ITEM #6
DRAFT

2018
CONGESTION MANAGEMENT PROCESS (CMP)
TECHNICAL REPORT

July 6, 2018

(Draft Final Report available as individual chapters at the following URL)

https://www.mwcog.org/events/2018/7/6/tpb-technical-committee/

National Capital Region Transportation Planning Board
Metropolitan Washington Council of Governments

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EXECUTIVE SUMMARY

Background

A Congestion Management Process (CMP) has been a requirement since the 2005 Safe Accountable Flexible Efficient Transportation Equity Act - A Legacy for the Users (SAFETEA-LU) federal legislation. The current Fixing America's Surface Transportation (FAST) Act and its supporting federal regulations fully maintain the requirements of the CMP with additional strategies and options. These legislations and regulations are a basis for the CMP component that is wholly incorporated in the region's long-range transportation plan, Visualize 2045. The CMP component of Visualize 2045 constitutes the region's official CMP, and serves to satisfy the federal requirement of having a regional CMP.

This CMP Technical Report serves as a background document to the official CMP within Visualize 2045, providing detailed information on data, strategies, and regional programs involved in congestion management. This 2018 CMP Technical Report is an updated version of the previously published CMP Technical Reports (2016, 2014, 2012 and 2010, respectively).

Components of the CMP

The National Capital Region's Congestion Management Process has four components as described in the CLRP:

- Monitor and evaluate transportation system performance
- Define and analyze strategies
- Implement strategies and assess
- Compile project-specific congestion management information

This report documents and provides technical details of the four components of the CMP. It compiles information from a wide range of metropolitan transportation planning activities, as well as providing some additional CMP specific analyses, particularly travel time reliability and non-recurring congestion analyses.

Congestion on Highways

Regional Congestion Trends, 2010-2017

Based on the results revealed by the I-95 Corridor Coalition Vehicle Probe Project (VPP)/INRIX traffic monitoring[1], peak period congestion in the Washington region decreased between 2010 and 2012, but more recently has increased moderately.

The congestion intensity, measured by the Travel Time Index (TTI)[2] from a traveler's perspective, decreased 6.7% between 2010 and 2012 and increased by 2.0% from 2012 to 2017 (Figure E-1).

[1] I-95 Corridor Coalition Vehicle Probe Project, http://i95coalition.org/projects/vehicle-probe-project/
[2] Travel Time Index (TTI) is an indicator of the intensity of congestion, calculated as the ratio of actual experienced travel time to free flow travel time. A travel time index of 1.00 implies free flow travel without any delays, while a travel time index of 1.30 means one has to spend 30% more time to finish a trip compared to free flow travel.

The spatial extent of congestion, measured by Percent of Congested Miles[3] from a system perspective, varied similarly to the TTI (Figure E-2). Regionally 21% of all monitored roadways were congested during peak periods in 2010. This number decreased to approximately 9% in 2013, the lowest in the last six years, and then increased to over 15% in 2016 but decreased slightly to less than 15% in 2017.

Figure E-1: Annual Average Travel Time Index by Highway Category: Total AM and PM Peaks

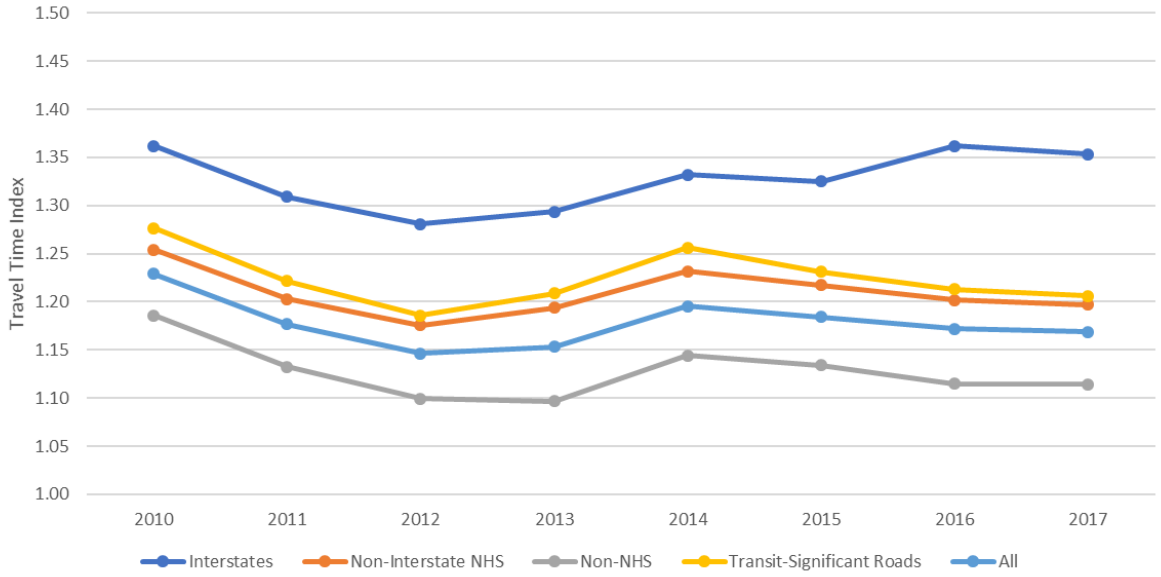
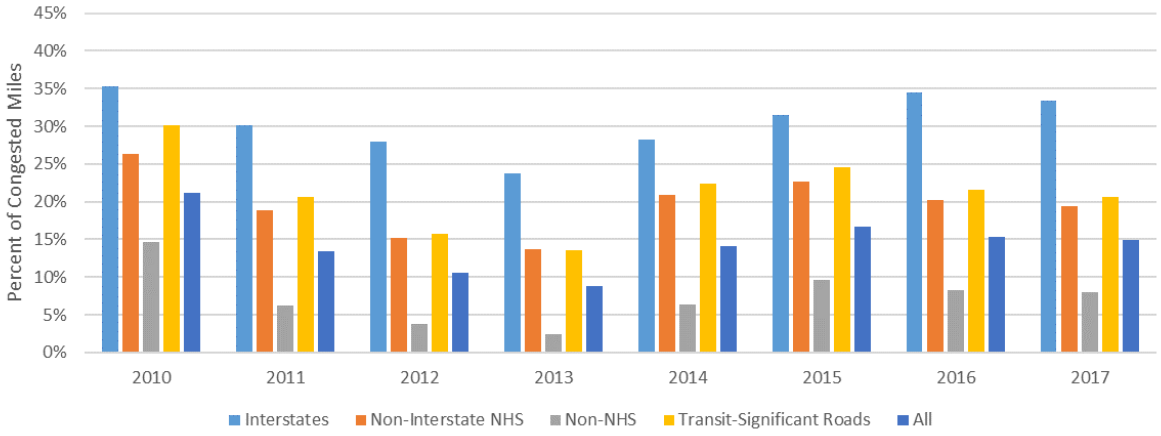


Figure E-2: Annual Average Percent of Congested Miles by Highway Category: Total AM and PM Peaks



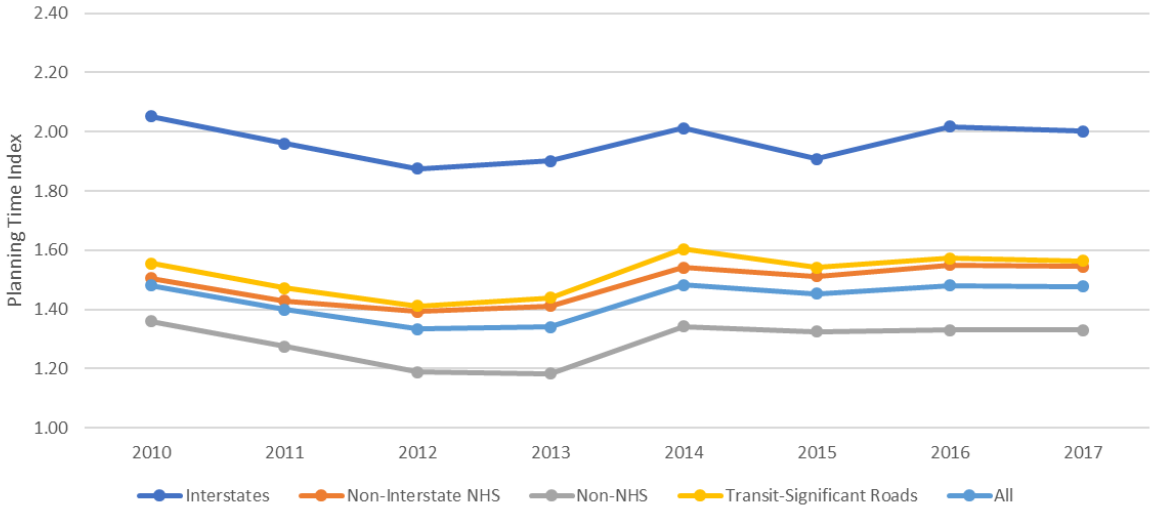
REGIONAL TRAVEL TIME RELIABILITY TRENDS, 2010-2017

Travelers in the Washington region typically will need to budget about two times the free flow travel time during peak periods to ensure on-time arrivals. These numbers are based on all directions of travel, therefore for those who traveling in the peak direction would need to budget even more.

[3] Percent of Congested (Directional) Miles is a system-wide measure that captures the spatial extent of congestion. Congestion is defined if actual travel time is 30% longer than the free-flow travel time[3], i.e., Travel Time Index > 1.3, based on recommendations made by the National Transportation Operations Coalition in 2005.

Similar to the trends observed in traffic congestion, travel time reliability improved approximately 10% between 2010 and 2012 but has almost gone back to the 2010 level in 2014, 2016, and 2017 (Figure E-3).

Figure E-3: Annual Average Planning Time Index by Highway Category: Total AM and PM Peaks



CONGESTION MONTHLY VARIATION

Congestion varies from month to month within a year, as shown for 2017 in Figure E-4. Monthly variations of congestion were most noticeable on the Interstate System, followed by the Transit-Significant Roads, the Non-Interstate NHS, and the Non-NHS.

Congestion generally peaks regionally in May and June, and again in October and November, and is lowest in January, February, July, and August. All five of the investigated highway categories followed this trend.

CONGESTION DAY OF WEEK VARIATION

Congestion also varies within a week (Figure E-5). The middle weekdays – Tuesday, Wednesday and Thursday – were the most congested days of a week. During these three weekdays, the AM Peak had almost identical congestion while the most congested PM Peak occurred on Thursday, followed by Wednesday and Tuesday.

Monday and Friday had unique traffic patterns. Monday morning's traffic was lower than that of the middle weekdays but higher than Friday; Monday afternoon had the least congestion among weekdays. Friday morning had the least congestion in all weekdays; Friday afternoon's congestion was almost as bad as the normal weekdays, but it came about one hour earlier without ending earlier – expanded congested time period.

Weekend days had the lowest traffic in a week and Sunday was even lower than Saturday. During these two days, mid-day traffic (12:00 – 3:00 pm) was the highest.

Figure E-4: 2017 Monthly Variation of Congestion: Total AM and PM Peaks

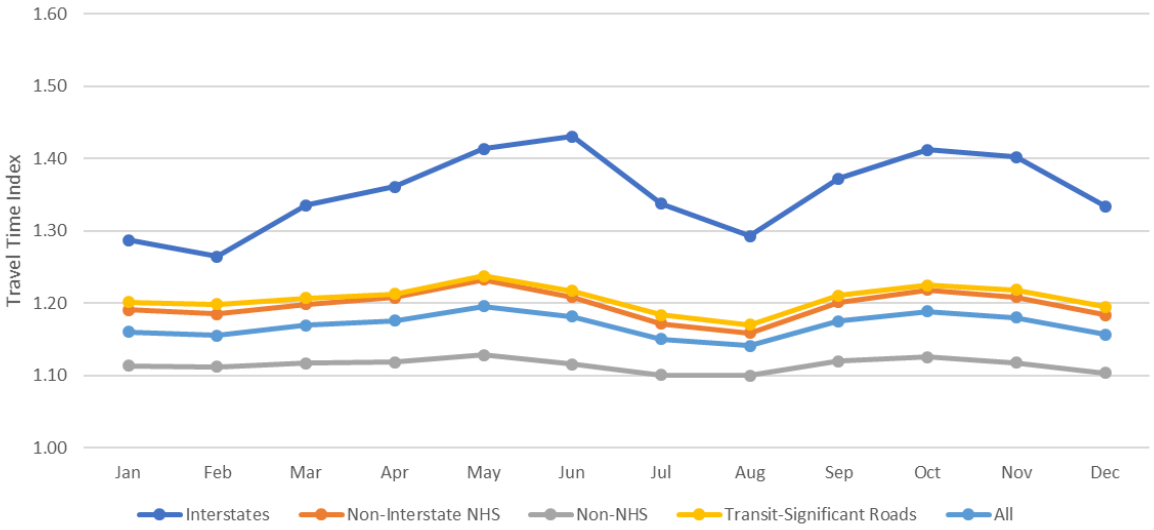
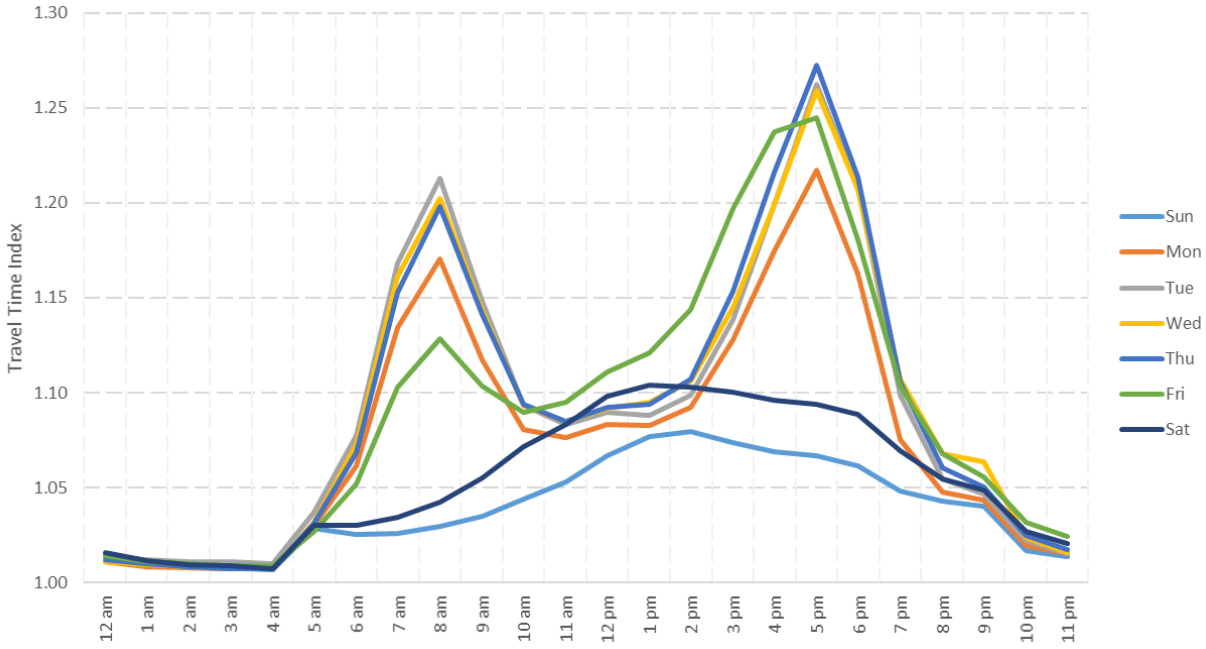


Figure E-5: Time of Day and Day of Week Variation of Congestion in 2017



TOP BOTTLENECKS

This report provides two lists of top bottlenecks in the Washington region for 2017: one is based on all time of the year – 24/7/365 (Table E-1 and Figure E-6), and the other is for peak periods only, i.e., non-holiday weekdays 6:00-9:00 am and 4:00-7:00 pm (Table E-2 and Figure E-7). The bottlenecks are ranked two ways: by the combination of Travel Time Index (TTI) and length, and by multiplication of TTI, length and Annual Average Daily Traffic volume (AADT). The former is informative to individual travelers and the latter could be useful from a system-wide perspective.

Table E-1: 2017 Top Bottlenecks – All Time

Location	State	Ave. TTI	Length (miles)	TTI*Miles	Rank by TTI*Miles	AADT	AADT*TTI* Miles	Rank by AADT*TTI *Miles
I-495 IL between Exit45/VA267 and Exit43/GW Pkwy	VA	1.89	3.25	6.16	1	158,932	979,612	2
I-95 SB between Lorton Rd/Exit 163 and Gordon Blvd/Exit 160	VA	1.78	3.36	5.97	2	199,147	1,188,452	1
DC-295 NB between Pennsylvania Ave SE and E Capitol St SE	DC	1.81	1.90	3.44	3	104,671	359,789	5
I-495 IL between Exit28/New Hampshire Ave and Exit 29/University Blvd E.	MD	1.52	1.71	2.59	4	210,814	546,526	3
I-495 IL between Exit 34/I-270 and Exit 33/Md-185	MD	1.52	1.55	2.35	5	212,690	500,565	4
I-495 OL around VA-241/TELEGRAPH RD/EXIT 2	VA	1.59	1.46	2.32	6	139,400	322,880	6
Interchange of Va-267 to I-495	VA	2.11	0.76	1.61	7	162,117	261,438	8
I-395 NB between Jefferson Davis Hwy and GW Pkwy	VA	1.76	0.88	1.56	8	182,964	285,010	7
N CAPITOL ST NE between H St NE and R St NW	DC	1.58	0.92	1.45	9	29,607	43,011	12
I-66 EB near Exit 69	VA	1.51	0.87	1.32	10	114,721	151,611	10
I-270 SPUR	MD	1.65	0.79	1.31	11	126,830	165,733	9
I-495/I-295 IL between New Jersey Ave SE and S Capital St SW	DC	1.59	0.61	0.97	12	91,316	88,479	11
US-1 between King St/Va-7 and Pendleton St	VA	1.84	0.40	0.73	13	22,182	16,239	15
Clara Barton Pkwy between Arizona Ave NW and N Glebe Rd	DC	1.54	0.46	0.71	14	17,059	12,150	16
Interchange From Va-286 to I-66 WB	VA	1.54	0.39	0.60	15	9,951	5,956	18

Table E-2: 2017 Top Bottlenecks – Peak Periods

Location	State	Ave. TTI	Length (miles)	TTI*Miles	Rank by TTI*Miles	AADT	AADT*TTI* Miles	Rank by AADT*TTI *Miles
I-495 IL between Va-650 and GW Pkwy	VA	3.53	4.29	15.15	1	158,932	2,408,117	3
I-495 OL between I-95 and Exit31/Md-97/Georgia Ave	MD	2.35	5.76	13.54	2	10,814	2,854,836	1
I-495 OL between I-395 and GW Pkwy	VA	2.28	5.93	13.50	3	39,400	1,881,587	4
I-95 SB between Va-286/Fairfax County Pkwy and Va-123/Gordan Blvd	VA	2.04	6.20	12.67	4	194,122	2,459,393	2
US-29/Lee Hwy intersets with Sudley Rd.	VA	2.06	4.90	10.09	5	9,939	100,300	17
Va-28/Centreville Rd between Va-234/Sudley Rd/Prescott Ave and Va-620/New Braddock Rd	VA	1.69	5.49	9.29	6	28,923	268,630	11
GW Pkwy SB between Va-123 and I-66	VA	1.67	8.08	8.12	7	71,067	576,943	9
Old Ox Rd/Va-606 between US-50/John S Mosby Hwy and Va-267/Dulles Greenway	VA	1.52	4.63	7.02	8	25,915	181,849	13
I-495 OL between Exit 174 and Exit 177/US-1	VA	2.44	2.69	6.56	9	152,943	1,003,174	5
Va-234/Sudley Rd between I-66 and Va-659/Gum Spring Rd	VA	1.72	3.34	5.75	10	11,919	68,532	20
Va-267/Dulles Toll Rd between I-495 and I-66	VA	1.91	2.87	5.48	11	47,860	262,276	12
Clara Barton Pkwy between Cabin John Pkwy and DC border	MD	1.91	2.77	5.29	12	21,391	113,243	16
I-66 EB between Exit 44/Prince William Pkwy and Exit 47/Sudley Rd	VA	2.02	2.55	5.14	13	119,414	614,107	9
I-495 OL between MD-210/Indian Head Hwy and Livingston Rd	MD	1.80	2.73	4.93	14	162,500	800,486	8
US-15/Leesburg Byp between N King St and Va-773/Fort Evans Rd NE	VA	2.37	2.03	4.80	15	26,386	126,711	15

Figure E-6: 2017 Top Bottlenecks – All Time

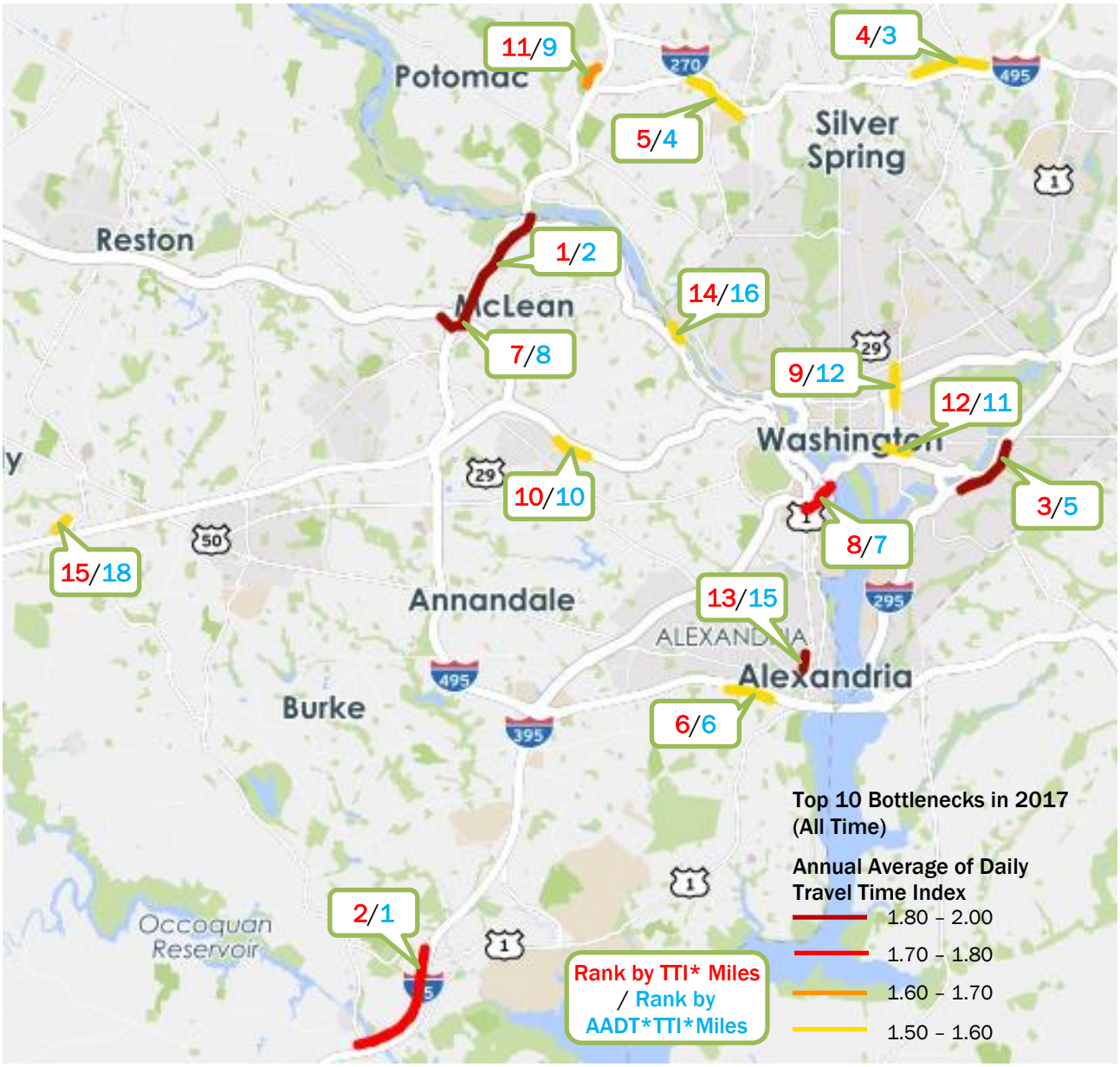
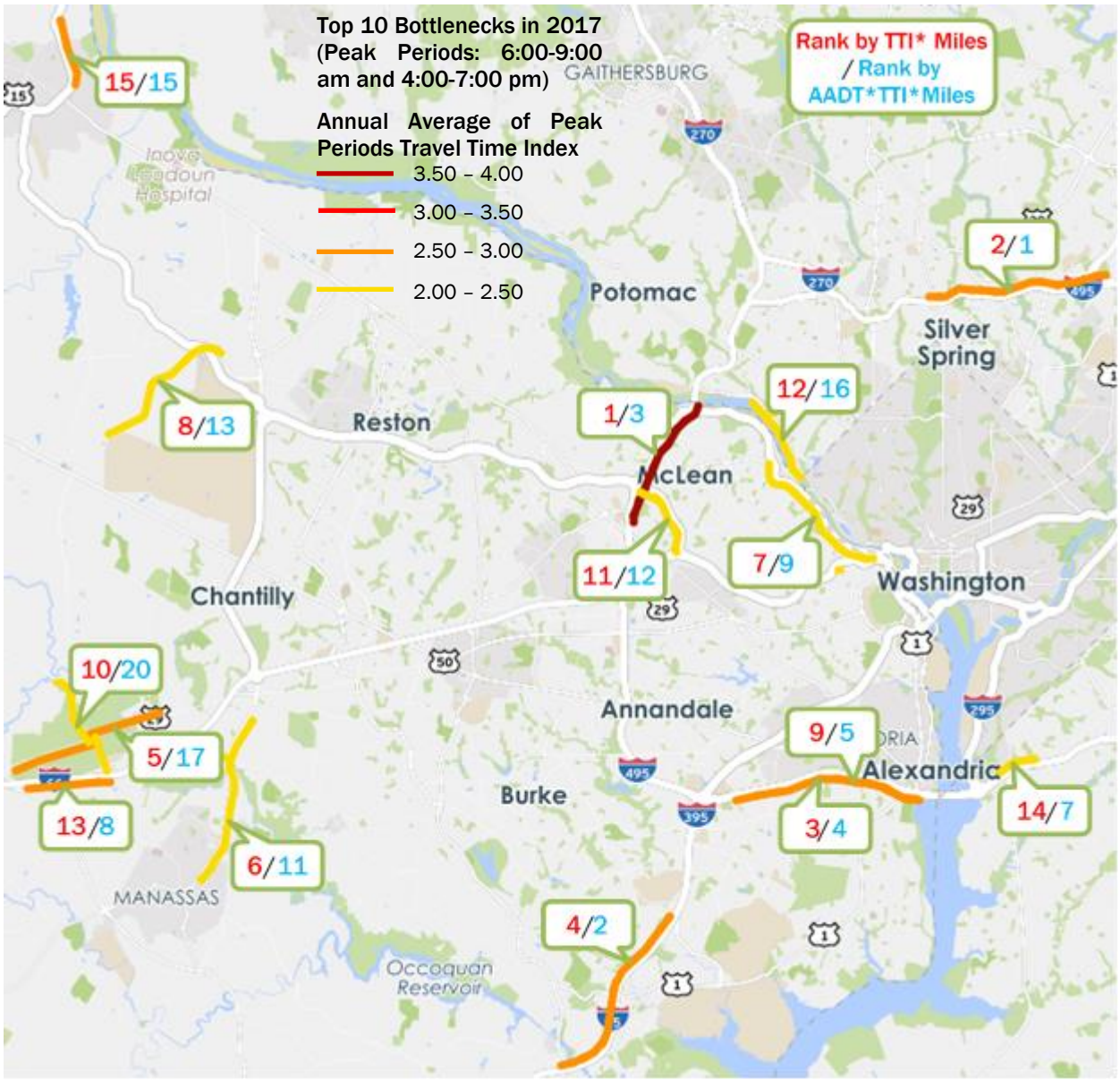


Figure E-7: 2017 Top Bottlenecks – Peak Periods



MAJOR FREEWAY COMMUTE ROUTES

In addition to the regional summaries as presented by the above performance measures, route- or corridor-specific analysis has also been carried out in this report. A total of 18 major freeway commute routes are defined between major interchanges and/or major points of interest for each peak period. Travel times along the 18 major commute routes in both directions were plotted by the "Performance Charts" tool of the VPP Suite for every Tuesday, Wednesday and Thursday in 2010 and 2015-2017, as described in Chapter 2 and Appendix C.

CONGESTION ON ARTERIALS

Using emerging data sources such as the VPP/INRIX data, NPMRDS[4] and Bluetooth data, staff now applies such data in arterial traffic monitoring as a successor to field monitoring. Travel Time Index and Planning Time Index on all monitored roads including arterials are provided in detail in Appendices A and B.

TRAFFIC SIGNAL TIMING

Delays occurring at signalized intersections account for a significant portion of overall arterial and urban street delays. Improving traffic signal timing has been identified as a LRP priority area.

The TPB has conducted four surveys of the status of signal optimization in 2005[5], 2009[6], and 2013, and 2018[7]. The 2018 survey found that of the approximate total of 5,900 signalized intersections in the region, 73 percent were retimed/optimized, 24 percent not retimed/optimized, and no report received for 3 percent. The 2018 results were similar to previous surveys.

Since late 2011, the TPB's Traffic Signal Subcommittee has conducted six regional surveys on traffic signals power back-up systems. The last survey was conducted as of December 31, 2017 and found that about 37% of the region's 5,900 signals are already equipped with battery-based power back-up systems, and 69% are equipped with generator-ready back-up systems (most battery-based systems also have generator-ready features). These power back-up systems can improve the resiliency of the transportation network.

Congestion on Transit and Other Systems

The CMP Technical Report includes information from a variety of sources, both more recent and less recent, that have looked at congestion's interaction with a variety of issues and modes. Chapter 2 includes this detailed coverage. The following are a few highlights, especially focusing on the most recently emerging information.

TRANSIT

The National Capital Region possesses a multimodal and diverse transit system, including Metrorail, commuter rail and a variety of bus operations. Congestion on the transit system is always one of the concerns of the CMP.

Congestion on the region's roadway network often has an impact on bus transit systems. The identified congested locations, especially those on the Washington Metropolitan Area Transit Authority's (WMATA) Priority Corridor Network and the Transit-Significant Roads as identified by the TPB's Regional Public Transportation Subcommittee (further discussed in section 2.3.1.1) are usually also bottlenecks for bus transit. Relieving roadway congestion will directly have a positive impact on

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[4] National Performance Management Research Data Set (NPMRDS), a national data set procured by FHWA from HERE, LLC. http://www.ops.fhwa.dot.gov/freight/freight_analysis/perform_meas/vpds/npmrdsfaqs.htm

[5] Andrew Meese, Briefing on the Implementation of Traffic Signal Optimization in the Region, a memorandum to the TPB Board Meeting on November 16, 2005. http://www.mwcog.org/uploads/committee-documents/tVtXWlY20051110144208.pdf

[6] Edward Jones and Andrew Meese, Status Report on Traffic Signal Optimization in the Washington Region, a memorandum to the TPB Board Meeting on March 18, 2009. http://www.mwcog.org/uploads/committee-documents/bV5cXFhc20090312161527.pdf

[7] Ling Li and Andrew Meese, Briefing on Traffic Signal Timing/Optimization in the Washington Region, a presentation to the TPB Board Meeting on February 19, 2014. http://www.mwcog.org/uploads/committee-documents/al1ZXFpb20140212133426.pdf

bus operations, such as reducing travelers' delay, reducing bus operations cost, improving bus reliability and increasing ridership.

Congestion can also be an issue within transit. If the demand for buses, rail and train is high and the capacity cannot keep up with that demand, then transit becomes overcrowded. Metrorail crowdedness are often observed during rush hours along certain stations. Congestion also exists within certain transit stations, especially multimodal transit centers, e.g. Union Station. Station congestion is a congestion of different nature, mostly due to limitations in design and circulation as well as ridership growth. Momentum, Metro's strategic plan for 2013-2025[8] found that there are crowded conditions at peak periods today; without rail fleet expansion, most rail lines will be even more congested by 2025.

MANAGED LANES FACILITIES

A number of HOV facilities in the region have been reconstructed to high occupancy toll lanes where HOVs continue to use the facility, for free whereas single occupant vehicles can use them by paying a congestion-responsive toll Future CMP Technical Reports may include information on the operational results.

PARK-AND-RIDE FACILITIES

There are over 160,000 parking spaces at nearly 400 Park & Ride lots throughout the Washington/Baltimore Metropolitan areas where commuters can conveniently bike, walk or drive to and join up with carpools/vanpools or gain access to public transit. According to the region's Commuter Connections program: two thirds of Park & Ride Lots have bus or rail service available; parking is free at 89% of the Park & Ride Lots; and more than 25% of Park & Ride Lots have bicycle parking facilities.

AIRPORT ACCESS

The transportation linkage between airports and local activities is a critical component of the transportation system. The Washington region has two major airports – Ronald Reagan Washington National Airport (DCA) in Arlington, VA, and Washington Dulles International Airport (IAD) in Loudoun County, VA. The region is also served by the nearby Baltimore/Washington International Thurgood Marshall Airport (BWI). According to the most recent TPB Air Passenger Survey the majority (92%) of those traveling to the region's airports does so via the highway network (i.e. personal cars, rental cars, taxis, buses). Therefore, understanding ground airport access is important to congestion management.

The TPB regularly carries out Regional Airport Ground Access Travel Time Studies (1995, 2003, 2011 2015, and 2017) and provides relevant information to congestion management. In aggregate, travel times to the airports, as measured by Travel Time Index (TTI) has not changed substantially from the 2011/2012 period to 2016/2017.

FREIGHT

The National Capital Region has a responsive freight system to support the vitality of economy and quality of life. This region features a consumer and service-based economy and approximately 86% of freight by weight moving into, out of and within the region is transported by truck[9].

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[8] WMATA, Strategic Plan 2013-2025, https://www.wmata.com/initiatives/strategic-plans/upload/momentum-full.pdf

[9]National Capital Region Freight Plan, July 2016
https://www.mwcog.org/documents/2010/07/28/national-capital-region-freight-plan-freight/

Future Congestion

A new kind of long-range transportation plan, i.e. Visualize 2045, was introduced for the National Capital Region after the 2016 CLRP. One of the cornerstones of plan performance is the forecasting of future congestion. The plan performance looks at where in the region congestion will occur in the future and compares current congestion to future congestion. It looks at criteria that may affect congestion, such as changes in population, employment, transit work trips, vehicle work trips, lane miles, and lane miles of congestion. The analysis also breaks down lane miles of congestion into core, inner suburbs, and outer suburbs, providing information on where, generally, the most lane miles of congestion can be found in 2040 compared to 2016.

From 2016 to 2040, the region is forecast to be home to 23% more residents and 29% more jobs in 2040. Towards accommodating that growth, 7% more lane miles of roadway and 26% more transit rail miles are planned to be constructed. The total number of trips taken is expected to increase by 23%, while transit, walk, and bike trips together are expected to increase at a faster rate than single driver trips. The overall amount of driving (VMT) is expected to grow by 21%. This is slightly less than forecast population growth, which means that VMT per capita is expected to drop by 2%. The increase in demand on the roadways is forecast to out-pace the increase in supply, leading to a significant increase in congestion.

National Comparison of the Washington Region's Congestion

The Washington region is among the most congested metropolitan areas in the nation. Based on annual average hours wasted in traffic, INRIX ranked the Washington region the 6th in 2017[10]. And based on extra travel time compared to free flow conditions, TomTom ranked the region the 9th in the United States in 2017[11].

Congestion Management Strategies

The CMP has been playing an important role in developing strategies, including strategies in association with capacity-expanding projects, to combat congestion or mitigate the impact of congestion. The CLRP and TPB member agencies have pursued many alternatives to capacity increases, with considerations of these strategies informed by the CMP. Implemented or continuing strategies include demand management strategies and operational management strategies, as shown in Figure 8. It should be noted that although strategies are divided into two categories for reporting purposes in this document, demand management and operational management strategies should be designed and implemented to work in cooperation.

Demand Management Strategies

Demand Management aims at influencing travelers' behavior for the purpose of redistributing or reducing travel demand. Examples of TPB's demand management strategies include:

- Commuter Connections Program – Including strategies such as Telework, Employer Outreach, Guaranteed Ride Home, Liver Near Your Work, Carpooling, Vanpooling, Ridematching Services, Car Free Day, and Bike To Work Day.
- Promotion of local travel demand management – Local demand management strategies are documented in the main body of the CMP Technical Report.

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[10] INRIX, Inc., Traffic Scorecard, http://inrix.com/scorecard/
[11] TomTom, Traffic Index, https://www.tomtom.com/en_gb/trafficindex/list

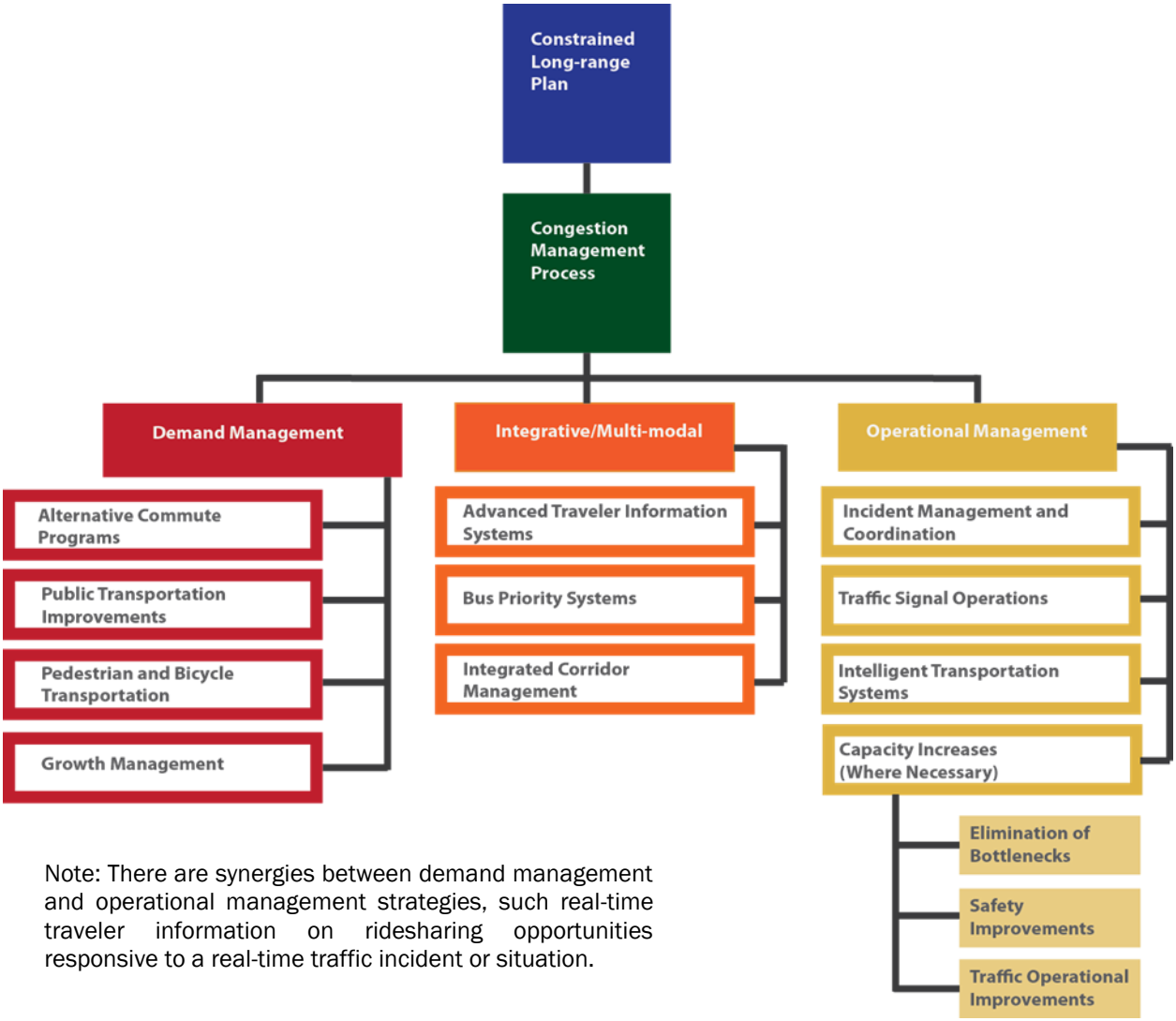
- Public transportation improvements – The Washington region continues to support a robust transit system as a major alternative to driving alone.
- Pedestrian and bicycle transportation enhancements as promoted and tracked through the Bicycle and Pedestrian Planning program – The number of bicycle and pedestrian facilities in the region has increased in recent years; the regional bikesharing program, Capital Bikeshare can be found in Washington, D.C., Arlington County, the City of Alexandria, Montgomery County, MD, and Prince George's County. There are plans to expand Capital Bikeshare to other Counties. The City of College Park began its own bikeshare program in 2016. And dockless bikeshare programs have emerged, with initial pilot programs in some jurisdictions.
- Car sharing - Local governments work with private companies to make the region's car sharing market viable.
- Land use strategies – Including those promoted by the Transportation-Land Use Connections (TLC) Program.

OPERATIONAL MANAGEMENT STRATEGIES

Operational management focuses on improvements made to the existing transportation system to keep it functioning effectively. Examples of TPB's operational management strategies include:

- High Occupancy Vehicle (HOV) facilities – Existing HOV facilities include I-66, I-95/I-395, I-270, US-50 and the Dulles Toll Road.
- Variably-Priced Lane Facilities – The 18-mile Inter-county Connector (ICC) in Maryland the 495 Express Lanes in Northern Virginia the 95 Express Lanes Northern Virginia, and the fall 2017 opened I-66 inside the Beltway continue to offer alternatives.
- Incident Management – The region's state DOTs all pursue strategies for managing their transportation systems, including operation of 24/7 traffic management centers, roadway monitoring, service patrols, and communications interconnections among personnel, centers and systems.
- Regional Transportation Operations Coordination – Notably the Metropolitan Transportation Operations Coordination (MATOC) program, whose development the TPB helped shepherd, uses real-time transportation systems monitoring and information sharing to help mitigate the impacts of non-recurring congestion.
- Intelligent Transportation Systems are considered, particularly through the SPOTS committee. Examples include traffic signal optimization, adaptive traffic signal systems, safety service patrols, drone technology for accident reconstruction and traveler information.

Figure E-8: Major CMP Strategies



Note: There are synergies between demand management and operational management strategies, such real-time traveler information on ridesharing opportunities responsive to a real-time traffic incident or situation.

INTEGRATED/MULTI-MODAL STRATEGIES

While there is often overlap in demand management and operational management strategies, for example, real-time traveler information on ridesharing opportunities responsive to a real-time traffic incident or situation, there are projects in the region that fully integrate demand and operational management strategies.

- Integrated Corridor Management - VDOT's current ICM project development focuses on I-95 and US-1 corridor from the DC line to Fredericksburg. VDOT received a grant study ICM in its east-west travel shed.
- Advanced Traveler Information Systems – Travelers have more ways than ever for obtaining trip planning information such as traffic, incidents, real-time transit arrivals, and emergency information. The prevalence of internet capable mobile devices and social media provide new means of communication between travelers and operators.
- I-270 Innovative Congestion Management Project – The aim of the project is to safely move the most traffic farthest and fastest using innovative approaches within a fixed $100 million

dollar budget. The project would contain both roadway improvements and innovative technology and techniques to achieve the goal.

Additional System Capacity

Federal law and regulations list capacity increases as another possible component of operational management strategies, for consideration in cases of elimination of bottlenecks, safety improvements and/or traffic operational improvements. These capacity increase projects are documented in CLRP or TIP.

There have been relatively few capacity increase projects in recent years, however. This region has an emphasis on demand and operational management strategies, such us transit improvements, the Commuter Connections program and the strategies developed by the System Performance, Operations and Technology Subcommittee (SPOTS) .

Assessment of Congestion Management Strategies

Assessment of Implemented Strategies

The TPB assesses the implemented congestion management strategies in a variety of ways. Many strategies have specific assessments and the overall effectiveness of all strategies is repeatedly evaluated by congestion monitoring and analysis.

Specific assessments (of individual or several strategies):

- A variety of surveys within the Commuter Connections Program are regularly conducted to provide firsthand data inputs for the assessments, including the Guaranteed Ride Home Customer Satisfaction Survey, Commuter Connections Applicant Placement Rate Survey, State of the Commute Survey, Employee Commute Surveys, Carshare Survey, Vanpool Driver Survey, Employer Telework Assistance Follow-up Survey, and the Bike-to-Work Day Participant Survey.
- Public transportation improvements, pedestrian and bicycle transportation improvements, and land use strategies are assessed in Regional Household Travel Surveys, Regional Bus Surveys, and Regional Travel Trends Reports.
- Status of traffic signal optimization program and improvement to the resiliency of the signal system is assessed by surveys.

Overall assessments (of all implemented strategies):

a) I-95 Corridor Coalition probe-vehicle-based traffic monitoring data.
b) National Performance Management Research Data Set (NPMRDS).
c) Maryland, Virginia and the District of Columbia's Highway Performance Monitoring Systems (HPMS).

Assessment of Potential Strategies Through Scenario Planning

The TPB has a long history of scenario planning studies over the years. The two most recent scenario studies are the Long Range Plan Task Force Report which identified seven initiatives for inclusion in the visualize 2045, and the Multi-sector Working Group identified projects in the transportation and land use sector with the aim of reducing greenhouse gases.

The TPB has also undertaken the Transportation/Land Use Connections (TLC) Program. The TLC Program addresses the "how to" challenges related to improving transportation/land-use coordination and realizing an alternative future for the region, through providing both direct technical assistance and information about best practices and model projects.

TPB also has assessed special potential strategies on an as-needed basis.

Compiling Project-Specific Congestion Management Information

Pursuant to Federal regulations, the TPB encourages consideration and inclusion of congestion management strategies in all Single Occupancy Vehicle (SOV) capacity-increasing projects. This involves compiling and analyzing information in the Call for Projects documentation forms, which are submitted from regional agencies when the CLRP is developed.

The Call for Projects documentation requests any project-specific information available on congestion that necessitates or impacts the proposed project. Agencies compile this information from various sources, including TPB-published congestion information (if available), internal or other directly measured information, or by conducting engineering estimates of the Level of Service (LOS). TPB compiles and analyzes this submitted information, along with information from other CMP sources.

Specifically for SOV capacity-increasing projects, the TPB requests documentation that the implementing agency considered all appropriate systems and demand management alternatives to the SOV capacity. In the Call for Projects documentation a special set of SOV questions is completed by implementing agencies and the TPB compiles this information.

Congestion Management as a Process in the LRP

Components of the CMP Fully Integrated in Visualize 2045

To be developed.

Key Findings of the 2018 CMP Technical Report

1. Congestion – Peak period congestion in the Washington region decreased between 2010 and 2012, and then increased moderately in 2014. It then decreased moderately after 2015 but still remaining lower than that of 2010. The Travel Time Index dropped 6.7% between 2010 and 2012, but climbed 2.0% between 2012 and 2017. The percent of congested road miles was 21% in 2010, 11% in 2012, and 15% in 2017 (Sections 2.2.1.1 and 2.2.1.3).

2. Reliability – Travel time reliability in the region improved between 2010 and 2012, and then worsened in 2014, 2016, and 2017, almost back to the 2010 level. The Planning Time Index decreased (improved) by 10% between 2010 and 2012, but increased (worsened) by 11% between 2012 and 2017 (Section 2.2.1.2).

3. Bottlenecks – There segments of I-495 inner loop (IL) were showed on the top 10 bottlenecks list in this report. Among them, the I-495 IL segment between Exit45/VA267 and Exit43/GW Pkwy was also on the top of bottlenecks found in the 2016 CMP Technical Report. The other two segments, including I-495 IL between Exit28/New Hampshire Ave and Exit 29/University Blvd E. and I-495 IL between Exit 34/I-270 and Exit 33/Md-185, are newly identified in this report with the 4th and 5th place respectively. A segment of DC-295 NB between Pennsylvania Ave SE and E Capitol St SE was raised to the 3rd place on this year's bottleneck list from the 8th place on the top ten list of the 2016 version. (Section 2.2.1.6).

4. Travel Demand Management – Travel demand management continues to be an important tool for day-to-day congestion management and played a key role in congestion management during the June 2015 Papal visit and the March 16, 2016 Metrorail shutdown. The Commuter Connections program remains the centerpiece to assist and encourage people in the Washington region to use alternatives to the single-occupant automobile. The transit system in the Washington region serves as a major alternative to driving alone – transit mode share is the highest among several metropolitan areas in the country (Section 3.2.1).

5. Regional Transportation Operations Coordination – The Metropolitan Washington Area Transportation Operations Coordination (MATOC) continues to play an important role in coordination and communicating incident information during both typical travel days and special events such as severe weather and construction work (Section 3.3.3.4).

6. Real-time travel information – The increasing availability of technology to monitor, detect, and evaluate travel conditions allows operators to make changes to the transportation network through active travel demand management, traffic signal optimization, and integrative corridor management. For travelers, real-time traffic and transit information are available from a number of sources though mobile applications and mobile versions of websites. Social media provides a mutually beneficial direct connection between transportation providers and users. Mobile applications related to non-auto modes, such as bikesharing and carsharing, allow travelers to be flexible with their mode choices (Section 3.4.6).

7. Variably Priced Lanes (VPLs) - VPLs provide additional options to travelers in the region. Maryland Route 200 (Intercounty Connector (ICC)) was fully opened between I-370/I-270 and US-1 in November 2014; a Before-and-After study identified the ICC improved its adjacent area's traffic by 3-4%. The 495 Express Lanes opened on the Virginia side of the Capital Beltway in November 2012; there were 42,000 average workday trips in the June 2015 quarter, up from 35,000 in the June 2014 quarter, and 29,000 in the June 2013 quarter. The 95 Express Lanes in Northern Virginia opened in December 2014 which had 45,000 average workday trips in the quarter ending in June 2015. (Section 3.3.2). I-66 inside the Beltway Express Lanes opened for traffic in Fall 2017.

8. Walking and Bicycling – Walking and bicycling continue to grow in the region in part due to bikesharing and carsharing options and increasing connectivity in the bicycle and pedestrian network (Sections 3.2.4 and 3.2.5).

Recommendations for the Congestion Management Process

The 2018 CMP Technical Report documents the updates of the Congestion Management Process in the Washington region from mid-2016 to mid-2018. Looking forward, the report leads to several important recommendations for future improvements.

1. **Continue the Commuter Connections program.** The Commuter Connections program is a primary key strategy for demand management in the National Capital Region and it is beneficial to have a regional approach. Meanwhile, this program in addition to reducing trips and vehicle miles of travel, reduces transportation emissions and improves air quality.
2. **Continue and enhance the MATOC program and support agency/jurisdictional transportation management activities.** The MATOC program/activities are key strategies of operational management in the National Capital Region. Recent enhancements have included efforts on severe weather mobilization and the construction and coordination. Future enhancements of the MATOC program should be considered when appropriate to expand the function and participation of the program.

3. **Consider a regional Congestion Management Plan (CMPL).** The FAST Act and the new Metropolitan Planning Final Rule call for an optional development of a CMPL that includes projects and strategies that will be considered in the Transportation Improvement Program.

4. **Incorporate performance measures to be finalized in the final rule on System Performance, Freight Movement, and CMAQ.** The next update of the CMP Technical Report should include those performance measures to assess the performance of the National Highway System, freight movement on the Interstate System, and the Congestion Mitigation and Air Quality (CMAQ) program (traffic congestion only), in addition to existing performance measures that the CMP considers appropriate.

5. **Continue to encourage integration of operations management and travel demand management components of congestion management for more efficient use of the existing transportation network.** State DOTs are encouraged to continue to explore ATM strategies along congested freeways and actively manage arterials along freeways. Transportation agencies (including transit agencies) and stakeholders are encouraged to work collaboratively along congested corridors to explore the feasibility of an ICM system. Ongoing projects on I-95/I-395 and I-66 support these concepts.

6. **Pursue sufficient investment in the existing transportation system, which is important for addressing congestion.** Prioritizing maintenance for the existing transportation system as called for in TPB's Regional Transportation Priorities Plan is critical to congestion management.

7. **Consider variable pricing and other management strategies in conjunction with capacity increasing projects.** Variably priced lanes (VPLs) provide a new option to avoid congestion for travelers and an effective way to manage congestion for agencies.

8. **Continue to encourage transit in the Washington region and explore transit priority strategies.** The transit system in the Washington region serves as a major alternative to driving alone, and it is an important means of getting more out of existing infrastructure. Local jurisdictions are encouraged to work closely with transit agencies to explore appropriate transit priority strategies that could have positive impacts on travelers by all modes.

9. **Encourage implementation of congestion management for major construction projects.** The construction project-related congestion management has been very successful in the past such as for the 11th Street Bridge and Northern Virginia Megaprojects.

10. **Continue to encourage access to non-auto travel modes.** The success of the Capital Bikeshare program, and dockless bikeshare programs and the decrease in automobile registrations in the District of Columbia indicate that there is a shift, at least in the urban areas, to non-automobile transportation.

11. **Continue and enhance providing real-time, historical, and multimodal traveler information.** Providing travelers with information before and during their trips can help them to make decisions to avoid congestion and delays and better utilize the existing road and transit infrastructure. Websites such as MATOC's www.trafficview.org, state DOTs' 511 systems, instant carpooling apps, and real-time transit information allow travelers to make more informed decisions for their trips. The value of real-time traveler information can be largely

enriched by integrating historical travel information which can provide valuable travel time reliability measures.

12. **Continue to look for ways to safely interface with the public through new technology such as mobile devices and social media.** The increased prevalence of mobile internet-capable devices and social media present a rapidly evolving platform for both disseminating and gathering information. Explore ways to utilize crowdsourced incident information for traffic operations planning.

13. **Encourage connectivity within and between Regional Activity Centers.** The recent refinement of the Regional Activity Centers map, adopted in 2013, helps coordinate transportation and land use planning for future growth. Geographically-focused Household Travel Surveys can collect data which allows planners to see local level travel patterns and behaviors impacting mode shifts.

14. **Continue and enhance the regional congestion monitoring program with multiple data sources.** There are a wealth of sources, both public and private sector, for data related to congestion which have their individual strengths and shortcomings. Private sector probe-based monitoring provides unprecedented spatial and temporal coverage on roadways, but still needs to be supplemented with data from other sources including data on traffic volumes and traffic engineering considerations. There should be continual review of the quality and availability of data provided by different sources and the structuring of a monitoring program in way that is adaptable for potential future changes in data reporting and/or data sources.

15. **Monitor trends in freight, specifically truck travel, due to the opening of the Panama Canal expansion in 2016.** This expansion allows much larger ships from Asia to serve East Coast ports, including the nearby ones in Baltimore and the Hampton Roads area in Virginia. Much of the new cargo arriving at these ports will pass through the Washington region by truck or rail on its way to inland destinations.

16. **Participate in collaborative planning connected and autonomous vehicle readiness.** These emerging technologies will dramatically alter future transportation planning. Standards and interoperability are critical issues and should be addressed through extensive collaboration with a variety of stakeholders.

17. **Continue to coordinate with providers of shared mobility services.** According to the American Public Transit Association (APTA), people who uses shared modes such as bikesharing, carsharing, and ride hailing own fewer cars and spend less on transportation. Cooperation and communication between the public and private sectors is required to promote safe and beneficial transportation options.

18. **Encourage Traffic Incident Management (TIM).** COG's 2018 creation of its Traffic Incident Management Enhancement (TIME) initiative highlighted the importance of TIM within congestion management. Continued TIM efforts will be beneficial to the region.