NATIONAL CAPITAL REGION TRANSPORTATION PLANNING BOARD

National Capital Region Congestion Report

4th Quarter 2015

Metropolitan Washington Council of Governments
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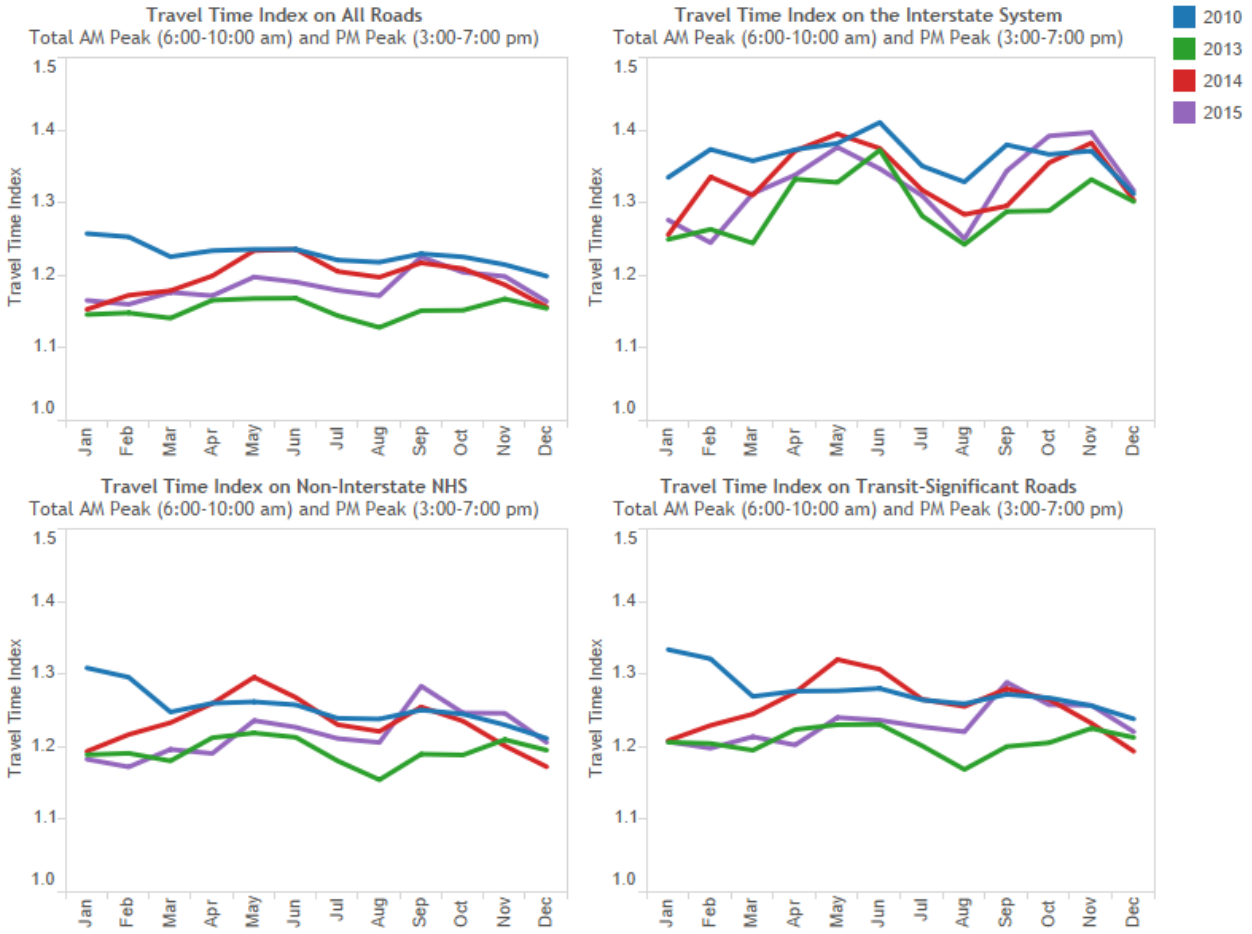
Congestion – Travel Time Index (TTI)

Interstate System		
TTI 4th Quarter 2015:	1.37	↑1.6% or 0.02[1]
TTI Trailing 4 Quarters:	1.33	↓0.5% or 0.01[2]
Non-Interstate NHS[3]		
TTI 4th Quarter 2015:	1.23	↑2.5% or 0.03
TTI Trailing 4 Quarters:	1.22	↓1.2% or 0.01
Transit-Significant[4]		
TTI 4th Quarter 2015:	1.25	↑1.2% or 0.01
TTI Trailing 4 Quarters:	1.23	↓2.0% or 0.03
All Roads		
TTI 4th Quarter 2015:	1.19	↑0.4% or 0.005
TTI Trailing 4 Quarters:	1.18	↓1.0% or 0.01

[1] Compared to 4th quarter 2014; [2]Compared to one year earlier; [3] NHS: National Highway System; [4]See page 14.

Figure 1. Monthly average Travel Time Index for Total AM peak (6:00-10:00 am) and PM peak (3:00-7:00 pm)



Travel Time Index

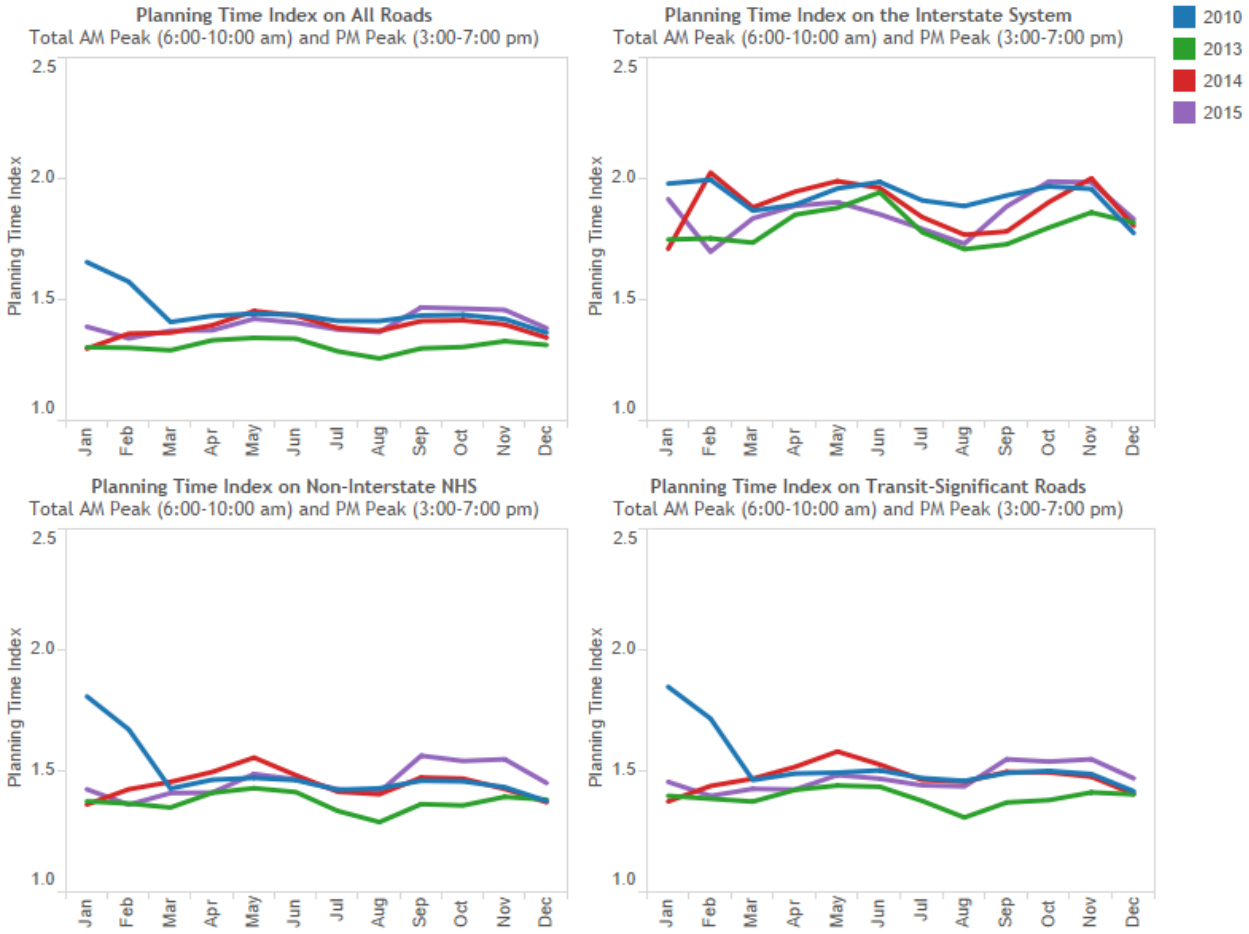
Travel Time Index (TTI), defined as the ratio of actual travel time to free-flow travel time, measures the intensity of congestion. The higher the index, the more congested traffic conditions it represents, e.g., TTI = 1.00 means free flow conditions, while TTI = 1.30 indicates the actual travel time is 30% longer than the free-flow travel time.

Unreliability – Planning Time Index (PTI)

Interstate System		
PTI 4th Quarter 2015:	1.93	↑1.7% or 0.03[1]
PTI Trailing 4 Quarters:	1.86	↓1.4% or 0.03[2]
Transit-Significant[4]		
PTI 4th Quarter 2015:	1.52	↑4.2% or 0.06
PTI Trailing 4 Quarters:	1.47	↓0.3% or 0.01
Non-Interstate NHS[3]		
PTI 4th Quarter 2015:	1.51	↑6.4% or 0.09
PTI Trailing 4 Quarters:	1.46	↑1.0% or 0.01
All Roads		
PTI 4th Quarter 2015:	1.43	↑3.6% or 0.05
PTI Trailing 4 Quarters:	1.40	↑1.1% or 0.02

[1] Compared to 4th quarter 2014; [2]Compared to one year earlier; [3] NHS: National Highway System; [4]See page 14.

Figure 2. Monthly average Planning Time Index for Total AM peak (6:00-10:00 am) and PM peak (3:00-7:00 pm)



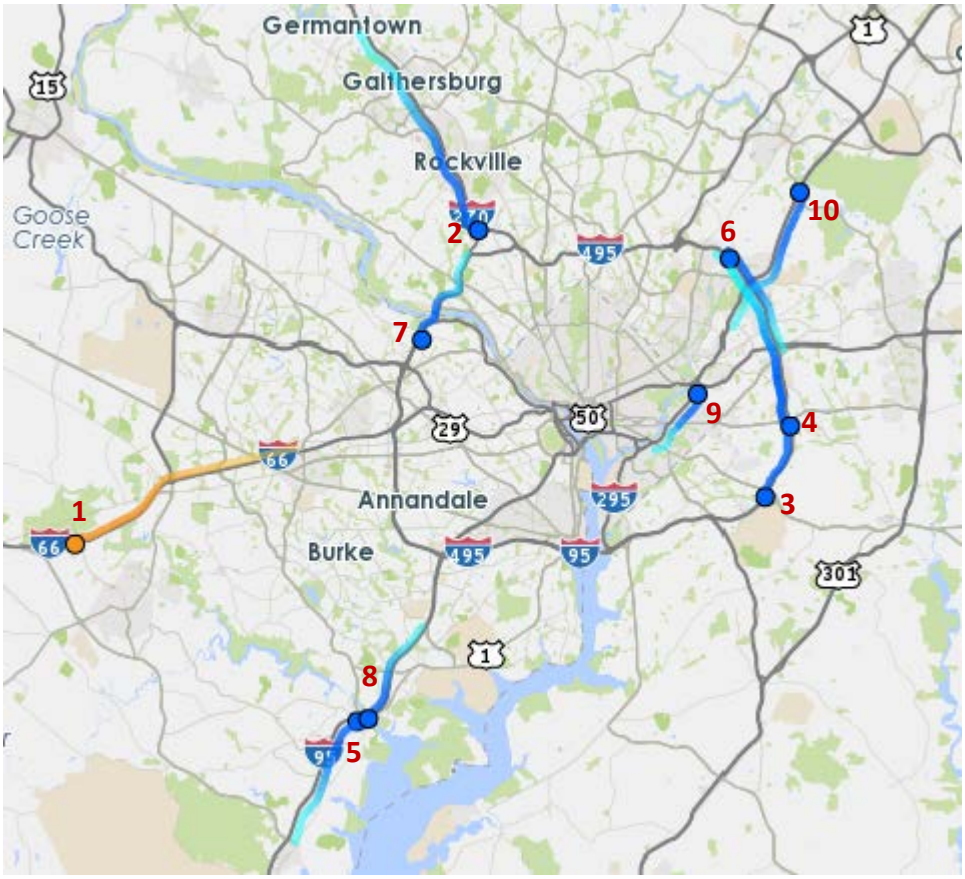
Planning Time Index

Planning Time Index (PTI), defined as the ratio of 95th percentile travel time to free flow travel time, measures travel time reliability. The higher the index, the less reliable traffic conditions it represents, e.g., PTI = 1.30 means a traveler has to budget 30% longer than the uncongested travel time to arrive on time 95% of the times (i.e., 19 out of 20 trips).

Top 10 Bottlenecks

Rank (Last Quarter Rank)	Location	Average duration	Average max length (miles)	Occur-rences	Impact factor
1 (9)*	I-66 W @ VA-234/EXIT 47	2 h 59 m	12.21	98	214,122
2 (3)	I-270 S @ I-270 (SPUR)	2 h 8 m	12	128	196,645
3 (22)	I-495 CW @ MD-4/PENNSYLVANIA AVE/EXIT 11	3 h 8 m	13.61	70	179,173
4 (1)	I-495 CW @ MD-214/CENTRAL AVE/EXIT 15	2 h 10 m	8.49	151	166,733
5 (4)	I-95 N @ VA-123/EXIT 160	2 h 24 m	6.01	181	156,679
6 (29)	I-495 CCW @ GREENBELT METRO DR/EXIT 24	1 h 52 m	5.05	255	144,335
7 (18)	I-495 CCW @ VA-193/GEORGETOWN PIKE/EXIT 13	2 h	5.34	223	142,950
8 (2)	I-95 S @ VA-123/EXIT 160	2 h 44 m	5.09	165	137,862
9 (7)	DC-295 N @ EASTERN AVE	3 h 28 m	3.49	185	134,329
10 (5)	MD-295 N @ MD-197/EXIT 11	3 h 34 m	6.98	70	104,493

** See "Bottlenecks" section in the "Background" chapter for ranking variability from quarter to quarter.*



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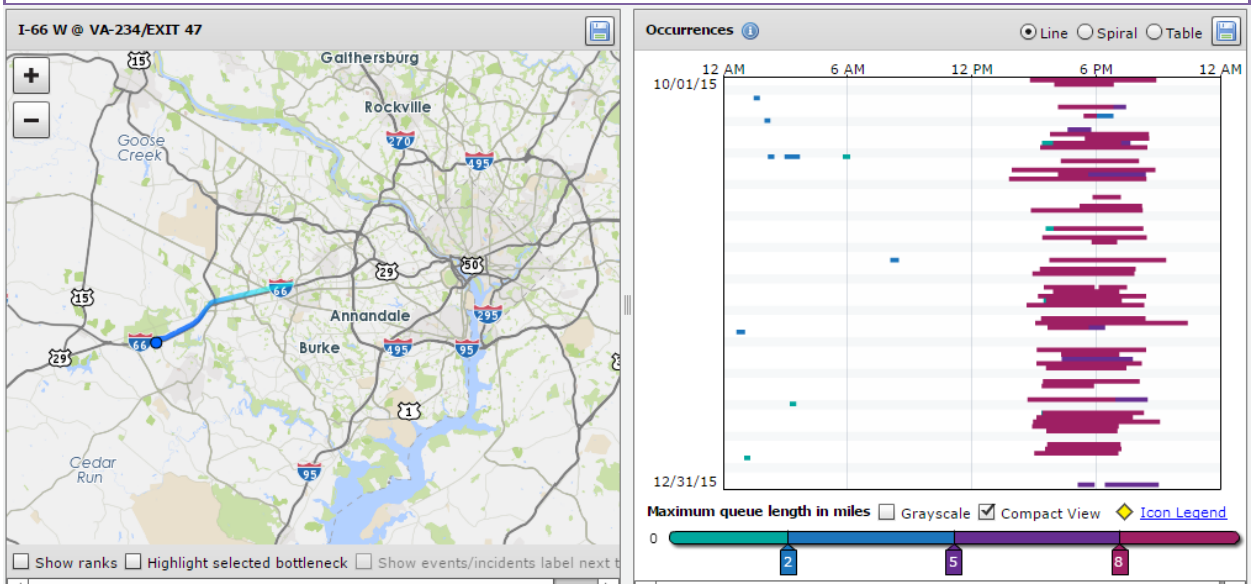

** The Impact Factor of a bottleneck is simply the product of the Average Duration (minutes), Average Max Length (miles) and the number of occurrences.*

Rank	Location	Average duration	Average max length (miles)	Occurrences	Impact factor
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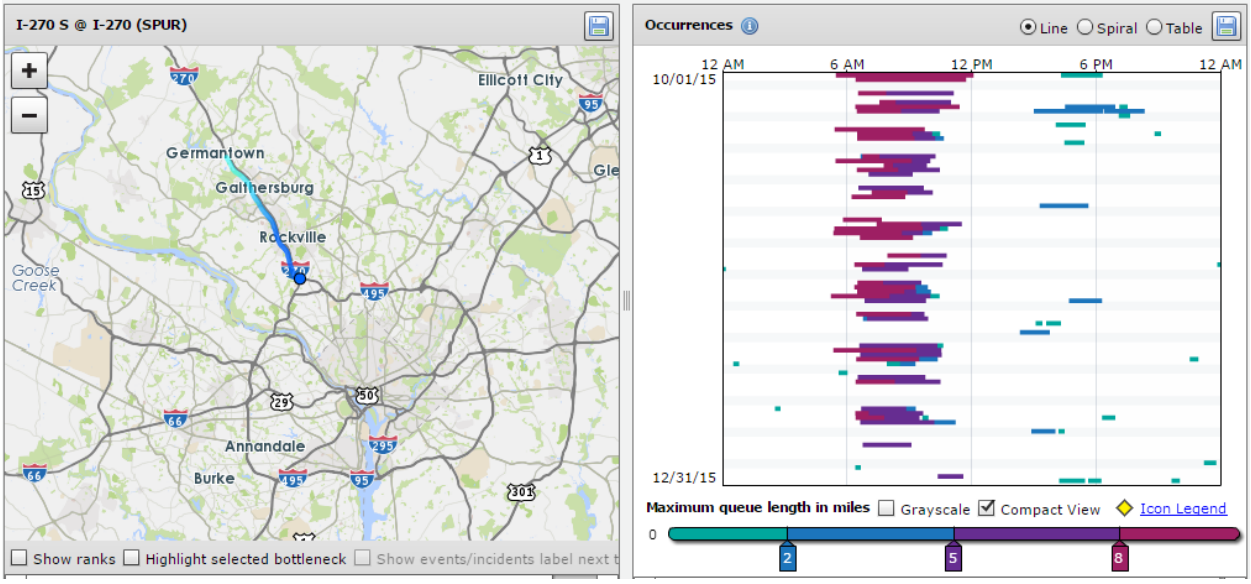

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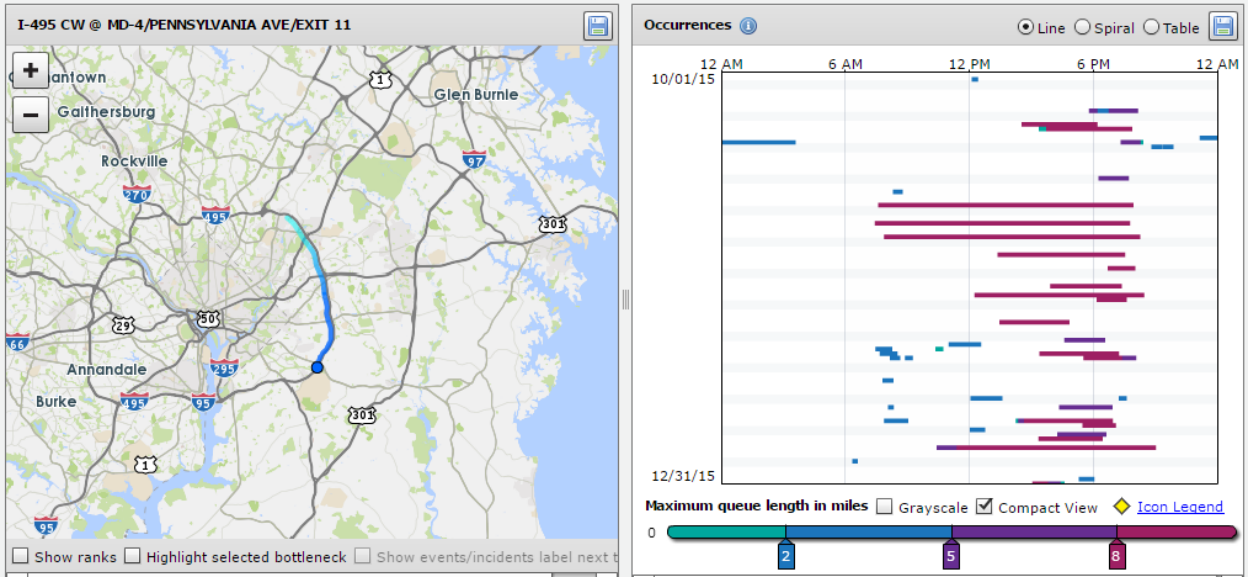

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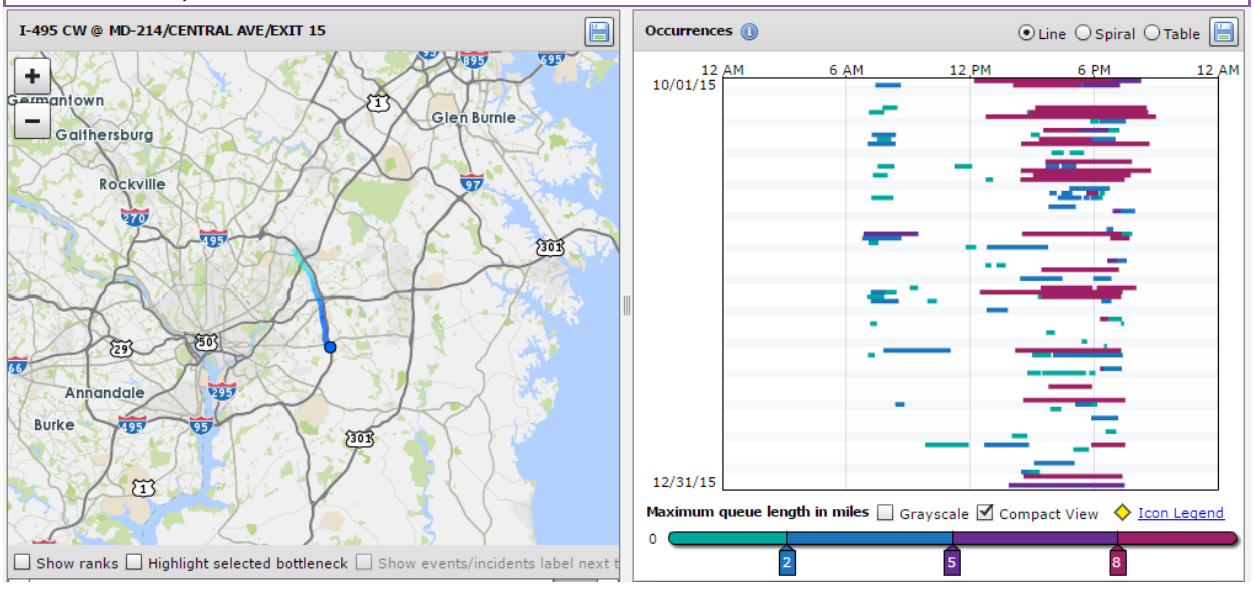

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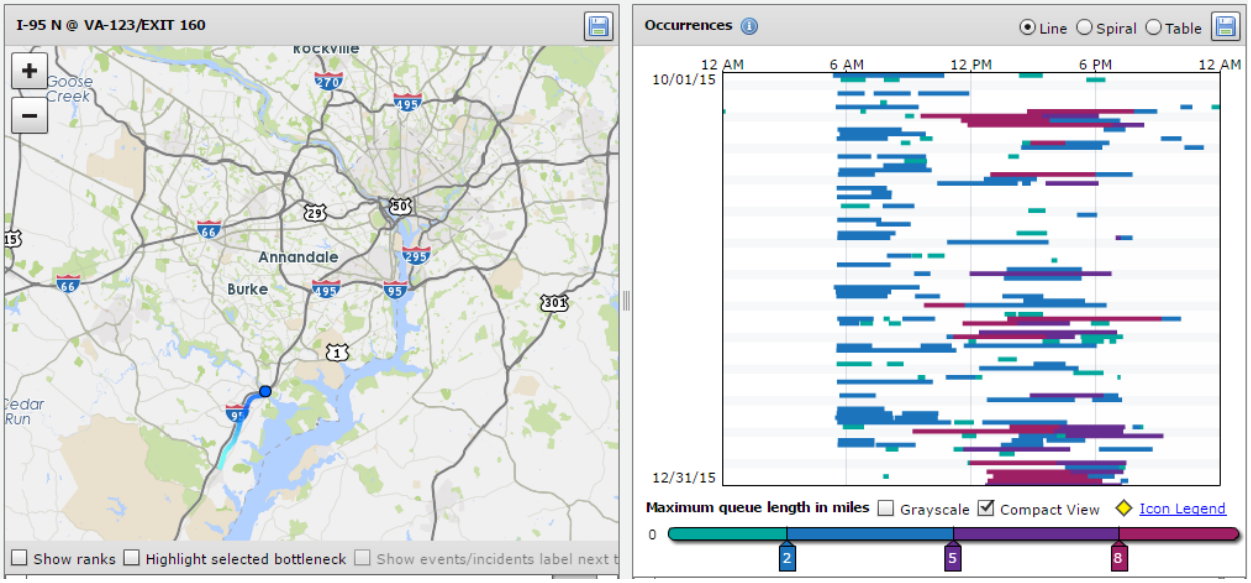

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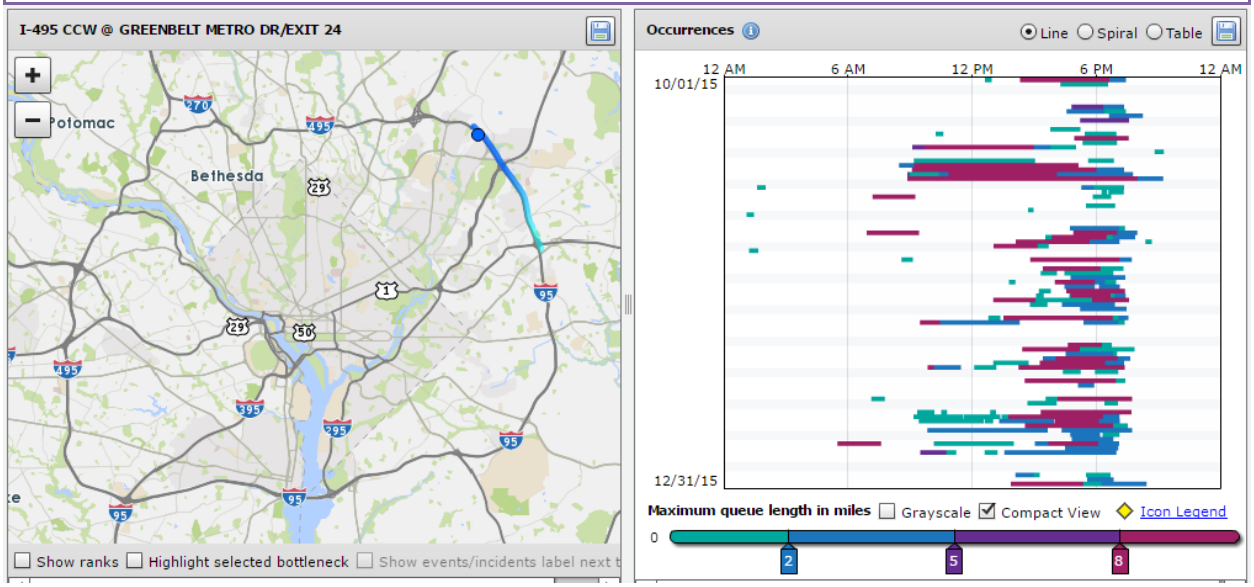

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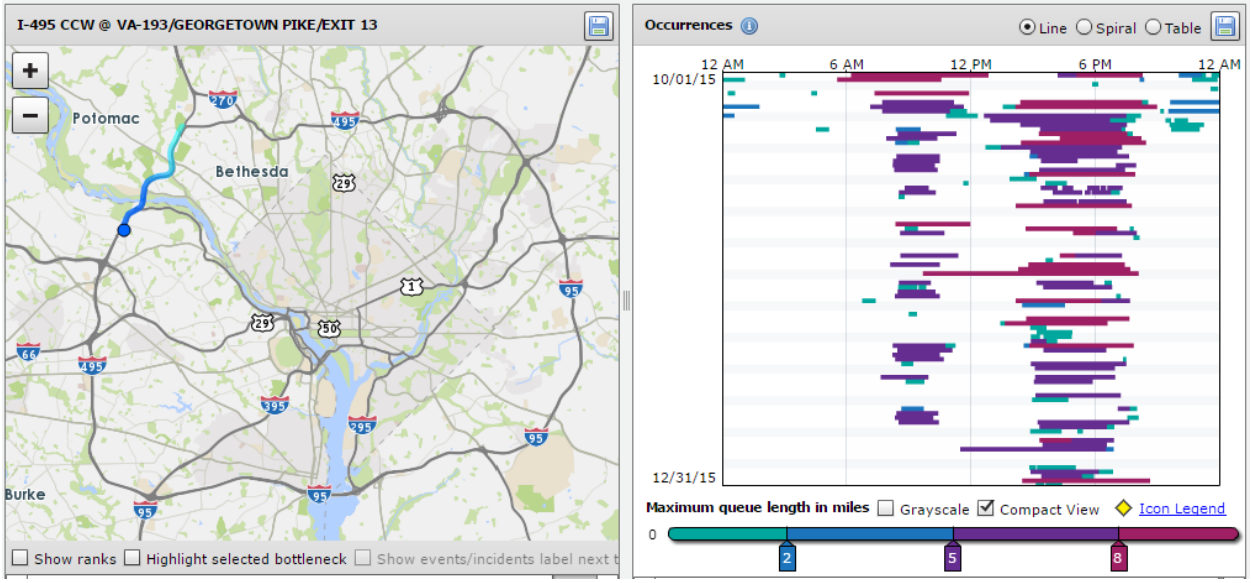

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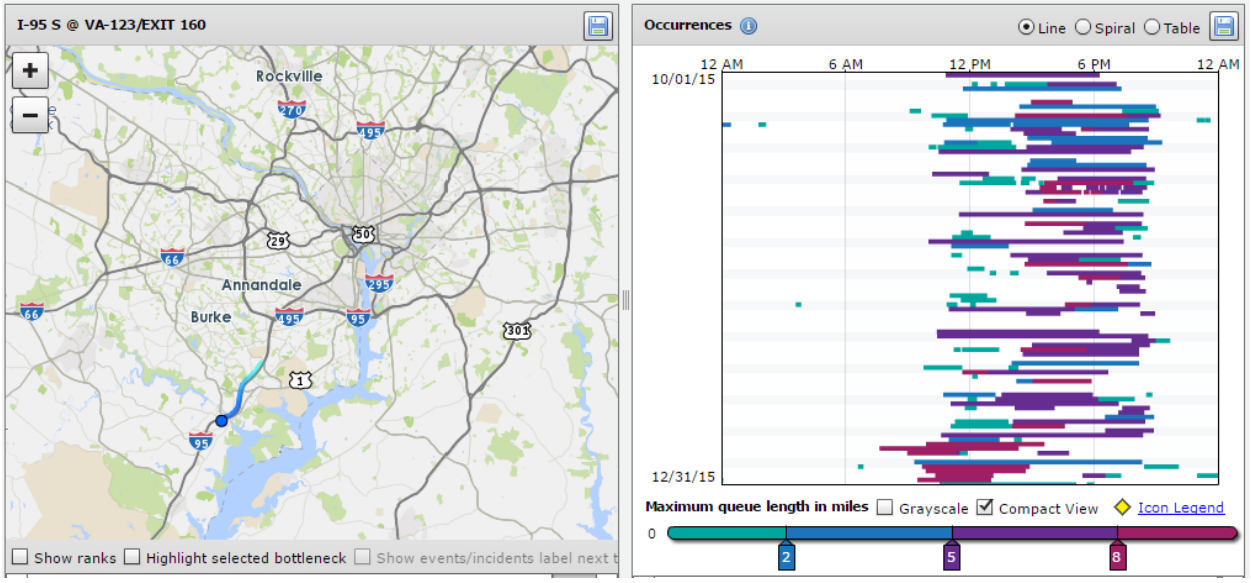

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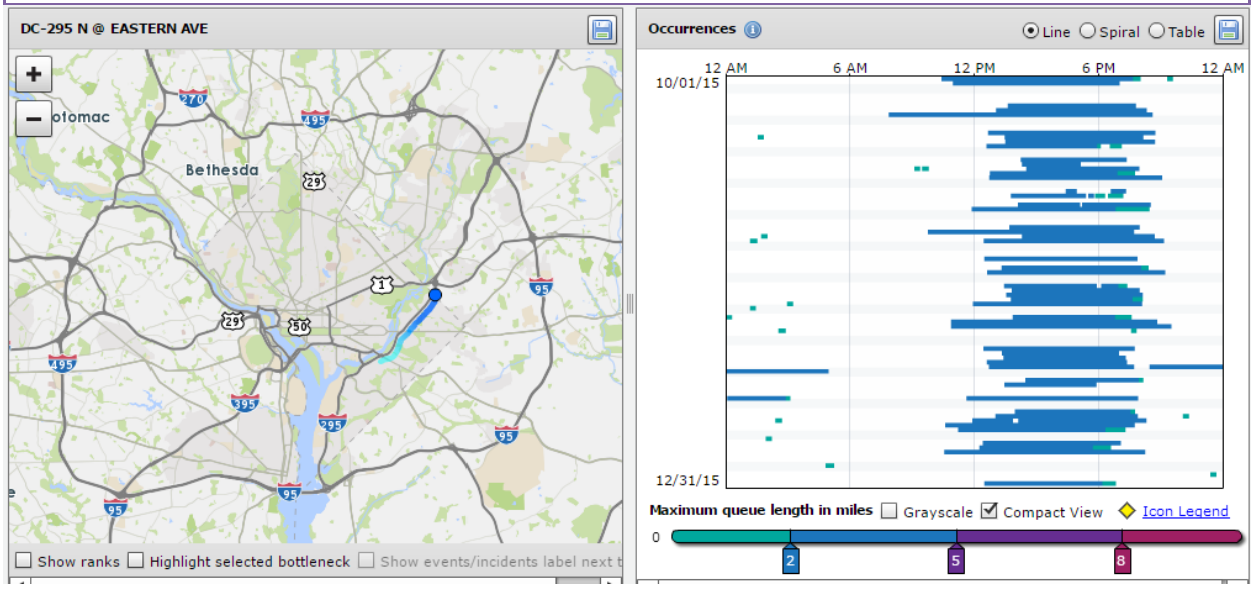

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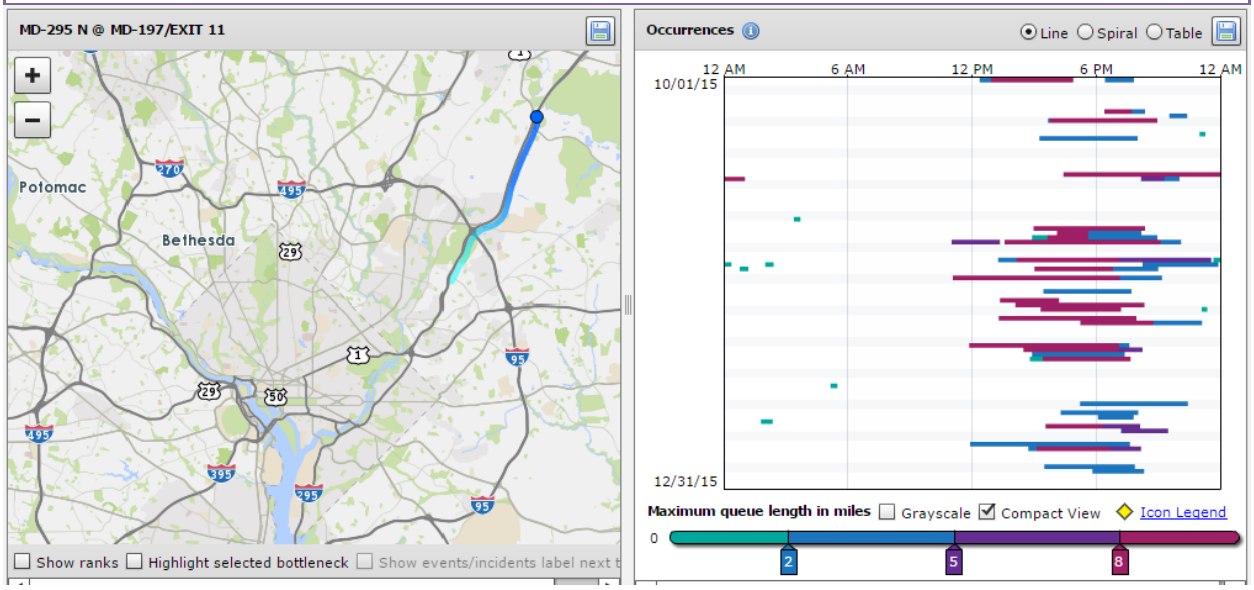


Congestion Maps

Figure 3. Travel Time Index during weekday 8:00-9:00 AM in 4th Quarter 2015

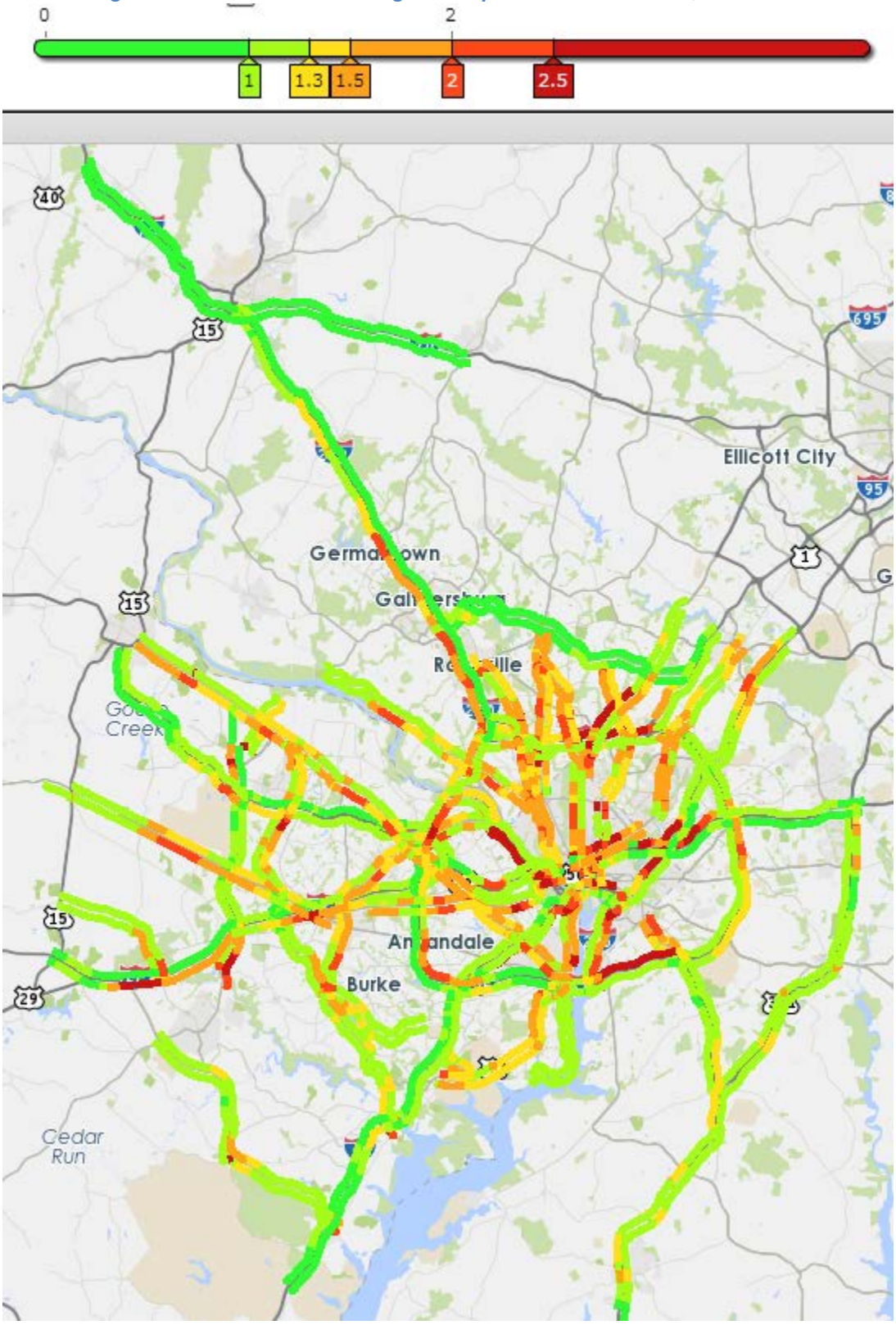
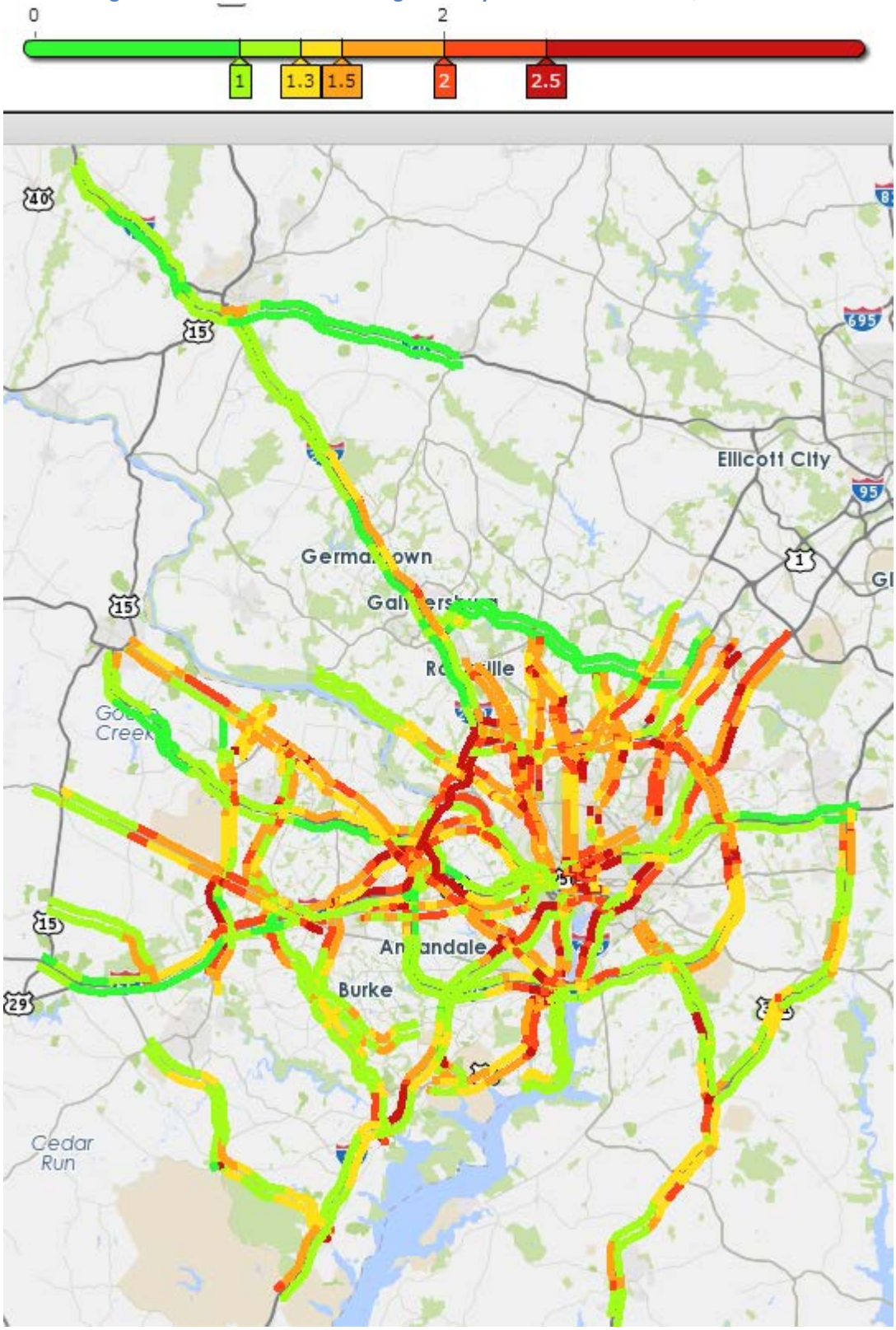


Figure 4. Travel Time Index during weekday 5:00-6:00 PM in 4th Quarter 2015



4th Quarter 2015 Spotlight – CMP in FAST Act

Introduction

On December 4, 2015, President Obama signed the "Fixing America's Surface Transportation" (FAST) Act, authorizing $305 billion surface transportation funding for the next five years. This is the first bill to provide funding for more than two years since SAFETEA-LU, giving states and local governments more certainty to plan and invest in improvements to roadway, bridge, and transit systems. This quarterly spotlight takes a first look at the FAST Act in the area of Congestion Management Process (CMP).

CMP in FAST Act

The CMP is enriched in the FAST Act by adding an OPTIONAL Congestion Management Plan (CMPL) that may be developed by a transportation management area (TMA). The Act states that:

> *"A metropolitan planning organization serving a transportation management area may develop a plan that includes projects and strategies that will be considered in the TIP of such metropolitan planning organization. Such plan shall—*
>
> *(i) develop regional goals to reduce vehicle miles traveled during peak commuting hours and improve transportation connections between areas with high job concentration and areas with high concentrations of low-income households;*
>
> *(ii) identify existing public transportation services, employer-based commuter programs, and other existing transportation services that support access to jobs in the region; and*
>
> *(iii) identify proposed projects and programs to reduce congestion and increase job access opportunities."*

In developing the Congestion Management Plan:

> *"…, a metropolitan planning organization shall consult with employers, private and nonprofit providers of public transportation, transportation management organizations, and organizations that provide job access reverse commute projects or job-related services to low income individuals."*

Another change regarding the CMP is that the FAST Act elaborates on travel demand reduction strategies that include "intercity bus operators, employer-based commuting programs such as a carpool program, vanpool program, transit benefit program, parking cash-out program, shuttle program, or telework program". The Act also adds "job access projects" in addition to travel demand reduction and operational management strategies to address congestion management.

The FAST Act retains the MAP-21 performance-based planning requirements with no changes. The CMP, especially congestion measures and this quarterly congestion report, is expected to be adjusted by the forthcoming US DOT System Performance Measures rulemaking.

Background

Motivation

Inspired by various agency and jurisdictional dashboard efforts around the country (e.g., the Virginia Department of Transportation Dashboard), driven by the MAP-21 legislation and the emerging probe-based traffic speed data from the I-95 Corridor Coalition Vehicle Probe Project, this quarterly updated National Capital Region Congestion Report takes advantage of the availability of rich data and analytical tools to produce customized, easy-to-communicate, and quarterly updated traffic congestion and travel time reliability performance measures for the Transportation Planning Board (TPB) Planning Area. The goal of this effort is to timely summarize the region's congestion and the programs of the TPB and its member jurisdictions that would have an impact on congestion, to examine reliability and non-recurring congestion for recent incidents/occurrences, in association with relevant congestion management strategies, and to prepare for the MAP-21 performance reporting.

Methodology

Travel Time Index (TTI)

TTI is defined as the ratio of actual travel time to free-flow travel time, measures the intensity of congestion. The higher the index, the more congested traffic conditions it represents, e.g., TTI = 1.00 means free flow conditions, while TTI = 1.30 indicates the actual travel time is 30% longer than the free-flow travel time. For more information, please refer to Travel Time Reliability: Making It There On Time, All The Time, a report published by the Federal Highway Administration and produced by the Texas Transportation Institute with Cambridge Systematics, Inc. This report uses the following method to calculate TTI:

1. Download INRIX 5-minute raw data from the I-95 Traffic Monitoring website (http://i95.inrix.com) or the VPP Suite website (https://vpp.ritis.org).
2. Aggregate the raw data to monthly average data by day of the week and hour of the day. Harmonic Mean was used to average the speeds and reference speeds (Harmonic Mean is only used here; other averages used are all Arithmetic Mean). For each segment (TMC), the monthly data have 168 observations (7 days in a week * 24 hours a day) in a month.
3. Calculate TTI = reference speed / speed in the monthly data. If TTI < 1 then make TTI = 1. If constraint TTI >= 1 was not imposed, some congestion could be cancelled by conditions with TTI < 1.
4. Calculate regional average TTI for the Interstate system, non-Interstate NHS, non-NHS, and all roads for AM peak (6:00-10:00 am) and PM Peak (3:00-7:00 pm) respectively, using segment length as the weight.
5. Calculate the average TTI of the AM Peak and PM Peak to obtain an overall congestion indicator.

Planning Time Index (PTI)

PTI is defined as the ratio of 95th percentile travel time to free flow travel time, measures travel time reliability. The higher the index, the less reliable traffic conditions it represents, e.g., PTI = 1.30 means a traveler has to budget 30% longer than the uncongested travel time to arrive on time 95% of the times (i.e., 19 out of 20 trips), while TTI = 1.60 indicates that one has to budget 60% longer than the uncongested travel time to arrive on time most of the times. For more information, please refer to Travel Time Reliability: Making It There On Time, All The Time, a report published by the Federal

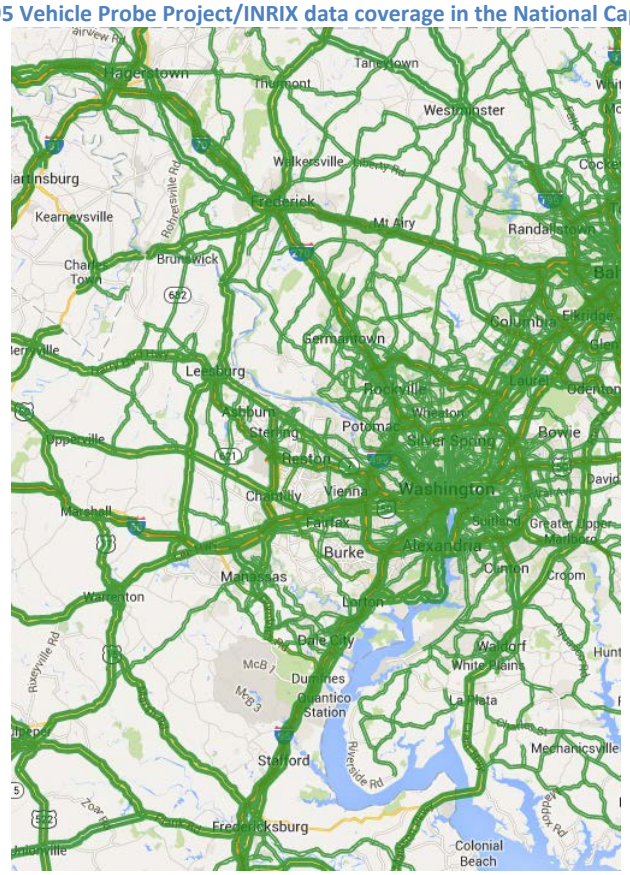
Highway Administration and produced by the Texas Transportation Institute with Cambridge Systematics, Inc. This report uses the following method to calculate PTI:

1. Calculate TTI = reference speed / speed in the monthly data obtained in step 2 of the above TTI methodology. Do not impose constraint TTI >= 1, since the purpose of this calculation is to rank the TTIs to find the 95th percentile, not to average the TTIs.
2. Calculate monthly average PTI: including sorting the data obtained in step 1 by segment, peak period, and month, finding the 95th percentile TTI and this TTI is PTI by definition, and averaging the PTIs using segment length as the weight to get regional summaries (for the Interstate system, non-Interstate NHS, non-NHS, and all roads for AM peak (6:00-10:00 am) and PM Peak (3:00-7:00 pm) respectively).
3. Calculate yearly average PTI: including sorting the data obtained in step 1 by segment and peak period, finding the 95th percentile TTI and this TTI is PTI by definition, and averaging the PTIs using segment length as the weight to get regional summaries.
4. Calculate the average PTI of the AM Peak and PM Peak to obtain an overall travel time reliability indicator.

National Highway System (NHS) – the October 1, 2012 designation of NHS was used in this report. In compliance with the MAP-21 requirements, all principal arterials have been added to the NHS.

All Roads (in Figures 1 and 2) – are the roads covered by the I-95 Corridor Coalition Vehicle Probe Project/INRIX data, as shown below.

Figure 5. I-95 Vehicle Probe Project/INRIX data coverage in the National Capital Region

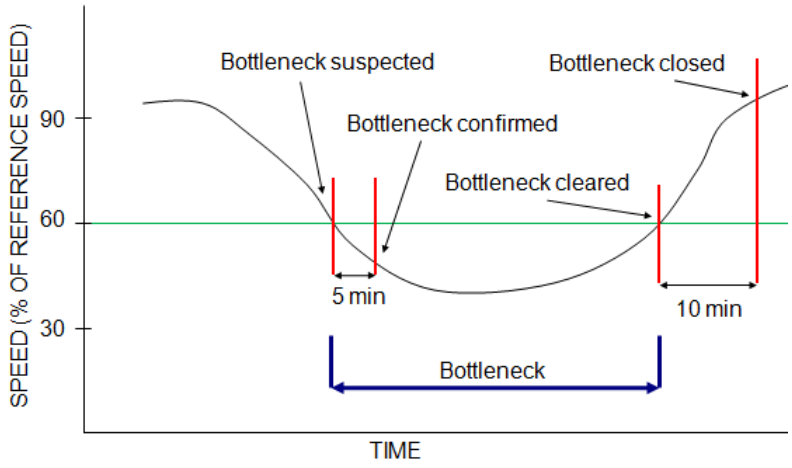


Bottlenecks

This report uses the "Bottleneck Ranking" tool in the VPP Suite to get the top 10 most significant bottleneck in the TPB Planning Area for a quarter. The VPP Suite uses the following methodology to track bottlenecks:

Bottleneck conditions are determined by comparing the current reported speed to the reference speed for each segment of road. **Reference speed** values are provided by INRIX, Inc. for each segment and represent the 85th percentile observed speed for all time periods with a maximum value of 65 mph. If the reported speed falls below 60% of the reference, the road segment is flagged as a potential bottleneck. If the reported speed stays below 60% for five minutes, the segment is confirmed as a bottleneck location. Adjacent road segments meeting this condition are joined together to form the bottleneck queue. When reported speeds on every segment associated with a bottleneck queue have returned to values greater than 60% of their reference values and remained that way for 10 minutes, the bottleneck is considered cleared. The total **duration** of a bottleneck is the difference between the time when the congestion condition was first noticed (prior to the 5 minute lead in) and the time when the congestion condition recovered (prior to the 10 minute lead out). Bottlenecks whose total queue length, determined by adding the length of each road segment associated with the bottleneck, is less than 0.3 miles are ignored.

Figure 6. The Life of a Bottleneck by Speed and Time



This report uses the **Impact Factor** to rank the bottlenecks. The Impact Factor is simply the product of the Average Duration (minutes), Average Max Length (miles) and the number of occurrences.

The University of Maryland CATT Lab is currently reviewing the bottleneck ranking methodology and it may soon be improved given the observed variability from quarter to quarter. Nonetheless, the identified bottlenecks by the current methodology represent significant choke points along traffic flows.

Bottleneck location maps and spiral charts are all screen shots from the VPP Suite.

Congestion Maps

The maps were generated by the "Trend Map" tool in the VPP Suite. Since the VPP Suite limits the total number of segments of a query, the maps only show the freeways and some major arterials.