2 PURPOSE AND NEED

2.1 PURPOSE OF THE BAY CROSSING STUDY

The Chesapeake Bay Crossing Study: Tier 1 NEPA considers corridors for providing additional capacity and access across the Chesapeake Bay in order to improve mobility, travel reliability and safety at the existing Bay Bridge. The Tier 1 NEPA Study will evaluate potential new corridor alternatives through the assessment of existing and potentially expanded transportation infrastructure needed to support additional capacity, improve travel times, and accommodate maintenance activities, while considering financial viability and environmental responsibility.

Public and agency input was considered in the scoping phase of the study to help inform the Purpose and Need. More detailed information on the public and agency involvement activities and comments received throughout the Tier 1 Study is in **Chapter 6**, "Coordination"**.**

This chapter is a summary of the ***Bay Crossing Study Purpose and Need*** document.

2.2 NEEDS

The following three primary needs have been identified for the Tier 1 NEPA Study and are the basis for evaluating corridor alternatives: adequate capacity; dependable and reliable travel times; and flexibility to support maintenance and incident management in a safe manner. Recognizing the importance of the resources involved and the magnitude of possible solutions, other elements considered include the financial viability and environmental responsibility of any solutions proposed to address the study needs.

2.2.1 Adequate Capacity

At present, the MDTA is responsible for the four-mile long, dual-span Bay Bridge and its approach roadways. US 50/US 301 is classified as an urban freeway/expressway with three lanes in each direction at both approaches to the Bay Bridge. For eastbound travelers in Anne Arundel County, there is an eleven-lane wide toll plaza, where all lanes are electronic toll collection (ETC) enabled (three lanes were designated as ETC only in 2018). There are no tolls for westbound travelers.

The Bay Bridge typically carries three lanes of westbound traffic except during periods of heavy eastbound travel when one westbound lane is reversed to provide a third eastbound lane. This reverse travel flow condition is called "contra-flow operation". The eastbound travel lane widths are 12 feet five inches and the westbound travel lanes are 12 feet wide. There are less than two feet of offset on the outside of the travel lanes in each direction.

The existing two spans of the Bay Bridge carry increasing volumes of travelers that frequently approach or exceed its capacity for long durations. These increasing travel volumes, containing a high percentage of trucks during weekdays, correlate with increases in regional population and employment, and result in greater congestion. Queue lengths of up to four miles eastbound during summer weekend evenings have been observed during the study period. While the computed capacity of the Bay Bridge in either the eastbound or westbound direction is up to approximately 4,900 vehicles per hour (vph), queues have been observed to begin forming at demand levels at or less than 3,900 vph. The reported capacity of the eastbound toll plaza is 9,900 vph. Queues begin to develop when traffic volumes approach or exceed capacity; therefore, the bridge itself is the constraining factor to travel flow.

To illustrate the historical increase of travel volumes at the Bay Bridge, **Figure 2-1** and **Table 2-1** present the annual number of vehicle trips across the Bay Bridge. After 57 years of consistent growth between 1953 and 2007, the annual number of vehicles crossing the bridge fluctuated between 2008 and 2014, coinciding with the national economic recession. A minimum of two percent annual growth in the number of vehicles crossing the bridge was reported in 2015 and 2016, with the greatest number of reported crossings occurring in 2016, which is over two and half times the number of crossings in 1980.

Figure 2-1: Annual Chesapeake Bay Bridge Volume

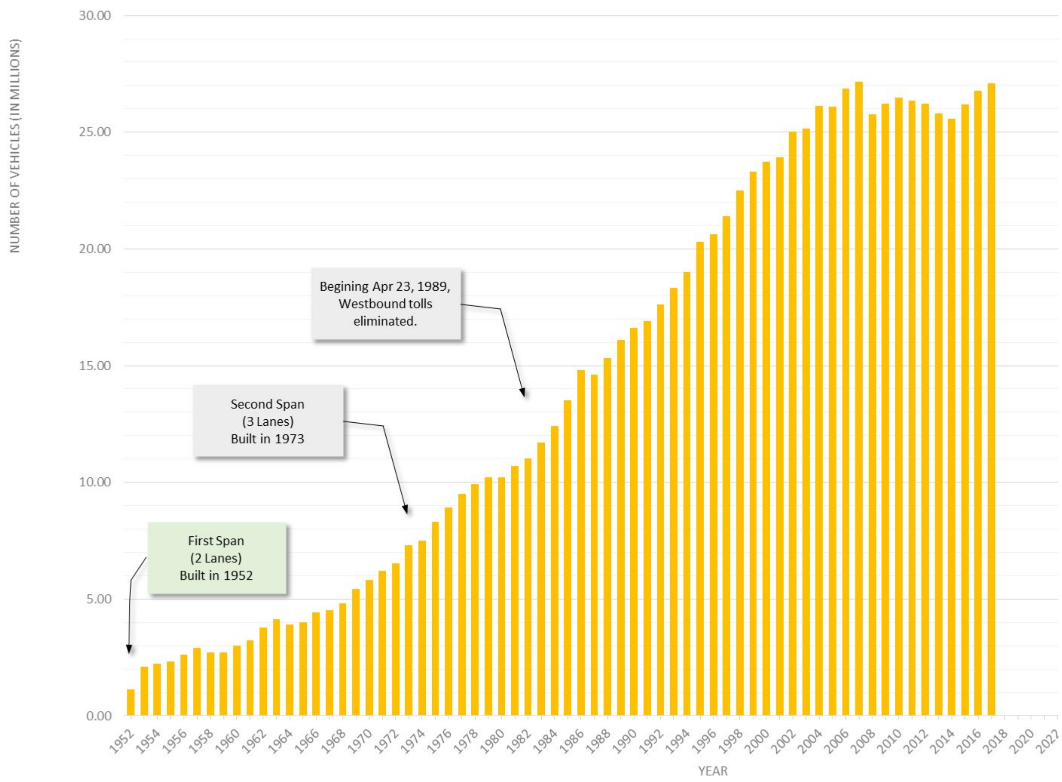


Table 2-1: Annual Number of Vehicle Trips across the Bay Bridge[1]

YEAR	NUMBER OF VEHICLES	ANNUAL GROWTH (%)
1953[2]	2,100,000	-
1974[3]	7,500,000	+6.2
1980[4]	10,323,300	+5.5
1985	13,686,400	+5.8
1990	16,078,600	+3.3
1995	20,410,800	+4.9
2000	23,867,600	+3.2
2005	26,066,100	+1.8
2006	26,855,600	+2.9
2007	27,140,600	+1.1
2008	25,740,950	-5.2
2009	26,184,950	+1.7
2010	26,449,700	+1.0
2011	26,344,950	-0.4
2012	26,193,150	-0.6
2013	25,788,700	-1.5
2014	25,544,900	-0.9
2015	26,173,400	+2.5
2016	26,696,100	+2.0

[1] Number of vehicles obtained by doubling the annual vehicle counts in the EB direction
[2] 1953 is the year after the first Bay Bridge span opened to traffic.
[3] 1974 is the year after the second Bay Bridge span opened to traffic.
[4] Five-year increments are shown between 1980 to 2005 due to steady annual growth during this period of time (see Figure 2-1, below). Annual growth shown reflects the annual growth between each of these entries, not the 5-year growth.

As a comparison to the growth in trips across the Bay Bridge, **Table 2-2** presents the historic population growth in Maryland.

Table 2-2: Population in the State of Maryland

YEAR	POPULATION (IN MILLIONS)	DIFFERENCE
1952 (original span of Bay Bridge opens)	2.5	-
1973 (second span of Bay Bridge opens)	4.1	1.6 times
1980	4.2	1.0 times
2016	6.0	1.4 times

Source: US Census Bureau

The growth in the State population between 1980 and 2016 was less than the growth in the number of crossings during the same period (1.4 times versus 2.5 times). Moreover, the growth in the State population since the second span was opened is approaching the growth that occurred between the opening of the original and second spans (1.4 times versus 1.6 times).

Increasing travel demand at the crossing has resulted in growing congestion and vehicle queues at the Bay Bridge. These congested conditions at the bridge, which can last up to four hours during an average weekday evening and up to 11 hours through a summer weekend afternoon and evening, are expected to worsen by the planning horizon year of 2040 due to anticipated regional growth in population and employment from the Baltimore Metropolitan Council (BMC) land use model Round 8b and Metropolitan Washington Council of Governments (MWCOG) land use model Round 9.0 as shown in **Figure 2-2**.

This anticipated growth will increase demand for trips across the Bay during the average weekday, as well as during summer months and weekends, as tourists and recreationists make their way east to points such as Ocean City and the Delaware beaches.

The ability of the Bay Bridge to support this growing volume of vehicle demand is further impacted by the amount of trucks in the vehicle mix. Trucks occupy a larger amount of space and do not accelerate as quickly as smaller vehicles at toll booths and along climbing grades. The current weekday percentage of trucks crossing the Bay Bridge is shown in **Table 2-3**. Bridge capacity is further negatively impacted because the weekday average percentage of trucks on the Bridge, 13.5 percent, far exceeds the Maryland Statewide average of five percent for other similar type roadways (i.e., urban freeway expressways) and carries a substantial percentage of trucks as compared to other major waterway crossings in the State as shown in **Table 2-4**.

Table 2-3: Percentage of Trucks within Weekday Vehicle Mix on the Bay Bridge

YEAR	PERCENTAGE OF TRUCKS
2013	15.5%
2014	15.5%
2015	13.5%
2016	13.5%

Source: Maryland Department of Transportation State Highway Administration (MDOT SHA) Truck Volume Maps

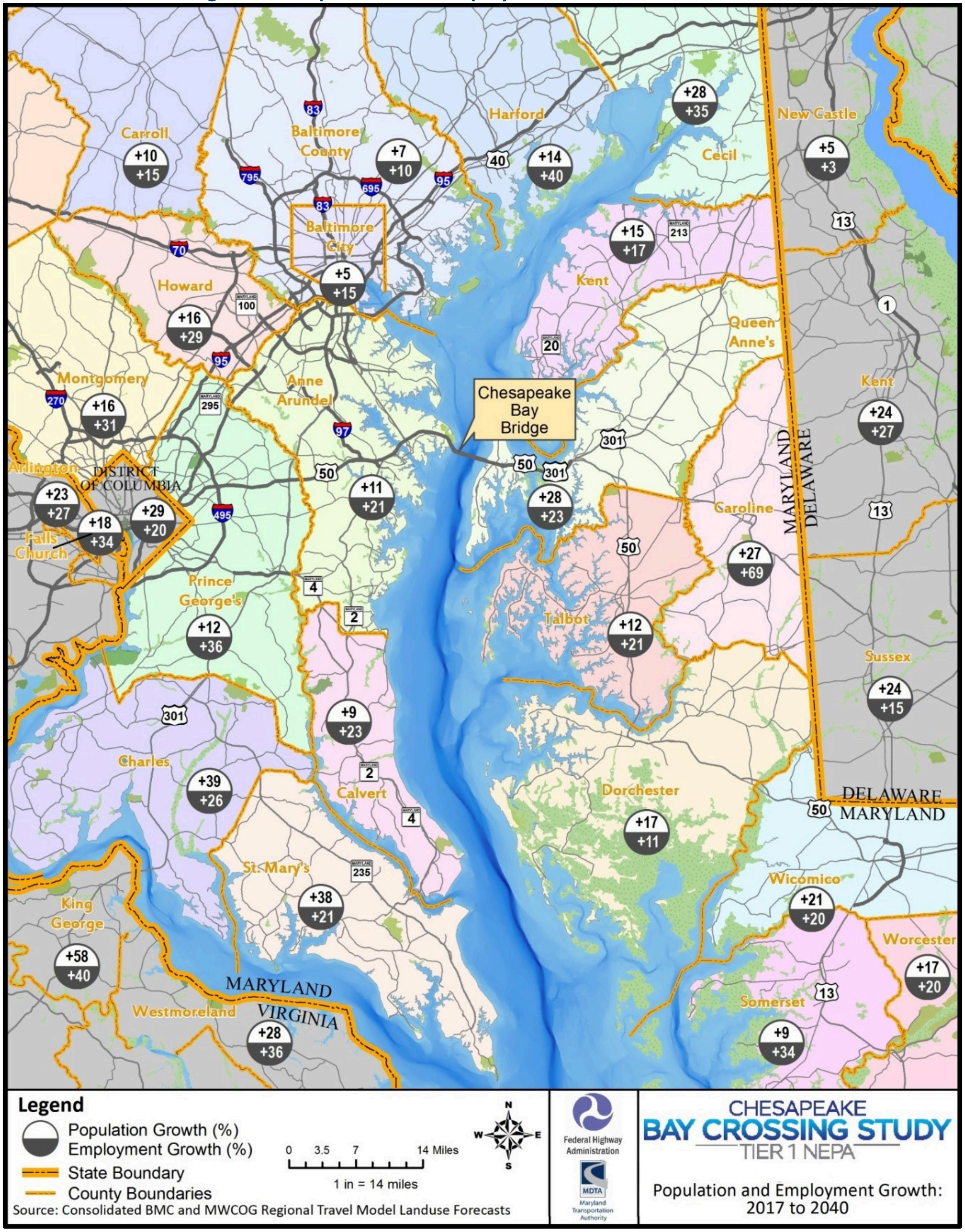
Table 2-4: 2016 Reported Weekday Percentage of Trucks at Maryland Waterway Crossings

FACILITY	ROUTE NO.	ROAD CLASSIFICATION	AADT	TRUCK %	STATEWIDE AVG TRUCK % *
Harbor Tunnel	I-895	Urban Interstate	72,000	5.3 %	5.0%
Hatem Bridge	US 40	Urban Other Principal Arterial	28,000	6.6%	5.0%
Nice Bridge	US 301	Rural Other Principal Arterial	19,000	10.9%	5.0%
Bay Bridge	US 50	Urban Freeway Expressway	73,000	13.5%	5.0%
Ft. McHenry Tunnel	I-95	Urban Interstate	107,000	14.4%	5.0%
Key Bridge	I-695	Urban Interstate	98,000	14.5%	5.0%
Tydings Bridge	I-95	Rural Interstate	85,000	20.1%	5.0%

** For Urban Freeway Expressways*

Source: Maryland Department of Transportation State Highway Administration (MDOT SHA) Truck Volume Maps

Figure 2-2: Population and Employment Growth: 2017 to 2040



2.1.1.1 Travel Demand Origins and Destinations

The capacity provided by the Bay Bridge supports travel demand for both local trips (e.g., work related and discretionary trips) with origins and destinations (O-D) relatively close to the shores, and regional trips (e.g., commerce, recreation, regional travel) with O-Ds throughout and beyond Maryland. Current travel patterns are observed from origin-destination surveys of trips crossing the Bay Bridge conducted between June and August 2016 and 2017, and October and May 2016 and 2017, as reflected in **Figure 2-3** and **Figure 2-4**.

The data provides that a "trip" ends when a vehicle remains stopped for 5 minutes. Accordingly, some actual trips may be longer than shown in this O-D data. For example, if a vehicle is going from Baltimore to Ocean City and makes an intermediate stop for longer than five minutes, then its intermediate-stop becomes its trip-end. When the vehicle starts moving again, it will begin a new trip. However, the data does not create such stops on highways, so extreme delays due to congestion (or toll booths) will not break up trips.

During a non-summer weekday, 60 to 67 percent of the trips crossing the Bay Bridge are between points near either the western or eastern ends of the existing bridge, as shown in **Table 2-5**, which are typical destinations of local or commuter trips. During summer weekends, as reflected by travel on a summer Sunday, there is a higher percentage of trip destinations beyond the western and eastern ends of the bridge (42 to 50 percent) as compared to weekday trips (32 to 39 percent), which are more characteristic of regional or recreational trips. As the region's population and employment levels grow, the demand for all trip types will increase, requiring more travel capacity across the Bay.

Table 2-5: Origins and Destinations (Dest.) of Trips across the Bay Bridge

	NON-SUMMER WEEKDAY (TUESDAY THROUGH THURSDAY)				SUMMER SUNDAY			
	EB TRIP ORIGINS	EB TRIP DEST.	WB TRIP ORIGINS	WB TRIP DEST.	EB TRIP ORIGINS	EB TRIP DEST.	WB TRIP ORIGINS	WB TRIP DEST.
Near western end of the bridge[1]	62.7%			60.6%	57.5%			51.1%
Near eastern end of the bridge[2]		66.3%	67.4%			55.5%	49.9%	
Beyond vicinity of bridge	37.3%	33.7%	32.6%	39.4%	42.5%	44.5%	50.1%	48.9%

Note: EB = eastbound, WB = westbound
[1] Anne Arundel and Prince George's counties, MD; Washington, D.C.; Arlington and Alexandria VA
[2] Caroline, Queen Anne's and Talbot counties, MD

Figure 2-3: Non-Summer Average Weekday Travel across Bay Bridge

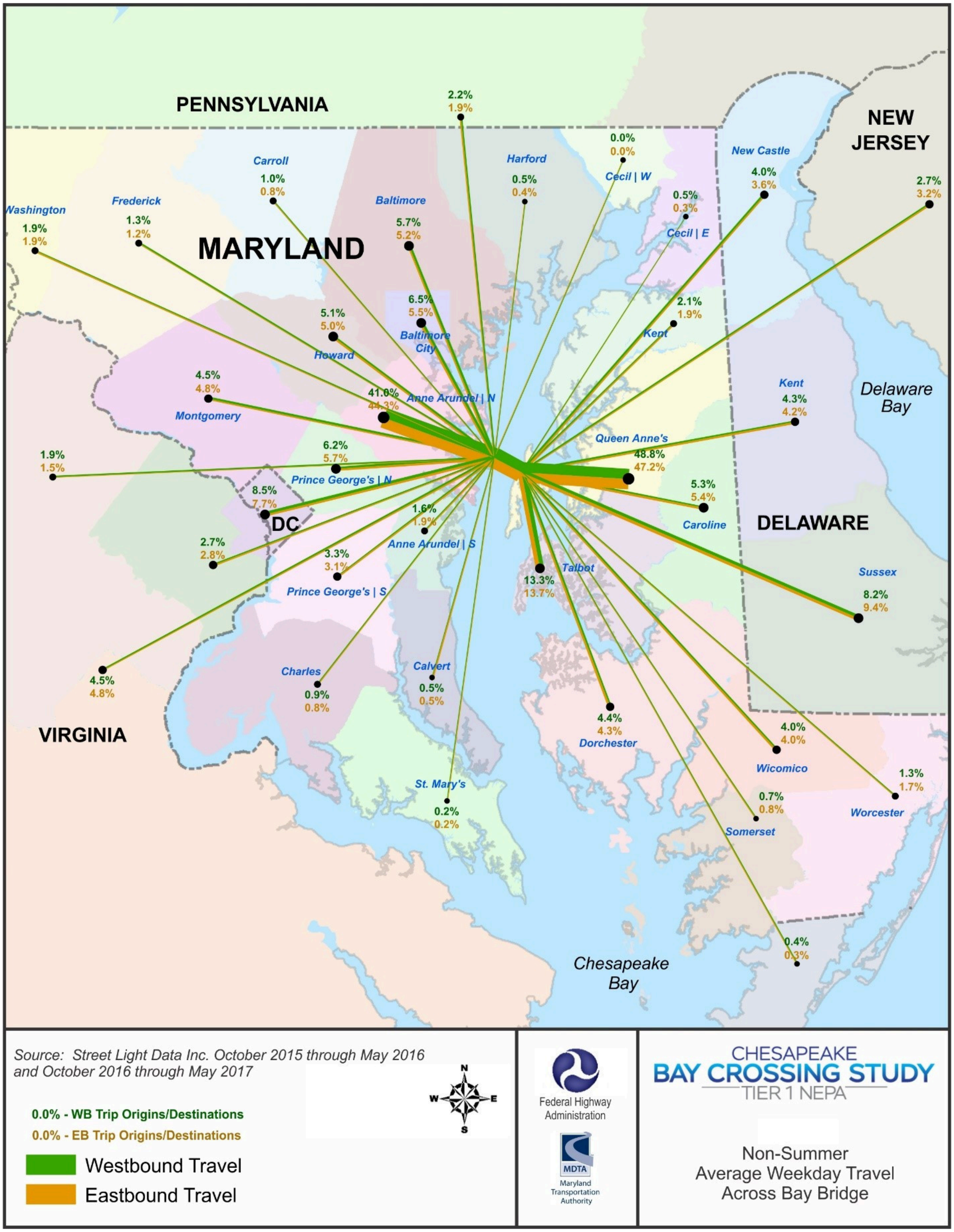
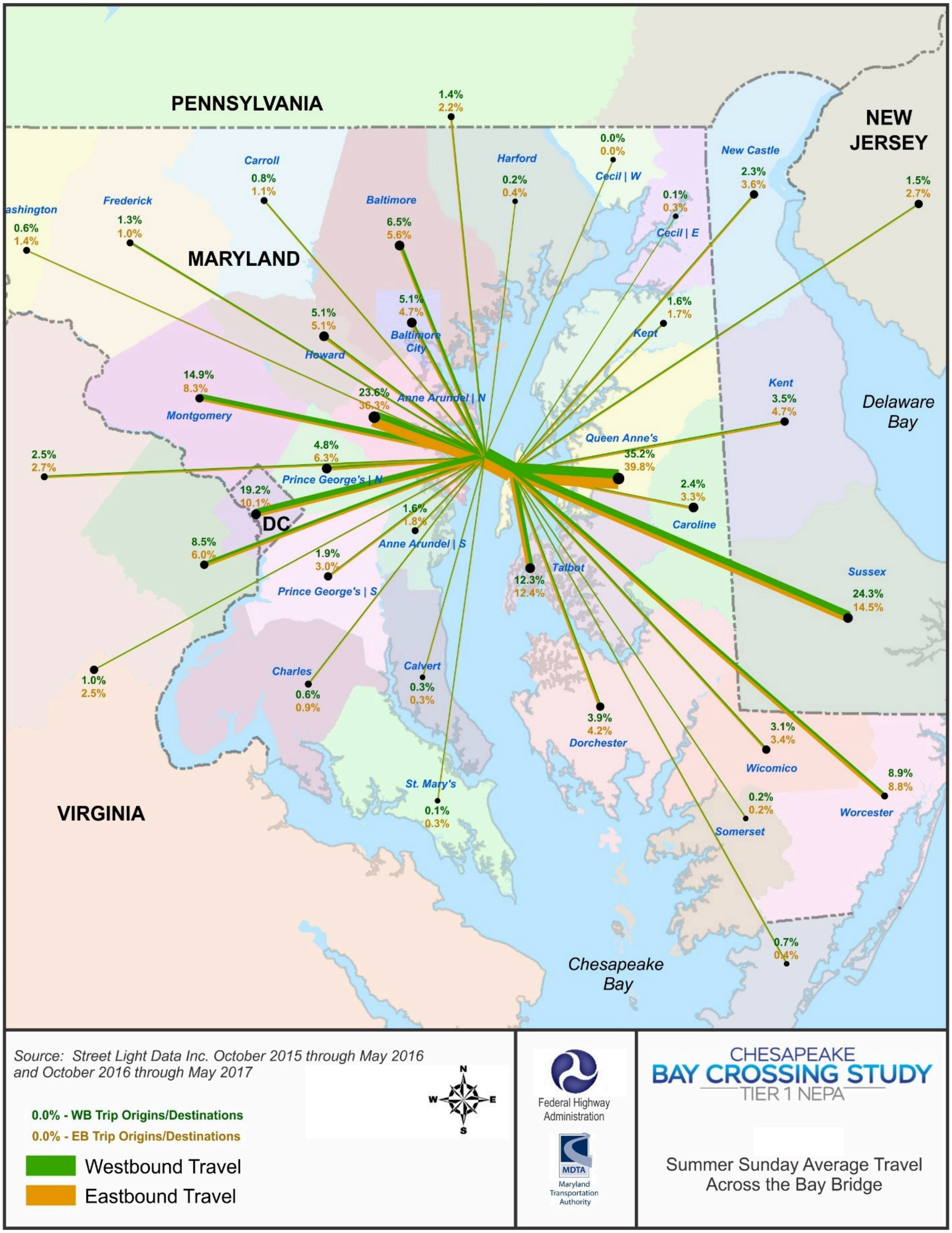


Figure 2-4: Summer Sunday Average Travel across the Bay Bridge



2.1.1.2 Travel Demand Volume

Table 2-6 presents the average daily travel volume at the Bay Bridge in 2017 and projected in the planning horizon year 2040 using the Maryland Statewide Travel Model. As shown in **Table 2-6**, the Bay Bridge is expected to carry nearly 14 to 23 percent more daily travel volume in 2040 as compared to current daily travel demand in 2017.

Table 2-6: Daily Trips across the Bay Bridge (vehicles per day)

	2017	2040 NO-BUILD	PERCENT CHANGE (%)
Average Weekday	68,598	84,276	22.9
Summer Weekend Day	118,579	135,280	14.1

Source: May and August 2017 counts and Maryland Statewide Travel Demand Model

Results from an analysis of the Peak Hour vehicle volumes for average weekdays and summer weekend days are summarized in **Table 2-7**. The Sunday afternoon volumes during the summer are very consistent between 12 PM and 10 PM. The shift in the peak hour reflected for 2017 and 2040 is a result of this steady flow condition. The results in **Table 2-7** show a projected increase of current peak hour traffic volumes ranging from 11.7 to 19.4 percent by 2040 – eastbound weekday and summer weekend peak hour increases are projected to be identical at 19.4 percent. The need for additional capacity is demonstrated by both the daily and peak hour projected travel volumes, which indicate a continuation of the historic trend of increases in travel demand at the Bay Bridge.

Table 2-7: Directional Peak Hour Volumes across the Bay Bridge (vehicles per hour)

	AVERAGE WEEKDAY		SUMMER WEEKEND DAY	
	EASTBOUND (5-6 PM)	WESTBOUND (7-8 AM)	EASTBOUND - FRIDAY (4-5 PM)	WESTBOUND - SUNDAY (12-1 PM IN 2017 4-5 PM IN 2040)
2017	3,395	3,448	4,299	4,170
2040 No-Build	4,055	4,009	5,133	4,658
Percent Change (%)	19.4	16.3	19.4	11.7

Source: May and August 2017 counts and Maryland Statewide Travel Demand Model

2.2.2 Dependable and Reliable Travel Times

Mobility across and around the Bay will continue to be reduced by the anticipated increase in population and employment in communities on both sides of the Chesapeake Bay (**Figure 2-2**), a nearly 20 percent increase in commuter travel, and increased tourism and recreational travel (**Table 2-6** and **Table 2-7**). Marylanders and visitors need dependable Chesapeake Bay crossing options with reliable operating speeds and travel times. Reliable crossing options support access to employment and recreation areas, as well as facilitate emergency services and evacuation events.

One method to describe how dependable travel flow is operating is "level of service" (LOS). The Highway Capacity Manual (HCM) 6th Edition (Transportation Research Board, 2016) defines LOS as, "A quantitative stratification of a performance measure or measures that represent quality of service, measured on an A-F scale, with LOS A representing the best operating conditions from the traveler's perspective and LOS F the worst." Usually a LOS D is regarded as the lowest acceptable operating condition in rural areas and

LOS E is regarded as the lowest acceptable operating condition in urban areas. A summary of the 2017 and projected 2040 no-build directional hourly LOS for both average weekday and summer weekend day conditions across the Bay Bridge using the Highway Capacity Software (HCS) is presented in **Table 2-8**.

During an average weekday in 2017, the hourly travel demand in one direction approaches the capacity of the Bay Bridge for three hours in the afternoon. Similarly, during summer weekends in 2017, the hourly travel demand approached or exceeded the bridge capacity in at least one direction for 10 hours. Under 2040 No-Build conditions, hourly travel demand is predicted to exceed the capacity of the Bay Bridge in at least one direction for five hours on an average weekday (as compared to three hours in 2017) and 12 hours on a summer weekend day (as compared to 10 hours in 2017).

Table 2-8: Hourly Levels of Service across the Bay Bridge

	2017				2040 NO-BUILD			
	AVERAGE WEEKDAY		SUMMER WEEKEND		AVERAGE WEEKDAY		SUMMER WEEKEND	
TIME	EB	WB	EB	WB**	EB	WB	EB	WB**
12-1AM	A	A	A	A	A	A	A	A
1-2AM	A	A	A	A	A	A	A	A
2-3AM	A	A	A	A	A	A	A	A
3-4AM	A	A	A	A	A	A	A	A
4-5AM	A	B	A	A	A	B	A	A
5-6AM	A	C	B	A	B	D	B	A
6-7AM	C	D	C	A	C	E	D	A
7-8AM	C	D	D	A	D	F	D*	A
8-9AM	C	D	C*	B	D	D	D*	B
9-10AM	C	C	D*	C	D	D	E*	C
10-11AM	D	B	E*	D	C*	D	F*	D
11AM-12PM	D	B	E*	D	C*	D	F*	D
12-1PM	D	B	E*	E	C*	D	F*	F
1-2PM	D	B	E*	E	D*	D	F*	E
2-3PM	D*	C	E*	D	E*	D	F*	E
3-4PM	E*	C	E*	E	F*	D	F*	E
4-5PM	E*	C	F*	E	F*	D	F*	F
5-6PM	E*	C	E*	E	F*	D	F*	F
6-7PM	D*	C	E*	E	E*	C	F*	E
7-8PM	C*	B	E*	E	D*	B	F*	F
8-9PM	C	A	D*	E	D	A	E*	F
9-10PM	C	A	C*	E	C	A	D*	F
10-11PM	B	A	D	D	B	A	D	D
11PM-12AM	A	A	B	B	B	A	C	B

Source: Calculations Based on May and August 2017 counts and Maryland Statewide Travel Demand Model
**Assuming contra-flow operation on the westbound bridge*
***Assuming 3 lanes in the Westbound Peak-Flow Direction, this never overlaps the Eastbound Peak-Flow*
Note: Highlighted values exceed LOS D.

The current summer weekend vehicle queues of up to four miles eastbound are projected to increase to nearly 13 miles in 2040. Similarly, in the westbound direction, the current two and a half mile queues are predicted to grow to over 10 miles during the summer weekend evenings in 2040. During average weekdays, current evening eastbound queues of up to one mile are expected to increase to five miles in 2040, while westbound morning queues over one mile long are expected to form by 2040.

The annual "State Highway Mobility Report" accounts for non-recurring events in trip reliability using the measurement of the Planning Time Index (PTI). Non-recurring events such as vehicle breakdowns, crashes, weather, and maintenance activities reduce usable capacity and affect the reliability of the facility and adds to the variability of trip times. The PTI represents the 95th percentile travel time for a section of the transportation network and is considered the total time travelers should allow for trips to assure on-time arrival at destinations. Statewide PTI are categorized as Reliable (PTI less than 1.5), Moderately Unreliable (PTI between 1.5 and 2.5) and Highly to Extremely Unreliable (PTI above 2.5).

The PTI for a trip along US 50/US 301 between the MD 2 interchange in Anne Arundel County and the US 50/US 301 split in Queen Anne's County for each travel direction was calculated for 2017 during average weekdays and Fridays and Sundays during the summer. **Table 2-9** and **Table 2-10** present the PTI findings. The highest PTI for an eastbound trip in 2017 occurs on a summer Friday between 6 PM and 7 PM with a measurement 5.80. The highest PTI for a 2017 westbound trip occurs on a summer Sunday between 3 PM and 4 PM with a measurement of 3.37.

The dependability and reliability of trip travel times across the Chesapeake Bay support the need for additional capacity given the following conditions at the existing crossing:

- expected growth in vehicle queue length and duration by 2040;
- predicted increase in the number of hours of unsatisfactory Level of Service by 2040; and
- current unreliability of the Bay Bridge as measured by the Planning Time Index.

Table 2-9: Planning Time Index for Eastbound Trips on US 50/US 301 between MD 2 and the US 50/US 301 Split

TIME OF DAY	2017 AVERAGE WEEKDAY (SEP. 2016 TO MAY 2017)	2017 SUMMER FRIDAY (JUN 2017 TO AUG 2017)	2017 SUMMER SUNDAY (JUN 2017 TO AUG 2017)
12-1AM	1.13	1.12	1.10
1-2AM	1.14	1.12	1.11
2-3AM	1.13	1.09	1.14
3-4AM	1.12	1.07	1.11
4-5AM	1.08	1.06	1.09
5-6AM	1.06	1.04	1.12
6-7AM	1.04	1.01	1.16
7-8AM	1.04	1.02	1.07
8-9AM	1.04	1.02	1.04
9-10AM	1.05	1.04	1.09
10-11AM	1.05	1.08	1.46
11AM-12PM	1.07	1.32	2.34
12-1PM	1.06	1.27	3.57
1-2PM	1.05	1.57	3.84
2-3PM	1.21	2.47	3.52
3-4PM	1.42	4.42	3.15
4-5PM	1.74	5.25	3.58

TIME OF DAY	2017 AVERAGE WEEKDAY (SEP. 2016 TO MAY 2017)	2017 SUMMER FRIDAY (JUN 2017 TO AUG 2017)	2017 SUMMER SUNDAY (JUN 2017 TO AUG 2017)
5-6PM	1.96	5.08	2.76
6-7PM	1.66	5.80	1.89
7-8PM	1.17	5.39	1.27
8-9PM	1.14	5.63	1.09
9-10PM	1.14	3.71	1.12
10-11PM	1.13	2.03	1.13
11PM-12AM	1.13	1.24	1.20

Source: RITIS Data (September 01, 2016 to May 31, 2017 for average weekday values and June 01, 2017 to August 31, 2017 for summer values). Note: Highlighted values exceed the threshold for moderately unreliable conditions

Table 2-10: Planning Time Index for Westbound Trips on US 50/US 301 between the US 50/US 301 Split and MD 2

TIME OF DAY	2017 AVERAGE WEEKDAY (SEP. 2016 TO MAY 2017)	2017 SUMMER FRIDAY (JUN 2017 TO AUG 2017)	2017 SUMMER SUNDAY (JUN 2017 TO AUG 2017)
12-1AM	1.08	1.13	1.20
1-2AM	1.07	1.10	1.11
2-3AM	1.07	1.11	1.11
3-4AM	1.06	1.07	1.09
4-5AM	1.03	1.07	1.07
5-6AM	1.00	0.99	1.11
6-7AM	1.00	0.98	1.14
7-8AM	1.08	1.01	1.05
8-9AM	1.14	1.04	1.05
9-10AM	1.05	1.04	1.05
10-11AM	1.04	1.22	1.06
11AM-12PM	1.06	1.41	1.28
12-1PM	1.06	1.74	1.63
1-2PM	1.06	1.56	1.91
2-3PM	1.06	1.51	2.65
3-4PM	1.05	1.60	3.37
4-5PM	1.06	1.32	3.36
5-6PM	1.07	1.26	3.28
6-7PM	1.08	1.28	3.23
7-8PM	1.08	1.13	3.32
8-9PM	1.10	1.10	2.93
9-10PM	1.13	1.09	3.44
10-11PM	1.08	1.08	2.45
11PM-12AM	1.08	1.09	1.57

Source: RITIS Data (September 01, 2016 to May 31, 2017 for average weekday values and June 01, 2017 to August 31, 2017 for summer values) Note: Highlighted values exceed the threshold for moderately unreliable conditions

2.2.3 Flexibility to Support Maintenance and Incident Management in a Safe Manner

As reported in the 2015 Bay Bridge Life Cycle Cost Analysis conducted by MDTA, the need for maintenance and rehabilitation activities will increase as the Bay Bridge ages. These activities, along with the incident management (i.e., crash response, debris removal) on the Bay Bridge, increase congestion, causing travelers to wait out the resulting delays due to the lack of nearby alternative detour routes. These conditions also put maintenance workers and incident responders at risk when performing their duties next to moving traffic. Additional capacity across the Bay is needed to maintain flexible options for safe travel during maintenance and for management of incidents on the Bay Bridge.

Structural analysis concludes that the existing spans of the Bay Bridge are currently in satisfactory condition and can provide functionality for the next 15-20 years with scheduled rehabilitation and maintenance (i.e., painting, deck rehabilitation, suspension span rehabilitation, traffic control device and electrical repairs). Beyond the Tier 1 Study horizon year of 2040, major superstructure and substructure rehabilitation/replacement work involving short- and long-term lane closures would be required to maintain fair condition of the bridges. Such rehabilitation work will cause a substantial impact to capacity and travel operations across the Bay. During maintenance work, as well as during incident management on the Bay Bridge, flexibility in crossing the Chesapeake Bay is needed to support any required lane closures or width/use restrictions (i.e., narrowed lane widths, vehicle width/weight prohibitions). Those restrictions, in turn, exacerbate congestion and negatively affect safety conditions.

The MDTA attempts to schedule maintenance activities during periods when they will have the least impact on travel operations. Many maintenance activities on the Bay Bridge occur during overnight hours when volumes are lowest. Lane closures (or bridge closures) are signed on the impacted roadways well in advance, in accordance with statewide standards for lane/roadway closures. In addition, the MDTA attempts to notify the public of upcoming maintenance activities through public announcements using various sources (i.e., traditional and social media, postings at toll booths, etc.).

During an incident, the MDTA uses state-of-the-art incident management techniques to detect, verify, respond to, and clear the incident. The primary goal is to save lives and address any injuries, while protecting the public and employees from any further injury. Once those issues have been addressed, clearing the incident to restore full capacity of the crossing is undertaken. The MDTA and the MDTA Police are active members of the Coordinated Highways Action Response Teams (CHART) program, which also includes the Maryland Department of Transportation State Highway Administration and the Maryland State Police. This program provides advanced notification to travelers of the incident and the related progress made in clearing the incident. The CHART Program also coordinates evacuations with Maryland and local government agencies, as well as agencies in other states for the use of the Bay Bridge during major weather events. Increased crossing capacity would provide resiliency in the network to better handle evacuations and major incidents requiring travel.

A total of 224 crashes were reported for US 50 from Oceanic Drive to MD 8 (Romancoke Road) between January 1, 2014 to December 31, 2016, as obtained at the onset of this study. The resulting 49.3 crashes per 100 million vehicle miles traveled (MVMT) is significantly higher than Maryland Statewide rate for urban freeway expressways (39.0 crashes per 100 MVMT). There was one fatal crash reported in 2016, while 62 of the crashes involved injuries. The 161 property damage crashes occurred at a rate of 35.4 crashes per 100 MVMT, which is significantly higher than the Maryland Statewide rate for urban freeway expressways (25.2 crashes per 100 MVMT). Property damage crashes typically result from lower speed incidents, which correlate to congested conditions. **Table 2-11** lists the most frequent probable causes of crashes as listed on police reports, and **Table 2-12** lists the types of crashes most frequently reported for this segment of US 50.

Rear-end, sideswipe and opposite direction type crashes occurred at a rate significantly higher than the Maryland Statewide rate for urban freeways/expressways. Rear-end type crashes are typically experienced during congested conditions. The rate of truck related crashes was 9.2 crashes per 100 MVMT, which is significantly higher than the Maryland Statewide rate for urban freeway expressways (4.5 crashes per 100 MVMT). This finding correlates to the high percentage of trucks in the weekday vehicle mix across the Bay Bridge.

Table 2-11: Most Frequent Reported Probable Causes of Crashes along US 50 from Oceanic Drive to MD 8 (Romancoke Road) (January 1, 2014 – December 31, 2016)

REPORTED PROBABLE CAUSE OF CRASH	NUMBER OF CRASHES	PERCENT (%) OF CRASHES
Other or Unknown	65	29
Failure to give Full Attention*	47	21
Too Fast for Conditions*	35	16
Followed too Closely*	33	15

Source: MDOT SHA Office of Traffic and Safety
**These causes relate closely with congested conditions.*

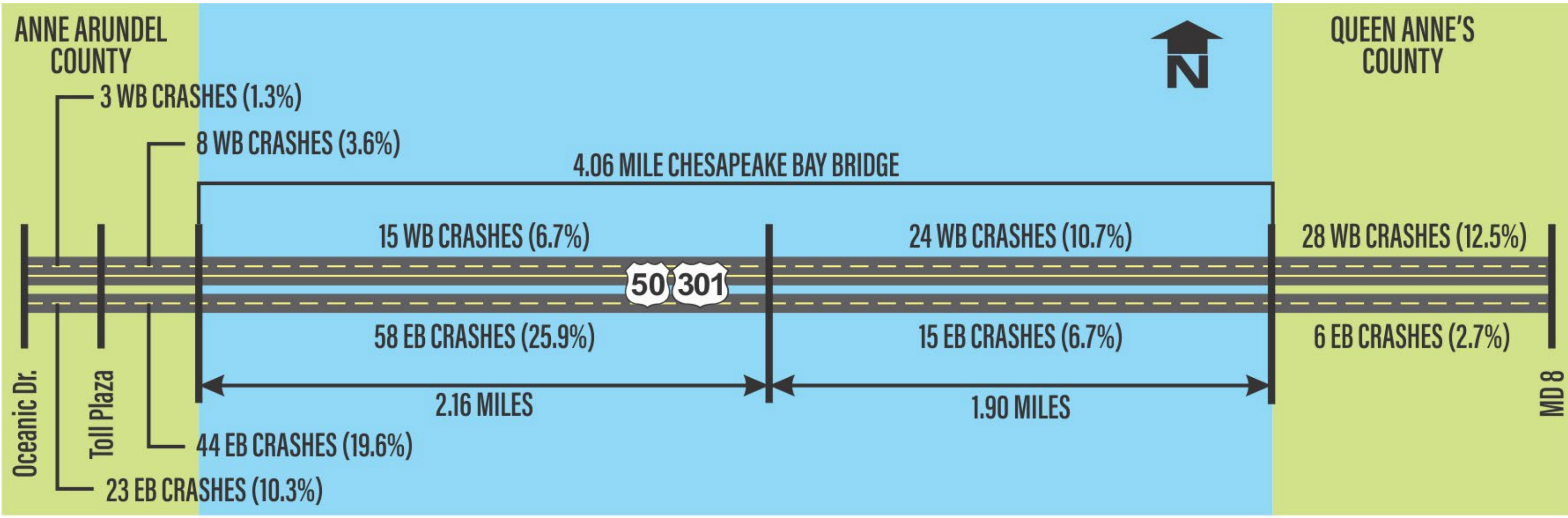
Table 2-12: Most Frequent Type of Reported Crash along US 50 from Oceanic Drive to MD 8 (Romancoke Road) (January 1, 2014 – December 31, 2016)

REPORTED TYPE OF CRASH	NUMBER OF CRASHES	PERCENT (%) OF CRASHES
Rear-End	139	62
Sideswipe	53	24
Other	15	7
Guardrail/Barrier	10	4
Opposite Direction	4	0.9

Source: MDOT SHA Office of Traffic and Safety

Figure 2-5 presents the location and direction of the reported crashes along the segment of US 50/US 301 between Oceanic Drive and MD 8 from 2014 through 2016. Of the 224 reported crashes in this segment, 112 or half occurred on the Bay Bridge itself. Almost two times more crashes were reported in the eastbound direction than in the westbound direction of travel (146 versus 78). The portion of this segment of US 50/US 301 west of the center of the Bay Bridge saw the majority of the total reported crashes (151 out of 224, or 67.4 percent). Most of the crashes occurring west of the center of the Bay Bridge were in the eastbound direction (125 out of 146, or 85.6 percent). This result may be related to the two-lane eastbound span versus the three-lane westbound span and the toll plaza on the eastbound approach to the bridge. It is noted that 162 or 72.3 percent of the reported crashes occurred between 11 AM and 8 PM, with the peak of 27 crashes being reported in the 3 PM timeframe. Approximately 41 percent of the crashes occurred in the months of June, July and August and 55 percent were reported on Friday, Saturday and Sunday. Twenty seven percent of the crashes were reported on a Friday, Saturday or Sunday in June, July and August.

Figure 2-5: Crash Experience in Vicinity of the Bay Bridge (2014 Through 2016)



As shown from recent crash history in the vicinity of the Bay Bridge, and the Life Cycle Analysis of the Bay Bridge structures, additional capacity is needed across the Chesapeake Bay to provide travelers alternate routes to avoid crash-related delays. There is also an expected increase in frequency of maintenance and rehabilitation activities as the Bay Bridge ages, which will require additional short- and long- term lane closures on the Bridge in the future and exacerbate congestion. As documented in previous studies, the lack of roadside shoulders or buffer areas results in the loss of a lane or roadway closures during incident management activities, which impacts the vehicular capacity of the Bridge. This supports the need for additional capacity across the Bay, in order to maintain flexible options for safe travel during maintenance and for management of other incidents on the Bay Bridge.

2.3 Financial Viability

Providing additional capacity across the Chesapeake Bay, as well as improvements to existing facilities, must be financially viable. In order to assess potential additional crossing corridor alternatives, it is necessary to consider the means to pay for the development, operation and maintenance of the facilities. As an independent State agency, the MDTA does not receive funding from tax dollars, the General Fund or the Maryland Transportation Trust Fund. The MDTA will explore potential funding strategies for any potential Bay Crossing improvements, which must be deemed financially viable (i.e., ability to pay for the development, operation and maintenance of such facilities).

The level of financial viability analysis conducted for this study of corridor alternatives cannot be as detailed as that undertaken during a Tier 2 study. This Tier 1 NEPA Study will not define the specific construction actions to be evaluated in a Tier 2 study, yet some level of cost estimating was conducted for each corridor alternative based on, among other factors:

- future navigational channel planning;
- the potential amount of new or upgraded approach transportation network facilities that may be required;
- the range of structure lengths required to cross the Bay (if appropriate);
- the type of structure crossing the Bay (if appropriate);
- the theoretical capacity of the Bay Crossing;
- an order of magnitude of impacts; and
- the anticipated operating and maintenance costs associated with the crossing improvements (i.e., amount of infrastructure required).

2.4 Environmental Responsibility

The MDTA recognizes that the Chesapeake Bay is a critical environmental resource in Maryland. Any Bay Crossing improvements must consider the sensitivity of the Bay, including existing environmental conditions, and the potential for adverse impacts to the Bay and the important natural, recreational, socioeconomic and cultural resources it supports. As noted previously, this tiered NEPA study has analyzed the full range of engineering and environmental issues at a level of detail appropriate for a Tier 1 Study. Additional detail will be included in Tier 2. Impacts, including those to environmental resources to be discussed include, but are not limited to:

- natural resources (e.g., floodplain, wetlands, water quality, flora, fauna, prime farmland);
- cultural resources (e.g., archeology, historic properties);
- socioeconomics (e.g., land use compatibility, environmental justice, economics);
- air quality;
- noise;
- hazardous materials; and
- indirect and cumulative effects.

Consistent with State priorities, all counties neighboring the Bay have planning documents with goals that address resource protection, growth and development. Preservation of natural resources, including forests, steep slopes, wetlands, floodplains, watersheds, and waterways is a high priority as evident in programs (e.g., Chesapeake Bay Critical Area, Heritage Areas, Open Space, Priority Preservation Areas) that limit and control development. Maryland State legislation and local land use planning processes guide development patterns throughout each county by structuring projects around designated growth areas where planned growth is suitable, while preserving the low-density development and rural areas, and limiting sprawl development.

During Tier 2, the MDTA will take into account the Bay and the communities dependent upon it during the study to identify the effects of any potential corridor alternative on natural environmental, cultural and community resources. MDTA will also take into consideration the potential beneficial and adverse effects to regional economic activities, such as the recreational and tourism industries. Potential corridor alternatives will be evaluated for their ability to support planned economic development. Local land uses, existing and planned development patterns, and economics will be critical elements of the corridor evaluation.

2.5 SUMMARY

Congestion currently experienced at the Bay Bridge during weekdays and summer weekends is due to increasing travel demands and the inadequate capacity of the existing Bridge and its approach roadways. Adding to the congestion problem is a need for increased rehabilitation and maintenance efforts in future years, which will require lane closures and result in further back-ups and delays. The region needs a dependable Bay crossing that provides reliable operating speeds and travel times; facilitates emergency services and evacuation events; allows access to employment and recreation areas; and offers flexible options for safe travel during rehabilitation, maintenance and incident management on the existing Bridge. Therefore, in an effort to improve mobility, travel reliability and safety at the existing Bay Bridge, the purpose of the Bay Crossing Tier 1 NEPA Study is to consider corridors for providing additional capacity and access across the Bay in order to improve mobility, travel reliability and safety at the existing Bay Bridge. After extensive vetting, including public input, the MDTA, the Federal Highway Administration and the Bay Crossing Study cooperating agencies have concurred on the Purpose and Need for the Bay Crossing Study.

The evaluation of potential new corridor alternatives for the Bay Crossing Study includes an assessment of the transportation infrastructure needed, while also taking into account financial viability and environmental responsibility, accounting for potential adverse effects to the Bay and the important natural, recreational, socioeconomic and cultural resources it supports.