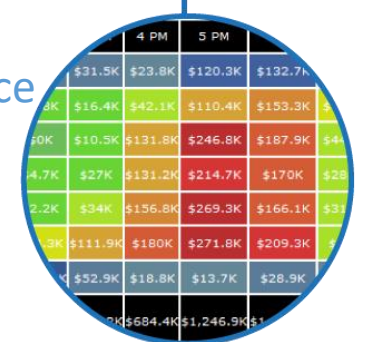


Real-World Challenges, Real-World Solutions

Using big data and information analytics



Performance Measures



Planning



Operations

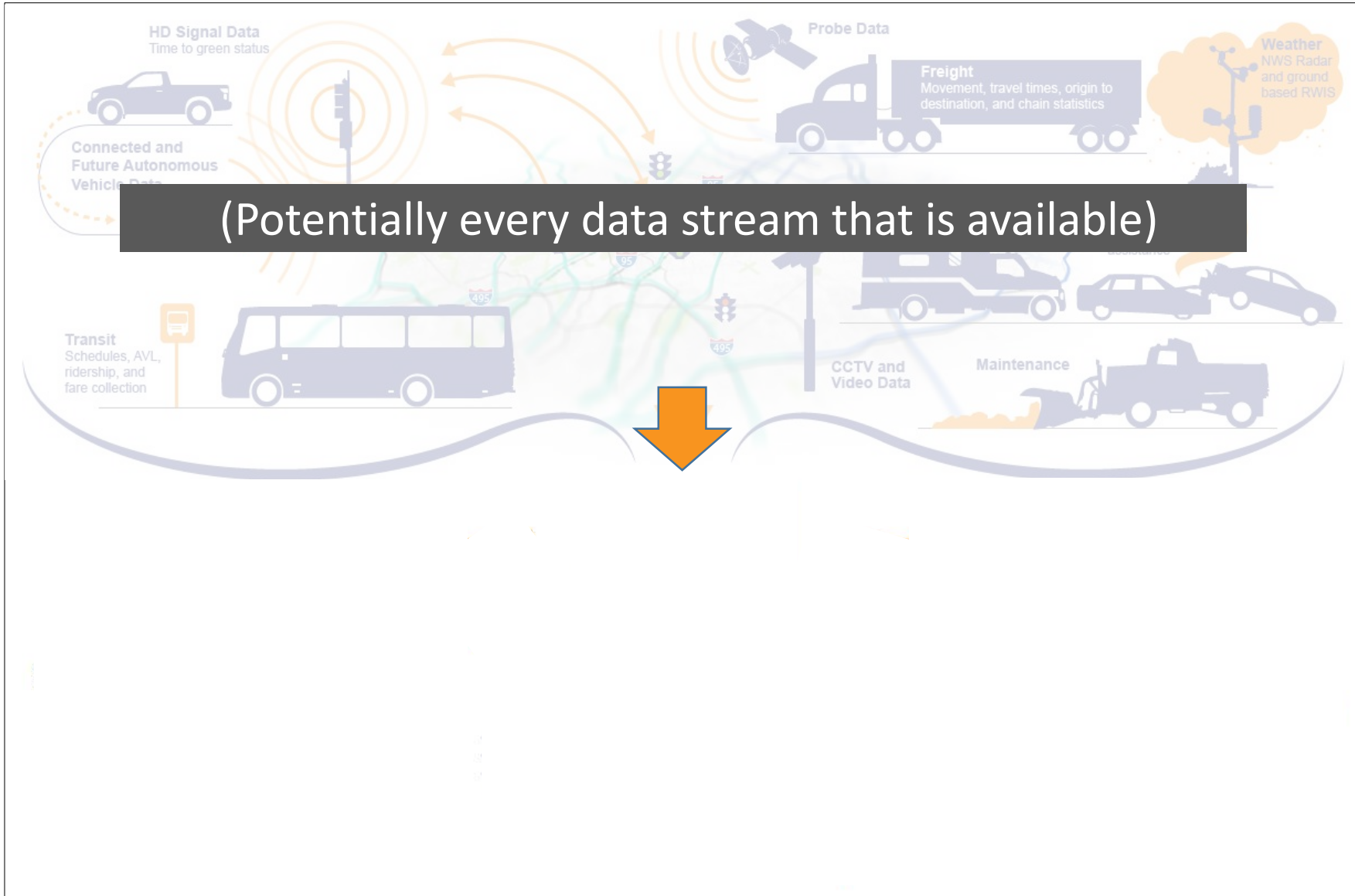


Communications

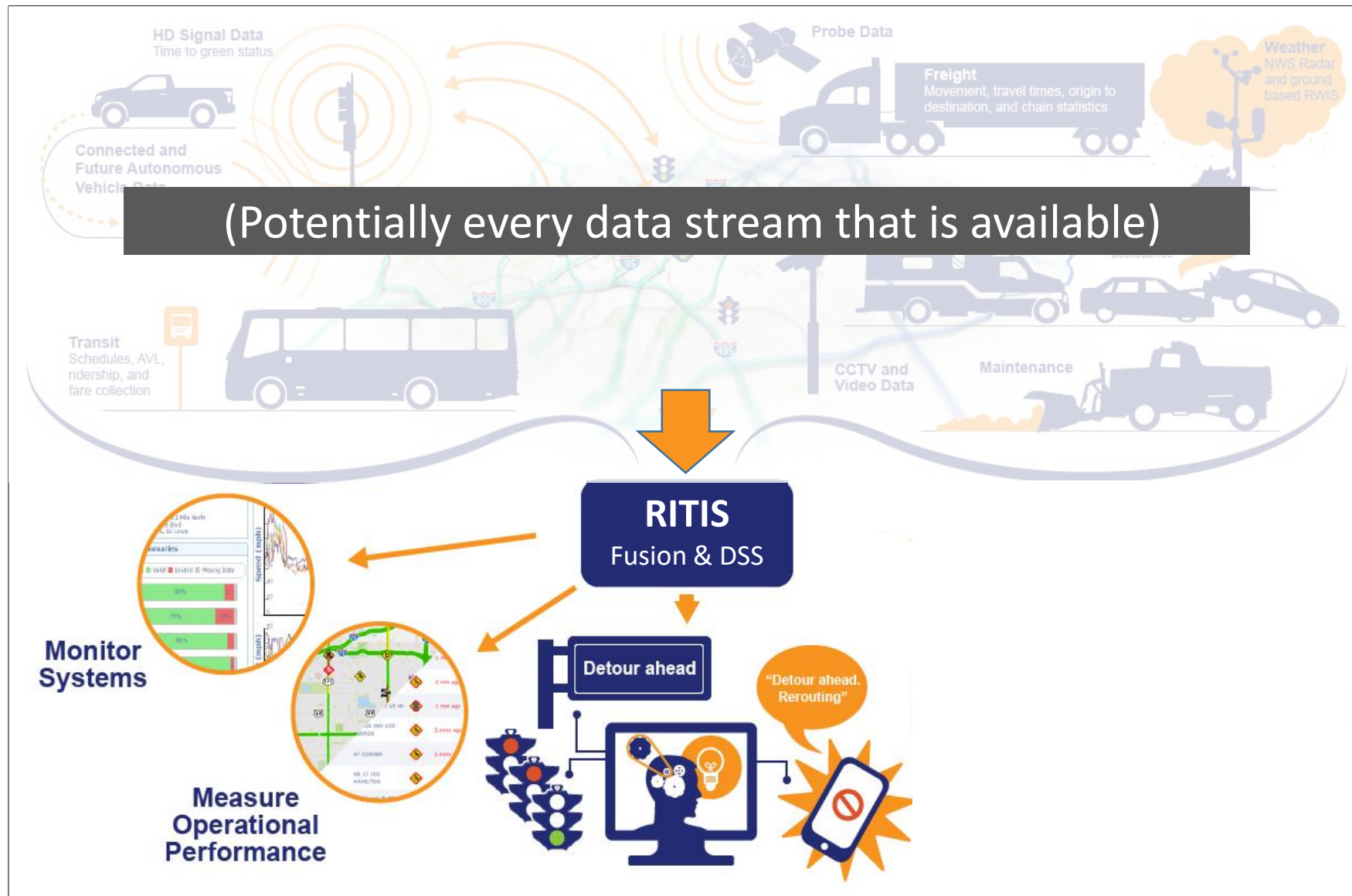


Enabling Effective Decision Making With Data

RITIS: Fuse Data and Produce Actionable Information in Real Time



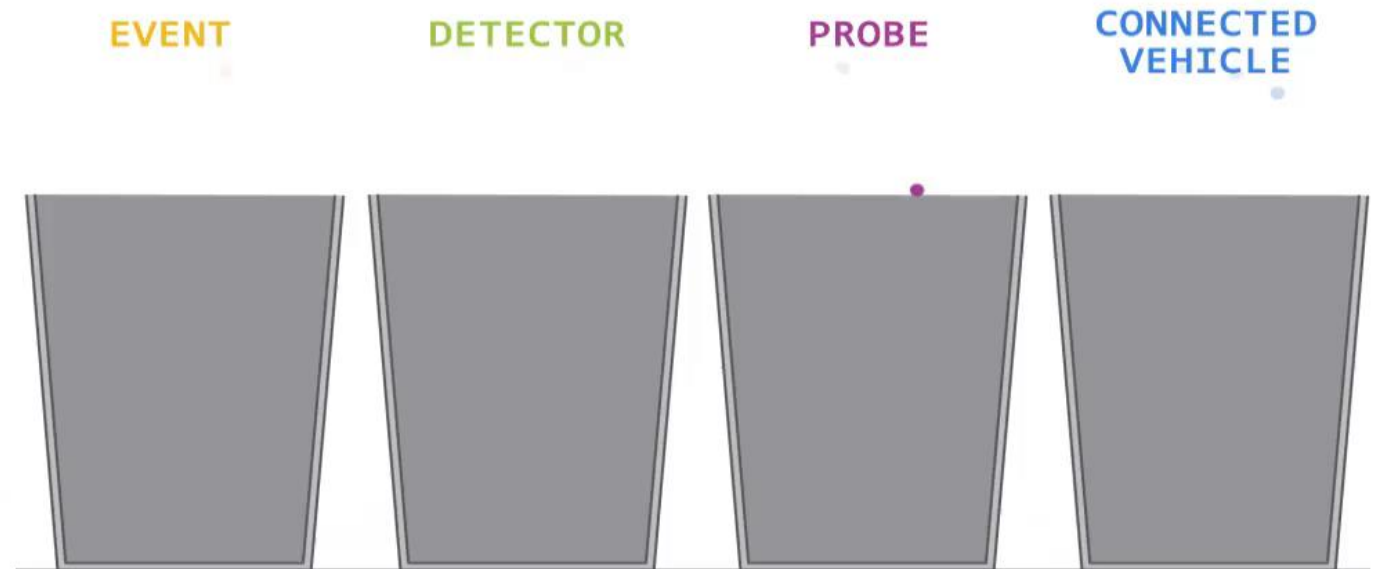
RITIS: Archive and Analyze Data to Support Decision Making



How Much Transportation Data Flows Through RITIS?

RITIS Today:

- Traffic accidents: 120,000 records per day: 0.002 Gb/day
- Traffic detectors: 45,000,000 records per day: 5 Gb/day
- Probe vehicle data: 7,500,000,000 records per day: 550 Gb/day (expected to jump to 8 Trillion)
- CCTV, weather, radio, etc: (no stats kept) records per day: ??? Tb/day
- V2X & Automation data: ?,???,???,???,??? records per day: ??? ?b/day (Starting in 6 months)



Our Goal is to:

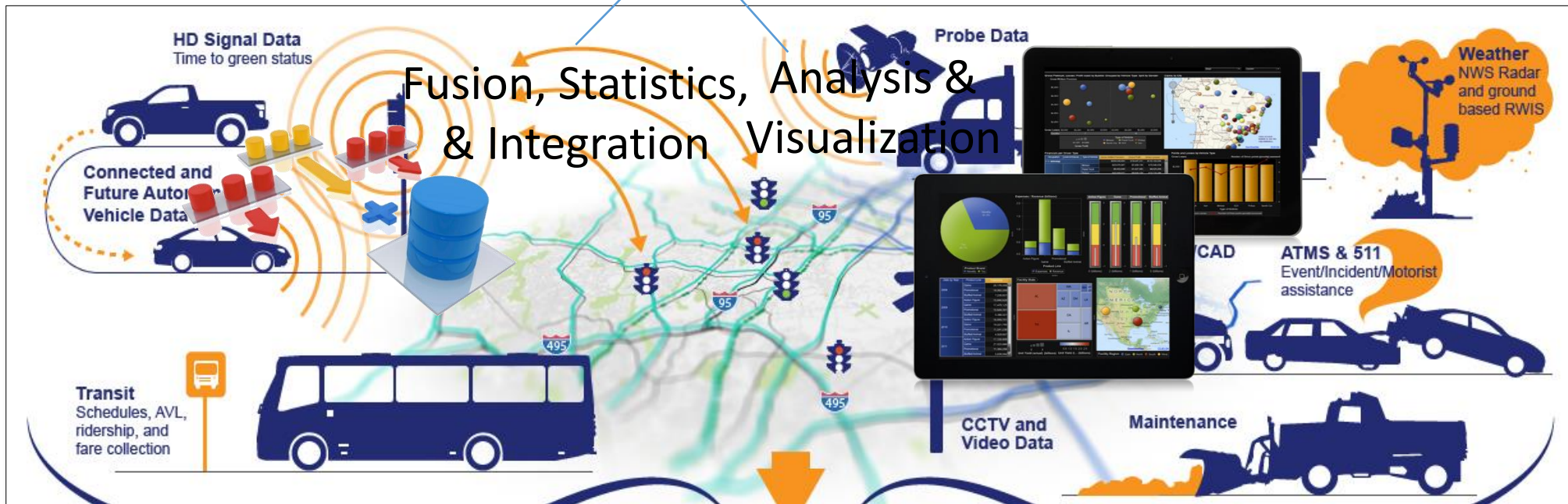
Provide tools to make data

- **easily accessible,**
- **usable,**
- **understandable, and**
- **allowing for insights discovery**

To domain experts or the general public



The Components of a Great Big Data System



There Are Many Use Cases for Transportation Visualizations

- Operations
 - Situational Awareness
 - Decision Support
 - Information Sharing
 - Coordination
 - Evacuation Support
 - AARs
 - Etc.
- Research
 - Open Data
 - Ease of Access
- Planning
 - Identifying problems
 - Prioritizing Projects
 - Before & After Studies
 - Etc.
- Traveler Information
 - Blending multi-agency data
 - Public and Private Data
 - APIs for 3rd Parties

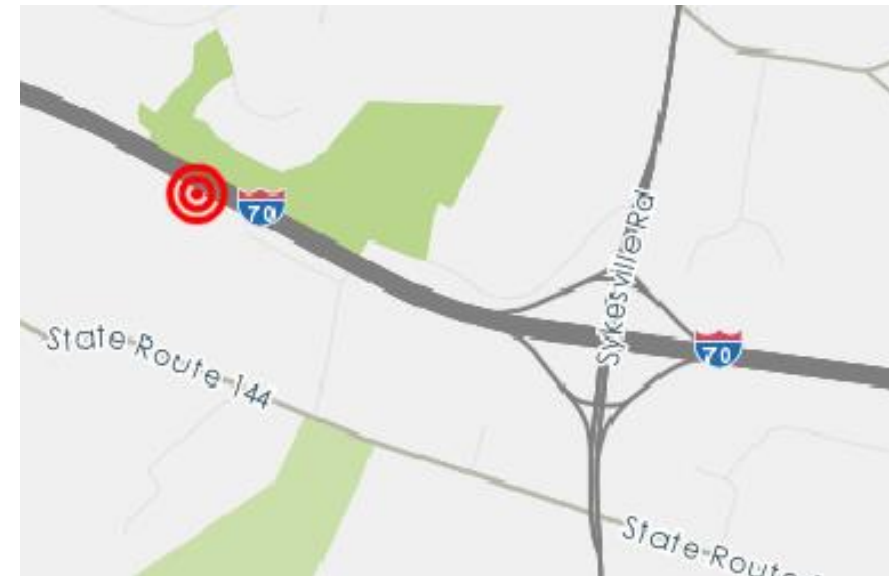
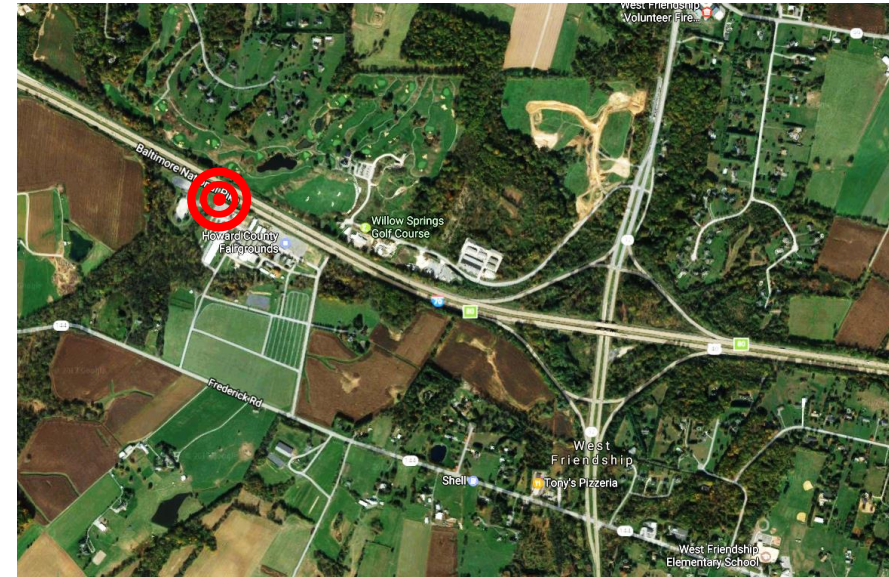
Challenge: After Action Reviews

There's just been a serious fatal incident on I-70. The incident took a long time to clear—maybe too long. The Director of Operations is asking you to facilitate an after action review meeting with the DOT, fire service, police, and others to understand what was done well and what could have been done better. If you find any problems, can you use multiple AARs from similar incidents to create a case for changing policies related to incident clearance in the state?

I-70 fatality incident

> Background...

- Occurred on October 29, 2016 at around 4:30 AM
- Located on I-70 West, past Exit 80 - MD 32 Sykesville Rd
- A car hit a deer, then a tractor trailer hit the car, and jack-knifed, resulting in one fatality
- All lanes were closed in the WB direction for over 7 hrs
- It took about 11 hrs to fully clear the incident and reopen all lanes



I-70 fatality incident

- › Several RITIS / PDA tools were used to conduct impact analysis and provide visual content as part of an After Action Review...

EQT
Event Query Tool



EQT/ Incident Timeline

Region Explorer

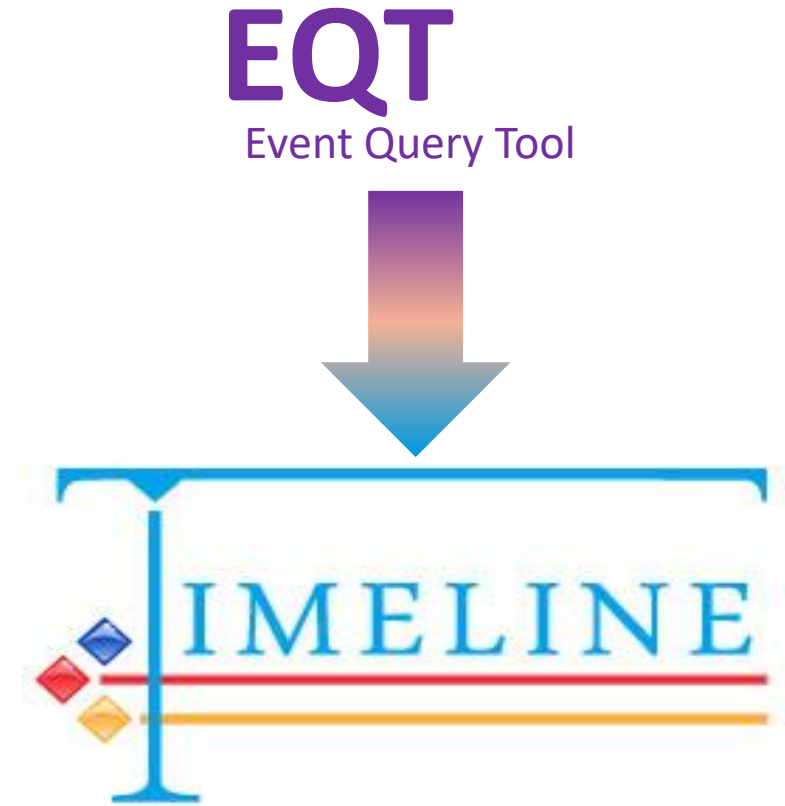
Trend Map

Congestion Scan

User Delay Cost

I-70 fatality incident

- > Incident Timeline...
 - Used to review responder response times, lane & event clearance times, and Operator notes.
 - Timeline graphics are inserted in to AARs
 - “Heat Map” is used to see trends in incident activity



EQT analyzes your ATMS event data for insight into event impacts on your roadway system, through auto-created tables, charts and maps.

Timeline displays how an incident is being managed by showing the relationships between responder notifications & arrival times, lane status, traffic queues, clearance times, communication logs, CCTV, and DMS.

Integrated Event Management



TOC Communications



Notifications & Responders



Lane Status

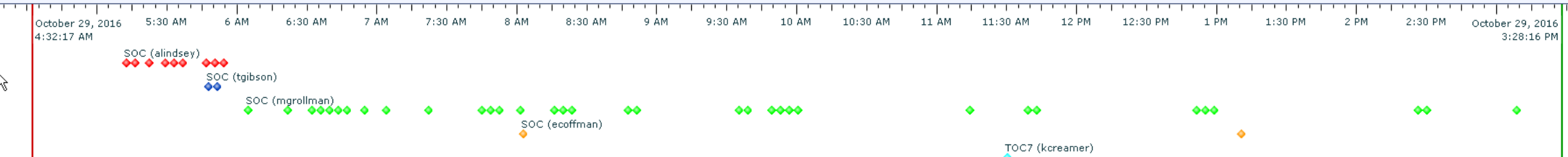


Overhead Sign Messages



Speed Readings

Traffic management center communications



SOC (alindsey) (5:12:40 AM): 9413 EVENT PAST 32 ABLE TO ACCESS EXIT RAMP
SOC (alindsey) (5:13:59 AM): CAR HIT A DEER THEN THE TT CAME AND HIT THE CAR PRIORITY 4
SOC (alindsey) (5:22:29 AM): WAITING FOR ROUGH ETC FROM 9413 BEFORE ADVISE OCRI
SOC (alindsey) (5:29:18 AM): OCRI ADVISED
SOC (alindsey) (5:31:59 AM): OIL PAN ON THE TRACTOR MY BE COMPROMISED HAZMAT IS ON SCENE PUMPING THE TANKS
SOC (alindsey) (5:32:11 AM): MSP ADVISED REQUESTING MDE
SOC (alindsey) (5:46:53 AM): MSP ADVISED NO ETC AT THIS TIME AND CONFIRMED THAT THIS IS A F
SOC (tgibson) (5:47:46 AM): DETOUR WILL BE 70 W TO MD 32 TO MD 144 TO MD 97 TO 70
SOC (tgibson) (5:48:14 AM): 7315 ON SCENE TO SET UP DETOUR
SOC (alindsey) (5:50:30 AM): DETOUR 70W TO 32 TO 144 TO 97 BACK ONTO 70W
SOC (alindsey) (5:51:26 AM): AT ACTUAL LOCATION IS RIGHT BEFORE THE ENTRANCE FOR THE SCALE HOUSE
SOC (mgorollman) (6:04:52 AM): CALLED 9700 UNABLE TO LEAVE MESSAGE PHONE KEPT RINGING
SOC (mgorollman) (6:21:49 AM): 9701 HAS BEEN NOTIFIED OF THE UPDATES
SOC (mgorollman) (6:32:10 AM): 9413 ADV AT THIS POINT HE DOES NOT KNOW WHAT THE TT IS LOADED WITH
SOC (mgorollman) (6:32:21 AM): 9413 ADV HE CONTACTED 9004 BUT WAS UNABLE TO REACH 9701
SOC (mgorollman) (6:33:45 AM): 9413 ADV TT WAS HAULING AMAZON PACKAGES
SOC (mgorollman) (6:34:52 AM): 9413 ADV HE LEFT HIS STATE PHONE IN HIS REGULAR TRUCK, # TO REACH HIM AT IS 443 698 2648
SOC (mgorollman) (6:36:10 AM): 9701 ADV OF 9413'S PHONE #
SOC (mgorollman) (6:54:47 AM): OCRI UPDATED ON EVENT
SOC (mgorollman) (7:04:06 AM): 9413 ADV MSP IS ALLOWING THE REMOVAL OF THE DEER CARCASS IN LN/1
SOC (mgorollman) (7:22:15 AM): 9413 ADV DEBRIS HAS BEEN REMOVED OUT OF LN/1 AND SAND TRUCK IS GETTING READY TO MAKE A PASS
SOC (mgorollman) (7:45:03 AM): 9413 ADV AN ETC OF 10 MINS TO REOPEN THE LEFT LANE, HOWEVER DID NOT MENTION AT FIRST IT WAS JUST TO RELIEVE THE TRAFFIC STUCK IN THE QUEUE
SOC (mgorollman) (7:45:05 AM): UPDATED PAGE SENT OUT
SOC (mgorollman) (7:45:19 AM): 9413 ADV CRASH TEAM IS STILL ANOTHER HOUR OUT DUE TO COMING FROM THE EASTERN SHORE
SOC (mgorollman) (8:01:37 AM): 9703 ADV HE IS ENROUTE TO ASSIST 9413
SOC (ecoffman) (8:02:49 AM): 9315 ADV DETOUR IN PLACE WB 32 TO MD 97
SOC (mgorollman) (8:16:09 AM): 9413 ADV CRASH TEAM THAT WAS ORIGINALLY COMING IS NO LONGER GOING TO BE ENROUTE, MSP ON SCENE WILL HANDLE THE REST OF THE PICTURES AND INVESTIGATION TOW HAS BEEN CALLED
SOC (mgorollman) (8:16:12 AM): 9413 ADV STILL NOT ETC
SOC (mgorollman) (8:16:54 AM): 9413 ADV THE QUEUE HAS BEEN CLEARED
SOC (mgorollman) (8:47:45 AM): 9703 ADV WB DELAYS BEGIN AT SANDS HILL RD
SOC (mgorollman) (8:47:54 AM): 9703 ADV RUNNING CODE
SOC (mgorollman) (9:35:22 AM): 9703 ADV THE INVESTIGATION IS COMPLETE PASSENGER CAR IS GOING TO REMOVED FIRST AND THEN THEY ARE GOING TO CUT MORE GUARDRAIL TO FREE THE TT
SOC (mgorollman) (9:35:25 AM): NO ETC
SOC (mgorollman) (9:49:20 AM): MSP HEADQUARTERS SENT OUT AN EMAIL THAT ALSO
SOC (mgorollman) (9:49:57 AM): CONFIRMED WITH 9703 THAT ALL LANES WERE STILL CLOSED
SOC (mgorollman) (9:50:11 AM): CALLED WATERLOO BARRACK TO ADV THEM TO TELL HEADQUARTERS THAT ALL LANES STILL REMAINED CLOSED
SOC (mgorollman) (9:50:29 AM): W/B I-70 @ MD RT 32 is now open

MSP Headquarters Duty Officer
P.C.S.D.
410-653-4200
MSP.HQDO@Maryland.gov

SOC (mgorollman) (11:14:19 AM): 9703 ADV RECOVERY PROCESS IS NOT GOING WELL THEY ARE TRYING TO GET THINGS CLEARED OUT OF THE WAY SO THEY CAN REOPEN LN/1 IN THE NEXT 30 MINS
TOC7 (kcreamer) (11:30:25 AM): 9711 ADVISED MD 144 IS BACKED UP TO MD 32
SOC (mgorollman) (11:39:14 AM): 9703 ADV ROTATOR IS ENROUTE
SOC (mgorollman) (11:39:35 AM): 9703 ADV LEFT LN IS OPEN AT THE SCENE AND THEY ARE LETTING THE SHOP KNOW TO LIFT THEIR DETOUR
SOC (mgorollman) (12:51:31 PM): 16 MSP 044425
SOC (mgorollman) (12:51:36 PM): 50-60 FT OF GUARDRAIL DAMAGE
SOC (mgorollman) (12:55:37 PM): 9703 ADV 2 ROTATORS ARE ON SCENE FROM MORTONS
SOC (ecoffman) (1:10:41 PM): SHOP ADV DETOUR REMOVED
SOC (mgorollman) (2:26:31 PM): 9703 ADV TT IS BACK UP ON ITS WHEELS
SOC (mgorollman) (2:26:36 PM): APPROX 15 MINS TO REOPEN LN/2
SOC (mgorollman) (3:08:48 PM): 9703 ADV THE TT HAS BEEN TOWED TO THE SCALEHOUSE AND LN/2 IS NOW REOPEN HOWEVER LN/1 WILL REMAIN CLOSED FOR CLEANUP

Notifications & Responders

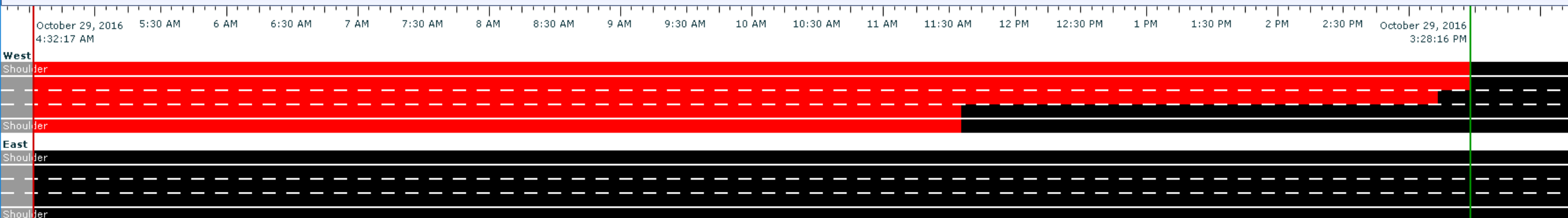
I-70 WEST PAST EXIT 80 MD 32 SYKESVILLE RD (EB)

Collision (Fatality)    

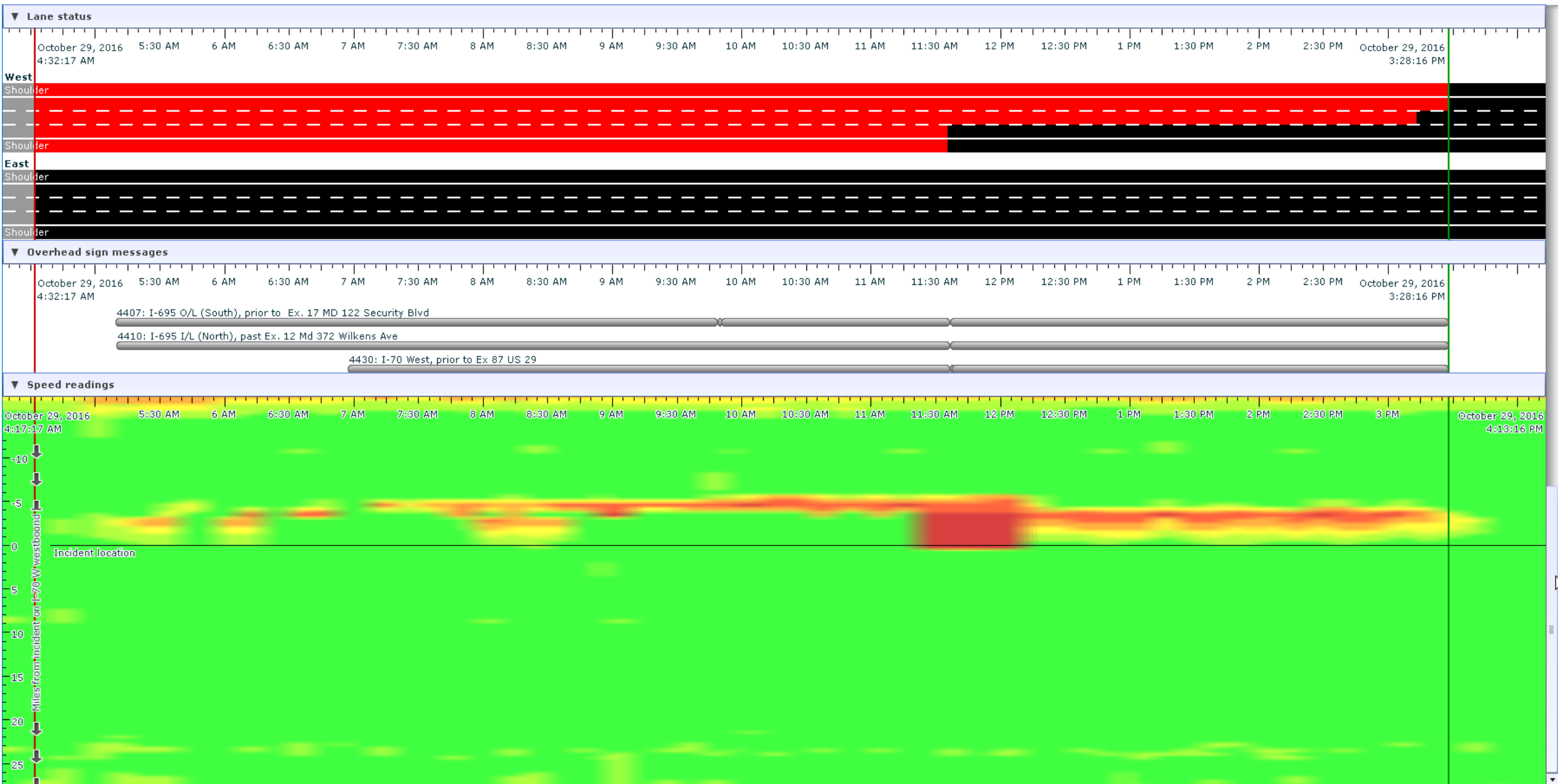
▼ Notifications and responders



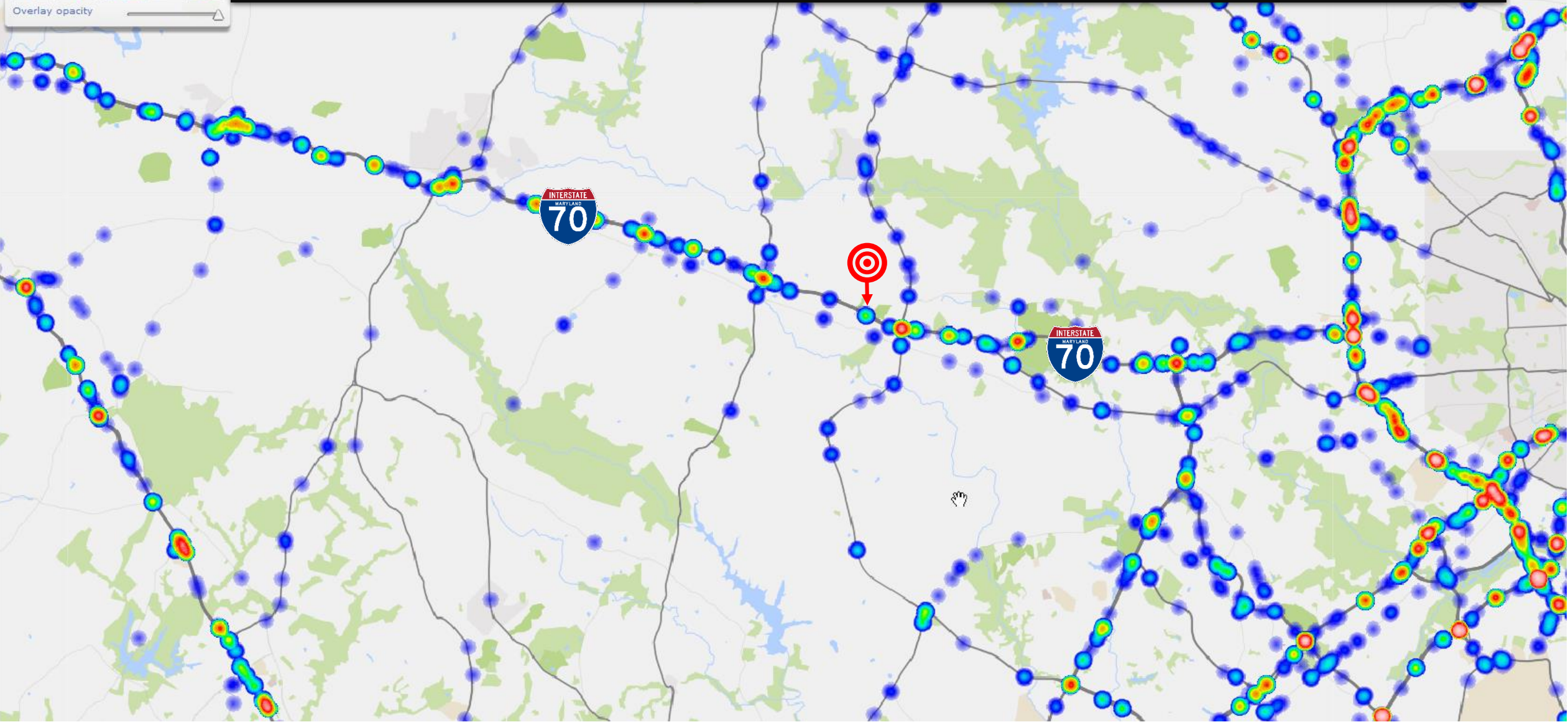
▼ Lane status



Lane Status, Sign Messages, Speeds



Events from MDOT CHART that started between September 1, 2016 and October 31, 2016



I-70 fatality incident

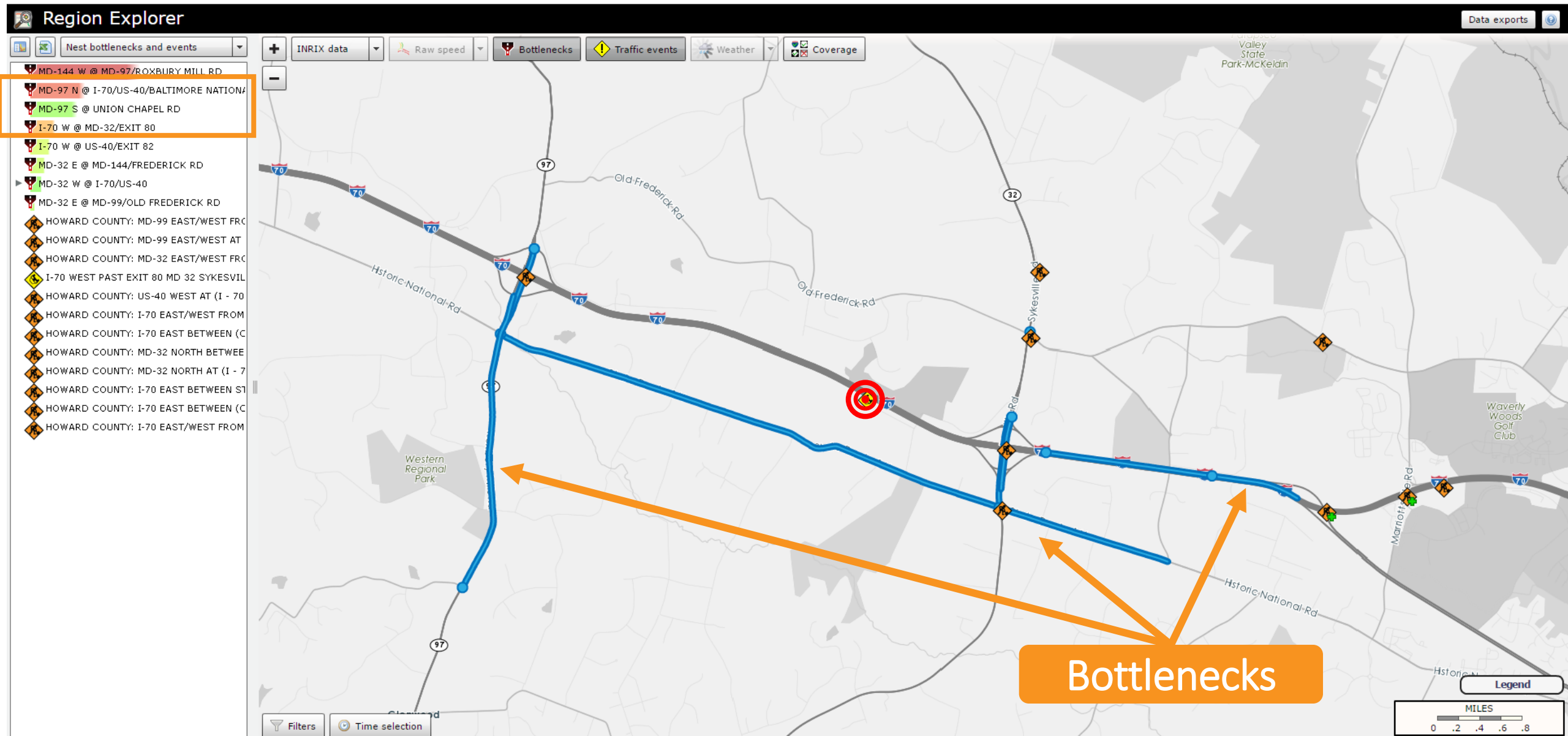
> Region Explorer...

- Used to determine the choke points of traffic during the incident, and future detour points
- Helps improve Quick Clearance practices by honing in on the effects on tertiary roadways

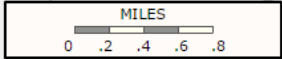


An interactive traffic conditions app that can be used to explore the impacts of bottlenecks and incidents along a road, in real-time, or previous point in time.

Bottleneck Locations at 12:00 PM on 10.29.2016



Bottlenecks



I-70 fatality incident

- > Trend Map...
 - Used it to determine the significance of the delay over the time of the incident's duration
 - Using it as a case to promote Quick Clearance practices



An animated congestion and event conditions map that dynamically displays changes over time.

Congested Locations at 12:15 PM on 10.29.2016

Trend Map - Using INRIX data

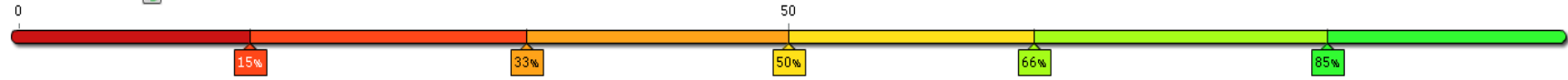
Switch to...

Data Type

Color Thresholds

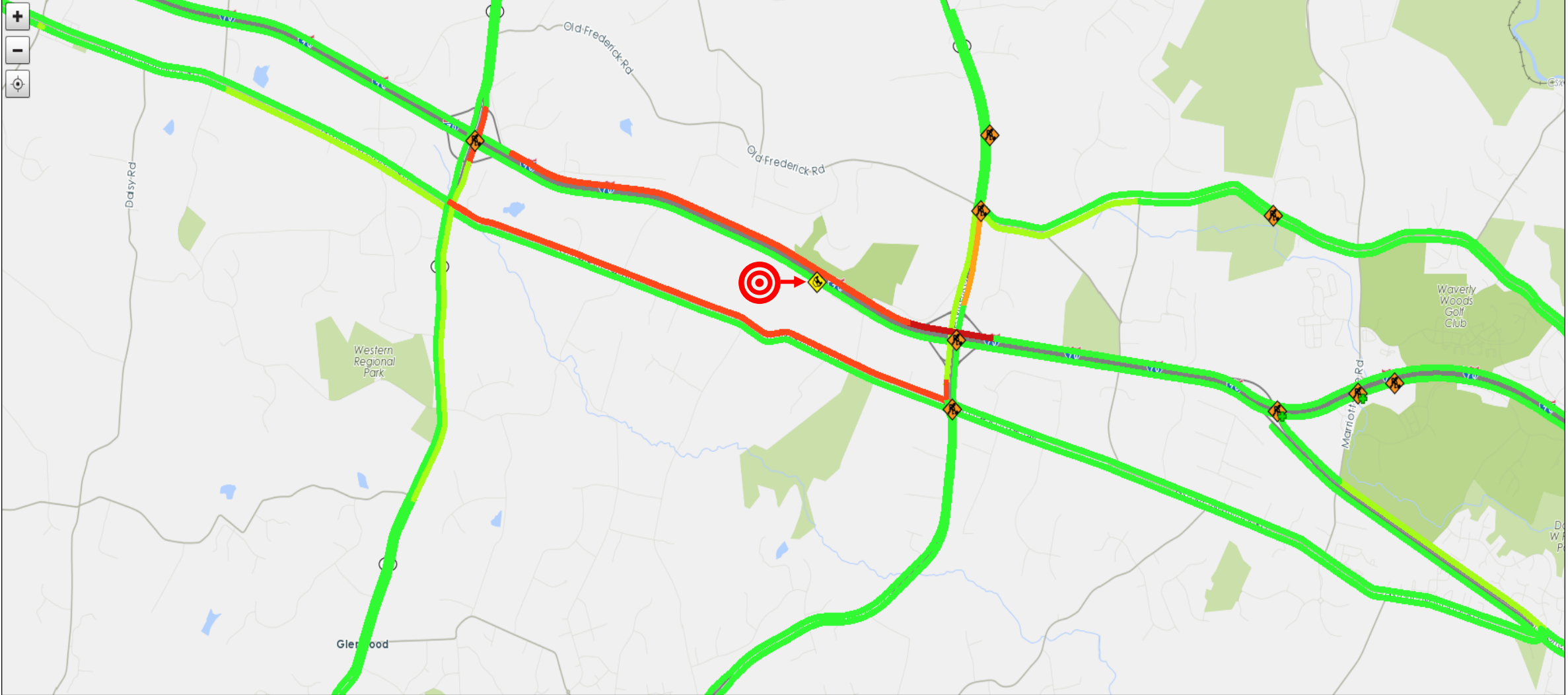
New search

Congestion



Display options

12:15 PM - October 29, 2016



12:15 PM

11:45 PM at 15 minute intervals

I-70 fatality incident

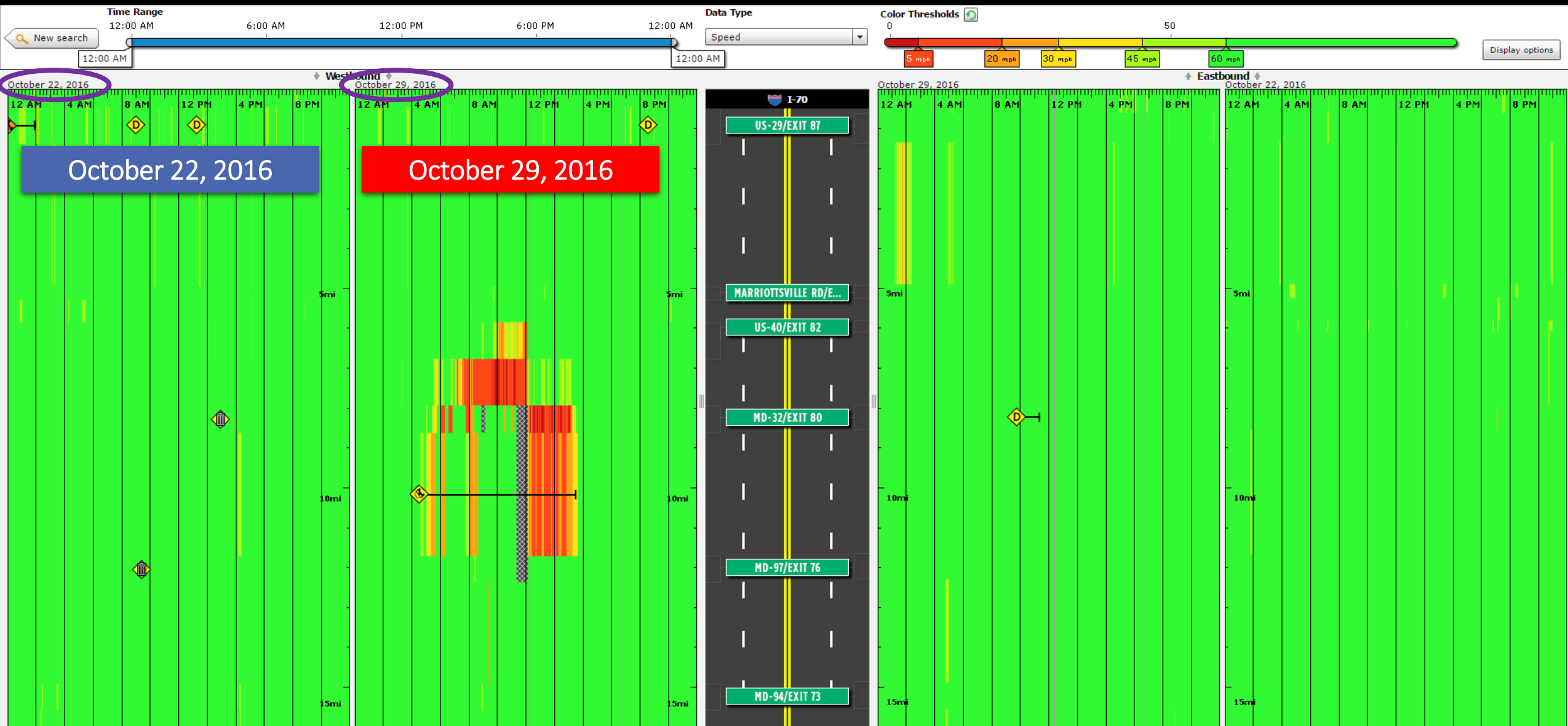
- > Congestion Scan...
 - Used to view historical extent of the queue
 - Queue graphics are inserted into AARs for emphasis



Analyze temporal and spatial conditions on one or more stretches for road, selecting from several mobility and reliability performance metrics.

Comparing Oct. 29th to the prior Saturday

Congestion Scan - Using INRIX data



I-70 fatality incident

> User Delay Cost...

- The tool we use more heavily
- Helps put things into dollars and cents, to prove the value of our TSM&O program
- *Crucial* to our program's funding is to prove the benefit of Quick Clearance practices
- By analyzing the cost of a long-duration incident, we can better make the case for additional or improved resources

Example: for this incident, we were able to make the case that the State Police need an adjustment to how it manages it's tow list (i.e.; a company should be able to prove that it has the necessary equipment for heavy duty operations)



Combine speed data with volume data to estimate the cost of delay (and other measures) due to congestion.

What's the User Delay Cost on the following roads



Assuming an Average Value of time of:
\$16.79 per hour (Passenger Vehicles)
\$86.81 per hour (Commercial Vehicles)

(NOTE: User Delay is calculated any time speeds fall below free-flow)

User delay on I-70 and nearby arterials

	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
10/22/16	\$0.1K	\$0.1K	\$0.1K	\$0K	\$0K	\$0.2K	\$0.3K	\$0.2K	\$0.3K	\$0.3K	\$0.3K	\$0.3K	\$0.3K	\$0.3K	\$0.3K
10/23/16	\$0.2K	\$0.1K	\$0.2K	\$0K	\$0K	\$0.4K	\$0.3K	\$0.4K	\$0.4K	\$0.4K	\$0.4K	\$0.4K	\$0.4K	\$0.4K	\$0.1K
10/24/16	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0.1K	\$2.2K	\$11.9K	\$5K	\$1.1K	\$0.2K	\$0.3K	\$0.5K	\$0.6K	\$1K
10/25/16	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0.2K	\$8.1K	\$22.4K	\$7.5K	\$2K	\$0.4K	\$0.3K	\$0.3K	\$0.5K	\$0.3K
10/26/16	\$0.1K	\$0K	\$0K	\$0.1K	\$0.2K	\$0.1K	\$3.2K	\$25.7K	\$12.5K	\$2.1K	\$0.2K	\$0.3K	\$0.2K	\$0.3K	\$0.4K
10/27/16	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$0.2K	\$2.6K	\$6K	\$2.5K	\$0.5K	\$0.4K	\$0.2K	\$0.3K	\$0.2K	\$3.9K
10/28/16	\$0K	\$0K	\$0.1K	\$0K	\$0K	\$0.1K	\$1.8K	\$4.2K	\$6.8K	\$0.9K	\$0.2K	\$0.2K	\$0.2K	\$0.3K	\$0.6K
10/29/16	\$0.1K	\$0.4K	\$0.1K	\$0K	\$0.1K	\$0.3K	\$1.5K	\$2.4K	\$3.6K	\$9.3K	\$13.8K	\$14.7K	\$9.4K	\$8.9K	\$7.8K
10/30/16	\$0.1K	\$0.1K	\$0.1K	\$0.1K	\$0.3K	\$0.1K	\$0.3K	\$0.5K	\$0.4K	\$0.3K	\$0.2K	\$0.3K	\$0.2K	\$0.1K	\$0.2K

Normal Saturday
= \$6k - \$7k

Daily Totals
\$6.2K
\$6.2K
\$34.2K
\$66.3K
\$61.9K
\$44.6K
\$72.1K
\$76.7K
\$7.2K

7 PM	8 PM	9 PM	10 PM	11 PM	Daily Totals
\$0.7K	\$0.5K	\$0.2K	\$0.1K	\$0.1K	\$6.2K
\$0.2K	\$0.2K	\$0.3K	\$0.1K	\$0.1K	\$6.2K
\$0.2K	\$0.2K	\$0.3K	\$0.1K	\$0K	\$34.2K
\$1K	\$0.2K	\$0.2K	\$0.2K	\$0.1K	\$66.3K
\$1.1K	\$0.2K	\$0.4K	\$0.1K	\$0.1K	\$61.9K
\$0.8K	\$0.2K	\$0.1K	\$0.1K	\$0.1K	\$44.6K
\$0.3K	\$0.4K	\$0.3K	\$0.1K	\$0K	\$72.1K
\$0.4K	\$0.3K	\$0.3K	\$0.1K	\$0.1K	\$76.7K
\$0.3K	\$0.3K	\$0.2K	\$0.1K	\$0.2K	\$7.2K

Oct. 29th Saturday
= ~\$77k
Worse than Friday
the day before!

Challenge: Effectively Managing Work Zones

How can I understand how my work zones are performing?
Am I causing more problems than I'm solving? Am I creating
safety issues?

Work Zone Dashboard

Workzone Dashboard

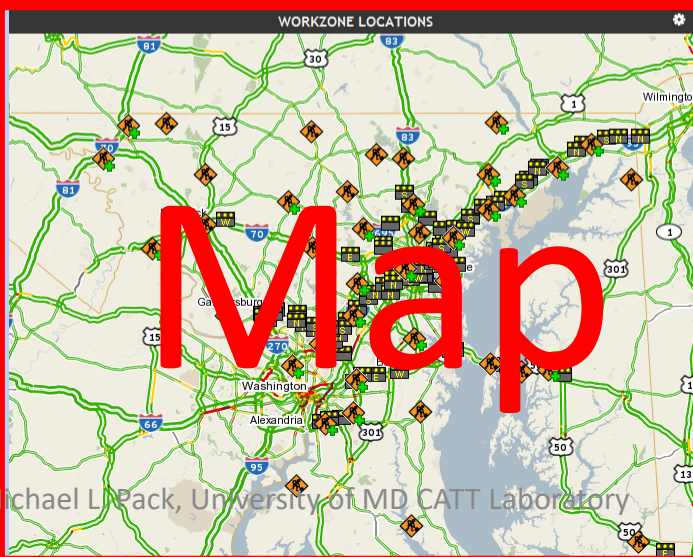
CURRENT WORKZONES IN MARYLAND				
REGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	
▼ Maryland (76)	2043	1.06	\$374,858.00	
▼ Allegany (3)	0	0	\$9,618.00	
🚧 I-68 EAST AT PLEASANT VALLEY RD	0	0	\$1,396.00	
🚧 US 220 SOUTH SOUTH OF MP 12.75	0	0	\$59.00	
🚧 I-68 WEST FROM S JOHNSON ST TO PARK ST	0	0	\$8,163.00	
▼ Anne Arundel (2)	0	0	\$18,167.00	
🚧 MD 198 EAST AT MD 295	0	0	\$8,374.00	
🚧 MD 2 NORTH AT MD 255	0	0	\$9,793.00	
▼ Baltimore (15)	197	0.22	\$77,435.00	
🚧 MD 26 EAST AT DEER PARK RD	0	0	\$9,738.00	
🚧 I-95 NORTH PAST EXIT 64 I 695 BALTIMORE BELTWAY[MM.64.3-64.8]	0	0	\$431.00	
🚧 MD 45 NORTH BETWEEN OLD PADONIA RD AND BEAVER RUN LA	0	0	\$5,942.00	
🚧 I-83 SOUTH PAST EXIT 4 MD 295 ENTRANCE (MM 3.6-4.7) LONG TERM SHOULDER CLOSURE	83	0	\$9,748.00	
🚧 I-895 SOUTH PAST EXIT 4 MD 295 ENTRANCE (MM 3.6-4.7) LONG TERM & CONTINUOUS	0	0	\$3,718.00	
🚧 MD 45 SOUTH BETWEEN OLD PADONIA RD AND TITANIUM RD	0	0	\$880.00	
🚧 I-83 NORTH AT I-27 MD 295 ENTRANCE	0	0	\$8,648.00	
🚧 I-83 NORTH BETWEEN FORGOTTEN AND PERRY MILLS RD	0	0	\$9,028.00	
🚧 I-70 EAST BETWEEN ROLLING RD AND COOKS LA	0	0	\$5,854.00	
🚧 MD 25 NORTH BETWEEN JOPPA RD AND GREENSPRING VALLEY RD	0	0.22	\$58.00	
🚧 I-695 OUTER LOOP FROM EXIT 18 MD 26 LIBERTY RD TO EXIT 17 MD 122 SECURITY BLVD	0	0	\$6,995.00	
🚧 MD 25 SOUTH/NORTH FROM MT CARMEL RD TO BENSON MILL RD	0	0	\$939.00	
🚧 MD 147 SOUTH BETWEEN KNOLL ACRES DR AND NORTH WIND RD	0	0	\$2,107.00	
🚧 I-95 SOUTH SOUTH OF EXIT 49 I 695 BALTIMORE BELTWAY	1	0	\$4,168.00	
🚧 MD 45 SOUTH FROM WINDWOOD RD TO DEER PARK RD	0	0	\$9,181.00	
▼ Baltimore City (4)	178	0	\$26,997.00	
🚧 I-95 NORTH PAST EXIT 50 US 1 CATON AVE. LONG TERM/SHIFT/SHOULDER	17	0	\$9,485.00	
🚧 I-895 NORTH AT POTEES ST ON POTEES ST	0	0	\$2,945.00	
🚧 I-695 INNER LOOP PAST EXIT 1 MD 173 HAVEN POINT RD	0	0	\$9,257.00	
🚧 I-895 SOUTH AT EXIT 7 MD 2 POTEES ST (LONG TERM/CONTINUOUS)	161	0	\$5,310.00	
▼ Calvert (1)	0	0	\$324.00	
🚧 MD 231 EAST BETWEEN SKIPJACK RD AND STAFFORD RD	0	0	\$324.00	
▼ Carroll (3)	1	0	\$18,550.00	
🚧 MD 26 WEST AT MP 16.7	0	0	\$7,678.00	
🚧 MD 97 SOUTH/NORTH AT OLD HANOVER RD	0	0	\$1,092.00	
🚧 MD 26 EAST/WEST BETWEEN MD 27 AND BUFFALO RD	1	0	\$9,780.00	
▼ Cecil (4)	20	0	\$22,638.00	
🚧 US 40 WEST AT Thomas Hatem Memorial Bridge	0	0	\$5,919.00	
🚧 I-95 SOUTH PAST EXIT 100 MD 272 NORTHEAST RD (MM 99.54 -96.73)	19	0	\$7,475.00	
🚧 I-95 SOUTH PAST EXIT 93 MD 222 BAINBRIDGE RD (MM92-89)	0	0	\$1,173.00	
🚧 I-95 SOUTH PAST EXIT 100 MD 272 NORTHEAST RD (MM 100-98.5)	1	0	\$1,173.00	

TOP CRITICAL WORKZONES				
SEVERITY/EVENT	LANE STATUS	QUEUE LENGTH (MI)	USER DELAY COST (\$)	

Critical

Overview

List

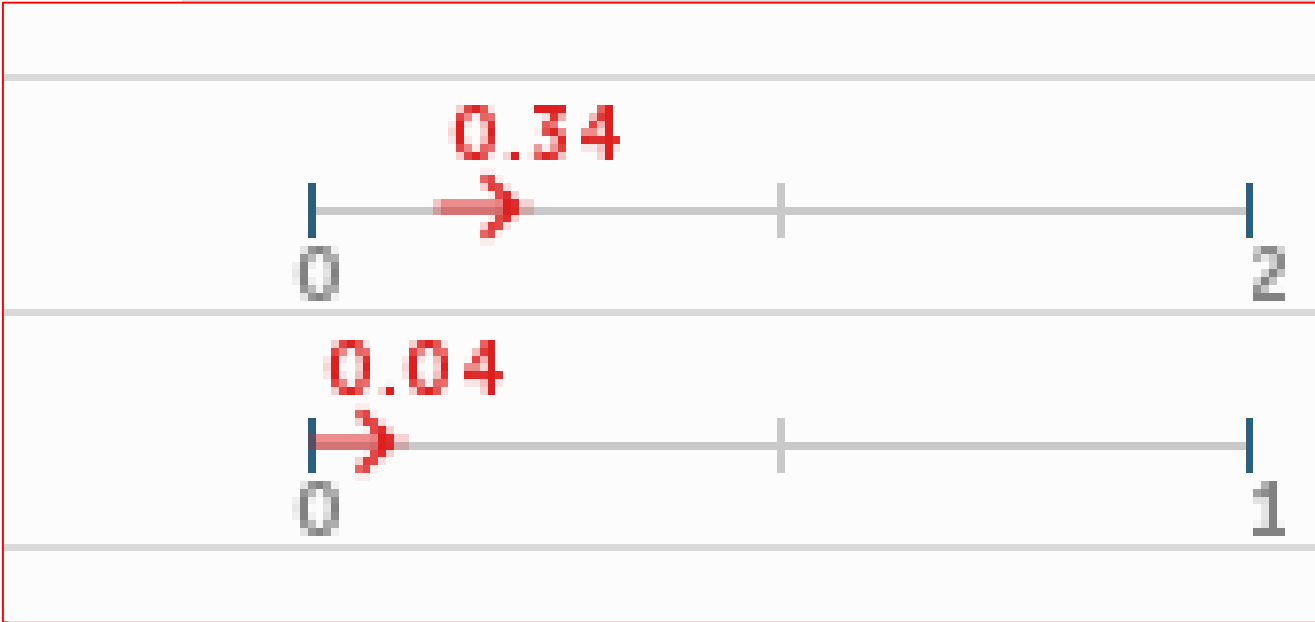


USER DELAY COST BY CORRIDOR AND DAY OF WEEK					
	Total User Delay Cost				
	I-95	I-695	US-50	I-70	Daily Totals
Wed 4/09/2014	\$2,678,358.64	\$626,606.88	\$229,861.28	\$48,652.15	\$3,583,478.94
Thu 4/10/2014	\$1,239,852.54	\$1,050,702.81	\$301,406.33	\$77,104.65	\$2,669,066.33
Fri 4/11/2014	\$1,900,000.00	\$1,105,801.53	\$474,634.47	\$107,010.25	\$3,493,788.29
Sat 4/12/2014	\$3,367,461.00	\$1,790,000.00	\$107,000.00	\$721.70	\$3,660,917.46
Sun 4/13/2014	\$2,548,280.00	\$83,900.00	\$8,000.00	\$8,000.00	\$2,677,692.82
Mon 4/14/2014	\$2,660,000.00	\$323,977.71	\$190,000.00	\$184,000.00	\$3,369,250.33
Tue 4/15/2014	\$2,838,798.60	\$905,736.49	\$258,710.91	\$125,300.87	\$4,128,557.87
Wed 4/16/2014	\$2,937,018.16	\$500,186.92	\$212,687.02	\$83,203.90	\$3,733,096.00
Corridor Totals	\$20,077,788.75	\$4,729,538.59	\$1,867,770.87	\$640,749.82	Grand Total: \$27,315,848.03

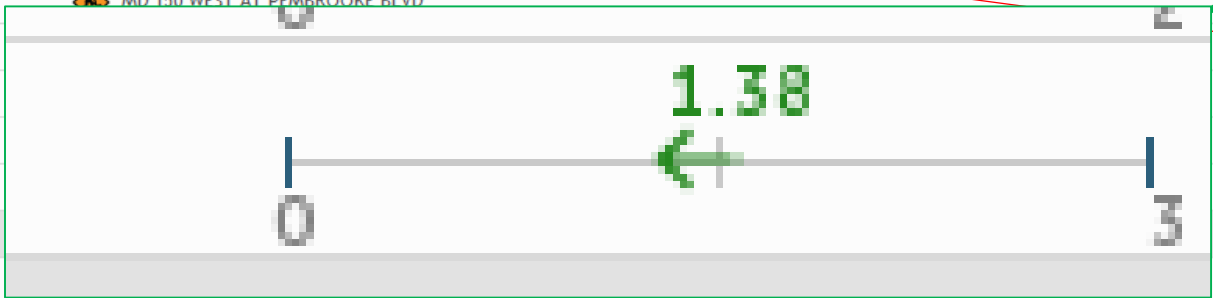
Delay

Current Work Zone List

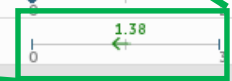
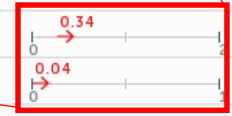
REGION/EVENT	# OF NEARBY INCIDENTS	QUEUE LENGTH (MI)	USER DELAY COST (\$)
▼ Maryland (55)	527	5.24	\$310,306.00
	0	0	\$6,278.00
	0	0	\$6,278.00
	0	0	\$20,774.00
	0	0	\$9,431.00
	0	0	\$1,364.00
	0	0	\$9,979.00
	87	2.73	\$78,513.00
	0	0	\$8,660.00
	0	0	\$5,553.00
	0	0	\$1,926.00
	86	0	\$6,712.00
	0	2.35	\$4,940.00
	0	0	\$9,900.00
	0	0	\$2,903.00
	0	0	\$4,873.00
	0	0	\$8,583.00
	0	0	\$5,448.00
	0	0	\$2,880.00
	0	0	\$6,473.00
	1	0	\$4,803.00
	0	0	\$4,859.00
	2	1.38	\$14,329.00
	1	0	\$5,945.00
	0	0	\$2,314.00
	1	1.38	\$6,070.00
▼ Calvert (3)	0	0	\$24,014.00



- I-695 OUTER LOOP AT HARFORD RD
- MD 26 EAST/WEST BETWEEN PIKESWOOD DR AND TIVERTON RD
- I-83 NORTH AT EXIT 31 MIDDLETOWN RD
- MD 150 WEST AT PEMBROKE BLVD



- I-695 INNER LOOP AT MP 47.5 (FRANCIS SCOTT KEY BRIDGE)
- I-695 OUTER LOOP WEST OF EXIT 1 MD 173 HAWKINS POINT RD (CURTIS CREEK DRAWBRIDGE)



Individual Work Zone Profile

Planned Closure @ I-695 INNER LOOP BETWEEN EXIT 12 MD 372 WILKENS AVE AND EXIT 13 MD 144 FREDERICK RD

Started: Thu, Apr 24, 2014 at 09:24:56 AM

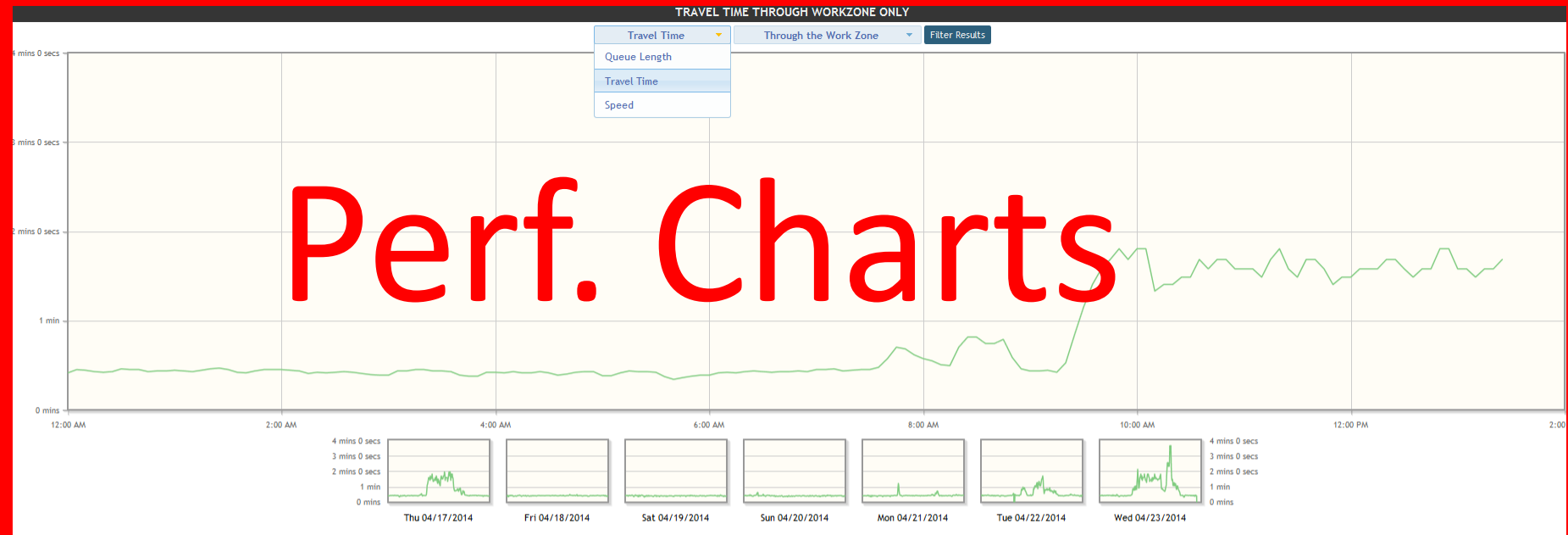
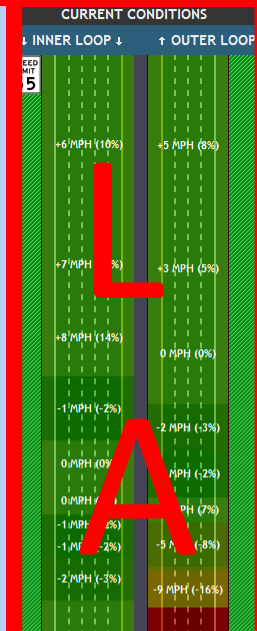
SETTINGS

Data Type...
 Measured Speeds
 Comparison to Historical Average

Show...
 Work Zone Bounds
 Posted Speeds
 Associated MS
 Nearby Cameras
 Nearby Incidents
 Lane Status
 Bottlenecks (when available)
 5 miles upstream
 5 miles downstream

Permit Information
 Project Information
 Site Details
 Configure Alerts

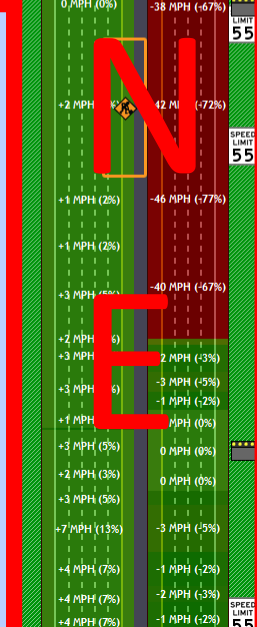
Settings



Perf. Charts



Map



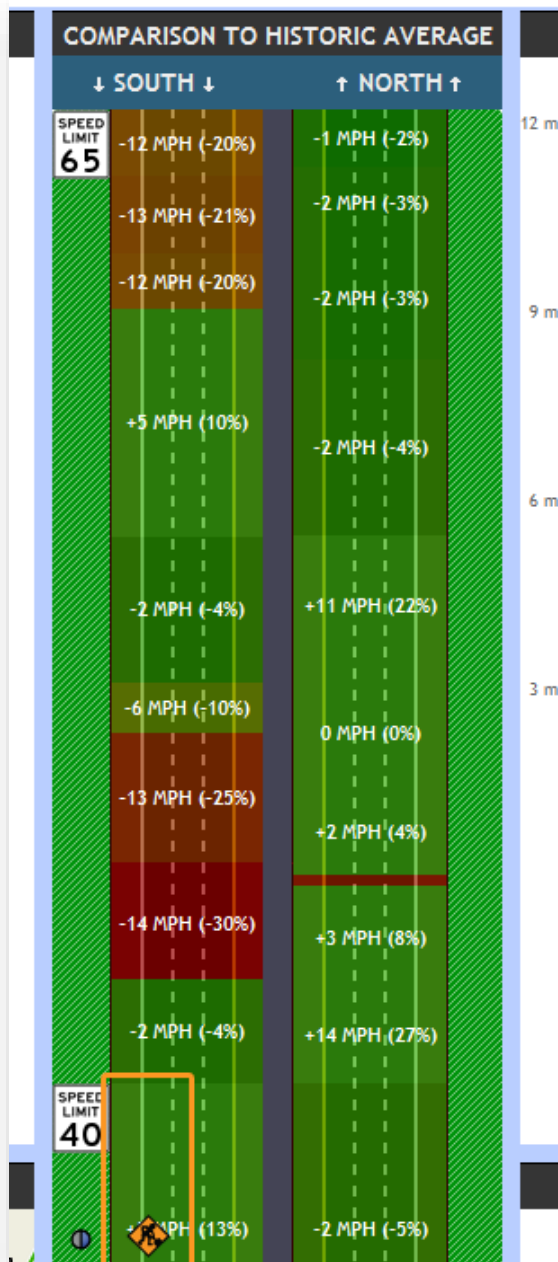
USER DELAY COST

Total User Delay Cost

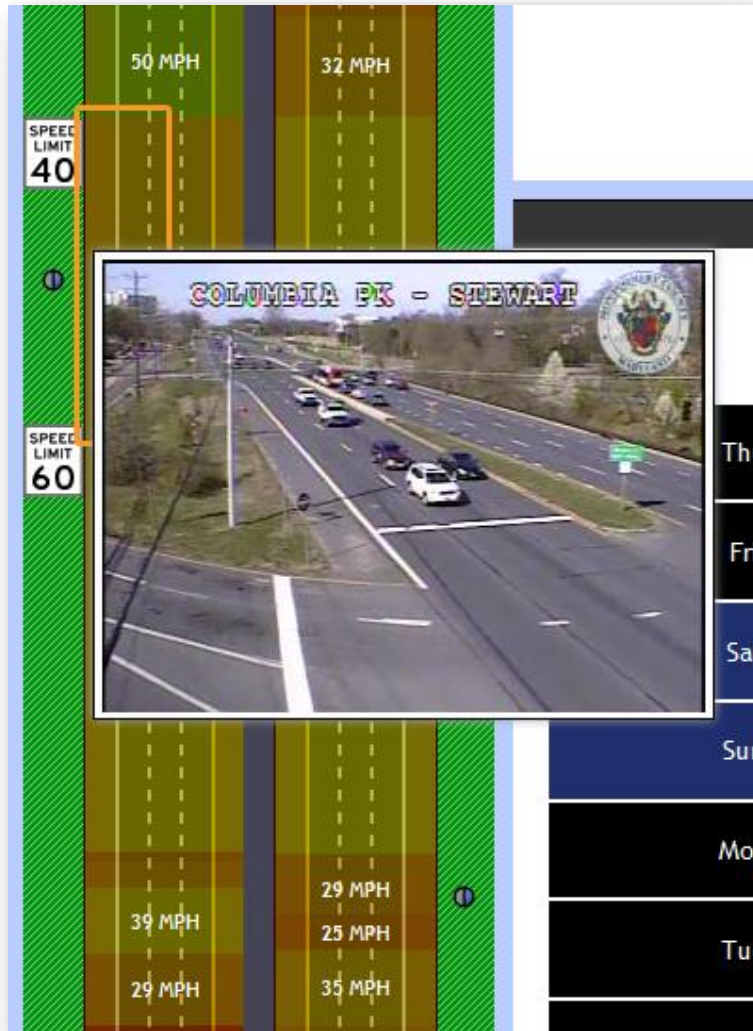
	12AM - 4AM	4AM - 8AM	8AM - 12PM	12PM - 4PM	4PM - 8PM	8PM - 12AM	Daily Totals
Thu 4/17/2014	\$11.52	\$183.00	\$9,306.97	\$16,405.23	\$2,958.90	\$67.58	\$28,933.20
Fri 4/18/2014	\$6.17	\$29.46	\$82.00	\$221.35	\$127.06	\$50.00	\$516.04
Sat 4/19/2014	\$27.17	\$7.65	\$3.12	\$22.42	\$17.28	\$46.01	\$123.66
Sun 4/20/2014	\$39.81	\$24.66	\$22.22	\$6.45	\$26.78	\$18.42	\$115.80
Mon 4/21/2014	\$2.46	\$48.75	\$2.23	\$2.10	\$899.54	\$131.35	\$1,973.63
Tue 4/22/2014	\$25.38	\$264.46	\$1,819.65	\$8,771.39	\$2,675.70	\$189.00	\$13,745.58
Wed 4/23/2014	\$20.52	\$477.24	\$12,525.82	\$13,993.07	\$16,213.27	\$80.23	\$43,310.14
Hourly Totals	\$133.04	\$1,035.22	\$24,525.89	\$39,522.78	\$22,918.53	\$582.59	Grand Total: \$88,718.06

Delay

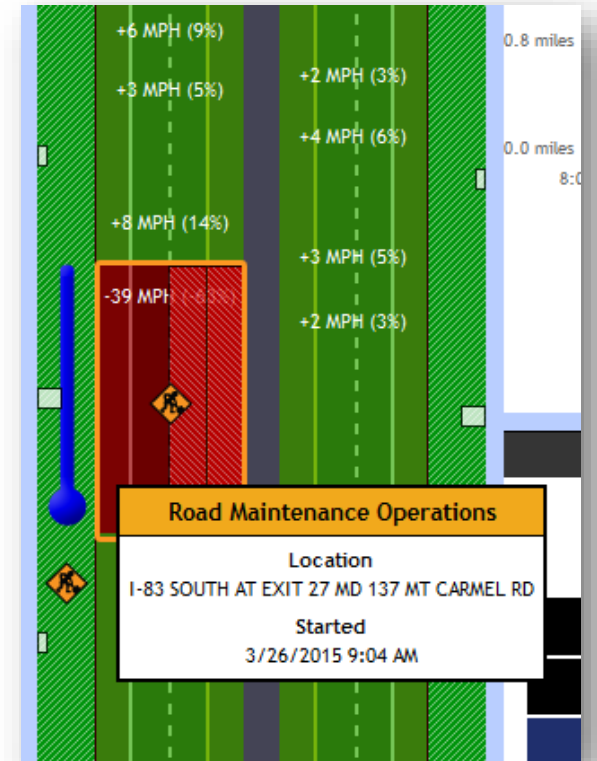
Lane Profile Interaction



Segment Speeds



Live CCTV & DMS



Bottlenecks & Nearby Events

Individual Work Zone Profile

Planned Closure @ US 29 SOUTH AT INDUSTRIAL PKWY

Started: Thu, Apr 17, 2014 at 09:16:31 AM

SETTINGS

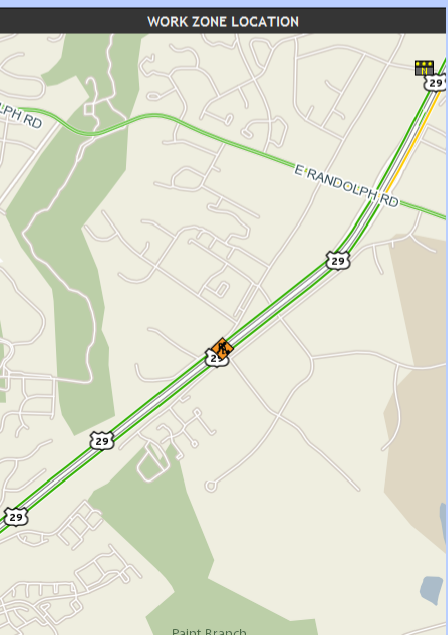
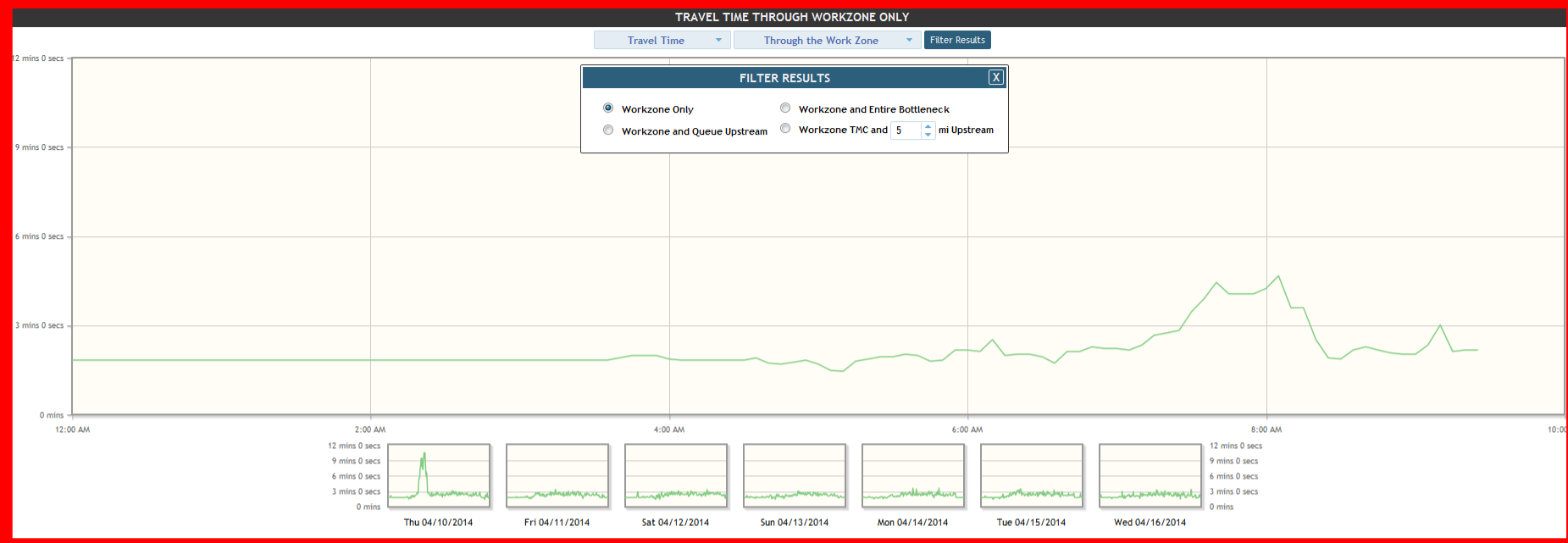
Data Type...
 Measured Speeds
 Comparison to Historical Average

Show...
 Work Zone Bounds
 Posted Speeds
 Associated DMS
 Nearby Cameras
 Nearby Incidents
 Lane Status
 Bottlenecks (when available)
 5 miles upstream
 5 miles downstream

Permit Information
 Project Information
 Site Details
 Configure Alerts

CURRENT CONDITIONS

	↓ SOUTH ↓	↑ NORTH ↑
SPEED LIMIT 60	71 MPH	64 MPH
	74 MPH	64 MPH
	72 MPH	61 MPH
	45 MPH	50 MPH
	58 MPH	40 MPH
	60 MPH	58 MPH
	60 MPH	44 MPH
	56 MPH	27 MPH
	50 MPH	32 MPH
SPEED LIMIT 40		
SPEED LIMIT 60		
	29 MPH	29 MPH
	39 MPH	25 MPH
	29 MPH	34 MPH
	29 MPH	22 MPH
	22 MPH	21 MPH
	20 MPH	16 MPH
	17 MPH	20 MPH
	20 MPH	18 MPH
SPEED LIMIT 55		



USER DELAY COST

Total User Delay Cost

	12AM - 4AM	4AM - 8AM	8AM - 12PM	12PM - 4PM	4PM - 8PM	8PM - 12AM	Daily Totals
Thu 4/10/2014	\$5.78	\$6,873.19	\$12,665.11	\$3,206.89	\$2,729.29	\$727.68	\$26,207.94
Fri 4/11/2014	\$1.43	\$1,659.88	\$2,890.60	\$3,409.59	\$2,672.82	\$725.83	\$11,360.16
Sat 4/12/2014	\$28.72	\$157.52	\$2,128.63	\$3,515.62	\$2,832.64	\$1,460.89	\$10,124.02
Sun 4/13/2014	\$26.27	\$130.17	\$903.41	\$3,146.27	\$2,241.61	\$563.40	\$7,011.13
Mon 4/14/2014	\$6.28	\$745.76	\$2,621.76	\$3,140.43	\$2,590.54	\$687.18	\$9,791.94
Tue 4/15/2014	\$4.02	\$1,656.16	\$3,762.04	\$3,180.66	\$2,815.89	\$621.03	\$12,039.80
Wed 4/16/2014	\$13.48	\$999.74	\$1,930.41	\$3,092.66	\$2,405.12	\$598.21	\$9,039.62
Hourly Totals	\$85.97	\$12,222.42	\$26,901.96	\$22,692.12	\$18,287.90	\$5,384.23	Grand Total: \$85,574.60

Adjusting Parameters

EXIT 13 MD 144 FREDERICK RD

Started: Thu, Apr 24, 2014 at 09:24:56 AM

TRAVEL TIME THROUGH WORKZONE ONLY

Travel Time ▼ South Through the Work Zone ▼ Filter Results

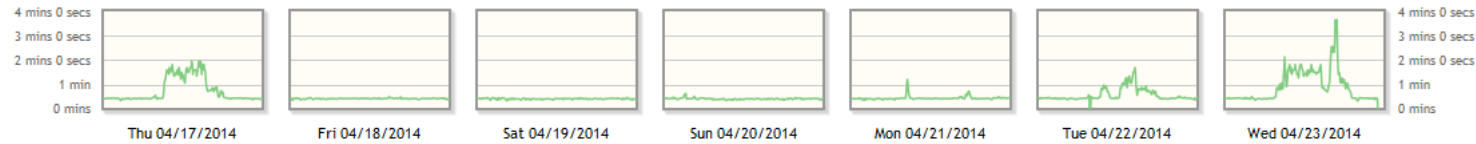
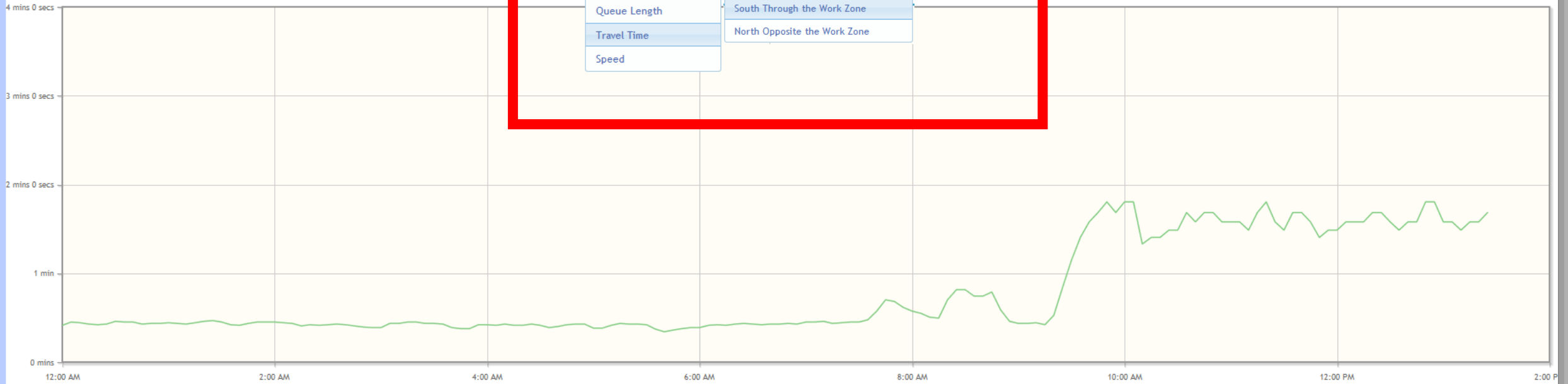
Queue Length

Travel Time

Speed

South Through the Work Zone

North Opposite the Work Zone



Work Zone Alerts

CREATE AN ALERT FOR THIS WORK ZONE

Fill out each section to set up an alert for this work zone.

1. Alert me if...

An accident happens near this work zone.
Within mile(s) upstream or mile(s) downstream

There is a bottleneck that's head or queue includes this work zone.
Keep in mind [the formula for determining bottleneck conditions](#).

Alert me only when the queue upstream from the work zone exceeds mile(s)

Speeds in the work zone fall below or exceed a certain range.

When speeds fall below mph

When speeds rise above mph

Alert me when speed is out of range for longer than minute(s)

Alert me when speed returns within range for longer than minute(s)

2. Alert me by...

Send me an email
Alert will be sent to your account email: *ivanovn@umd.edu*

Send me a text message
Enter your phone number

3. Alert me when...

Time zone

Time period
1.

Select day of week

Problem: Identifying and Prioritizing Projects

Your agency continues to struggle with its budget. Times are tough, and you don't have enough money to fix every problem out there. You need to spend wisely based on real data, not politics. Your decisions are going to be scrutinized. What are you going to do?

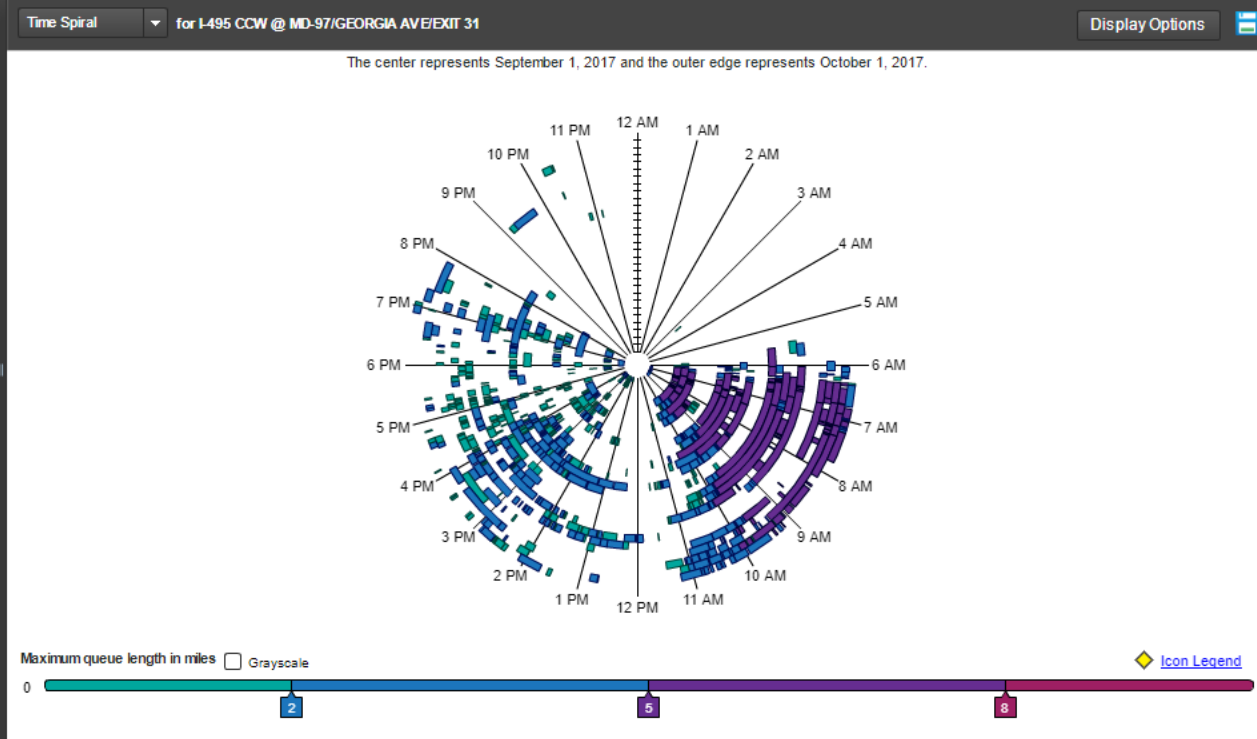
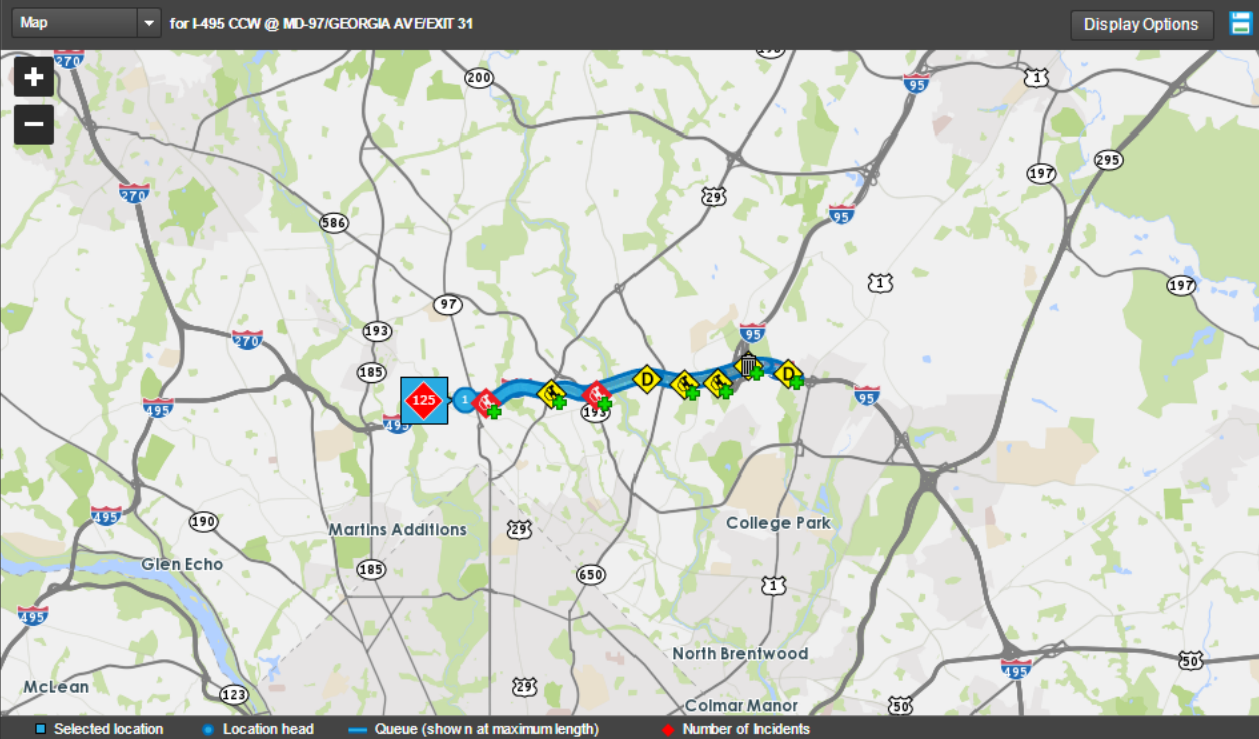


#1 Bottleneck Ranking - Using INRIX data

Bottleneck Ranking Table for Interstates in Maryland (1185 TMCs) between September 1, 2017 and September 30, 2017 (627 total)

Display Options

Rank	Map	Head Location (approximate)	Impact	Average max le...	Average daily duration	Total duration	All Events/Incit...	Speed-Differential-Impact	Speed-Percent-Impact	Volume Estimate	Delay Surrogate	External Tool Links
1	<input type="checkbox"/>	I-495 CCW @ MD-97/GEORGIA AVE/EXIT 31	28,158.28	2.95	4 h 31 m	5 d 15 h 59 m	125	1,049,374.80	58,174.81	108,841.00	114,215,002,929.19	
2	<input type="checkbox"/>	I-495 CW @ I-270 SPUR	27,191.12	5.53	2 h 28 m	3 d 02 h 27 m	79	1,213,243.18	84,735.95	99,797.00	121,078,029,819.49	
3	<input type="checkbox"/>	I-270 S @ MD-109/EXIT 22	25,221.53	4.37	3 h 01 m	3 d 18 h 49 m	78	942,049.99	58,090.93	44,649.00	42,081,589,981.41	
4	<input type="checkbox"/>	I-695 CW @ I-83/MD-25/EXIT 23	24,590.40	3.86	4 h 06 m	5 d 03 h 07 m	173	835,586.86	36,835.62	95,048.00	79,420,859,821.87	
5	<input type="checkbox"/>	I-495 CW @ CLARA BARTON PKWY/EXIT 41	21,013.02	3.09	4 h 08 m	5 d 04 h 25 m	85	821,942.71	42,117.89	94,370.00	77,586,733,481.27	
6	<input type="checkbox"/>	I-695 CCW @ EDMONDSON AVE/EXIT 14	18,631.49	4.62	1 h 58 m	2 d 11 h 22 m	153	674,338.53	33,439.78	95,342.00	64,292,784,065.96	
7	<input type="checkbox"/>	I-695 CCW @ US-40/EXIT 15	17,992.18	3.67	2 h 41 m	3 d 08 h 30 m	251	585,373.18	26,240.90	93,698.00	54,847,125,374.34	
8	<input type="checkbox"/>	I-95 S @ I-495/EXIT 27-25	16,667.62	2.31	3 h 50 m	4 d 19 h 12 m	60	608,566.34	28,847.49	94,545.00	57,536,904,812.24	



User Delay Cost at this Location: \$50.8M

	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	
7/01/15	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$10.5K	\$19.5K	\$65.7K	\$37.1K	\$13.5K	\$0.2K	\$0K	\$0K	\$0.9K	\$6.6K	\$2.9K	\$1.3K	\$0.3K	\$0K	\$0K	\$0K	\$0K	\$0K	\$158.6K	
7/02/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$5.4K	\$19.1K	\$56K	\$46K	\$20.1K	\$5.8K	\$0.2K	\$1K	\$16.9K	\$34.2K	\$20K	\$0.5K	\$20.7K	\$29.7K	\$1.7K	\$0K	\$0.2K	\$0K	\$277.6K	
7/03/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0K	\$0K	\$0.2K	\$0K	\$0.1K	\$0.3K	\$0.1K	\$1K	
7/04/15	\$0.1K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.3K	\$0.9K	\$0K	\$0K	\$0K	\$0K	\$0.2K	\$1.5K	\$0.6K	\$0.2K	\$1.3K	\$0.1K	\$0K	\$0.1K	\$0.1K	\$5.7K	
7/05/15	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$1.3K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0K	\$0K	\$1.7K	
7/06/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$4.2K	\$1.9K	\$10.8K	\$3.2K	\$0K	\$0K	\$0.1K	\$0.1K	\$1.9K	\$6.4K	\$3.1K	\$10.7K	\$2.9K	\$2.4K	\$0.6K	\$0.2K	\$0K	\$0K	\$48.5K	
7/07/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$10.6K	\$16.7K	\$58.9K	\$34.8K	\$5.2K	\$1.9K	\$27.7K	\$3.9K	\$0.2K	\$3.4K	\$1.3K	\$2.4K	\$5.7K	\$2.2K	\$0K	\$0K	\$0K	\$0K	\$175K	
7/08/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$8.3K	\$1.8K	\$36.3K	\$22.4K	\$2.8K	\$0K	\$0.2K	\$0.9K	\$0K	\$2.7K	\$0K	\$1.1K	\$1.5K	\$0.8K	\$0K	\$0.1K	\$0K	\$0K	\$78.9K	
7/09/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$9.8K	\$13.5K	\$47.5K	\$24.5K	\$3.1K	\$0K	\$0.1K	\$0K	\$0.2K	\$8.5K	\$2.8K	\$1.6K	\$1.4K	\$0.3K	\$0K	\$0.1K	\$0K	\$0.1K	\$113.5K	
7/10/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$4.4K	\$7.3K	\$36.3K	\$13.2K	\$0.8K	\$0K	\$1.2K	\$0.6K	\$1.5K	\$11.1K	\$4.6K	\$1.1K	\$1.4K	\$0K	\$0K	\$0.1K	\$0.1K	\$0.1K	\$83.9K	
7/11/15	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$0.6K	\$6K	\$2.4K	\$0.7K	\$4K	\$7K	\$5.7K	\$4.3K	\$0K	\$0K	\$0.3K	\$0.3K	\$0.1K	\$31.8K	
7/12/15	\$0.1K	\$0.1K	\$0.1K	\$0K	\$0K	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$1.4K	\$9.2K	\$4.7K	\$26K	\$4.4K	\$0.1K	\$0K	\$0K	\$0.2K	\$3.1K	\$0.1K	\$49.7K	
7/13/15	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$10.5K	\$41.6K	\$60.6K	\$45.9K	\$6.2K	\$0K	\$0.1K	\$0K	\$0.1K	\$2.2K	\$4.1K	\$36.9K	\$5.3K	\$0.5K	\$0K	\$0K	\$0K	\$0K	\$0K	\$214.3K
7/14/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$12.3K	\$17.7K	\$54K	\$12.3K	\$1.1K	\$0K	\$0K	\$0.1K	\$47.5K	\$74.9K	\$61.3K	\$48.9K	\$8.4K	\$0K	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$338.4K
7/15/15	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$10.7K	\$33.2K	\$59.5K	\$54.8K	\$17.8K	\$0.3K	\$0.1K	\$0K	\$0.3K	\$6.9K	\$61.3K	\$48.9K	\$8.4K	\$0K	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$204.7K
7/16/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$11.9K	\$34.5K	\$56.7K	\$23.9K	\$6.5K	\$0.1K	\$0.6K	\$8.8K	\$18.6K	\$7.5K	\$61.3K	\$48.9K	\$8.4K	\$0K	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$217.8K
7/17/15	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0K	\$3.6K	\$3.4K	\$18K	\$2.6K	\$0K	\$0K	\$0K	\$0K	\$10K	\$31.9K	\$61.3K	\$48.9K	\$8.4K	\$0K	\$0K	\$0K	\$0.1K	\$0K	\$0K	\$71.3K
7/18/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.3K	\$0.4K	\$1.3K	\$3.8K	\$5.7K	\$0.8K	\$4K	\$11.6K	\$61.3K	\$48.9K	\$8.4K	\$0K	\$0K	\$0.4K	\$0.3K	\$0.1K	\$0K	\$89.6K
7/19/15	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0.2K	\$7.7K	\$7.6K	\$61.3K	\$48.9K	\$8.4K	\$0K	\$0K	\$0.3K	\$0.1K	\$0K	\$0K	\$31.6K
7/20/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$10.9K	\$18.6K	\$69K	\$47K	\$11.8K	\$1K	\$0.1K	\$0K	\$0.5K	\$1.3K	\$61.3K	\$48.9K	\$8.4K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0K	\$167.8K
7/21/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$10.1K	\$7.9K	\$48K	\$22K	\$7.9K	\$1.9K	\$0.1K	\$0K	\$1K	\$4.7K	\$0.4K	\$1.6K	\$3K	\$0K	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$108.7K
7/22/15	\$0K	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$9.9K	\$34.5K	\$63.2K	\$40.5K	\$9.9K	\$0.5K	\$0K	\$0.1K	\$2K	\$3.8K	\$2.1K	\$6.9K	\$12.6K	\$1.8K	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$188.1K
7/23/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$43.6K	\$41.8K	\$64.7K	\$37.8K	\$32.4K	\$17.7K	\$1.7K	\$0K	\$1.4K	\$13.1K	\$16.5K	\$4.1K	\$2.5K	\$1.6K	\$0.1K	\$0.2K	\$0.1K	\$0.1K	\$0K	\$279.3K
7/24/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$7.7K	\$11.3K	\$38.3K	\$21.7K	\$3.1K	\$0.1K	\$0.2K	\$8.5K	\$14.5K	\$18.6K	\$0K	\$1.1K	\$9.8K	\$3.6K	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$138.6K
7/25/15	\$0K	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$1.2K	\$0.2K	\$0K	\$0.1K	\$0.1K	\$4.4K	\$11.6K	\$4.1K	\$0K	\$0.2K	\$1.2K	\$0K	\$0.4K	\$0.3K	\$0.1K	\$0K	\$24.1K
7/26/15	\$0.1K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.1K	\$0.4K	\$4.8K	\$6K	\$6.3K	\$5K	\$3.8K	\$1.1K	\$0.4K	\$0.2K	\$0K	\$0K	\$0K	\$28.2K
7/27/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0.4K	\$18.8K	\$17.5K	\$42.5K	\$13.7K	\$0K	\$0K	\$0K	\$0K	\$7.3K	\$16.5K	\$25.2K	\$18.6K	\$3.9K	\$0.1K	\$0K	\$0.2K	\$0.1K	\$0K	\$0K	\$165.1K
7/28/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$13.7K	\$22.5K	\$55.5K	\$30.4K	\$5.8K	\$0.1K	\$0.2K	\$0K	\$1K	\$6.8K	\$8.1K	\$8.5K	\$3.7K	\$0.1K	\$0K	\$0.1K	N/A	N/A	\$0K	\$156.7K
7/29/15	N/A	N/A	N/A	\$0K	\$0K	\$0K	\$17K	\$28.8K	\$54.8K	\$29.6K	\$6.3K	\$1K	N/A	\$0K	\$0K	\$4.2K	\$8.8K	\$5.6K	\$0.9K	\$0K	\$0K	\$0.1K	\$0.1K	\$0K	\$0K	\$157.1K
7/30/15	\$0K	\$0K	\$0K	\$0K	\$0K	\$0K	\$15.5K	\$11.8K	\$27.3K	\$23.6K	\$3.7K	\$0K	\$0K	\$0.6K	\$23.9K	\$24.4K	\$12.1K	\$4.7K	\$1.1K	\$0K	\$0K	\$0.1K	\$0.1K	\$0.1K	\$0K	\$149.1K

Tuesday, July 14, 2015 3:00 PM

Delay cost:
 Total: \$74,852.1
 Per VMT: \$1.32

Hours of delay:
 Person-hours: 3325h 53m 6s
 Vehicle-hours: 2715h 29s


Vehicle miles traveled (VMT):
 Total: 49,012 miles
 Passenger: 44,111 miles
 Commercial: 4,901 miles

Delay per VMT: 3.3237 mins / mile

Data validity: 100%

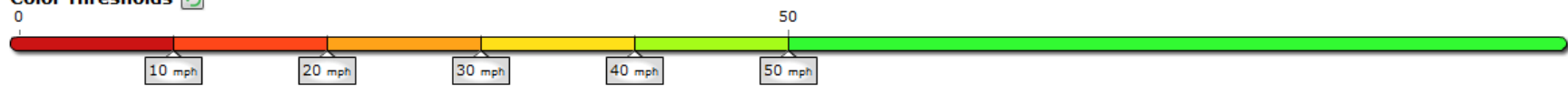
Click the table cell to see links to congestion scans

Data Type

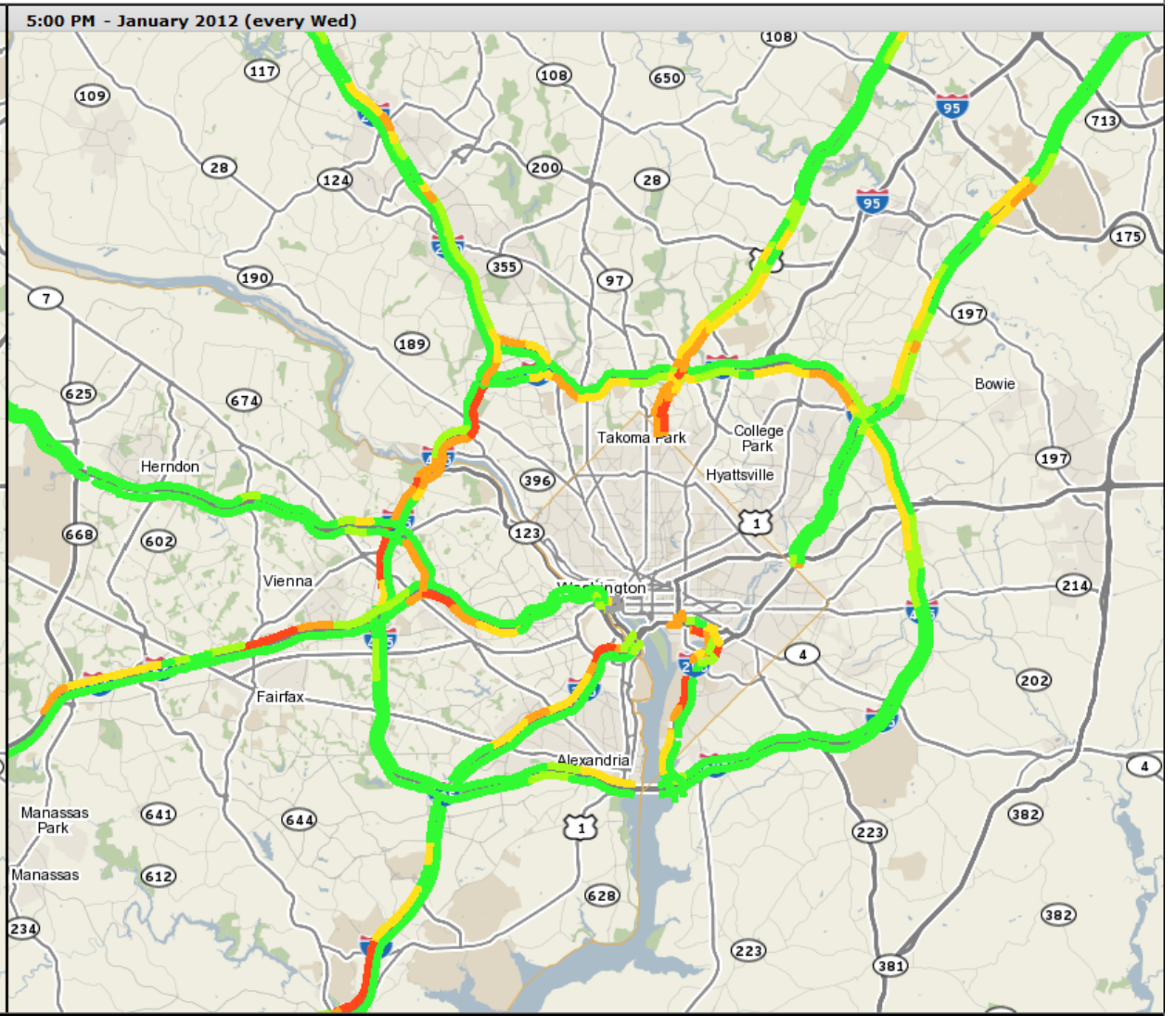
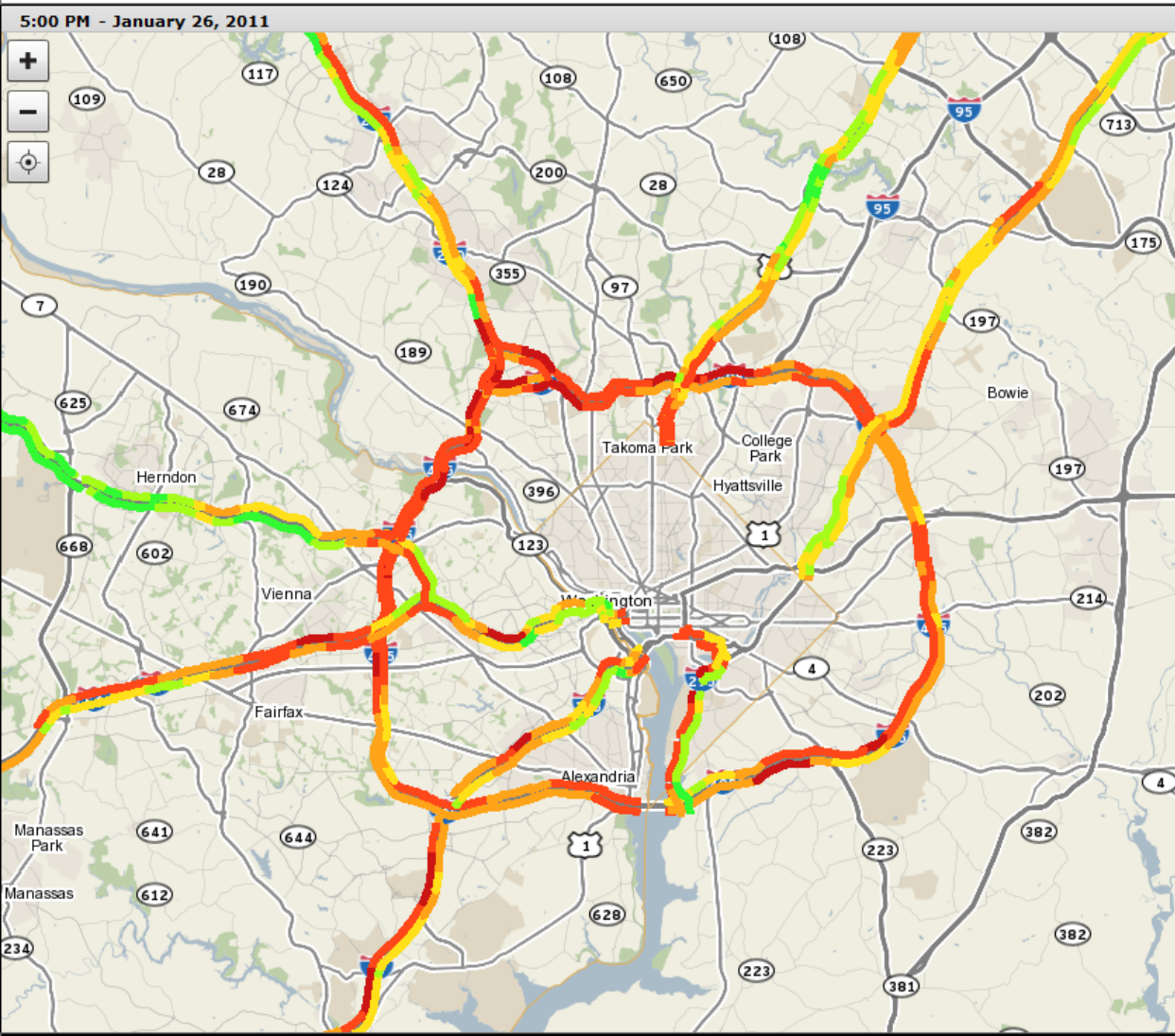
Color Thresholds 

 New search

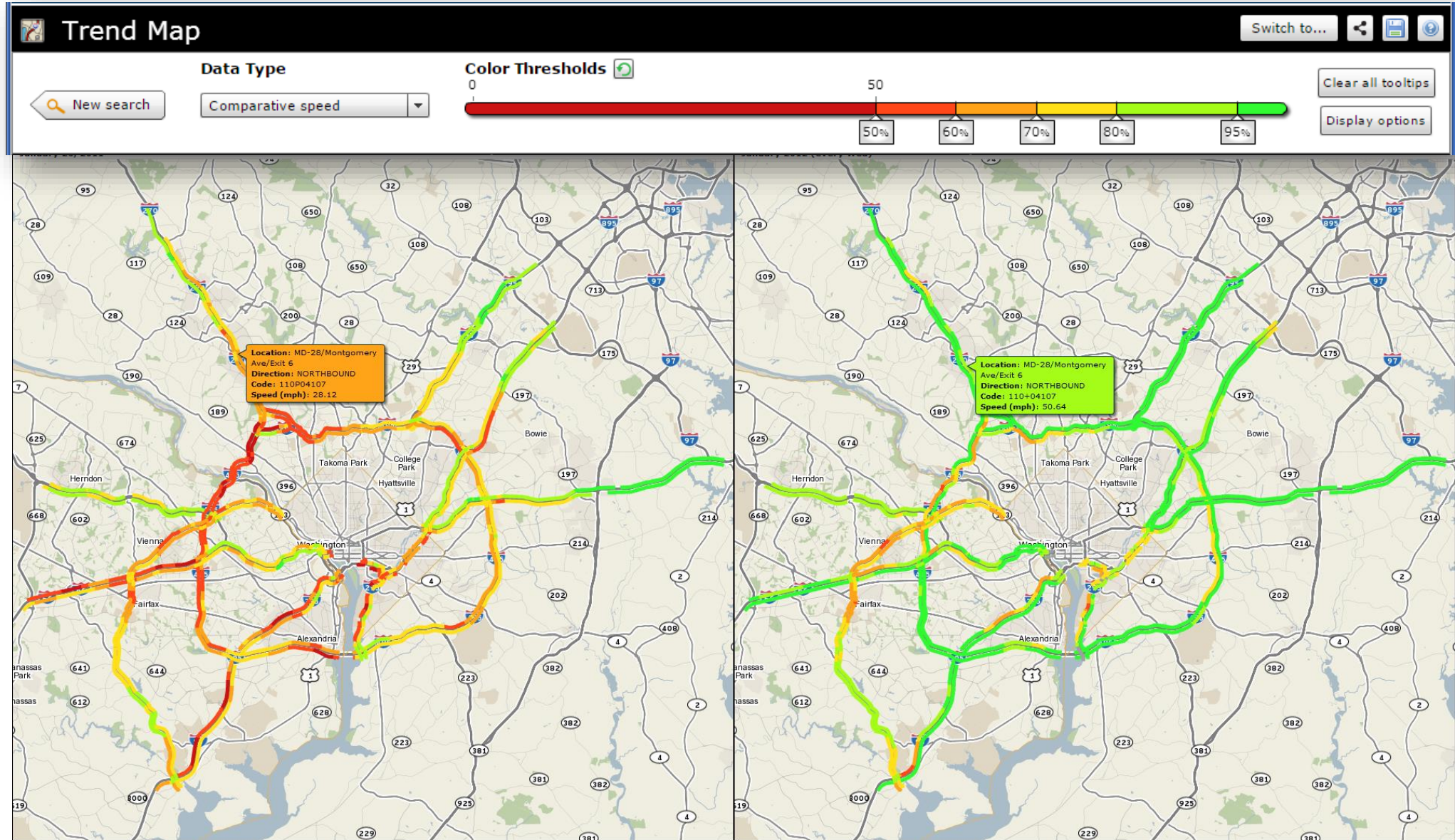
Speed 



Display options



Press Releases: Pre-Thanksgiving traffic vs. normal



2PM Wed. Before Thanksgiving

2PM Normal Wednesdays in November

Problem: Justify your recent investment/project

You just spent millions removing a bunch of traffic signals on the Garden State Parkway. Was it worth it? Did you improve things? How can you justify your expenses to the public?

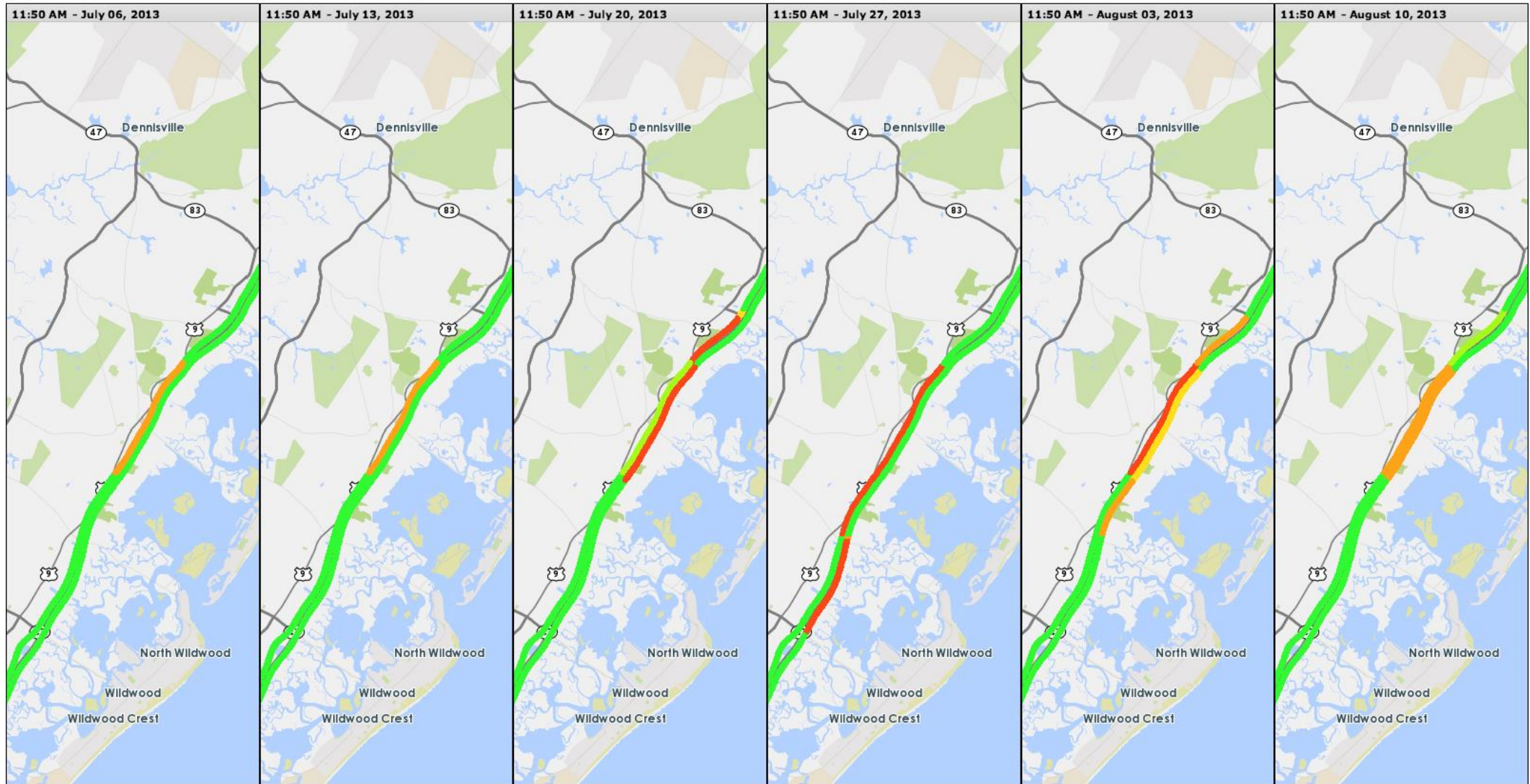
7 Saturdays in 2013 (before work to remove 3 signals)



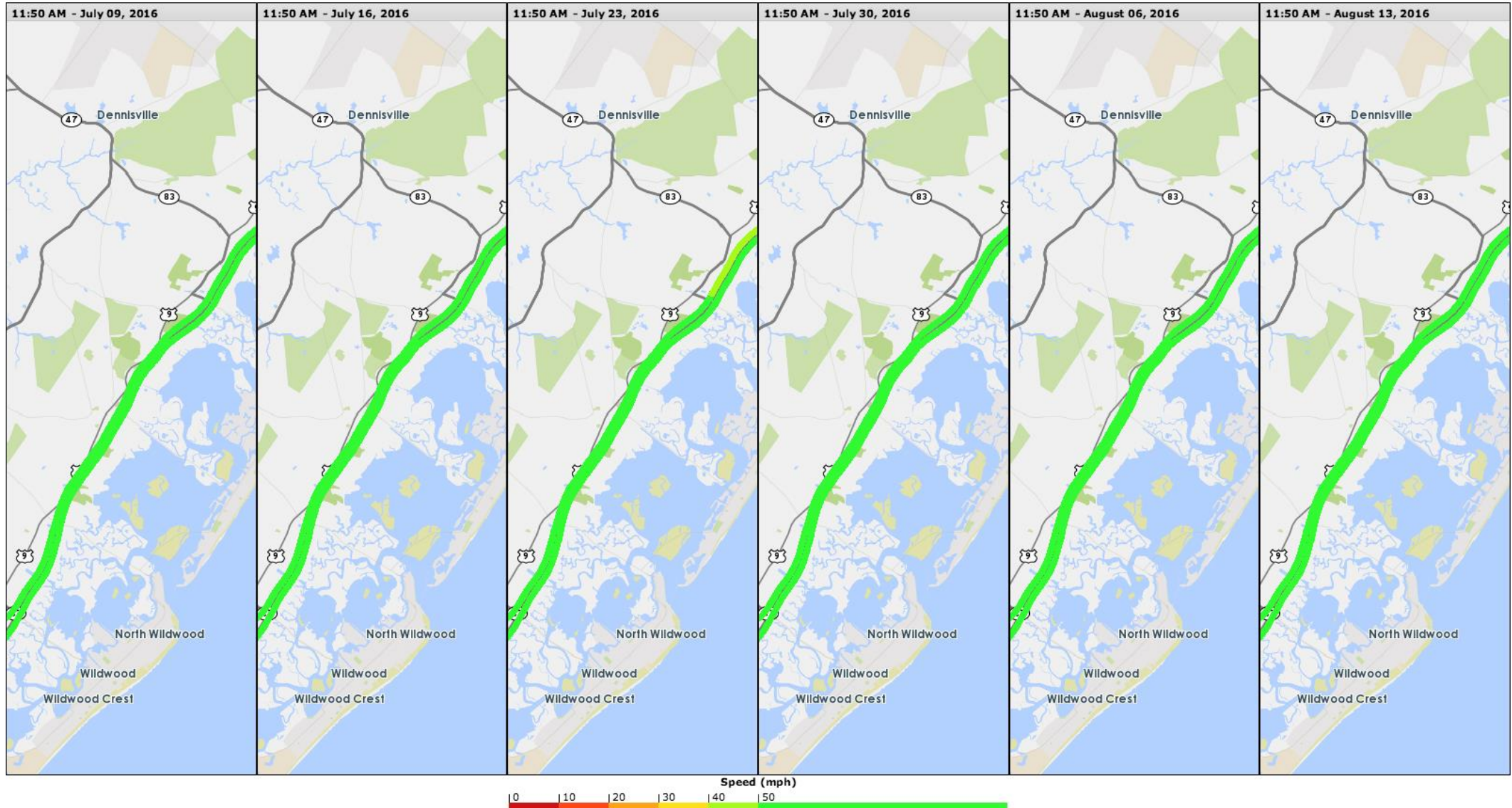
7 Saturdays in 2016 (after removal of signals)



GARDEN STATE PKWY between NJ-109 and Toll Booth Plaza using INRIX data



GARDEN STATE PKWY between NJ-109 and Toll Booth Plaza using INRIX data



Thank You!

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