



I-695 @ Old Harford Road

Capital Projects

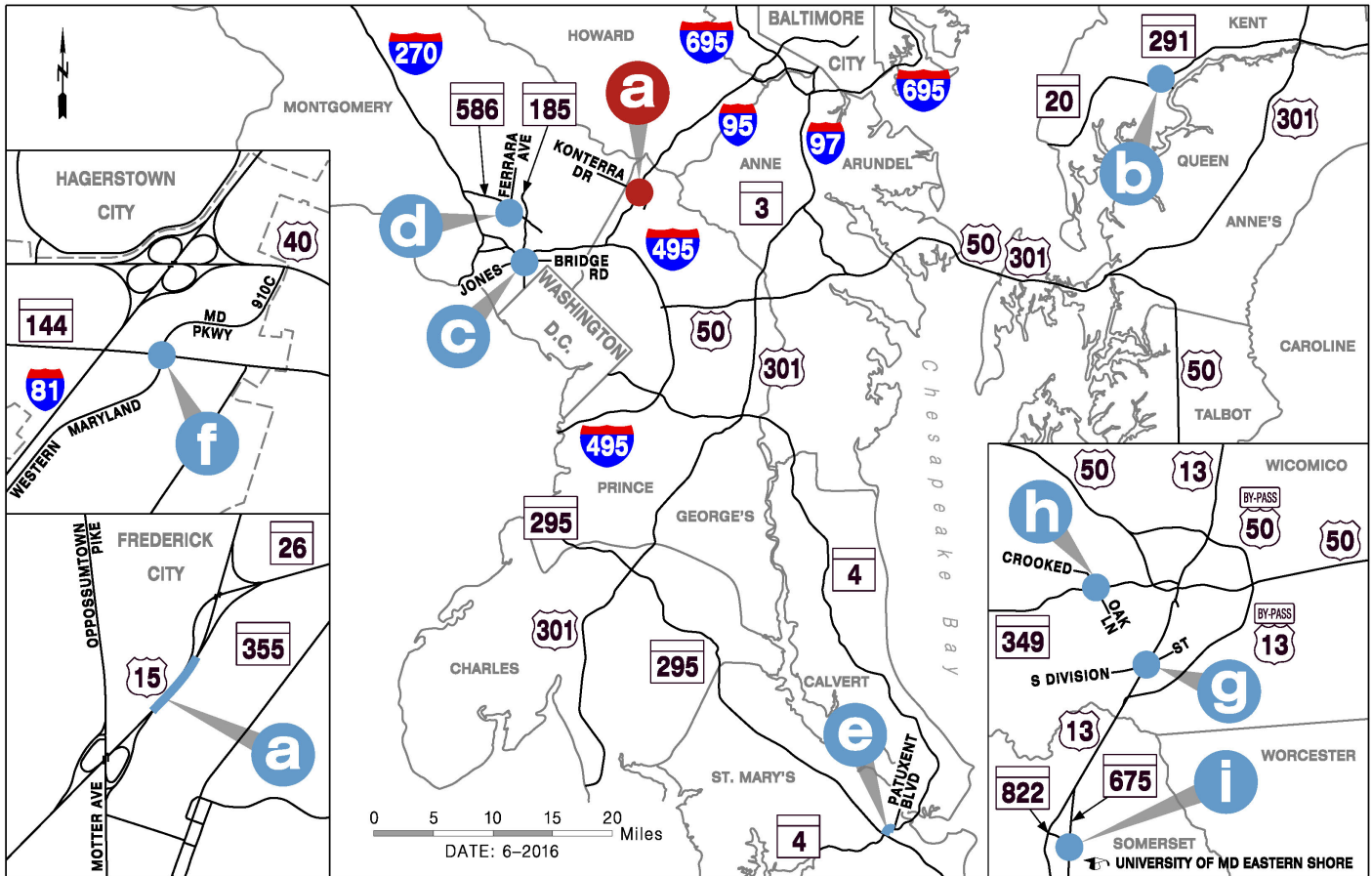
Traffic volumes and congestion continue to increase in Maryland. In order to address these mobility issues, SHA employs a variety of strategies to meet the needs of the traveling public. There are many challenges involved in developing projects including the cost of projects, right-of-way impacts and environmental constraints. SHA constructs major capital projects and uses programs that implement bottleneck solutions in a systematic and responsible manner. This is completed through a performance-based approach to identify and plan/design/construct congestion mitigation solutions from a practical design standpoint.

SHA projects and programs identify both short and long term solutions to address transportation issues. Capital projects can take years to complete to meet the Federal requirements. As a result, a major emphasis in recent years has been on system preservation. In 2015, it was announced that another 13 new major capital projects have been funded to improve mobility. Secondly, but

just as important, SHA continues to focus on alleviating congestion hotspots through a variety of lower cost geometric improvements along freeways and arterial roadways, ranging from the reconstruction of interstates to minor geometric improvements such as turn lanes and roundabouts. Other projects include upgrades to the freight network and new pedestrian and bicycle facilities. In order to address mobility issues throughout the State, ten construction projects were opened to traffic in 2015. These projects provide for congestion relief, improve safety, and enhance traffic operations. Of the ten projects, the major element of one of the projects was to improve accessibility. This involved constructing a new interchange on I-95 to improve access to the Konterra area of northern Prince George's County. In addition, two major projects were completed in December 2014 including the final section of MD 200 (Intercounty Connector) and the I-95 express toll lanes.

2016 MARYLAND STATE HIGHWAY MOBILITY REPORT

The location of the mobility and accessibility projects completed in 2015 are depicted on the following map:



MOBILITY PROJECTS

- a. US 15 NB from Motter Ave. to MD 26
- b. MD 20/High St. @ MD 291
- c. MD 185 @ Jones Bridge Rd.
- d. MD 586 @ Ferrara Ave.
- e. MD 4 from MD 235 to Patuxent Blvd.
- f. MD 144 @ MD 910C
- g. US 13 Business @ S. Division St.
- h. MD 349 @ Crooked Oak Ln.
- i. MD 822 @ MD 675

ACCESSIBILITY PROJECTS

- a. I-95 at Konterra Dr.

The mobility projects provide \$4.25 million in annual user benefits.

1. MOBILITY IMPROVEMENT PROJECTS

Nine mobility improvement projects were completed in 2015. These are as follows:



US 15 Northbound From Motter Ave to MD 26 (Frederick County)

US 15 was configured with a separate acceleration lane for the ramp from Motter Avenue to US 15 northbound and a separate deceleration lane to MD 26. These were approximately 2,000 feet apart. This project consisted of providing a continuous lane to tie in the Motter Avenue on ramp acceleration lane with the MD 26 off ramp deceleration lane.



MD 20/High Street @ MD 291 (Kent County)

The intersection of MD 20/High Street and MD 291 is located in Chestertown just to the west of Washington College. It is a three legged intersection with MD 20 the north leg, MD 291 the east leg, and High Street the south leg. The intersection was previously all way stop controlled. Delays were occurring on all three legs of the intersection due to all motorists being forced to stop at the intersection. A single lane roundabout was constructed to reduce delay and improve traffic flow.



MD 185 @ Jones Bridge Road (Montgomery County)

MD 185 (Connecticut Avenue) at Jones Bridge Road/Kensington Parkway is near the Walter Reed National Military Medical Center. The intersection experienced increased traffic volumes due to the Base Realignment and Closure Act (BRAC). The project consisted of widening MD 185 southbound to provide an exclusive right turn lane from the I-495 off ramp to Jones Bridge Road. An additional through lane was constructed on MD 185 northbound from Manor Road that ends at the ramp to I-495 eastbound. Pedestrian upgrades were included in the construction.



MD 586 @ Ferrara Ave (Montgomery County)

This project improved operations and safety at the MD 586/Ferrara Ave intersection. Left turning motorists from MD 586 westbound to Ferrara Ave southbound were at times unable to access the left turn lane or would block through motorists on MD 586. In order to alleviate this congestion, the project extended the left turn lane approximately 150 feet to improve the storage for this movement. The traffic signal phasing was also upgraded.

MD 4 from MD 235 to Patuxent Blvd. (St. Mary's County)



A major point of congestion in the Lexington Park area is along MD 4 from the the MD 4/MD 235 intersection and points north. Through a series of lane drops and merges this reduces MD 4 northbound from three lanes to one lane within 1,200 feet of the MD 235 intersection at Oak Drive. Motorists operate in stop and go conditions along the entire section of MD 4 until they start descending on the Thomas Johnson Bridge over three (3) miles from the MD 235/MD 4 intersection. The congestion along MD 4 also impacts traffic operations along MD 235. This project along MD 4 extended the two northbound lanes from south of Oak Drive to Patuxent Blvd a distance of approximately 4,000 feet to improve operations at the MD 235/MD 4 intersection and along MD 235 northbound. The volume at the Thomas Johnson Bridge is still greater than the capacity of the bridge therefore congestion will still occur along MD 4. Ultimately, MDOT has a separate study to evaluate improvements for the Thomas Johnson Bridge.



MD 144 @ MD 910 C (Washington County)

The intersection of MD 144 (Washington Street) and MD 910 C (Western Maryland Parkway) lies at the western edge of the City of Hagerstown. Originally, MD 910 C was stop controlled for both approaches while MD 144 free flowed through the intersection. There were right turn lanes on all approaches. Since traffic volumes were relatively equal, this made for an ideal location to construct a single lane roundabout.



US 13 Business at South Division Street (Wicomico County)

The US 13 Business/South Division Street intersection is located in the City of Salisbury. US 13 Business is a four lane divided highway and South Division Street is a two lane roadway. Left turn lanes were not provided on US 13 Business. This meant that along US 13 Business left turning motorists would queue in the median area and into the through lanes. This project constructed left turn lanes on both northbound and southbound US 13 Business and signalized the intersection. A bike lane was provided along US 13 Business. Bennett Middle School was just constructed about ¼ mile west of the intersection.



MD 349 @ Crooked Oak Lane (Wicomico County)

The intersection of MD 349 (Nanticoke Road) and Crooked Oak Lane is located in Wicomico County near Salisbury. The northbound and southbound Crooked Oak Lane approaches consisted of a single lane. MD 349 eastbound and westbound had one through lane and one right turn lane. This project also provided a left turn lane on both MD 349 approaches. A left turn lane was added on Crooked Oak Lane southbound and a northbound right turn lane was constructed.



MD 822 @ MD 675 (Somerset County)

MD 822 intersects with MD 675 about a mile from the University of Maryland Eastern Shore campus in Princess Anne. The MD 675 approaches consisted of a single lane entering the intersection while MD 822 (UMES Blvd.) eastbound approach included a single left, through and right turn lane while westbound consisted of a left and through right lane. The intersection was stop controlled for MD 675 motorists. In order to improve mobility and safety a single lane roundabout was constructed at this intersection.

a. Mobility Improvement Project Benefits

Before and after safety and traffic analysis were performed to determine the annual user benefits of the completed mobility projects. The benefits are related to the reduction in delay incurred by motorists and commercial vehicles, the reduction in fuel consumption, the safety benefit anticipated by the improvement, and the benefit provided by increased reliability of the system.

The construction of the nine projects provided the following benefits as depicted in the subsequent chart.

MOBILITY PROJECTS ANNUAL BENEFITS				
Location	Reduction in Delay	Reduction in Fuel Consumption	Safety Savings	Annual Cost Savings (\$ Thousands)
	\$ Savings (Thousands)	\$ Savings (Thousands)	\$ Savings (Thousands)	
US 15 NB Motter Ave to MD 26	481	9	217	707
MD 20/MD 291/High Street	28	1	27	56
MD 185 @ Jones Bridge Road	1,930	44	30	2,004
MD 586 @ Ferrara Ave	-156	-4	291	131
MD 4 - MD 235 to Patuxent Blvd	243	5	69	317
MD 144 @ MD 910 C	13	<1	44	57
US 13 Business @ S. Division St.	816	18	87	921
MD 349 @ Crooked Oak Lane	9	<1	21	30
MD 822 @ MD 675	4	<1	23	27
Total	3,368	73	809	4,250

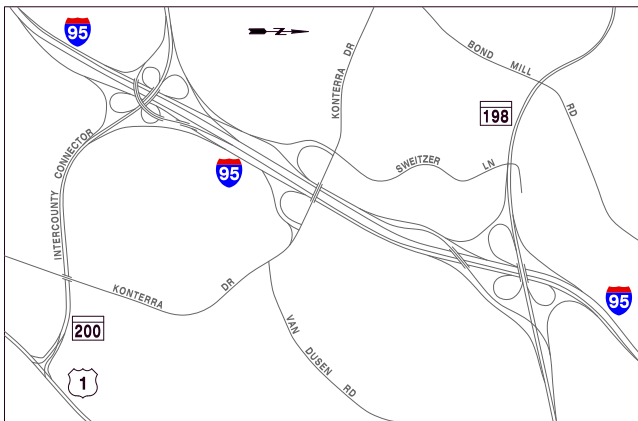
The nine projects provide for a combined \$4.25 million in annual user benefits including \$300,000 in savings by truck traffic through these locations.

2. ACCESSIBILITY IMPROVEMENT PROJECTS

MDOT leads several projects to improve access to nearby major roadways to serve existing residents/businesses as well as future economic development. Normally these projects are major investments. In calendar year 2015, one major accessibility improvement project was completed. This was completed in conjunction with the last section of the Intercounty Connector (MD 200) which opened in December 2014.



I-95 @ Konterra Drive



I-95/Konterra Drive (Prince George’s County)

Along I-95 just north of the Capital Beltway, interchanges are located at MD 198, MD 200 (Intercounty Connector) and MD 212 (from north to south). These interchanges are spaced approximately two (2) miles apart. Since MD 200 is an access controlled facility, the next nearest interchanges are located either one (1) mile to the east or 2.5 miles to the west of I-95. The accessibility to the area of West Laurel was limited to the local roadway network. This area includes several major office/flex complexes, residential developments and the Laurel Regional Hospital. Traffic along I-95 desiring to access these complexes was using local roadways such as Old Gunpowder Rd, Contee Rd, or Virginia Manor Rd which varied in their ability to handle these volumes. To meet existing traffic needs and for future economic development, an interchange was constructed at I-95 at Konterra Dr. In conjunction with the new interchange, collector-distributor roads were constructed along I-95, minimizing the weaving movements along the four mainline travel lanes of I-95 therefore, improving travel speeds along I-95.

Traffic volumes at the I-95/Konterra Dr interchange for the average weekday was approximately 12,000 vehicles per day. This includes approximately 400 vehicles in the peak hour/peak direction.

The construction of this interchange has reduced traffic at the MD 198 interchange. Traffic volumes at the MD 198 ramps have been reduced by about 600-1,600 vehicles per day.



I-95 @ Konterra Drive



**MD 200 (Intercounty Connector)
(Prince George’s County)**

Another project that improved accessibility is the final section of MD 200, the Intercounty Connector (ICC) in northern Prince George’s County which opened in December 2014. The final section extends approximately 1.5 miles from I-95 to US 1 tying into the original section between I-370 and I-95. The construction of this final section brings the total length of MD 200 to 19 miles.

The construction consisted of completing the remaining interchange movements at the I-95 interchange, a new interchange at Virginia Manor Road, an at-grade intersection at US 1 plus construction of the mainline

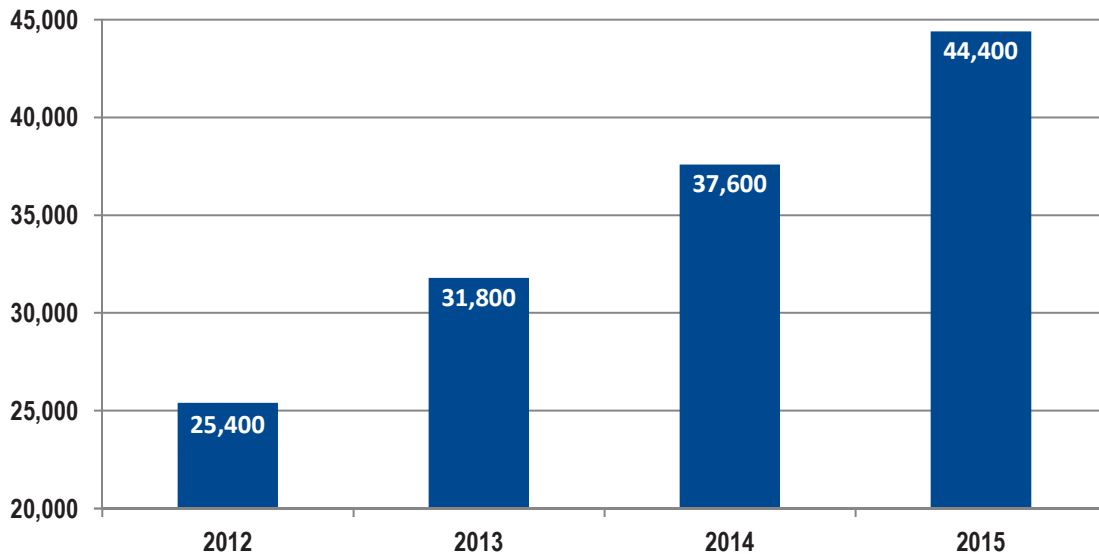
of the ICC. The ICC/US 1 intersection is unique since it is only the second displaced left turn intersection in Maryland.

Traffic volumes, in 2015 along the section of MD 200 from I-95 to US 1 average approximately 7,000 vehicles per day. Volumes along the remaining portion of the ICC are more than 45,000 vehicles per day on sections west of US 29. These volumes have steadily grown over the last four years. The ICC has reduced traffic volumes along I-270, I-495 and I-95 by about 5%. Local roadways such as Shady Grove Road, MD 108, MD 28/MD 198 has seen volumes decrease between 8% and 13% since the opening of the MD 200. The growth in traffic volumes on the ICC is illustrated in the following chart.

3. EXPRESS TOLL LANE PROJECTS

The first express toll lane project on I-95 from south of I-895 to north of MD 43 opened to traffic in December 2014. Motorists have the option of utilizing the four free general purpose lanes or paying a toll using EZ-Pass to travel in the free flow express toll lanes. The project was developed from the I-95 Master Plan which identified potential improvements from south of I-895 to the Delaware State Line. In the first eight miles, referred to

ICC AVERAGE DAILY TRAFFIC VOLUMES BETWEEN I-370 AND I-95 FOR FIVE SEGMENTS



as Section 100 of the Master Plan, it was recognized that adding general purpose lanes would solve the existing congestion but the same operational issues would reappear in future years. In order to address future travel demands, two additional barrier separated express toll lanes were constructed on northbound and southbound I-95 for the express toll lanes. The interchanges of I-95 at I-895, I-695 and MD 43 and the I-895 interchange with Moravia Road were reconstructed. The express toll lanes are free for transit vehicles, improving their on-time performance and reliability.

This was the most congested section of I-95 north of the Baltimore City line for AM/PM peak hour traffic. AM volumes southbound and PM volumes northbound exceed 7,000 vehicles per hour. PM peak hour volumes northbound on a Friday evening can approach 8,000 vehicles per hour.

Volumes on the express toll lanes have averaged more than 22,000 vehicles per day. PM peak hour volumes on the express toll lanes in the northbound direction have exceeded 2,000 vehicles per hour Fridays in the summer.

4. DEVELOPER PROJECTS

Throughout the State, various residential, commercial, office and warehouse developments are constructed. This is a positive for economic development in Maryland but these projects can cause impacts to nearby intersections by generating higher traffic volumes. This can cause operational issues including failing intersections or traffic from turn lanes queuing into through lanes. In order to mitigate these additional traffic volumes, SHA works with developers to determine the improvements required to offset the additional traffic the development will generate. The improvements funded by developers range from acceleration and deceleration lanes, to a new traffic signal, to a minor/major intersection enhancement to interchange modifications. Some of the developer related improvement projects completed in 2015 include:

- US 301 @ Croom Road & Osborne Road (Prince George's County)
- MD 6 east of Calvert Street (Charles County)
- MD 24 at Singer Road (Harford County)
- MD 32 @ Raincliffe Road/Sandusky Road (Carroll County)
- MD 32 Westbound @ Cedar Lane (Howard County)
- MD 63 North of I-70 (Washington County)

These projects assist traffic operations by improving travel times and reducing delay. This not only assists motorists going to the developments but other users passing through the intersection.

5. FREIGHT PROJECTS

Freight and goods movement are critical to the economic development of the State. The more trucks on the road means the more interaction occurs with autos/bicyclists/pedestrians. This does present challenges to balance maximizing the mobility of truckers with providing safe facilities for all users. This is accomplished through various freight projects/programs.

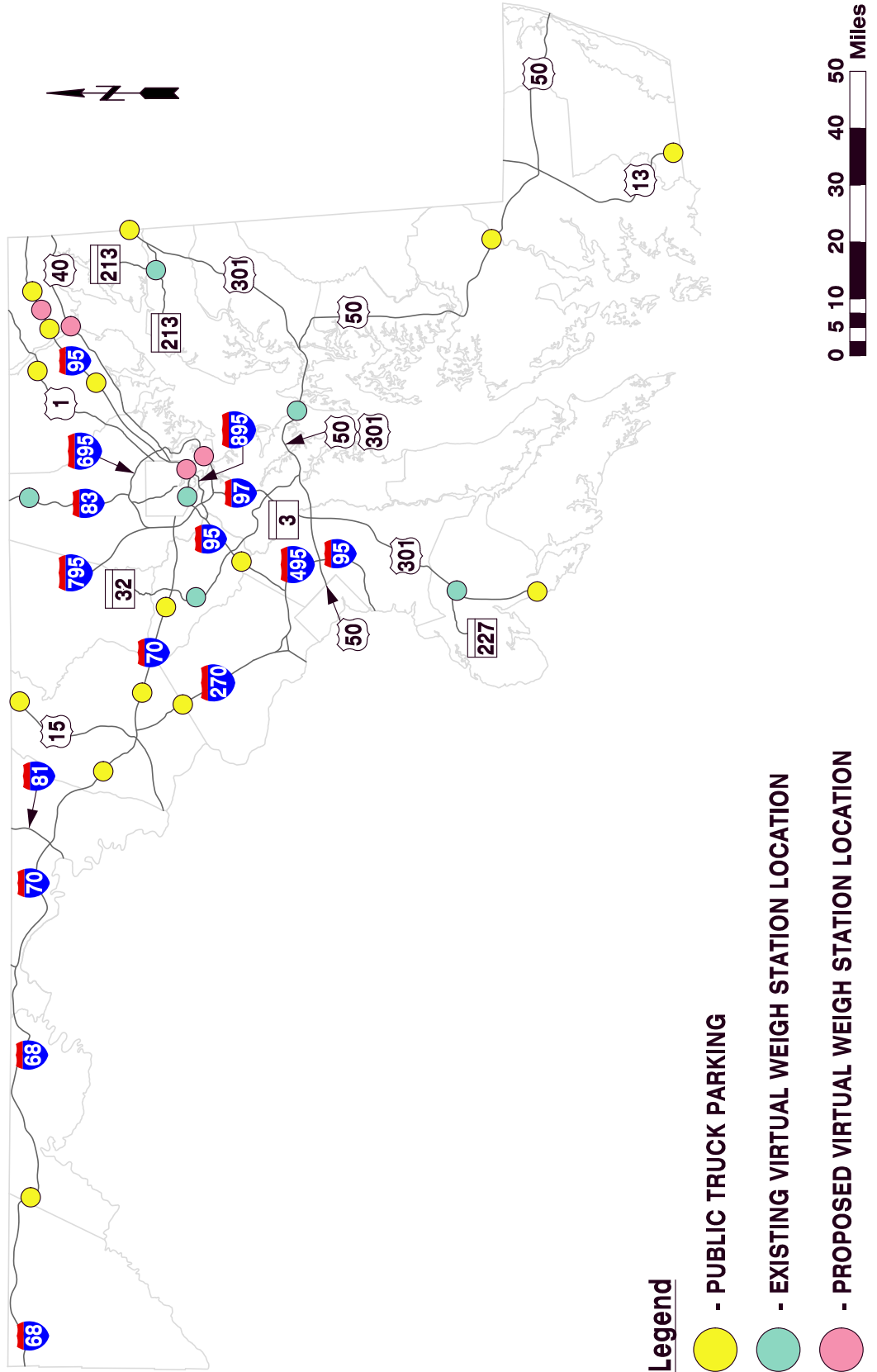
One of the programs managed by the SHAs' Motor Carrier Division is the Virtual Weigh Station (VWS) program. This program uses technology to protect the reliability of the pavement and keep trucks moving smoothly. Maryland's VWS promotes the goals of safety, freight mobility and infrastructure preservation through an automated system of sensors and cameras that record activity of Commercial Motor Vehicles (CMV) traveling at high speeds. The VWS can record the speed, height, and weight of a commercial vehicle without requiring the vehicle to stop, which reduces delay time for compliant vehicles. Overweight vehicles which damage roads and bridges can be identified for possible educational contact or enforcement action. In addition, each VWS provides a volume and classified count including the image of the vehicle. The analytics feature of the VWS application allows better targeting of enforcement activities with real-time reports identifying traffic volumes, speeds, class, and weight related trends. Currently, there are eight active VWS sites across the state. Three more sites are anticipated to be constructed over the next year with nine additional sites planned in the next three years. Ten of these sites will monitor Maryland Transportation

Authority's bridges and tunnels. Once complete, this will allow for a system that electronically checks a majority of CMV's, intercepts the ones that are unsafe or overweight, and minimizes delay to others operating legally.

For vehicles transporting shipments that exceed the legal size and weight limits, the Motor Carrier Division issues special hauling permits. The total weight, axle weight, dimensions, and routes of travel are identified on the application. Previously, permit approval could take hours or days depending upon the request. In May, 2016, the new automated Maryland One permit system became operational. Now, more than 70% of permit applications submitted by our customers are processed in a matter of minutes and without error. Most permits for Superloads up to 200,000 pounds can be issued within two (2) days. Permitting for megaloads which can exceed 1,000,000 pounds will still take months of preparation and coordination by agencies/participants.

Other programs address issues related to truck parking and at grade railroad crossings. Truck parking is both a safety and infrastructure preservation issue. In order to address truck parking, two projects were completed to expand the truck parking capacity. The first was at the I-95 southbound Welcome Center in Laurel. This approximately doubled the number of spaces at this location to 61. In addition, ten spaces were added at the US 301/MD 834 Bay Country Rest Area in Centerville. Public truck parking locations and the location of VMS are depicted on the following map.

PUBLIC TRUCK PARKING AND VIRTUAL WEIGH STATION LOCATIONS





MD 144

6. RAILROAD CROSSING PROJECTS

In Maryland, there are 633 public at-grade rail crossings and 22 separate pedestrian only crossings. These can present a safety issue. Improvements can include a range of possible solutions such as new flashing light signals (with or without gates replacement), updating of components at existing active warning devices, and improved crossing surfaces, both on State roads and County roads. There were approximately eight (8) crossings modified in 2015 including projects along Concrete Road, Fountain Rock Road, Monocacy Boulevard, Connelley Mill Road and Brandywine Road.

7. PEDESTRIAN AND BICYCLE PROJECTS

Projects to improve pedestrian and bicyclists are a key element of a multi-modal transportation system. In February 2016, MDOT announced \$14 million in reimbursable grant funding for walking, biking and recreational trail projects. MDOT has allocated \$100 million to upgrade these facilities since the start of the various programs.

Pedestrian facility improvements may involve the building of new sidewalks or the rehabilitation of existing sidewalks. Across the State, 11 miles of new sidewalk were installed in 2015 including:

- MD 210 - Ruth B Swann Drive to Wooster Drive (Charles County)
- MD 144 - Wisner Street to King Avenue (Frederick County)
- MD 825 B - South 11th Street to South Oakhall Drive (Garrett County)

MDOT projects in 2015 incorporated upgrades of more than \$2 million for dedicated bicycle improvement projects. This along with improvements to bicycle facilities as part of roadway projects are an important part of the Complete Streets philosophy, that involves providing on-street bike lanes or off street facilities to encourage safe bicycle use. In 2015, 12.6 miles of marked bicycle facilities were constructed including:

- MD 170 - MD 648 to MD 762 (Anne Arundel County)
- US 1 - US 1 Alt to Linden Avenue (Baltimore County)

8. PAST PROJECT BENEFITS

A variety of projects have been completed along Maryland's freeway/expressway system in the past four years including rehabilitating existing bridges structures (I-695 at MD 372) while others have provided capacity improvements. Projects such as I-695 at MD 26 were completed but another project (I-695 at Milford Mill Road) is presently on-going which impacts traffic operations in the area. Two projects completed in 2014 that provided benefits to mobility were:

- I-95 - Express Toll Lanes - I-895 to MD 43
- I-70 - East Patrick St to West of South St./Monocacy Blvd.

CONGESTION IMPROVEMENT BY COMPLETED PROJECTS			
LOCATION	2011 TTI	2015 TTI	% REDUCTION
I-95 AM SB MD 43 to I-695	1.50	1.00	+33
I-95 AM SB I-695 to I-895	1.59	1.01	+36
I-95 AM SB I-895 to US 40	1.31	1.08	+18
I-95 PM NB US 40 to I-895	1.72	1.03	+40
I-95 PM NB I-895 to I-695	1.33	1.03	+23
I-95 PM NB I-695 to MD 43	1.13	1.04	+8
I-70 PM EB South St to MD 144	1.04	1.00	+4

An evaluation was performed to determine the mobility benefits of these improvements. The Travel Time Index (TTI) was used as a basis for the evaluation. Data from the years 2011 and 2015 were utilized for the comparison. The year 2011 represented the oldest year that INRIX data was analyzed for travel time index. A comparison was made between the peak direction TTI for 2011 and 2015 data which identified the following changes:

The I-95 express toll lanes had a major impact on travel time throughout the corridor. Average travel times were reduced by up to 40% on a segment. In the statewide rankings of all freeway/expressway segments the I-95 express toll lane project provided an approximately 400 place improvement in congestion (e.g. from the 100th most congested segment on Maryland freeways/expressways to the 500th more congested segment). The I-70 widening provided less benefit but still improved travel time.