Signal Analytics

- Probe-based signalized intersection performance measures

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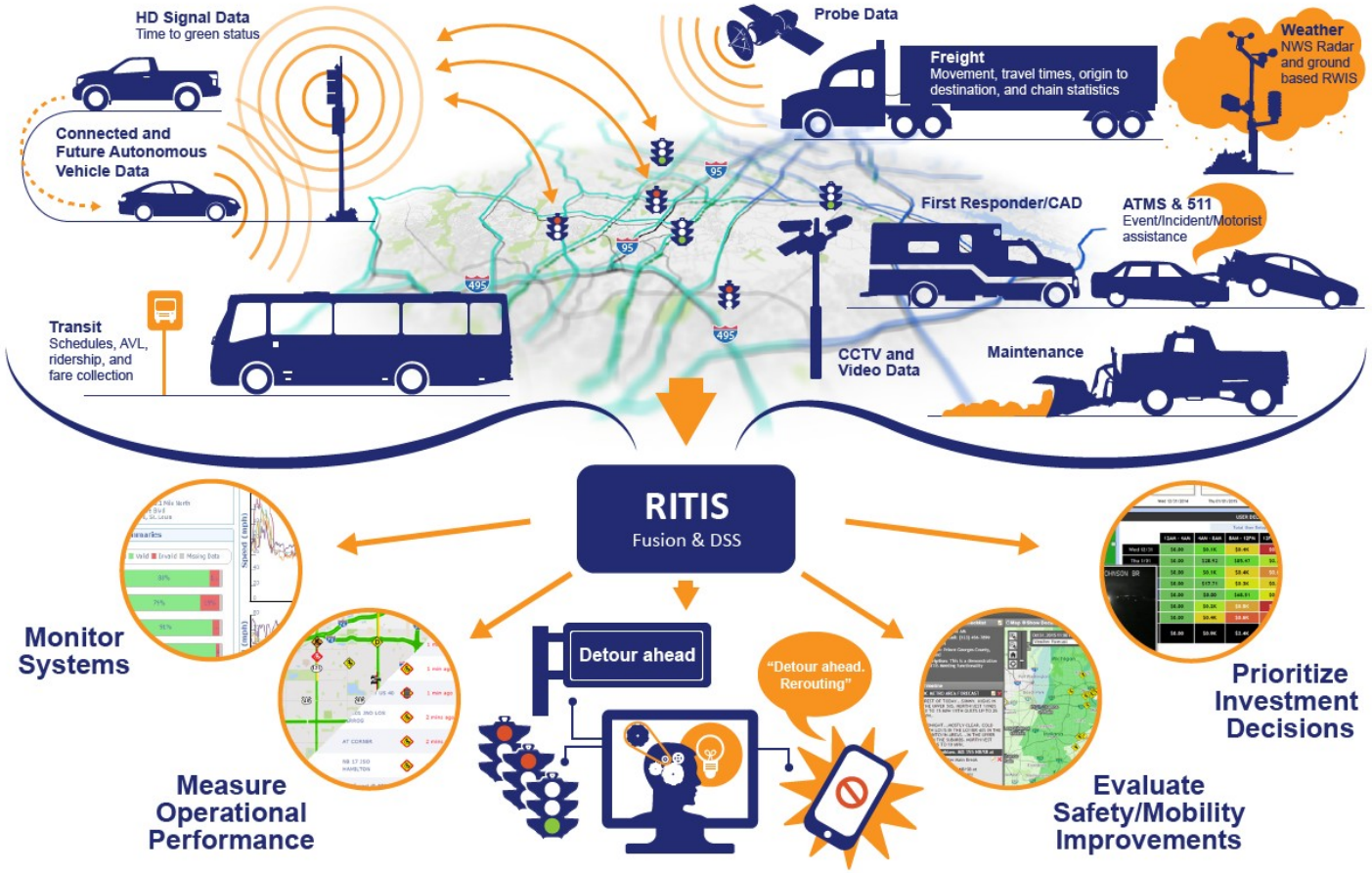
Agenda

- Signal Analytics Background
- Alignment with IIJA
- Waypoint Intersection Metrics
- Dashboard and Deep Dive Tools
- Future Enhancements
- Use Cases
- Q&A



https://signals.ritis.org/analytics/

Impact of Well-Timed Signals

Reduction of Fuel Consumption and GHG Emissions

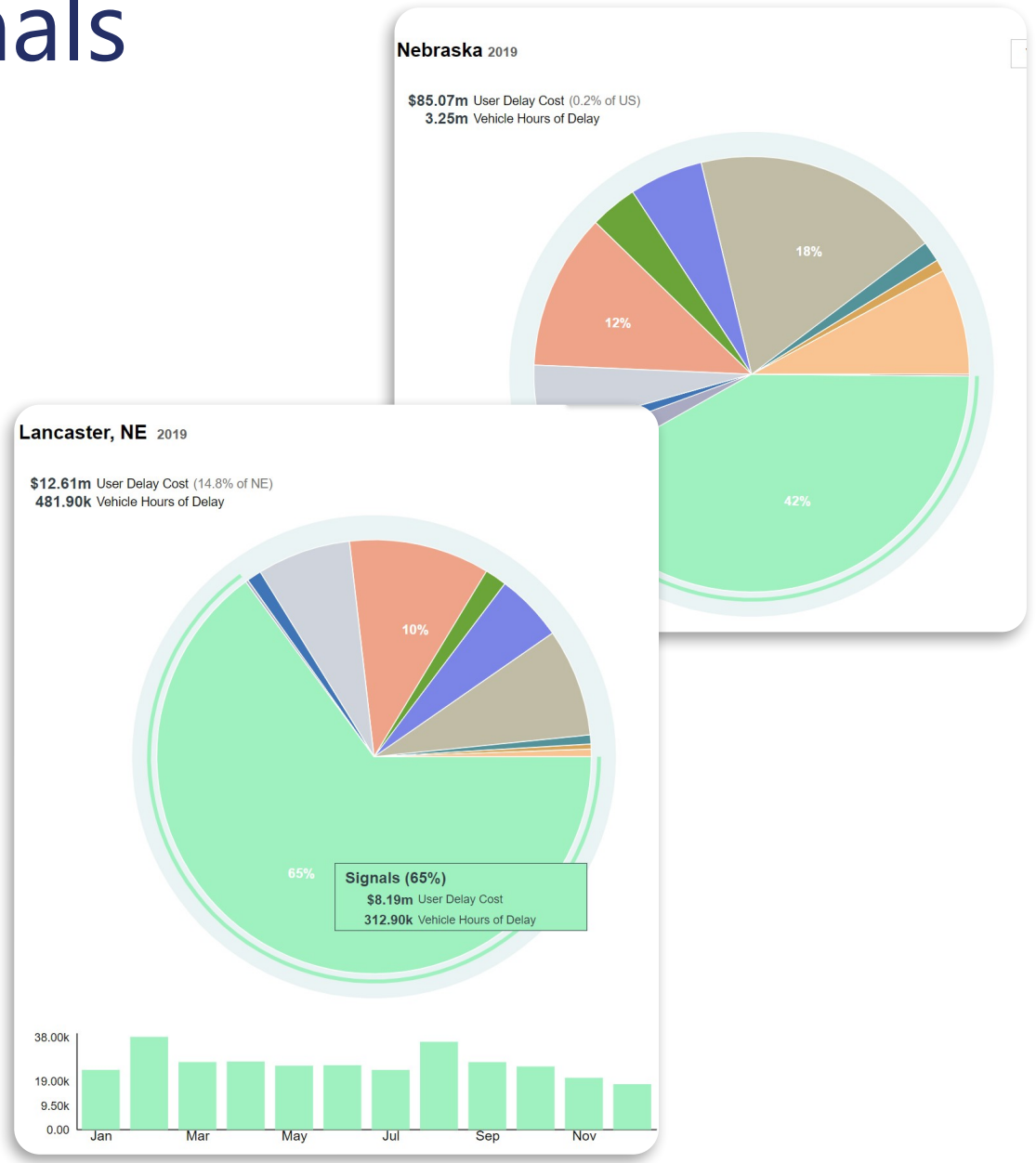
- Inst. of Transportation Engineers (ITE) estimates that properly timed signals decreases fuel consumption by 6% to 9%
- Aligns your with IIJA SMART program

Improve Safety

- Where queues exist, correlation to safety issues
- Reducing split failures, reduces more aggressive driving behaviors

Reduce Delay

- Recent estimates indicate that traffic signals account for roughly **329 million vehicle hours of delay per year**
- ITE reports,signal retiming projects reduce motorist delay by between 15% to 37%

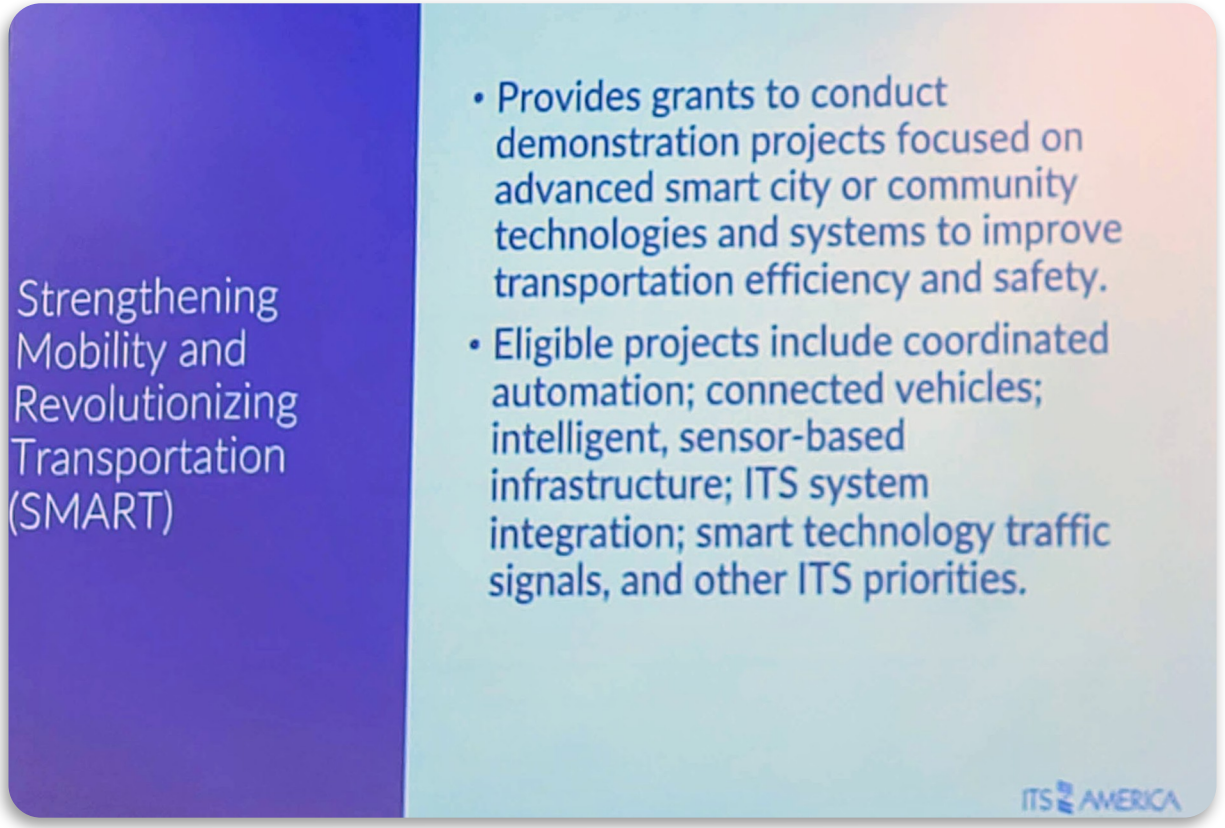


SOURCE: HRG Report on Traffic Signal Retiming Cost Benefits

Visit: https://congestion-causes.ritis.org/

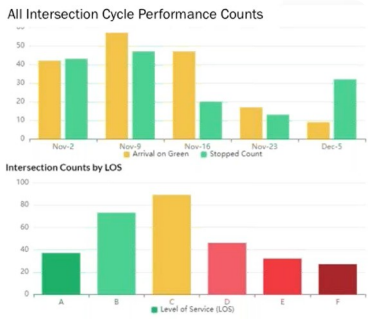
Strengthening Mobility and Revolutionizing Transportation (SMART) Grant

- IIJA - Strengthening Mobility and Revolutionizing Transportation (SMART) Grant Program
  - $500 million
  - $100 million in FY22
  - Funding to projects across rural, midsized, and large communities
  - SMART Grant program will deliver competitive grants to States, local governments, and Tribes for projects that improve transportation safety and efficiency



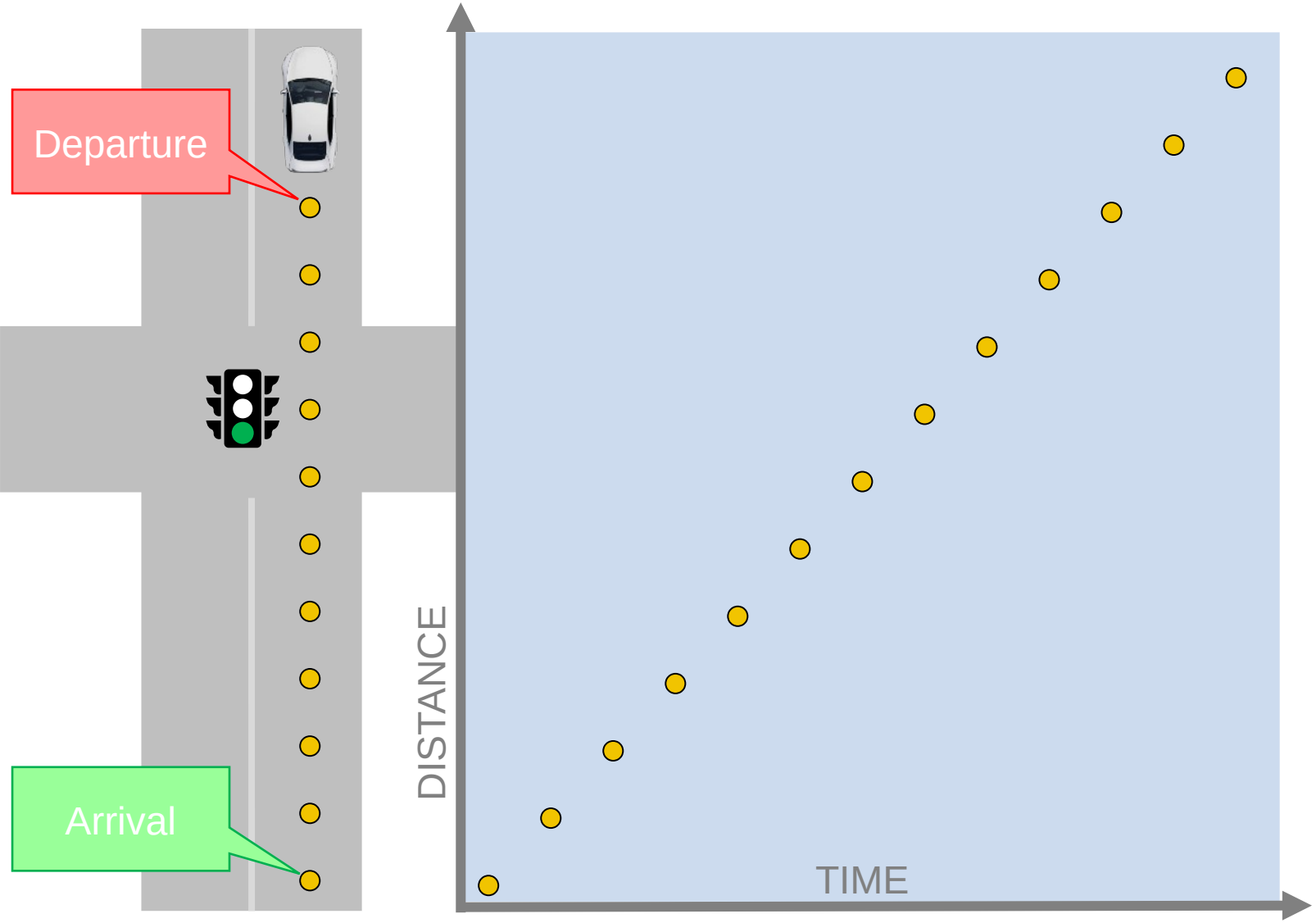
SOURCE: *USDOT Building a Better America Fact Sheet for Rural Communities*

What is Signal Analytics?



- **The Data**
  - 3 to 5 second frequency vehicle waypoints collected from connected vehicles
  - Snapped to a free, open, and global map
- **The Metrics**
  - Individual vehicle waypoints are used to determine the travel time of a vehicle moving through an intersection
  - Other vehicle attributes include turning movement, vehicle stop, approach speed, or vehicle split failure and volume
- **The Tools – Cloud based Solution as a Service**
  - Agency defines number of intersections to license
  - Collaboration between CATT Lab and INRIX
  - Aggregate the performance measures by intersection
  - Report summary metrics over various time periods

The Metrics – Each Vehicle



Metrics for each vehicle

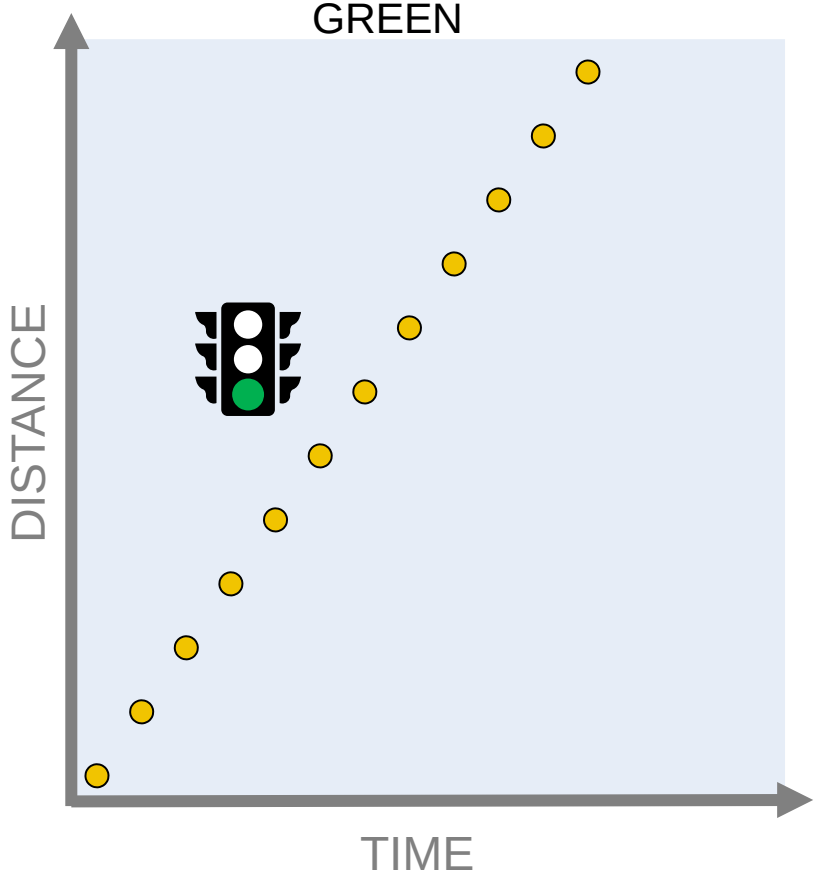
- Travel Time
- Approach Speed
- Vehicle Stop
- Vehicle Double Stop
- Movement (Left, Thru, Right)
- Volume

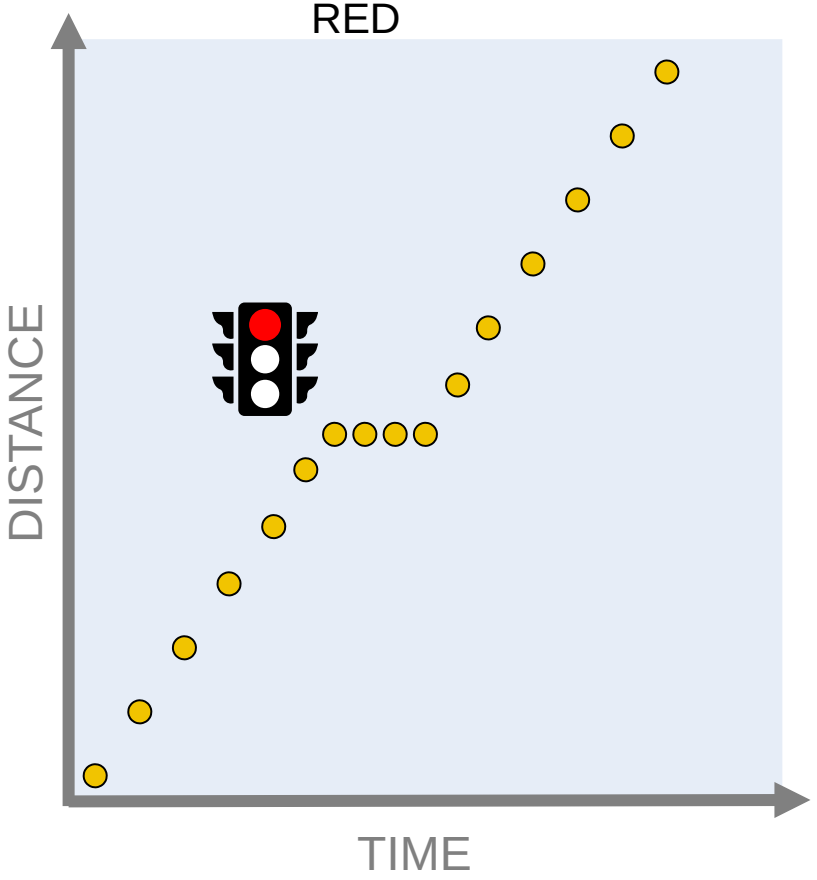
The Metrics – Assumptions

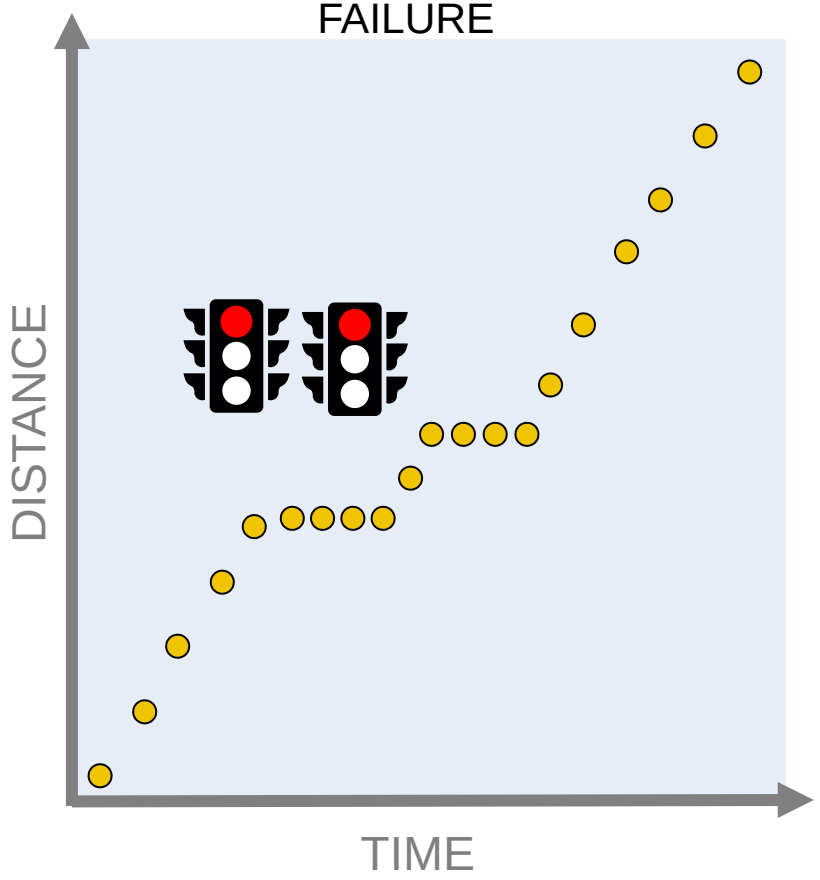
42 sec
ARRIVAL ON GREEN

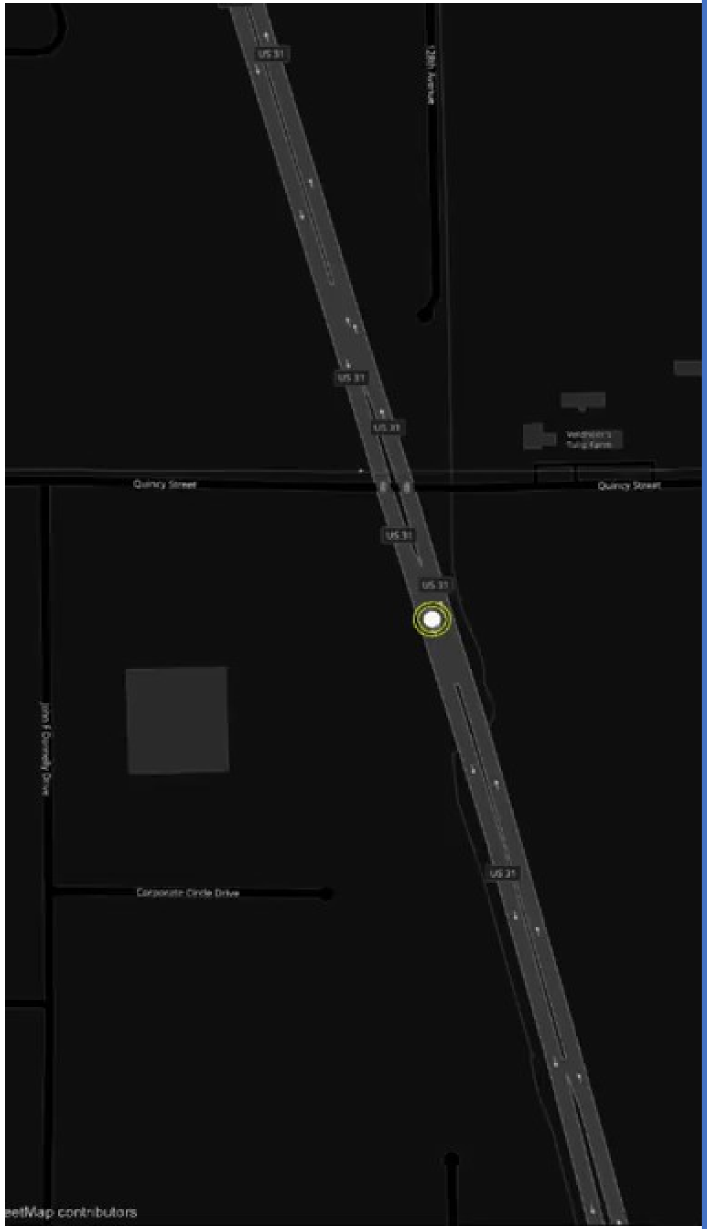
61 sec
ARRIVAL ON RED

100 sec
SPLIT FAILURE








Quincy Street
Quincy Street
Corporate Circle Drive
eetMap contributors


Quincy Street
Quincy Street
US 31
Reflections Drive
Greenly Street
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Stainless Drive
Riley Street
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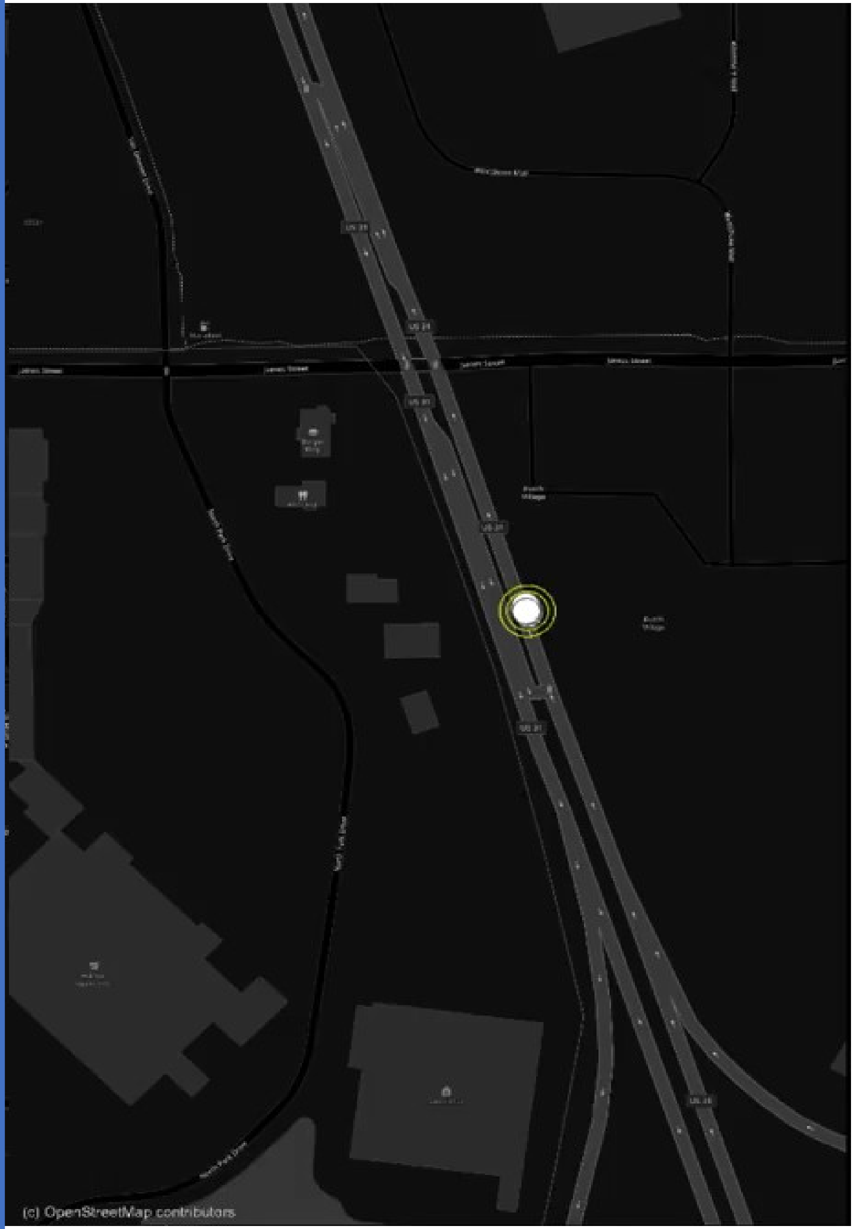
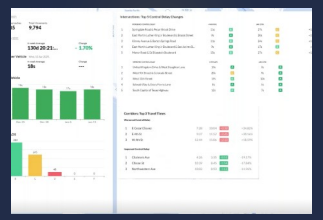
Southland Court
North Bellwood Drive
Thistlewood Lane
Caryn Walk
Blueberry Lane
Felch Street
Redwood Drive
James Street
Beth Street
eetMap contributors

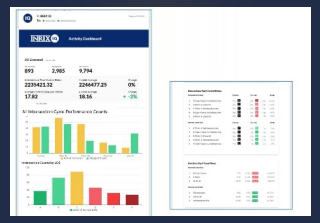

(c) OpenStreetMap contributors

Signal Analytics - **Dashboard**

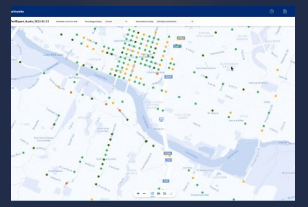
Daily Report



Email Summary



Systemwide Map

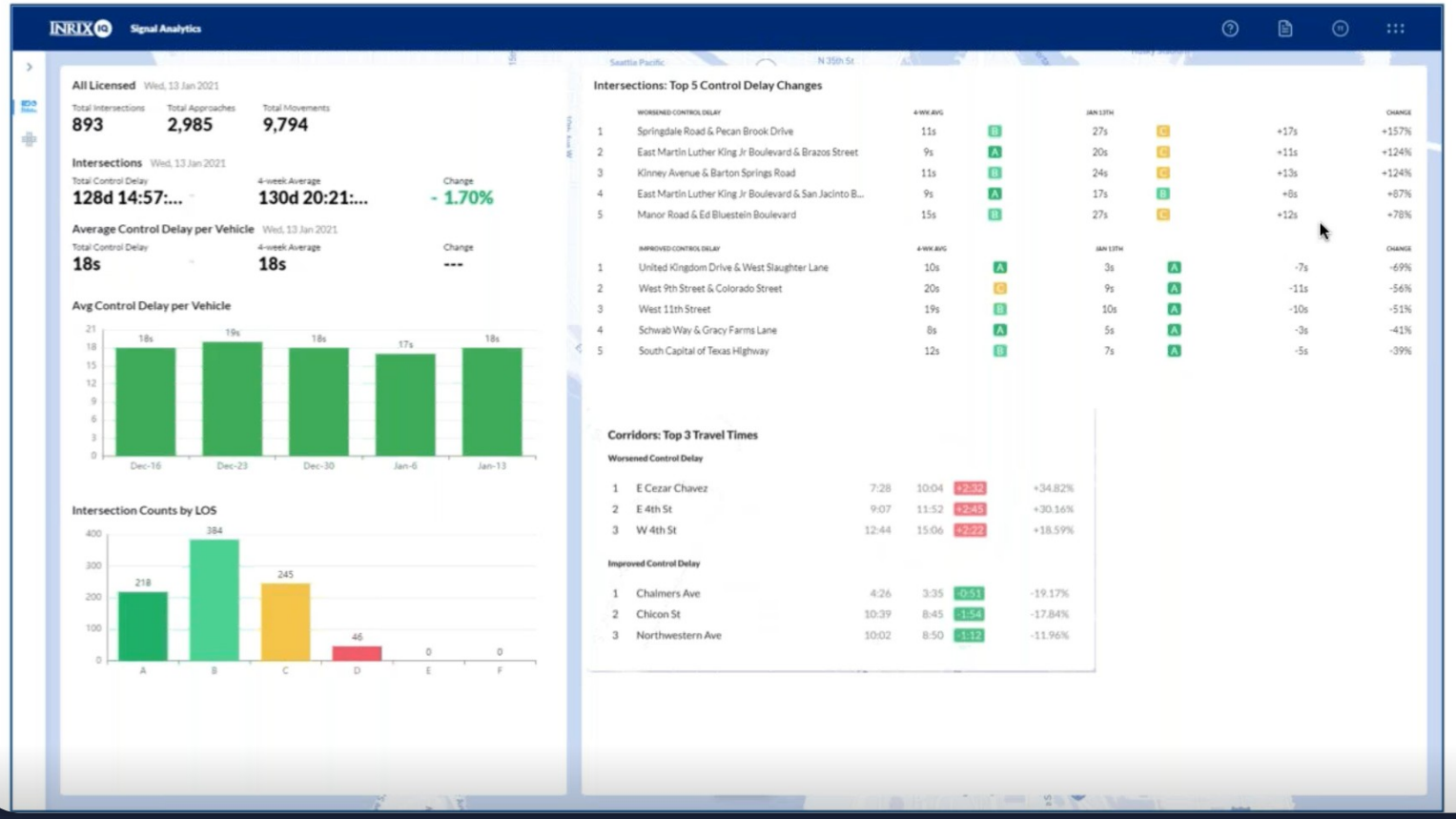


Intersection Perf Rpt

Signal Analytics – Daily Report

Daily Report – Dashboard

Updated automatically each morning



Agency Defined:

- Intersections
- Peak period times

Metrics at a Glance:

- Top ranked TT for corridors
- Delay per vehicle stats
- Top ranked control delay variations

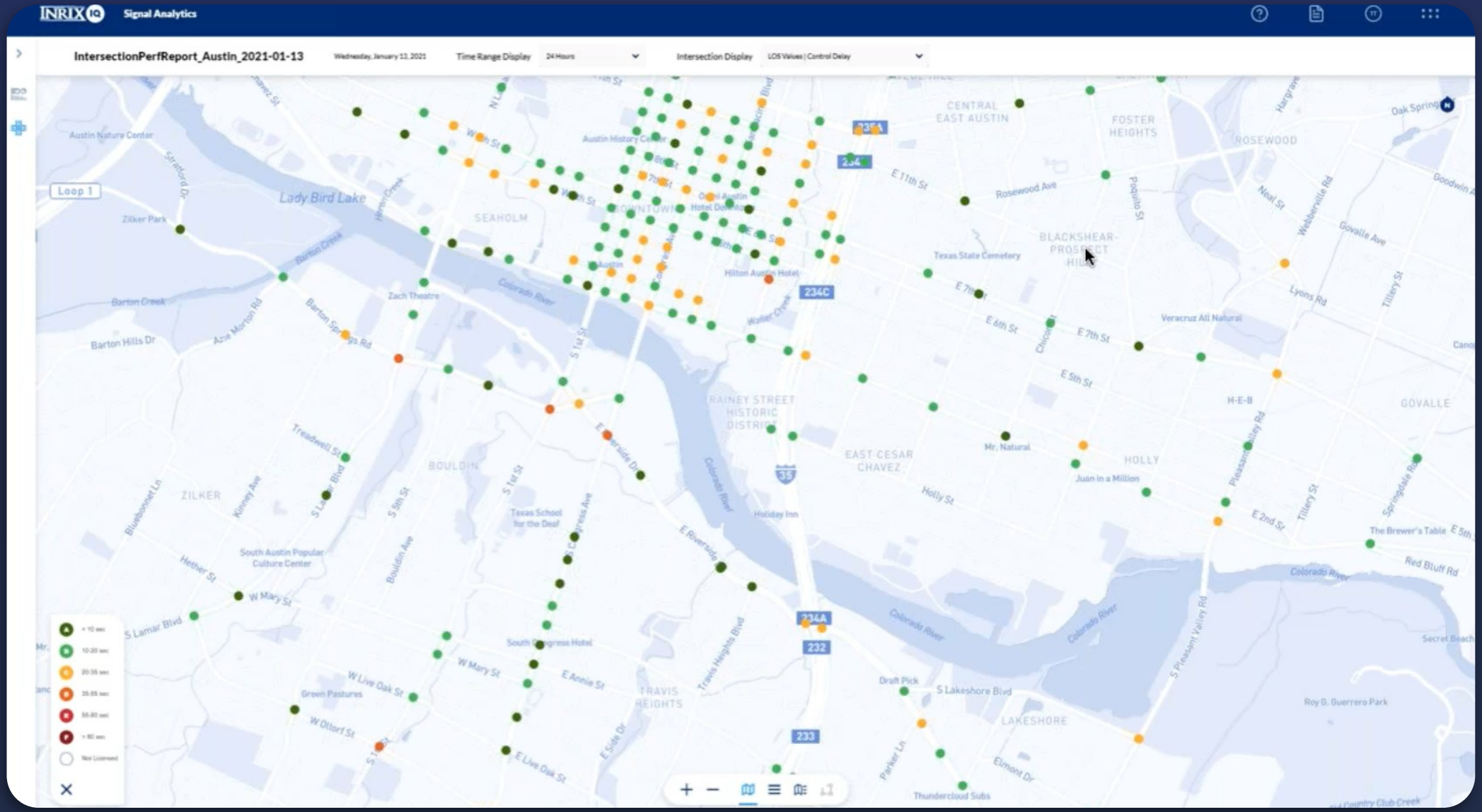
Signal Analytics – Email Summary

Daily Email Summary

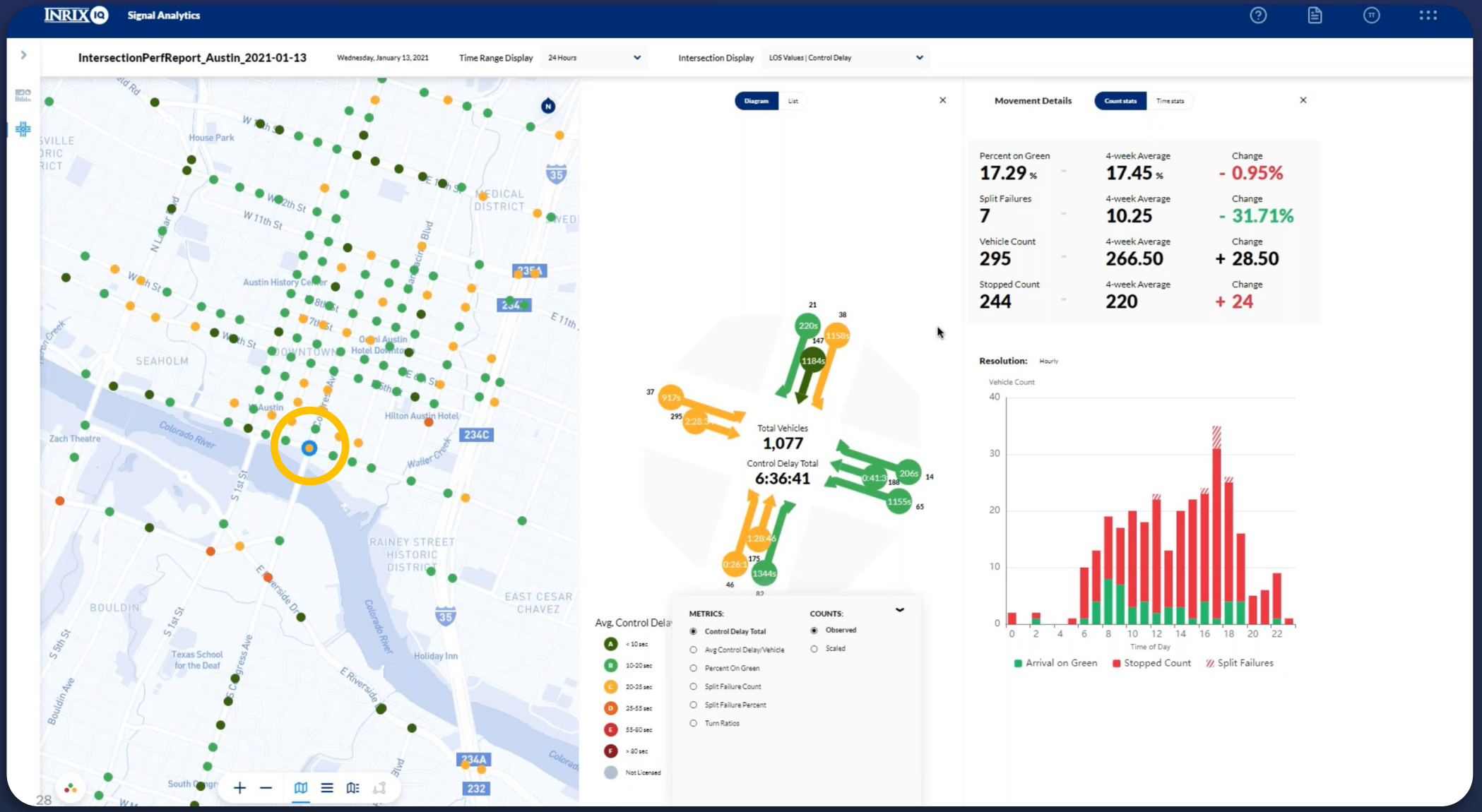
Updated and delivered automatically each morning

- System Summary Statistics
  - Total Control Delay
  - Average per Vehicle
- Intersection Performance Counts by Metric
  - Arrival in Green
  - Level of Service
- Top 5 Intersections
  - Change in Delay
- Corridor Summary

Signal Analytics – Systemwide Map

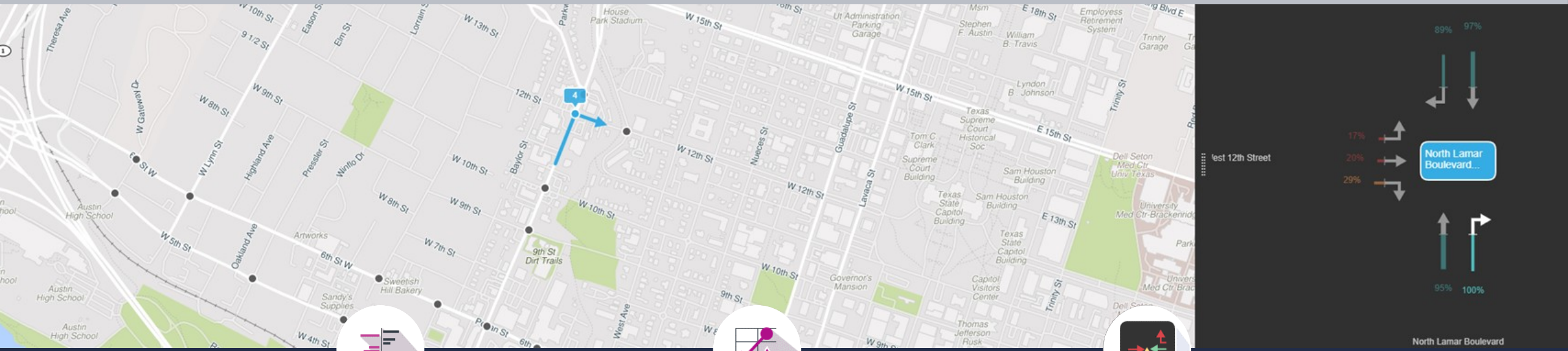


Signal Analytics – Intersection Performance Report

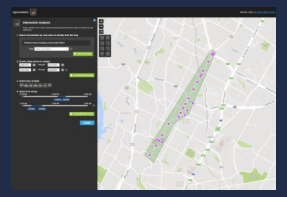


Signal Analytics – **Deep Dive Intersection Analysis**

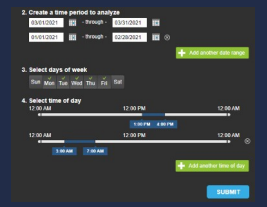
Deep Dive Analysis of Key Performance Indicators for Signalized Intersections



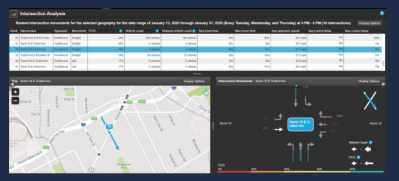
Detailed Spatial Selection



Date/Time Range Filters

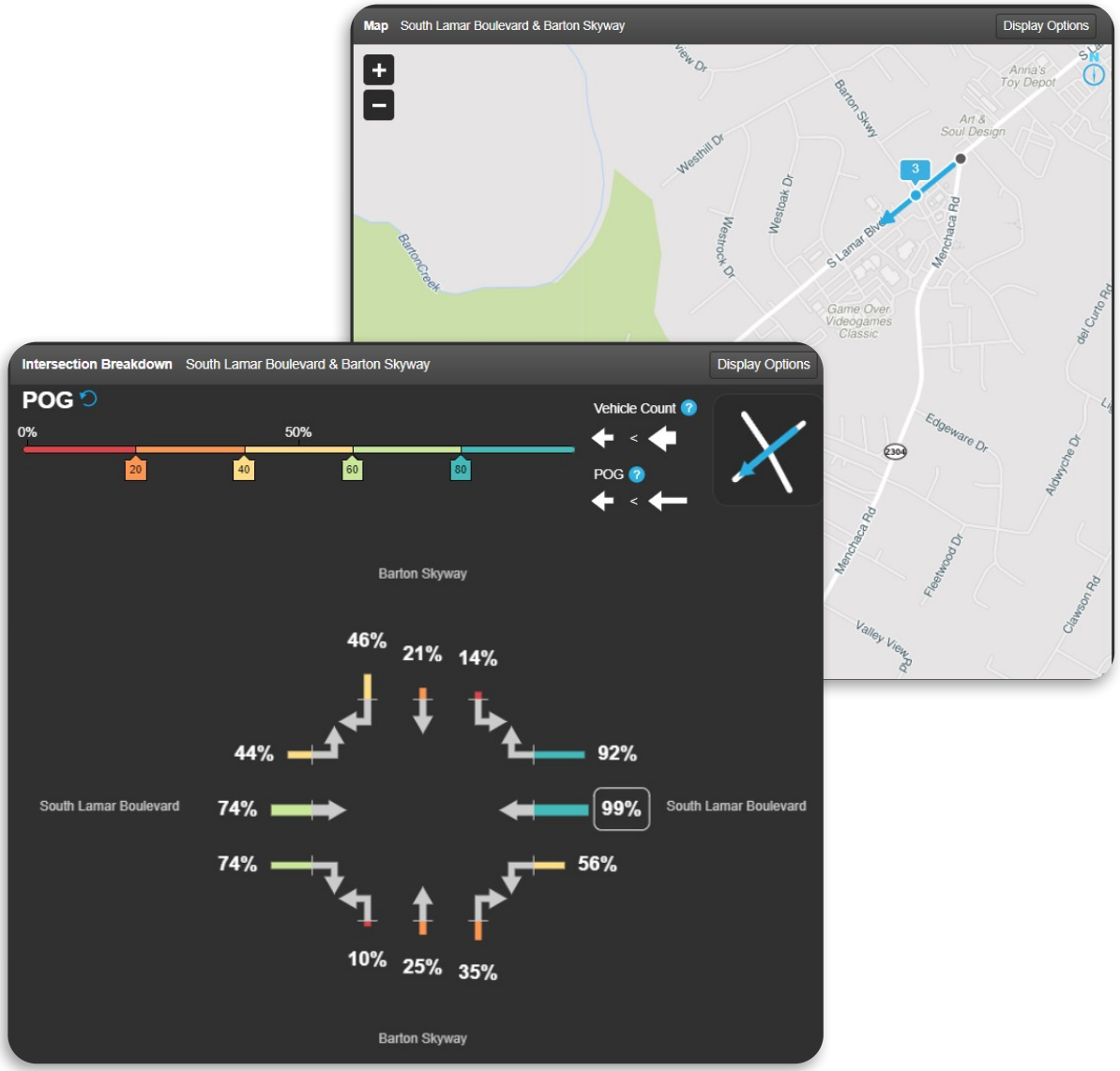


Turning Movement PMs



Intersection Analysis – Data Visualizations and KPIs

- Dynamic and interactive maps, tables and data visualizations
- Historic comparisons
  - Analyze historic KPIs for selected intersections
- KPIs for every signaled intersection
  - POG
  - Vehicle count
  - Stopped vehicle count
  - Avg/Max travel time
  - Avg/Max approach speed
  - Avg/Max control delay
  - Split failure count



Signal Analytics – Output KPIs

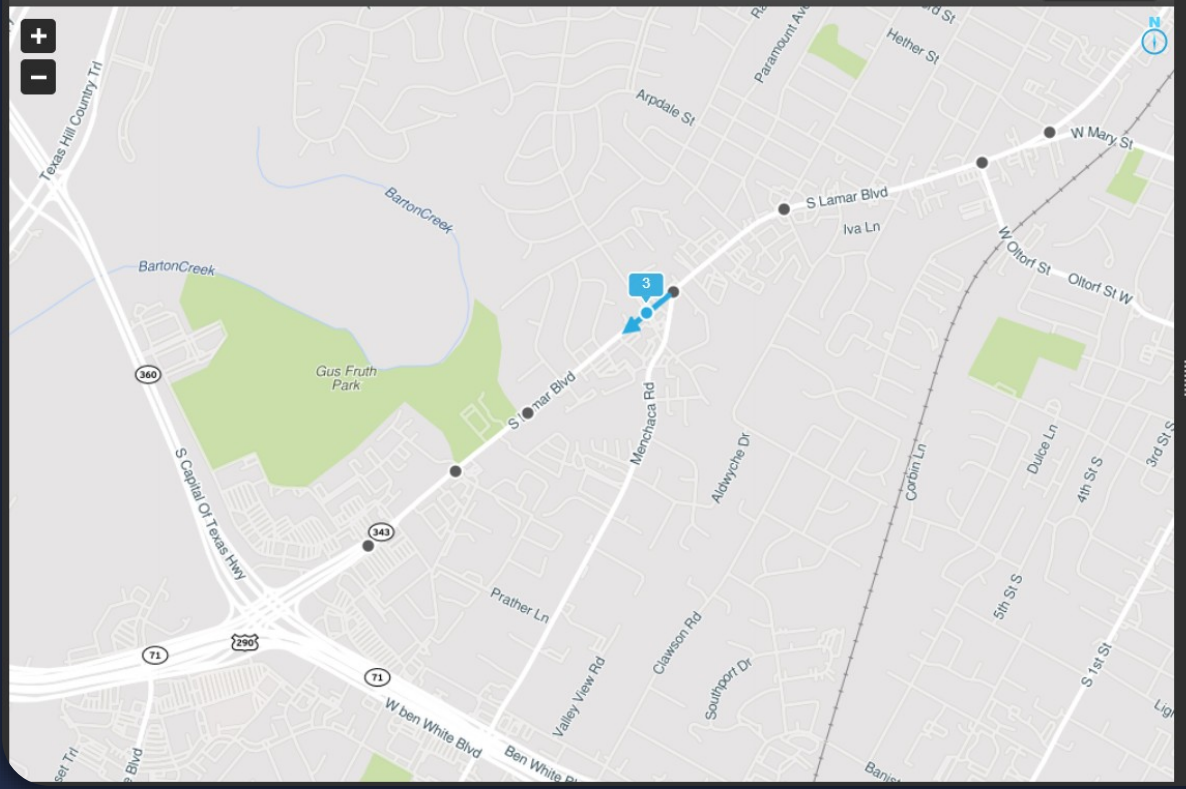
Intersection Analysis

Ranked intersection movements for the selected geography for the date range of March 01, 2021 through March 31, 2021 (Every weekday) at 7 AM - 7 PM (8 intersections)

Filter | Display Options

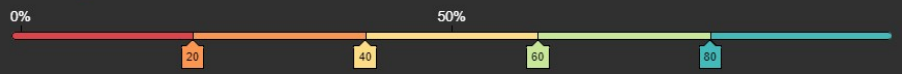
Rank	Intersection	Approach	Movement	Vehicle Count: Total	Vehicle Count: Stopped	POG	Split Failure: Percentage	Split Failure: Count	Travel Time: Avg (sec)	Travel Time: Max (sec)	Approach Speed: Avg (...	Control Delay: Avg (sec)	Control Delay: Max (sec)
1	South Lamar Boulevard	Eastbound	Right	29	0	100%	0%	0	71	393	33	45	367
2	South Lamar Boulevard & West Mary Street	Eastbound	Right	149	0	100%	0%	0	22	31	35	4	13
3	South Lamar Boulevard & Barton Skyway	Westbound	Through	6122	45	99%	0%	2	13	466	34	4	457
4	South Lamar Boulevard	Eastbound	Through	7977	343	96%	0%	0	15	108	39	4	97
5	Panther Trail & South Lamar Boulevard	Northbound	Right	421	19	95%	0%	0	24	71	34	5	52
6	South Lamar Boulevard	Eastbound	Through	6389	352	94%	0%	2	14	247	34	5	238
7	South Lamar Boulevard	Eastbound	Right	113	7	94%	0%	0	19	57	29	5	43
8	West Oltorf Street & South Lamar Boulevard	Eastbound	Right	1576	100	94%	0%	1	23	471	30	7	455
9	Panther Trail & South Lamar Boulevard	Northbound	Through	7647	512	93%	0%	0	15	66	39	5	55

Map South Lamar Boulevard & Barton Skyway — Display Options



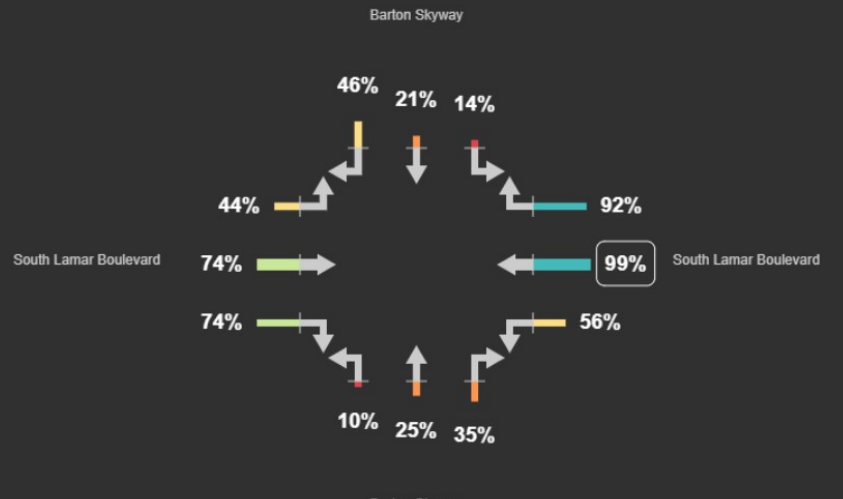
Intersection Breakdown South Lamar Boulevard & Barton Skyway — Display Options

POG

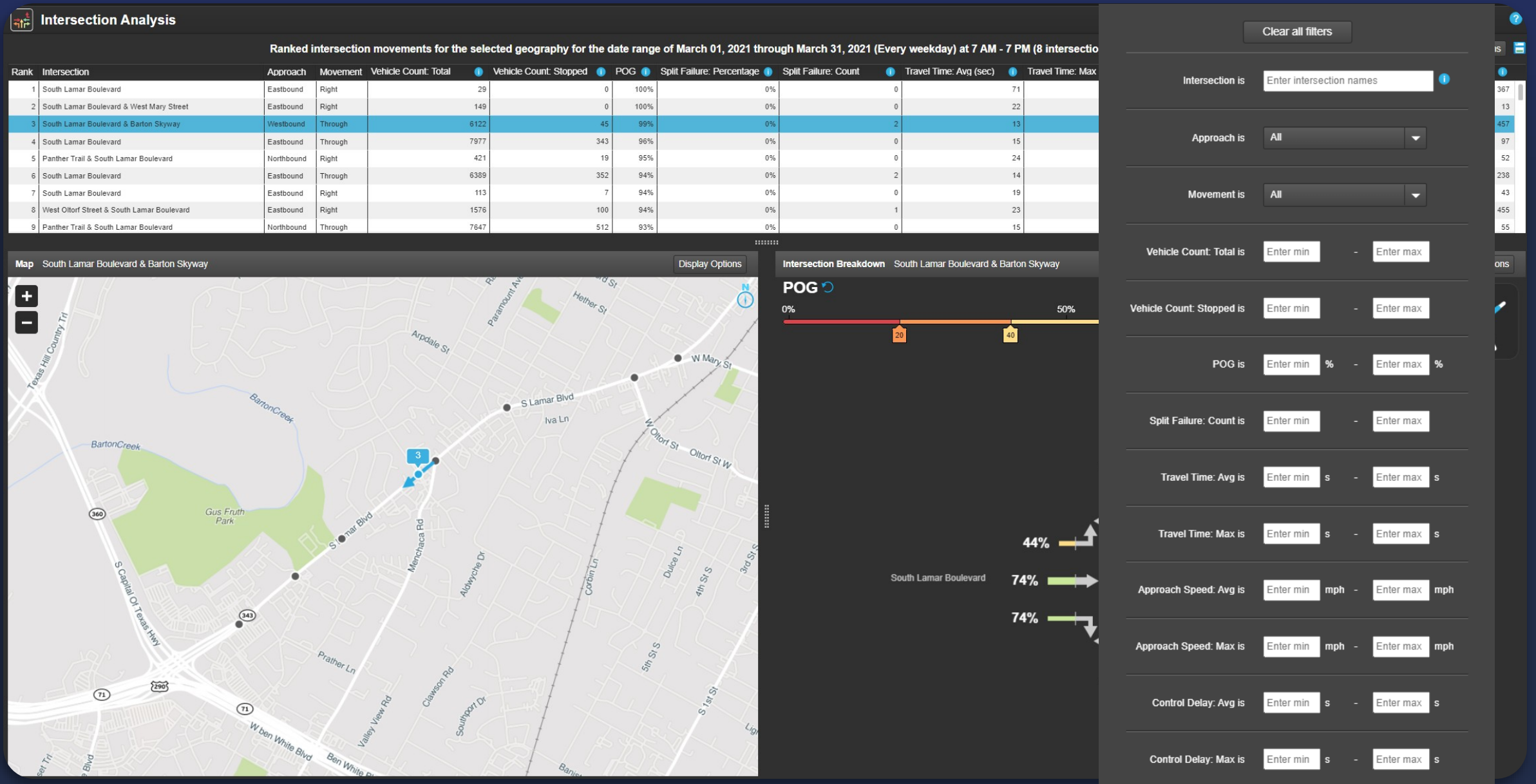


Vehicle Count

POG

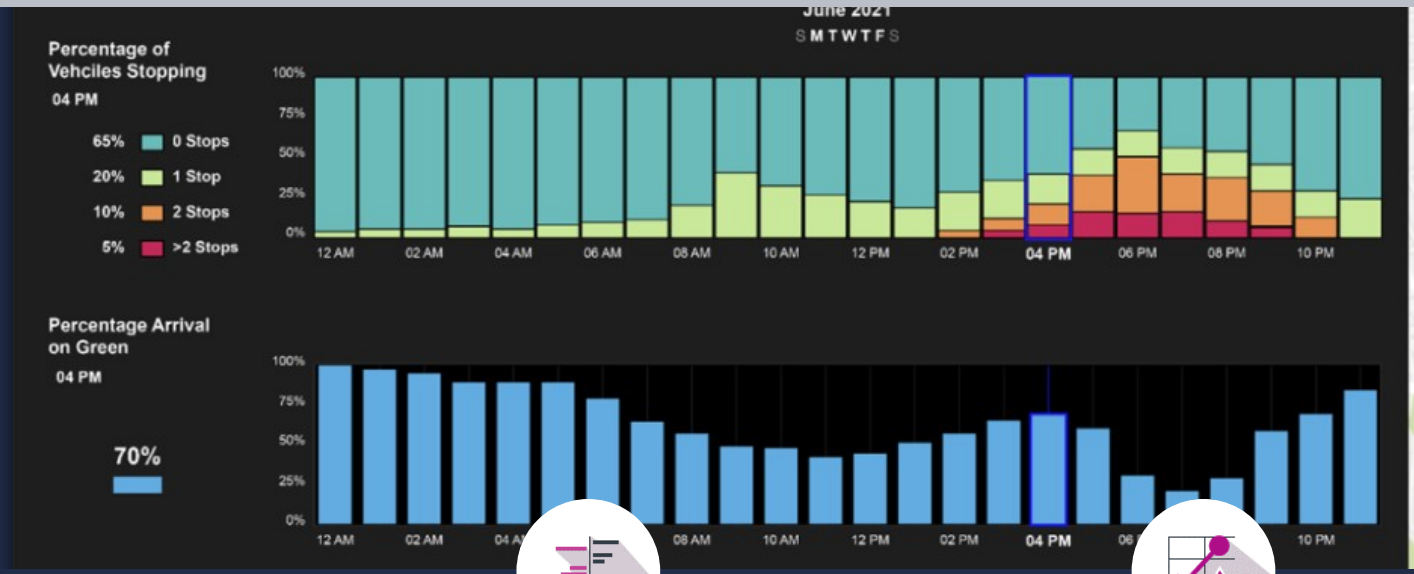


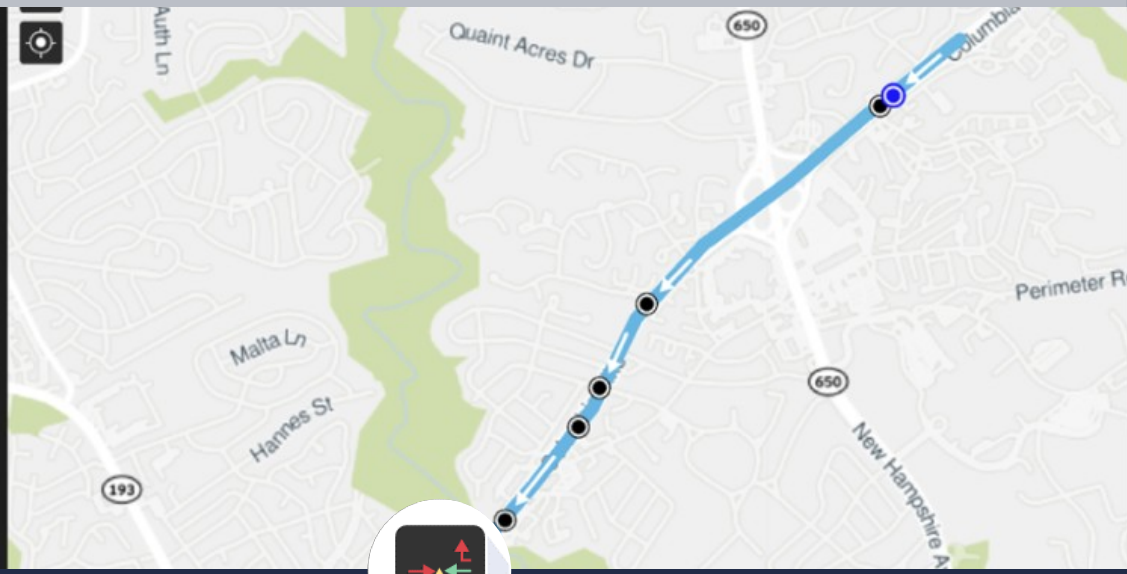
Signal Analytics – Filtering Options



Signal Analytics – **Coming Soon**

Deep Dive Analysis of Key Performance Indicators for Signalized Intersections





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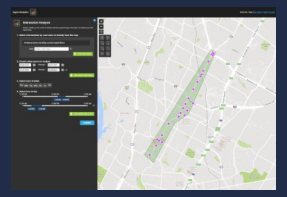

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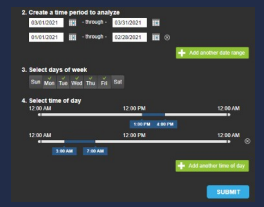

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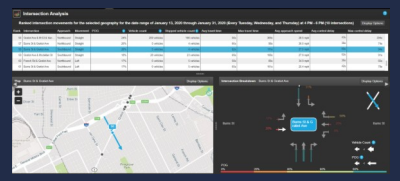
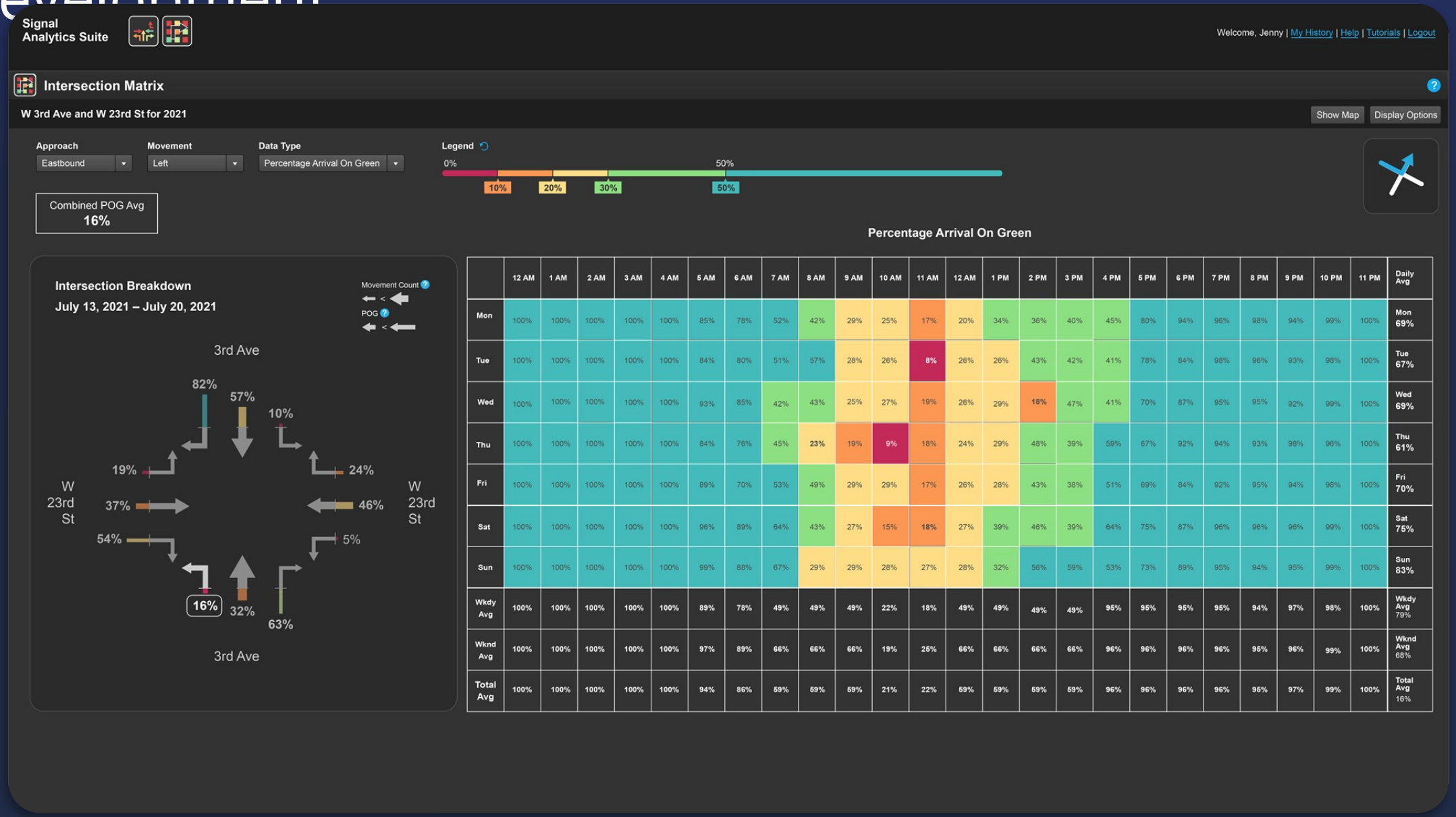
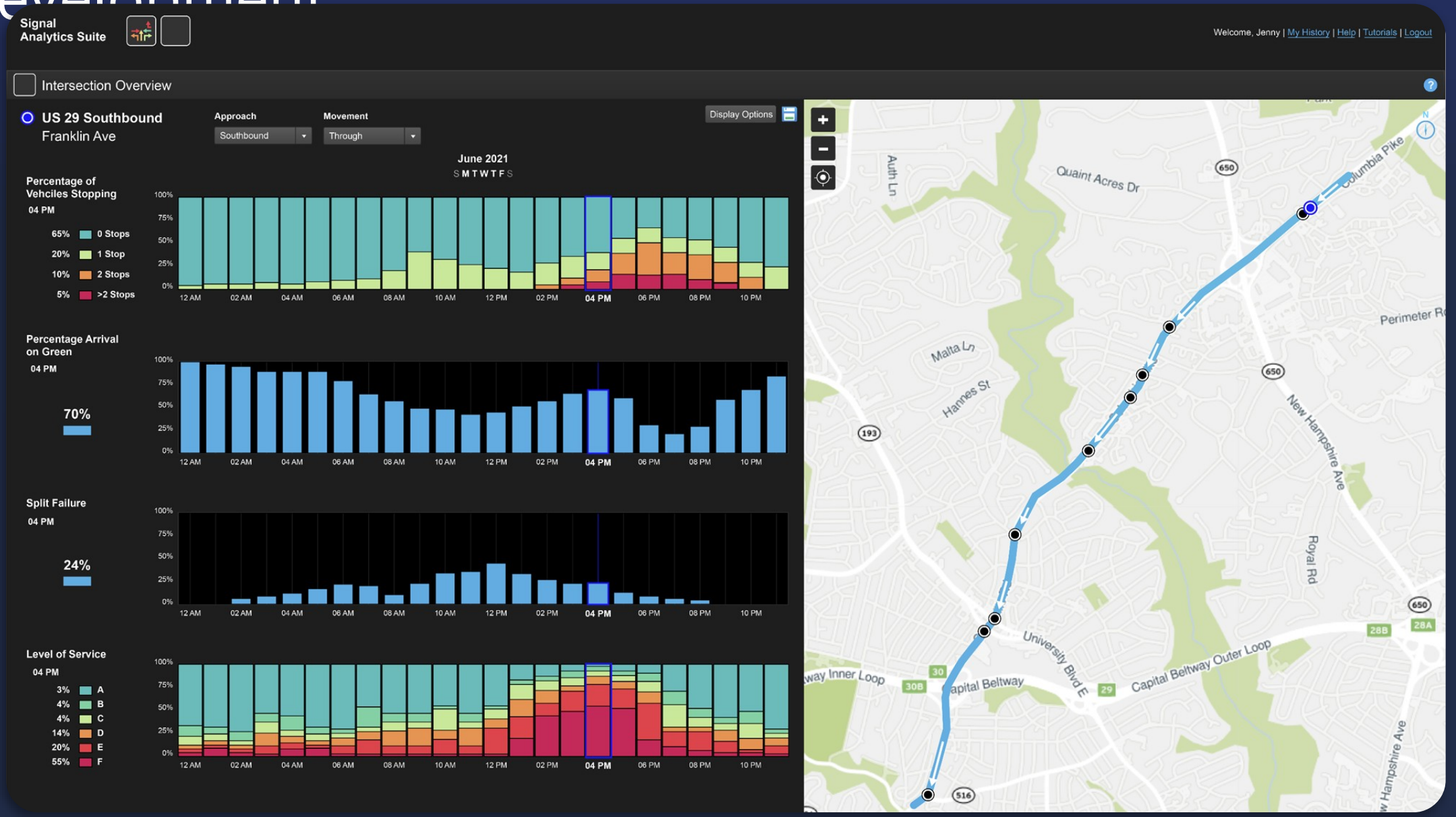


Signal Analytics – New Visualizations Under Development



	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 AM	1 PM	2 PM	3 PM	4 PM	5 PM	6 PM	7 PM	8 PM	9 PM	10 PM	11 PM	Daily Avg
Mon	100%	100%	100%	100%	100%	85%	78%	52%	42%	29%	25%	17%	20%	34%	36%	40%	45%	80%	94%	96%	98%	94%	99%	100%	Mon 69%
Tue	100%	100%	100%	100%	100%	84%	80%	51%	57%	28%	26%	8%	26%	26%	43%	42%	41%	78%	84%	98%	96%	93%	98%	100%	Tue 67%
Wed	100%	100%	100%	100%	100%	93%	85%	42%	43%	25%	27%	19%	26%	29%	18%	47%	41%	70%	87%	95%	95%	92%	99%	100%	Wed 69%
Thu	100%	100%	100%	100%	100%	84%	76%	45%	23%	19%	9%	18%	24%	29%	48%	39%	59%	67%	92%	94%	93%	98%	96%	100%	Thu 61%
Fri	100%	100%	100%	100%	100%	89%	70%	53%	49%	29%	29%	17%	26%	28%	43%	38%	51%	69%	84%	92%	95%	94%	98%	100%	Fri 70%
Sat	100%	100%	100%	100%	100%	96%	89%	64%	43%	27%	15%	18%	27%	39%	46%	39%	64%	75%	87%	96%	96%	96%	99%	100%	Sat 75%
Sun	100%	100%	100%	100%	100%	99%	88%	67%	29%	29%	28%	27%	28%	32%	56%	59%	53%	73%	89%	95%	94%	95%	99%	100%	Sun 83%
Wkdy Avg	100%	100%	100%	100%	100%	89%	78%	49%	49%	49%	22%	18%	49%	49%	49%	49%	95%	95%	95%	95%	94%	97%	98%	100%	Wkdy Avg 79%
Wknd Avg	100%	100%	100%	100%	100%	97%	89%	66%	66%	66%	19%	25%	66%	66%	66%	66%	96%	96%	96%	96%	95%	96%	99%	100%	Wknd Avg 68%
Total Avg	100%	100%	100%	100%	100%	94%	86%	59%	59%	59%	21%	22%	59%	59%	59%	59%	96%	96%	96%	96%	95%	97%	99%	100%	Total Avg 16%

Signal Analytics – New Visualizations Under Development



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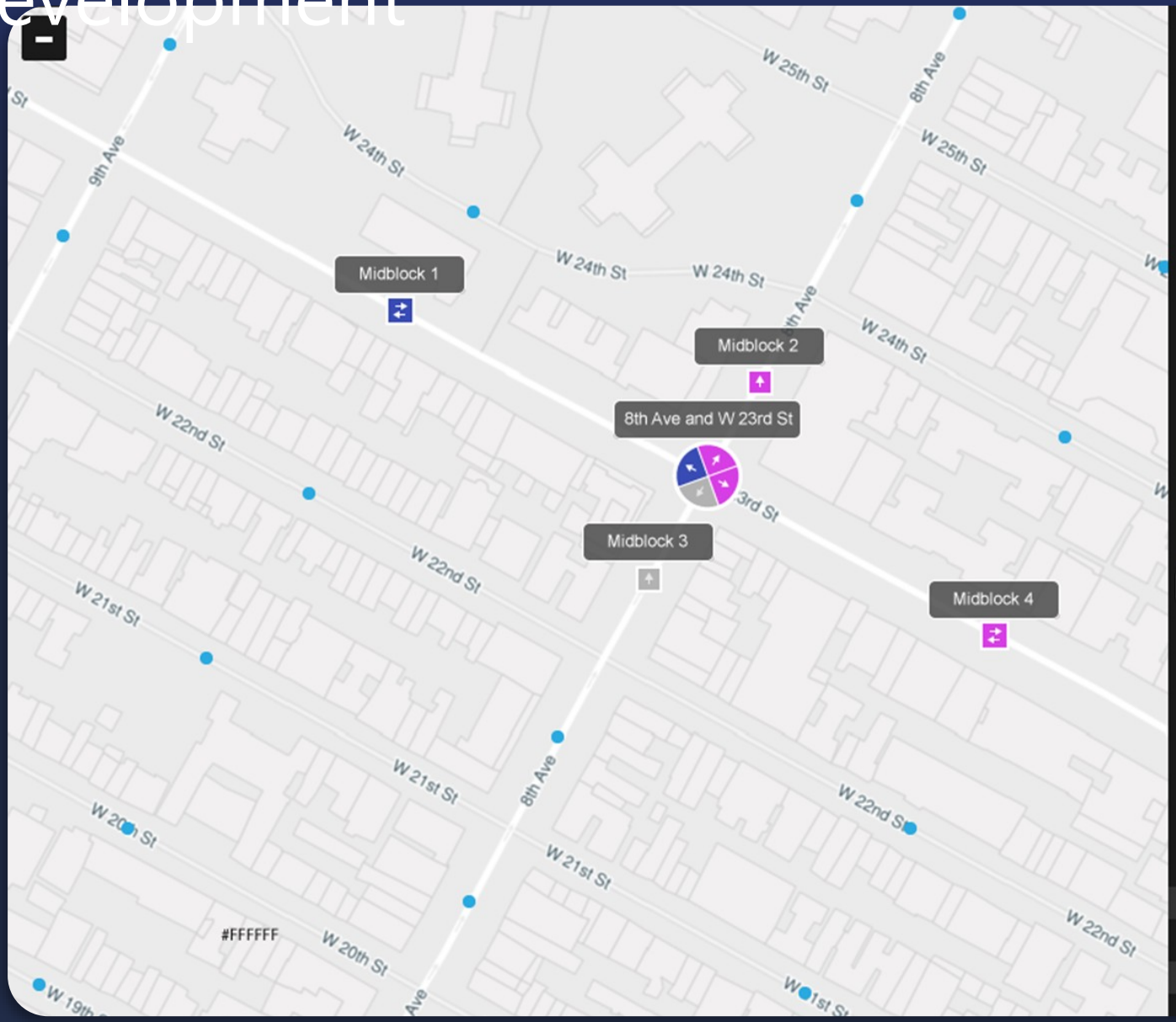
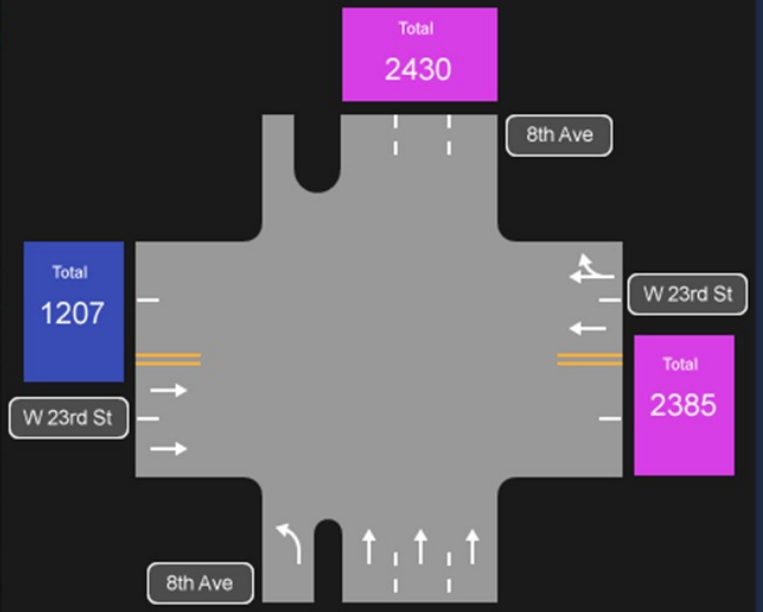


8th Ave and W 23rd St

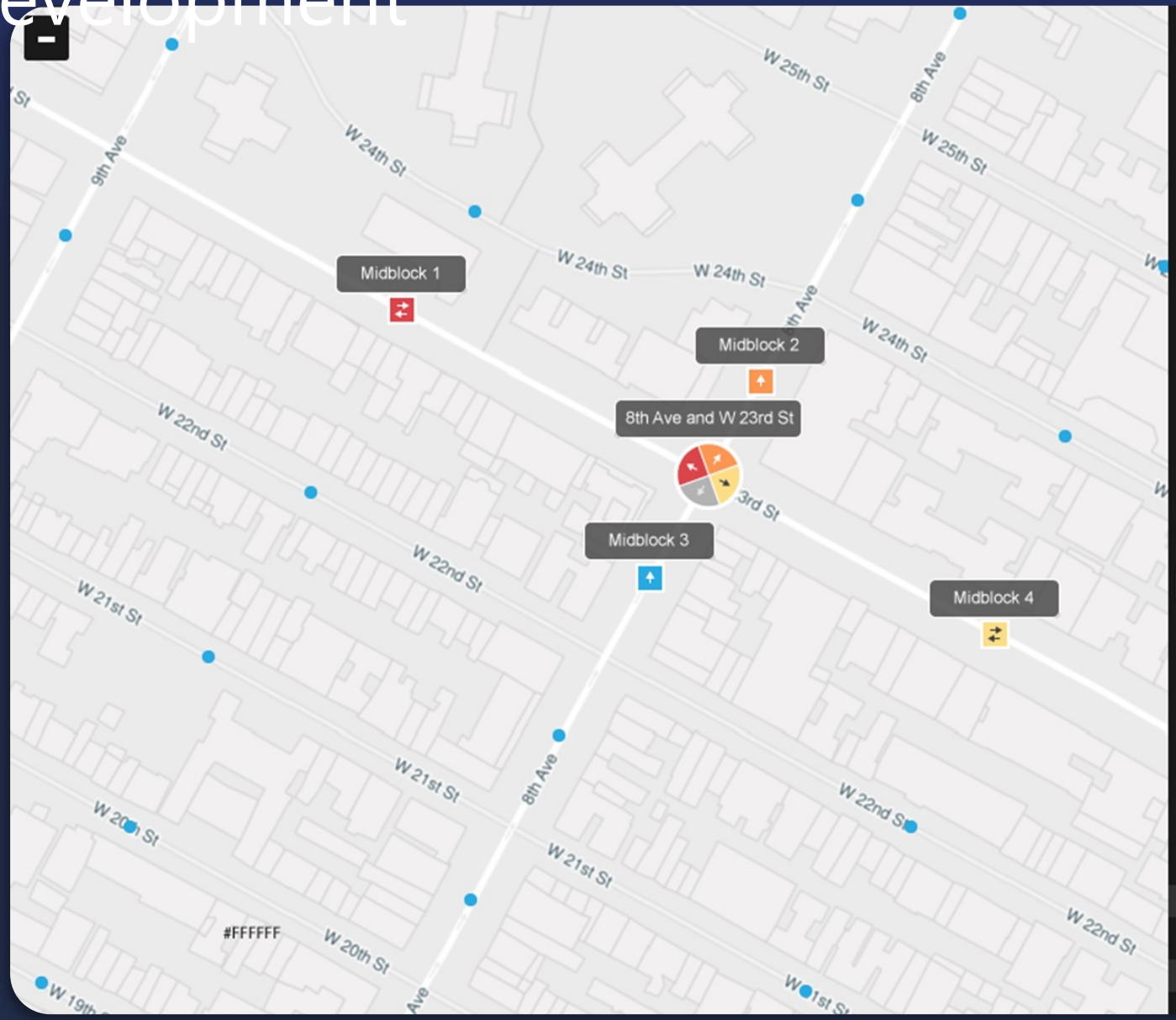
Date range
05/10/2018 SMTWTFS

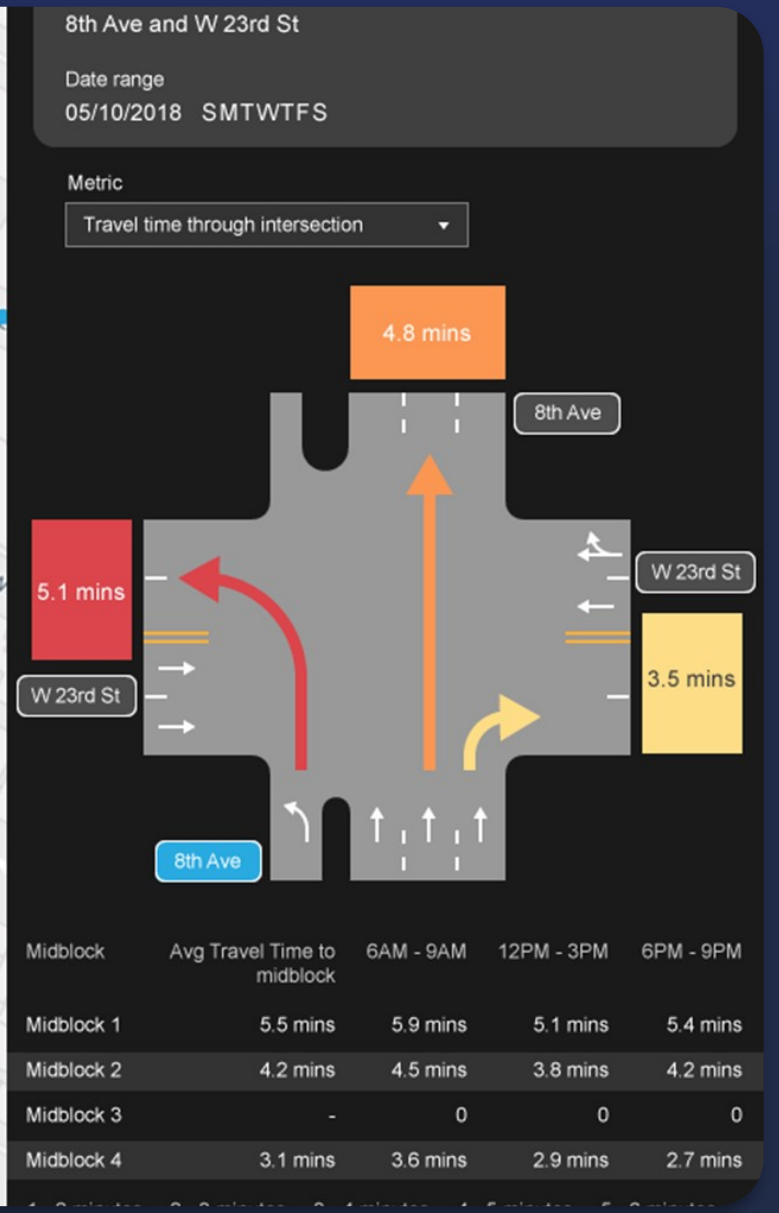
Metric
Number of vehicles passed through



Midblock	Trips from intersection to midblock	6AM - 9AM	12PM - 3PM	6PM - 9PM
Midblock 1	1207	415	248	544
Midblock 2	2430	830	529	1071
Midblock 3	0	0	0	0
Midblock 4	2385	802	787	796

Signal Analytics – New Visualizations Under Development



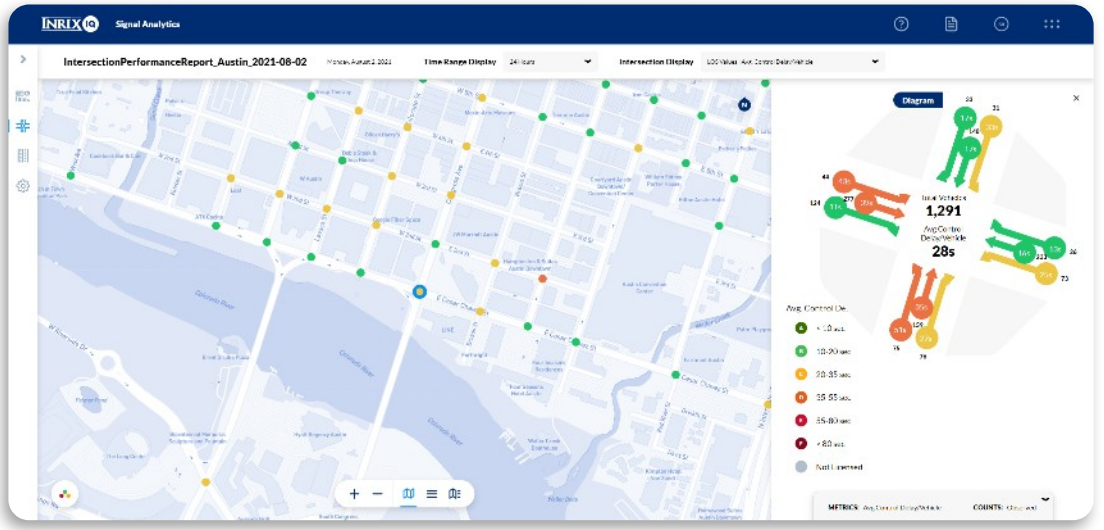


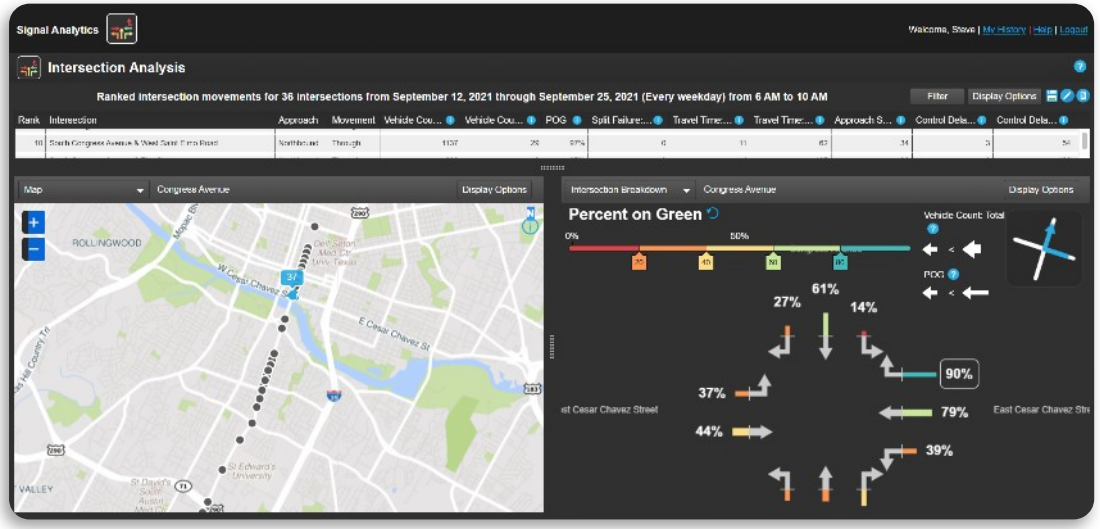
Midblock	Avg Travel Time to midblock	6AM - 9AM	12PM - 3PM	6PM - 9PM
Midblock 1	5.5 mins	5.9 mins	5.1 mins	5.4 mins
Midblock 2	4.2 mins	4.5 mins	3.8 mins	4.2 mins
Midblock 3	-	0	0	0
Midblock 4	3.1 mins	3.6 mins	2.9 mins	2.7 mins

Signal Analytics – **Use Cases**

Core Use Cases – Signal Analytics

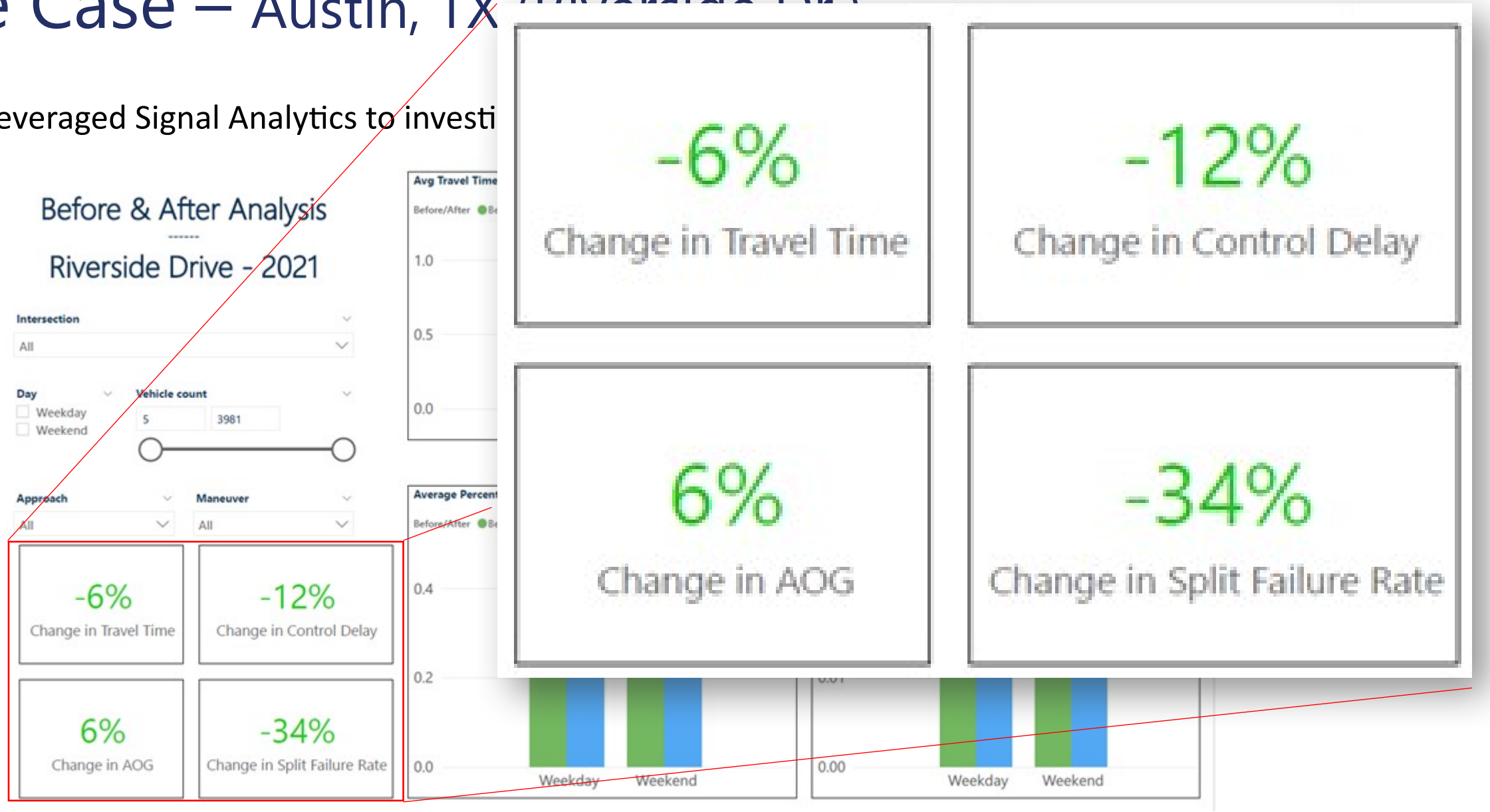
- **Safety and Emmissions**
  - Reducing split failures, reduces idling
  - Where queues exist, safety issues arise
- **Project prioritization**
  - Scan the entire traffic signal network to focus on problem intersections
- **Performance**
  - Identify underperforming intersections
  - Discover and measure iterative changes to signal timings
- **Before and After studies**
  - Did the retiming have a positive outcome
- **Traffic Models**
  - Validate the results of traffic modeling or simulation software





Use Case – Austin, TX (Riverside Dr.)

- Leveraged Signal Analytics to investi



Use Case – Washington County, OR

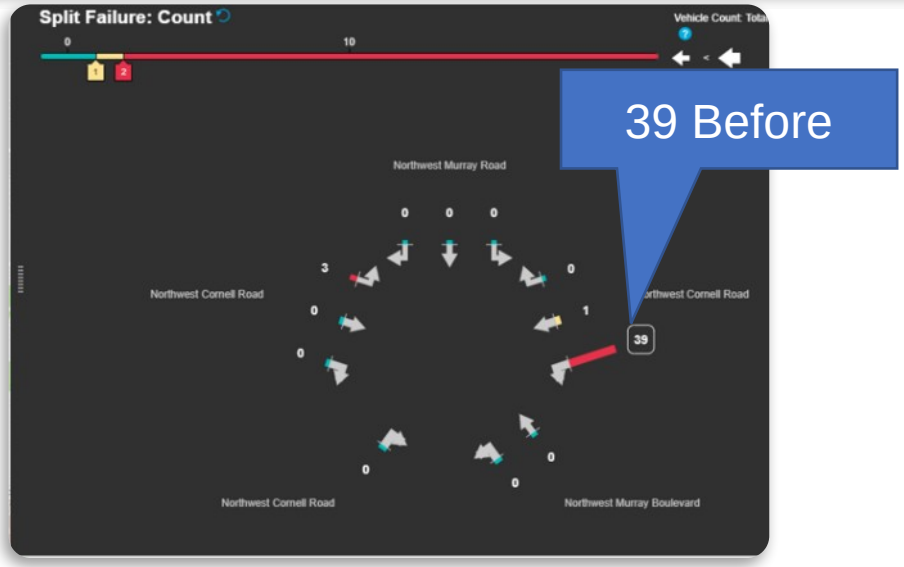
- Leveraged Signal Analytics to investigate citizen complaint

NW Cornell Rd at NW Nurray Blvd 7/22-8/11/21 5am-9pm

Ranked intersection movements for 1 intersection from July 22, 2021 through August 11, 2021 from 5 AM to 9 PM

Filter | Display Options

Rank	Intersection	Approach	Movement	Vehicle Count: Total	Vehicle Count: Stopped	POG	Split Failure: Count ▼	Travel Time: Avg (sec)	Travel Time: Max (sec)	Approach Speed: Avg (...	Control Delay: Avg (sec)	Control Delay: Max (sec)
1	Northwest Cornell Road	Westbound	Left	1183	1038	12%	39	74	239	27	57	222
2	Northwest Cornell Road	Eastbound	Left	75	71	5%	3	80	157	28	64	141
3	Northwest Cornell Road	Westbound	Through	1390	702	49%	1	37	118	31	24	105
4	Northwest Cornell Road	Eastbound	Right	974	365	63%	0	27	86	32	12	71
5	Northwest Cornell Road	Westbound	Right	239	95	60%	0	33	95	31	15	77
6	Northwest Cornell Road	Eastbound	Right	1509	711	53%	0	37	165	27	20	148
7	Northwest Cornell Road	Northbound	Through	557	346	38%	0	47	118	30	33	104
8	Northwest Cornell Road	Southbound	Right	15	11	27%	0	49	94	29	28	73
9	Northwest Cornell Road	Northbound	Left	1401	1057	25%	0	50	147	29	44	132



Impact of Well-Timed Signals

Reduction of Fuel Consumption and GHG Emissions

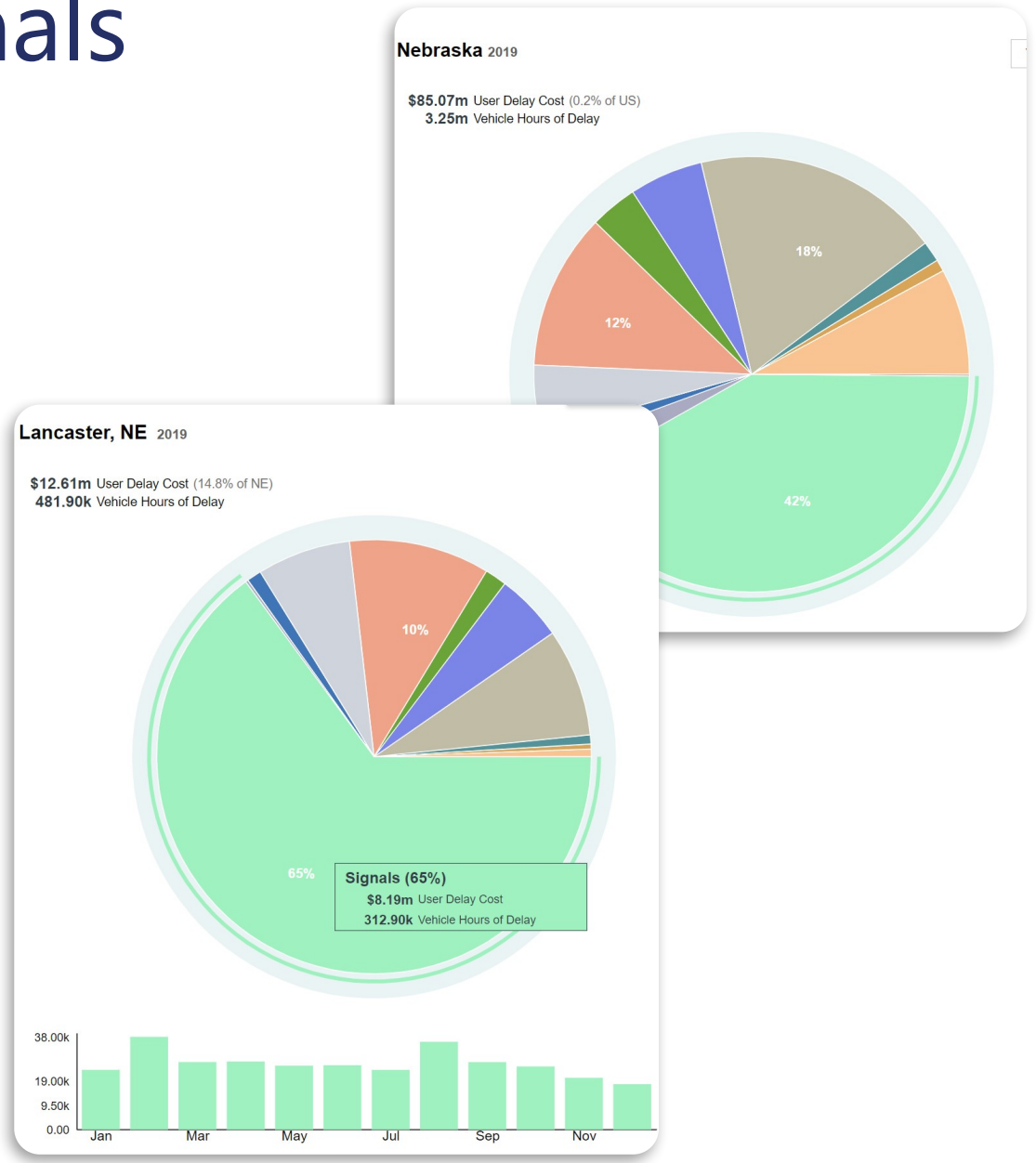
- Inst. of Transportation Engineers (ITE) estimates that properly timed signals decreases fuel consumption by 6% to 9%
- Aligns your with IIJA SMART program

Improve Safety

- Where queues exist, correlation to safety issues
- Reducing split failures, reduces more aggressive driving behaviors

Reduce Delay

- Recent estimates indicate that traffic signals account for roughly **329 million vehicle hours of delay per year**
- ITE reports,signal retiming projects reduce motorist delay by between 15% to 37%



SOURCE: HRG Report on Traffic Signal Retiming Cost Benefits

Visit: https://congestion-causes.ritis.org/

Q & A


CATT LABORATORY
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Thank You!

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