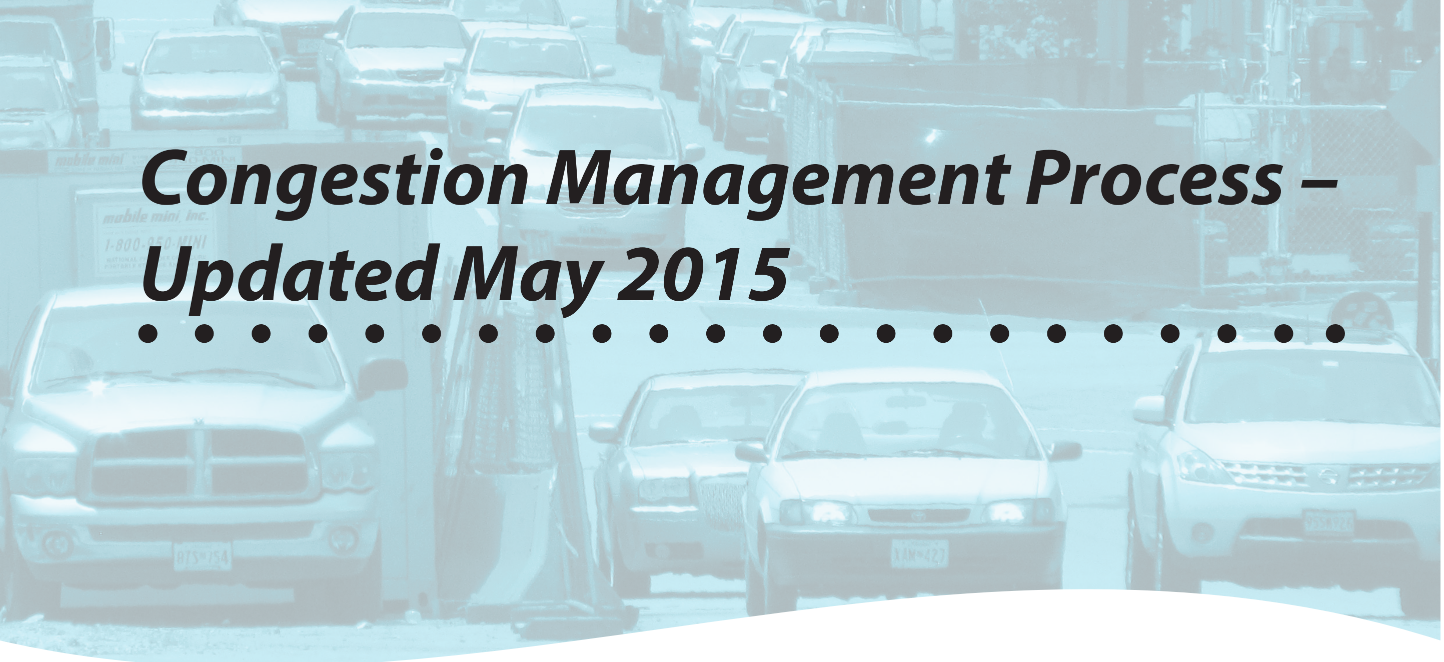


Congestion Management Process – Updated May 2015

Congestion management is the application of strategies to improve transportation system performance and reliability by reducing the adverse impacts of congestion on the movement of people and goods. A congestion management process (CMP) is a systematic and regionally accepted approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs. The CMP is intended to move these congestion management strategies into the funding and implementation stages.

The CMP, as defined in federal regulation, is intended to serve as a systematic process that provides for safe and effective integrated management and operation of the multimodal transportation system. The process includes:

- Development of congestion management objectives
- Establishment of measures of multimodal transportation system performance
- Collection of data and system performance monitoring to define the extent and duration of congestion and determine the causes of congestion
- Identification of congestion management strategies
- Implementation activities, including identification of an implementation schedule and possible funding sources for each strategy
- Evaluation of the effectiveness of implemented strategies

A CMP is required in metropolitan areas with population exceeding 200,000, known as Transportation Management Areas (TMAs). Federal requirements also state that in all TMAs, the CMP shall be developed and implemented as an integrated part of the metropolitan transportation planning process.

In TMAs designated as ozone or carbon monoxide non-attainment areas, the CMP takes on a greater significance. Federal law prohibits projects that result in a significant increase in carrying capacity for single-occupant vehicles (SOVs) from being programmed in these areas unless the project is addressed in the region's CMP. The CMP must provide an analysis of reasonable travel demand reduction and operational management strategies. If the analysis demonstrates that these strategies cannot fully satisfy the need for additional capacity and additional SOV capacity is warranted, then the CMP must identify strategies to manage the SOV facility safely and effectively, along with other travel demand reduction and operational management strategies appropriate for the corridor.

Although a CMP is required in every TMA, federal regulations are not prescriptive regarding the methods and approaches that must be used to implement a CMP. This flexibility has been provided in recognition that different metropolitan areas may face different conditions regarding traffic congestion and may have different visions of how to deal with congestion. As a result, TMAs across the country have demonstrated compliance with the regulations in different ways.

The flexibility in the development of the CMP allows MPOs to design their own approaches and processes to fit their individual needs. The CMP continuously progresses and adjusts over time as goals and objectives change, new congestion issues arise, new information sources become available, and new strategies are identified and evaluated. As such, the Baltimore region CMP is an ongoing process with system monitoring as a core activity over the past decade. The following sections describe some of the key elements of the regional CMP.

1. Congestion Management Objectives

Congestion management objectives define what the region wants to achieve regarding congestion management, and are an essential part of an objectives-driven, performance-based approach to planning for operations. Congestion management objectives serve as one of the primary points of connection between the CMP and the LRP, and serve as a basis for defining the direction of the CMP and performance measures that are used.

The goals and objectives from the LRP feed directly into the CMP. Below is information on how the goals adopted for *Plan It 2035* directly relate to the Baltimore region's CMP:

Goal 1: Improve Transportation System Safety

While the emphasis of Goal 1 is to protect the traveling public, reducing the number of crashes will have the secondary effect of easing nonrecurring congestion related to incident delay.

Goal 3: Improve Accessibility

This involves planning for an integrated transportation system that is accessible, equitable, and reliable for all system users and that provides for improved connectivity among all modes and across interjurisdictional and interregional boundaries. Related strategies that have guided transportation investment decisions in the Baltimore region include:

- Expanding transit options
- Providing facilities that better accommodate bicycles and pedestrians

Goal 4: Increase Mobility

This involves integrating management and operations strategies that improve the performance and reliability of the existing transportation infrastructure to relieve congestion and reduce delay. Improving performance and reliability includes addressing these concerns:

- Recurring delay – Dealing with recurring delay can involve applying such approaches as intelligent transportation systems (ITS), better signal timing, implementing flextime or telework arrangements at major employment centers, and judicious capacity adding projects. Another approach that might be considered in the future is instituting congestion pricing or tolls.
- Nonrecurring delay – This involves incident management and providing information on incident-, construction-, or weather-related delays to transportation system users.

Goal 5: Preserve the Environment

This involves promoting a sustainable environment by establishing policies that abate emissions from mobile sources, reduce the use of single-occupant vehicles, reduce energy consumption and the use of fossil fuels, and conserve and protect natural and cultural resources. Programs that relate to this goal and its supporting strategies include:

- Rideshare programs
- High-occupancy vehicle (HOV) lanes
- Land use policies that seek to promote responsible growth (thus promoting the reduction of VMT and discouraging transportation projects that add capacity outside of designated Priority Funding Areas)

2. CMP Network

The CMP network involves defining two aspects of the system that will be examined as part of the planning process:

- The geographic boundaries or area of application; and
- The system components/network of surface transportation facilities

The primary area covered under the CMP network consists of the jurisdictions under the BRTB's function as the Baltimore region's MPO: Baltimore City, the City of Annapolis, and the counties of Anne Arundel, Baltimore, Carroll, Harford, and Howard. The travel demand model also includes and considers the effects of transportation facilities and operations within areas covered by other MPOs (e.g., Washington, DC metropolitan area; southern Pennsylvania; Cecil County, Maryland).

The system components include:

- Highway system (interstates, arterials)
- Transit system (LRT, MTA bus, MARC, local transit service providers)
- Freight routes / intermodal connections (intermodal terminals, airports, etc.)

3. Performance Measures

Performance measures are a critical component of the CMP. According to Federal regulation, the CMP must include *"appropriate performance measures to assess the extent of congestion and support the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods."*

Volume-to-Capacity-Based Measures

Measures relying on volume-to-capacity ratios traditionally have been used because: (a) data on traffic volumes are usually relatively easy to obtain and often already exist, (b) travel demand models are designed to estimate future volumes on the transportation network, and (c) estimates of capacity can be derived using documents such as the *Highway Capacity Manual (HCM)*. LOS indicators with a simple standardized A-through-F grading system are assigned to the regional network. The advantage of these measures is that data are generally available from travel models, and there is a large existing body of experience in defining and applying these measures. On the other hand, they are limited in that they traditionally focused on the movement of vehicles, rather than people or goods. Another limitation of volume-to-capacity measures is that they may not be readily understood by the public without a citizen education effort.

Travel Time Measures

Travel time measures focus on the time needed to travel along a selected portion of the transportation system. Common variations of travel time metrics include:

- **travel time** – the amount of time needed to traverse a segment or corridor
- **travel speed** – usually measured in one of two ways
  a) average travel speed: the length of a segment divided by the travel time, or
  b) spot speed: the speed of a vehicle or a sample of vehicles over a given time interval passing a point along a roadway
- **delay** – the difference between travel time and acceptable or free-flow travel time
- **travel time index** – ratio of peak-period to non-peak-period travel time.

These measures can be translated, using various assumptions, into other measures such as user costs, and can be used in the process of validating travel demand forecasting models.

Variability of Congestion/Reliability

The variability or change in congestion on a day-to-day basis provides a measure of reliability. Recurring congestion is generally predicable, regularly occurring, and typically caused by excess demand compared to the capacity of the system. On the other hand, nonrecurring congestion causes unreliable travel times and is caused by transient events such as traffic incidents, weather conditions, work zones, or special events. Nonrecurring congestion, and unreliable travel times that result, are often the most frustrating form of congestion to travelers. Moreover, FHWA estimates that nonrecurring sources of congestion are responsible for perhaps half of all delay experienced by travelers. Since the transportation planning models used in metropolitan transportation planning are designed to address recurring congestion issues, many regions have found it challenging to incorporate measures of nonrecurring congestion as part of their CMP. Some MPOs have used crash data as a surrogate measure for nonrecurring congestion under the premise that traffic incidents are directly linked to nonrecurring congestion. Others have begun to gather archived real-time traffic data from operating agencies to examine the variability in traffic volumes, speeds, and/or travel times on a daily basis.

BMC staff is working on developing travel time measures using both traditional sources of data and new technologies that take advantage of operations data such as probes and ITS devices.

4. Data Collection and Monitoring System Performance

Data collection and system monitoring are needed to provide information to make effective decisions, and are typically an ongoing activity. According to federal regulation, the CMP must include:

> *establishment of a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion, to contribute in determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions. To the extent possible, this data collection program should be coordinated with existing data sources (including archived operational/ITS data) and coordinated with operations managers in the metropolitan area.*

Using Vehicle Probe Data to Monitor Traffic

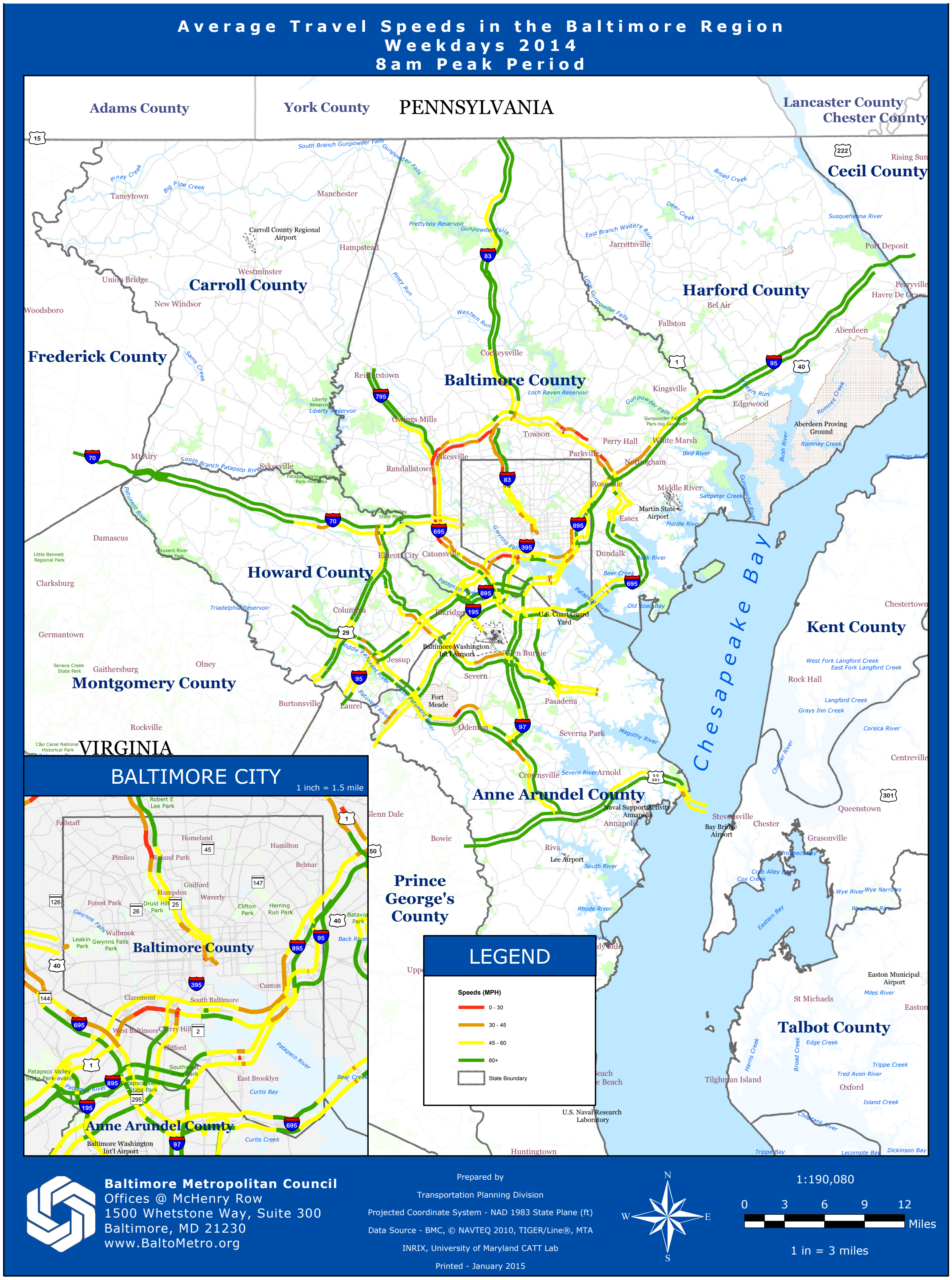
Since 2013, BMC has been in partnership with the I-95 Corridor Coalition and University of Maryland Center for Advanced Transportation Technology Lab (CATT Lab). This setup enables the agency to have access to continuous (24/7) probe data to monitor traffic conditions throughout the region. Access to the data is through the Vehicle Probe Project Suite, an online set of tools that can be accessed through a web browser . This eliminates the need for the many hours of processing of raw data that BMC's previous approach (collecting GPS speed data) required.

The Vehicle Probe Project (VPP) began in 2008 with the primary goal of enabling Coalition members to acquire reliable travel time and speed data for their roadways without the need for sensors and other hardware. More information on the VPP Suite can be found at the link below:

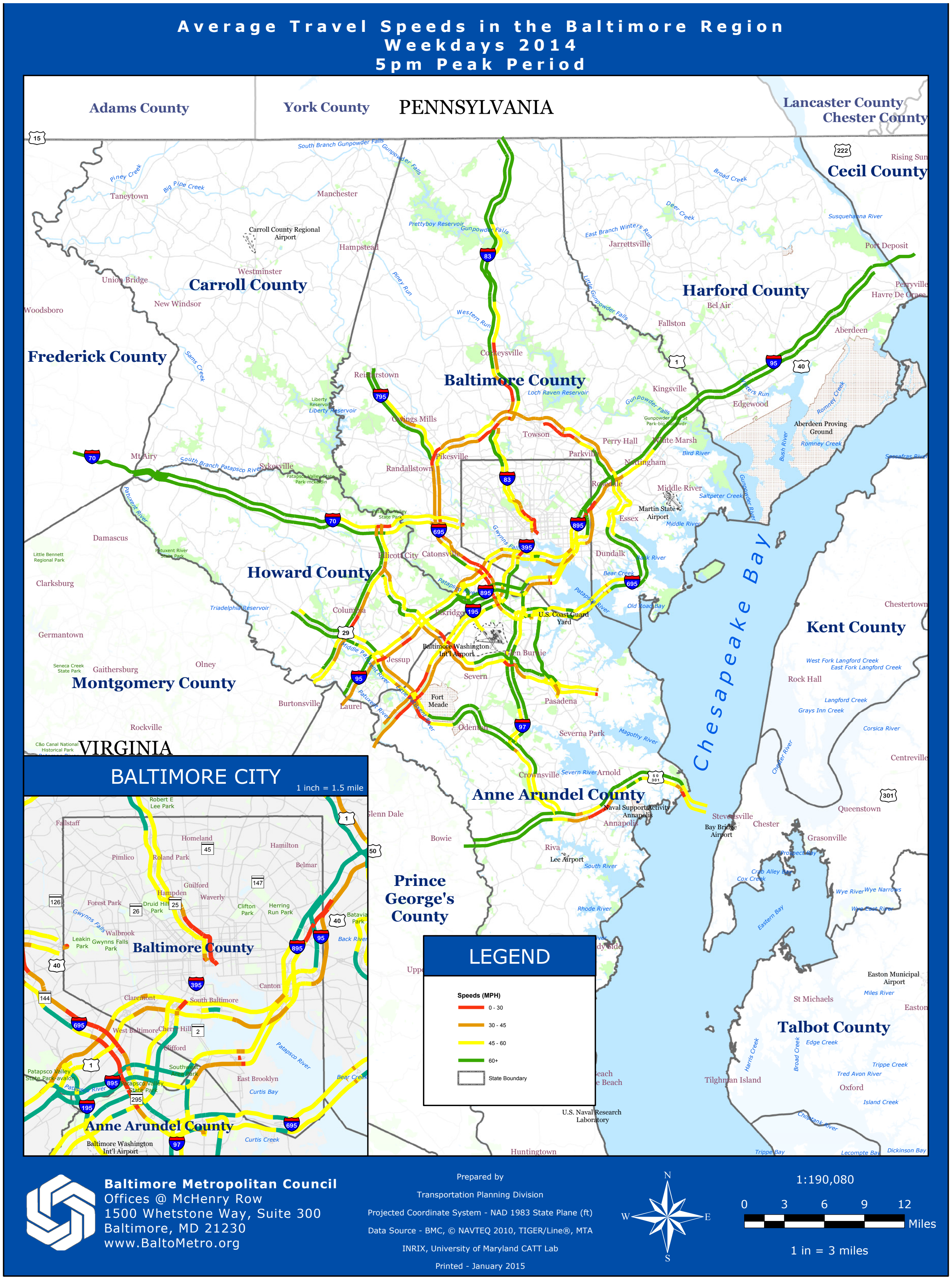
http://www.i95coalition.org/wp-content/uploads/2015/02/One_Pager_VPP_VPP_Suite-31dec2014-final2.pdf

The following maps show VPP data collected for the a.m. and p.m. peak periods. The first map shows average 2014 travel speeds for the a.m. peak period for freeways and major arterials. The second map shows average 2014 travel speeds for the p.m. peak period for freeways and major arterials.

2014 Average Travel Speeds: A.M. Peak Period



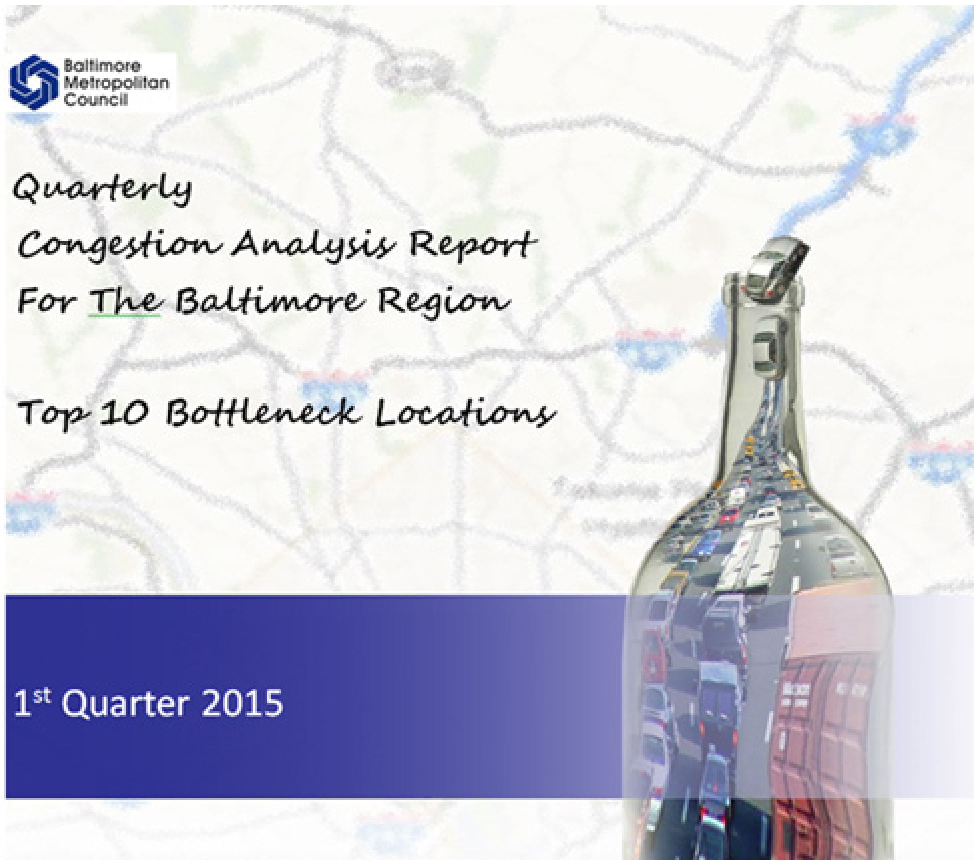
Average 2014 Travel Speeds: P.M. Peak Period



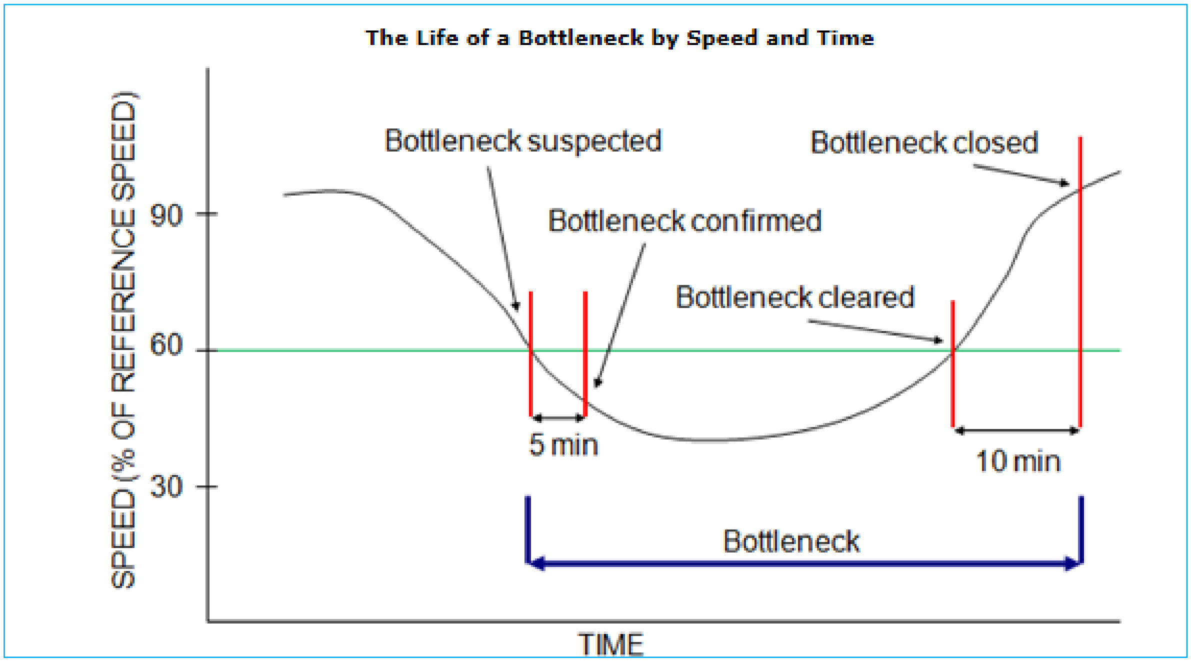
5. Congestion Analysis

Analysis Based on VPP Data

Using VPP data, beginning in 2013 BMC developed the "Quarterly Congestion Analysis Report" identifying the Top 10 Bottlenecks in the Baltimore Region.



The VPP tool determines bottleneck conditions by comparing the current reported speed to the reference speed for each segment of road. INRIX provides reference speed values for each segment. These represent the 85th percentile observed speed for all time periods, with a maximum value of 65 mph. If the reported speed falls below 60 percent of the reference, the road segment is flagged as a potential bottleneck. If the reported speed stays below 60 percent 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 percent of their reference values and have remained that way for 10 minutes, the bottleneck is considered cleared. The process ignores bottlenecks whose total queue length, determined by adding the length of each road segment associated with the bottleneck, is less than 0.3 miles.



The quarterly report identifies the top bottlenecks in the Baltimore region and ranks them by Impact Factor. This is calculated by multiplying the number of times a bottleneck occurred by its average duration by its average length.

Top 10 Bottlenecks in the Baltimore Region
1st Quarter 2014

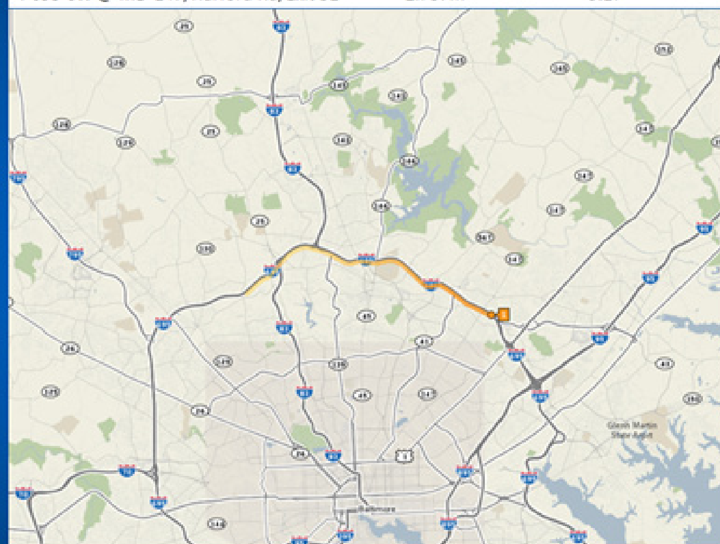
By Impact Factor
(Number of Occurrences x Average Duration in Minutes x Average Length)

	Location	Average Duration	Average max length (miles)	Occurrences	Impact Factor
1	I-695 CW @ MD-147/Harford Rd/Exit 31	2 h 37 m	9.17	89	128,065
2	US-29 N @ MD-175	1 h 57 m	5.76	164	110,520
3	I-95 N @ MD-100/Exit 43	1 h 39 m	8.07	131	104,596
4	I-695 CCW @ Edmondson Ave/Exit 14	1 h 52 m	5.44	142	86,452
5	I-95 S @ I-495/Exit 27-25	2 h 36 m	20.91	26	84,812
6	I-695 CW @ I-83/MD-25/Exit 23	1 h 26 m	6.59	122	69,193
7	I-83 S @ I-695	58m	3.87	295	66,201
8	MD-295 S @ I-495/I-95	2 h 46 m	12.58	31	64,720
9	I-97 S @ US-301/US-50	1 h 28 m	11.68	58	59,607
10	MD-295 N @ I-195	1 h 40 m	8.71	68	59,222

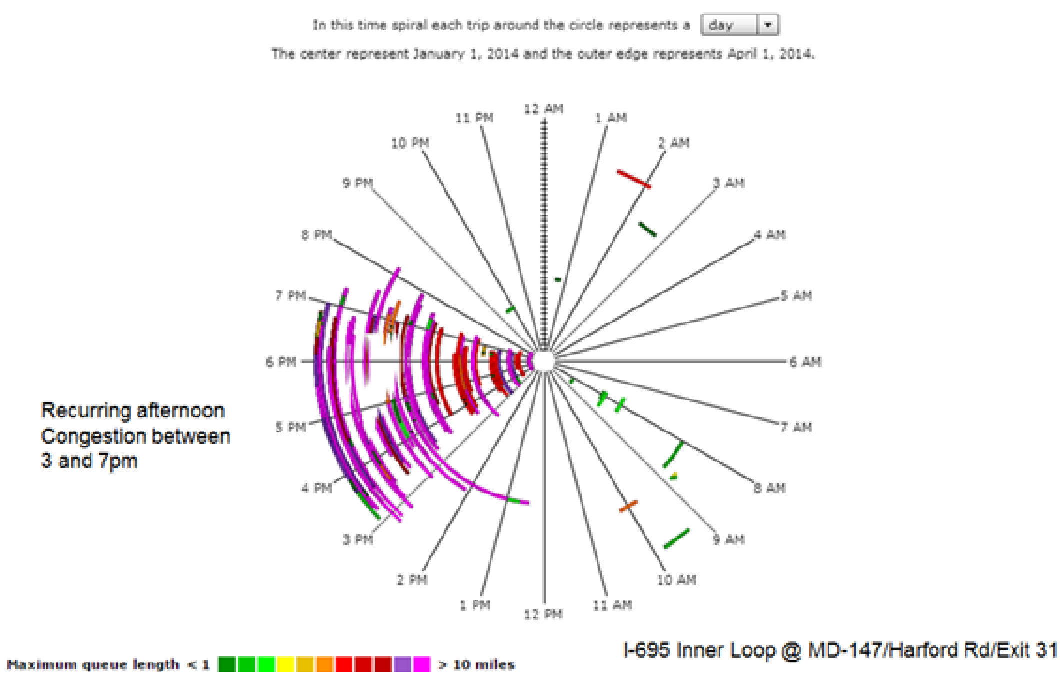
Along with the ranking, staff attempts to assess what is causing the congestion and utilizes tools in the VPP Suite to illustrate what is occurring at each location. The following example uses the top ranked bottleneck from the first quarter of 2014.

#1 Ranked Bottleneck Q1 2014

Location	Average Duration	Average max length (miles)	Occurrences	*Impact Factor
I-695 CW @ MD-147/Harford Rd/Exit 31	2h 37m	9.17	89	128,065



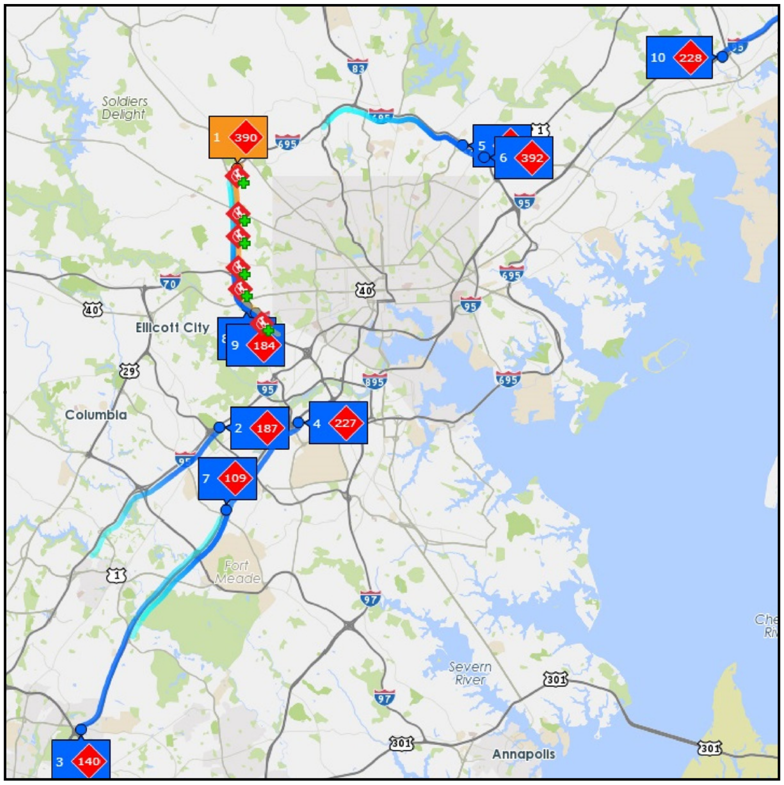
Congestion was most severe between I-83 and Providence Rd. Factors contributing to this long standing and extended congested zone: merging and weaving associated with traffic at each interchange and a lane drop (to 3 lanes) at MD-45/York Rd.



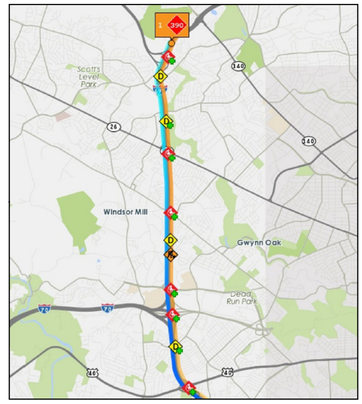
From the bottleneck report, staff can create specialized maps showing congested locations. Following is an example of such a map, this one showing the top 10 congested locations in 2014 based on VPP data.

Top 10 Ranked Bottlenecks in the Baltimore Region
4th Quarter 2014

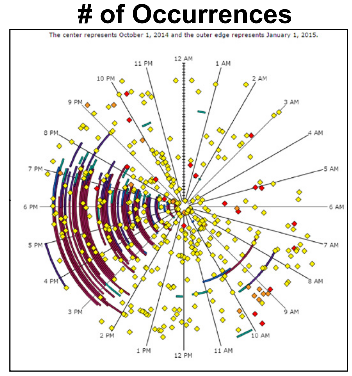
Top 10 Bottlenecks



#1 Ranked Bottleneck



of Occurrences



Rank	Location	Direction	Average Duration	AVG max length (miles)	Occurrences	Impact Factor	All Events/ Incidents
1	I-695 CW @ I-795/EXIT 19	CLOCKWISE	2 h 16 m	8.68	153	180,532	390
2	I-95 N @ MD-100/EXIT 43	NORTHBOUND	2 h 15 m	8.68	138	161,735	187
3	MD-295 S @ MD-193	SOUTHBOUND	2 h 50 m	11.55	63	123,738	140
4	MD-295 N @ I-195	NORTHBOUND	2 h 25 m	10.17	78	114,982	227
5	I-695 CW @ MD-41/PERRING PKWY/EXIT 30	CLOCKWISE	1 h 47 m	6.01	161	103,602	288
6	I-695 CW @ MD-147/HARFORD RD/EXIT 31	CLOCKWISE	2 h 42 m	8.39	70	95,189	392
7	MD-295 N @ MD-175	NORTHBOUND	2 h 22 m	7.07	92	92,356	109
8	I-695 CCW @ US-40/EXIT 15	COUNTERCLOCKWISE	1 h 30 m	6.68	145	87,182	230
9	I-695 CCW @ EDMONDSON AVE/EXIT 14	COUNTERCLOCKWISE	2 h 14 m	6.44	98	84,580	184
10	I-95 S @ MD-24/EXIT 77	SOUTHBOUND	2 h 06 m	13.13	47	77,767	228

Incident/Event Icons

- Injury
- Police Activity
- Fire
- Closure
- Sports Event
- Delays
- Signal System
- Tornado
- Wind
- Fallen Tree
- Hazmat
- Debris
- Flood
- Animal Struck
- Special Event
- Congestion
- Incident
- Fog
- Fallen Rocks
- Other
- Vehicle Fire
- Collision
- Disabled Vehicle
- Roadwork
- Emergency Roadwork
- Draw Bridge Opening
- Water Main Work
- Medical Emergency
- Overgrown Foliage

Red — Severe events and incidents
- Emergency Roadwork
- Injury
- Medical Emergency

Orange — Roadwork

Yellow — All other events and incidents

Baltimore Metropolitan Council
Offices @ McHenry Row
1500 Whetstone Way, Suite 300

Prepared by
Transportation Planning Division
Projected Coordinate System - NAD 1983 State Plane (ft)

Jurisdictional Priority Letters

Each year, the local jurisdictions send so-called "priority letters" to MDOT. These letters list the projects the jurisdictions consider critical to addressing their transportation needs. These needs often include alleviating traffic congestion and addressing safety concerns.

These priority letters are a source of information to help BMC and MDOT staffs identify corridors for additional analysis related to relieving traffic congestion and improving safety. BMC technical analysis would focus on better understanding the extent, duration, and causes of congestion along a corridor and on developing potential operational countermeasures for short-term efficiency and safety. Such analyses would try to capture both recurring and nonrecurring congestion.

Analysis along the selected corridor(s) would help the local jurisdictions better understand the connections among congestion, safety, land use, freight movements, and operations. This process also would establish linkages among local jurisdiction priorities, the regional long-range transportation plan, and the TIP. Data gathered and analyzed by BMC staff also could provide background information for subsequent NEPA analysis.

These types of analyses are intended to be conducted in future years under proposed consultant activities. UPWP funds could be designated for data collection and analysis.

6. Implement/Manage Strategies

Integrated Corridor Management

In 2013, FHWA issued a Request for Applications inviting states, MPOs, and local governments to apply for deployment planning grants to initiate or continue Integrated Corridor Management[1] (ICM) development with their partners, such as arterial management agencies, tolling authorities, and transit authorities. The purpose of this program is to promote the integrated management and operations of the transportation system, thereby improving multimodal transportation system management and operations.

Using the Vehicle Probe Project Suite, BMC staff identified a portion of MD 295 as having the worst bottleneck in 2012. Based on this, staff began developing a congestion brochure to highlight the issues and potential tools that could be used to address the congestion. In the process of gathering information for the brochure, staff learned that SHA was also studying this corridor to identify low-cost improvements.

As a result of meetings with staff from SHA to discuss the corridor and potential solutions, there was agreement by SHA and BMC staff that the region should apply for the ICM grant to help jump-start this approach in the corridor. The grant work will include developing a Concept of Operations for integrated corridor operations, beginning the development of an Analysis, Modeling and Simulation Plan for the corridor, and developing an ICM deployment approach.

The area selected includes the north-south corridor of MD 295, US 1, and I-95 from I-695 to MD 32. The project will consider roadway and transit alternatives and will include the following groups: SHA; BMC/BRTB and relevant committees; Anne Arundel, Baltimore, and Howard counties; MTA, Central Maryland Regional Transit, the National Park Service, and Fort Meade.

SHA will be the lead for this project, working closely with BMC and the other project stakeholders.

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1 As noted in the TRB RTSMO Committee Glossary of Regional Transportation Systems Management and Operations Terms, "ICM may encompass several activities, such as cooperative and integrated policy among stakeholders, concept of operations for corridor management, communications among network operators and stakeholders, improving the efficiency of cross-network junctions and interfaces, mobility opportunities, including shifts to alternate routes and modes, real-time traffic and transit monitoring, real-time information distribution (including alternate networks), congestion management (recurring and non-recurring), incident management, travel demand management, public awareness programs, transportation pricing and payment, access management, and grown management. Integrated Corridor Management may result in the deployment of an actual transportation management system (ICMS) connecting the individual network-based transportation management systems; or integrated corridor management may just be a set of operational procedures – agree to by the netwo4rk owners – with appropriate linkages between their respective systems." (See https://docs.google.com/a/baltometro.org/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnx0cmJydHNtb2NvbW1pdHRlZXxneDo0NWY1OTFjMTg1Nzc3ZTAy)

Plan It 2035 Strategies

The BRTB approved the following strategies under the goal of Improve Mobility. These strategies will help the region reduce congestion and improve traffic flow.

- Continue to refine and implement a Congestion Management Process (CMP), incorporating the regional ITS architecture as well as transportation systems management and operations strategies
- Prepare congestion mitigation plans, including the consideration of congestion pricing, for corridors and locations experiencing recurring high congestion levels
- Sustain and balance capacity in the highway, transit, and rail systems and pedestrian and bicycle networks
- Increase mobility, including traffic and transit incident response and recovery, through traffic and transit system management and operations techniques
- Improve transportation system reliability through broad-based information distribution for interstate highways, surface streets, and transit network

Other strategies that might be considered in the future to help the region ease congestion are:

- Work more closely with other adjacent metropolitan areas to develop interregional approaches to measuring and managing congestion, including performance measures adopted and applied on an interregional basis. As noted previously, the Baltimore region has taken some initial steps in this area by meeting periodically with traffic and operations staff from adjacent MPOs and other state DOTs to discuss interregional approaches to improving mobility and managing congestion.
- Select relatively low-cost, "low-hanging fruit" congestion management projects ("spot" improvements, signal timing) that could be funded with CMAQ or, potentially, PL or STP funds.

Specific Strategies – Preferred Alternative Projects

BMC staff requested some detailed information from local jurisdictions submitting projects for consideration for *Plan It 2035*. Some of this information relates to strategies, either in place or under consideration, that could provide congestion management benefits for each proposed project. The following chart shows the strategies submitted for each project in the preferred alternative:

CONGESTION MANAGEMENT STRATEGIES SUBMITTED FOR PROJECTS IN THE PREFERRED ALTERNATIVE

Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*
ANNE ARUNDEL COUNTY			
MD 175	MD 170 to Howard County line	From AA County line to MD 295 - 2 to 3 lanes. From MD 295 to MD 170 - 4 to 6 lanes	• Intersection improvements were studied for the corridor • The County is pursuing additional transit service in the area • BWI Business Partnership is pursuing funding for additional ridesharing in the area
I-97	MD 32 to US50/301	New roadway in median to accommodate barrier separated managed lanes	• Channelized or grade-separated intersections or roundabouts • Interconnected/coordinated traffic signal system
MD 100	AA-Howard County Line to I-97	Inside base widening to add 1-lane per direction	• Considering Light Rail to run in median for a portion of the route • Real-time surveillance (CHART) and freeway service patrol for incident management • Park-and-ride lot within a 1-mile radius of project location • Channelized or grade-separated intersections
MD 198	MD 295 to MD 32	Widen MD 198 to provide easier access to Ft. Meade and Odenton Town Center	• Reversible, turning, acceleration/deceleration, or bypass lanes • High-occupancy vehicle facilities or systems • Real-time surveillance/traffic device controlled by a traffic operations center • Interconnected/coordinated traffic signal system • Real-time traveler information (CHART/511) • BWI Business Partnership is looking to increase ridesharing in area through a grant • The County is looking to increase transit service in the area
MD 3	AA-PG County line to MD 32	Improve safety and capacity on MD 3	• Channelized or grade-separated intersections or roundabouts • Transit stop within a ½ mile radius of project location • Park-and-ride lot within a 1-mile radius of project location • Traffic operational improvements were considered. This project will incorporate a Michigan U (new type of signal control)
BALTIMORE COUNTY			
I-795	Franklin Blvd. to South of MD 940	New Interchange at I-795 Pleasant Hill Rd. / Dolfield Blvd.	• TMA is in the vicinity • Reversible, turning, acceleration/deceleration, or bypass lanes • High-occupancy vehicle facilities or systems • Real-time surveillance/traffic device controlled by a traffic operations center • Interconnected/coordinated traffic signal system • Real-time traveler information and freeway service patrol for incident management
MD 7/MD 43	MD 7/MD 43	Interchange upgrade – 2 new ramps	• Interconnected/coordinated traffic signal system • Real-time traveler information and freeway service patrol for incident management • Channelized or grade-separated intersections or roundabouts • Park-and-ride lot within a 1-mile radius of project location • Local ridesharing, telecommuting, guaranteed ride-home, employer programs • Signal timing, geometric improvements, M&O traveler information, and VMS will be considered during current study and future studies performed by SHA

Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*
MD 140	Garrison View Rd to Owings Mills Blvd.	Capacity and safety improvements to MD 140	• TMA is in the vicinity • Reversible, turning, acceleration/deceleration, or bypass lanes • High-occupancy vehicle facilities or systems • Real-time surveillance/traffic device controlled by a traffic operations center
MD 122	Existing terminus to Fairbrook Road	New 2-lane roadway	• Channelized or grade-separated intersections or roundabouts • Park-and-ride lot within a 1-mile radius of project location • Local ridesharing, telecommuting, guaranteed ride-home, employer programs • Real-time surveillance/traffic device controlled by a traffic operations center • Real-time traveler information and freeway service patrol for incident management
CARROLL COUNTY			
MD 26	MD 32 to Liberty Reservoir	Widen from 4 to 6 lanes including bike and pedestrian facilities	• Interconnected/coordinated traffic signal system • Real-time surveillance, traveler information and freeway service patrol for incident management • Channelized intersections
MD 32	MD 26 to Howard County line	Widen from 2 to 4 lanes	• Traffic operational improvements • Real-time surveillance and freeway service patrol for incident management • Channelized intersections
MD 97	MD 140 to Pleasant Valley Drive	Widen to 5 lane section. New interchange at Meadow Branch Road	• Traffic operational improvements • Real-time surveillance and freeway service patrol for incident management • Channelized intersections
MD 140	County line to Keys Mills Road	Widen to 4-lane divided closed section	• Traffic operational improvements • Real-time surveillance and traveler information • Channelized intersections
MD 140	Sullivan Drive to Market Street	Widen from 6 to 8 lanes, full interchange at MD 97, CFI at Center Street	• Traffic operational improvements • Real-time surveillance and traveler information • Channelized intersections
HARFORD COUNTY			
MD 22	MD 543 to APG gate	Widen to 4-lane divided open section. Bicycle and pedestrian access where applicable	• Ridesharing, telecommuting, guaranteed-ride-home, employer programs • Channelized and/or grade-separated intersection(s) • Reversible, turning, acceleration/deceleration, or bypass lanes • Transit stop within a ½ mile radius of project location • Park and ride lot within a 1-mile radius of project location • Interconnected/coordinated traffic signal system • May include segments with dedicated bus lanes and dedicated bicycle lanes and sidewalks
MD 24	US 1 to Singer Road	Add one lane in each direction including turn lanes and bicycle and pedestrian access where applicable	• Channelized and/or grade-separated intersection(s) • Reversible, turning, acceleration/deceleration, or bypass lanes • Transit stop within a ½ mile radius of project location • Park and ride lot within a 1-mile radius of project location • Interconnected/coordinated traffic signal system • May include segments with dedicated bus lanes and dedicated bicycle lanes and sidewalks

Project Name	Project Limits	Improvement	Likely Congestion Management Strategies*
US 1	MD 152 to MD 147	Add one lane in each direction including turn lanes and bicycle and pedestrian access where applicable	• Channelized and/or grade-separated intersection(s) • Reversible, turning, acceleration/deceleration, or bypass lanes • Transit stop within a ½ mile radius of project location • Park and ride lot within a 1-mile radius of project location • Interconnected/coordinated traffic signal system
US 1 Bypass	MD 147/Bus US 1 to MD 24/MD 924	Widen from 2 to 4 lanes and improve US 1 @ MD 24 and US 1 @ MD 924 interchange	• Channelized and/or grade-separated intersection(s) • Reversible, turning, acceleration/deceleration, or bypass lanes • Transit stop within a ½ mile radius of project location • Park and ride lot within a 1-mile radius of project location
HOWARD COUNTY			
I-70	US 29 to US 40	Widen from 4 to 6 lanes; upgrade interchanges at US 29 and Marriottsville Road	• Park and ride lot within 1-mile radius of project location • Real-time surveillance and traveler information
MD 32	Cedar Lane to Howard/Anne Arundel County Line	Widen from 4/6 lanes to 10 lanes with one HOV lane in each direction	• Ridesharing, telecommuting, guaranteed-ride-home, employer programs • Channelized and/or grade-separated intersection(s) • High-occupancy vehicle facilities or systems • Transit stop within a ½ mile radius of project location • Real-time surveillance and traveler information
MD 32	MD 99/Old Frederick Road to Carroll County Line	Safety and capacity improvements – widening, access control and auxiliary lanes	• Reversible, turning, acceleration/deceleration, or bypass lanes • Park and ride lot within a 1-mile radius of project location • Access management plan to improve safety
US 1 at MD 175	US 1 at MD 175	Upgrade intersection and approaches with capacity, operational and safety improvements	• Transit stop within a ½ mile radius of project location • Interconnected/coordinated traffic signal system
US 29	Middle Patuxent to MD 175	Widen from 2 to 3 lanes	• Channelized and/or grade-separated intersection(s) • Transit stop within a ½ mile radius of project location • Park and ride lot within a 1-mile radius of project location
US 1	MD 100 to county line	6-lane divided, closed section	• Channelized and/or grade-separated intersection(s) • Interconnected/coordinated traffic signal system • Real-time surveillance and traveler information

* congestion management strategies listed in this table are based on information provided by local jurisdictions and staff knowledge of existing operational characteristics along these project corridors.

CHART

The Coordinated Highways Action Response Team (CHART) program is a statewide program operated jointly by MDOT, SHA, MDTA, and Maryland State Police. CHART focuses its operations on nonrecurring congestion, such as crashes. The Statewide Operations Center, Authority Operations Center, and the two satellite Operations Centers in the region survey the state's roadways to quickly identify incidents. CHART also includes traffic patrols, which operate 24 hours / 7 days per week on many of the state highways in the region. The patrols play a key part in guiding traffic around the incidents and in clearing the scene more quickly. The faster broken-down or crashed vehicles are cleared, the less time travelers spend in their cars due to lane blockages. Besides mitigating congestion and reducing delay, CHART operations save many gallons of fuel that otherwise would be burned and polluting the air.

7. Monitor Effectiveness of Strategies

As noted in the discussions under steps 4 and 5, data from the VPP Suite and analyses using VPP and other data provide information on congestion problem areas. The ongoing program provides BMC staff and other planners with feedback on the performance of transportation investments and provides insight for future decisions.