koenig Ln	RM-620 / RM-2222 / Bullick Hollow Rd	W	10699	22	76	3.98
NB RM 2222	RM-2222 / Ranch Road 2222 / RM 2222 / W Koenig Ln	RM-2222 / River Place Blvd	W	1287	7	38	3.01
SB RM 2222	RM-2222 / Ranch Road 2222 / RM 2222 / W Koenig Ln	RM-2222 / City Park Rd	E	1130	7	47	2.14
NB RM 2222	RM-2222 / Ranch Road 2222 / RM 2222 / W Koenig Ln	RM-2222	W	1123	3	77	3.02
SB RM 2222	RM-2222 / Ranch Road 2222 / RM 2222 / W Koenig Ln	RM-2222 / Mount Bonnell Rd	E	117	1	53	1.37

1 to 5 of 11 Entries

Show items 5 ▾ « 1 2 3 »

RM-2222 / Ranch Road 2222 / RM 2222 / W Koenig Ln



Occurrences

Show 24 hour view

Max Length (miles)	Date	Max Duration (min) 00:00 – 23:59
7.22	-10-31	3h 1m (16:13 – 19:14)
5.38	-11-08	48m (17:04 – 17:52)
4.86	-11-08	51m (18:00 – 18:51)
4.86	-11-14	58m (17:27 – 18:25)
4.5	-11-06	1h 51m (16:46 – 18:37)
4.28	-11-07	2h 9m (16:34 – 18:43)
4.19	-11-13	1h 34m (16:30 – 18:04)
4.19	-11-15	1h 58m (16:28 – 18:26)
4.07	-10-18	1h 50m (16:33 – 18:23)
3.88	-11-09	54m (18:01 – 18:55)
3.86	-10-16	11m (17:26 – 17:37)

USER DELAY COST

Monday, October 16, 2017 1:00 AM
Delay cost:
Total: $4.16
Per VMT: $0.01
Hours of delay:
Person-hours: 10m 6s
Vehicle-hours: 8m 15s
Vehicle miles traveled (VMT):
Total: 508 miles
Passenger: 458 miles
Commercial: 51 miles
Delay per VMT: 0.0162 mins / mile
Data validity: 100%
Click the table cell to see links to congestion scans

	12 AM	1 AM	2 AM	3 AM	4 AM	5 AM	6 AM	7 AM	8 AM	9 AM	10 AM	11 AM	12 PM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	Daily Totals
10/16/17	$0K	$0K					$0.2K	$0.4K	$0.4K	$0.3K	$0.3K	$0.2K	$0.2K	$0.4K	$0.5K	$0.4K	$3.5K	$6.3K	$1.4K	$0.3K	$0.1K	$0.1K	$0K	$0K	$15.1K
10/17/17	$0K	$0K					$0.2K	$0.8K	$0.5K	$1.3K	$0.1K	$0.5K	$0.3K	$0.2K	$0.7K	$0.5K	$4.7K	$6K	$2.1K	$0.4K	$0.2K	$0.1K	$0K	$0K	$18.8K
10/18/17	$0K	$0K					$0.8K	$0.3K	$1K	$0.4K	$0.1K	$0.1K	$0.2K	$0.2K	$0.9K	$0.9K	$5K	$7.6K	$1.9K	$0.2K	$0K	$0K	$0K	$0.1K	$20K
10/19/17	$0K	$0K					$0.1K	$0.5K	$0.5K	$0.6K	$0.1K	$0.1K	$0.3K	$0.3K	$0.4K	$0.9K	$4.9K	$5.3K	$1.9K	$0.4K	$0.1K	$0.1K	$0K	$0K	$16.6K
10/20/17	$0K	$0K					$0.1K	$0.4K	$1K	$0.5K	$0.4K	$0.4K	$0.3K	$0.1K	$1K	$0.9K	$4.6K	$2.9K	$0.4K	$0.2K	$0.2K	$0K	$0K	$0K	$13.7K
10/21/17	$0K	$0K					$0K	$0.1K	$0.2K	$0K	$0.1K	$0.2K	$0.2K	$0.9K	$0.2K	$0.4K	$0.4K	$0.3K	$0.2K	$0.3K	$0K	$0K	$0K	$0.1K	$3.8K
10/22/17	$0K	$0K					$0K	$0.1K	$0.1K	$0.4K	$0.3K	$0.1K	$0.3K	$0.2K	$0.4K	$0.1K	$0.2K	$0K	$0.1K	$0K	$0K	$0K	$0K	$0K	$2.3K
10/23/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.8K	$1.1K	$0.6K	$0.1K	$0.1K	$0.5K	$0.1K	$0.2K	$0.4K	$2.8K	$5.4K	$1.2K	$0.1K	$0.1K	$0K	$0K	$0K	$13.6K
10/24/17	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.5K	$0.4K	$0.9K	$1K	$0.2K	$0.5K	$0.3K	$0.2K	$0.6K	$0.3K	$4.4K	$5K	$1.3K	$0.4K	$0.1K	$0K	$0K	$0K	$16.3K
10/25/17	$0K	$0K	$0K	$0K	$0K	$0.2K	$0.2K	$0.3K	$0.8K	$0.2K	$0K	$0.1K	$0.1K	$0.2K	$0.7K	$0.8K	$5.1K	$5.6K	$2.1K	$0.3K	$0.1K	$0.2K	$0.1K	$0K	$17.3K
10/26/17	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.1K	$0.7K	$1.1K	$0.8K	$0.3K	$0.2K	$0.7K	$0.3K	$0.7K	$0.6K	$6.1K	$4.9K	$1.9K	$0.5K	$0.3K	$0.1K	$0K	$0K	$19.5K
10/27/17	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.2K	$0.7K	$1.2K	$0.6K	$0K	$0.1K	$0.3K	$0.6K	$1.2K	$1.4K	$5.9K	$5.2K	$0.8K	$0.1K	$0K	$0.1K	$0K	$0K	$18.5K
10/28/17	$0K	$0K	$0K	$0K	$0K	$0.1K	$0K	$0K	$0K	$0.1K	$0.1K	$0.3K	$0.2K	$0.2K	$0.3K	$0.3K	$0.3K	$1.4K	$0.4K	$0.2K	$0.1K	$0K	$0.1K	$0K	$4.2K
10/29/17	$0K	$0K	$0.1K	$0K	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.2K	$0.1K	$0.2K	$0.1K	$0.1K	$0.2K	$0.3K	$0.2K	$0.4K	$0K	$0K	$0.1K	$0K	$0.1K	$2.4K
10/30/17	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.2K	$0.6K	$0.2K	$0.1K	$0.3K	$0K	$0.2K	$0.7K	$0.5K	$0.4K	$3.1K	$5.2K	$2.4K	$0.7K	$0.1K	$0K	$0K	$0K	$14.8K
10/31/17	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.1K	$0.6K	$0.8K	$0.5K	$0.4K	$0.6K	$0.4K	$0.6K	$1K	$0.7K	$14K	$24.3K	$9.1K	$2.5K	$0.4K	$0.1K	$0K	$0K	$56.2K
11/01/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.6K	$1.3K	$0.9K	$0.2K	$0.3K	$0.7K	$0.7K	$0.6K	$1K	$4.2K	$5.1K	$2.3K	$0.4K	$0.1K	$0.1K	$0K	$0K	$18.6K
11/02/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.3K	$1.3K	$0.7K	$0.3K	$0.6K	$0.4K	$0.3K	$0.4K	$0.5K	$3.1K	$2.9K	$0.9K	$0.4K	$0.2K	$0.1K	$0K	$0K	$12.6K
11/03/17	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.4K	$0.8K	$1.4K	$0.7K	$0.1K	$0.2K	$0.6K	$1K	$1.1K	$1.7K	$4.5K	$2.7K	$0.7K	$0.3K	$0.1K	$0.1K	$0K	$0K	$16.6K
11/04/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.1K	$0.1K	$0.1K	$0.2K	$0.2K	$0.2K	$0.3K	$0.1K	$0.4K	$0.2K	$0.5K	$0.3K	$0.2K	$0K	$0.1K	$0K	$0K	$3.1K
11/05/17	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.1K	$0.3K	$0.2K	$0.3K	$1K	$0.4K	$0.2K	$0.4K	$0.1K	$0K	$0.1K	$0K	$0K	$0.1K	$0K	$0K	$3.4K
11/06/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.8K	$1K	$0.8K	$0.3K	$0.3K	$0.2K	$0.5K	$0.6K	$0.5K	$2.8K	$6.8K	$3.2K	$0.3K	$0.1K	$0K	$0K	$0K	$18.5K
11/07/17	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.2K	$0.5K	$1.3K	$0.8K	$0.1K	$0.5K	$0.3K	$0.5K	$1K	$0.9K	$4.3K	$8K	$3.6K	$0.6K	$0.1K	$0.1K	$0K	$0K	$22.7K
11/08/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.2K	$0.9K	$1.2K	$0.7K	$0.4K	$0.5K	$0.6K	$0.5K	$0.6K	$0.7K	$6.3K	$11.6K	$5K	$0.6K	$0.1K	$0.3K	$0K	$0K	$30.2K
11/09/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.3K	$0.9K	$1.2K	$0.7K	$0.2K	$0.2K	$0.2K	$0.5K	$0.3K	$0.7K	$4.6K	$7.3K	$4.9K	$0.3K	$0.1K	$0.1K	$0K	$0K	$22.7K
11/10/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.3K	$0.6K	$0.8K	$0.7K	$0.2K	$0.3K	$0.5K	$0.5K	$1.7K	$1K	$4.4K	$3.9K	$0.9K	$0.3K	$0.1K	$0.1K	$0.3K	$0.1K	$16.9K
11/11/17	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.1K	$0.2K	$0.2K	$0.4K	$0.6K	$0.9K	$0.4K	$0.5K	$0.4K	$0.4K	$0.2K	$0.3K	$0.3K	$0.2K	$0.1K	$0K	$5.3K
11/12/17	$0.1K	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.8K	$0.6K	$0.8K	$0.1K	$0K	$0.5K	$0.5K	$0.1K	$0.1K	$0K	$0.1K	$0K	$0K	$3.9K
11/13/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.2K	$0.5K	$0.7K	$0.6K	$0.5K	$0.1K	$0.4K	$0.2K	$0.6K	$0.5K	$4.2K	$7.9K	$1.8K	$0.7K	$0.1K	$0K	$0K	$0K	$19.3K
11/14/17	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.1K	$0.5K	$1K	$0.7K	$0.2K	$0.4K	$0.3K	$0.3K	$0.9K	$0.4K	$5.3K	$8.2K	$2.6K	$0.2K	$0.2K	$0.1K	$0K	$0K	$21.5K
11/15/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.2K	$0.5K	$1.1K	$0.8K	$0.1K	$0.1K	$0.3K	$0.4K	$0.5K	$0.4K	$5K	$7.1K	$2.4K	$0.5K	$0.3K	$0K	$0K	$0K	$19.9K
11/16/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.1K	$0.6K	$0.8K	$0.6K	$0.2K	$0.3K	$0.4K	$0.4K	$1K	$0.4K	$4.1K	$5.8K	$2.2K	$0.2K	$0.1K	$0.1K	$0K	$0.1K	$17.4K
11/17/17	$0K	$0K	$0K	$0K	$0K	$0K	$0.4K	$0.4K	$0.9K	$0.9K	$0.1K	$0.2K	$0.1K	$1K	$1K	$1.8K	$3.6K	$2.1K	$0.9K	$0.2K	$0K	$0.1K	$0.1K	$0K	$13.9K
Hourly Totals	$0.3K	$0.1K	$0.2K	$0.1K	$0.1K	$2.1K	$5.7K	$14.9K	$24.4K	$17.8K	$6.6K	$9.4K	$12.1K	$14.5K	$20.4K	$21.2K	$123K	$166.5K	$59.7K	$12.1K	$4.1K	$2.5K	$1.1K	$0.7K	Grand Total $519,505.71

I-95 Corridor Coalition

INRIX Real-Time and Historic Traffic Flow

LIVE NOW

For Roadway Performance Planning: INRIX was chosen as the most accurate, affordable, and comprehensive real-time traffic provider by the I-95 Corridor Coalition.

HIGHLIGHTS:

- Covered 40,000 centerline miles of roadway (8,000 freeway) across 11 states.
- Exceeded all 42 validation checks throughout 11 states and a full range of scenarios.
- INRIX continuously improved data quality across the 6 year span of the VPP.

I-95 ARTERIAL VALIDATION REPORTS

✔ RECOMMENDED	SHOULD BE TESTED	✖ NOT RECOMMENDED
• <= 1 signal per mile	• 1 to 2 signals per mile	• >= 2 signals per mile
• AADT > 40,000 vpd (2-way)	• AADT 20K to 40K vpd (2-way)	• AADT < 20K (2-way) - low volume
• Limited curb cuts	• Moderate number of curb cuts	• Substantial number of curb cuts
Principal Arterials	Minor Arterials	Major Collectors
Likely to be accurate…	Possibly accurate, test …	Unlikely to be accurate…

BENEFITS

- As accurate as Bluetooth
- No infrastructure investment
- Historical data available
- Large data set
- 24-hr continuous data set
- No local storage
- Advanced metrics
- No additional labor for collection

CHALLENGES

- No stop information
- Lack of context
  - Weather
  - Special events
  - Incidents
  - Temporary lane closures
- Combination of links

APPLICATIONS

- Comparing signal timing efforts with before/after studies
- Monitoring the system in real time
- Evaluating impacts of TMC operations
- Identifying trends
- Analyzing queues
- Quantifying benefits and costs
- Deep statistical analysis (e.g. reliability)
- Supplementing or replacing travel time runs
- Speed studies
- Other metrics that can be used to communicate effectively with the public or decision-makers

APPLICATIONS IN AUSTIN

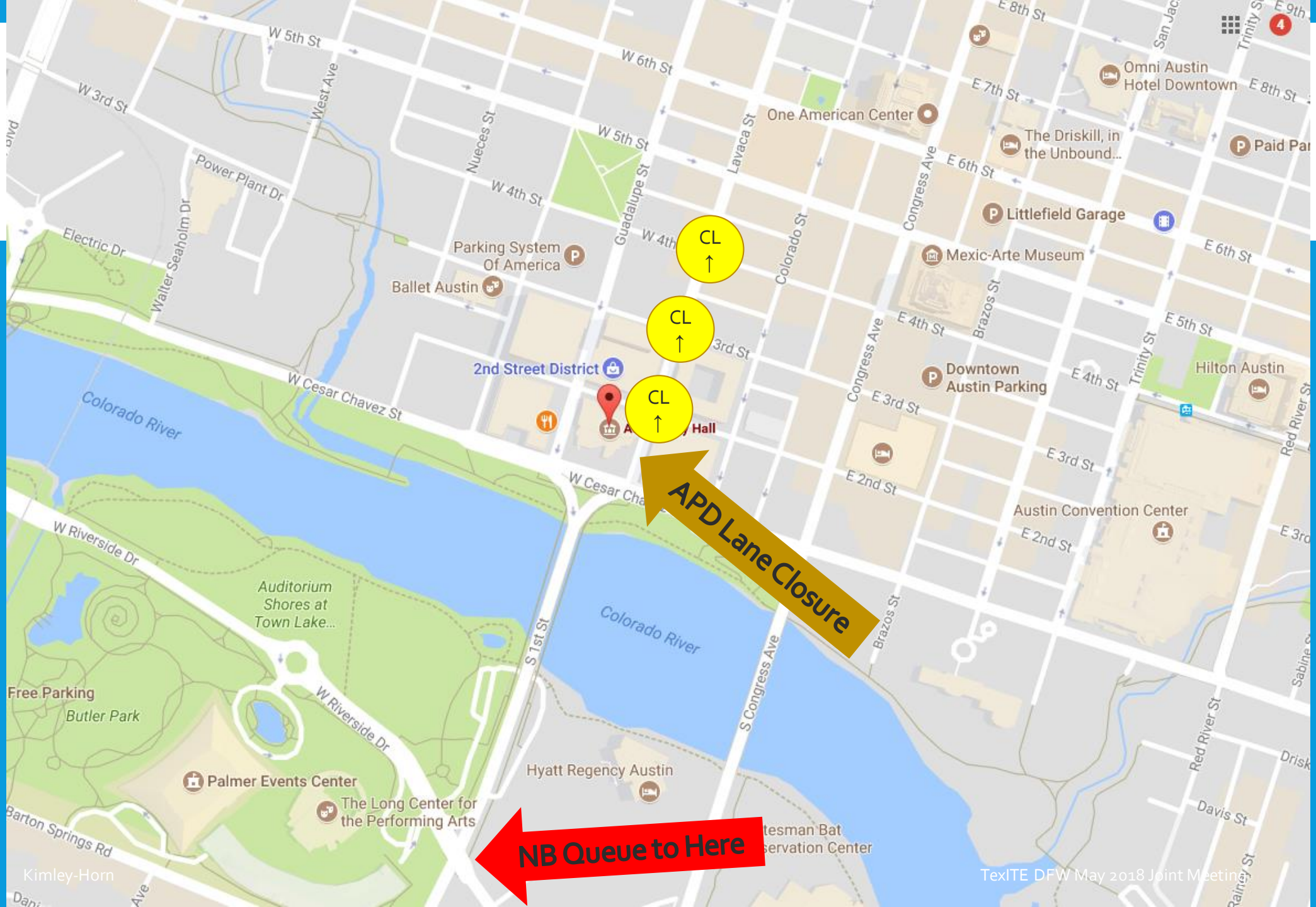
Quantifying the Benefits of the TMC

BACKGROUND

- PM Rush Hour on Wednesday, June 28th , 2017
- Austin TMC observed heavy congestion on 1st Street bridge heading NB direction via CCTV, which was unusual
- APD had shut down 1 lane on Lavaca immediately in front of the City Hall garage to allow 2 lanes of garage traffic exit on to Lavaca
- Caused back-up on the bridge extending to Riverside

BACKGROUND

- At 5:45 PM, TMC implemented higher cycle length to get the NB traffic moving
  - 2nd Street & Lavaca
  - 3rd Street & Lavaca
  - 4th Street & Lavaca
- Increased cycle length (CL) from 90-sec to 120-sec
- Changing cycle lengths on a tightly spaced grid creates issues upstream & downstream

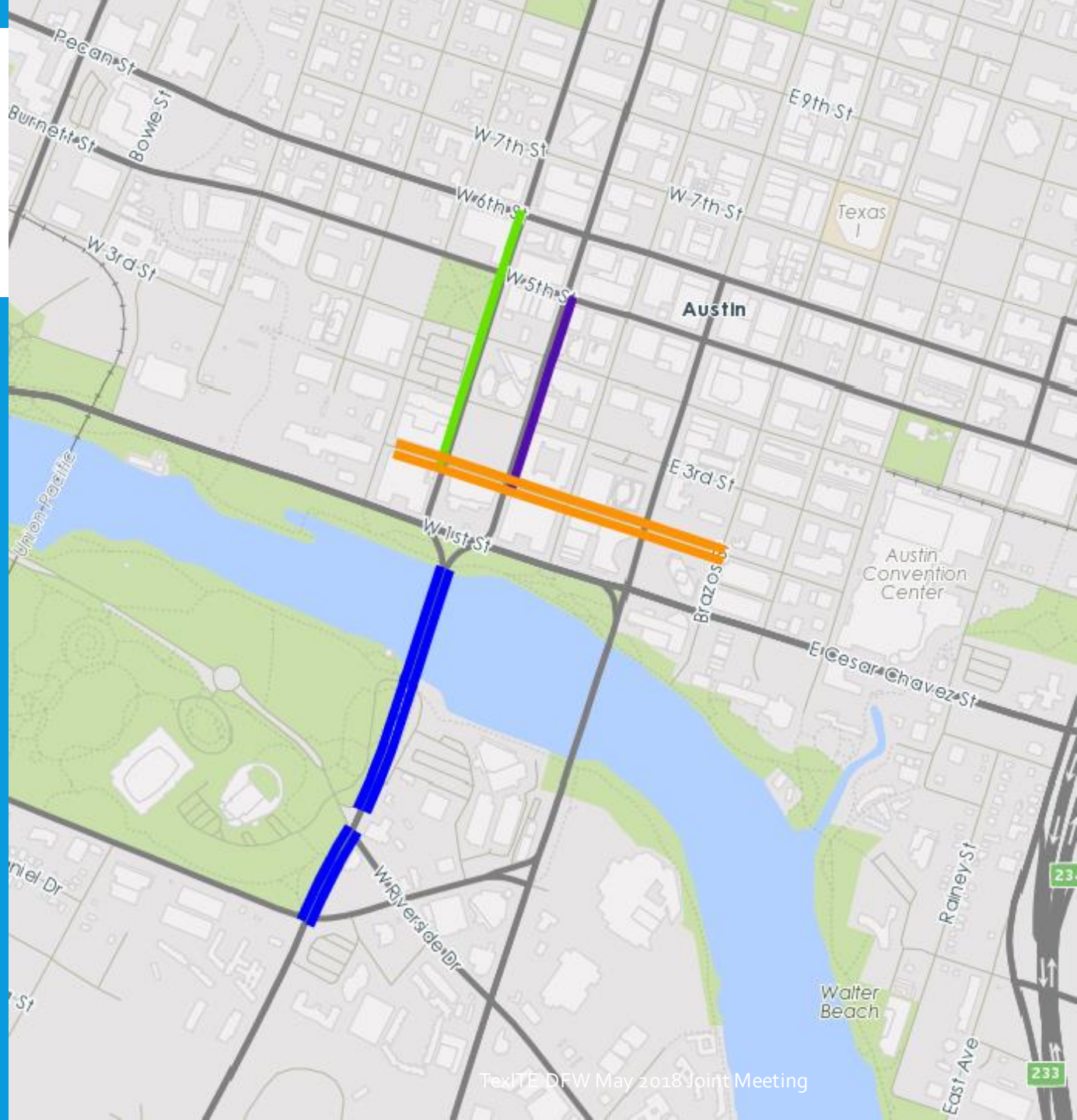

CL
CL
CL
APD Lane Closure
NB Queue to Here
W 5th St
W 6th St
W 3rd St
West Ave
Nueces St
Lavaca St
Guadalupe St
Colorado St
Congress Ave
Brazos St
Trinity St
Red River St
E 8th St
E 7th St
E 6th St
E 5th St
E 4th St
E 3rd St
E 2nd St
W 4th St
W Cesar Chavez St
W Riverside Dr
S 1st St
S Congress Ave
Power Plant Dr
Electric Dr
Walter Seaholm Dr
Barton Springs Rd
Davis St
Omni Austin Hotel Downtown
One American Center
The Driskill, in the Unbound...
Littlefield Garage
Mexic-Arte Museum
Parking System Of America
Ballet Austin
2nd Street District
Downtown Austin Parking
Hilton Austin
Austin Convention Center
Hall
Colorado River
Auditorium Shores at Town Lake...
Free Parking
Butler Park
Palmer Events Center
The Long Center for the Performing Arts
Hyatt Regency Austin
Kimley-Horn
TexITE DFW May 2018 Joint Meeting

AVAILABLE DATA

- Useful probe-based data available for
  - 1st Street (NB @ Cesar Chavez, SB @ Riverside)
  - Lavaca Street (NB @ 5th St)
  - Guadalupe Street (SB @ Cesar Chavez)
  - 2nd Street (EB @Trinity, WB @ San Antonio)
- 4 Performance Metrics chosen
  - Speed
  - Travel Time
  - Planning Index
  - Queue Length & Duration

AVAILABLE DATA

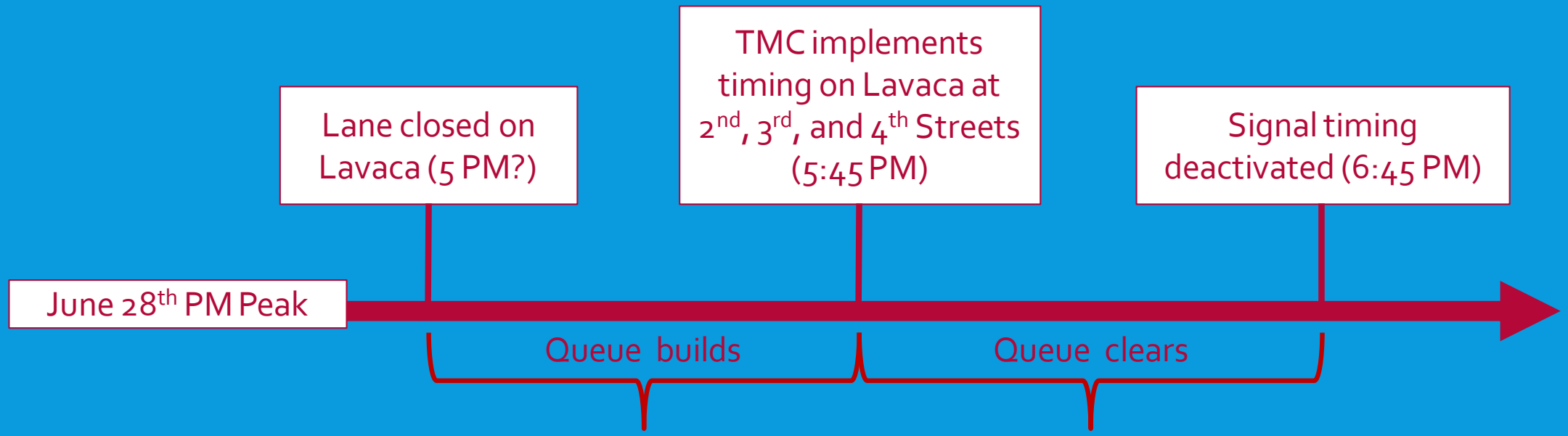
- Lavaca Street (Purple)
- Guadalupe Street (Green)
- 2nd Street (Orange)



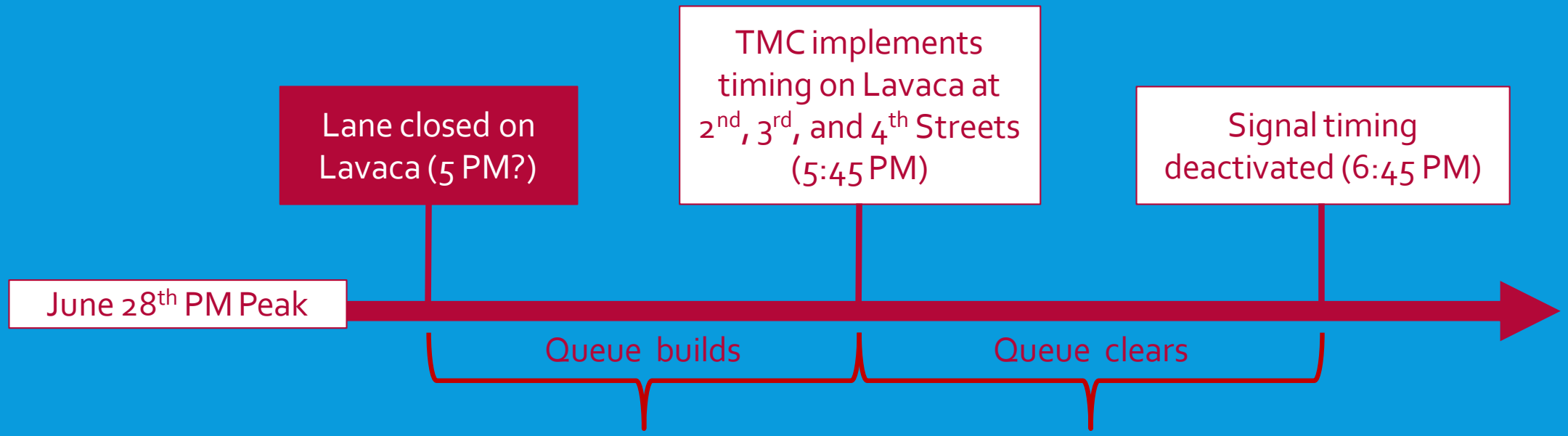
METHODOLOGY

- Average Summer Wednesday (6/7 - 7/26) used as baseline condition
  - Before and after event
  - June 28th excluded
- Worst-case condition
  - Largest negative deviation from the baseline data before or just after the timing was adjusted
- Best-case condition
  - Largest positive deviation from the baseline data after the timing was adjusted

TIMELINE


Lane closed on Lavaca (5 PM?)
TMC implements timing on Lavaca at 2nd, 3rd, and 4th Streets (5:45 PM)
Signal timing deactivated (6:45 PM)
June 28th PM Peak
Queue builds
Queue clears

TIMELINE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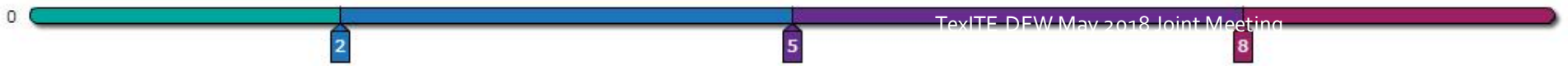
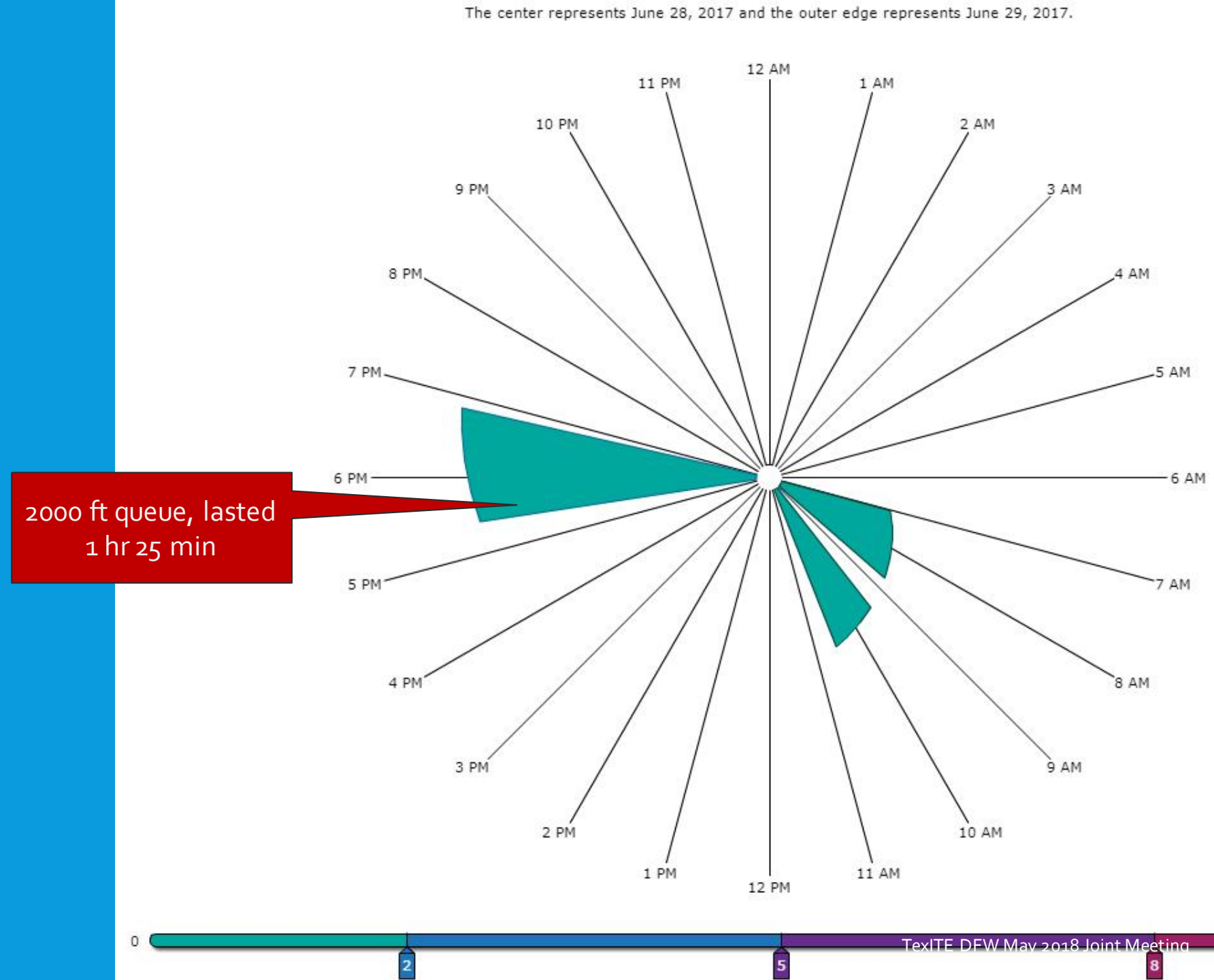
Signal timing deactivated (6:45 PM)
June 28th PM Peak
Queue builds
Queue clears

TYPICAL NB 1ST ST QUEUE AT CESAR CHAVEZ (6/14)

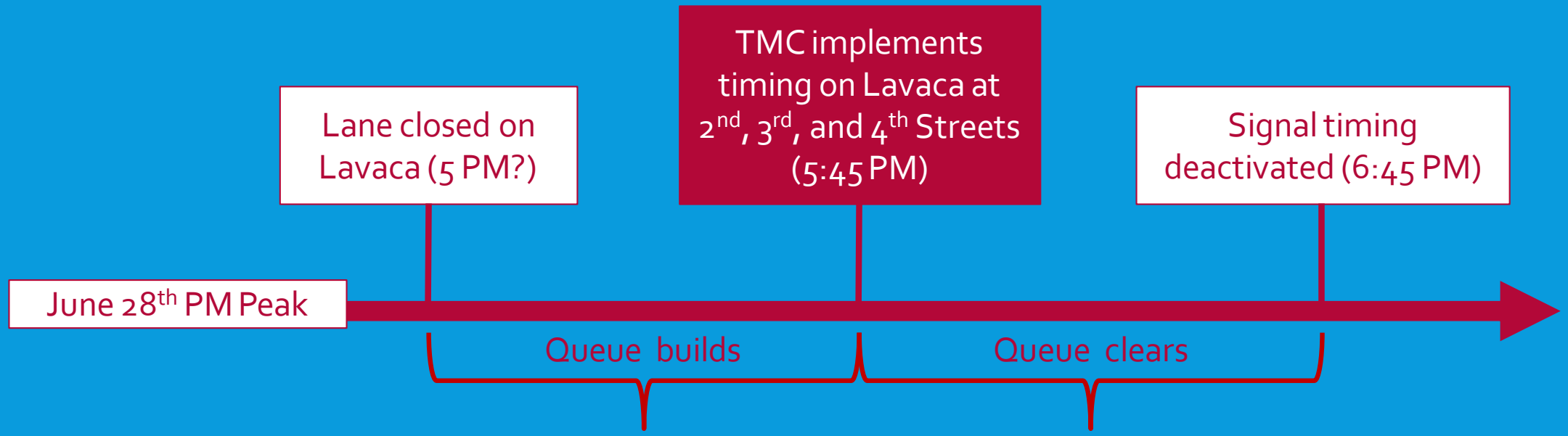
No PM Peak Queue



6/28 NB 1ST ST QUEUE AT CESAR CHAVEZ



TIMELINE


Lane closed on Lavaca (5 PM?)
TMC implements timing on Lavaca at 2nd, 3rd, and 4th Streets (5:45 PM)
Signal timing deactivated (6:45 PM)
June 28th PM Peak
Queue builds
Queue clears

INITIAL NEGATIVE IMPACTS OF CLOSURE ON 1ST STREET

City of Austin Transportation Management Center

Performance Measures Report - City Hall Garage Impacts (5 PM - 8 PM)

June 28th vs. Average Wednesday (6/7 - 7/26)

1st Street (Barton Springs to W 1st St/Cesar Chavez)	Metric	Speed (mph)						Travel Time (min)						Planning Index					
	Direction	Northbound			Southbound			Northbound			Southbound			Northbound			Southbound		
	Date	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ
	5:00 PM	19.01	15.45	↓3.56	12.79	17.64	↑4.85	1.26	1.52	↑0.26	2.06	1.33	↓0.73	1.66	1.58	↓0.08	2.64	1.39	↓1.25
	5:15 PM	18.34	12.67	↓5.67	9.97	11.94	↑1.97	1.31	1.85	↑0.54	2.50	1.96	↓0.54	1.68	3.60	↑1.92	3.46	2.46	↓1.00
	5:30 PM	18.99	6.69	↓12.30	9.14	8.61	↓0.53	1.27	3.50	↑2.23	2.72	2.72	NC	1.70	3.65	↑1.95	3.42	3.05	↓0.37
	5:45 PM	18.45	6.43	↓12.02	9.45	9.66	↑0.21	1.31	3.65	↑2.34	2.60	2.43	↓0.17	1.71	4.00	↑2.29	3.23	2.90	↓0.33
	6:00 PM	**19.17**	**4.70**	**↓14.47**	9.77	10.92	↑1.15	**1.34**	**4.99**	**↑3.65**	2.48	2.15	↓0.33	**1.97**	**6.49**	**↑4.52**	3.18	2.41	↓0.77
	6:15 PM	19.42	5.46	↓13.96	10.00	10.97	↑0.97	1.30	4.29	↑2.99	2.54	2.14	↓0.40	1.71	5.41	↑3.70	3.18	2.65	↓0.53
	6:30 PM	21.43	8.78	↓12.65	9.58	11.42	↑1.84	1.12	2.67	↑1.55	2.76	2.05	↓0.71	1.37	3.40	↑2.03	3.64	2.87	↓0.77
	6:45 PM	21.88	18.25	↓3.63	13.55	19.15	↑5.60	1.09	1.28	↑0.19	1.94	1.22	↓0.72	1.33	1.37	↑0.04	2.63	1.25	↓1.38
	7:00 PM	**20.97**	**21.15**	**↑0.18**	16.48	20.56	↑4.08	**1.15**	**1.11**	**↓0.04**	1.44	1.14	↓0.30	**1.52**	**1.18**	**↓0.34**	2.06	1.25	↓0.81
	7:15 PM	20.05	12.21	↓7.84	15.87	19.20	↑3.33	1.21	1.92	↑0.71	1.53	1.22	↓0.31	1.48	2.25	↑0.77	1.97	2.00	↑0.03
	7:30 PM	20.75	21.49	↑0.74	17.83	23.99	↑6.16	1.14	1.09	↓0.05	1.42	0.98	↓0.44	1.60	1.93	↑0.33	1.71	0.92	↓0.79
	7:45 PM	21.93	17.44	↓4.49	16.87	21.74	↑4.87	1.07	1.34	↑0.27	1.47	1.08	↓0.39	1.35	1.41	↑0.06	1.83	1.02	↓0.81
	Average	**20.03**	**12.56**	↓7.47	**12.61**	**15.48**	↑2.88	**1.21**	**2.43**	↑1.22	**2.12**	**1.70**	↓0.42	**1.59**	**3.02**	↑1.43	**2.75**	**2.01**	↓0.73

INITIAL NEGATIVE IMPACTS OF CLOSURE ON 1ST STREET

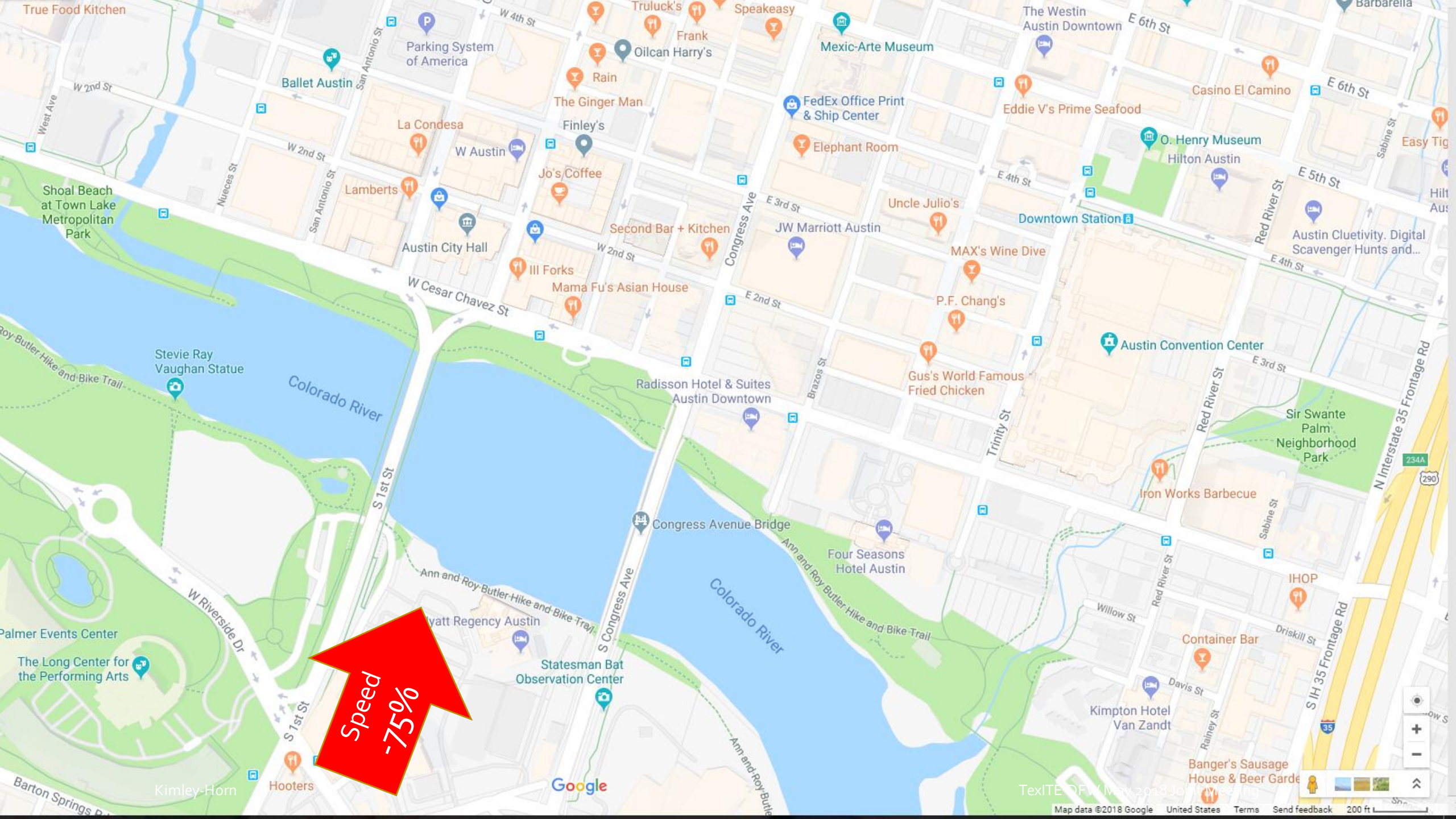
City of Austin Transportation Management Center

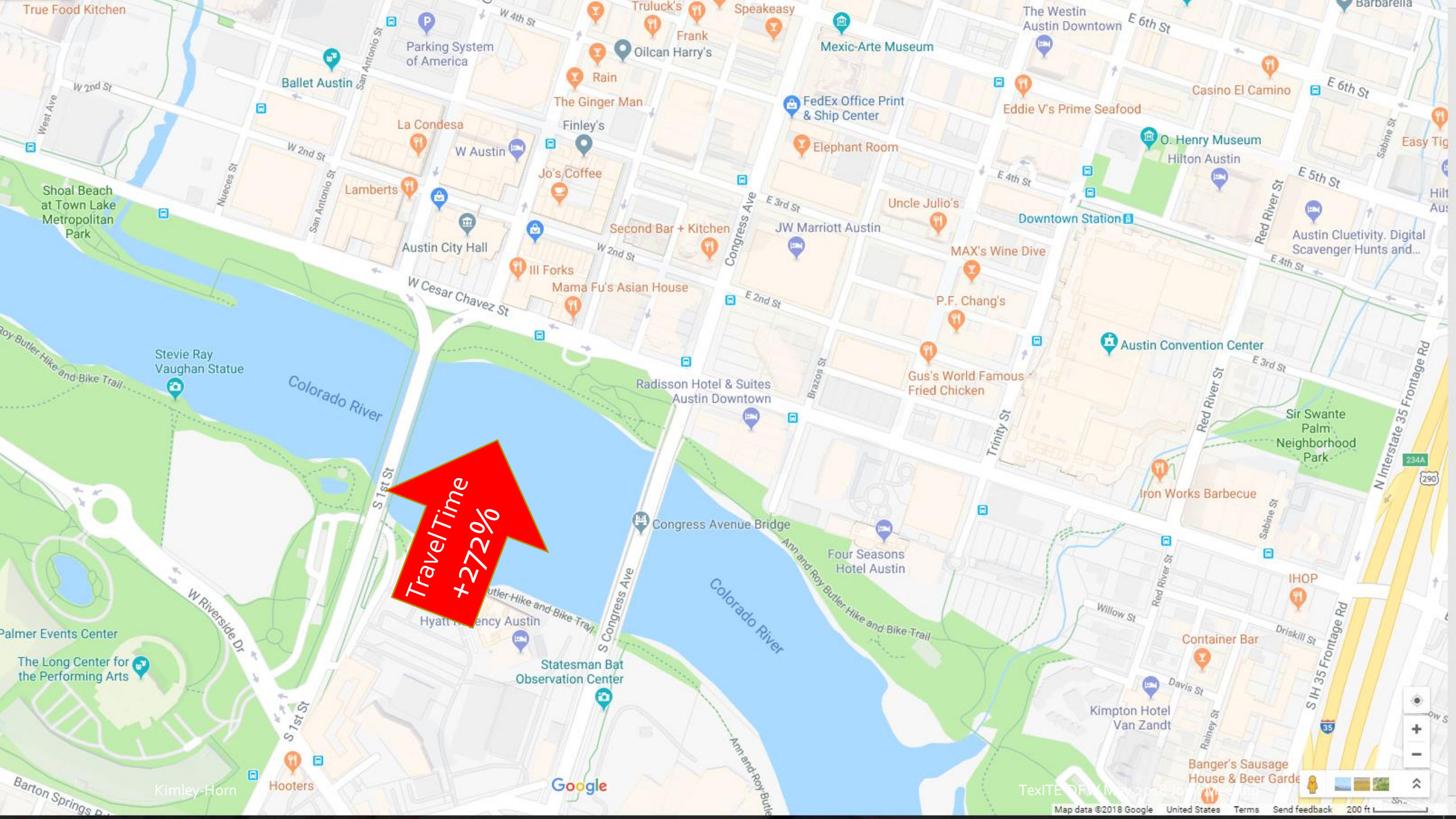
Performance Measures Report - City Hall Garage Impacts (5 PM - 8 PM)

June 28th vs. Average Wednesday (6/7 - 7/26)

1st Street (Barton Springs to W 1st St/Cesar Chavez)	Metric	Speed (mph)						Travel Time (min)						Planning Index					
	Direction	Northbound			Southbound			Northbound			Southbound			Northbound			Southbound		
	Date	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ
	5:00 PM	19.01	15.45	↓3.56	12.79	17.64	↑4.85	1.26	1.52	↑0.26	2.06	1.33	↓0.73	1.66	1.58	↓0.08	2.64	1.39	↓1.25
	5:15 PM	18.34	12.67	↓5.67	9.97	11.94	↑1.97	1.31	1.85	↑0.54	2.50	1.96	↓0.54	1.68	3.60	↑1.92	3.46	2.46	↓1.00
	5:30 PM	18.99	6.69	↓12.30	9.14	8.61	↓0.53	1.27	3.50	↑2.23	2.72	2.72	NC	1.70	3.65	↑1.95	3.42	3.05	↓0.37
	5:45 PM	18.45	6.43	↓12.02	9.45	9.66	↑0.21	1.31	3.65	↑2.34	2.60	2.43	↓0.17	1.71	4.00	↑2.29	3.23	2.90	↓0.33
	6:00 PM	**19.17**	**4.70**	**↓14.47**	9.77	10.92	↑1.15	**1.34**	**4.99**	**↑3.65**	2.48	2.15	↓0.33	**1.97**	**6.49**	**↑4.52**	3.18	2.41	↓0.77
	6:15 PM	19.42												1.71	5.41	↑3.70	3.18	2.65	↓0.53
	6:30 PM	21.43												1.37	3.40	↑2.03	3.64	2.87	↓0.77
	6:45 PM	21.88												1.33	1.37	↑0.04	2.63	1.25	↓1.38
	7:00 PM	**20.97**												**1.52**	**1.18**	**↓0.34**	2.06	1.25	↓0.81
	7:15 PM	20.05												1.48	2.25	↑0.77	1.97	2.00	↑0.03
	7:30 PM	20.75												1.60	1.93	↑0.33	1.71	0.92	↓0.79
	7:45 PM	21.93												1.35	1.41	↑0.06	1.83	1.02	↓0.81
	Average	***20.03***	**12.56**	↓7.47	12.61	13.48	↑2.88	**1.21**	**2.43**	↑1.22	**2.12**	**1.70**	↓0.42	**1.59**	**3.02**	↑1.43	**2.75**	**2.01**	↓0.73

Negative Impacts		
Speed	TT	PI
-75%	272%	229%


Speed
-75%
True Food Kitchen
Parking System of America
Ballet Austin
Truluck's
Frank
Speakeasy
Oilcan Harry's
Rain
The Ginger Man
Finley's
La Condesa
W Austin
Jo's Coffee
Lamberts
Austin City Hall
Shoal Beach at Town Lake Metropolitan Park
Ill Forks
Mama Fu's Asian House
Second Bar + Kitchen
Mexic-Arte Museum
FedEx Office Print & Ship Center
Elephant Room
JW Marriott Austin
Uncle Julio's
MAX's Wine Dive
P.F. Chang's
Gus's World Famous Fried Chicken
The Westin Austin Downtown
Eddie V's Prime Seafood
Casino El Camino
O. Henry Museum
Hilton Austin
Downtown Station
Austin Cluetivity. Digital Scavenger Hunts and...
Austin Convention Center
Radisson Hotel & Suites Austin Downtown
Four Seasons Hotel Austin
Iron Works Barbecue
Sir Swante Palm Neighborhood Park
IHOP
Container Bar
Kimpton Hotel Van Zandt
Banger's Sausage House & Beer Garde
Stevie Ray Vaughan Statue
Colorado River
Congress Avenue Bridge
Ann and Roy Butler Hike and Bike Trail
Hyatt Regency Austin
Statesman Bat Observation Center
Palmer Events Center
The Long Center for the Performing Arts
Hooters
W Cesar Chavez St
W 2nd St
W 4th St
E 2nd St
E 3rd St
E 4th St
E 5th St
E 6th St
S 1st St
S Congress Ave
Congress Ave
San Antonio St
Nueces St
West Ave
Red River St
Trinity St
Brazos St
Sabine St
Willow St
Driskill St
Davis St
Rainey St
N Interstate 35 Frontage Rd
S IH 35 Frontage Rd
W Riverside Dr
Barton Springs
Kimley-Horn
Google
Map data ©2018 Google
United States
Terms
Send feedback
200 ft


Travel Time
+272%
True Food Kitchen
Parking System of America
Ballet Austin
Truluck's
Frank
Speakeasy
Oilcan Harry's
Rain
The Ginger Man
Mexic-Arte Museum
The Westin Austin Downtown
Casino El Camino
Eddie V's Prime Seafood
FedEx Office Print & Ship Center
Finley's
La Condesa
W Austin
Elephant Room
O. Henry Museum
Hilton Austin
Jo's Coffee
Lamberts
Shoal Beach at Town Lake Metropolitan Park
Austin City Hall
Second Bar + Kitchen
JW Marriott Austin
Uncle Julio's
Downtown Station
Austin Cluetivity. Digital Scavenger Hunts and...
Ill Forks
Mama Fu's Asian House
MAX's Wine Dive
P.F. Chang's
W Cesar Chavez St
Austin Convention Center
Gus's World Famous Fried Chicken
Stevie Ray Vaughan Statue
Colorado River
Radisson Hotel & Suites Austin Downtown
Sir Swante Palm Neighborhood Park
Iron Works Barbecue
Congress Avenue Bridge
Four Seasons Hotel Austin
IHOP
Container Bar
Hyatt Regency Austin
Statesman Bat Observation Center
Kimpton Hotel Van Zandt
The Long Center for the Performing Arts
Palmer Events Center
Hooters
Banger's Sausage House & Beer Garde
Barton Springs
Kimley-Horn
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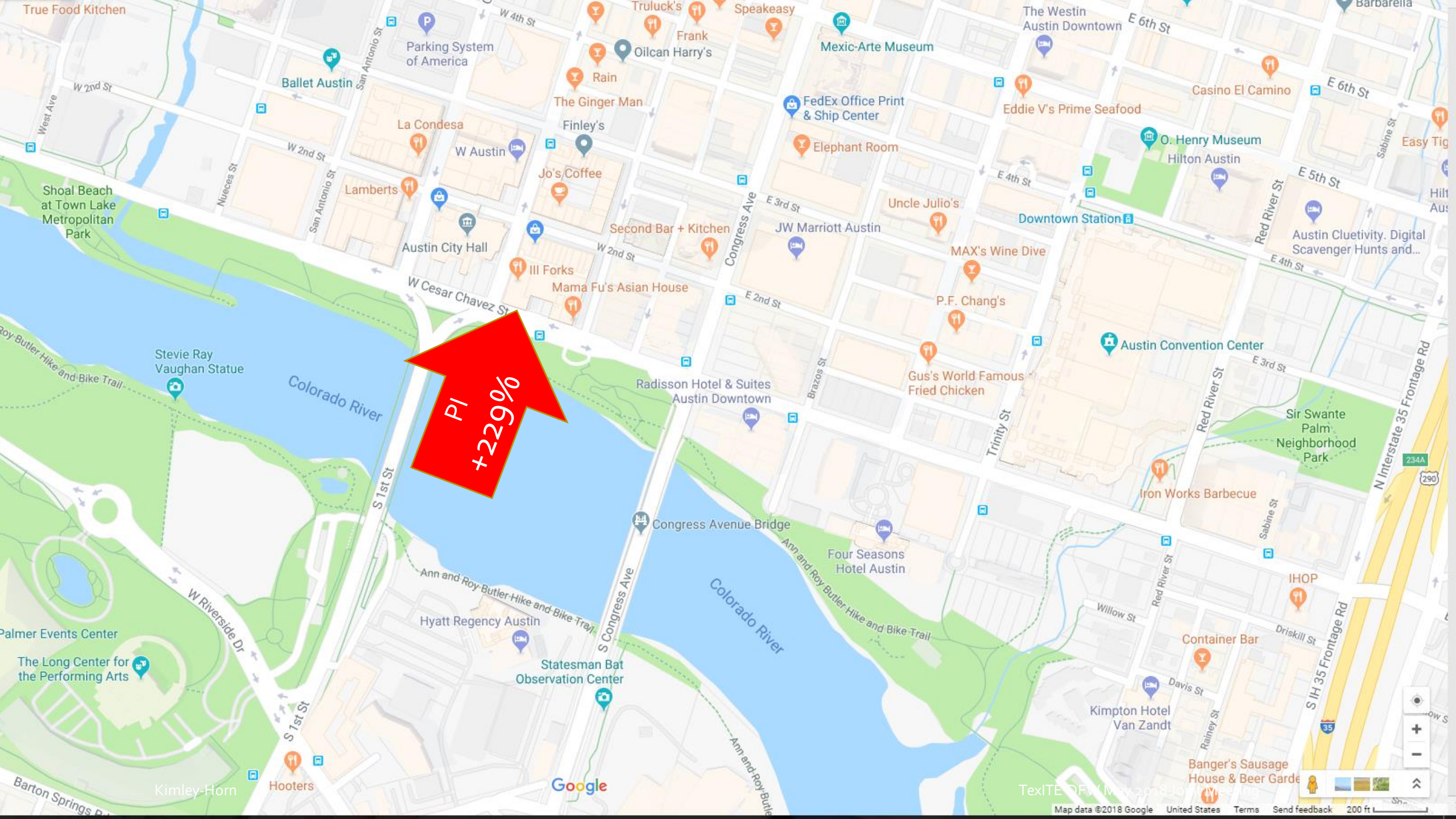
PI
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True Food Kitchen
Parking System of America
Ballet Austin
Truluck's
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Speakeasy
Oilcan Harry's
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The Ginger Man
Mexic-Arte Museum
The Westin Austin Downtown
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Finley's
W Austin
Jo's Coffee
Lamberts
Austin City Hall
Shoal Beach at Town Lake Metropolitan Park
W 2nd St
W 4th St
San Antonio St
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Congress Ave
Red River St
Second Bar + Kitchen
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Davis St
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Palmer Events Center
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Hyatt Regency Austin
S Congress Ave
Statesman Bat Observation Center
Hooters
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INITIAL NEGATIVE IMPACTS OF CLOSURE ON LAVACA STREET & GUADALUPE STREET

City of Austin Transportation Management Center

Performance Measures Report - City Hall Garage Impacts (5 PM - 8 PM)

June 28th vs. Average Wednesday (6/7 - 7/26)

Lavaca Street (Northbound) (2nd Street to 5th Street) and Guadalupe Street (Southbound) (5th Street to W 1st St/Cesar Chavez)

Metric	Speed (mph)						Travel Time (min)						Planning Index					
Direction	Lavaca (NB)			Guadalupe (SB)			Lavaca (NB)			Guadalupe (SB)			Lavaca (NB)			Guadalupe (SB)		
Date	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ
5:00 PM	12.48	3.66	↓8.82	9.52	8.01	↓1.51	1.43	4.42	↑2.99	2.19	2.53	↑0.34	1.60	4.67	↑3.07	2.40	2.65	↑0.25
5:15 PM	11.76	3.00	↓8.76	7.59	5.10	↓2.49	1.43	5.40	↑3.97	2.82	3.98	↑1.16	1.63	4.67	↑3.04	3.05	3.78	↑0.73
5:30 PM	11.30	3.13	↓8.17	6.64	4.35	↓2.29	1.47	5.17	↑3.70	3.34	4.67	↑1.33	1.72	4.67	↑2.95	3.89	4.84	↑0.95
5:45 PM	9.08	3.53	↓5.55	6.12	5.21	↓0.91	1.88	4.59	↑2.71	3.43	3.89	↑0.46	2.14	4.67	↑2.53	3.99	3.75	↓0.24
6:00 PM	**10.78**	**3.00**	**↓7.78**	6.85	8.73	↑1.88	**1.68**	**5.40**	**↑3.72**	3.13	2.32	↓0.81	**1.98**	**4.67**	**↑2.69**	3.84	2.18	↓1.66
6:15 PM	10.04	4.08	↓5.96	8.36	8.95	↑0.59	1.66	3.97	↑2.31	2.78	2.27	↓0.51	1.77	4.67	↑2.90	3.09	2.91	↓0.18
6:30 PM	9.33	4.69	↓4.64	8.16	8.46	↑0.30	1.95	3.45	↑1.50	2.72	2.40	↓0.32	2.11	3.50	↑1.39	3.04	2.24	↓0.80
6:45 PM	8.29	5.20	↓3.09	11.75	13.56	↑1.81	2.03	3.11	↑1.08	1.96	1.50	↓0.46	2.40	3.50	↑1.10	2.35	1.58	↓0.77
7:00 PM	**9.71**	**10.26**	**↑0.55**	13.55	15.52	↑1.97	**1.76**	**1.58**	**↓0.18**	1.59	1.31	↓0.28	**1.99**	**1.56**	**↓0.43**	1.82	1.16	↓0.66
7:15 PM	11.43	12.38	↑0.95	11.88	16.42	↑4.54	1.53	1.31	↓0.22	1.76	1.24	↓0.52	1.83	1.17	↓0.66	1.68	0.99	↓0.69
7:30 PM	11.62	11.54	↓0.08	12.28	14.09	↑1.81	1.44	1.40	↓0.04	1.67	1.44	↓0.23	1.79	1.40	↓0.39	1.63	1.15	↓0.48
7:45 PM	12.08	10.00	↓2.08	14.12	15.35	↑1.23	1.38	1.62	↑0.24	1.46	1.32	↓0.14	1.38	1.40	↑0.02	1.49	1.23	↓0.26
Average	**10.66**	**6.21**	↓4.45	**9.74**	**10.31**	↑0.58	**1.64**	**3.45**	↑1.82	**2.40**	**2.41**	↑0.00	**1.86**	**3.38**	↑1.52	**2.69**	**2.37**	↓0.32

INITIAL NEGATIVE IMPACTS OF CLOSURE ON LAVACA STREET & GUADALUPE STREET

City of Austin Transportation Management Center

Performance Measures Report - City Hall Garage Impacts (5 PM - 8 PM)

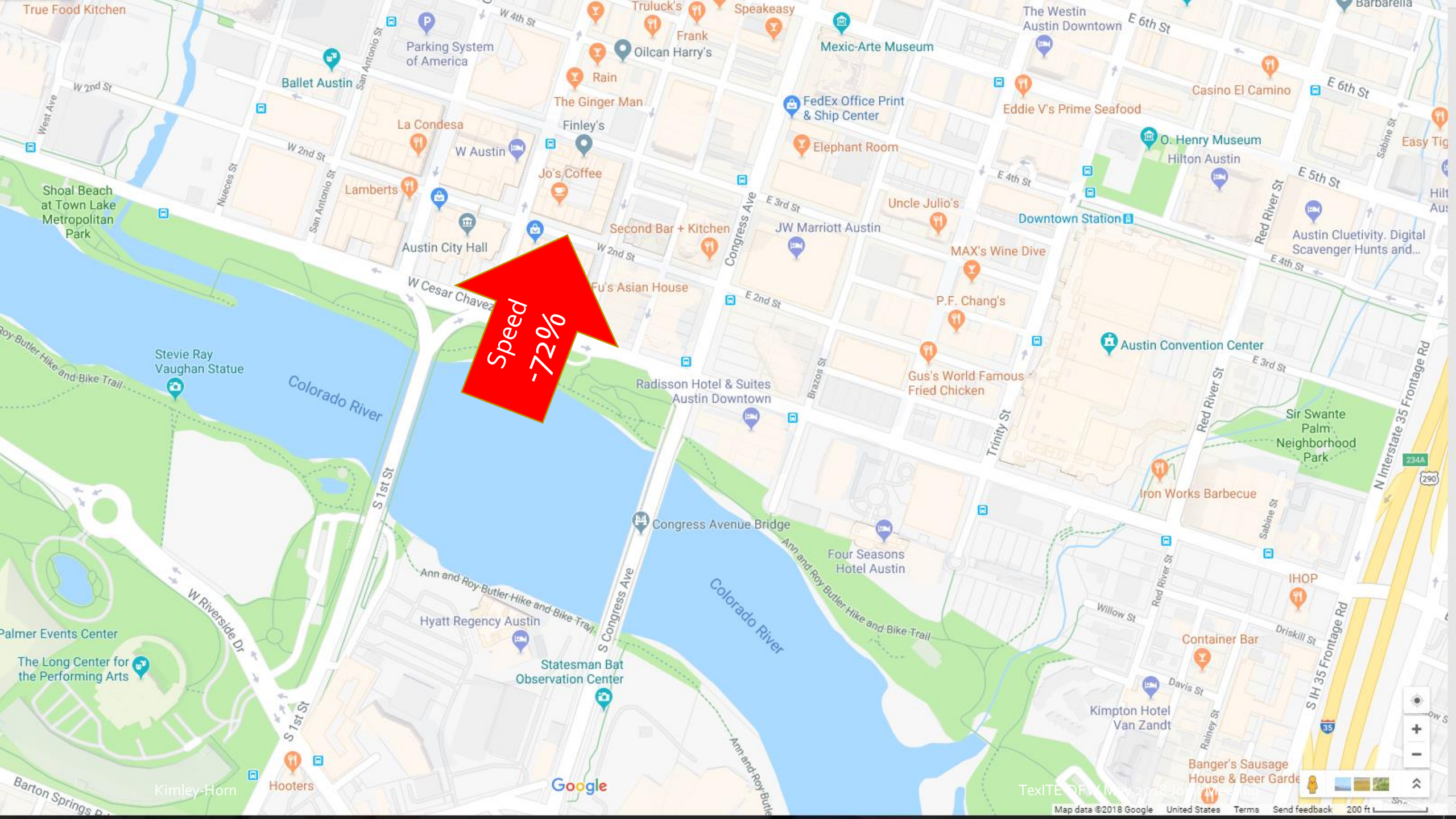
June 28th vs. Average Wednesday (6/7 - 7/26)

Lavaca Street (Northbound) (2nd Street to 5th Street) and Guadalupe Street (Southbound) (5th Street to W 1st St/Cesar Chavez)

Metric	Speed (mph)						Travel Time (min)						Planning Index					
Direction	Lavaca (NB)			Guadalupe (SB)			Lavaca (NB)			Guadalupe (SB)			Lavaca (NB)			Guadalupe (SB)		
Date	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ
5:00 PM	12.48	3.66	↓8.82	9.52	8.01	↓1.51	1.43	4.42	↑2.99	2.19	2.53	↑0.34	1.60	4.67	↑3.07	2.40	2.65	↑0.25
5:15 PM	11.76	3.00	↓8.76	7.59	5.10	↓2.49	1.43	5.40	↑3.97	2.82	3.98	↑1.16	1.63	4.67	↑3.04	3.05	3.78	↑0.73
5:30 PM	11.30	3.13	↓8.17	6.64	4.35	↓2.29	1.47	5.17	↑3.70	3.34	4.67	↑1.33	1.72	4.67	↑2.95	3.89	4.84	↑0.95
5:45 PM	9.08	3.53	↓5.55	6.12	5.21	↓0.91	1.88	4.59	↑2.71	3.43	3.89	↑0.46	2.14	4.67	↑2.53	3.99	3.75	↓0.24
6:00 PM	**10.78**	**3.00**	**↓7.78**	6.85	8.73	↑1.88	**1.68**	**5.40**	**↑3.72**	3.13	2.32	↓0.81	**1.98**	**4.67**	**↑2.69**	3.84	2.18	↓1.66
6:15 PM	10.04												1.77	4.67	↑2.90	3.09	2.91	↓0.18
6:30 PM	9.33												2.11	3.50	↑1.39	3.04	2.24	↓0.80
6:45 PM	8.29												2.40	3.50	↑1.10	2.35	1.58	↓0.77
7:00 PM	**9.71**												**1.99**	**1.56**	**↓0.43**	1.82	1.16	↓0.66
7:15 PM	11.43												1.83	1.17	↓0.66	1.68	0.99	↓0.69
7:30 PM	11.62												1.79	1.40	↓0.39	1.63	1.15	↓0.48
7:45 PM	12.08												1.38	1.40	↑0.02	1.49	1.23	↓0.26
Average	**10.66**												**1.86**	**3.38**	↑1.52	**2.69**	**2.37**	↓0.32

Negative Impacts

Speed	TT	PI
-72%	221%	136%


Speed
-72%
True Food Kitchen
Parking System of America
Ballet Austin
Truluck's
Frank
Speakeasy
Oilcan Harry's
Rain
The Ginger Man
Mexic-Arte Museum
The Westin Austin Downtown
E 6th St
Casino El Camino
Eddie V's Prime Seafood
FedEx Office Print & Ship Center
Elephant Room
O. Henry Museum
Hilton Austin
Easy Tig
La Condesa
Finley's
W Austin
Jo's Coffee
Lamberts
Austin City Hall
Shoal Beach at Town Lake Metropolitan Park
W 2nd St
W 4th St
West Ave
Nueces St
San Antonio St
Second Bar + Kitchen
Congress Ave
E 3rd St
JW Marriott Austin
Uncle Julio's
Downtown Station
E 4th St
E 5th St
Red River St
Austin Cluetivity. Digital Scavenger Hunts and...
MAX's Wine Dive
W Cesar Chavez
Fu's Asian House
E 2nd St
P.F. Chang's
Austin Convention Center
Gus's World Famous Fried Chicken
Radisson Hotel & Suites Austin Downtown
Brazos St
Trinity St
Sir Swante Palm Neighborhood Park
Stevie Ray Vaughan Statue
Colorado River
Roy Butler Hike and Bike Trail
S 1st St
Iron Works Barbecue
Sabine St
N Interstate 35 Frontage Rd
234A
290
Congress Avenue Bridge
Four Seasons Hotel Austin
Ann and Roy Butler Hike and Bike Trail
IHOP
Willow St
Driskill St
Container Bar
Hyatt Regency Austin
S Congress Ave
Statesman Bat Observation Center
W Riverside Dr
Palmer Events Center
The Long Center for the Performing Arts
Davis St
Kimpton Hotel Van Zandt
Rainey St
S IH 35 Frontage Rd
Banger's Sausage House & Beer Garde
Hooters
Barton Springs
Kimley-Horn
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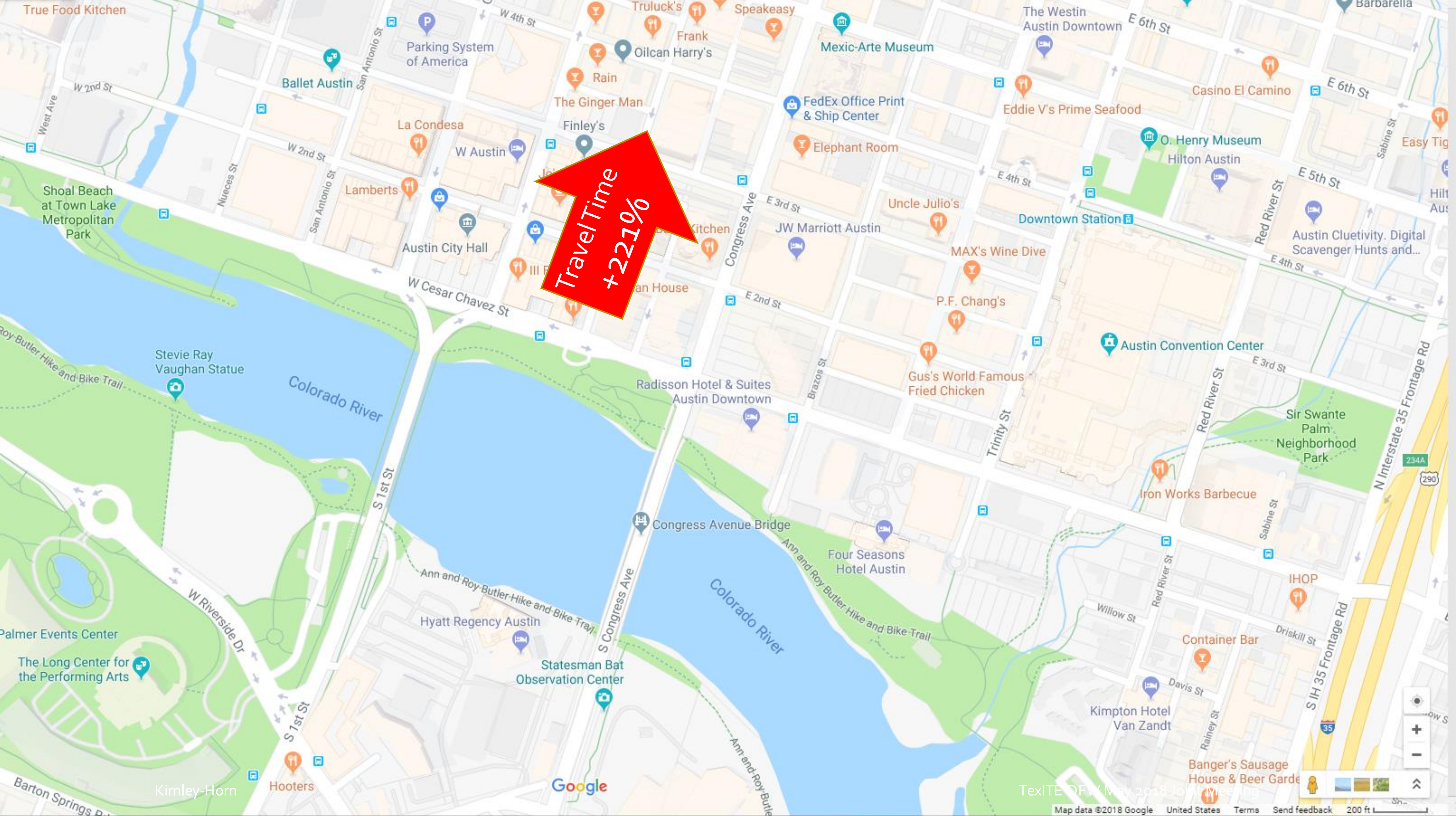
Travel Time
+221%
True Food Kitchen
W 4th St
Truluck's
Speakeasy
Frank
Oilcan Harry's
Mexic-Arte Museum
The Westin Austin Downtown
E 6th St
Barbarella
Parking System of America
Ballet Austin
W 2nd St
Rain
The Ginger Man
FedEx Office Print & Ship Center
Eddie V's Prime Seafood
Casino El Camino
La Condesa
Finley's
W Austin
Elephant Room
O. Henry Museum
Hilton Austin
E 5th St
Shoal Beach at Town Lake Metropolitan Park
Lamberts
E 3rd St
E 4th St
Uncle Julio's
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Austin City Hall
JW Marriott Austin
Congress Ave
Austin Cluetivity. Digital Scavenger Hunts and...
MAX's Wine Dive
W Cesar Chavez St
E 2nd St
P.F. Chang's
Austin Convention Center
Stevie Ray Vaughan Statue
Colorado River
Radisson Hotel & Suites Austin Downtown
Gus's World Famous Fried Chicken
Sir Swante Palm Neighborhood Park
Trinity St
Red River St
Brazos St
N Interstate 35 Frontage Rd
Iron Works Barbecue
S 1st St
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Ann and Roy Butler Hike and Bike Trail
IHOP
W Riverside Dr
Hyatt Regency Austin
S Congress Ave
Willow St
Driskill St
Container Bar
Palmer Events Center
The Long Center for the Performing Arts
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Davis St
Kimpton Hotel Van Zandt
S IH 35 Frontage Rd
Banger's Sausage House & Beer Garden
Barton Springs Rd
Hooters
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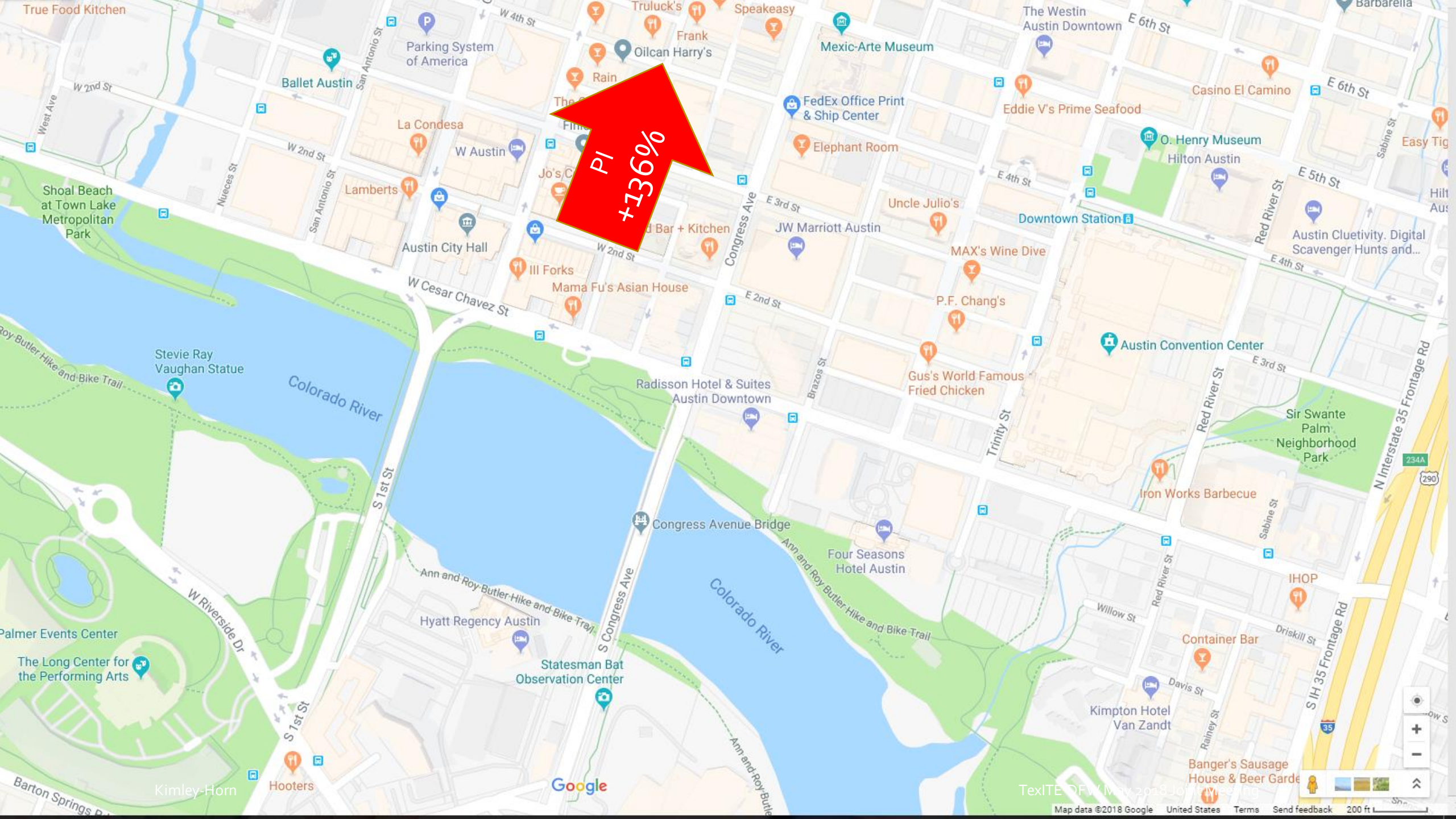
PI
+136%
True Food Kitchen
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W Cesar Chavez St
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Willow St
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Davis St
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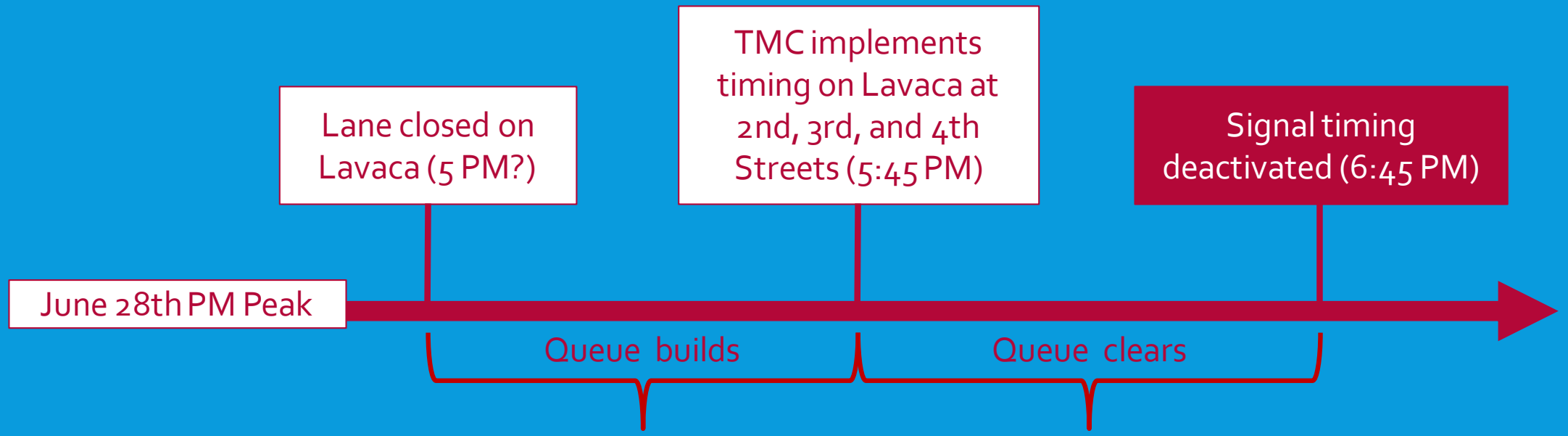
TIMELINE


Lane closed on Lavaca (5 PM?)
TMC implements timing on Lavaca at 2nd, 3rd, and 4th Streets (5:45 PM)
Signal timing deactivated (6:45 PM)
June 28th PM Peak
Queue builds
Queue clears

POSITIVE IMPACTS OF TMC RESPONSE ON 1ST STREET

City of Austin Transportation Management Center

Performance Measures Report - City Hall Garage Impacts (5 PM - 8 PM)

June 28th vs. Average Wednesday (6/7 - 7/26)

	Metric	Speed (mph)						Travel Time (min)						Planning Index					
	Direction	Northbound			Southbound			Northbound			Southbound			Northbound			Southbound		
1st Street (Barton Springs to W 1st St/Cesar Chavez)	Date	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ
	5:00 PM	19.01	15.45	↓3.56	12.79	17.64	↑4.85	1.26	1.52	↑0.26	2.06	1.33	↓0.73	1.66	1.58	↓0.08	2.64	1.39	↓1.25
	5:15 PM	18.34	12.67	↓5.67	9.97	11.94	↑1.97	1.31	1.85	↑0.54	2.50	1.96	↓0.54	1.68	3.60	↑1.92	3.46	2.46	↓1.00
	5:30 PM	18.99	6.69	↓12.30	9.14	8.61	↓0.53	1.27	3.50	↑2.23	2.72	2.72	NC	1.70	3.65	↑1.95	3.42	3.05	↓0.37
	5:45 PM	18.45	6.43	↓12.02	9.45	9.66	↑0.21	1.31	3.65	↑2.34	2.60	2.43	↓0.17	1.71	4.00	↑2.29	3.23	2.90	↓0.33
	6:00 PM	**19.17**	**4.70**	**↓14.47**	9.77	10.92	↑1.15	**1.34**	**4.99**	**↑3.65**	2.48	2.15	↓0.33	**1.97**	**6.49**	**↑4.52**	3.18	2.41	↓0.77
	6:15 PM	19.42	5.46	↓13.96	10.00	10.97	↑0.97	1.30	4.29	↑2.99	2.54	2.14	↓0.40	1.71	5.41	↑3.70	3.18	2.65	↓0.53
	6:30 PM	21.43	8.78	↓12.65	9.58	11.42	↑1.84	1.12	2.67	↑1.55	2.76	2.05	↓0.71	1.37	3.40	↑2.03	3.64	2.87	↓0.77
	6:45 PM	21.88	18.25	↓3.63	13.55	19.15	↑5.60	1.09	1.28	↑0.19	1.94	1.22	↓0.72	1.33	1.37	↑0.04	2.63	1.25	↓1.38
	7:00 PM	**20.97**	**21.15**	**↑0.18**	16.48	20.56	↑4.08	**1.15**	**1.11**	**↓0.04**	1.44	1.14	↓0.30	**1.52**	**1.18**	**↓0.34**	2.06	1.25	↓0.81
	7:15 PM	20.05	12.21	↓7.84	15.87	19.20	↑3.33	1.21	1.92	↑0.71	1.53	1.22	↓0.31	1.48	2.25	↑0.77	1.97	2.00	↑0.03
	7:30 PM	20.75	21.49	↑0.74	17.83	23.99	↑6.16	1.14	1.09	↓0.05	1.42	0.98	↓0.44	1.60	1.93	↑0.33	1.71	0.92	↓0.79
	7:45 PM	21.93	17.44	↓4.49	16.87	21.74	↑4.87	1.07	1.34	↑0.27	1.47	1.08	↓0.39	1.35	1.41	↑0.06	1.83	1.02	↓0.81
	Average	**20.03**	**12.56**	↓7.47	**12.61**	**15.48**	↑2.88	**1.21**	**2.43**	↑1.22	**2.12**	**1.70**	↓0.42	**1.59**	**3.02**	↑1.43	**2.75**	**2.01**	↓0.73

POSITIVE IMPACTS OF TMC RESPONSE ON 1ST STREET

City of Austin Transportation Management Center

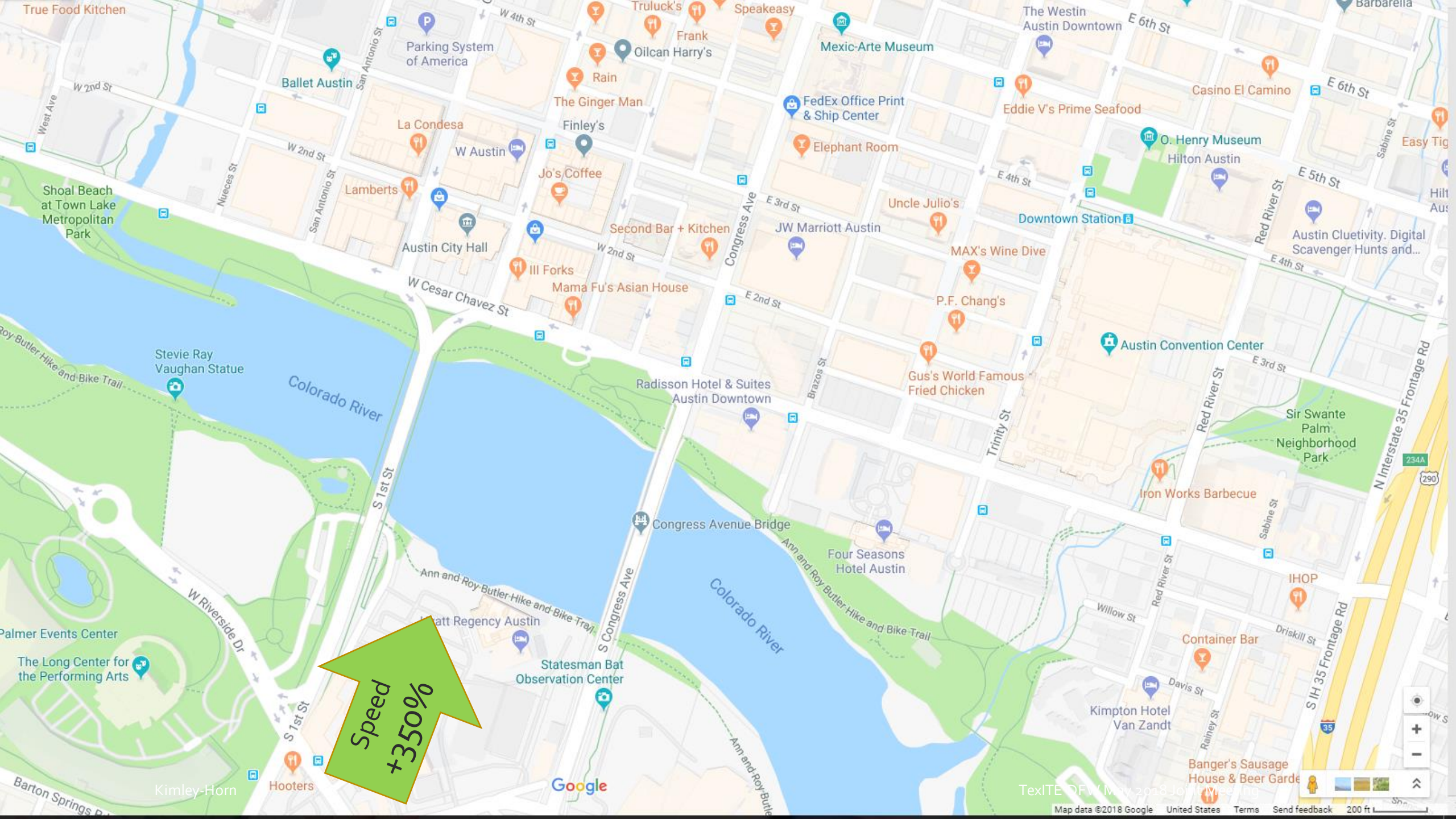
Performance Measures Report - City Hall Garage Impacts (5 PM - 8 PM)

June 28th vs. Average Wednesday (6/7 - 7/26)

1st Street (Barton Springs to W 1st St/Cesar Chavez)

Metric	Speed (mph)						Travel Time (min)						Planning Index					
Direction	Northbound			Southbound			Northbound			Southbound			Northbound			Southbound		
Date	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ
5:00 PM	19.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.66	1.58	↓0.08	2.64	1.39	↓1.25
5:15 PM	18.34	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.68	3.60	↑1.92	3.46	2.46	↓1.00
5:30 PM	18.99	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.70	3.65	↑1.95	3.42	3.05	↓0.37
5:45 PM	18.45	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.71	4.00	↑2.29	3.23	2.90	↓0.33
6:00 PM	**19.17**	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	**1.97**	**6.49**	**↑4.52**	3.18	2.41	↓0.77
6:15 PM	19.42	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.71	5.41	↑3.70	3.18	2.65	↓0.53
6:30 PM	21.43	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.37	3.40	↑2.03	3.64	2.87	↓0.77
6:45 PM	21.88	[illegible]	[illegible]	[illegible]	19.15	[illegible]	[illegible]	1.28	[illegible]	[illegible]	1.22	[illegible]	1.33	1.37	↑0.04	2.63	1.25	↓1.38
7:00 PM	**20.97**	**21.15**	**↑0.18**	16.48	20.56	↑4.08	**1.15**	**1.11**	**↓0.04**	1.44	1.14	↓0.30	**1.52**	**1.18**	**↓0.34**	2.06	1.25	↓0.81
7:15 PM	20.05	12.21	↓7.84	15.87	19.20	↑3.33	1.21	1.92	↑0.71	1.53	1.22	↓0.31	1.48	2.25	↑0.77	1.97	2.00	↑0.03
7:30 PM	20.75	21.49	↑0.74	17.83	23.99	↑6.16	1.14	1.09	↓0.05	1.42	0.98	↓0.44	1.60	1.93	↑0.33	1.71	0.92	↓0.79
7:45 PM	21.93	17.44	↓4.49	16.87	21.74	↑4.87	1.07	1.34	↑0.27	1.47	1.08	↓0.39	1.35	1.41	↑0.06	1.83	1.02	↓0.81
Average	**20.03**	**12.56**	↓7.47	**12.61**	**15.48**	↑2.88	**1.21**	**2.43**	↑1.22	**2.12**	**1.70**	↓0.42	**1.59**	**3.02**	↑1.43	**2.75**	**2.01**	↓0.73

Positive Impacts of TMC		
Speed	TT	PI
350%	-78%	-82%


Speed
+350%
Kimley-Horn
Google
TexITE DFW May 2018 Joint Meeting
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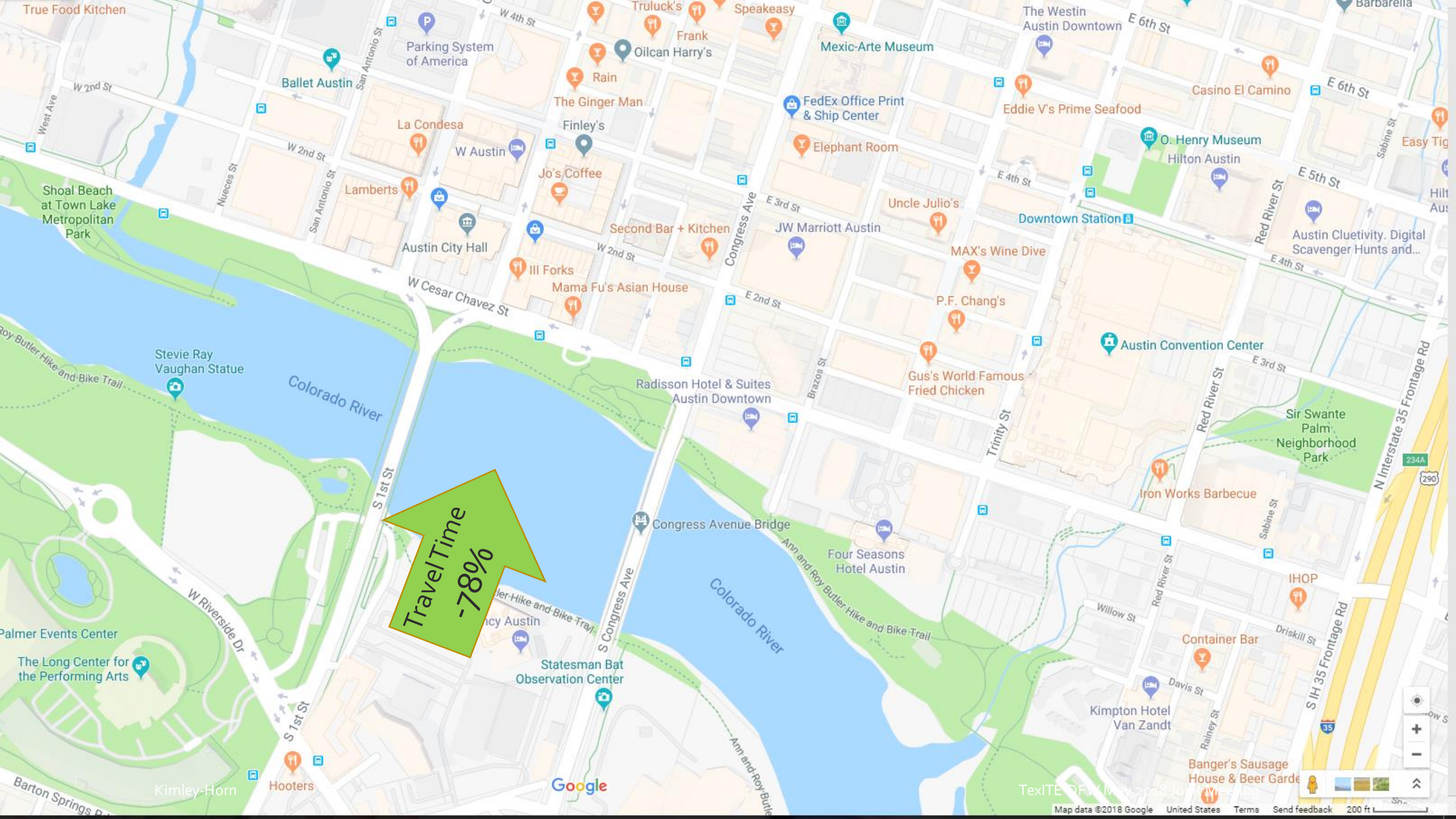
200 ft


Travel Time
-78%
True Food Kitchen
Parking System of America
Ballet Austin
Truluck's
Frank
Speakeasy
Oilcan Harry's
Rain
The Ginger Man
Mexic-Arte Museum
The Westin Austin Downtown
Casino El Camino
Eddie V's Prime Seafood
FedEx Office Print & Ship Center
Finley's
La Condesa
W Austin
Elephant Room
O. Henry Museum
Hilton Austin
Shoal Beach at Town Lake Metropolitan Park
Lamberts
Jo's Coffee
Austin City Hall
Second Bar + Kitchen
JW Marriott Austin
Uncle Julio's
Downtown Station
Austin Cluetivity. Digital Scavenger Hunts and...
Ill Forks
Mama Fu's Asian House
MAX's Wine Dive
P.F. Chang's
Gus's World Famous Fried Chicken
Austin Convention Center
Stevie Ray Vaughan Statue
Colorado River
Radisson Hotel & Suites Austin Downtown
Sir Swante Palm Neighborhood Park
Iron Works Barbecue
Congress Avenue Bridge
Four Seasons Hotel Austin
IHOP
Container Bar
Statesman Bat Observation Center
Kimpton Hotel Van Zandt
Palmer Events Center
The Long Center for the Performing Arts
Hooters
Banger's Sausage House & Beer Garde
W Cesar Chavez St
W 2nd St
W 4th St
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E 2nd St
West Ave
Nueces St
San Antonio St
Congress Ave
Brazos St
Trinity St
Red River St
Sabine St
S 1st St
W Riverside Dr
S Congress Ave
Willow St
Driskill St
Davis St
Rainey St
N Interstate 35 Frontage Rd
S IH 35 Frontage Rd
Ann and Roy Butler Hike and Bike Trail
Barton Springs
Kimley-Horn
Google
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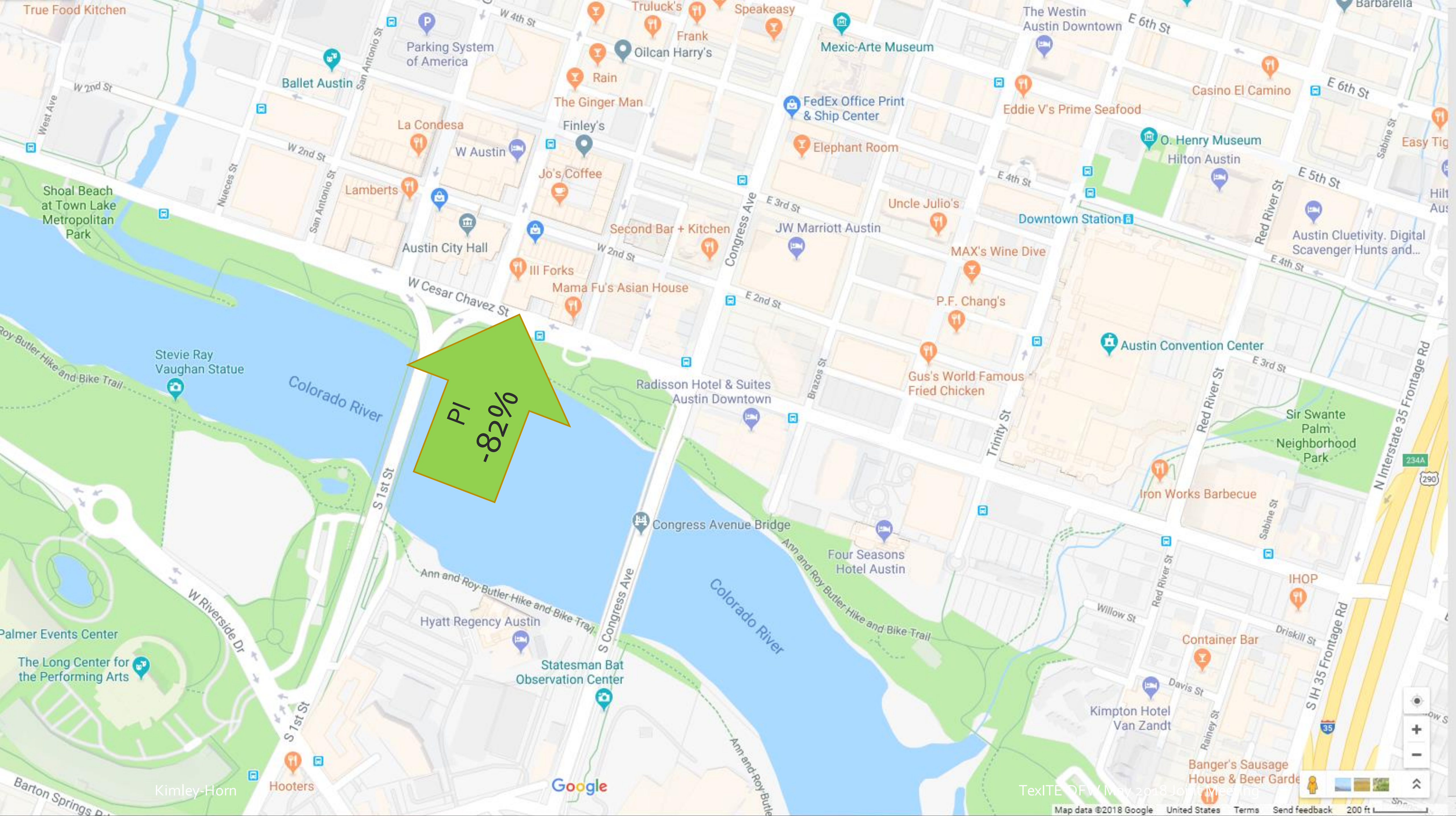
PI
-82%
True Food Kitchen
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Congress Avenue Bridge
Four Seasons Hotel Austin
Ann and Roy Butler Hike and Bike Trail
Hyatt Regency Austin
S Congress Ave
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Container Bar
Davis St
Kimpton Hotel Van Zandt
Rainey St
Banger's Sausage House & Beer Garden
S IH 35 Frontage Rd
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POSITIVE IMPACTS OF TMC RESPONSE ON LAVACA STREET & GUADALUPE STREET

City of Austin Transportation Management Center

Performance Measures Report - City Hall Garage Impacts (5 PM - 8 PM)

June 28th vs. Average Wednesday (6/7 - 7/26)

Lavaca Street (Northbound) (2nd Street to 5th Street) and Guadalupe Street (Southbound) (5th Street to W 1st St/Cesar Chavez)

Metric	Speed (mph)						Travel Time (min)						Planning Index					
Direction	Lavaca (NB)			Guadalupe (SB)			Lavaca (NB)			Guadalupe (SB)			Lavaca (NB)			Guadalupe (SB)		
Date	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ
5:00 PM	12.48	3.66	↓8.82	9.52	8.01	↓1.51	1.43	4.42	↑2.99	2.19	2.53	↑0.34	1.60	4.67	↑3.07	2.40	2.65	↑0.25
5:15 PM	11.76	3.00	↓8.76	7.59	5.10	↓2.49	1.43	5.40	↑3.97	2.82	3.98	↑1.16	1.63	4.67	↑3.04	3.05	3.78	↑0.73
5:30 PM	11.30	3.13	↓8.17	6.64	4.35	↓2.29	1.47	5.17	↑3.70	3.34	4.67	↑1.33	1.72	4.67	↑2.95	3.89	4.84	↑0.95
5:45 PM	9.08	3.53	↓5.55	6.12	5.21	↓0.91	1.88	4.59	↑2.71	3.43	3.89	↑0.46	2.14	4.67	↑2.53	3.99	3.75	↓0.24
6:00 PM	**10.78**	**3.00**	**↓7.78**	6.85	8.73	↑1.88	**1.68**	**5.40**	**↑3.72**	3.13	2.32	↓0.81	**1.98**	**4.67**	**↑2.69**	3.84	2.18	↓1.66
6:15 PM	10.04	4.08	↓5.96	8.36	8.95	↑0.59	1.66	3.97	↑2.31	2.78	2.27	↓0.51	1.77	4.67	↑2.90	3.09	2.91	↓0.18
6:30 PM	9.33	4.69	↓4.64	8.16	8.46	↑0.30	1.95	3.45	↑1.50	2.72	2.40	↓0.32	2.11	3.50	↑1.39	3.04	2.24	↓0.80
6:45 PM	8.29	5.20	↓3.09	11.75	13.56	↑1.81	2.03	3.11	↑1.08	1.96	1.50	↓0.46	2.40	3.50	↑1.10	2.35	1.58	↓0.77
7:00 PM	**9.71**	**10.26**	**↑0.55**	13.55	15.52	↑1.97	**1.76**	**1.58**	**↓0.18**	1.59	1.31	↓0.28	**1.99**	**1.56**	**↓0.43**	1.82	1.16	↓0.66
7:15 PM	11.43	12.38	↑0.95	11.88	16.42	↑4.54	1.53	1.31	↓0.22	1.76	1.24	↓0.52	1.83	1.17	↓0.66	1.68	0.99	↓0.69
7:30 PM	11.62	11.54	↓0.08	12.28	14.09	↑1.81	1.44	1.40	↓0.04	1.67	1.44	↓0.23	1.79	1.40	↓0.39	1.63	1.15	↓0.48
7:45 PM	12.08	10.00	↓2.08	14.12	15.35	↑1.23	1.38	1.62	↑0.24	1.46	1.32	↓0.14	1.38	1.40	↑0.02	1.49	1.23	↓0.26
Average	**10.66**	**6.21**	↓4.45	**9.74**	**10.31**	↑0.58	**1.64**	**3.45**	↑1.82	**2.40**	**2.41**	↑0.00	**1.86**	**3.38**	↑1.52	**2.69**	**2.37**	↓0.32

POSITIVE IMPACTS OF TMC RESPONSE ON LAVACA STREET & GUADALUPE STREET

City of Austin Transportation Management Center

Performance Measures Report - City Hall Garage Impacts (5 PM - 8 PM)

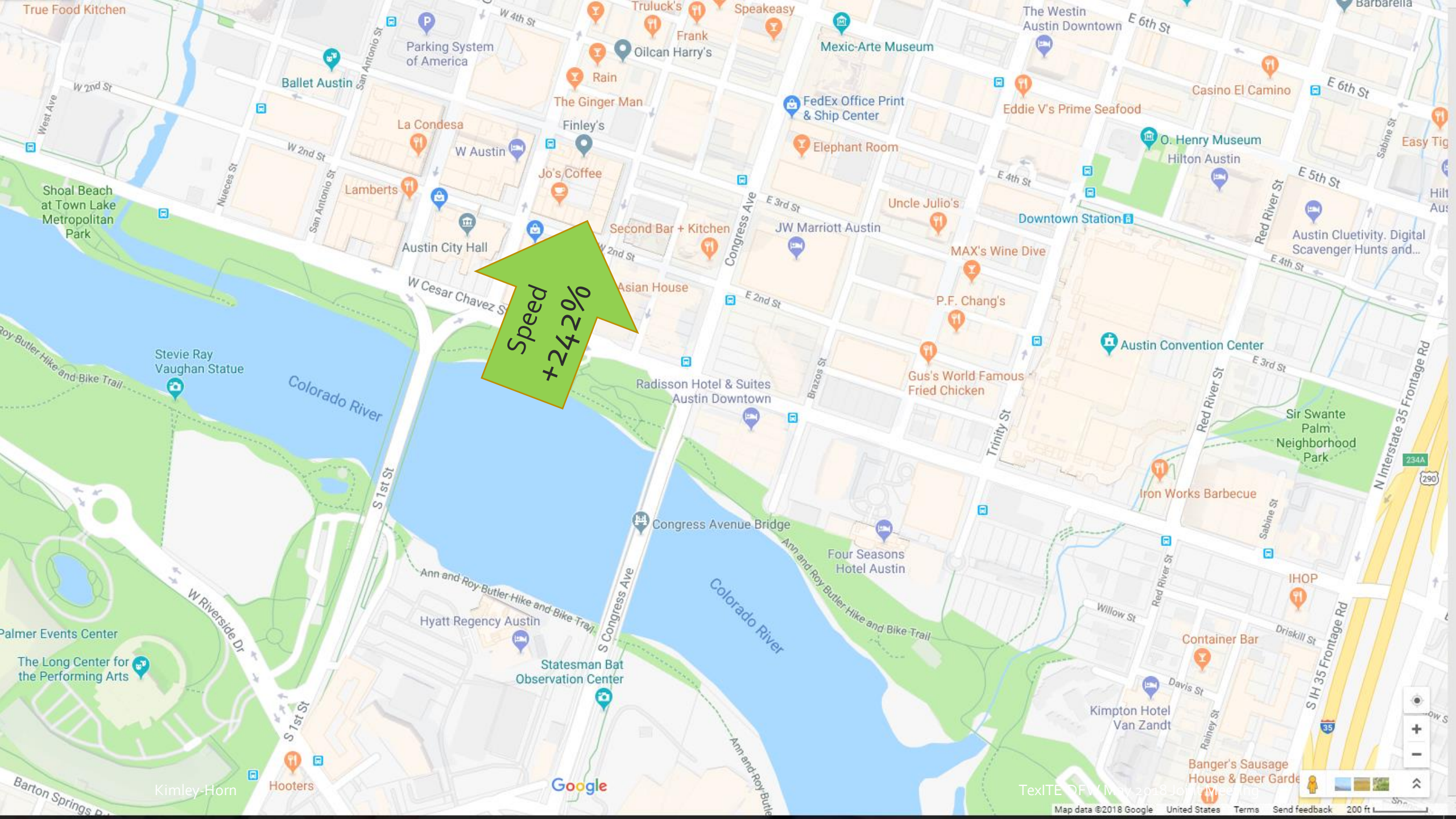
June 28th vs. Average Wednesday (6/7 - 7/26)

Lavaca Street (Northbound) (2nd Street to 5th Street) and Guadalupe Street (Southbound) (5th Street to W 1st St/Cesar Chavez)

Metric	Speed (mph)						Travel Time (min)						Planning Index					
Direction	Lavaca (NB)			Guadalupe (SB)			Lavaca (NB)			Guadalupe (SB)			Lavaca (NB)			Guadalupe (SB)		
Date	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ	Avg	6/28	Δ
5:00 PM	12.48												1.60	4.67	↑3.07	2.40	2.65	↑0.25
5:15 PM	11.76												1.63	4.67	↑3.04	3.05	3.78	↑0.73
5:30 PM	11.30												1.72	4.67	↑2.95	3.89	4.84	↑0.95
5:45 PM	9.08												2.14	4.67	↑2.53	3.99	3.75	↓0.24
6:00 PM	**10.78**												**1.98**	**4.67**	**↑2.69**	3.84	2.18	↓1.66
6:15 PM	10.04												1.77	4.67	↑2.90	3.09	2.91	↓0.18
6:30 PM	9.33												2.11	3.50	↑1.39	3.04	2.24	↓0.80
6:45 PM	8.29	5.20	↓3.09	11.75	13.56	↑1.81	2.03	3.11	↑1.08	1.96	1.50	↓0.46	2.40	3.50	↑1.10	2.35	1.58	↓0.77
7:00 PM	**9.71**	**10.26**	**↑0.55**	13.55	15.52	↑1.97	**1.76**	**1.58**	**↓0.18**	1.59	1.31	↓0.28	**1.99**	**1.56**	**↓0.43**	1.82	1.16	↓0.66
7:15 PM	11.43	12.38	↑0.95	11.88	16.42	↑4.54	1.53	1.31	↓0.22	1.76	1.24	↓0.52	1.83	1.17	↓0.66	1.68	0.99	↓0.69
7:30 PM	11.62	11.54	↓0.08	12.28	14.09	↑1.81	1.44	1.40	↓0.04	1.67	1.44	↓0.23	1.79	1.40	↓0.39	1.63	1.15	↓0.48
7:45 PM	12.08	10.00	↓2.08	14.12	15.35	↑1.23	1.38	1.62	↑0.24	1.46	1.32	↓0.14	1.38	1.40	↑0.02	1.49	1.23	↓0.26
Average	**10.66**	**6.21**	↓4.45	**9.74**	**10.31**	↑0.58	**1.64**	**3.45**	↑1.82	**2.40**	**2.41**	↑0.00	**1.86**	**3.38**	↑1.52	**2.69**	**2.37**	↓0.32

Positive Impacts of TMC

Speed	TT	PI
242%	-71%	-67%


Speed
+242%
True Food Kitchen
Parking System of America
Ballet Austin
Truluck's
Frank
Speakeasy
Oilcan Harry's
Rain
The Ginger Man
Mexic-Arte Museum
The Westin Austin Downtown
Casino El Camino
Eddie V's Prime Seafood
FedEx Office Print & Ship Center
Elephant Room
O. Henry Museum
Hilton Austin
La Condesa
Finley's
W Austin
Jo's Coffee
Lamberts
Shoal Beach at Town Lake Metropolitan Park
Austin City Hall
Second Bar + Kitchen
JW Marriott Austin
Uncle Julio's
Downtown Station
MAX's Wine Dive
Asian House
P.F. Chang's
Austin Cluetivity. Digital Scavenger Hunts and...
Austin Convention Center
Gus's World Famous Fried Chicken
Radisson Hotel & Suites Austin Downtown
Stevie Ray Vaughan Statue
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Iron Works Barbecue
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Congress Avenue Bridge
Four Seasons Hotel Austin
Ann and Roy Butler Hike and Bike Trail
Hyatt Regency Austin
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Hooters
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W 4th St
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West Ave
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Trinity St
Brazos St
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S 1st St
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W Riverside Dr
Willow St
Driskill St
Davis St
Rainey St
N Interstate 35 Frontage Rd
S IH 35 Frontage Rd
Kimley-Horn
Google
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Send feedback
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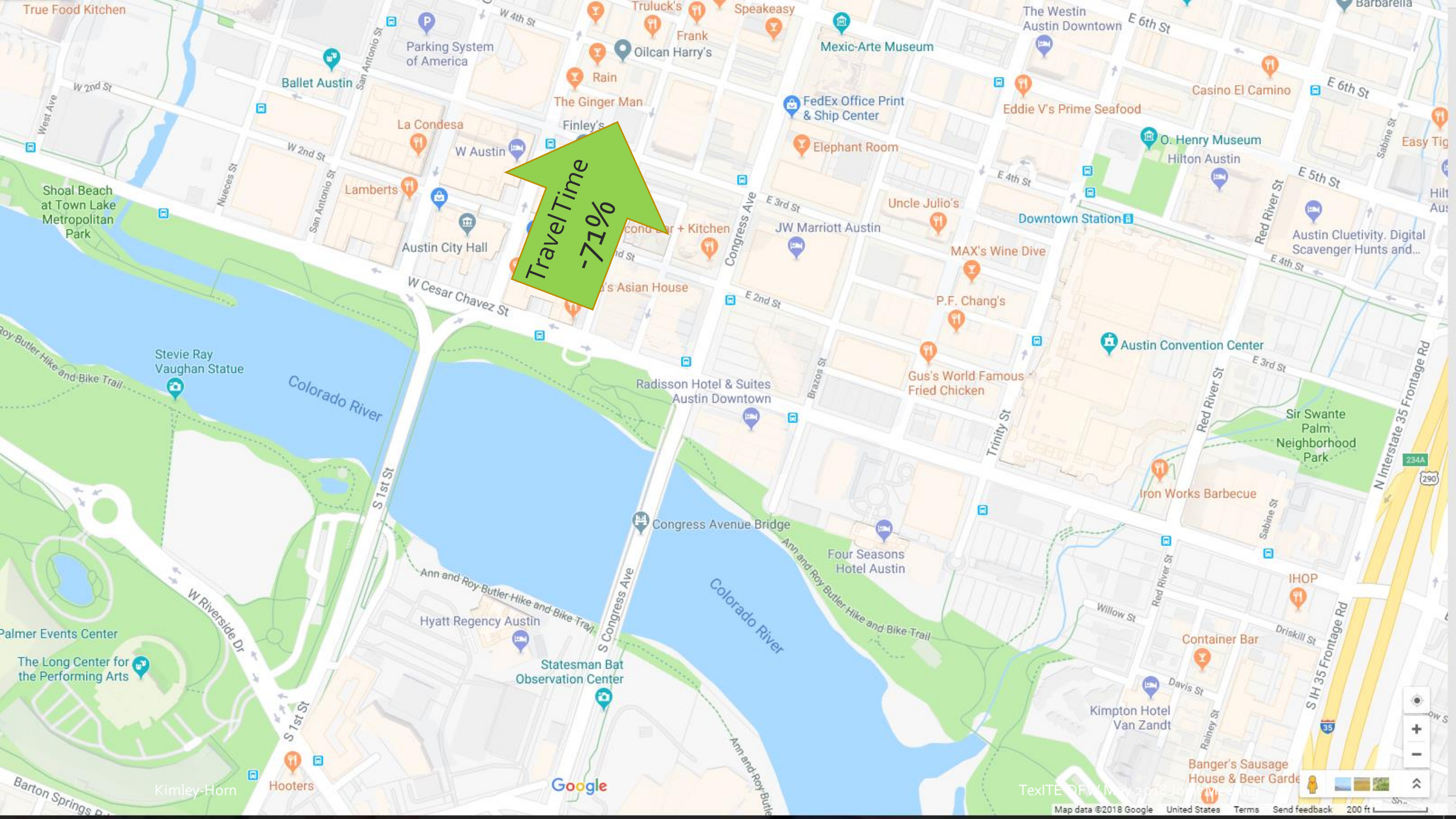
Travel Time
-71%
True Food Kitchen
Parking System of America
Ballet Austin
Truluck's
Frank
Speakeasy
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The Ginger Man
Mexic-Arte Museum
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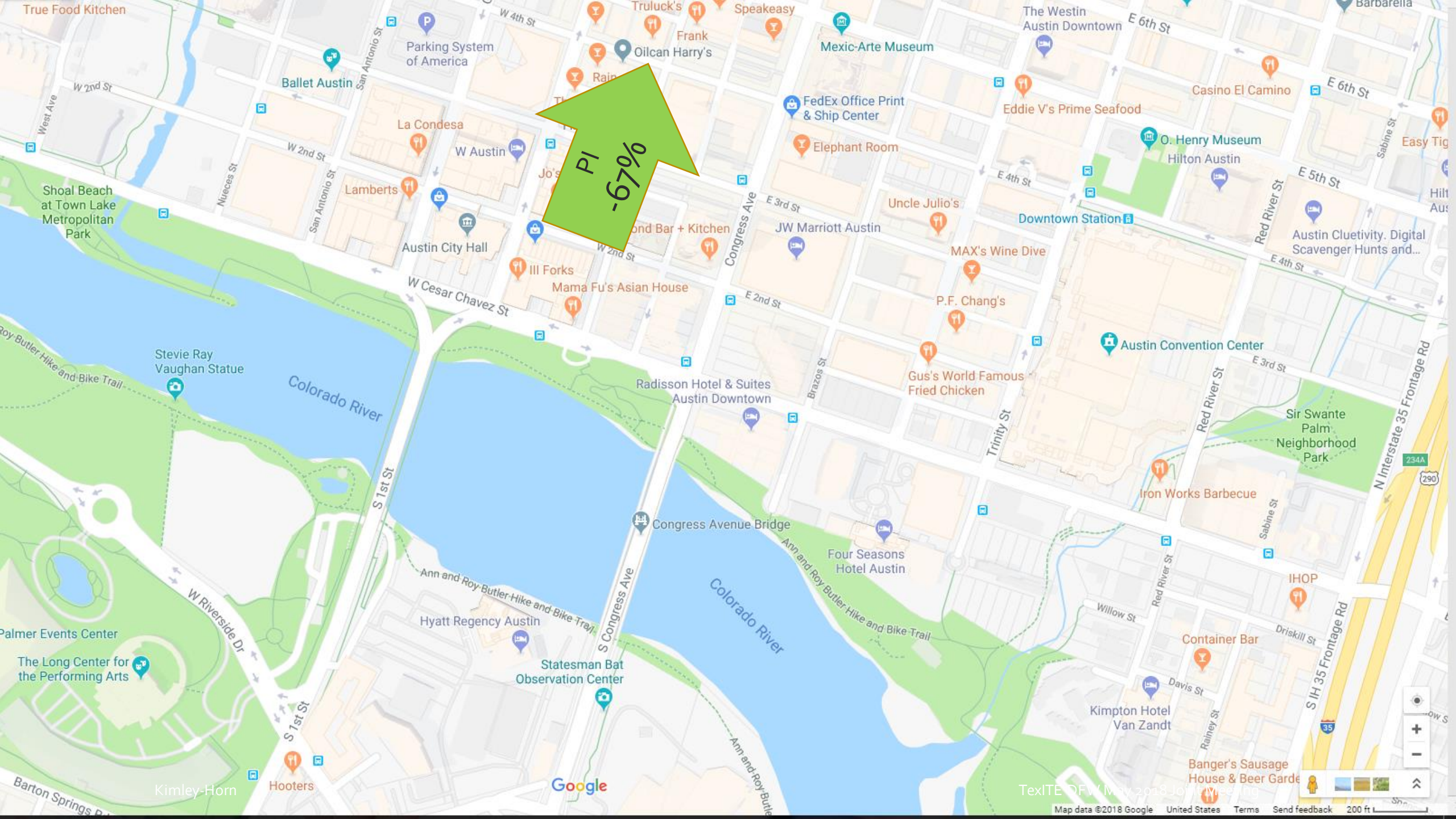
PI
-67%
True Food Kitchen
Truluck's
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LESSONS LEARNED

Quantifying the Benefits of the TMC

LESSONS LEARNED

- What is a normal day?
- What is statistically significant?
- How do you measure something that never happened?
- How do you quantify benefits?

APPLICATIONS IN AUSTIN

US 183 Shutdown

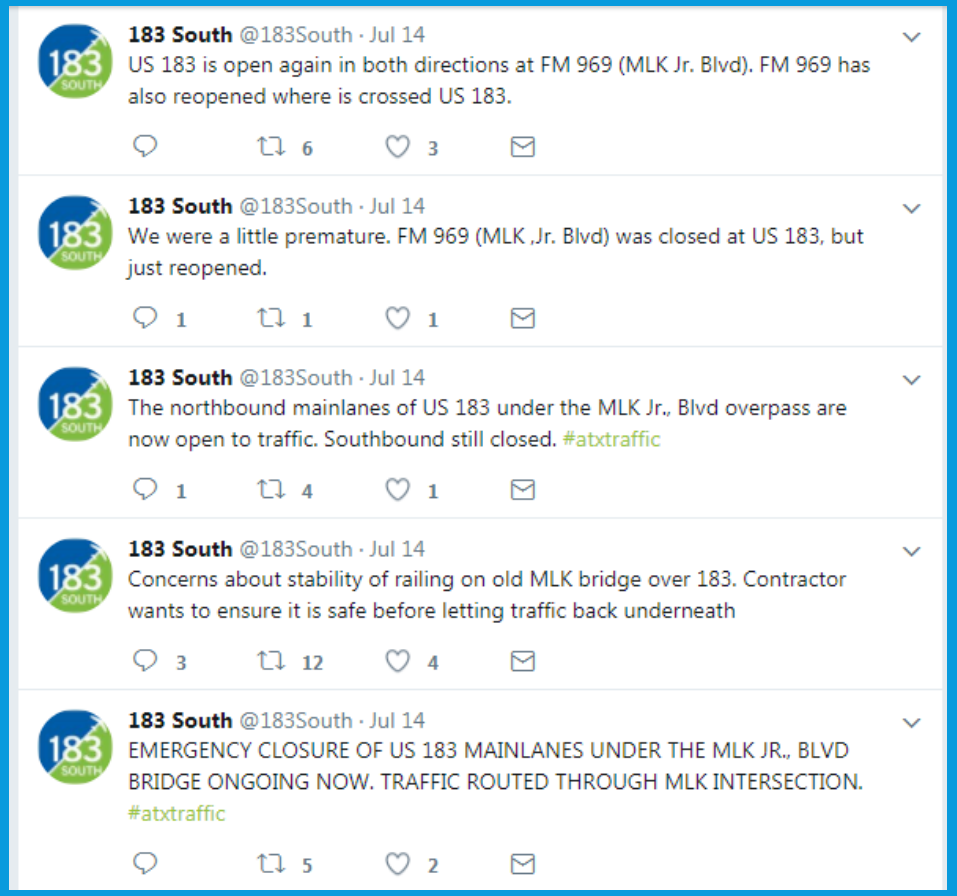
US 183

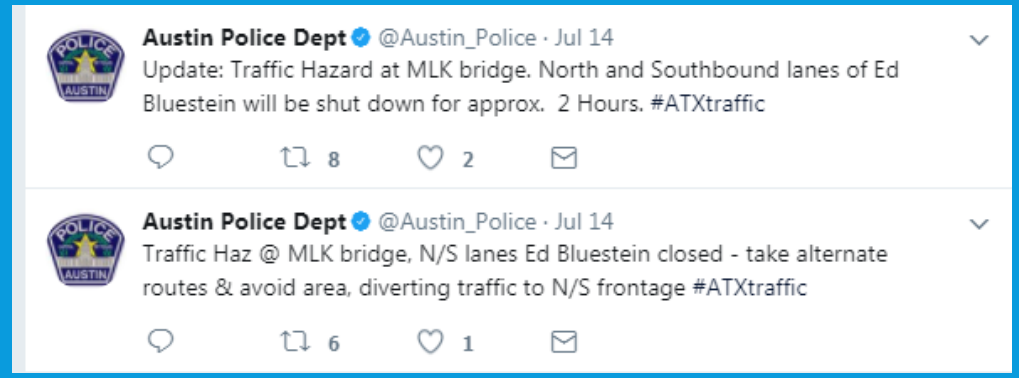
- Friday, July 14th, 2017
- TxDOT closed the mainlanes on US 183 at Martin Luther King Jr. Boulevard
- Unplanned closure to inspect the structural integrity of the bridge railing on the Martin Luther King Jr. Boulevard overpass
- The exact start time of the closure is unknown, but assumed to be prior to 10:30 AM.
- Contractor (not City) controls operations at the Martin Luther King Jr. Boulevard/US 183 interchange during construction.

TMC RESPONSE

- TMC staff was made aware of the closure, but TMC staff was not informed of the impromptu traffic management plan
- Closed-circuit television (CCTV) camera coverage in the affected area (East Austin) is sporadic
- TMC relied on Google Maps and INRIX data to spot congestion
- The only signals showing congestion were at the intersections of:
  - Martin Luther King Jr. Boulevard @ Springdale Road
  - Springdale Road @ 51st Street

TWITTER


183 South @183South · Jul 14
US 183 is open again in both directions at FM 969 (MLK Jr. Blvd). FM 969 has also reopened where is crossed US 183.
6 3
183 South @183South · Jul 14
We were a little premature. FM 969 (MLK ,Jr. Blvd) was closed at US 183, but just reopened.
1 1 1
183 South @183South · Jul 14
The northbound mainlanes of US 183 under the MLK Jr., Blvd overpass are now open to traffic. Southbound still closed. #atxtraffic
1 4 1
183 South @183South · Jul 14
Concerns about stability of railing on old MLK bridge over 183. Contractor wants to ensure it is safe before letting traffic back underneath
3 12 4
183 South @183South · Jul 14
EMERGENCY CLOSURE OF US 183 MAINLANES UNDER THE MLK JR., BLVD BRIDGE ONGOING NOW. TRAFFIC ROUTED THROUGH MLK INTERSECTION. #atxtraffic
5 2


Austin Police Dept @Austin_Police · Jul 14
Update: Traffic Hazard at MLK bridge. North and Southbound lanes of Ed Bluestein will be shut down for approx. 2 Hours. #ATXtraffic
8 2
Austin Police Dept @Austin_Police · Jul 14
Traffic Haz @ MLK bridge, N/S lanes Ed Bluestein closed - take alternate routes & avoid area, diverting traffic to N/S frontage #ATXtraffic
6 1

TMC RESPONSE

- Longer cycle lengths
  - Implemented approximately 10:35 AM
  - Deactivated approximately 12:30 PM
- The additional volume from diverting US 183 traffic was greater than the capacity at the intersection, but the longer cycle length was able to manage the queue.
- The TMC's actions enabled the queue to fully clear by approximately 11:50 AM, returning conditions to nearly normal.


120 sec plan activated at 11:00 AM
150 sec plan activated at 10:35 AM
Approximate US 183 Closure
E 51st St
Springdale Rd
Basswood Ln
Super 8 Austin/ Airport North
Harvey Penick Golf Campus
Walnut Creek
Rayburn Ln
Tower Trail
Hutchinson Dr
Krueger Ln
Bentsen Ln
Garden View Dr
King Charles Dr
King Henry Dr
Duchess Dr
Parliament Dr
Marlo Dr
Rimrock Trail
Pecan Springs Rd
Touchstone St
Walden Cir
Single Shot Cir
Bundyhill Dr
Broadhill Dr
Oldfort Hill Dr
Russet Hill Dr
Northdale Dr
Carsonhill Dr
York Hill Dr
Hilldale Dr
Eastdale Dr
Tannehill Ln
Torchy's Tac
Corporate Headquarte
Valero - Corner Store #1304
E Martin Luther King Jr Blvd
Austin Wildlife Rescue
969
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Heflin Ln
Scottsdale Rd
Overhill Dr
Oak Cliff Dr
Bandera Rd
Rhodes Rd
Adina St
Stone Gate Dr
Woodmoor Dr
Webberville Rd
Church of Christ at East Side
Dollar General
Craigwood Dr
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Leslie Ave
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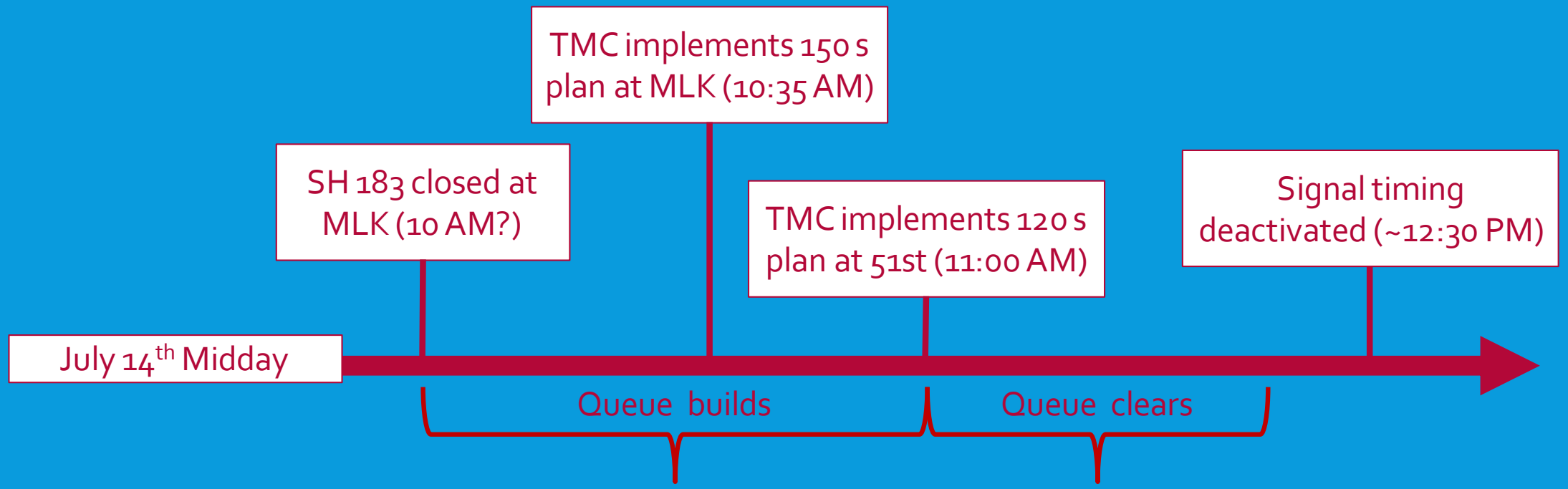
Wally Ave
Meander Dr
St. James' Episcopal Church
Greater Mount Zion Baptist Church
Ed Bluestein Blvd
Marcel Gres Dr
Kimley-Horn
TexITE DFW May 2018 Joint Meeting

TIMELINE


TMC implements 150 s plan at MLK (10:35 AM)
SH 183 closed at MLK (10 AM?)
TMC implements 120 s plan at 51st (11:00 AM)
Signal timing deactivated (~12:30 PM)
July 14th Midday
Queue builds
Queue clears

METHODOLOGY

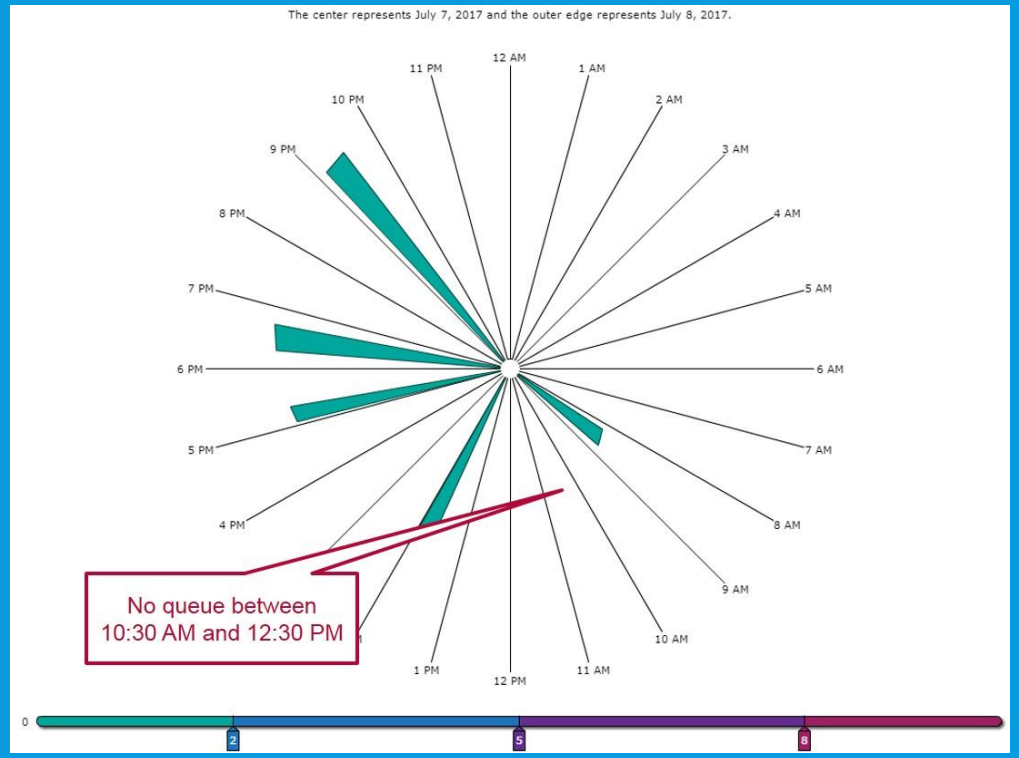
- Worst-case condition
  - Largest negative deviation from the baseline data before or just after the timing was adjusted
- Best-case condition
  - Largest positive deviation from the baseline data after the timing was adjusted

METHODOLOGY

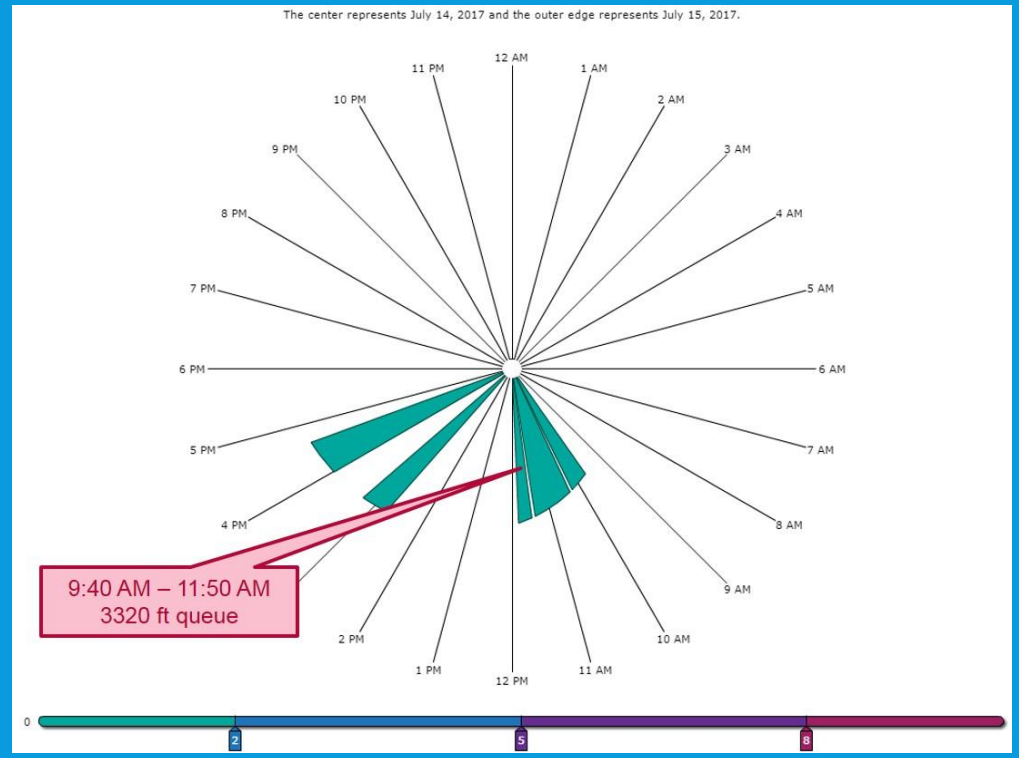
- SB Springdale Road at Martin Luther King, Jr. Boulevard
  - Only roadway section analyzed
  - Focus of the TMC's efforts
  - All extra green time was allocated to southbound through movements

- The performance measures for Springdale Road between Webberville Road and Manor Road on July 14th were compared to the average values for other Fridays in June and July 2017:
  - June 9, 2017
  - June 16, 2017
  - June 23, 2017
  - June 30, 2017
  - July 7, 2017
  - July 21, 2017
  - July 28, 2017

SB SPRINGDALE ROAD QUEUES

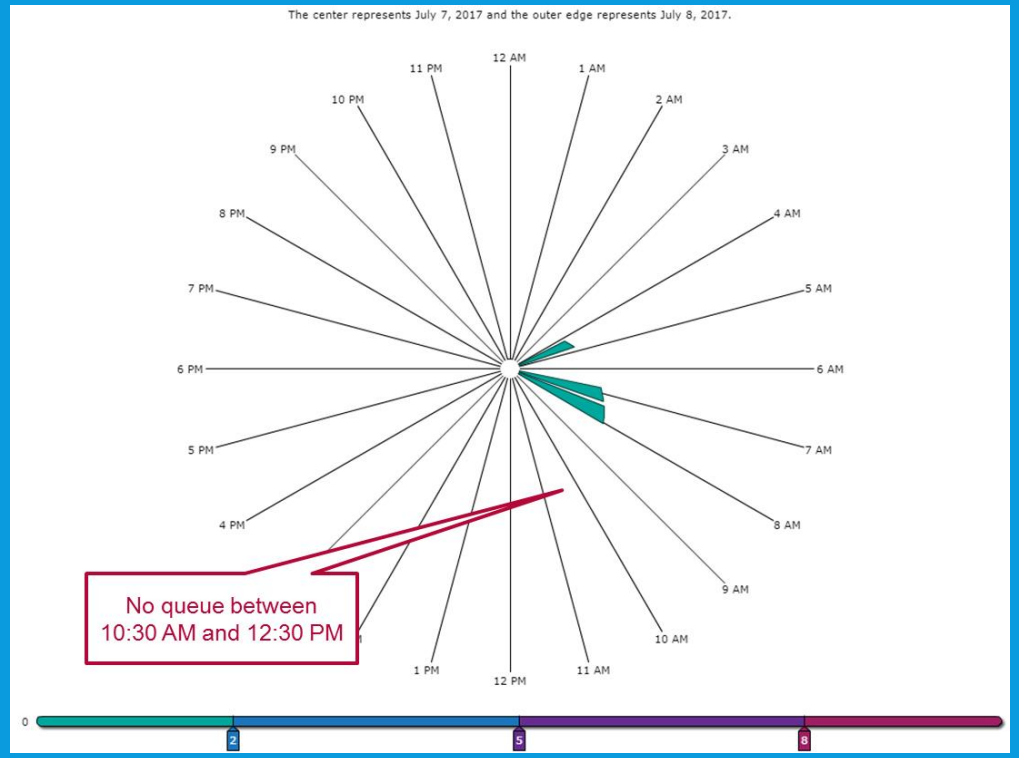


July 7th, 2017 ("Normal")

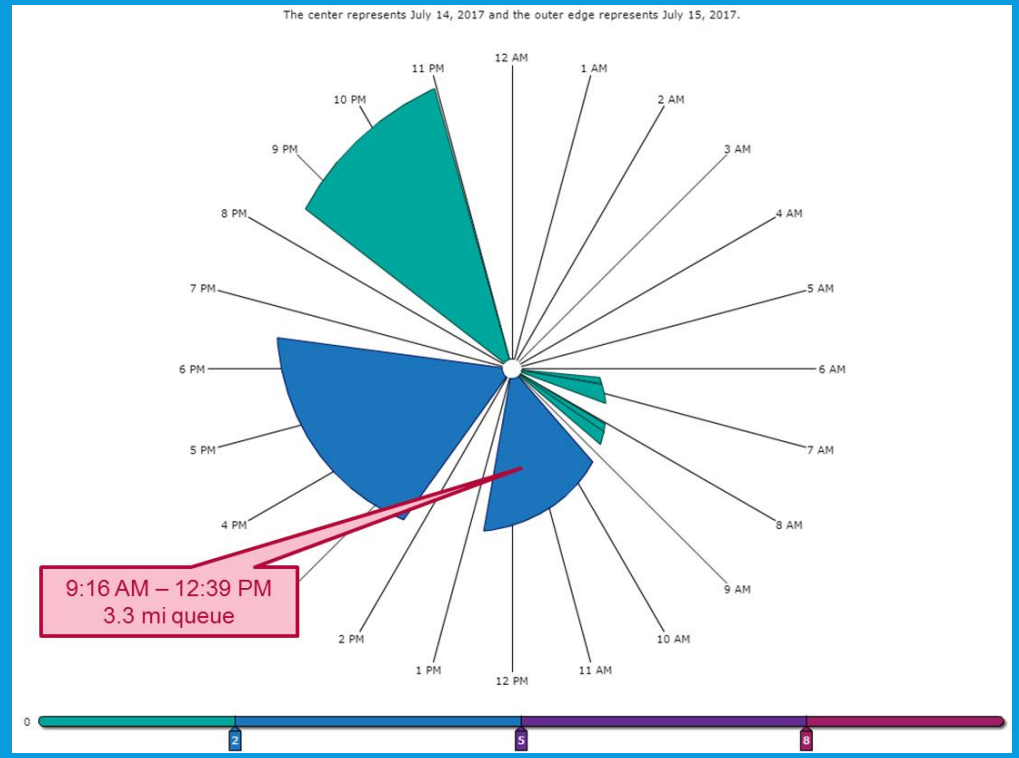


July 14th, 2017 (Incident)

SB 183 QUEUES



July 7th, 2017 ("Normal")



July 14th, 2017 (Incident)

City of Austin Transportation Management Center

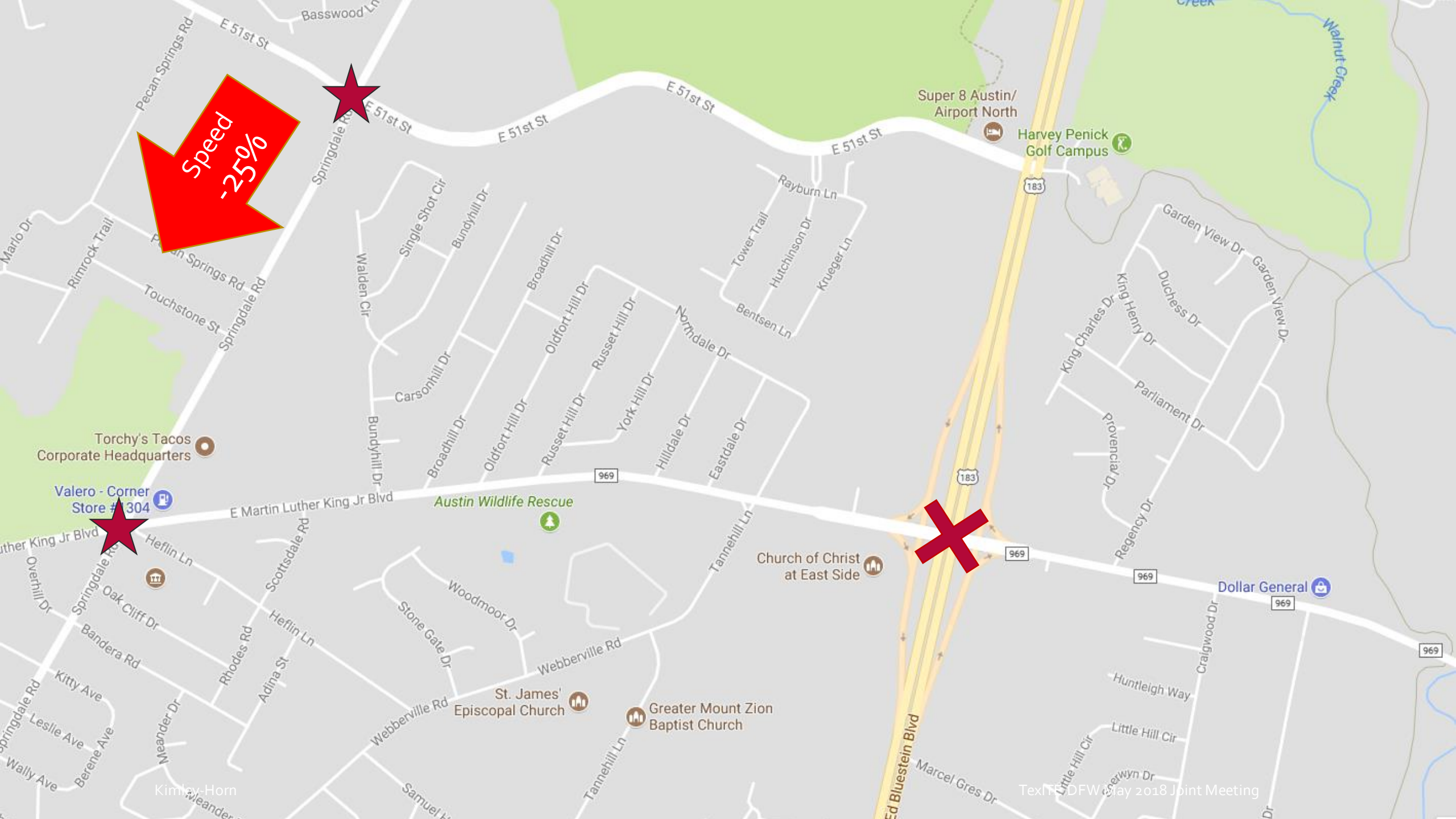
Performance Measures Report - US 183 Closure

July 14th vs. July 7th

Springdale Rd (Webberville Rd to Manor Rd)	Metric	Speed (mph)						Travel Time (min)						Planning Index						Congestion					
	Direction	Northbound			Southbound			Northbound			Southbound			Northbound			Southbound			Northbound			Southbound		
	Date	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ
	10:00 AM	26.76	24.11	↓2.65	27.75	23.77	↓3.98	5.76	6.39	↑0.63	5.56	6.49	↑0.93	1.09	1.48	↑0.39	1.36	1.48	↑0.12	95.92%	86.43%	↓9.49%	95.35%	81.69%	↓13.66%
	10:15 AM	27.77	21.57	↓6.20	27.56	20.34	↓7.22	5.55	7.14	↑1.59	5.60	7.59	↑1.99	1.00	1.61	↑0.61	1.38	1.91	↑0.53	99.54%	77.31%	↓22.23%	94.72%	69.88%	↓24.84%
	10:30 AM	26.50	26.34	↓0.16	**27.66**	**19.67**	↓7.99	5.81	5.85	↑0.04	**5.58**	**7.84**	↑2.26	1.18	1.38	↑0.20	**1.07**	**1.72**	↑0.65	95.00%	94.43%	↓0.57%	**95.04%**	**67.60%**	↓27.44%
	10:45 AM	26.03	26.18	↑0.15	27.11	19.21	↓7.90	5.92	5.88	↓0.04	5.69	8.03	↑2.34	1.24	1.21	↓0.03	1.11	1.54	↑0.43	93.32%	93.83%	↑0.51%	93.16%	66.01%	↓27.15%
	11:00 AM	27.23	21.35	↓5.88	26.41	22.36	↓4.05	5.66	7.22	**↑1.56**	5.84	6.90	↑1.06	1.14	1.50	**↑0.36**	1.13	1.54	↑0.41	97.63%	76.52%	↓21.11%	90.75%	76.83%	↓13.92%
	11:15 AM	27.14	22.80	**↓4.34**	28.65	26.73	↓1.92	5.68	6.76	↑1.08	5.39	5.77	↑0.38	1.15	1.25	↑0.10	1.06	1.36	↑0.30	97.29%	81.72%	↓15.57%	98.47%	91.86%	↓6.61%
	11:30 AM	26.35	26.81	↑0.46	28.49	23.54	↓4.95	5.85	5.75	↓0.10	5.42	6.56	↑1.14	1.20	1.15	↓0.05	1.04	1.61	↑0.57	94.44%	96.10%	↑1.66%	97.90%	80.88%	↓17.02%
	11:45 AM	22.16	28.28	↑6.12	30.64	23.07	↓7.57	6.95	5.45	↓1.50	5.04	6.69	↑1.65	1.20	1.11	↓0.09	1.04	1.73	↑0.69	79.44%	100.00%	↑20.56%	100.00%	79.29%	↓20.71%
	12:00 PM	25.94	29.40	**↑3.46**	29.00	24.81	↓4.19	5.94	5.24	**↓0.70**	5.32	6.22	↑0.90	1.16	1.01	**↓0.15**	1.04	1.62	↑0.58	92.99%	100.00%	↑7.01%	99.64%	85.25%	↓14.39%
	12:15 PM	23.02	28.38	↑5.36	29.90	25.84	↓4.06	6.69	5.43	↓1.26	5.16	5.97	↑0.81	1.28	1.03	↓0.25	1.03	1.65	↑0.62	82.53%	100.00%	↑17.47%	100.00%	88.79%	↓11.21%
	12:30 PM	21.35	23.13	↑1.78	28.66	25.68	↓2.98	7.21	6.66	↓0.55	5.38	6.01	↑0.63	1.31	1.21	↓0.10	1.06	1.60	↑0.54	76.54%	82.92%	↑6.38%	98.48%	88.24%	↓10.24%
	12:45 PM	22.67	24.67	↑2.00	**27.65**	**26.61**	↓1.04	6.80	6.24	↓0.56	**5.58**	**5.80**	↑0.22	1.45	1.22	↓0.23	**1.15**	**1.08**	↓0.07	81.26%	88.44%	↑7.18%	**95.01%**	**91.43%**	↓3.58%
	Average	**25.24**	**25.25**	↑0.01	**28.29**	**23.47**	↓4.82	**6.15**	**6.17**	↑0.02	**5.46**	**6.66**	↑1.19	**1.20**	**1.26**	↑0.06	**1.12**	**1.57**	↑0.45	90.49%	89.81%	↓0.68%	96.54%	80.65%	↓15.90%

NEGATIVE IMPACTS

- Before the timing was implemented by the TMC, diverting US 183 traffic had the following negative impacts on Southbound Springdale Road:
- Speed decreased 25% below typical
  - 25.63 mph typical vs. 19.21 mph on 7/14
  - Typical range 23.95 - 27.31 mph
- Planning index increased 35% above typical
  - 1.14 typical vs. 1.54 on 7/14
  - Typical range 1.06 - 1.22
- Despite the decreased speed and increased planning index, the travel time on southbound Springdale Road between Webberville Road and Manor Road decreased 1%, still within the typical range of 7.47 - 8.75 minutes.


Speed
-25%
E 51st St
Springdale Rd
Pecan Springs Rd
Basswood Ln
Super 8 Austin/
Airport North
Harvey Penick
Golf Campus
Walnut Creek
Rayburn Ln
Tower Trail
Hutchinson Dr
Krueger Ln
Bentsen Ln
Garden View Dr
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Duchess Dr
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Regency Dr
Rimrock Trail
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183
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Episcopal Church
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Huntleigh Way
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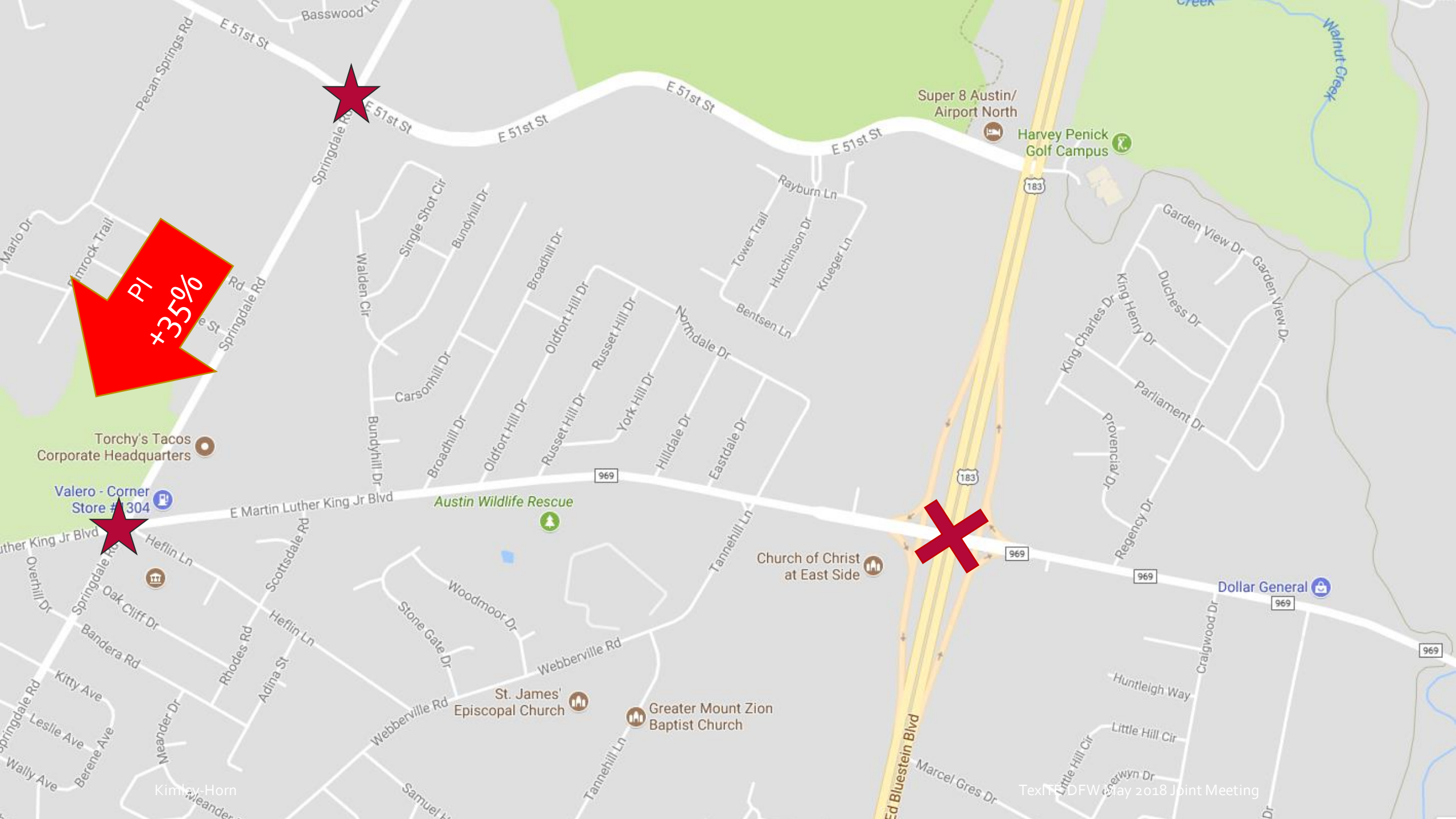
Little Hill Cir
Ed Bluestein Blvd
Marcel Gres Dr
Kimley-Horn
TexITE DFW May 2018 Joint Meeting


PI
+35%
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Pecan Springs Rd
Basswood Ln
Super 8 Austin/
Airport North
Harvey Penick
Golf Campus
Walnut Creek
Rayburn Ln
Tower Trail
Hutchinson Dr
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TexITE DFW May 2018 Joint Meeting

City of Austin Transportation Management Center

Performance Measures Report - US 183 Closure

July 14th vs. July 7th

Springdale Rd (Webberville Rd to Manor Rd)	Metric	Speed (mph)						Travel Time (min)						Planning Index						Congestion					
	Direction	Northbound			Southbound			Northbound			Southbound			Northbound			Southbound			Northbound			Southbound		
	Date	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ	7/4	7/14	Δ
	10:00 AM	26.76	24.11	↓2.65	27.75	23.77	↓3.98	5.76	6.39	↑0.63	5.56	6.49	↑0.93	1.09	1.48	↑0.39	1.36	1.48	↑0.12	95.92%	86.43%	↓9.49%	95.35%	81.69%	↓13.66%
	10:15 AM	27.77	21.57	↓6.20	27.56	20.34	↓7.22	5.55	7.14	↑1.59	5.60	7.59	↑1.99	1.00	1.61	↑0.61	1.38	1.91	↑0.53	99.54%	77.31%	↓22.23%	94.72%	69.88%	↓24.84%
	10:30 AM	26.50	26.34	↓0.16	**27.66**	**19.67**	↓7.99	5.81	5.85	↑0.04	**5.58**	**7.84**	↑2.26	1.18	1.38	↑0.20	**1.07**	**1.72**	↑0.65	95.00%	94.43%	↓0.57%	**95.04%**	**67.60%**	↓27.44%
	10:45 AM	26.03	26.18	↑0.15	27.11	19.21	↓7.90	5.92	5.88	↓0.04	5.69	8.03	↑2.34	1.24	1.21	↓0.03	1.11	1.54	↑0.43	93.32%	93.83%	↑0.51%	93.16%	66.01%	↓27.15%
	11:00 AM	27.23	21.35	↓5.88	26.41	22.36	↓4.05	5.66	7.22	**↑1.56**	5.84	6.90	↑1.06	1.14	1.50	**↑0.36**	1.13	1.54	↑0.41	97.63%	76.52%	↓21.11%	90.75%	76.83%	↓13.92%
	11:15 AM	27.14	22.80	**↓4.34**	28.65	26.73	↓1.92	5.68	6.76	↑1.08	5.39	5.77	↑0.38	1.15	1.25	↑0.10	1.06	1.36	↑0.30	97.29%	81.72%	↓15.57%	98.47%	91.86%	↓6.61%
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	11:45 AM	22.16	28.28	↑6.12	30.64	23.07	↓7.57	6.95	5.45	↓1.50	5.04	6.69	↑1.65	1.20	1.11	↓0.09	1.04	1.73	↑0.69	79.44%	100.00%	↑20.56%	100.00%	79.29%	↓20.71%
	12:00 PM	25.94	29.40	**↑3.46**	29.00	24.81	↓4.19	5.94	5.24	**↓0.70**	5.32	6.22	↑0.90	1.16	1.01	**↓0.15**	1.04	1.62	↑0.58	92.99%	100.00%	↑7.01%	99.64%	85.25%	↓14.39%
	12:15 PM	23.02	28.38	↑5.36	29.90	25.84	↓4.06	6.69	5.43	↓1.26	5.16	5.97	↑0.81	1.28	1.03	↓0.25	1.03	1.65	↑0.62	82.53%	100.00%	↑17.47%	100.00%	88.79%	↓11.21%
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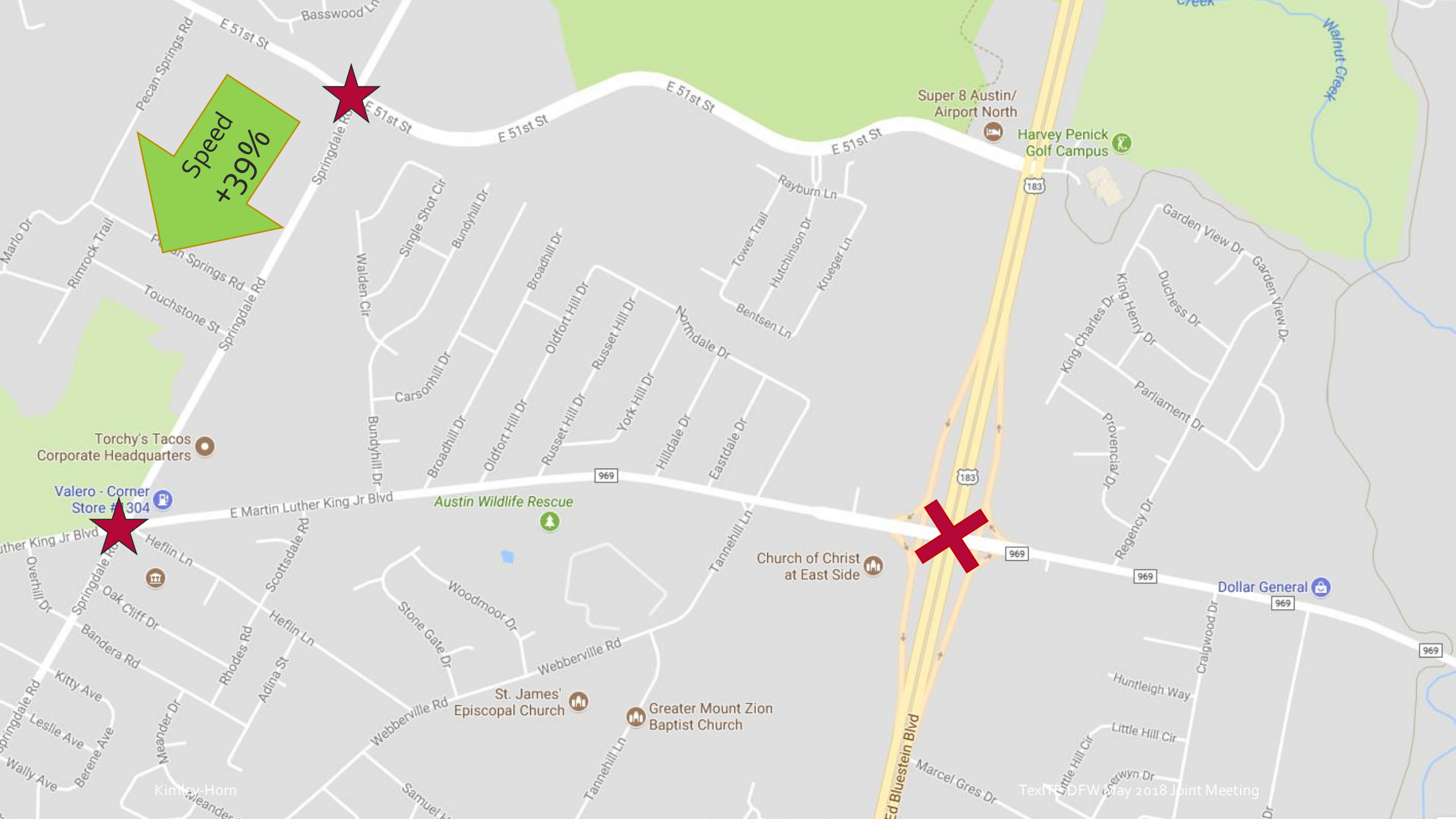
BENEFITS OF TMC RESPONSE

- Speed increased by 39%
  - 19.21 mph at 10:45 AM vs. 26.61 mph at 12:45 PM
  - Typical range 22.46 - 25.4 mph
- Travel time reduced by 28%
  - 8.03 minutes at 10:45 AM vs. 5.80 minutes at 12:45 PM
  - Typical range 8.12 - 9.2 min
- Planning index reduced by 30%
  - 1.54 at 10:45 AM vs. 1.08 minutes at 12:45 PM
  - Typical range 1.2 - 1.42


Speed
+39%
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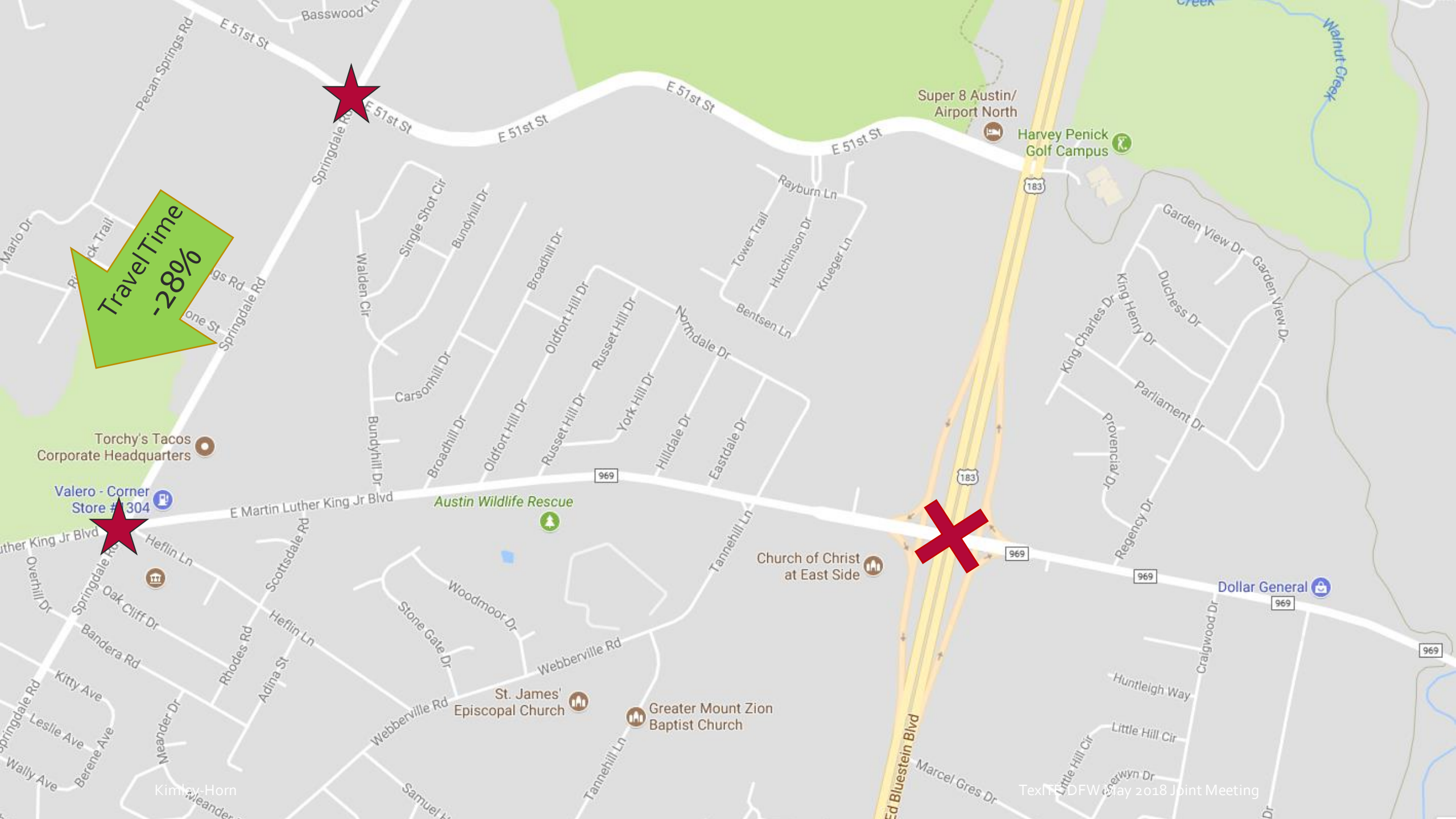
Samuel


Travel Time
-28%
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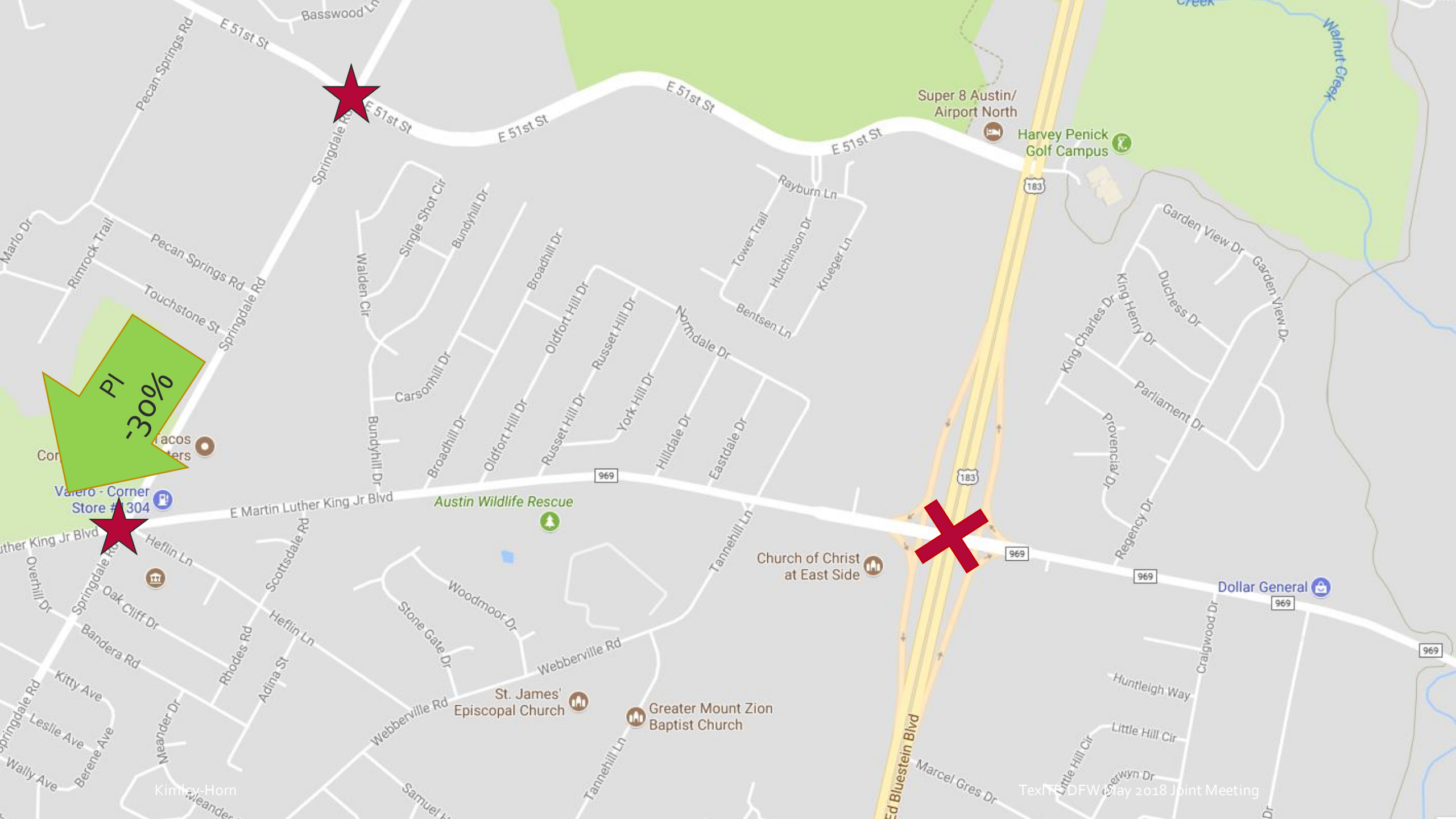
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Basswood Ln
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Ed Bluestein Blvd
Marcel Gres Dr
Kimley-Horn
TexITE DFW May 2018 Joint Meeting

DISCUSSION

- Even though the TMC was not able to directly observe the issue with CCTV, other data sources were able to fill in the blanks enough to generate a quick response
- Limited information
  - TMC intervened as much as prudent
  - Further changes without monitoring capabilities (i.e. CCTV in the area) would have potentially caused more harm than good
- Increase communication
- Prepare timing plans in advance
- Even though the TMC was not able to directly observe the issue with CCTV, other data sources were able to fill in the blanks enough to generate a quick response.
- The congestion caused by the lane closure was successfully managed; queues were reduced and the worst impacts mitigated.

LESSONS LEARNED

US 183 Shutdown

LESSONS LEARNED/DISCUSSION

- What is statistically significant?
- How do you measure something that never happened?
- How do you monitor without CCTV?

City of Austin Transportation Management Center

Performance Measures Report - US 183 Closure

July 14th vs. Typical Friday (6/9-7/28)

	Metric	Speed (mph)			Travel Time (min)			Planning Index		
	Direction	Northbound			Northbound			Northbound		
	Date	Typical Range	7/14	In Range?	Typical Range	7/14	In Range?	Average Range	7/14	In Range?
US 183 (Loyola Ln to Smith Rd)	10:00 AM	43.01 - 46.07 mph	**11.39**	No (Low)	6.85 - 7.33 min	**18.93**	No (High)	1.14 to 1.46	**6.40**	No (High)
	10:15 AM	45.16 - 49.22 mph	**8.56**	No (Low)	6.42 - 6.98 min	**25.19**	No (High)	1.07 to 1.23	**6.70**	No (High)
	10:30 AM	44.97 - 47.71 mph	**7.90**	No (Low)	6.61 - 7.01 min	**27.28**	No (High)	1.13 to 1.27	**6.60**	No (High)
	10:45 AM	44.65 - 47.15 mph	**9.91**	No (Low)	6.68 - 7.06 min	**21.76**	No (High)	1.1 to 1.24	**6.57**	No (High)
	11:00 AM	44.91 - 47.79 mph	**11.52**	No (Low)	6.59 - 7.03 min	**18.72**	No (High)	1.1 to 1.2	**5.24**	No (High)
	11:15 AM	44.38 - 46.84 mph	**17.22**	No (Low)	6.73 - 7.11 min	**12.52**	No (High)	1.14 to 1.56	**4.16**	No (High)
	11:30 AM	43.52 - 46.18 mph	**25.81**	No (Low)	6.83 - 7.25 min	**8.35**	No (High)	1.15 to 1.35	**2.79**	No (High)
	11:45 AM	42.57 - 46.23 mph	**40.61**	No (Low)	6.84 - 7.4 min	**5.31**	No (Low)	1.21 to 1.37	**1.42**	No (High)
	12:00 PM	41.04 - 46.84 mph	**41.11**	Yes	6.73 - 7.73 min	**5.24**	No (Low)	1.13 to 1.33	**1.69**	No (High)
	12:15 PM	39.54 - 44.74 mph	**50.99**	No (High)	7.05 - 8.01 min	**4.23**	No (Low)	1.22 to 1.48	**1.08**	No (Low)
	12:30 PM	34.88 - 42.42 mph	**47.49**	No (High)	7.46 - 9.14 min	**4.54**	No (Low)	1.28 to 1.6	**1.18**	No (Low)
	12:45 PM	32.34 - 41 mph	**44.50**	No (High)	7.7 - 9.96 min	**4.85**	No (Low)	1.31 to 1.81	**1.31**	No (Low)

Conditional formatting key:

↑0.82%	Speed ↑, TT ↓, PI ↓
↓1.42%	Speed ↓, TT ↑, PI ↑

APPLICATIONS IN AUSTIN

Before & After Studies

RM 2222 CORRIDOR INFORMATION

- 1.8 miles
- 7 signalized intersections
  - 861: RM 2222 & Bell Mountain Road
  - 689: RM 2222 & Jester Boulevard
  - 536: RM 2222 & City Park Road
  - 991: RM 2222 & Capital of Texas Highway Southbound Frontage Road
  - 992: RM 2222 & Capital of Texas Highway Northbound Frontage Road
  - 870: RM 2222 & Lakewood Drive
- Average speed limit 53.42 mph
- Five-lane undivided cross-section, with a two-way left-turn lane


861
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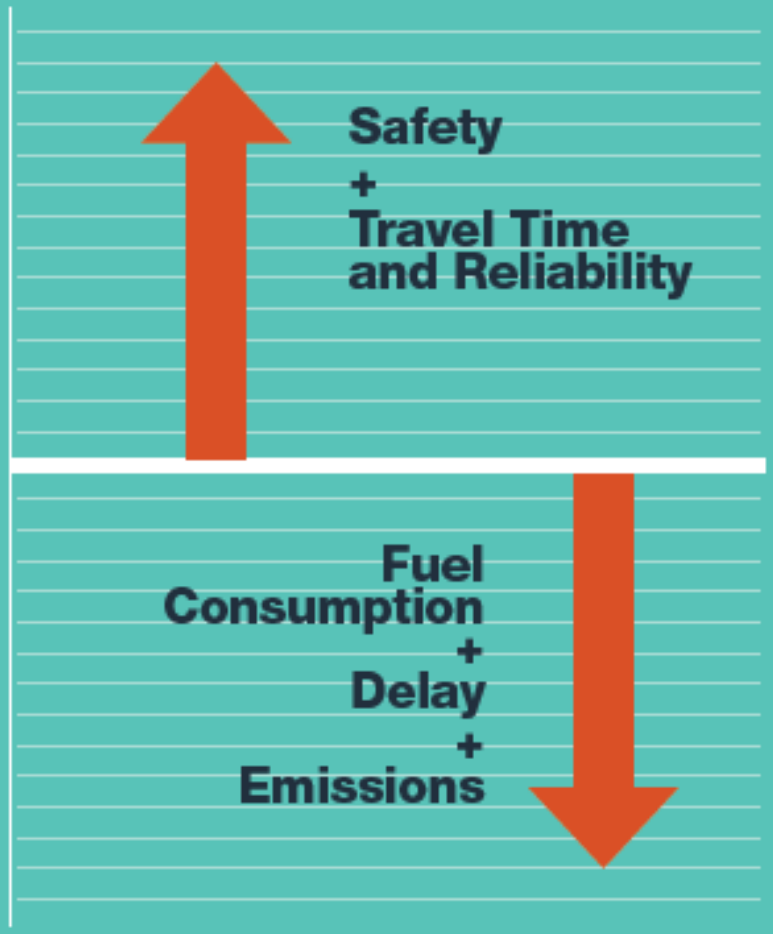
Bell Mountain Dr
Vaught Ranch Rd
Halbert Dr
Anaqua Dr
Rusty Fig Dr
Beauford Dr
Ledge Dr
Creekbluff Dr
Wallace Cove
Wallace Dr
Long Canyon Dr
Lakemoore Dr
Driftwood Dr
Lemonwood Dr
Smokey Valley
Cat Creek Trail
Back Trail Dr
Ladera Norte
Far W Blvd
N Capital of Texas Hwy
Finklea Cove
Coldwater Mountain Ct
Bridge Point Pkwy
Long Ct
360
Kimley-Horn
Texas DFW May 2018 Joint Meeting
Google Earth

RETIMING EFFORT

- City of Austin Staff implemented between January 15th and January 19th, 2018.
  - Adjusting splits to balance delay among all approaches
  - Adjusting offsets in the field to maximize progression on RM 2222
  - Optimizing sequences.
- The three weekday peaks were included in the retiming effort:
  - AM peak period: 6:30 AM - 9:00 AM
  - Midday peak period: 9:00 AM – 3:30 PM
  - PM peak period: 3:30 PM - 7:00 PM
- The existing cycle lengths were not changed as part of this retiming effort. The AM and PM peak periods remained at a 150-second cycle, and the Midday peak period remained at a 120-second cycle.

GOALS

- Prior to the retiming effort, the operations on the corridor were not observed to be unsatisfactory; the retiming effort was driven by scheduling. Field observations of the "before" condition showed possible improvements to splits, offsets, and sequences.
- The City of Austin's standard goal for retiming efforts is to reduce travel times by 5%. This was the only quantified goal of the RM 2222 signal retiming effort.



METHODOLOGY

- Data from INRIX was used to estimate the signal performance before and after the corridor was retimed. The data was collected one month before and one month after implementation, excluding major special events (e.g. SXSW), holidays (e.g. Christmas), and changes in school schedule (e.g. end of term).
- The data was examined for three time periods: weekday AM, weekday midday, and weekday PM.
- For periods lasting more than one hour, an average value of each MOE was calculated.

MEASURES OF EFFECTIVENESS

- Travel time (minutes)
- Speed (miles per hour)
- Travel time index
- Delay
- Buffer Time
- Planning Index
- User Delay Cost

ANALYSIS PERIODS

Before

- October 16th – November 17th, 2017
- One full month
- Prior to implementation
- Avoided
  - Thanksgiving (November 23rd, 2017)
  - Christmas (December 24th & 25th, 2017)
  - New Year's Eve (December 31st, 2017)
  - New Year's Day (January 1st, 2018)
- University of Texas in session
- Austin ISD in session

After

- January 22nd – February 23rd, 2018
- One full month
- After implementation
- University of Texas in session
- Austin ISD in session

ANALYSIS PERIODS

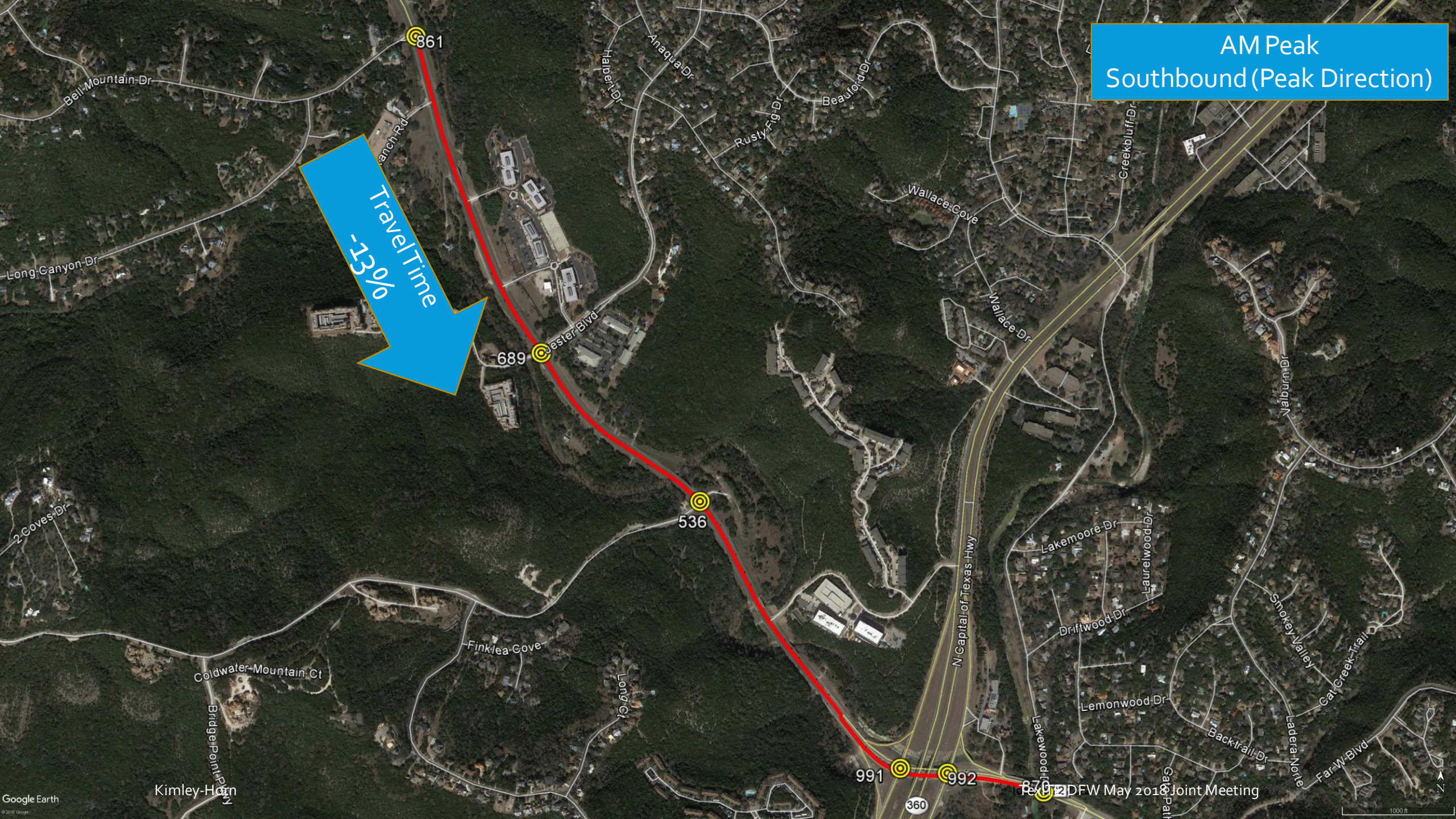
- Weekends are excluded from the City's annual signal retiming project.
- The City of Austin's standard assumed peak hours were used for analysis:
  - AM peak period: 6:30 AM - 9:00 AM
  - MD peak period: 9:00 AM – 3:30 PM
  - PM peak period: 3:30 PM - 7:00 PM

ANALYSIS AND RESULTS

- Travel Time
- Speed
- Travel Time Index
- Delay

TRADITIONAL MOES

Peak Period		Travel Time (s)		Speed (mph)		Travel Time Index		Delay (s)	
		NB	SB	NB	SB	NB	SB	NB	SB
AM (6:30 AM - 9:00 AM)	Before	203	202	38.20	37.59	1.16	1.22	55	54
	After	208	175	37.34	42.78	1.19	1.08	60	28
	Δ	+5	-27	-0.87	+5.19	+0.03	-0.14	+5	-26
	Δ%	+2%	-13%	-2%	+14%	+3%	-11%	+9%	-48%
MD (9:00 AM – 3:30 PM)	Before	188	173	41.07	43.23	1.07	1.05	40	26
	After	192	170	40.31	43.96	1.10	1.05	44	22
	Δ	+4	-3	-0.76	+0.73	+0.03	0.00	+4	-4
	Δ%	+2%	-2%	-2%	+2%	+3%	0%	+10%	-15%
PM (3:30 PM - 7:00 PM)	Before	221	190	35.55	39.49	1.25	1.15	73	42
	After	210	183	37.00	40.90	1.20	1.13	62	35
	Δ	-11	-7	+1.44	+1.41	-0.05	-0.02	-11	-7
	Δ%	-5%	-4%	+4%	+4%	-4%	-2%	-15%	-17%
Overall	Before	190	175	40.81	42.98	1.08	1.06	43	27
	After	189	169	40.96	44.47	1.08	1.04	42	21
	Δ	-1	-7	+0.16	+1.49	0.00	-0.02	-1	-6
	Δ%	-1%	-4%	+0%	+3%	0%	-2%	-2%	-22%


AM Peak
Southbound (Peak Direction)
TravelTime
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Bell Mountain Dr
Long Canyon Dr
2 Coves Dr
Coldwater Mountain Ct
Bridge Point Pkwy
Finklea Cove
Long Ct
Halper Dr
Anaqua Dr
Rusty Fig Dr
Beaufort Dr
Wallace Cove
Wallace Dr
Creekbluff Dr
Lakemoore Dr
Laurelwood Dr
Driftwood Dr
N Capital of Texas Hwy
Lakewood Trl
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Back Trail Dr
Smokey Valley
Cat Creek Trail
Ladera Norte
Far W Blvd
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Kimley-Horn
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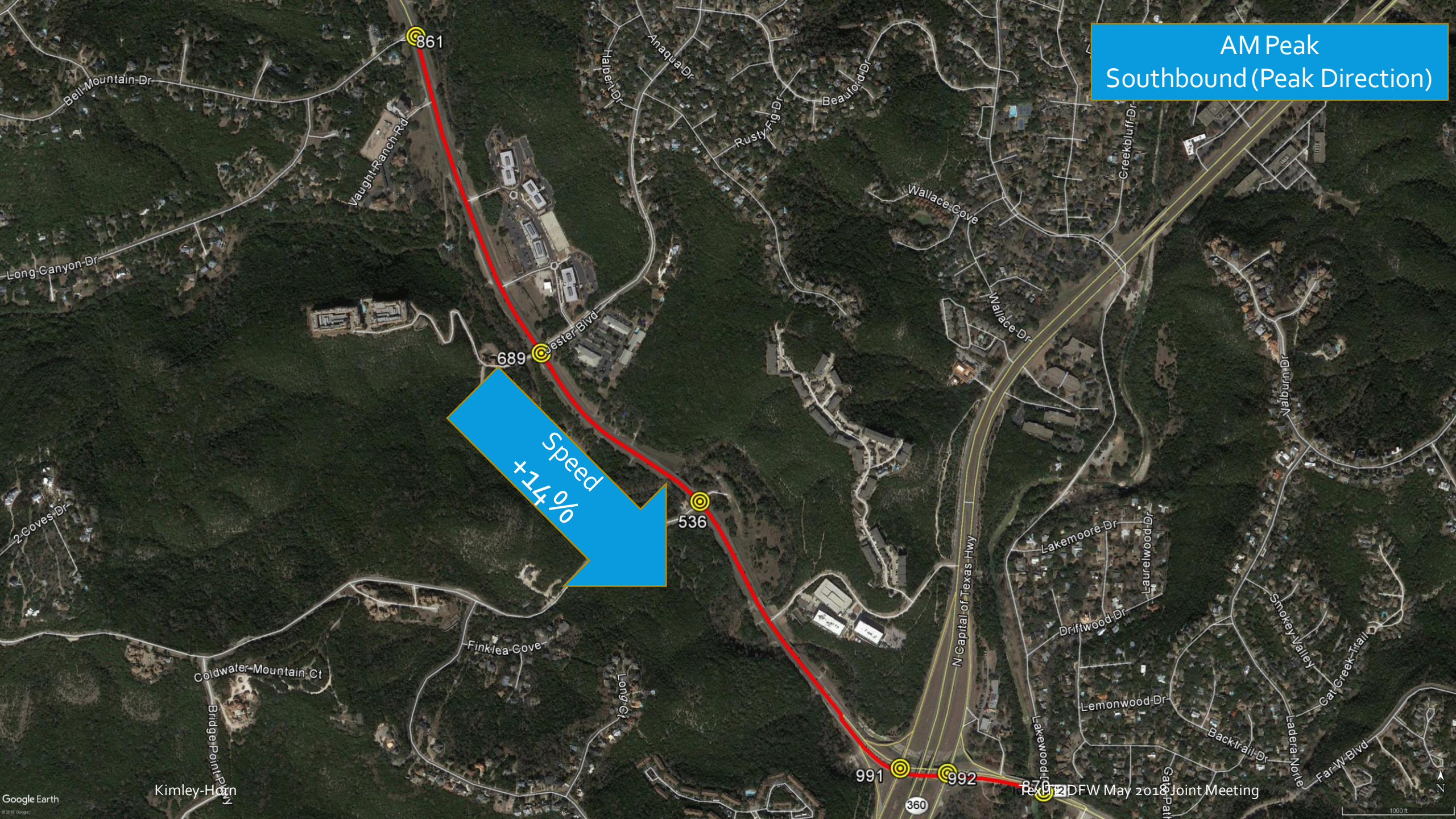
AM Peak
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Finklea Cove
Coldwater Mountain Ct
Bridge Point Pkwy
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Laurelwood Dr
Driftwood Dr
Smokey Valley
Cat Creek Trail
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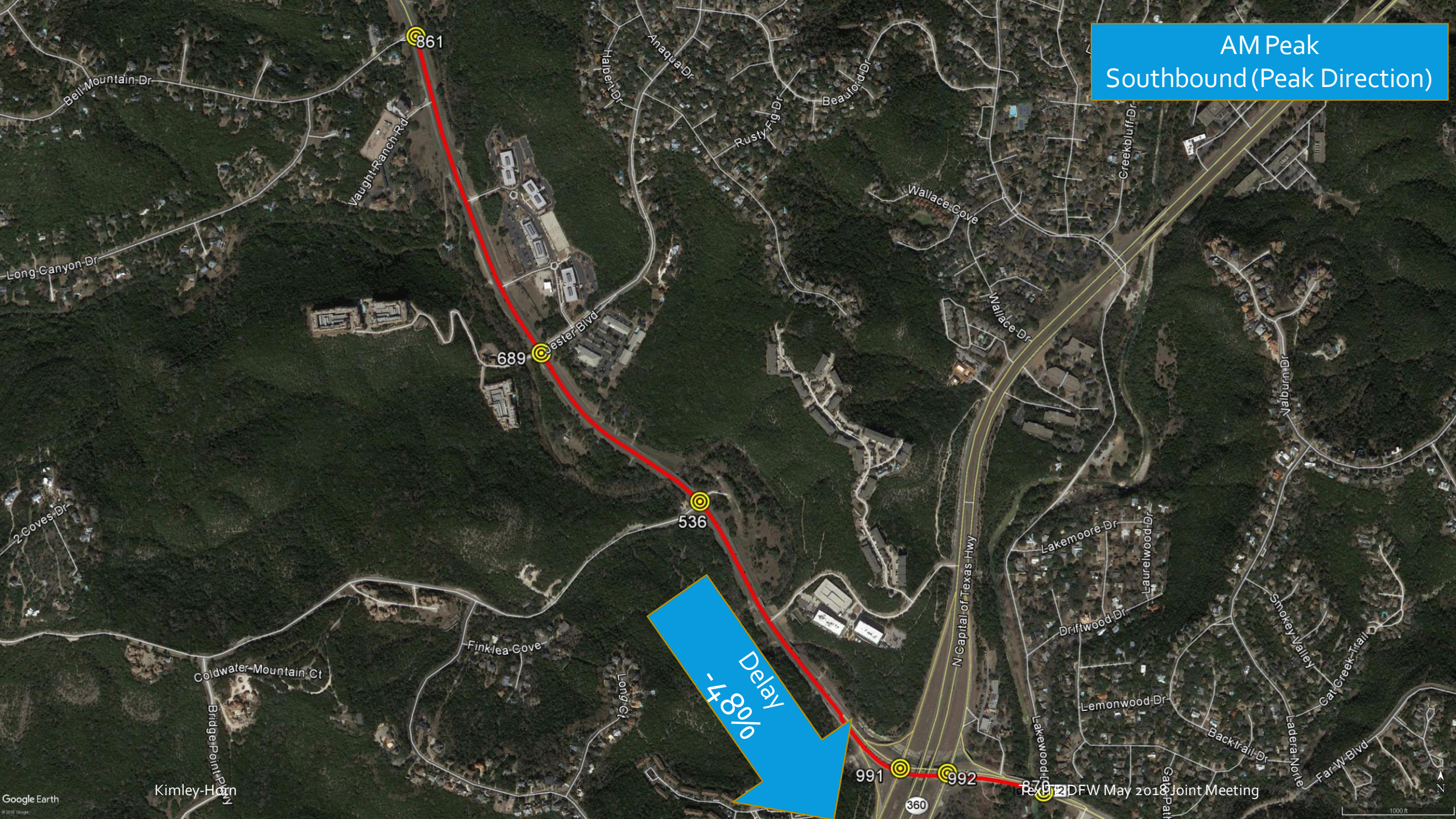
AM Peak
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Bell Mountain Dr
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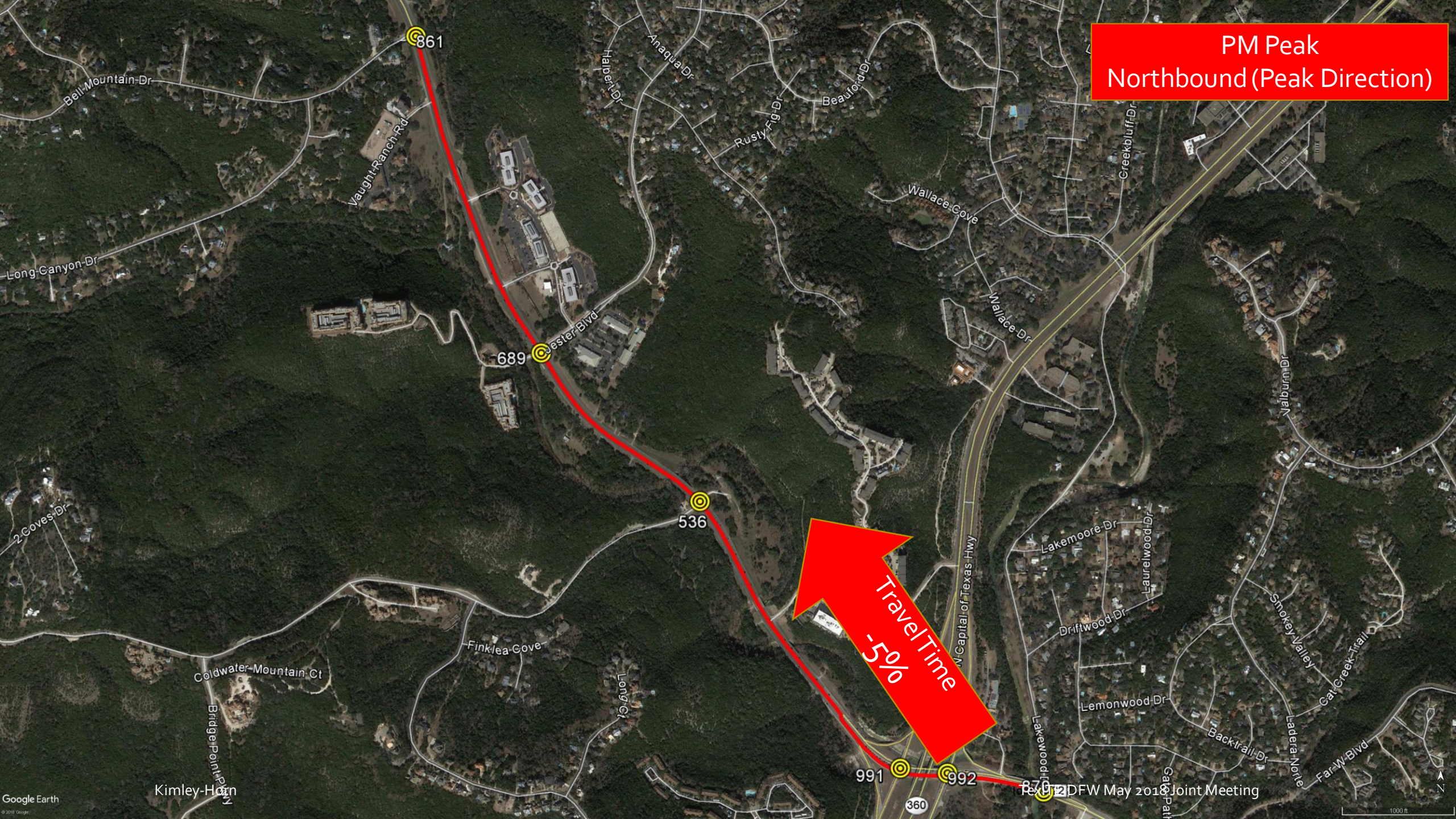
PM Peak
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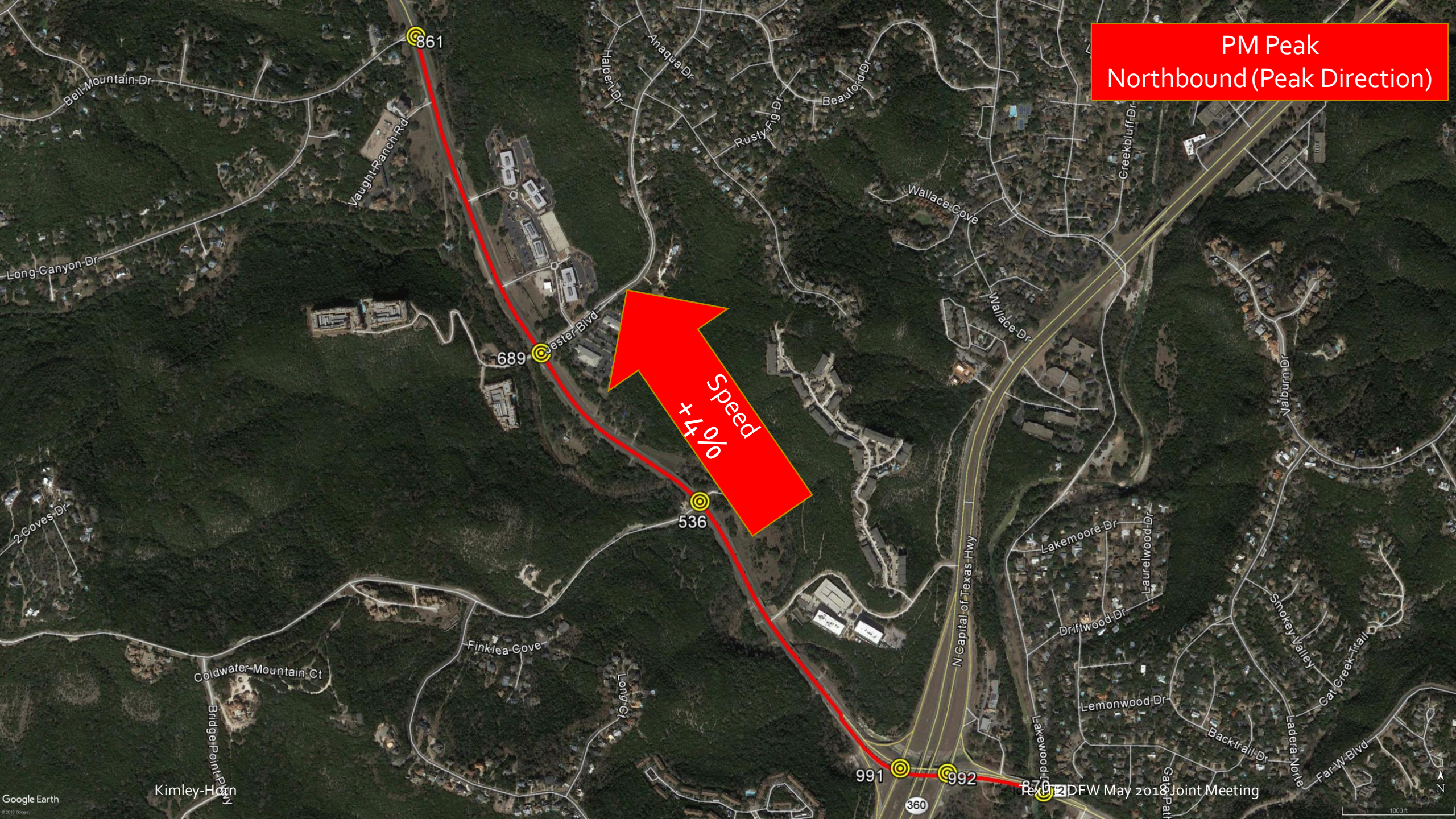
PM Peak
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Driftwood Dr
Lemonwood Dr
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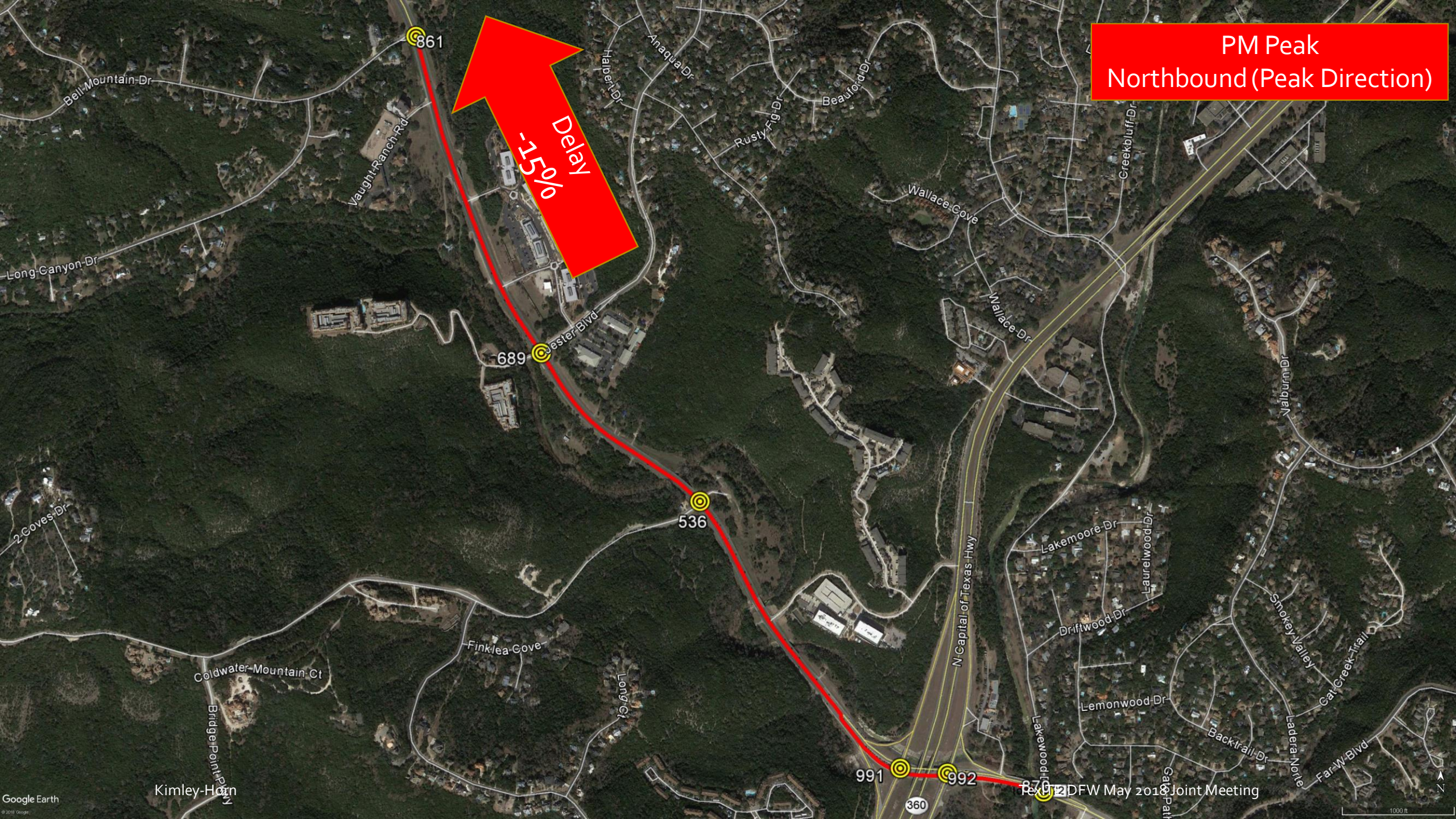
PM Peak
Northbound (Peak Direction)
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Cat Creek Trail
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Kimley-Horn
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Google Earth
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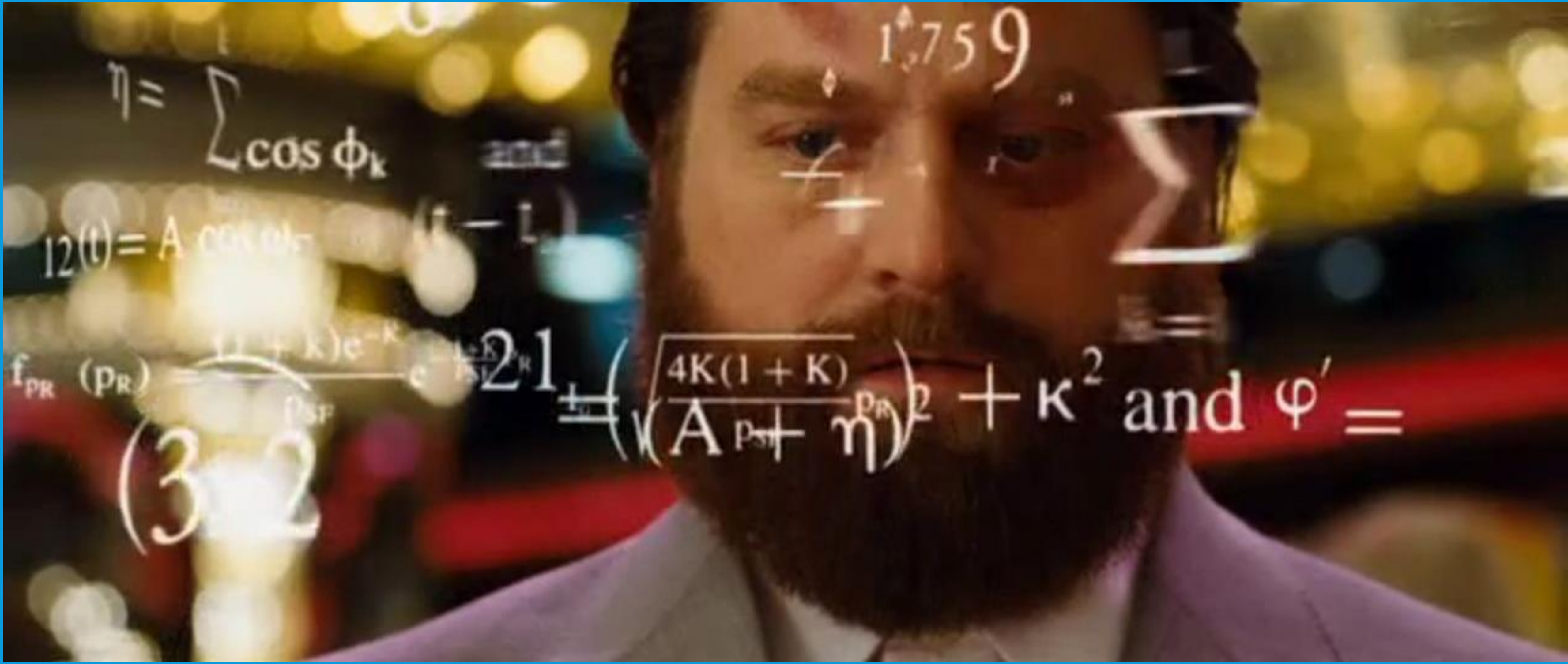
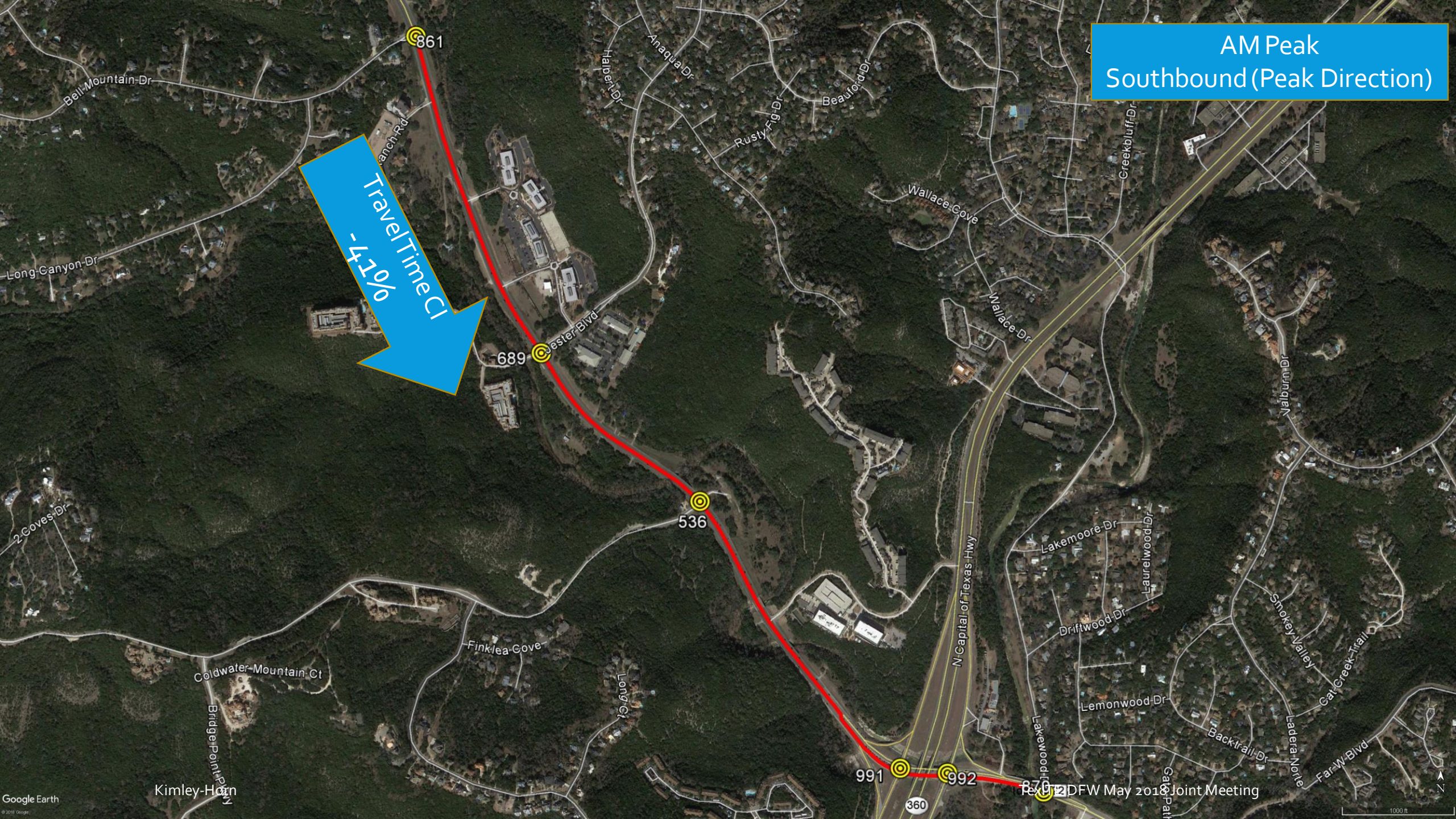
ADVANCED MOES

- Deeper analysis of signal retiming efforts
- Signal retiming can also improve reliability
- Δ confidence intervals (CI) of the MOEs
- Using the data provided by INRIX, the confidence intervals were calculated as the difference between the 95th percentile and the 5th percentile.


η = Σcos φk
and
4K(1 + K)
+ κ² and φ′ =

ADVANCED MOES

Peak Period		Travel Time CI (s)		Speed CI (mph)		Travel Time Index CI		Buffer Time (s)		Planning Index	
		NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
AM (6:30 AM - 9:00 AM)	Before	99	106	17.37	18.95	0.56	0.64	59	60	1.49	1.58
	After	105	63	17.72	14.60	0.60	0.39	62	38	1.55	1.32
	Δ	+6	-43	0.35	-4.35	0.04	-0.25	+3	-21	0.06	-0.26
	Δ%	+6%	-41%	+2%	-23%	+8%	-39%	+5%	-36%	+4%	-16%
MD (9:00 AM – 3:30 PM)	Before	79	57	15.98	13.42	0.45	0.34	49	34	1.35	1.25
	After	91	56	17.51	14.15	0.52	0.35	57	32	1.42	1.25
	Δ	+12	-1	1.53	0.73	0.07	0.00	+8	-1	0.07	0.00
	Δ%	+15%	-1%	+10%	+5%	+16%	+1%	+16%	-4%	+6%	+0%
PM (3:30 PM - 7:00 PM)	Before	163	83	21.60	16.33	0.93	0.50	108	50	1.87	1.45
	After	114	76	17.98	16.30	0.65	0.47	72	46	1.61	1.41
	Δ	-49	-7	-3.61	-0.02	-0.28	-0.03	-37	-4	-0.26	-0.04
	Δ%	-30%	-8%	-17%	-0%	-30%	-6%	-34%	-8%	-14%	-2%
Overall	Before	79	57	14.67	12.76	0.45	0.34	50	34	1.36	1.26
	After	73	47	13.80	11.56	0.42	0.29	46	28	1.34	1.21
	Δ	-6	-10	-0.87	-1.20	-0.03	-0.05	-4	-6	-0.02	-0.05
	Δ%	-8%	-18%	-6%	-9%	-7%	-16%	-8%	-17%	-1%	-4%


AM Peak
Southbound (Peak Direction)
TravelTime CI
-41%
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Bell Mountain Dr
Long Canyon Dr
2 Coves Dr
Coldwater Mountain Ct
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Rusty Fig Dr
Beaufort Dr
Wallace Cove
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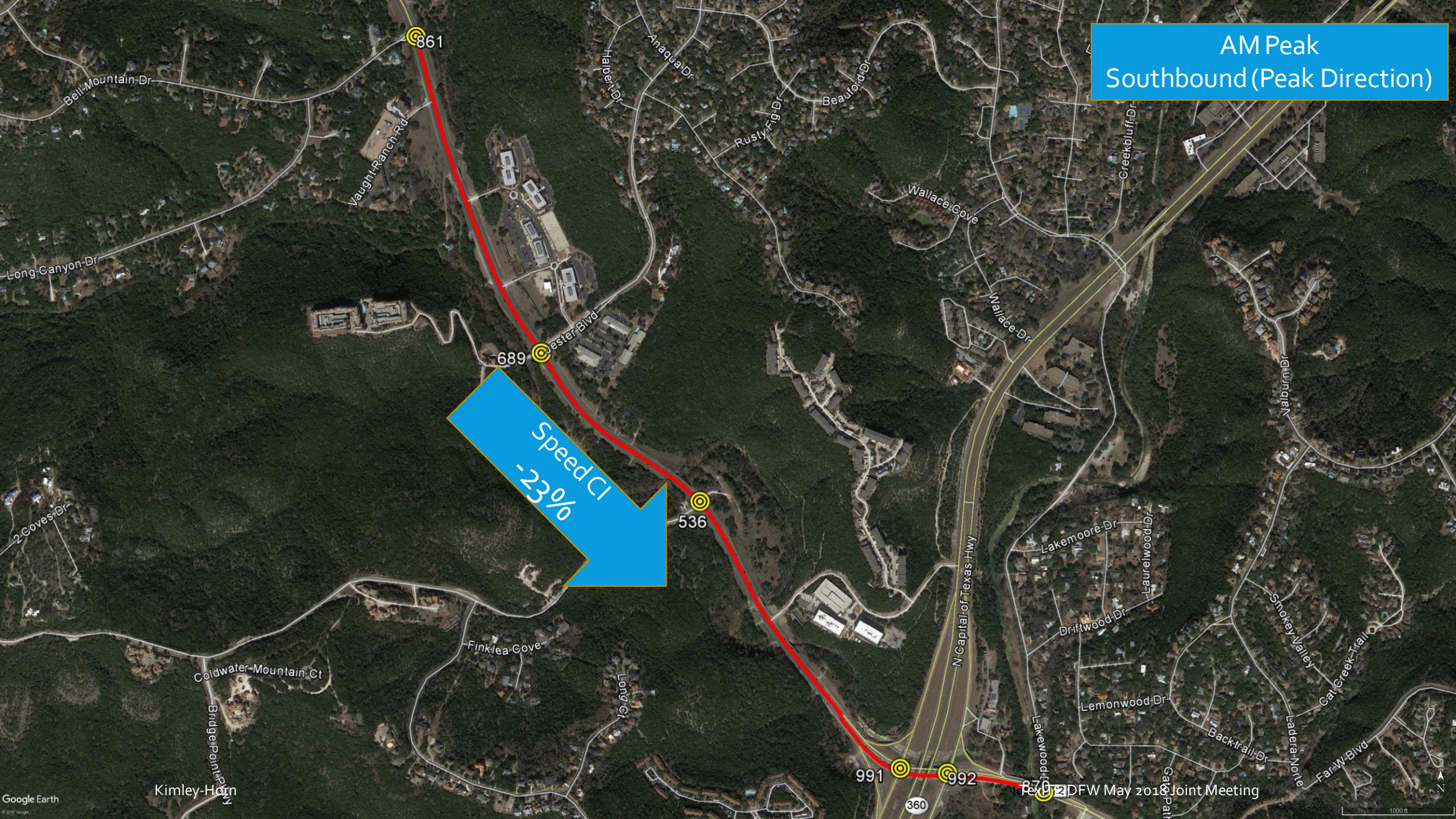
Kimley-Horn
Texas DFW May 2018 Joint Meeting
Google Earth


AM Peak
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Texas DFW May 2018 Joint Meeting
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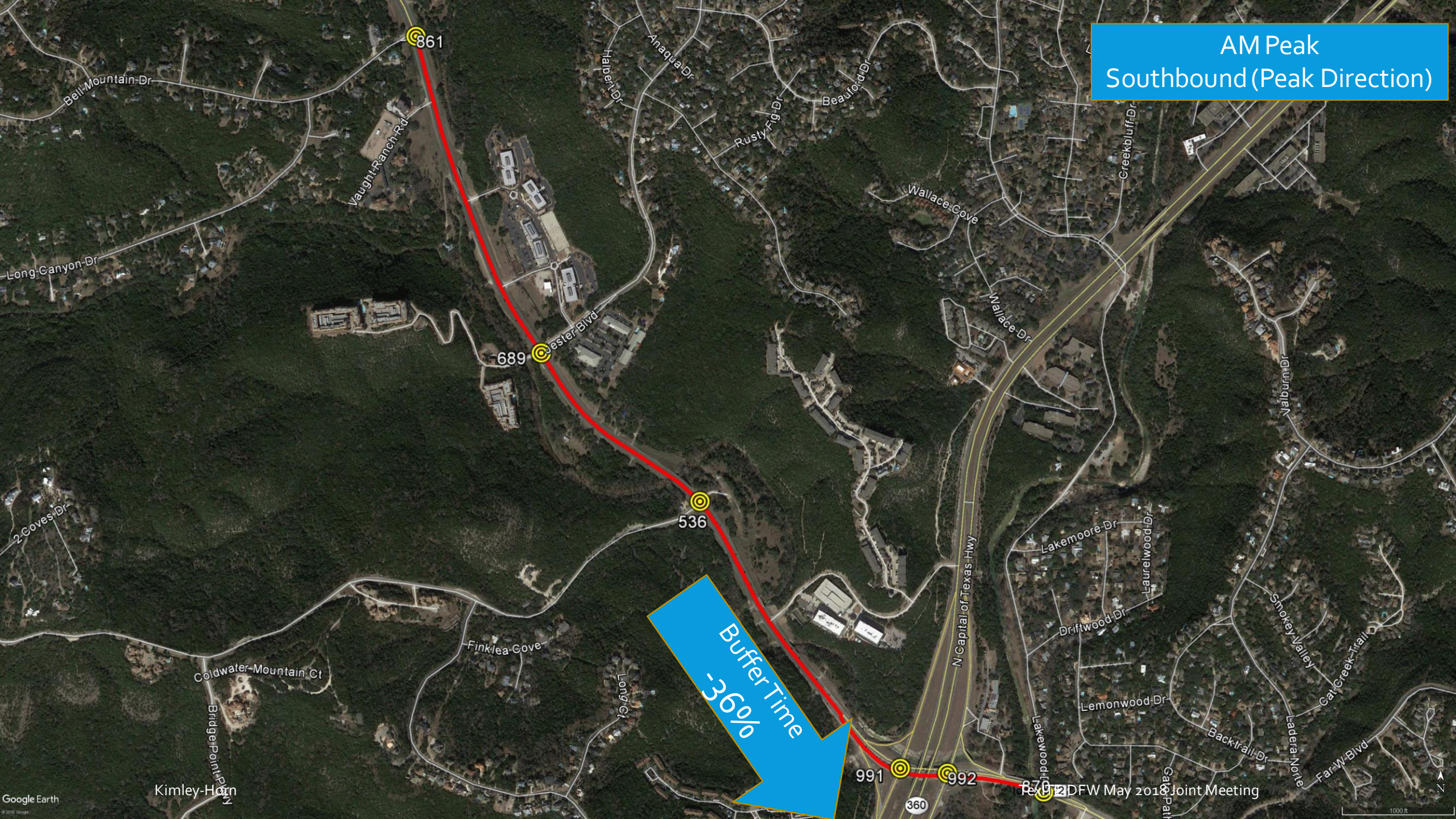
AM Peak
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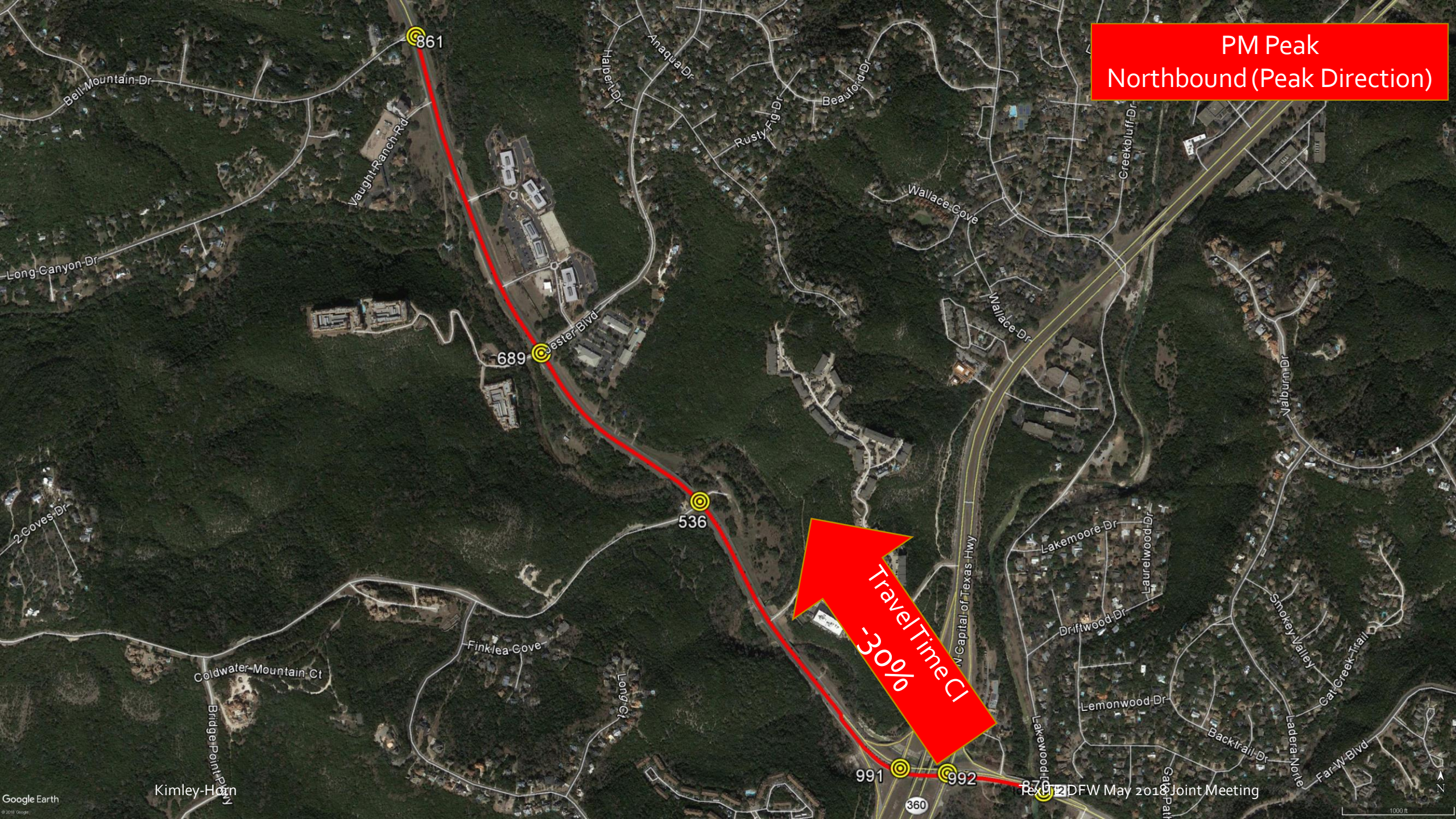
PM Peak
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Travel Time CI
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Bell Mountain Dr
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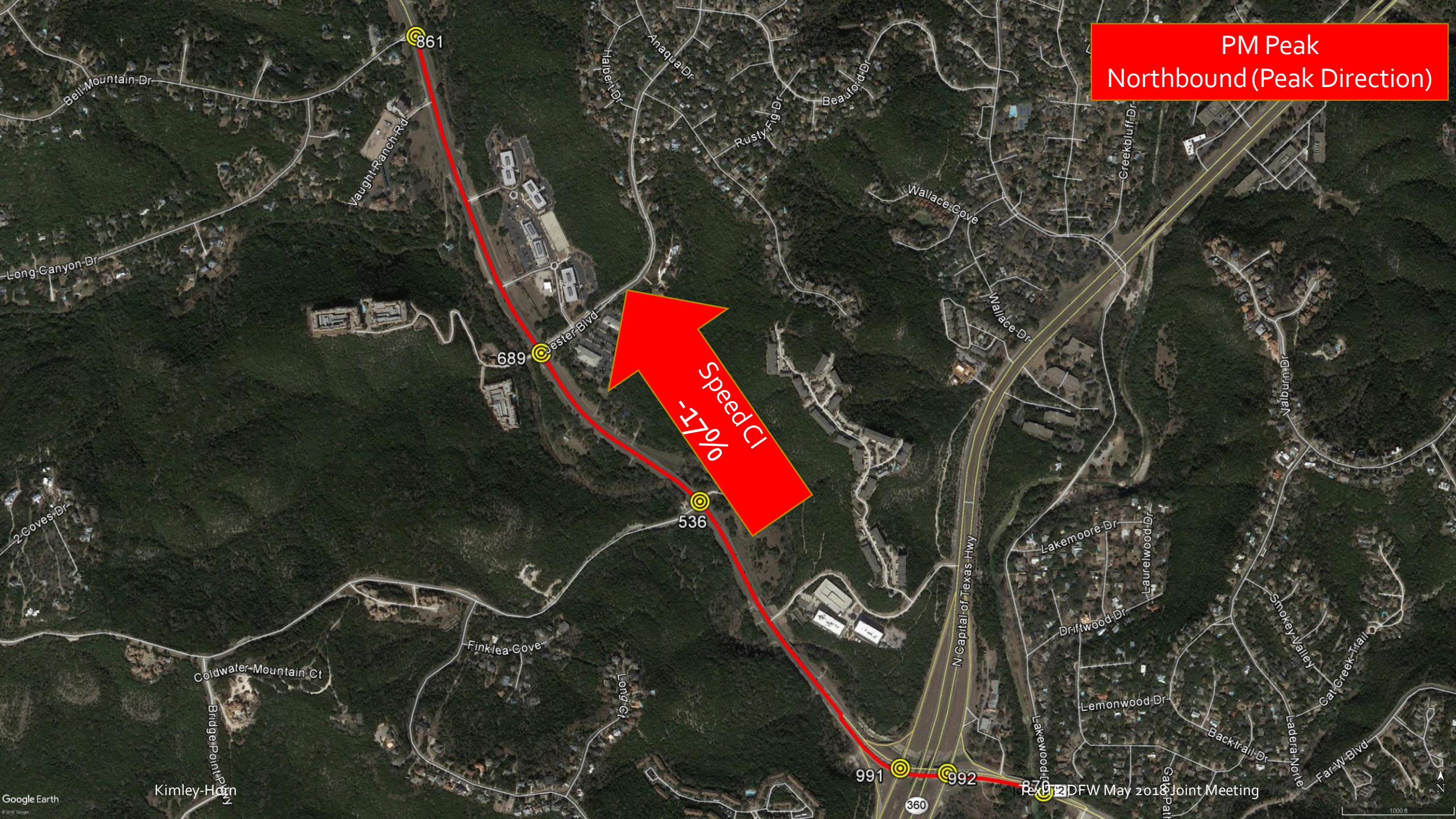
Google Earth


PM Peak
Northbound (Peak Direction)
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Cat Creek Trail
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Back Trail Dr
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Far W Blvd
Lakewood Trl
N Capital of Texas Hwy
2 Coves Dr
Finklea Cove
Coldwater Mountain Ct
Bridge Point Pkwy
Long Ct
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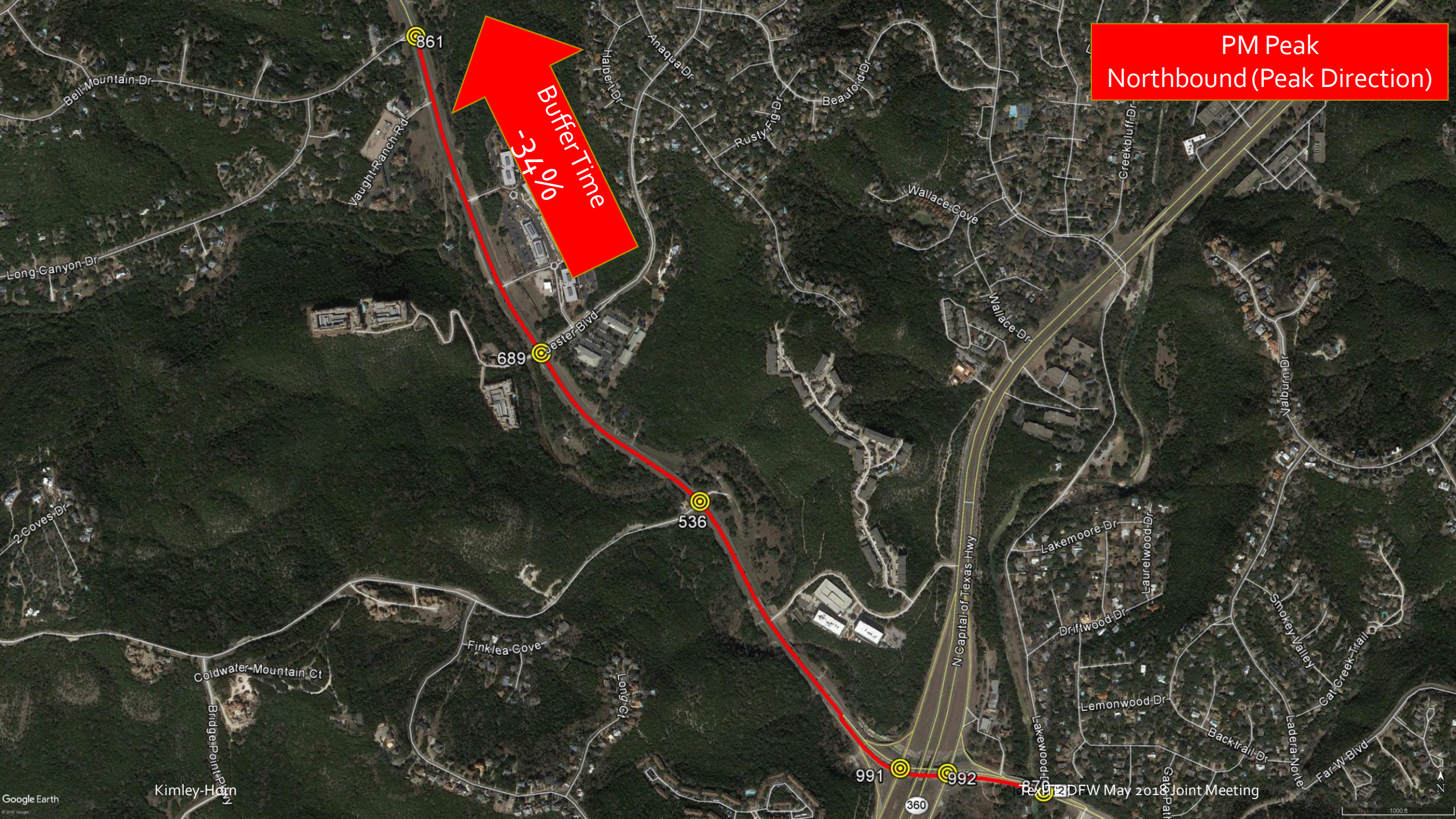
Kimley-Horn
Texas DFW May 2018 Joint Meeting
Google Earth


PM Peak
Northbound (Peak Direction)
Buffer Time
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Lakewood Trl
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Cat Creek Trail
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Verbena Dr
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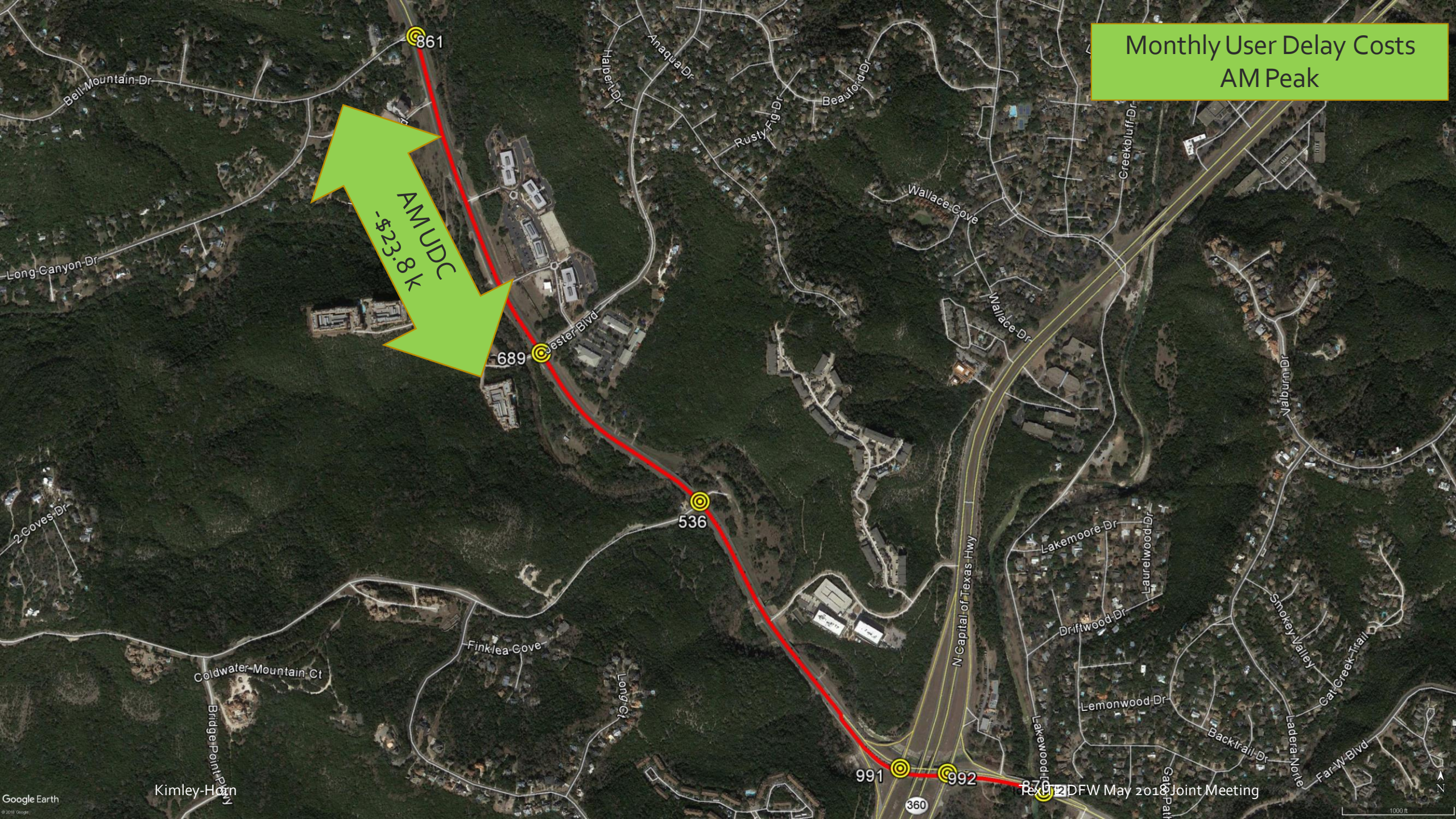
Kimley-Horn
Texas A2 DFW May 2018 Joint Meeting
Google Earth

USER DELAY COSTS

USER DELAY COSTS

Peak Period		User Delay Costs		
		NB	SB	Bi-Directional
AM (6:00 AM - 9:00 AM)	Before	$108,262.71	$43,663.65	$151,926.36
	After	$83,588.70	$44,492.33	$128,081.03
	Δ	-$24,674.01	$828.68	-$23,845.33
	Δ%	-23%	+2%	-16%
MD (9:00 AM – 4:00 PM)	Before	$66,574.44	$85,688.71	$152,263.15
	After	$72,585.38	$93,631.20	$166,216.58
	Δ	$6,010.94	$7,942.49	$13,953.43
	Δ%	+9%	+9%	+9%
PM (4:00 PM - 7:00 PM)	Before	$52,343.18	$341,841.10	$394,184.28
	After	$48,873.95	$248,185.20	$297,059.15
	Δ	-$3,469.23	-$93,655.90	-$97,125.13
	Δ%	-7%	-27%	-25%
Overall	Before	$264,134.23	$519,505.71	$783,639.94
	After	$250,810.67	$434,076.22	$684,886.89
	Δ	-$13,323.56	-$85,429.49	-$98,753.05
	Δ%	-5%	-16%	-13%


Monthly User Delay Costs
AM Peak
AM UDC
-$23.8 k
861
689
536
991
992
Bell Mountain Dr
Long Canyon Dr
2 Coves Dr
Coldwater Mountain Ct
Bridge Point Pkwy
Finklea Cove
Long Ct
Halbert Dr
Anaqua Dr
Rusty Fig Dr
Beaufort Dr
Wallace Cove
Wallace Dr
Creekbluff Dr
N Capital of Texas Hwy
Lakemoore Dr
Laurelwood Dr
Driftwood Dr
Lakewood Dr
Lemonwood Dr
Smokey Valley
Cat Creek Trail
Back Trail Dr
Ladera Norte
Far W Blvd
360
Kimley-Horn
Texas DFW May 2018 Joint Meeting
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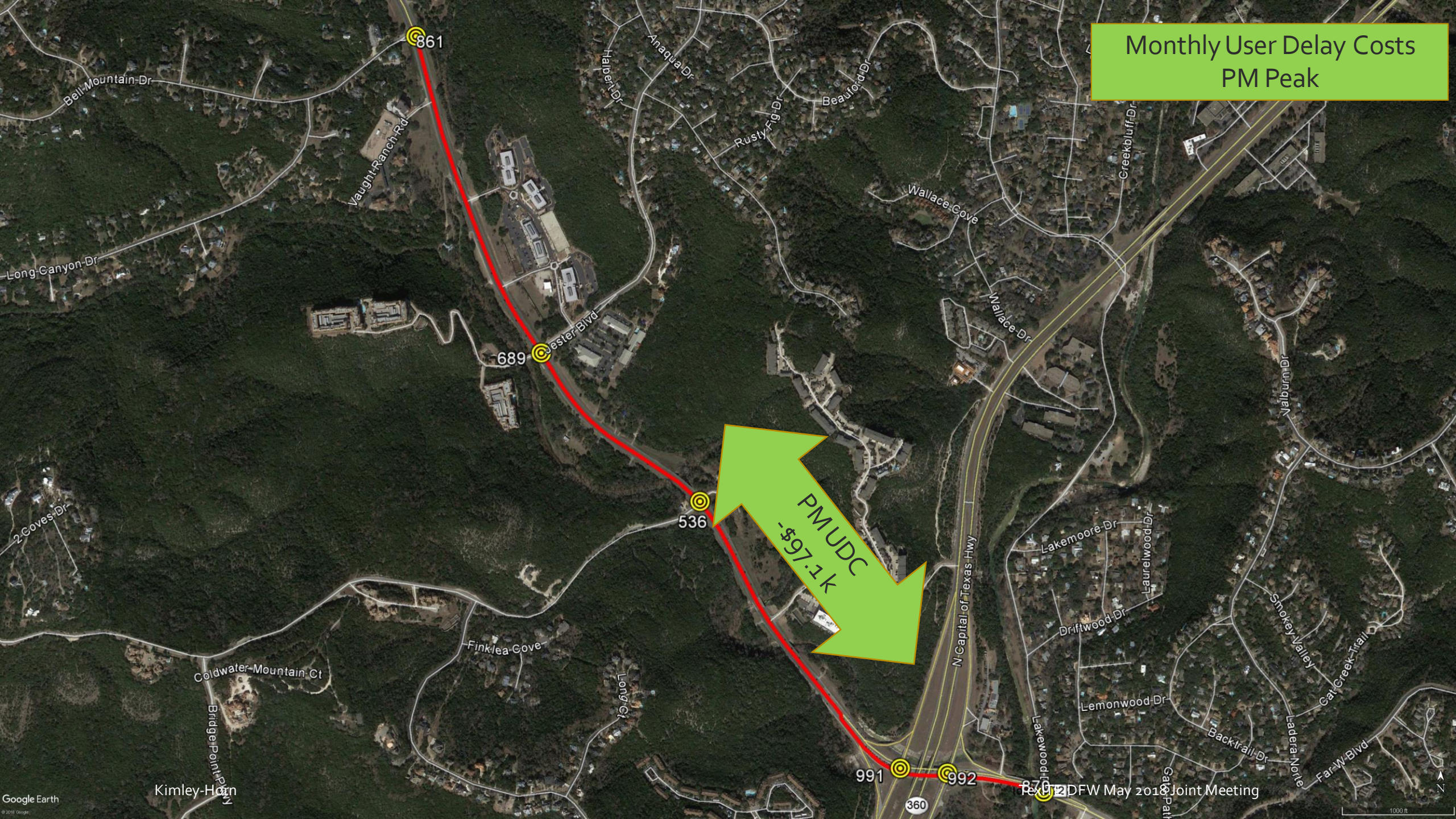
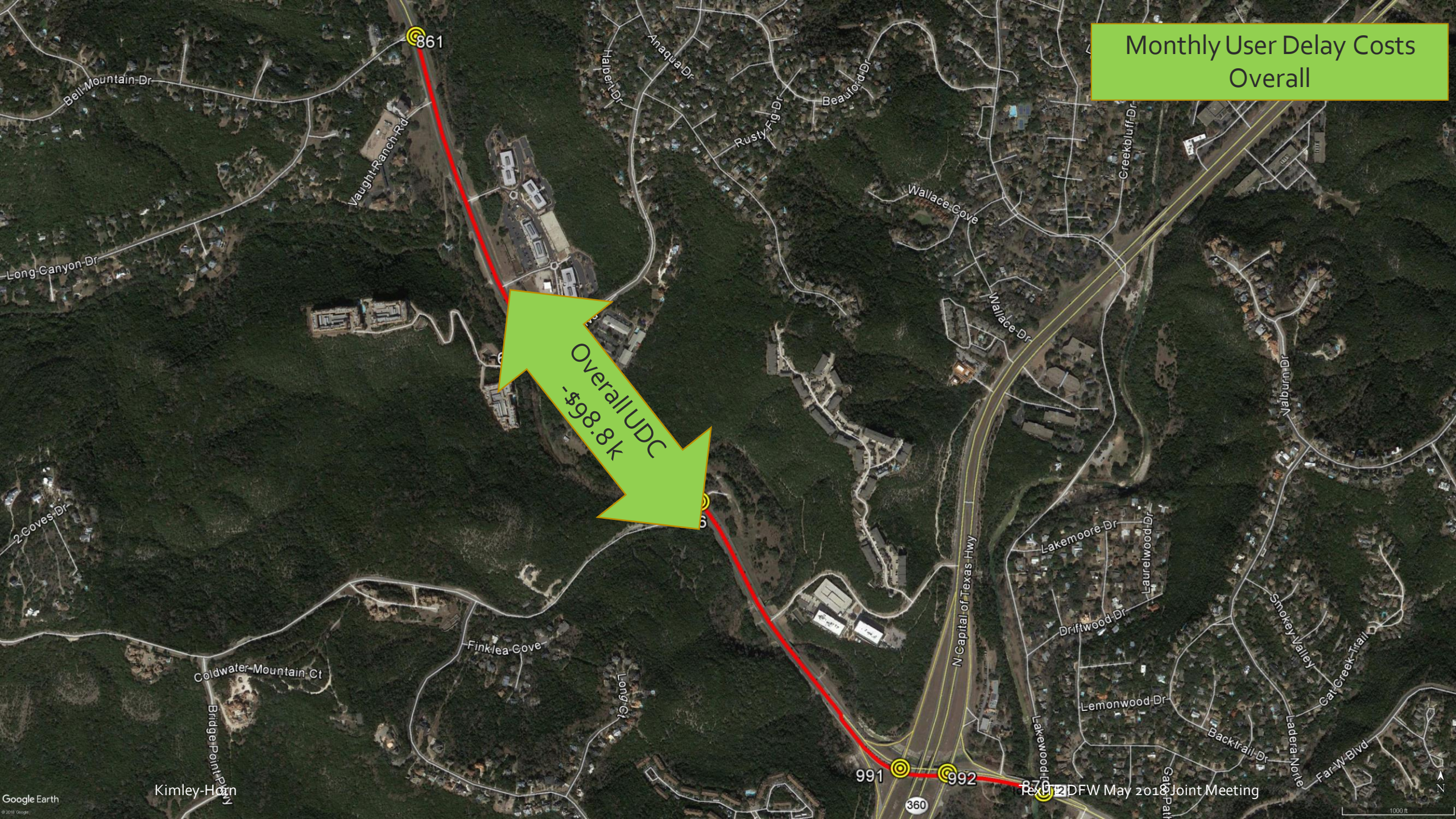

Monthly User Delay Costs
PM Peak
861
689
536
991
992
PM UDC
-$97.1k
Bell Mountain Dr
Vaught Ranch Rd
Halper Dr
Anaqua Dr
Rusty Fig Dr
Beauford Dr
Creekbluff Dr
Wallace Cove
Wallace Dr
Long Canyon Dr
Lester Blvd
2 Coves Dr
Finklea Cove
Coldwater Mountain Ct
Bridge Point Pkwy
Long Ct
N Capital of Texas Hwy
Lakemoore Dr
Laurelwood Dr
Driftwood Dr
Smokey Valley
Cat Creek Trail
Lemonwood Dr
Back Trail Dr
Ladera Norte
Far W Blvd
Lakewood Trl
Gate Path
Verbum Dr
360
Google Earth
Kimley-Horn
Texas DFW May 2018 Joint Meeting
N
1000 ft

Monthly User Delay Costs Overall



USER DELAY COSTS

- Decreased UDC, even though travel time and delay increased in the AM peak period, is attributed to increased reliability and decreased variability in the signal operations.
- The UDC measures total delay observed on the corridor, so as these high-cost delays are decreased, the total UDC decreases even though the average travel times may be higher.

CONCLUSIONS

- Explosive population growth in Central Texas
  - Resulting increase in traffic volumes in Austin
  - Creates difficult conditions for improvements in signal operations
  - Simply maintaining acceptable operations is often a challenge, much less improving travel times.
- Overall, the RM 2222 retiming effort was a success.
  - Travel time was reduced 5%
    - Peak direction in both the AM and PM peaks (SB and NB, respectively)
    - Operations made more reliable / less variable overall
    - Significant savings for the City of Austin
    - Midday was already operating fairly well, leaving only marginal potential for improvements
    - User delay costs were significantly improved for AM and PM peak directions, and overall.

LESSONS LEARNED

Before & After Studies

WHAT IS A NORMAL DAY?

- The last Wednesday?
- The last 7 Wednesdays?
- 2 weeks of weekdays?
- A month of weekdays?
- Events?
- Weather?
- Incidents?

HOW MUCH DATA DO YOU NEED?

- What was retimed?
- How many signals included?
- Austin data portal

WHY DOES THE DATA LOOK LIKE IT DOES?

- Crossing arterial progression
- Detection issues
- Capacity issues
- Travel patterns
- Incidents
- Schools

CONSIDERATIONS

WHY ARE TRAVEL TIME RUNS STILL NEEDED?

- Stops
- Travel across whole corridors
- Trajectory in TSD
- Mid block turning as part of calculation
- Statistics
- What's a normal day?