Keeping Maryland Mobile: Providing a Modern, Sustainable Transportation System in the Old Line State

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Founded in 1971, TRIP ® of Washington, DC, is a nonprofit organization that researches, evaluates and distributes economic and technical data on surface transportation issues. TRIP is sponsored by insurance companies, equipment manufacturers, distributors and suppliers; businesses involved in highway and transit engineering and construction; labor unions; and organizations concerned with efficient and safe surface transportation.

Executive Summary

Accessibility and connectivity are critical factors in a state's quality of life and economic competitiveness. The growth and development of a state or region hinges on efficient and safe access to employment, customers, commerce, recreation, education and healthcare via multiple transportation modes. As Maryland emerges from the COVID-19 pandemic, quality of life in the Old Line State, and the pace of the state's economic growth, will be closely tied to the condition, efficiency, safety and resiliency of its transportation system.

An adequate and reliable source of transportation funding will be critical to Maryland's ability to provide the system of roads, highways, bridges and transit that will be needed to support commerce within the state by connecting the state to markets around the globe, while providing the safe and efficient mobility needed to support a high quality of life and strong economy in Maryland.

TRIP's "Keeping Maryland Mobile" report examines the use and reliability of Maryland's surface transportation system and the importance of the recent reauthorization of the federal surface transportation program. The report also looks at the challenges Maryland faces to accommodate future transportation growth and sustain adequate funding despite the potential of increasing fuel efficiency standards and the adoption of electric vehicles. Sources of information for this report include the Maryland Department of Transportation State Highway Administration (MDOT SHA), the Federal Highway Administration (FHWA), the Bureau of Transportation Statistics (BTS), the U.S. Census Bureau, the Texas Transportation Institute (TTI), the American Road & Transportation Builders Association (ARTBA), and the National Highway Traffic Safety Administration (NHTSA).

TRAFFIC CONGESTION IN MARYLAND

Congested roads, highways and bottlenecks choke commuting and commerce and cost Marylanders $5.8 billion in 2022 in the form of auto delay, truck delay, and wasted fuel and emissions. Vehicle miles of travel (VMT) in Maryland increased by 20 percent from 2000 to 2019, and by six percent from 2014 to 2019. Due to the COVID-19 pandemic, vehicle travel in Maryland dropped by as much as 47 percent in April 2020 (compared to vehicle travel during the same month the previous year). By 2022, Maryland's overall VMT levels had rebounded to five percent below 2019's pre-pandemic levels. The chart below details the annual hours lost to congestion, congestion costs per driver and the average amount of fuel per driver wasted annually due to congestion in the state's largest urban areas.

Urban Area	Hours Lost to Congestion	Annual Cost Per Driver	Gallons of Fuel Wasted Per Driver
Baltimore	59	$1,371	22
Maryland DC Suburbs	99	$2,465	39

Increasing congestion on Maryland's major highways and roads hampers the state's ability to support economic development and quality of life by reducing the reliability and efficiency of personal and commercial travel, including the transport of goods and services.

Traffic congestion robs commuters of time and money and imposes increased costs on businesses, shippers and manufacturers, which are often passed along to consumers. Increased levels of congestion can also reduce the attractiveness of a location when a company is considering expansion or deciding where to locate a new facility. The charts below include a list of Maryland's fifteen most congested highway and arterial road segments during weekday morning and evening commutes.

Rank	AM Most Congested Highway Sections		PM Most Congested Highway Sections	
	Route	Miles	Route	Miles
1	I-495 Outer Loop - PG Co. Line to MD 97	4	I-495 Inner Loop - I-270 East Spur to MD 97	3.4
2	I-695 Outer Loop- MD 43 to Cromwell Bridge Rd.	3	I-695 Inner Loop - MD 139 to Providence Rd	3.7
3	I-695 Outer Loop - MD 122 to MD 144	3	MD 295 NB - MD 410 to MD 193	3.1
4	I-270 Local SB - I-370 to MD 189	3	I-895 NB - Frankfurst Ave. to Holabird Ave.	3.2
5	I-270 SB - Shady Grove Rd. to MD 189	3	I-695 Inner Loop - I-95 to US 40	3.5
6	US 50 Westbound - MD 410 to DC Line	4	MD 295 SB - MD 175 to MD 198	4.0
7	I-695 Inner Loop - Stevenson Rd. to I-83	3	I-270 Local NB - I-370 to Watkins Mill Road	2.9
8	I-895 NB - Frankfurst Ave. to Holabird Ave.	3	I-95/I-495 Inner Loop - I-95 to MD 295	3.2
9	MD 295 SB - MD 198 to Powder Mill Rd.	6	MD 295 NB - MD 198 to MD 175	4.1
10	I-95 SB - South of MD 200 to I-495	3	I-95/I-495 Outer Loop - MD 450 to MD 201	3.5
11	MD 295 SB - MD 193 to MD 410	3	I-270 NB - MD 121 to MD 109	4.1
12	I-270 SB - MD 80 to MD 109	4	I-95 NB - MD 2 to Fort McHenry Tunnel East	3.0
13	I-495 Outer Loop - MD 187 to MD 190	3	I-495 Inner Loop - VA Line to I-270 West Spur	3.9
14	I-95/I-495 Inner Loop - MD 414 to I-295	3	I-895 SB - MD 150 to Harbor Tunnel West	3.3
15	I-95/I-495 Inner Loop - I-95 to MD 295	4	I-270 NB - MD 189 to I-370	3.2

Rank	AM Most Congested Arterial Road Sections		PM Most Congested Arterial Roads Sections	
	Route	Miles	Route	Miles
1	MD 28 WB - W. Gude Rd. to Muddy Branch Rd.	2.1	US 301 SB - MD 381 to McKendree Rd/Cedarville Rd.	2.6
2	MD 410 WB - MD 650 to MD 390	2.9	MD 193 EB - I-495 to MD 650	2.0
3	MD 185 SB - I-495 to MD 191	2.1	MD 26 WB - Washington Ave. to Brenbrook Dr.	2.0
4	US 301 SB - Short Cut Rd. to Charles Co. Line	2.2	MD 177 WB - MD 100 to Catherine Ave.	2.0
5	MD 177 EB - Catherine Ave. to Schmidts Ln.	2.3	MD 26 EB - Brenbrook Dr. to I-695	2.2
6	MD 355 NB - Beach Dr./Grosvenor Ln. to Montrose Pkwy	2.1	MD 140 EB - Owings Mills Blvd. to McDonogh Rd./Craddock Ln.	2.1
7	MD 2 NB - College Parkway to Robinson Rd.	2.5	MD 650 SB - US 29 to Adelphi Rd.	2.3
8	MD 28 EB - Baltimore Rd. to MD 97	2.3	MD 177 EB - Waterford Rd. to MD 607	2.2
9	MD 424 SB - MD 3 to MD 450	2.4	MD 2 NB - College Pkwy. to Robinson Rd./Leelyn Dr.	2.5
10	MD 2 SB - MD 665 to Mayo Rd.	2.6	MD 30 NB - MD 30 Business (North) to MD 27	2.4
11	MD 97 SB - MD 586 to MD 390	2.0	MD 140 WB - Craddock Ln./McDonogh Rd. to Owings Mills Blvd	2.1
12	MD 108 WB - MD 182 to Bowie Mill Rd.	2.3	MD 212 NB - MD 410 to Adelphi Rd.	2.5
13	MD 2 SB - MD 10 to Robinson Rd.	2.9	MD 355 SB - Montrose Pkwy. to Beach Dr./ Grosvenor Ln.	2.3
14	MD 410 WB - Riverdale Rd. to US 1	2.2	MD 355 SB - Plummer Dr. to Odendhal Dr.	2.3
15	MD 97 NB - MD 390 to MD 586	2.0	MD 500 EB - DC Line to MD 410	2.1

Traffic congestion significantly reduces access to jobs and employees. In a 2020 report, (data was collected prior to the onset of the COVID-19 pandemic) the Center for Transportation Studies at the University of Minnesota found that of the approximately 1.9 million jobs accessible within a one-hour drive to a resident of the Baltimore metro area, only 51 percent are accessible within 40 minutes. Of the approximately 2.6 million jobs accessible within a one-hour drive to a resident of the Washington, DC metro area, only 45 percent are accessible within a 40-minute drive.

The Center for Transportation Studies report also found that the number of jobs accessible within 40 minutes during peak commuting times in the Baltimore and Washington, DC metro areas was reduced by 46 and 52 percent, respectively, as a result of traffic congestion.

Location	Jobs Reachable by Auto Within 60 Minutes	Percent of Jobs Reachable by Auto Within 40 Minutes	Percent Reduction of Jobs Reachable by Auto Within 40 Min. Due to Congestion
Baltimore	1,867,890	51%	46%
Washington, DC	2,603,119	45%	52%

The Center for Transportation Studies found that in 2020 (pre-COVID-19 pandemic) in the Baltimore and Washington, DC urban areas 111,973 and 310,582 jobs were accessible within a one-hour transit trip, respectively. In the Baltimore and Washington, DC urban areas 41,307 and 46,516 jobs were accessible within one hour by travel on a low-stress bicycle network and 90,214 and 193,483 jobs were accessible within one hour by travel on a low or medium-stress bicycle network, respectively.

Location	Jobs Reachable by Transit Within 60 Minutes	Jobs Reachable by Low-Stress Bicycle Within 60 Minutes	Jobs Reachable by Low and Medium-Stress Bicycle Within 60 Minutes
Baltimore	111,973	41,307	90,214
Washington, DC	310,582	46,516	193,483

TRAFFIC BOTTLENECKS IN MARYLAND

When a portion of a highway or signalized arterial roadway experience a significant reduction in travel speeds, they are deemed bottlenecks. Often these bottlenecks form at interchanges or intersections and the resulting delays spread to adjacent roadway segments. Based on the volume of traffic, traffic speed, and the extent and length of the delay, the chart below ranks the ten worst highway bottlenecks in Maryland. A list of Maryland's 20 worst highway bottlenecks is included in the report.

Rank	Top Highway Bottlenecks	Average Length (Mi.)
1	MD 295 Northbound at Powder Mill Rd.	3
2	US 50 Westbound at William Preston Lane Bridge	4
3	I-895 Northbound at Harbor Tunnel Thruway	2
4	I-270 Northbound at MD 109/Exit 22	6
5	I-270 Northbound at MD 85/Exit 31	8
6	MD 295 Southbound at MD 198	3
7	US 50 Eastbound William Preston Lane Bridge	5
8	I-270 Southbound at MD 109/Exit 22	4
9	MD 295 Southbound at Riverdale Rd	3
10	I-495 Inner Loop at I-270 Spur	5

When signalized intersections carry more traffic than they can efficiently accommodate, traffic operations degrade, resulting in most motorists having to wait through more than one green light indication before being able to go through the intersection. The following list indicates the 15 worst performing intersections in Maryland during morning and evening peak travel periods.

Rank	AM Most Congested Arterial Intersections	PM Most Congested Arterial Intersections
1	MD 4 at MD 337/Presidential Pkwy	MD 500 at MD 410/Adelphi Rd
2	MD 26 at Lord Baltimore Dr/ I-695 OL Off Ramp	US 301 at Cedarville Rd/McKendree Rd
3	US 29 at Rivers Edge Rd	MD 4 at FDR Blvd
4	MD 5 @ Surratts Rd	MD 500 at Eastern Ave
5	MD 210 at Livingston Rd/Kerby Hill Rd	MD 410 at MD 212
6	MD 2 at Tarragon Ln	MD 41 at Putty Hill Ave
7	MD 4 at Chaneyville Rd	MD 5 at MD 637 (Naylor Rd)
8	MD 108 at Old Baltimore Rd	MD 119 at I-370/Sam Eig Hwy
9	MD 410 at MD 212	US 1 at US 1AL/Hamilton St
10	MD 210 at Wilson Bridge Dr	MD 4 at MD 337/Presidential Pkwy
11	MD 4 at Dower House Rd	US 15 SB Ramps at Rosemont Ave/Schley Ave
12	MD 124 at Warfield Rd	MD 210 at Livingston Rd/Kerby Hill Rd
13	MD 450 at 48th Street	MD 414 at Ramp from I-95 WB
14	MD 355 at MD 911/Wootten Pkwy	MD 355 at Jones Bridge Rd/Center Dr
15	MD 193 at E. Franklin Ave/Franklin Ave	MD 2 at MD 4 (Sunderland)

FREIGHT TRANSPORTATION IN MARYLAND

The health and future growth of Maryland's economy is riding on its surface transportation system. Annually, $403 billion worth of freight are shipped to or from sites in Maryland, an amount that is anticipated to grow by 73 percent in inflation-adjusted dollars by 2045.

The amount of freight transported in Maryland and the rest of the U.S. is expected to increase significantly as a result of economic growth, changing business and retail models, increasing international trade, and rapidly changing consumer expectations that place an emphasis on faster deliveries, often of smaller packages or payloads.

The following chart shows the five highway locations in Maryland carrying the greatest number of large commercial trucks daily, and the five highway locations where large commercial trucks make up the largest share of daily traffic.

Rank	Highest Truck Volume		Highest Truck Percentage Locations	
	Route Location	Daily Trucks	Route Location	Percent
1	I-95 North of I-695	29,300	MD 159 – South of US 40	36%
2	I-95/I-495 North of US 50	23,200	I-81 South of PA Line	36%
3	I-81 North of I-70	20,600	I-81 South of US 11	32%
4	I-695 West of Greenspring Ave	18,200	US 522 N of I-70	31%
5	I-495 East of MD 185	16,200	MD 313 – South of US 301	30%

The efficiency of freight movement in Maryland is threatened by traffic congestion, which reduces the reliability of goods movement to and from destinations in and through the state. The following chart details the highway segments in Maryland that provide the worst travel reliability for commercial trucks as a result of traffic congestion.

Rank	Least Reliable Routes for Large Commercial Trucks	Miles
1	US 50/US 301 WB - Chester Station Ln. to Bay Bridge	3.2
2	I-495 Outer Loop - I-95 to US 29	3.2
3	US 50 EB - Bay Dale Drive to Oceanic Drive	3.8
4	I-495 Inner Loop - MD 187 to MD 97	4.5
5	I-695 Outer Loop - MD 122 to MD 144	3.1
6	I-695 Outer Loop - MD 43 to Cromwell Bridge Rd	3.1
7	I-695 Inner Loop - MD 139 to Providence Road	3.3
8	I-95/ I-495 Inner Loop - MD 5 to Woodrow Wilson Bridge	5.6
9	I-895 SB - I-95 to Ponca Street	3.2
10	I-270 NB - Shady Grove Road to Watkins Mill Road	3.7
11	US 50 WB - MD 410 to Columbia Park Road	3.1
12	I-95/I-495 Inner Loop - I-95 to MD 201	3.2
13	I-95 NB - US 1 Alt to Ft McHenry Tunnel	3.2
14	I-270 West Spur SB - I-270 Split to I-495	1.7
15	I-270 SB - MD 80 to MD 109	3.8

PROGRESS IN RELIEVING TRAFFIC CONGESTION IN MARYLAND

Using a combination of programs and projects, the Maryland Department of Transportation and State Highway Administration is taking steps to address Maryland's traffic congestion and reliability challenges. These efforts are aimed at improving the efficiency and expanding the capacity of the state's transportation system.

- MDOT SHA's congestion relief programs and projects to improve the efficiency and expand the capacity of the state's major roadways were estimated in 2020 to save approximately $1.2 billion in reduced delays, fuel consumption and emissions.

MDOT SHA congestion relief efforts include:

- ✓ An incident management program that in 2020 cleared approximately 35,000 incidents and assisted approximately 35,000 stranded motorists.
- ✓ Improved traffic signalization.
- ✓ The provision of more than 13,500 park and ride spaces at 107 locations.
- ✓ The use of High Occupancy Vehicle (HOV) lanes on portions of I-270 and US 50.
- ✓ The addition of 9.6 miles of new sidewalks with 66 projects in 21 counties, improvements to six directional miles for biker access, increasing the directional miles of marked bike facilities provided by MDOT to over 450.
- ✓ Nineteen virtual weigh stations are in operation and design work begun (presently on hold) for up to 20 additional truck parking spaces at the I-70 Welcome Center in Frederick County.
- ✓ The addition of roadway capacity at a number of intersections and portions of roadways, including the following in 2020: MD 2/4 from Fox Run Boulevard to Commerce Lane; MD 32 from Main Street to Macbeth Way; MD 180 from Swallowtail Drive to US 15/340 ramps; MD 22 from Prospect Mill Road to MD 136; I-270 and Watkins Mill Road; MD 97 at Randolph Road; I-81 from Potomac River Bridge to MD 63; US 113 from MD 365 to North of Five Mile Branch; US 50 at MD 589 and MD 346 from US 113 to Healthway Drive.

THE IMPACT OF TRANSPORTATION INVESTMENT ON ECONOMIC GROWTH IN MARYLAND

According to a report by the American Road & Transportation Builders Association, the design, construction and maintenance of transportation infrastructure in Maryland supports approximately 78,000 full-time jobs across all sectors of the economy. These workers earn $3.5 billion annually. Approximately one million full-time jobs in Maryland in key industries like tourism, retail sales, agriculture and manufacturing are completely dependent on the state's transportation network.

MARYLAND'S TRANSPORTATION SYSTEM AND FUNDING

Investment in Maryland's roads, highways and bridges is funded by local, state and federal governments. A lack of sufficient funding at all levels will make it difficult to adequately maintain and improve the state's existing transportation system.

The level of highway investment in Maryland is likely to increase as a result of the five-year federal Infrastructure Investment and Jobs Act (IIJA), signed into law in November 2021, which will provide $4.6 billion in road, highway and bridge funding in Maryland from 2022 to 2026, resulting in a 36 percent increase in federal funding in 2022.

According to the Status of the Nation's Highways, Bridges, and Transit, 24th Edition, submitted to Congress by the United States Department of Transportation (USDOT) in 2021, the nation faces a $1 trillion backlog in needed repairs and improvements to the nation's roads, highways and bridges.[1] The USDOT report found that the nation's annual investment in roads, highways and bridges by all levels of government should be increased by 55 percent annually to improve the conditions of roads, highways and bridges, relieve traffic congestion and improve traffic safety.[2]

The USDOT report also found that the nation faces a $105 billion backlog in needed repairs and improvements to the its transit systems.[3] The USDOT report found that the nation's annual investment in transit repairs and improvements by all levels of government should be increased by 30 percent to improve the condition and expand the service of the nation's transit systems.[4]

Highway and bridge spending multiplies through the economy by stimulating additional output. A 2021 macroeconomic analysis by IHS Markit found that that every dollar spent on highway and bridge improvements results in $3.4 dollars in combined direct, indirect and induced output from industries throughout the economy, resulting in a multiplier for highway and bridge investment of 3.4.

Sources of information for this report include the Federal Highway Administration (FHWA), the Maryland Department of Transportation and State Highway Administration (MDOT SHA), the American Road and Transportation Builders Association (ARTBA), the Bureau of Transportation Statistics (BTS), the U. S. Census Bureau, the Center for Transportation Studies, the Texas Transportation Institute (TTI) and the National Highway Traffic Safety Administration (NHTSA). All data used in the report are the most recent available.

Introduction

Maryland's surface transportation system provides a vital link for the state's residents, visitors and businesses, providing daily access to homes, jobs, shopping, natural resources and recreation. Supporting quality of life and a robust economy in Maryland requires that the state provide an efficient, safe and well-maintained transportation system that allows for a high level of accessibility, connectivity and safety. Maryland relies on a diverse economy including tourism, finance, retail, government services, manufacturing, agriculture and education. A safe, well-maintained and reliable network of roads and bridges is critical to each of these sectors and to the economic health of the state and the nation.

Adequate investment in Maryland's transportation network will help enhance economic development opportunities and improve business productivity while making it easier for the public to get to and from destinations including work, home, school, shopping and social events.

Population, Travel and Economic Trends in Maryland

Maryland residents and businesses require a high level of personal and commercial mobility. Population increases and economic growth in the state have resulted in an increase in vehicle miles of travel (VMT) and an increased demand for mobility and connectivity. To foster quality of life and spur continued economic growth, it will be critical that Maryland provide an efficient, safe and modern transportation system that can accommodate future growth in population, tourism, business, recreation and vehicle travel.

Maryland's population has grown steadily, reaching approximately 6.2 million residents in 2022, a 16 percent increase since 2000.[5] Maryland had approximately 4.4 million licensed drivers in 2021.[6]

From 2000 to 2021, Maryland's gross domestic product (GDP), a measure of the state's economic output, increased by 45 percent when adjusted for inflation.[7] U.S. GDP, adjusted for inflation, increased 48 percent during this period.[8]

From 2000 to 2019, annual VMT in Maryland increased by 20 percent, from approximately 50 billion miles traveled annually to approximately 60 billion miles traveled annually.[9] From 2014 to 2019 vehicle travel in Maryland increased by six percent.[10] Due to the COVID-19 pandemic, vehicle travel in Maryland dropped by as much as 47percent in April 2020 (as compared to vehicle travel during April 2019). By 2022, Maryland's overall VMT levels had rebounded to five percent below 2019's pre-pandemic levels.[11]

Transportation Funding in Maryland

Investment in Maryland's roads, highways and bridges is funded by local, state and federal governments. A lack of sufficient funding at all levels will make it difficult to adequately maintain and improve the state's existing transportation system.

Most federal funds for highway and transit improvements in Maryland are provided by federal highway user fees, largely an 18.4 cents-per-gallon tax on gasoline and a 24.4 cents-per-gallon tax on diesel fuel (additional revenue is generated by fees on the sale of large trucks, a highway use tax levied on vehicles in excess of 55,000 pounds and a tax on the sale of large truck tires).

Revenue from the motor fuel tax -- a critical source of transportation funding -- is likely to erode as a result of increasing vehicle fuel efficiency and the increasing use of electric vehicles. The average fuel efficiency of U.S. passenger vehicles increased from 20 miles per gallon in 2010 to 24.5 miles per gallon in 2020. Average fuel efficiency is expected to increase another 31 percent by 2030, to 32 miles per gallon, and increase 51 percent by 2040, to 37 miles per gallon.[12] The share of electric vehicles of total passenger vehicle sales in the U.S. is expected to increase to five percent by 2023 and 60 percent by 2040, by which time electric vehicles will represent approximately 30 percent of the passenger vehicle fleet.[13]

The level of highway investment in Maryland will increase as a result of the five-year federal Infrastructure Investment and Jobs Act (IIJA), signed into law in November 2021, which will provide $4.6 billion in road, highway and bridge funding from 2022 to 2026, resulting in a 36 percent increase in federal funding for Maryland in 2022.[14]

Maryland federal-aid eligible roads, bridges and highways include the most critical routes in the state, including the Interstate Highway System, major highways and important rural and urban routes. Federal-aid eligible roadways in Maryland account for 32 percent of state lane-miles and carry 89 percent of all vehicle miles of travel in the state.[15] Fifty-two percent of Maryland's bridges by count, and 84 percent of bridges measured by deck area are eligible for Federal aid.[16]

According to the Status of the Nation's Highways, Bridges, and Transit, 24th Edition, submitted to Congress by the United States Department of Transportation (USDOT) in 2021, the nation faces a $1 trillion backlog in needed repairs and improvements to the nation's roads, highways and bridges.[17] This backlog includes $556 billion for highway rehabilitation; $132 billion for bridge rehabilitation; $181 billion for system expansion and $143 billion for system enhancement.[18] The USDOT report found that the nation's current $107 billion annual investment in roads, highways and bridges by all levels of government should be increased by 55 percent to $166 billion annually to improve the conditions of roads, highways and bridges, relieve traffic congestion and improve traffic safety.[19]

The USDOT report also found that the nation faces a $105 billion backlog in needed repairs and improvements to its transit systems.[20] The USDOT report found that the nation's current $18.8 billion annual investment in transit repairs and improvements by all levels of government should be increased by 30 percent to $24.7 billion annually to improve the condition and expand the service of the nation's transit systems.[21]

Highway and bridge spending multiplies through the economy by stimulating additional output. A 2021 macroeconomic analysis by IHS Markit found that that every dollar spent on highway and bridge improvements results in $3.4 dollars in combined direct, indirect and induced output from industries throughout the economy, resulting in a multiplier for highway and bridge investment of 3.4.[22]

Traffic Congestion in Maryland

While traffic congestion is largely constrained to the state's urban areas, increasing congestion on Maryland's major highways and roads hampers the state's ability to support economic development and quality of life by reducing the reliability and efficiency of personal and commercial travel, including the transport of goods and services. Traffic congestion robs commuters of time and money and imposes increased costs on businesses, shippers and manufacturers, which are often passed along to consumers. Increased levels of congestion can also reduce the attractiveness of a location when a company is considering expansion or deciding where to locate a new facility.

Based on a 2021 report on urban mobility by the Texas Transportation Institute that analyzes urban traffic congestion levels and provides estimates on the amount of time and the value of lost time and wasted fuel as a result of traffic congestion, TRIP has estimated in the following chart the average number of hours lost annually for each driver, the per-driver cost of lost time and wasted fuel due to congestion and the average amount of fuel per driver wasted annually due to congestion in Maryland's largest urban areas.

Chart 1. Annual hours and fuel lost to congestion and congestion costs per driver.

Urban Area	Hours Lost to Congestion	Annual Cost Per Driver	Gallons of Fuel Wasted Per Driver
Baltimore	59	$1,371	22
Maryland DC Suburbs	99	$2,465	39

Source: TRIP estimate based on Texas Transportation Institute Analysis.

Congested roads, highways and bottlenecks choke commuting and commerce and cost Marylanders $5.8 billion in 2022 in the form of auto delay, truck delay, and wasted fuel and emissions.[23]

Traffic congestion significantly reduces access to jobs and employees. In a 2020 report, (data was collected prior to the onset of the COVID-19 pandemic) the Center for Transportation Studies at the University of Minnesota analyzed accessibility to jobs in private vehicles in the largest 50 urban areas in the U.S. The report found that of the approximately 1.9 million jobs accessible within a one-hour drive to a resident of the Baltimore metro area, only 51 percent are accessible within 40 minutes. Of the approximately 2.6 million jobs accessible within a one-hour drive to a resident of the Washington, DC metro area, only 45 percent are accessible within a 30-minute drive.[24]

The Center for Transportation Studies report also looked at the impact of traffic congestion on reducing accessibility to employment by comparing travel times during peak hours versus non-peak hours. The report found that the number of jobs accessible within 40 minutes during peak commuting times in the Baltimore and Washington, DC metro areas was reduced by 46 and 52 percent, respectively, as a result of traffic congestion.[25]

Chart 2. Transportation Reliability Impact on Accessibility to Employment.

Location	Jobs Reachable by Auto Within 60 Minutes	Percent of Jobs Reachable by Auto Within 40 Minutes	Percent Reduction of Jobs Reachable by Auto Within 40 Min. Due to Congestion
Baltimore	1,867,890	51%	46%
Washington, DC	2,603,119	45%	52%

Source: Center for Transportation Studies.

The Center for Transportation Studies also examined job accessibility by public transit and by bicycles in the nation's largest urban areas. Bicycle access is classified by the level of safety provided to bicyclist in a corridor, based on a route's characteristics including the presence of bike lanes, street lane configurations and prevailing traffic speeds.[26]

The reports found that in 2020 (pre COVID-19 pandemic) in the Baltimore and Washington, DC urban areas 111,972 and 310,582 jobs were accessible within a one-hour transit trip, respectively. In the Baltimore and Washington, DC urban areas 41,307 and 46,516 jobs were accessible within one hour by travel on a low-stress bicycle network and 90,214 and 193,483 jobs were accessible within one hour by travel on a low or medium-stress bicycle network, respectively.[27]

Chart 3. Employment Accessibility by Transit and Bicycle in Maryland's Largest Urban Areas (2020).

Location	Jobs Reachable by Transit Within 60 Minutes	Jobs Reachable by Low-Stress Bicycle Within 60 Minutes	Jobs Reachable by Low and Medium-Stress Bicycle Within 60 Minutes
Baltimore	111,973	41,307	90,214
Washington, DC	310,582	46,516	193,483

Source: Center for Transportation Studies, University of Minnesota.

In its 2021 annual mobility report, MDOT SHA ranked the state's most congested sections of highways and most congested sections of arterial (non-freeway) roadways. Traffic congestion on these routes reduces significantly the reliability of travel times in these corridors.

The following chart shows the most congested portions of Maryland highways during weekday AM and PM peak travel hours.

Chart 4. Most Congested Sections of Maryland Highways During AM and PM Peak Travel Hours.

Rank	AM Most Congested Highway Sections		PM Most Congested Highway Sections	
	Route	Miles	Route	Miles
1	I-495 Outer Loop - PG Co. Line to MD 97	4	I-495 Inner Loop - I-270 East Spur to MD 97	3.4
2	I-695 Outer Loop- MD 43 to Cromwell Bridge Rd.	3	I-695 Inner Loop - MD 139 to Providence Rd	3.7
3	I-695 Outer Loop - MD 122 to MD 144	3	MD 295 NB - MD 410 to MD 193	3.1
4	I-270 Local SB - I-370 to MD 189	3	I-895 NB - Frankfurst Ave. to Holabird Ave.	3.2
5	I-270 SB - Shady Grove Rd. to MD 189	3	I-695 Inner Loop - I-95 to US 40	3.5
6	US 50 Westbound - MD 410 to DC Line	4	MD 295 SB - MD 175 to MD 198	4.0
7	I-695 Inner Loop - Stevenson Rd. to I-83	3	I-270 Local NB - I-370 to Watkins Mill Road	2.9
8	I-895 NB - Frankfurst Ave. to Holabird Ave.	3	I-95/I-495 Inner Loop - I-95 to MD 295	3.2
9	MD 295 SB - MD 198 to Powder Mill Rd.	6	MD 295 NB - MD 198 to MD 175	4.1
10	I-95 SB - South of MD 200 to I-495	3	I-95/I-495 Outer Loop - MD 450 to MD 201	3.5
11	MD 295 SB - MD 193 to MD 410	3	I-270 NB - MD 121 to MD 109	4.1
12	I-270 SB - MD 80 to MD 109	4	I-95 NB - MD 2 to Fort McHenry Tunnel East	3.0
13	I-495 Outer Loop - MD 187 to MD 190	3	I-495 Inner Loop - VA Line to I-270 West Spur	3.9
14	I-95/I-495 Inner Loop - MD 414 to I-295	3	I-895 SB - MD 150 to Harbor Tunnel West	3.3
15	I-95/I-495 Inner Loop - I-95 to MD 295	4	I-270 NB - MD 189 to I-370	3.2

Source: Maryland Department of Transportation State Highway Administration.

The following chart lists the most congested portions of Maryland arterial (non-highway) roadways during weekday AM and PM peak travel hours.

Chart 5. Most Congested Sections of Maryland Arterial Roadways During AM and PM Peak Travel Hours.

Rank	AM Most Congested Arterial Road Sections		PM Most Congested Arterial Roads Sections	
	Route	Miles	Route	Miles
1	MD 28 WB - W. Gude Rd. to Muddy Branch Rd.	2.1	US 301 SB - MD 381 to McKendree Rd/Cedarville Rd.	2.6
2	MD 410 WB - MD 650 to MD 390	2.9	MD 193 EB - I-495 to MD 650	2.0
3	MD 185 SB - I-495 to MD 191	2.1	MD 26 WB - Washington Ave. to Brenbrook Dr.	2.0
4	US 301 SB - Short Cut Rd. to Charles Co. Line	2.2	MD 177 WB - MD 100 to Catherine Ave.	2.0
5	MD 177 EB - Catherine Ave. to Schmidts Ln.	2.3	MD 26 EB - Brenbrook Dr. to I-695	2.2
6	MD 355 NB - Beach Dr./Grosvenor Ln. to Montrose Pkwy	2.1	MD 140 EB - Owings Mills Blvd. to McDonogh Rd./Craddock Ln.	2.1
7	MD 2 NB - College Parkway to Robinson Rd.	2.5	MD 650 SB - US 29 to Adelphi Rd.	2.3
8	MD 28 EB - Baltimore Rd. to MD 97	2.3	MD 177 EB - Waterford Rd. to MD 607	2.2
9	MD 424 SB - MD 3 to MD 450	2.4	MD 2 NB - College Pkwy. to Robinson Rd./Leelyn Dr.	2.5
10	MD 2 SB - MD 665 to Mayo Rd.	2.6	MD 30 NB - MD 30 Business (North) to MD 27	2.4
11	MD 97 SB - MD 586 to MD 390	2.0	MD 140 WB - Craddock Ln./McDonogh Rd. to Owings Mills Blvd	2.1
12	MD 108 WB - MD 182 to Bowie Mill Rd.	2.3	MD 212 NB - MD 410 to Adelphi Rd.	2.5
13	MD 2 SB - MD 10 to Robinson Rd.	2.9	MD 355 SB - Montrose Pkwy. to Beach Dr./ Grosvenor Ln.	2.3
14	MD 410 WB - Riverdale Rd. to US 1	2.2	MD 355 SB - Plummer Dr. to Odendhal Dr.	2.3
15	MD 97 NB - MD 390 to MD 586	2.0	MD 500 EB - DC Line to MD 410	2.1

Source: Maryland Department of Transportation State Highway Administration.

Traffic Bottlenecks in Maryland

When a portion of a highway or signalized arterial roadway experience a significant reduction in travel speeds, they are deemed bottlenecks. Often these bottlenecks form at interchanges or intersections and the resulting delays spread to adjacent roadway segments. Based on the volume of traffic, traffic speed and the extent and length of the delay, the following chart ranks the worst highway bottlenecks in Maryland.[28]

Chart 6. Top Maryland Highway Bottlenecks.

Rank	Top Highway Bottlenecks	Average Length (Mi.)
1	MD 295 Northbound at Powder Mill Rd.	3
2	US 50 Westbound at William Preston Lane Bridge	4
3	I-895 Northbound at Harbor Tunnel Thruway	2
4	I-270 Northbound at MD 109/Exit 22	6
5	I-270 Northbound at MD 85/Exit 31	8
6	MD 295 Southbound at MD 198	3
7	US 50 Eastbound William Preston Lane Bridge	5
8	I-270 Southbound at MD 109/Exit 22	4
9	MD 295 Southbound at Riverdale Rd	3
10	I-495 Inner Loop at I-270 Spur	5
11	I-495 Inner Loop at MD 193/University Blvd	4
12	I-695 Inner Loop at MD 122/Security Blvd	3
13	I-495 Outer Loop at MD 193/University Blvd	2
14	I-495 Inner Loop at I-270	2
15	MD 295 Northbound at I-95/I-495	4
16	I-95 Southbound at MD 272	8
17	I-495 Northboudn at I-495/I-95/Capital Beltway	2
18	I-495 Outer Loop at MD 97/Georgia Ave	3
19	I-495 Inner Loop at I-295	3
20	I-270 Northbound at MD 117/W Diamond Ave	3

Source: Maryland Department of Transportation State Highway Administration.

When signalized intersections carry more traffic than they can efficiently accommodate, traffic operations degrade resulting in most motorists having to wait through more than one green light indication before being able to go through the intersection. The following list indicates the worst performing intersections in Maryland during morning and evening peak travel periods.[29]

Chart 7. Worst Performing Maryland Signalized Intersections During AM and PM Peak Travel Hours.

Rank	AM Most Congested Arterial Intersections	PM Most Congested Arterial Intersections
1	MD 4 at MD 337/Presidential Pkwy	MD 500 at MD 410/Adelphi Rd
2	MD 26 at Lord Baltimore Dr/ I-695 OL Off Ramp	US 301 at Cedarville Rd/McKendree Rd
3	US 29 at Rivers Edge Rd	MD 4 at FDR Blvd
4	MD 5 @ Surratts Rd	MD 500 at Eastern Ave
5	MD 210 at Livingston Rd/Kerby Hill Rd	MD 410 at MD 212
6	MD 2 at Tarragon Ln	MD 41 at Putty Hill Ave
7	MD 4 at Chaneyville Rd	MD 5 at MD 637 (Naylor Rd)
8	MD 108 at Old Baltimore Rd	MD 119 at I-370/Sam Eig Hwy
9	MD 410 at MD 212	US 1 at US 1AL/Hamilton St
10	MD 210 at Wilson Bridge Dr	MD 4 at MD 337/Presidential Pkwy
11	MD 4 at Dower House Rd	US 15 SB Ramps at Rosemont Ave/Schley Ave
12	MD 124 at Warfield Rd	MD 210 at Livingston Rd/Kerby Hill Rd
13	MD 450 at 48th Street	MD 414 at Ramp from I-95 WB
14	MD 355 at MD 911/Wootten Pkwy	MD 355 at Jones Bridge Rd/Center Dr
15	MD 193 at E. Franklin Ave/Franklin Ave	MD 2 at MD 4 (Sunderland)

Source: Maryland Department of Transportation State Highway Administration.

Freight Transportation in Maryland

Today's culture of business demands that an area has well-maintained and efficient roads, highways and bridges if it is to remain economically competitive. Global communications and the impact of free trade in North America and elsewhere have resulted in a significant increase in freight movement, making the quality of a region's transportation system, including its highways, railroads, air and maritime ports, a key component in a business's ability to compete locally, nationally and internationally.

Businesses have responded to improved communications and the need to cut costs with a variety of innovations including just-in-time delivery, increased small package delivery, demand-side inventory management and e-commerce. The result of these changes has been a significant improvement in logistics efficiency as firms move from a push-style distribution system, which relies on large-scale warehousing of materials, to a pull-style distribution system, which relies on smaller, more strategic movement of goods. These improvements have made mobile inventories the norm, resulting in the nation's trucks literally becoming rolling warehouses.

Highways are vitally important to continued economic development in Maryland. As the economy expands, creating more jobs and increasing consumer confidence, the demand for consumer and business products grows. In turn, manufacturers ship greater quantities of goods to market to meet this demand, a process that adds to truck traffic on the state's highways and major arterial roads.

The amount of freight transported in Maryland and the rest of the U.S. is expected to increase significantly as a result of economic growth, changing business and retail models, increasing international trade, and rapidly changing consumer expectations that place an emphasis on faster deliveries, often of smaller packages or payloads.

Annually, $403 billion worth of freight are shipped to or from sites in Maryland, an amount that is anticipated to grow by 73 percent in inflation-adjusted dollars by 2045. [30]

The following chart shows the five highway locations in Maryland carrying the largest number of large commercial trucks daily, and the five highway locations where the greatest share of overall traffic is made up of large commercial trucks.

Chart 8. Highest Maryland Truck Volume and Percentage Locations.

Rank	Highest Truck Volume		Highest Truck Percentage Locations	
	Route Location	Daily Trucks	Route Location	Percent
1	I-95 North of I-695	29,300	MD 159 – South of US 40	36%
2	I-95/I-495 North of US 50	23,200	I-81 South of PA Line	36%
3	I-81 North of I-70	20,600	I-81 South of US 11	32%
4	I-695 West of Greenspring Ave	18,200	US 522 N of I-70	31%
5	I-495 East of MD 185	16,200	MD 313 – South of US 301	30%

Source: Maryland Department of Transportation State Highway Administration.

The efficiency of freight movement in Maryland is threatened by traffic congestion, which reduces the reliability of goods movement to, from and through the state. The following chart details the highway segments in Maryland that provide the worst travel reliability for commercial trucks as a result of traffic congestion.

Chart 9. Least Reliable Highway Routes for Large Commercial Trucks Due to Traffic Congestion.

Rank	Least Reliable Routes for Large Commercial Trucks	Miles
1	US 50/US 301 WB - Chester Station Ln. to Bay Bridge	3.2
2	I-495 Outer Loop - I-95 to US 29	3.2
3	US 50 EB - Bay Dale Drive to Oceanic Drive	3.8
4	I-495 Inner Loop - MD 187 to MD 97	4.5
5	I-695 Outer Loop - MD 122 to MD 144	3.1
6	I-695 Outer Loop - MD 43 to Cromwell Bridge Rd	3.1
7	I-695 Inner Loop - MD 139 to Providence Road	3.3
8	I-95/ I-495 Inner Loop - MD 5 to Woodrow Wilson Bridge	5.6
9	I-895 SB - I-95 to Ponca Street	3.2
10	I-270 NB - Shady Grove Road to Watkins Mill Road	3.7
11	US 50 WB - MD 410 to Columbia Park Road	3.1
12	I-95/I-495 Inner Loop - I-95 to MD 201	3.2
13	I-95 NB - US 1 Alt to Ft McHenry Tunnel	3.2
14	I-270 West Spur SB - I-270 Split to I-495	1.7
15	I-270 SB - MD 80 to MD 109	3.8

Source: Maryland Department of Transportation State Highway Administration.

The ability of Maryland's and the nation's freight transportation system to accommodate the growing demand for freight movement efficiently and safely could be hampered by inadequate transportation capacity, a lack of adequate safety features on some transportation facilities, institutional barriers to enhancing the nation's freight facilities, a lack of adequate funding for needed improvements to the freight network, and a shortage of drivers.

The need to improve the U.S. freight network is occurring at a time when the nation's freight delivery system is being transformed by advances in vehicle autonomy, manufacturing, warehousing and supply chain automation, increasing e-commerce, and the growing logistic networks being developed by Amazon and other retail organizations in response to the demand for a faster and more responsive delivery and logistics cycle.

The Importance of Transportation to Economic Growth in Maryland

Investments in transportation improvements in Maryland play a critical role in the state's economy. A report by the American Road & Transportation Builders Association found that the design, construction and maintenance of transportation infrastructure supports the equivalent of approximately 78,000 full-time jobs across all sectors of the state economy, earning these workers approximately $3.5 billion annually.[31] These jobs include approximately 39,000 full-time jobs directly involved in transportation infrastructure construction and related activities. Spending by employees and companies in the transportation design and construction industry supports an additional 39,000 full-time jobs in Maryland.[32] Transportation construction in Maryland contributes an estimated $638 million annually in state and local income, corporate and unemployment insurance taxes and the federal payroll tax.[33]

Approximately one million full-time jobs in Maryland in key industries like tourism, retail sales, agriculture and manufacturing are dependent on the quality, safety and reliability of the state's transportation infrastructure network. These workers earn approximately $40 billion in wages and contribute an estimated $7.2 billion in state and local income, corporate and unemployment insurance taxes and the federal payroll tax.[34]

Local, regional and state economic performance is improved when a region's surface transportation system is expanded or repaired. This improvement comes as a result of the initial job creation and increased employment created over the long-term because of improved access, reduced transport costs and improved safety.

Increasingly, companies are looking at the quality of a region's transportation system when deciding where to re-locate or expand. Regions with congested or poorly maintained roads may see businesses relocate to areas with a smoother, more efficient and more modern transportation system. Highway access has a significant impact on the competitiveness of a region's economy. In a 2022 survey of corporate executives by Area Development Magazine, highway accessibility was ranked fifth out of 28 selection factors in choosing a location.[35]

Improving Transportation Safety, Resiliency and Efficiency

Recognizing that extreme weather, sea level change, and changes in environmental conditions may threaten the condition and longevity of the nation's transportation infrastructure, transportation agencies have begun to assess vulnerabilities and consider the resilience of their transportation assets during the transportation planning process. Transportation agencies across the country have begun to incorporate resilience in asset management plans, addressing resilience in project development and design and optimizing operations and maintenance practices.[36]

Based on the importance of maximizing the level and safety of mobility provided by its transportation system, transportation agencies are adopting Transportation Systems Management and Operations (TSMO) practices and incorporating improved resiliency into their transportation network. While a TSMO program does not eliminate the need for capacity expansions along some routes, it helps enhance the mobility of an existing corridor as much as possible.

A TSMO program adopts an integrated set of strategies to improve traffic flow and safety on a portion of a roadway, including work zone management, traffic incident management, freight management, traveler information, traffic signal coordination, ramp management, transit management and improved bicycle and pedestrian crossings.[37] The benefits of TSMO can include reduced traffic congestion, reduced fuel consumption and reduced emissions.

Progress in Relieving Traffic Congestion in Maryland

Using a combination of programs and projects, the MDOT SHA is addressing Maryland's traffic congestion and travel reliability challenges. These efforts include programs and projects aimed to improve the efficiency and expand the capacity of the state's transportation system and in 2020 were estimated to save the state approximately $1.2 billion in reduced delays, fuel consumption and emissions.

These programs include:

Incident management: In 2020 the state's Coordinated Highways Action Response Team (CHART) cleared approximately 35,000 traffic incidents and assisted approximately 35,000 stranded motorists.

Improved traffic signalization: In 2020, MDOT SHA re-timed 56 traffic signals and implemented smart/adaptive traffic signals that support real-time signal timing adjustments in seven additional corridors containing 66 signals, increasing the number of adaptive signal systems in operation statewide to 18, which is improving traffic flow.

Park and ride lots: MDOT SHA maintains more than 13,500 park and ride spaces at 107 locations in 20 counties to connect private vehicle commuters to transit.

HOV lanes: HOV lanes are provided on portions of I-270 and US 50 to increase the number of people able to travel through these corridors.

HOV lanes- Managed and Express Toll Lanes: Maryland added two managed or tolled facilities in 2014 to provide congestion relief. The 19-mile MD 200 (Intercounty Connector) provides tolled highway access (toll rates vary by time of day) from I-370 in Montgomery County to US 1 in Prince George's County. Express toll lanes were added on I-95 from south of I-895 in Baltimore City to north of MD 43 in Baltimore County, which provide motorists an alternative to the free, general-purpose lanes and which also carry transit vehicles for free.

Pedestrian and bike facilities: MDOT SHA provided an additional 9.6 miles of new sidewalks with 66 projects in 21 counties during 2020, and improved six directional miles for biker access, increasing the directional miles of marked bike facilities provided by MDOT to over 450.

Improved freight movement: Nineteen virtual weigh stations are in operation and design work has begun (presently on hold) for up to 20 additional truck parking spaces at the I-70 Welcome Center in Frederick County.

Additional capacity: MDOT SHA continues to provide additional roadway capacity at a number of intersections and portions of roadways, including the following in 2020: MD 2/4 from Fox Run Boulevard to Commerce Lane; MD 32 from Main Street to Macbeth Way; MD 180 from Swallowtail Drive to US 15/340 ramps; MD 22 from Prospect Mill Road to MD 136; I-270 and Watkins Mill Road; MD 97 at Randolph Road; I-81 from Potomac River Bridge to MD 63; US 113 from MD 365 to North of Five Mile Branch; US 50 at MD 589 and MD 346 from US 113 to Healthway Drive.

Conclusion

As Maryland emerges from the COVID-19 pandemic it will be critical that the state can provide a reliable 21st-century transportation system that can accommodate the mobility demands of a modern society.

Maryland continues to make progress in providing transportation improvements that are improving the reliability of the state's most heavily traveled roads and highways. The return of vehicle travel in Maryland to near pre-COVID levels is an encouraging sign that the state is rebounding from the pandemic. But, with the heaviest traveled major urban roadways in the country, the second-longest average commute in the nation, and as home to two of the country's most heavily congested urban areas, it is critical that Maryland is able to make the transportation improvements necessary to improve reliable access, which is vital to the state's residents, businesses and visitors.

# # #

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