

Maryland Transportation Authority 2017 Traffic and Toll Revenue Forecast Update (Legacy Facilities)



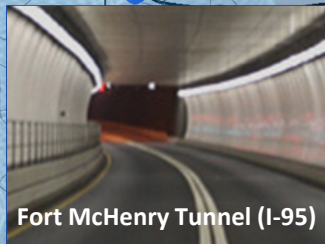
FINAL REPORT
November 2017



Kennedy Highway (I-95)



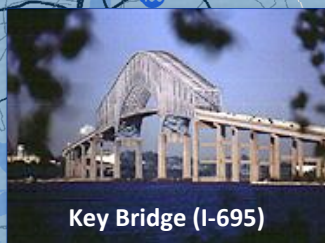
Hatem Bridge (US 40)



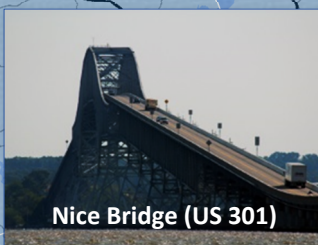
Fort McHenry Tunnel (I-95)



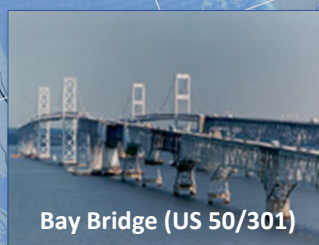
Harbor Tunnel (I-895)



Key Bridge (I-695)



Nice Bridge (US 301)



Bay Bridge (US 50/301)



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Appendices

Appendix A Detailed Traffic and Revenue Forecasts by Facility

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Executive Summary

As one of the traffic and revenue consultants for the Maryland Transportation Authority (MDTA), CDM Smith conducted a traffic and revenue study for the seven legacy toll facilities operated by the MDTA shown in Figure ES-1. These seven facilities provide critical transportation infrastructure links for both local and regional movement of people and goods, and fulfill varied roles within the local and regional transportation system. Accordingly, they therefore serve a varied mix of passenger car and commercial vehicle traffic that make toll payments by E-ZPass®, video and cash methods. Collectively, these facilities generated \$601.9 million of In-Lane Toll Revenue in Fiscal Year (FY) 2017.

The objective of this study was to develop updated 10-year forecasts for each of the seven legacy facilities. The forecasts cover the period extending from FY 2018, beginning July 1, 2017, through FY 2027, ending June 30, 2027. The study made maximum use of all available data, including historical trend information by vehicle classification and methods of toll payment for each facility. The analysis also included a general overview of socioeconomic trends, both nationally and within the service areas of the tolled facility. A review and update of the socioeconomic and demographic data that help explain travel demand used to aid in forecasting transactions and revenue for each toll facility was also performed.

Transaction and toll revenue forecasts for the Intercounty Connector (ICC/MD 200), the State's first all-electronic, congestion-managed toll road, connecting the I-370 and I-95/US 1 corridors and the all-electronic, congestion-managed I-95 Express Toll LanesSM project were not included in this report. Separate traffic and revenue studies have been performed for these facilities.

What follows is an overview of the complete study effort, including a review of historical transaction and revenue trends, relevant socioeconomic conditions, and the 10-year transaction and revenue forecasts.

Historical Transaction and Revenue Trends

Historical transaction and revenue trend data provided by the MDTA for each of the seven legacy toll facilities were reviewed, including regional traffic trends on adjacent competing highways, as these trends served as inputs to updating future traffic growth rates used in developing the 10-year transaction and revenue forecasts. Additionally, E-ZPass® market penetration rates and vehicle classification distributions were also reviewed.

While transaction and revenue trends were reviewed for each facility, historical transaction and revenue data on a system-wide basis between FY 1996 and FY 2017 are described below and presented in Figure ES-2. Also shown in Figure ES-2 is the duration of recent recessions, as well as the years in which toll increases occurred. Even considering the recession which began in late FY 2001 and extended almost half way into FY 2002, transactions on a system-wide basis increased each year between FY 1996 and FY 2002 at an average annual rate of 3.1 percent. However, during the subsequent five years from FY 2002 through FY 2007, transaction growth slowed to an average of 0.7 percent per annum, influenced by the three toll increases occurring each year from FY 2002 through

Figure ES-1
Legacy Facilities Location Map

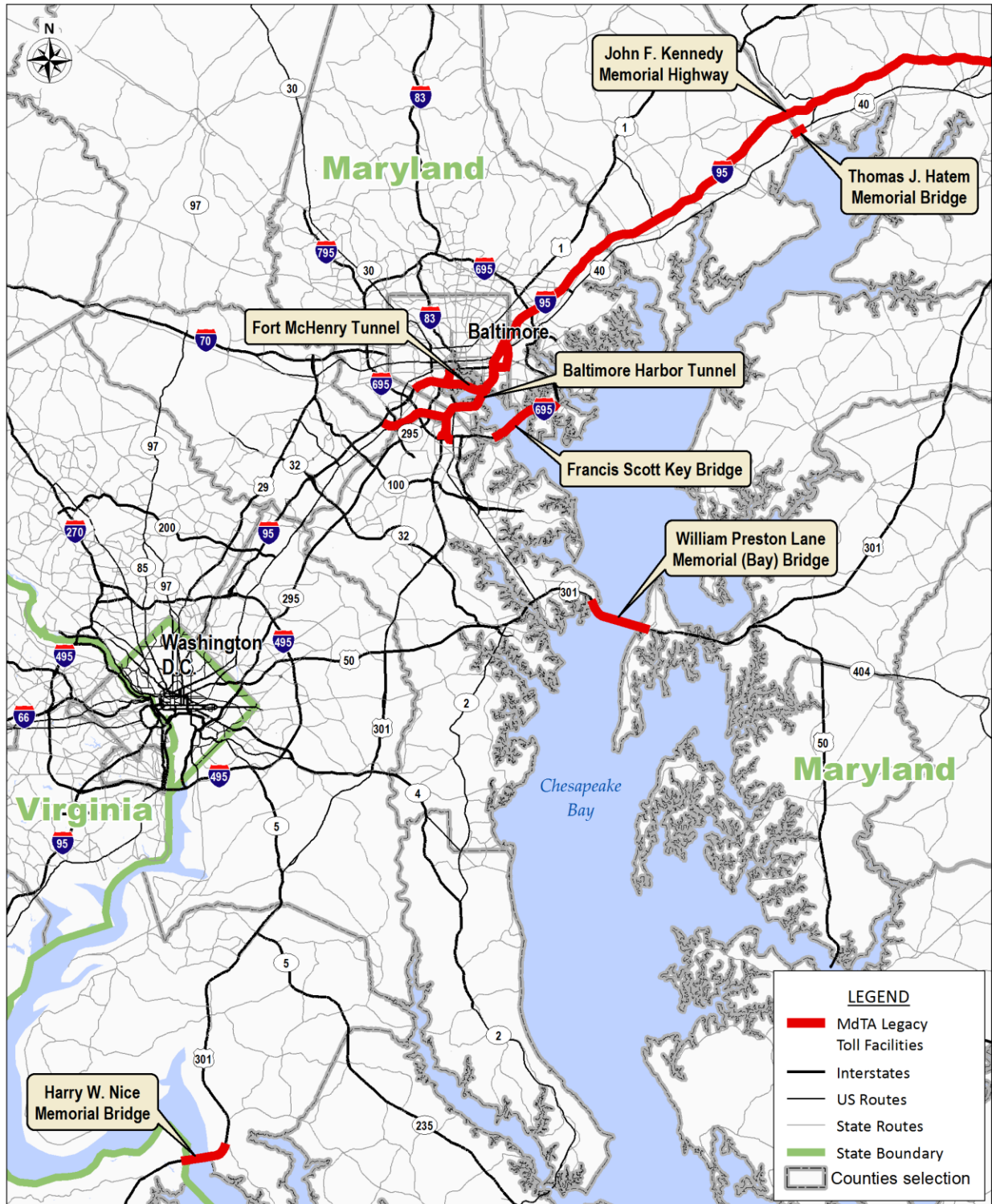
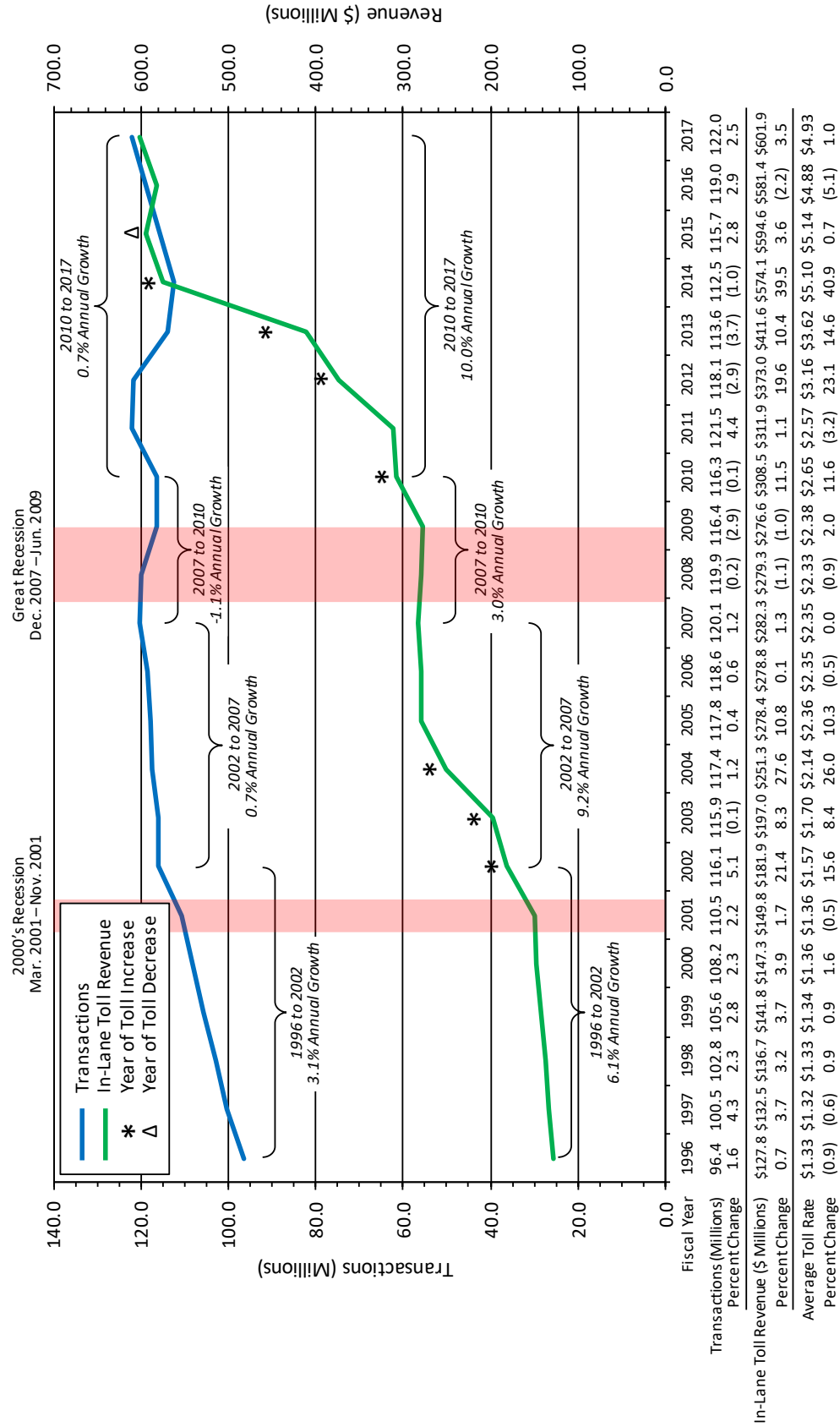


Figure ES-2
Systemwide Historical Transaction and Revenue Trends
FY 1996 through FY 2017



FY 2004. Following this period of continued growth, transactions declined between FY 2007 and FY 2010 by an average of 1.1 percent per year, due to the impacts of the Great Recession and the FY 2010 toll increase. Transactions recovered in FY 2011, reaching a system high of 121.5 million, before decreasing annually through FY 2014 because of annual toll increases from FY 2012 through FY 2014. Transactions increased by 2.8 percent in FY 2015 and 2.9 percent in FY 2016. These higher growth rates during the last two fiscal years are due to several factors, the most significant being a delayed recovery from the Great Recession of 2008/2009, and declines in retail gasoline prices. Gasoline prices fell by more than 25 percent per gallon in 2015 from approximately \$3.50 to \$2.50 on average. Low gasoline prices continued in 2016, averaging close to \$2.25 per gallon. A more modest portion of the traffic growth in FY 2016, estimated at approximately 0.5 percent, was the combined result of the toll reductions on the MDTA system for a select number of payment methods and vehicle categories, and the additional day due to leap year. In FY 2017, transactions increased by 2.4 percent to 122.0 million. Long-term average annual transaction growth on the legacy facilities was 1.1 percent between FY 1996 and FY 2017.

Except for FY 2008 and FY 2009, systemwide, In-Lane Toll Revenue increased each year between FY 1996 and FY 2017. As shown in Figure ES-2, between FY 1996 and FY 2002, toll revenue grew at an average annual rate of 6.1 percent, the result of the 3.1 percent per annum increase in transactions, combined with a 2.8 percent per annum growth in the average toll; the latter influenced almost exclusively by the FY 2002 toll increase. Over the next five years, a series of toll increases resulted in an average annual revenue increase of 9.2 percent per year. As a result of the decreases in transaction growth related to the Great Recession, revenues declined in FY 2008 by 1.1 percent and in FY 2009 by 1.0 percent. Revenues have recovered in recent years, aided by a series of toll increases. Revenues increased by 3.6 percent in FY 2015 to \$594.6 million, but declined by 2.2 percent in FY 2016 to \$581.4 million due to the select toll rate reductions. In FY 2017, In-Lane Toll Revenue increased by 3.5 percent, reaching \$601.9 million. Annual In-Lane Toll Revenue growth has averaged 7.7 percent per year between FY 1996 and FY 2017.

Socioeconomic Review

The latest historical and forecasts of socioeconomic data were collected and analyzed in this update, with the findings summarized in Chapter 3. Particularly noteworthy in the historical data is a combination of a solid improvement in the labor markets as employment and incomes increased and the unemployment rates continued to decline, along with sustained low gasoline prices over the last two years. This blend of favorable factors likely contributed to a strong rebound in traffic volumes on the MDTA facilities since FY 2014.

The economic recovery has resulted in growth in State and regional employment ranging from 1.5 percent to 1.9 percent per annum depending on the geography between 2010 to 2016. This is in contrast to reductions in employment during the overall 2005 and 2010 period inclusive of the recession, which ranged from 0.1 percent to 0.2 percent per annum. In addition to rising employment, there were also real increases in per capita income between 2010 to 2015 of between 0.9 percent to 2.0 percent per annum. These increases result in more disposable income for spending on various goods and services including those related to automobile travel.

Based on the analysis of the forecast data, it was concluded that the latest socioeconomic growth projections for the next 10 years are overall very close to those developed for the previous round of traffic and revenue forecasts. Consequently, overall growth in traffic demand is anticipated to be

moderate over the coming decade, and the recently experienced strong pace of traffic growth is expected to decelerate due to the impact of less advantageous future gasoline prices and employment and income improvements. These updated growth forecasts were incorporated into the current traffic and toll revenue forecast model.

Forecasts of Traffic and Revenue

A summary of both historical and forecasted transactions and In-Lane Toll Revenue from FY 2007 through FY 2027 by facility and aggregated to the total MDTA system is presented in Table ES-1 and shown graphically in Figure ES-3. The forecasts are also provided by facility and vehicle class in Appendix A. In FY 2018, the initial year of the forecast, transactions of 124.1 million have been forecasted, a 1.7 percent increase over FY 2017. In-Lane Toll Revenues are estimated at \$614.0 million, a 2.0 percent increase over FY 2017. Following the robust transaction increases between FY 2015 and FY 2017, which were heavily influenced by historically low gasoline prices, the delayed economic recovery, and the FY 2016 toll reductions, transaction and revenue growth rates going forward are estimated to increase at more moderate rates ranging from 0.3 to 1.7 percent, consistent with long-term historical trends. Total transactions are forecasted to grow to 132.2 million by FY 2027, or a total of 6.5 percent during the forecast period. This equates to a growth rate of 0.7 percent per annum. In-Lane Toll Revenue follows similar growth trends, increasing by a total of 6.1 percent from \$614.0 million in FY 2018 to \$651.5 million in FY 2027, equating to an average annual change of 0.7 percent.

In addition to the forecasted transactions and In-Lane Toll Revenue, forecasts of various “Other Toll Revenue” sources for the MDTA were developed. These include unused toll revenue through the commuter program, transponder sales, civil penalties, commercial discounts, over-size permits, concession revenue and revenue associated with the Hatem E-Z Pass program. The “Other Toll Revenue” forecasts, along with In-Lane and total revenue are provided in Table ES-2.

Forecast Comparison

To set the context for the current forecast, this section provides a comparison of prior revenue forecasts to the actual revenue collected by MDTA, as well as a comparison of the most recent prior forecast to the current forecast. Table ES-3 provides prior forecasts of In-Lane Toll Revenue and Total Toll Revenue from FY 2010 through FY 2017, as well as the actual In-Lane Toll Revenue and Total Toll Revenue collected by MDTA. In general, this table provides an indication of the reasonableness of recent forecasts. The table identifies the year in which the forecast was prepared, the fiscal year being forecasted and the accuracy of those forecasts for both In-Lane Toll Revenue and Total Toll Revenue. Both actual In-Lane Toll Revenue and actual Total Toll Revenue have always exceeded the forecasts, with In-Lane Toll Revenue and Total Toll Revenue being 2.1 percent and 5.4 percent above the latest forecast, respectively. It is believed the differences between forecasted and actual In-Lane Toll Revenue may be the result of several factors including a delayed recovery from the 2008/2009 Great Recession and declining retail gasoline prices. Based on short-term fuel elasticity in the range of -0.02 to -0.03, the 20-25 percent drop in fuel prices in 2015/2016 potentially added a 0.50 percent to 0.75 percent increase in transactions and revenue systemwide. Without the fuel price impacts, the percent difference in In-Lane Toll Revenue would have been reduced to between 1.1 percent and 1.6 percent. Coupled with an underestimate in Civil Penalties (Other Revenue) of roughly \$10 million, the difference in forecasted versus actual Total Toll Revenue may have been closer to between 2.8 percent to 3.3 percent.

Figure ES-3
Historical and Forecasted Transactions and In-Lane Toll Revenue

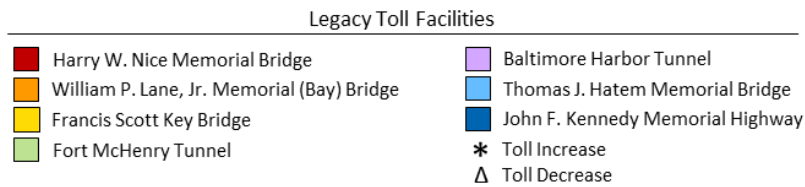
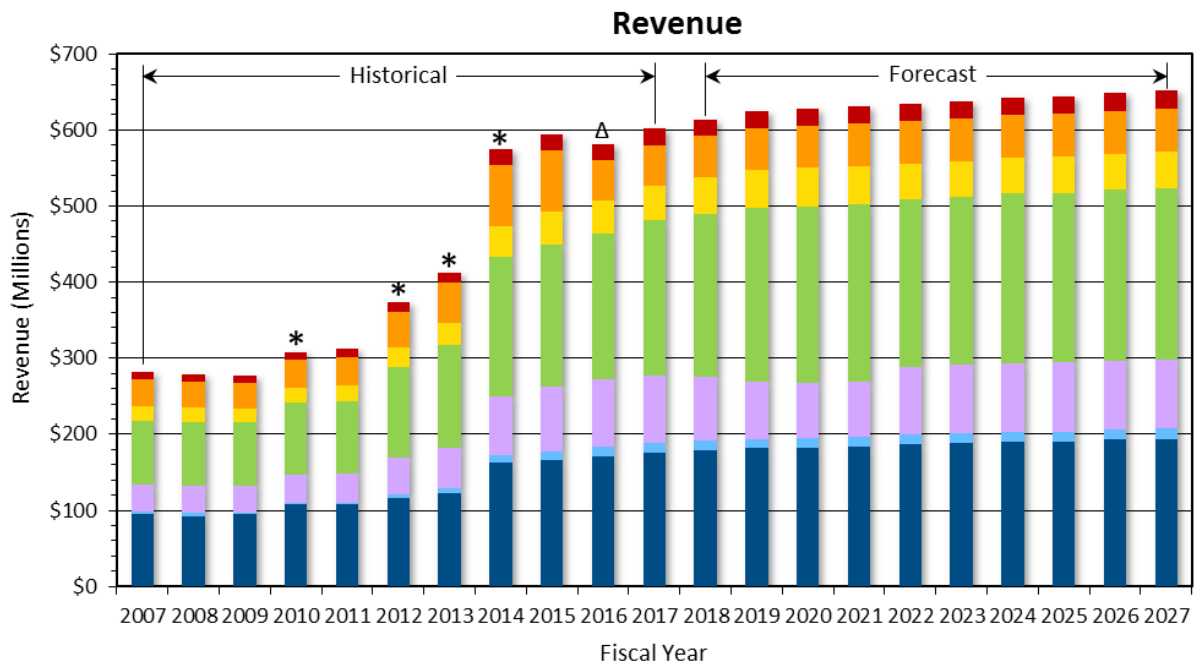
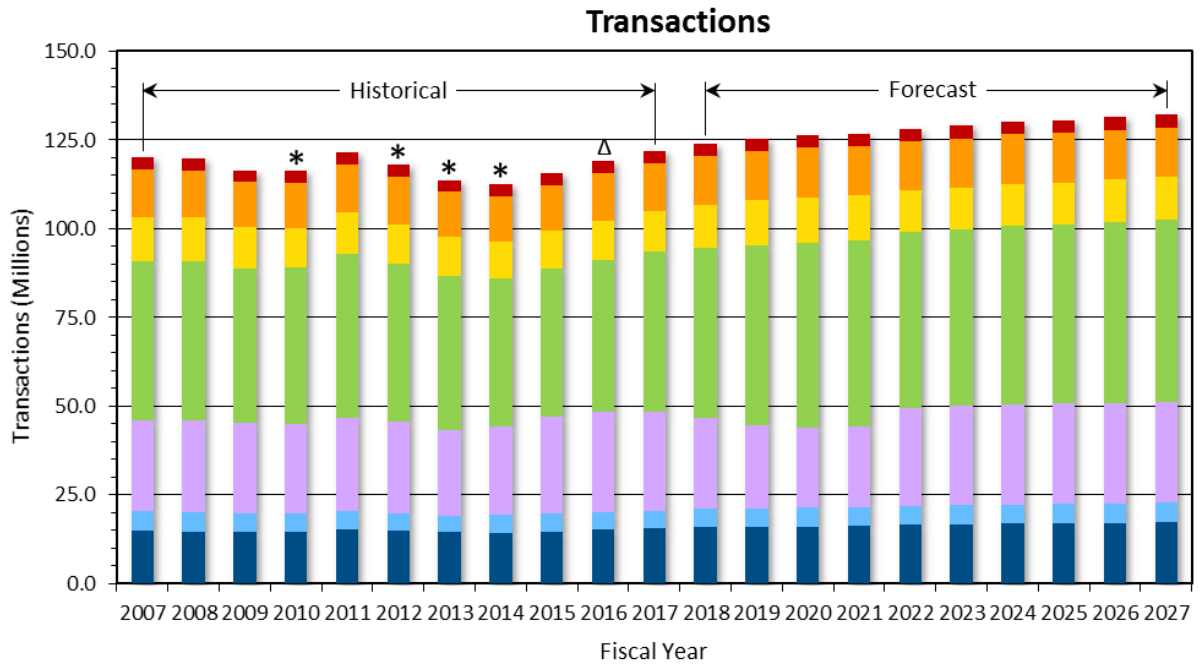


Table ES-3
Comparison of MDTA Forecasted Revenue versus Actual, FY 2010 through FY 2017

Year	Forecast				Actual		Percent Difference	
	Forecast Prepared	Fiscal Year Forecasted	In-Lane		In-Lane		In-Lane	
			Toll Revenue	Total Toll Revenue	Toll Revenue	Total Toll Revenue	Toll Revenue	Total Toll Revenue
2009	⁽¹⁾	2010	\$ 294.4	\$ 315.3	\$ 308.5	\$ 331.8	4.8	5.2
2009	⁽¹⁾	2011	295.6	315.9	312.0	335.0	5.5	6.0
2010	⁽¹⁾	2011	307.6	331.0	312.0	335.0	1.4	1.2
2011	⁽¹⁾	2012	367.1	387.2	373.0	395.2	1.6	2.1
2011	⁽¹⁾	2013	409.0	425.9	411.6	434.7	0.6	2.1
2012	⁽¹⁾	2013	411.4	434.4	411.6	434.7	0.0	0.1
2013	⁽¹⁾	2014	540.3	570.3	574.1	606.9	6.3	6.4
2014	⁽²⁾	2015	575.1	611.1	594.6	637.0	3.4	4.2
2015	⁽²⁾	2016	561.7	592.7	581.4	622.0	3.5	4.9
2016	⁽²⁾	2017	589.6	628.3	601.9	662.4	2.1	5.4


⁽¹⁾ Forecasts prepared by others.
⁽²⁾ Forecasts prepared by CDM Smith.

As part of prior studies, it was estimated that the FY 2016 toll reduction would increase MDTA legacy facility transactions by approximately 0.2 percent and decrease toll revenue by 6.5 percent, compared to estimated FY 2016 levels without the toll decrease. Some of the estimated decrease in toll revenue was the result of assumed shifts in method of payment due to the increased differential between Maryland E-ZPass® and the full fare methods of payment. From a review of FY 2016 transactions and revenue data, it is believed that these estimated impacts were generally realized based on the observed level of overall increases in Maryland E-ZPass® and decreases in cash, video and full fare E-ZPass® methods of payment. Looking at year-over-year differences, total FY 2016 legacy facility transactions increased beyond the level of impact estimated because of the toll reductions, while revenues did not decrease as much as anticipated, due primarily to higher than anticipated traffic growth. This traffic growth resulted from the continuing economic recovery, as well as reductions in the price of gasoline. Removing from consideration these other factors, the actual impacts of the FY 2016 toll decrease were comparable to those estimated as part of prior studies.

Table ES-4 provides a comparison of the last 10-year forecast for legacy facilities (prepared in December 2016) with the current forecast. These forecasts include both In-Lane and "Other" Toll Revenue. Highlighted in blue is the FY 2017 actual total revenue collected, which was 5.4 percent or \$34.1 million higher than the forecast. The latest forecast of Total Revenue is 6.7 percent or \$434.1 million higher from FY 2017 to FY 2026.

Table ES-4
Comparison of 2016 Forecast versus 2017 Forecast
of Total Toll Revenue (In-Lane and "Other" Toll Revenue)

Fiscal Year	Total Revenue			Percent Difference
	2016 Forecast	2017 Forecast	Difference	
2017	\$ 628.3	\$ 662.4	\$ 34.1	5.4
2018	634.5	673.5	39.0	6.2
2019	637.9	684.0	46.2	7.2
2020	642.5	688.3	45.8	7.1
2021	644.1	691.4	47.3	7.3
2022	650.1	694.8	44.7	6.9
2023	655.3	699.0	43.7	6.7
2024	660.7	705.0	44.3	6.7
2025	662.7	706.9	44.2	6.7
2026	666.5	711.4	44.9	6.7
Total	\$ 6,482.5	\$ 6,916.7	434.1	6.7

 - Represents actual data.

Chapter 1

Introduction

Under contract to the Maryland Transportation Authority (MDTA), CDM Smith conducted a Traffic and Revenue Update Study for the legacy bridges, tunnels, and highways currently operated by the MDTA. The study culminated in the development of 10-year transaction and revenue estimates for each facility through FY 2027. This report summarizes the study analysis, including a presentation of historical and current traffic trends, relevant socioeconomic conditions and forecasts, and the 10-year transaction and revenue forecasts.

1.1 System Description and History

The seven legacy toll facilities currently owned and operated by the MDTA include:

- Thomas J. Hatem Memorial Bridge (Hatem Bridge)
- John F. Kennedy Memorial Highway, excluding the Express Toll Lanes (Kennedy Highway)
- Baltimore Harbor Tunnel (Harbor Tunnel)
- Fort McHenry Tunnel (Fort McHenry Tunnel)
- Francis Scott Key Bridge (Key Bridge)
- William Preston Lane Jr. Memorial Bridge (Bay Bridge)
- Harry W. Nice Memorial Bridge (Nice Bridge)

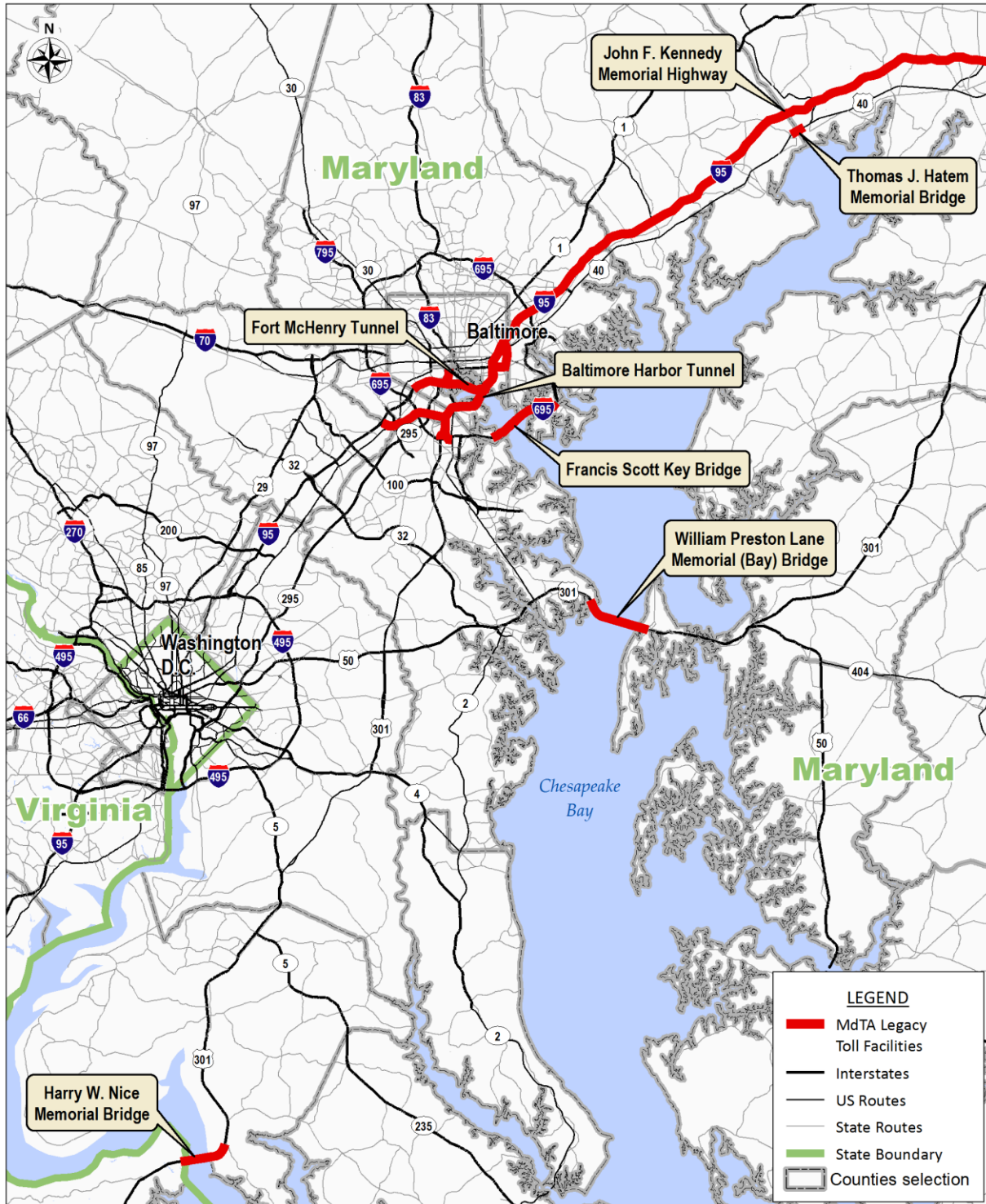
The Intercounty Connector (ICC/MD 200), the State's first all-electronic, congestion-managed toll road connecting the I-370 and I-95 corridors and the all-electronic congestion-managed I-95 Express Toll LanesSM project are *not addressed* in this report. Separate traffic and revenue studies have been performed for these facilities.

The objective of this analysis was to develop updated 10-year forecasts for each of the seven legacy facilities. The forecast period extends from FY 2018, beginning July 1, 2017, through FY 2027, ending June 30, 2027. The study made maximum use of all available data, including historical traffic trend information by vehicle category and method of toll payment for each facility. The analysis also includes a general overview of economic trends, both nationally and within the service areas of each facility.

1.1.1 System Description

Figure 1-1 shows the locations of the seven MDTA legacy facilities in a regional context. The legacy facilities fulfill varied roles within the local and regional transportation system and consequently have a mix of traffic, including both E-ZPass®, video and cash customers. Collectively, these facilities generated \$601.9 million of In-Lane Toll Revenue in FY 2017.

Figure 1-1
Legacy Facilities Location Map



The MDTA has separated the seven toll facilities into three regions. The Northern Region consists of the John F. Kennedy Memorial Highway and the Thomas J. Hatem Bridge. The Central Region consists of the Fort McHenry Tunnel, the Baltimore Harbor Tunnel, and the Francis Scott Key Bridge. The Southern Region consists of the Harry W. Nice Memorial Bridge and the William Preston Lane Jr. Memorial (Bay) Bridge.

In the Northern Region, the Thomas J. Hatem Bridge and the John F. Kennedy Memorial Highway form two parallel crossings of the Susquehanna River. The Hatem Bridge carries US 40 across the river and is the oldest of the MDTA's facilities, having been open to traffic since August 1940. The existing structure replaced an older bridge that first opened in 1910. The John F. Kennedy Memorial Highway is a 50-mile segment of I-95 that was opened in November 1963. The mainline toll plaza is located just northeast of the Susquehanna River.

The Central Region contains three alternative routes that cross Baltimore Harbor: the Baltimore Harbor Tunnel (I-895), the Francis Scott Key Bridge (I-695), and the Fort McHenry Tunnel (I-95). The oldest of the three Baltimore Harbor crossings is the Harbor Tunnel which opened in November 1957. The Key Bridge was built to alleviate congestion and delays at the Harbor Tunnel and was opened in March 1977. The newest of these facilities, the Fort McHenry Tunnel, an eight-lane crossing that opened in November 1985, completed the triplet of existing harbor crossings.

The Southern Region contains two facilities which carry US 301 to diverse destinations. The William Preston Lane Jr. Memorial (Bay) Bridge was first opened to traffic in July 1952 and crosses the Chesapeake Bay. Twenty-one years later in June 1973, a parallel span carrying westbound traffic was opened, with the original span carrying eastbound traffic. The Harry W. Nice Bridge was opened in December 1940, connecting Maryland with Virginia, thereby allowing travelers making regional through-trips to bypass the Washington DC area.

1.1.2 Toll Rate Structure and History

An understanding of the structure of payment options for MDTA customers was necessary in developing the traffic and revenue forecasts. Since different method of payment categories tend to have different travel patterns, values of time and trip frequencies, the traffic and revenue forecasts were also developed by method of payment category. This necessitated an understanding of the various payment options offered by MDTA, a summary of which is provided here.

MDTA customers have the option of paying their toll through a variety of toll payment methods. The MDTA legacy facility customers can pay via E-ZPass®, video tolling or cash. In general, Maryland registered E-ZPass® customers receive a discount over cash customers, while E-ZPass® customers with transponders from out-of-state pay the same base toll rate as the cash customers. Video tolling customers pay a 50 percent surcharge over the base toll rate. MDTA also offers several discount programs for commuters, shoppers using the Bay Bridge, motorists using the Hatem Bridge, and high-volume and frequent-user commercial vehicle accounts. Some of these discounts are substantial, such as the Hatem Discount Plans, which provide Hatem Bridge customers with unlimited trips for a flat annual fee of \$20. The current toll schedule including select toll rate reductions effective on July 1, 2015 are provided by Region in Tables 1-1 through 1-3.

The two Northern Region facilities employ a one-way toll collection system; that is round-trip tolls are collected in the eastbound/northbound direction only. Hence, the round-trip tolls are generally the same as those of the Central Region toll facilities. The base toll is \$8.00 for passenger cars, with a video toll of \$12.00, including a 50 percent surcharge. Maryland two-axle, E-ZPass® customers receive

**Table 1-1
Northern Region Tolls**

Method of Payment	Vehicle Class	John F. Kennedy Memorial Highway (I-95)		Thomas J. Hatem Memorial Bridge (US 40)	
		Before July 1, 2015	After July 1, 2015	Before July 1, 2015	After July 1, 2015
Maryland E-ZPass®	Commuter, 2-axles ⁽²⁾	\$2.80	**	\$2.80 ⁽¹⁾	** ⁽¹⁾
	Class 2 2-axles	\$7.20	\$6.00	\$7.20 ⁽¹⁾	\$6.00 ⁽¹⁾
	Class 3 3-axles	\$16.00	**	\$16.00	\$11.20
	Class 4 4-axles	\$24.00	**	\$24.00	\$16.80
	Class 5 5-axles ⁽³⁾⁽⁴⁾	\$48.00	**	\$48.00	**
	Class 6 6+-axles ⁽³⁾⁽⁴⁾	\$60.00	**	\$60.00	**
Cash / Base / Non-MD E-ZPass®	Class 2 2-axles	\$8.00	**	\$8.00	**
	Class 3 3-axles	\$16.00	**	\$16.00	**
	Class 4 4-axles	\$24.00	**	\$24.00	**
	Class 5 5-axles	\$48.00	**	\$48.00	**
	Class 6 6+-axles	\$60.00	**	\$60.00	**
	Video	Class 2 2-axles	\$12.00	**	\$12.00
Class 3 3-axles		\$24.00	**	\$24.00	**
Class 4 4-axles		\$36.00	**	\$36.00	**
Class 5 5-axles		\$63.00	**	\$63.00	**
Class 6 6+-axles		\$75.00	**	\$75.00	**

** Indicates no change from previous toll rate.

Notes:

⁽¹⁾ Two E-ZPass® Hatem Bridge plans were made available as of Sept. 30, 2012:

- The first replaced the Hatem Bridge AVI Decal Program and was offered for two-axle vehicles only with an existing valid transponder beginning Feb. 1, 2012, providing unlimited trips on the Hatem Bridge only. The plan cost \$10 beginning on Feb. 1, 2012 and increased to \$20 on July 1, 2013.
- The second plan opened the Hatem Bridge-Only Plan to existing or new E-ZPass® Maryland customers. The primary difference is that accounts under the second plan are subject to transponder fees and pre-paid toll deposits, while those under the first plan are not.

⁽²⁾ Commuter rates are for two-axle vehicles with a Maryland E-Zpass® Commuter Plan, which includes 50 trips and costs \$70.00. Two "trips" are required per transaction for the Northern Region facilities per trip. All commuter plans (E-Zpass®) are valid for 45 days.

⁽³⁾ Business accounts operating five-or-more-axle vehicles may qualify for an E-Zpass® post-usage discount based on the tolls paid in every 30-day period, with a 10 percent discount offered for total monthly tolls of \$150.00 to \$1,999.99, 15 percent for total monthly tolls of \$2,000.00 to \$7,500.00 and 20 percent for total monthly tolls of over \$7,500.00.

⁽⁴⁾ A supplemental rebate program is offered to five-or-more-axle vehicles with individual transponders making 60 or more trips per month. As of July 1, 2015, a 10 percent discount is offered for five- or more-axle vehicle transponders making 60-79 trips per month, 15 percent for 80-99 trips per month, and 20 percent for 100 or more per month.

**Table 1-2
Central Region Tolls**

Method of Payment	Vehicle Class	Baltimore Harbor Tunnel (I-895), Fort McHenry Tunnel (I-95/I-395) and Francis Scott Key Bridge (I-695)	
		Before	After
		July 1, 2015	July 1, 2015
Maryland E-ZPass®	Commuter, 2-axles ⁽¹⁾	\$1.40	**
	Class 2 2-axles	\$3.60	\$3.00
	Class 3 3-axles ⁽⁴⁾	\$8.00	**
	Class 4 4-axles ⁽⁴⁾	\$12.00	**
	Class 5 5-axles ⁽²⁾⁽³⁾⁽⁴⁾	\$24.00	**
	Class 6 6+-axles ⁽²⁾⁽³⁾⁽⁴⁾	\$30.00	**
Cash / Base / Non-MD E-ZPass®	Class 2 2-axles	\$4.00	**
	Class 3 3-axles	\$8.00	**
	Class 4 4-axles	\$12.00	**
	Class 5 5-axles	\$24.00	**
	Class 6 6+-axles	\$30.00	**
	Video	Class 2 2-axles	\$6.00
Class 3 3-axles		\$12.00	**
Class 4 4-axles		\$18.00	**
Class 5 5-axles		\$36.00	**
Class 6 6+-axles		\$45.00	**

** Indicates no change from previous toll rate.

Notes:

- ⁽¹⁾ Commuter rates are for two-axle vehicles with a Maryland E-ZPass® Commuter Plan, which includes 50 trips and costs \$70.00. All commuter plans (E-ZPass®) are valid for 45 days.
- ⁽²⁾ Business accounts operating five-or-more-axle vehicles may qualify for an E-ZPass® post-usage discount based on the tolls paid in every 30-day period, with a 10 percent discount offered for total monthly tolls of \$150.00 to \$1,999.99, 15 percent for total monthly tolls of \$2,000.00 to \$7,500.00 and 20 percent for total monthly tolls of over \$7,500.00.
- ⁽³⁾ A supplemental rebate program is offered to five-or-more-axle vehicles with individual transponders making 60 or more trips per month. As of July 1, 2015, a 10 percent discount is offered for five- or more-axle vehicle transponders making 60-79 trips per month, 15 percent for 80-99 trips per month, and 20 percent for 100 or more per month.
- ⁽⁴⁾ As of January 1, 2016, commercial-vehicle drivers with a valid Maryland E-ZPass® account and transponder pay \$2.00 per axle for 3, 4, 5 and 6+ axle vehicles when using the I-895/Childs Street ramps at the Baltimore Harbor Tunnel or the I-695/Broening Highway turnaround at the Francis Scott Key Bridge.

**Table 1-3
Southern Region Tolls**

Method of Payment	Vehicle Class	William Preston Lane, Jr. Memorial (Bay) Bridge (US 50/301)		Gov. Harry W. Nice Memorial Bridge (US 301)	
		Before	After	Before	After
		July 1, 2015	July 1, 2015	July 1, 2015	July 1, 2015
Maryland E-ZPass®	Commuter, 2-axles ⁽¹⁾	\$2.10	\$1.40	\$2.10	**
	Shoppers, 2-axles ⁽²⁾	\$3.00	\$2.00	Not Applicable at this Facility	
	Class 2 2-axles	\$5.40	\$2.50	\$5.40	\$4.50
	Class 3 3-axles	\$12.00	\$8.00	\$12.00	**
	Class 4 4-axles	\$18.00	\$12.00	\$18.00	**
	Class 5 5-axles ⁽³⁾⁽⁴⁾	\$36.00	\$24.00	\$36.00	**
Cash / Base / Non-MD E-ZPass®	Class 6 6+-axles ⁽³⁾⁽⁴⁾	\$45.00	\$30.00	\$45.00	**
	Class 2 2-axles	\$6.00	\$4.00	\$6.00	**
	Class 3 3-axles	\$12.00	\$8.00	\$12.00	**
	Class 4 4-axles	\$18.00	\$12.00	\$18.00	**
	Class 5 5-axles	\$36.00	\$24.00	\$36.00	**
	Class 6 6+-axles	\$45.00	\$30.00	\$45.00	**
Video	Class 2 2-axles	\$9.00	\$6.00	\$9.00	**
	Class 3 3-axles	\$18.00	\$12.00	\$18.00	**
	Class 4 4-axles	\$27.00	\$18.00	\$27.00	**
	Class 5 5-axles	\$51.00	\$36.00	\$51.00	**
	Class 6 6+-axles	\$60.00	\$45.00	\$60.00	**

** Indicates no change from previous toll rate.

Notes:

- ⁽¹⁾ Commuter rates are for two-axle vehicles with a Maryland E-ZPass® Commuter Plan, which includes 25 trips and are valid for 45 days. The Bay Bridge Plan costs \$35.00 and the Nice Bridge Plan costs \$52.50.
- ⁽²⁾ Shopper rates are for two-axle vehicles with a Maryland E-ZPass® Commuter Plan, which includes 10 trips that can be used Sunday through Thursday and costs \$20.00. All shopper plans are valid for 90 days.
- ⁽³⁾ Business accounts operating five-or-more-axle vehicles may qualify for an E-ZPass® post-usage discount based on the tolls paid in every 30-day period, with a 10 percent discount offered for total monthly tolls of \$150.00 to \$1,999.99, 15 percent for total monthly tolls of \$2,000.00 to \$7,500.00 and 20 percent for total monthly tolls of over \$7,500.00.
- ⁽⁴⁾ A supplemental rebate program is offered to five-or-more-axle vehicles with individual transponders making 60 or more trips per month. As of July 1, 2015, a 10 percent discount is offered for five- or more-axle vehicle transponders making 60-79 trips per month, 15 percent for 80-99 trips per month, and 20 percent for 100 or more per month.

a 25 percent discount, or a toll of \$6.00. For the Northern Region facilities, commuter tolls are offered for two-axle vehicles with a Maryland E-ZPass® Commuter Plan, which includes 50 trips and costs \$70.00 or \$1.40 per trip. Since the Northern Region facilities utilize one-way tolling, two "trips" are required per transaction, making the effective toll rate \$2.80 per transaction or a 65 percent discount over the base toll rate. Vehicles with three-or-more axles are charged progressively higher rates. As of July 1, 2015, tolls for three and four-axle vehicles with Maryland E-ZPass® using the Hatem Bridge were reduced by 30 percent. With this discount, the toll for three-axle vehicles was reduced from \$16.00 to \$11.20 and for four-axle vehicles from \$24.00 to \$16.80. The current tolls for the Northern Region toll facilities are shown in Table 1-1.

Special discounts are available at the Hatem Bridge. Currently, two plans are offered: Hatem Plan A and Hatem Plan B. Both plans provide unlimited trips to two-axle Maryland E-ZPass® account holders for a flat annual fee of \$20. Plan A does not include transponder fees, prepaid toll deposits or account statements. However, an E-ZPass® account under Plan A cannot be used at other toll facilities or combined with other Maryland E-ZPass® discounts. Plan B is an add-on to a standard Maryland E-ZPass® account and is subject to the standard fees and pre-paid toll deposits. In addition, E-ZPass® accounts under Plan B can be used at other toll facilities and combined with other Maryland E-ZPass® discounts.

Tolls are collected in both directions at the three Baltimore Harbor crossings that comprise the Central Region. Passenger cars pay a base toll of \$4.00. Video customers pay \$6.00, which includes a 50 percent surcharge, while Maryland two-axle, E-ZPass® customers receive a 25 percent discount for a toll of \$3.00. Commuter discounts are offered to two-axle vehicles with a Maryland E-ZPass® Commuter Plan. This plan includes 50 trips at a cost of \$70.00, making the effective toll rate \$1.40 per transaction, or a 65 percent discount over the base toll rate. As shown in Table 1-2, vehicles with three-or-more axles are charged progressively higher rates.

The two Southern Region facilities employ one-way toll collection. The base toll at the Harry W. Nice Bridge is \$6.00 for passenger cars. Video toll customers pay a \$9.00 toll, including a 50 percent surcharge. Maryland two-axle, E-ZPass® customers receive a 25 percent discount, or a toll of \$4.50. Also at the Harry W. Nice Bridge, commuter discounts are offered to two-axle vehicles with a Maryland E-ZPass® Commuter Plan, which includes 25 trips at a cost of \$52.50, making the effective toll \$2.10 per transaction. This represents a 65 percent discount over the base toll. Progressively higher tolls are charged to vehicles with three-or-more-axles.

Following the July 1, 2015 toll reductions, the base toll at the Bay Bridge was reduced from \$6.00 to \$4.00 for passenger cars. The video toll is \$6.00, including a 50 percent surcharge. Maryland two-axle, E-ZPass® customers receive a 37.5 percent discount which reduces the toll from \$5.40 to \$2.50. Also at the William Preston Lane Memorial Bridge, commuter discounts are offered to two-axle vehicles with a Maryland E-ZPass® Commuter Plan, which includes 25 trips at a cost of \$35.00, making the effective toll \$1.40 per transaction, or a 65 percent discount over the base toll. While the tolls charged to three-or-more-axle vehicles are progressively higher, on July 1, 2015 the tolls for these vehicles were reduced by 33.3 percent. The current tolls for the Southern Region toll facilities are shown in Table 1-3.

Another discount option is offered specifically to motorists using the Bay Bridge. The E-ZPass® Maryland Shoppers' Plan is for Maryland E-ZPass® holders. Following the July 1, 2015 toll reductions, the plan costs \$20.00 for 10 trips, or \$2.00 per trip. The plan is valid for 90 days and can be used on Sundays through Thursdays, only.

Business accounts that operate vehicles with five-or-more-axes may qualify for a post-usage discount based on total tolls paid in 30-day cycles. The first 30-day cycle begins with the first use of the transponder. Discounts vary from 10 to 20 percent based on the total toll usage during the cycle and are credited back to the account 30 days after the completion of a cycle. In addition, the supplemental rebate program provides rebates to individual vehicles with five-or-more-axes and Maryland E-ZPass® transponders that make 60 or more trips per month.

1.2 Report Structure

Chapter 2, Historical Traffic and Revenue Trends, provides a summary of historical trends and variations of traffic and revenue on the legacy bridges, tunnels, and highways currently operated by the MDTA.

Chapter 3, Socioeconomic Review, provides a summary of updated recent historical trends and forecasts of socioeconomic variables to provide the context for the traffic and revenue growth projections. The socioeconomic trends review and analysis consisted of data collection efforts that included compiling and updating a host of different pertinent variables such as population, employment, income, gasoline prices, and real gross regional product from a variety of public and private sources. These included the Bureau of Economic Analysis (BEA), US Census, Bureau of Labor Statistics (BLS), Maryland State Data Center (MD SDC), U.S. Energy Information Administration (EIA), Woods & Poole Economics (W&P), and Moody's Analytics (Moody's).

Chapter 4, Traffic and Revenue Forecast, provides a summary of the basic underlying assumptions used in the traffic and revenue forecasting process. Also presented are the 10-year traffic and revenue forecasts by facility and vehicle class for each of the legacy facilities and the system as a whole.

Chapter 2

Historical Traffic and Revenue Trends

Regional traffic trends as well as historical transactions and revenue trends provided by MDTA for each of the seven legacy toll facilities have been reviewed, with the results presented in this chapter. Regional trends were reviewed to understand the context within which the MDTA facilities operate, including vehicle miles traveled (VMT) and traffic counts on major Maryland highways. Historical transaction and revenue trends for each of the legacy facilities were reviewed, as these trends served as an input in developing the 10-year transaction growth rates for the traffic and revenue forecasts. Current E-ZPass® market penetration rates and vehicle classification distributions were also reviewed.

2.1 Regional Traffic Review

Regional traffic patterns and trends were analyzed to better understand the factors influencing traffic demand on the MDTA legacy facilities. Included in this analysis was a review of regional VMT trends and historical traffic counts on nearby competing routes. This data was used to ensure that near-term and future traffic growth rates developed for the MDTA facilities were reasonable within the context of these historical regional traffic growth and trends.

2.1.1 Vehicle Miles Traveled

VMT represents the total number of miles travelled by all vehicles annually. VMT trends are important to a better understanding of general trends in traffic growth nationally and, more specifically, within a state and region. The Federal Highway Administration develops annual estimates of national and state-wide VMT by roadway type, which have been summarized in Table 2-1 for years 1994 through 2016 for the United States and Maryland.

Maryland VMT trends during the last 20+ years have generally followed those of the United States. Prior to 2004, VMT increased at an average annual rate of 2.3 percent in both the United States and Maryland. Between 2004 and 2009, national and Maryland VMT experienced essentially no growth. This was primarily because following the onset of the Great Recession of 2008/2009, VMT declined for the first time since 1980.

The average annual percent change in VMT was 0.7 percent both nationally and in Maryland between 2009 and 2015. These recent trends in VMT represent a change from prior long-term historical trends, with VMT levels slightly above or below the peak levels of 2007. Several factors may be responsible for the change. First, the reduction in employment caused by the Great Recession has led to general reductions in travel by commuters. Additionally, the changes may be indicative of longer-term trends such as adjustments to gasoline prices, shifts in development patterns to revitalize traditional urban centers, and increases in telecommuting, carpooling and transit use.

However, 2016 national data suggests a change from the past slowdown in VMT growth. National VMT increased by 3.5 percent in 2016. In the near term, this increase may represent a return to the higher growth rates experienced between 1994 and 2004, a result of the combined impacts associated with the decline and stabilization of gasoline prices and recovery from the Great Recession.

Table 2-1
National and State-wide Trends in Vehicle Miles Traveled

Year	United States ⁽¹⁾					Maryland				
	Interstate			Total		Interstate			Total	
	VMT (Millions)	Percent Change	Percent of Total	VMT (Millions)	Percent Change	VMT (Millions)	Percent Change	Percent of Total	VMT (Millions)	Percent Change
1994	550,096	---	23.2	2,372,026	---	12,674	---	28.7	44,165	---
1995	569,024	3.4	23.3	2,438,244	2.8	13,263	4.6	29.6	44,882	1.6
1996 ⁽²⁾	581,579	2.2	23.4	2,482,201	1.8	13,721	3.5	29.8	46,033	2.6
1997	606,067	4.2	23.5	2,576,543	3.8	14,013	2.1	30.1	46,609	1.3
1998	630,157	4.0	23.9	2,641,891	2.5	14,407	2.8	29.8	48,343	3.7
1999	648,124	2.9	23.9	2,708,328	2.5	14,499	0.6	29.5	49,126	1.6
2000	667,603	3.0	24.1	2,767,363	2.2	15,208	4.9	30.3	50,174	2.1
2001	678,723	1.7	24.1	2,815,135	1.7	15,633	2.8	30.1	51,996	3.6
2002	693,942	2.2	24.1	2,873,866	2.1	16,214	3.7	30.2	53,702	3.3
2003	708,173	2.1	24.3	2,909,567	1.2	16,536	2.0	30.2	54,701	1.9
2004	727,163	2.7	24.4	2,982,017	2.5	16,668	0.8	30.1	55,284	1.1
2005	733,655	0.9	24.4	3,009,217	0.9	16,807	0.8	29.8	56,319	1.9
2006	741,000	1.0	24.4	3,033,752	0.8	16,850	0.3	29.9	56,302	(0.0)
2007	745,457	0.6	24.4	3,049,027	0.5	17,015	1.0	30.1	56,503	0.4
2008	725,078	(2.7)	24.2	2,992,705	(1.8)	16,710	(1.8)	30.4	55,023	(2.6)
2009	722,655	(0.3)	24.3	2,975,804	(0.6)	16,965	1.5	30.7	55,293	0.5
2010	729,015	0.9	24.4	2,985,854	0.3	17,040	0.4	30.4	56,126	1.5
2011	725,787	(0.4)	24.4	2,968,990	(0.6)	16,964	(0.4)	30.2	56,221	0.2
2012	735,915	1.4	24.6	2,988,021	0.6	17,054	0.5	30.2	56,475	0.5
2013	745,106	1.2	24.8	3,006,911	0.6	17,064	0.1	30.1	56,688	0.4
2014	756,374	1.5	24.9	3,040,220	1.1	17,057	(0.0)	30.2	56,432	(0.5)
2015	782,111	3.4	25.1	3,109,937	2.3	17,102	0.3	29.7	57,516	1.9
2016	N/A			3,217,956	3.5	N/A			N/A	
Average Annual Percent Change										
1994-2015		1.7			1.3		1.4			1.3
1994-2004		2.8			2.3		2.8			2.3
2004-2015		0.7			0.4		0.2			0.4
2004-2009		(0.1)			(0.0)		0.4			0.0
2009-2015		1.3			0.7		0.1			0.7
2015-2016		---			3.5		---			---

1994-2014 VMT Data source: Table VM-2, Highway Statistics 1994-2014, USDOT FHWA Office of Policy Information.
2015 and 2016 VMT Data source: USDOT FHWA Office of Policy Information.
⁽¹⁾ Includes Puerto Rico.
⁽²⁾ Interstate-level VMT data unavailable for 1996, and was estimated based on the average 1995 and 1997 interstate miles as a percent of total VMT.

Additionally, the favorable factors underpinning traffic increases since 2014, including relatively robust labor market growth, combined with the aforementioned declines in fuel prices, are unlikely to prove sustainable over the upcoming decade. Nevertheless, the forecasts of moderate socioeconomic growth may translate into continued modest increases in traffic demand on the legacy facilities over the coming decade.

The percent of total VMT occurring on Interstate routes has remained relatively constant throughout the past 20 years. Approximately 25 percent of national VMT and 30 percent of Maryland VMT are made on interstate routes, which account for 2.5 percent and 3.9 percent of all roads in the nation and Maryland, respectively.

The annual transaction growth rates from the transaction forecasts presented in Chapter 4, Traffic and Revenue Forecast, were compared with VMT growth to ensure that growth rates were reasonable in light of these trends in VMT.

2.1.2 Historical Traffic on Other Major Highways

In order to better understand regional traffic growth patterns, historical traffic counts on select competing major routes were reviewed dating back to FY 1995. These roads include interstates and major highways that compete with or complement the MDTA legacy facilities. The data presented in this section are based on historical average annual daily traffic volumes and associated growth rates at each location. At MDTA locations where there is a one-way toll, the one-way average annual daily traffic volume was doubled to be more comparable to other locations. For comparative purposes, the roadways are grouped into three regions: Northern, Central, and Southern, corresponding to the MDTA regions.

Historical average annual daily traffic volumes and annual growth rates for the Northern Region facilities, located in proximity to the Susquehanna River, are presented in Table 2-2. Volumes are provided through 2016 for comparative purposes. Traffic volumes on the two Northern Region MDTA facilities have generally followed the regional trends over the last 20 years. Between 1995 and 2005, average annual traffic growth was 2.2 percent per year for the MDTA facilities and a comparable 2.4 percent per year for the region. Between 2005 and 2016, average annual traffic growth was -0.1 for both the MDTA facilities and the region, with the most significant decreases occurring in 2008, 2009 and 2013. This overall trend may be related to reductions in travel associated with the immediate and long-term impacts of the Great Recession of 2008/2009. Toll increases implemented in 2013 were also likely responsible for the decline in traffic on the MDTA facilities in that year. In 2016, traffic volumes increased on the MDTA facilities by 1.6 percent and by 2.0 percent for all Northern Region facilities. Much of this increase is likely due to the continued economic recovery and the significant reductions in gasoline prices experienced in 2015.

Table 2-3 presents the historical average annual daily traffic volumes and annual growth rates for the Central Region, located in the Baltimore area. Historical average annual daily traffic volumes are provided through 2016 for comparative purposes. Traffic volumes at the three Central Region MDTA facilities have also generally followed the regional trends over the last 20 years. Between 1995 and 2005, average annual traffic growth was 2.1 percent per year for the MDTA facilities as compared with a slightly higher 2.6 percent per year for the region. Traffic volumes on the Maryland State Highway Administration (MSHA) facilities decreased by an average of 2.2 percent in 2008, most likely due to the impacts of the Great Recession, while traffic volumes on the Central Region MDTA facilities increased slightly, averaging 0.2 percent. On the MDTA facilities, traffic volumes decreased in 2009 and 2010. These impacts resulted, at least in part, from the Great Recession and the 2010 toll increase. Sizeable traffic volume decreases occurred in both 2013 and 2014. Toll increases implemented in these years were likely the primary catalyst for the declines. Overall, average annual traffic growth between 1995 and 2016 was 1.1 percent per year for the MDTA facilities and 1.4 percent per year for all Central Region highways. In 2016, traffic volumes on the MDTA facilities increased by 3.2 percent. Much of this increase was likely due to a continuing economic recovery and relatively low and stable gasoline prices. Regional traffic volumes decreased by 0.5 percent in 2015, but recovered in 2016, growing by 4.7 percent over the prior year. This could be due in part to a recovery and return of traffic following the construction-related decreases on I-695 and I-95 in 2015.

**Table 2-2
Average Annual Daily Traffic for Selected Northern Region Facilities**

Calendar Year	MSHA Facilities ⁽¹⁾										MDTA Facilities		Northern Region	
	MDTA Facilities					MSHA Facilities ⁽¹⁾					Average	AAPC ⁽²⁾	Average	AAPC ⁽²⁾
	John F. Kennedy Mem. Highway	Thomas J. Hatem Mem. Bridge	I-83 S of Belfast Rd.	US 1 E of Cedar Church Rd.	US 301 S of River Rd.	AAPC ⁽²⁾	AAPC ⁽²⁾	AAPC ⁽²⁾	AAPC ⁽²⁾	AAPC ⁽²⁾	Average	AAPC ⁽²⁾	Average	AAPC ⁽²⁾
1995	67,890	22,521	46,539	8,675	9,450	---	---	---	---	---	45,206	31,015	---	
2000	78,466	25,205	50,219	9,650	10,475	2.2	2.2	2.2	2.1	2.1	51,836	40,885	5.7	
2005	81,957	30,520	61,975	9,950	11,425	3.9	4.3	0.6	1.8	1.6	56,239	39,165	(0.9)	
2006	80,744	30,450	66,760	9,852	11,650	(1.5)	7.7	(1.0)	2.0	(1.1)	55,597	39,891	1.9	
2007	81,317	30,474	62,068	11,640	11,531	0.7	(7.0)	18.1	(1.0)	0.5	55,896	39,406	(1.2)	
2008	80,283	30,445	59,830	11,061	10,952	(1.3)	(3.6)	(5.0)	(5.0)	(1.0)	55,364	38,514	(2.3)	
2009	80,229	27,617	61,620	11,282	10,370	(0.1)	3.0	2.0	(5.3)	(2.6)	53,923	38,224	(0.8)	
2010	80,815	27,325	61,971	10,050	10,451	0.7	0.6	(10.9)	0.8	0.3	54,070	38,122	(0.3)	
2011	84,739	27,797	60,988	9,861	10,252	4.9	(1.6)	(1.9)	(1.9)	4.1	56,268	38,727	1.6	
2012	84,402	27,810	60,165	9,882	10,620	(0.4)	(1.3)	0.2	3.6	(0.3)	56,106	38,576	(0.4)	
2013	80,448	25,002	60,401	9,310	10,571	(4.7)	0.4	(5.8)	(0.5)	(6.0)	52,725	37,146	(3.7)	
2014	78,780	27,115	60,041	9,301	10,562	(2.1)	(0.6)	(0.1)	(0.1)	0.4	52,948	37,160	0.0	
2015	80,495	28,747	61,311	9,522	9,920	2.2	2.1	2.4	(6.1)	3.2	54,621	37,999	2.3	
2016	83,087	27,889	61,091	11,530	10,141	3.2	(0.4)	21.1	2.2	1.6	55,488	38,748	2.0	
Average Annual Percent Change														
1995-2005	1.9	3.1	2.9	1.4	1.9	(0.8)	2.9	1.4	1.9	2.2	2.2	2.4	(0.1)	
2005-2016	0.1	(0.8)	(0.1)	1.3	(1.1)	1.0	(0.1)	1.3	0.3	(0.1)	(0.1)	1.1	(0.1)	
1995-2016	1.0	1.0	1.3	1.4	1.1	1.0	1.3	1.4	0.3	1.0	1.0	1.1	1.1	

Source: MDTA and MSHA AADT Reports.
⁽¹⁾ Maryland State Highway Administration.
⁽²⁾ Annual Average Percent Change.

Table 2-3
Average Annual Daily Traffic for Selected Central Region Facilities

Calendar Year	MSHA Facilities ⁽¹⁾										MDTA Facilities				
	I-83 N of N Charles St. N of MD 108	I-95 N of MD 15	AAPC ⁽²⁾	I-95 N of MD 108	AAPC ⁽²⁾	I-97 N of MD 176	AAPC ⁽²⁾	I-695 S of I 70	AAPC ⁽²⁾	I-695 E of MD 146	AAPC ⁽²⁾	MD 295 N of MD 100	AAPC ⁽²⁾	Average	AAPC ⁽²⁾
1995	46,900	134,475	---	153,275	---	70,500	---	156,175	---	142,475	---	59,075	---	---	---
2000	50,850	138,575	0.7	192,575	4.7	95,575	6.3	175,125	2.3	147,725	0.7	58,025	(0.4)	---	---
2005	113,475	173,825	4.5	189,825	(0.3)	99,325	0.8	188,325	1.5	152,650	0.7	86,250	8.3	---	---
2006	113,481	161,780	(6.9)	191,880	1.1	102,610	3.3	188,333	0.0	152,652	0.0	85,392	(1.0)	---	---
2007	113,482	161,781	0.0	191,881	0.0	102,611	0.0	193,050	2.5	155,270	1.7	91,630	7.3	---	---
2008	111,230	157,742	(2.5)	188,042	(2.0)	100,562	(2.0)	189,191	(2.0)	152,711	(2.0)	88,881	(3.0)	---	---
2009	112,341	160,880	2.0	192,100	2.2	105,110	4.5	188,860	(0.2)	153,693	1.0	88,882	0.0	---	---
2010	112,792	161,521	0.4	192,671	0.4	105,531	0.4	189,671	0.4	150,850	(1.8)	89,423	0.6	---	---
2011	102,860	161,682	0.1	193,062	0.1	105,642	0.1	189,812	0.1	151,001	0.1	93,390	4.4	---	---
2012	103,371	162,493	0.5	191,280	(0.9)	106,210	0.5	190,763	0.5	151,762	0.5	92,641	(0.8)	---	---
2013	104,302	165,972	2.1	193,001	0.9	107,171	0.9	192,484	0.9	149,460	(1.5)	92,832	0.2	---	---
2014	116,260	165,815	(0.1)	192,812	(0.1)	107,062	(0.1)	192,295	(0.1)	149,311	(0.1)	107,730	16.0	---	---
2015	119,051	159,150	(4.0)	197,443	2.4	106,490	(0.5)	173,900	(9.6)	152,892	2.4	101,350	(5.9)	---	---
2016	N/A	162,491	2.1	201,594	2.1	108,731	2.1	186,350	7.2	150,190	(1.8)	103,281	1.9	---	---
Average Annual Percent Change															
1995-2005			9.2	2.6	2.2		3.5	1.9		0.7		3.9			
2005-2016			---	(0.6)	0.5		0.8	(0.1)		(0.1)		1.7			
1995-2016			---	0.9	1.3		2.1	0.8		0.3		2.7			
Calendar Year	Baltimore Harbor				Fort McHenry				MDTA Facilities				Central Region		
	Tunnel	AAPC ⁽²⁾	Francis Scott Key Bridge	AAPC ⁽²⁾	Tunnel	AAPC ⁽²⁾	Average	AAPC ⁽²⁾	Average	AAPC ⁽²⁾	Average	AAPC ⁽²⁾	Average	AAPC ⁽²⁾	
1995	109,096	---	52,603	---	198,356	---	120,018	---	112,293	---	112,293	---	---	---	
2000	126,192	3.0	59,945	2.6	223,342	2.4	136,493	2.6	126,893	2.5	126,893	2.5	---	---	
2005	139,720	2.1	66,324	2.0	238,453	1.3	148,166	1.7	144,817	2.7	144,817	2.7	---	---	
2006	143,902	3.0	65,171	(1.7)	238,754	0.1	149,276	0.7	144,396	(0.3)	144,396	(0.3)	---	---	
2007	141,002	(2.0)	66,867	2.6	245,776	2.9	151,208	1.3	146,339	1.3	146,339	1.3	---	---	
2008	141,209	0.1	67,692	1.1	245,639	(0.1)	151,493	0.2	144,230	(1.4)	144,230	(1.4)	---	---	
2009	139,914	(0.9)	64,045	(5.3)	238,059	(3.1)	147,339	(2.7)	144,388	0.1	144,388	0.1	---	---	
2010	138,222	(1.2)	60,050	(6.2)	241,443	1.4	146,572	(0.5)	144,232	(0.1)	144,232	(0.1)	---	---	
2011	143,746	4.0	64,410	7.3	255,169	5.7	154,442	5.4	146,077	1.3	146,077	1.3	---	---	
2012	144,402	0.5	63,992	(0.6)	253,771	(0.5)	154,055	(0.3)	146,069	(0.0)	146,069	(0.0)	---	---	
2013	131,354	(9.0)	59,847	(6.5)	238,775	(5.9)	143,325	(7.0)	143,520	(1.7)	143,520	(1.7)	---	---	
2014	136,398	3.8	57,093	(4.6)	229,454	(3.9)	140,982	(1.6)	145,423	1.3	145,423	1.3	---	---	
2015	148,480	8.9	58,233	2.0	229,299	(0.1)	145,337	3.1	144,629	(0.5)	144,629	(0.5)	---	---	
2016	154,995	4.4	61,344	5.3	233,639	1.9	149,593	3.2	151,402	4.7	151,402	4.7	---	---	
Average Annual Percent Change															
1995-2005		2.5		2.3		1.9		2.1		2.6		2.6			
2005-2016		0.9		(0.7)		(0.2)		0.1		0.4		0.4			
1995-2016		1.7		0.7		0.8		1.1		1.1		1.4			

Source: MDTA and MSHA AADT Reports.
⁽¹⁾ Maryland State Highway Administration.
⁽²⁾ Annual Average Percent Change.

Historical average annual daily traffic volumes and annual growth rates for the Southern Region are presented in Table 2-4. Due to the proximity to Virginia, two county locations in northern Virginia have also been included. Historical average annual daily traffic volumes are provided through 2016. Traffic volumes on the two Southern Region MDTA facilities have generally followed the regional trends over the last 20 years. Between 1995 and 2005, average annual traffic growth was 2.5 percent per year for the MDTA facilities and a slightly higher 2.8 percent per year for the region. During the 2005 to 2016 period, MSHA and Virginia roadways experienced decreases in volumes during 2008. MDTA facilities experienced decreases in volume in both 2008 and 2009. This pattern may be the result of some immediate and some lagging impacts of the Great Recession. A traffic volume decrease on the MDTA facilities also occurred in 2013, followed by no growth in 2014. Both impacts are likely the result of toll increases. However, overall average annual traffic growth between 1995 and 2016 was 1.3 percent on the MDTA facilities, and 1.4 percent for the region. In 2016, traffic volumes increased on the MDTA southern facilities by 3.0 percent and for all Southern Region facilities by 2.0 percent. On a regional level, these growth rates were the greatest since 2006.

Based on the data available for the selected facilities, the MDTA legacy facilities have generally exhibited traffic growth in line with that of the region. Moreover, traffic volumes have grown at similar rates among the three regions, averaging between 2.0 to 2.5 percent between 1995 and 2005, with slight increases of approximately 1.0 to 1.3 percent between 1995 and 2016. Trends over the past 11-year period were used as a guide in estimating the ten-year traffic growth for the traffic and revenue forecasts presented in Chapter 4.

2.2 MDTA Toll Transaction and In-Lane Revenue Trends

A review of the historical toll transaction and In-Lane Toll Revenue trends for each of the seven MDTA legacy facilities follows. In-Lane Toll Revenue is the revenue that is collected at the point of transaction and excludes any fees. “Other Revenue”, which will be discussed further in Chapter 4, is the revenue produced by service fees and sales, violation recovery, concession revenue, and additional commercial vehicle revenue. What follows is an overview of the recent short-term trends. Historical data are presented by facility on a fiscal year (July 1 to June 30) basis. In addition, current E-ZPass® market penetration rates and vehicle classification percentages are also presented. These data serve as important inputs used in developing the 10-year transaction and revenue forecasts.

2.2.1 Short-Term Traffic and Revenue Impacts

The latest FY 2017 traffic and revenue data were reviewed to understand the factors impacting traffic demand at the MDTA legacy facilities. These data were compared to the prior forecast, as shown in Table 2-5. Actual FY 2017 transactions were 0.70 million, or 0.6 percent greater than those previously forecasted. In-lane toll revenue exceeded the forecast by \$12.29 million or 2.1 percent, while other toll revenues were lower than the forecast by \$1.45 million or 3.7 percent. Several factors contributed to actual transactions and revenues exceeding forecasts. In addition to normal growth, two major impacts to transactions and revenue were identified in FY 2017. These included (1) shifts in method of payment, and (2) the decline and stabilization of gasoline prices. Various construction-related impacts also had varied, but minor impacts at the three Central Region facilities, serving to redistribute traffic among these facilities. Using available data, each of these impacts were considered in estimating future normal growth rates.

**Table 2-4
Average Annual Daily Traffic for Selected Southern Region Facilities**

Calendar Year	MDTA Facilities			MSHA Facilities ⁽¹⁾			Virginia DOT Facilities			Southern Region					
	William P. Lane, Jr. Mem. (Bay) Bridge	AAPC ⁽²⁾	Mem. Bridge	Harry W. Nice Mem. Bridge	AAPC ⁽²⁾	US 301 s of MD 234	AAPC ⁽²⁾	I-95 (Virginia) N of Courthouse Rd	AAPC ⁽²⁾	US 301 (Virginia) N of Kings Hwy	AAPC ⁽²⁾	MDTA Facilities Average	AAPC ⁽²⁾	Southern Region Average	AAPC ⁽²⁾
1995	55,233	---	14,137	14,137	---	17,350	---	99,000	---	N/A	---	34,685	---	46,430	---
2000	64,877	3.3	14,849	14,849	1.0	25,400	7.9	120,000	---	N/A	---	39,863	2.8	56,282	3.9
2005	71,123	1.9	17,592	17,592	3.4	22,975	(2.0)	134,000	2.2	13,000	---	44,358	2.2	51,738	1.8 ⁽³⁾
2006	72,716	2.2	18,385	18,385	4.5	22,751	(1.0)	138,000	3.0	14,000	7.7	45,551	2.7	53,170	2.8
2007	73,941	1.7	18,731	18,731	1.9	22,522	(1.0)	137,000	(0.7)	14,000	-	46,336	1.7	53,239	0.1
2008	73,260	(0.9)	18,580	18,580	(0.8)	21,403	(5.0)	133,000	(2.9)	13,000	(7.1)	45,920	(0.9)	51,849	(2.6)
2009	69,874	(4.6)	18,341	18,341	(1.3)	21,834	2.0	136,000	2.3	13,000	-	44,108	(3.9)	51,810	(0.1)
2010	71,200	1.9	18,378	18,378	0.2	22,520	3.1	136,000	-	12,000	(7.7)	44,789	1.5	52,020	0.4
2011	74,651	4.8	18,693	18,693	1.7	22,091	(1.9)	135,000	(0.7)	12,000	-	46,672	4.2	52,487	0.9
2012	74,248	(0.5)	18,308	18,308	(2.1)	22,142	0.2	135,000	-	12,000	-	46,278	(0.8)	52,340	(0.3)
2013	69,783	(6.0)	17,868	17,868	(2.4)	20,840	(5.9)	132,000	(2.2)	13,000	8.3	43,826	(5.3)	50,698	(3.1)
2014	69,911	0.2	17,770	17,770	(0.5)	20,821	(0.1)	131,000	(0.8)	14,000	7.7	43,841	0.0	50,700	0.0
2015	70,442	0.8	18,112	18,112	1.9	21,322	2.4	134,000	2.3	14,000	-	44,277	1.0	51,575	1.7
2016	72,723	3.2	18,525	18,525	2.3	21,880	2.6	136,000	1.5	14,000	-	45,624	3.0	52,626	2.0
Average Annual Percent Change															
1995-2005	2.6		2.2	2.2		2.8		2.8		3.1	---	3.1		2.5	2.8 ⁽³⁾
2005-2016	0.2		0.5	0.5		(0.4)		(0.4)		0.1	0.7	0.1		0.3	0.2
1995-2016	1.3		1.3	1.3		1.1		1.1		1.5	---	1.5		1.3	1.4 ⁽³⁾

Source: MDTA, MSHA and Virginia DOT AADT Reports.

⁽¹⁾ Maryland State Highway Administration.

⁽²⁾ Annual Average Percent Change.

⁽³⁾ For comparative purposes, percent change calculated based on averages that excludes US 301 (Virginia) traffic volumes.

**Table 2-5
Comparison of FY 2017 Forecasted Versus Actual Legacy Facility Transactions and Revenue**

Item	FY 2016 Actual (millions)		FY 2017 Forecasted (millions)		FY 2017 Actual (millions)		FY 2017 Actual versus FY 2017 Forecasted (millions)	
	Amount	Percent	Amount	Percent	Amount	Percent	Difference	Percent
Transactions	119.03		121.26	1.9	121.96	2.5	0.70	0.6
In-Lane Toll Revenue	\$ 581.41		\$ 589.62	1.4	\$ 601.91	3.5	\$ 12.29	2.1
Other Toll Revenue	\$ 40.58		\$ 38.71	(4.6)	\$ 37.26	(8.2)	\$ (1.45)	(3.7)

Note: Includes transactions and revenue for MDTA Legacy Facilities only.

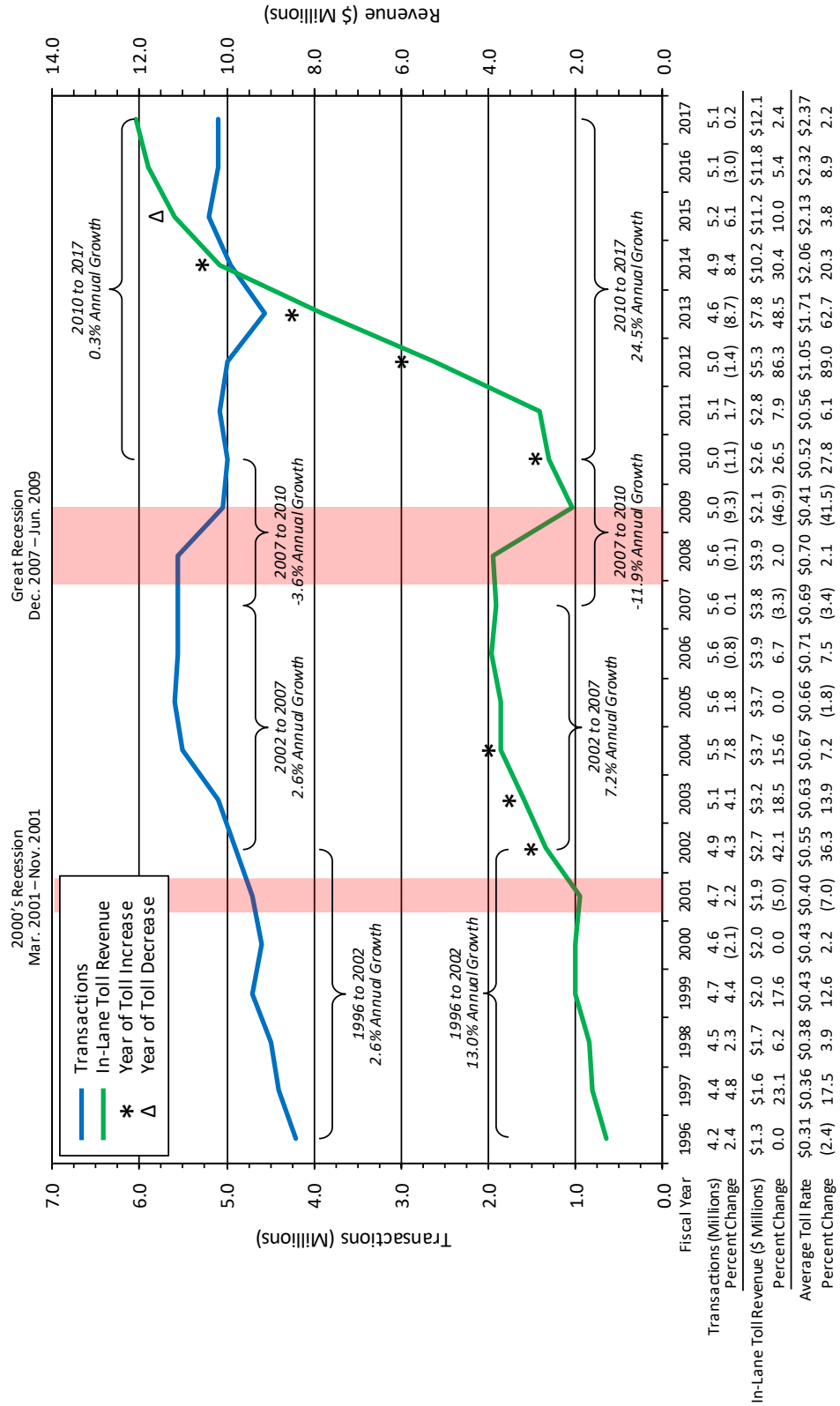
2.2.2 Thomas J. Hatem Memorial Bridge

Historical transactions and revenue for the Thomas J. Hatem Memorial Bridge between FY 1996 and FY 2017 are provided in Figure 2-1. Toll rate increases are represented with an asterisk for each fiscal year that an increase occurred. The toll rate decrease of FY 2016 is represented by a triangle. It should be noted that toll rate increases did not necessarily occur at the beginning of the fiscal year, but varied by year.

Transactions grew steadily between FY 1996 and FY 2002 at an average annual rate of 2.6 percent. Transactions decreased in FY 2000 prior to the 2001 recession, but then recovered the following year. Despite three toll increases, transactions then continued to grow between FY 2002 and FY 2007 at an average annual rate of 2.6 percent. Transactions peaked in FY 2005 at 5.6 million prior to the 2008/2009 Great Recession. The recession may have begun influencing transactions on the Thomas J. Hatem Memorial Bridge as early as FY 2006, as transactions dipped 0.8 percent in that year. Transactions remained at 5.6 million until FY 2009 when they decreased by 9.3 percent, the largest decrease occurring in a year without a toll increase. Following this decrease, continued economic uncertainty and several toll increases resulted in transactions decreasing further to 4.6 million in FY 2013. Transactions recovered slightly to 4.9 million in FY 2014, despite the toll increase that year, and grew again in FY 2015 by 6.1 percent to 5.2 million. Transactions decreased in FY 2016 by 3.0 percent, driven by a correction in Hatem A Discount Plan participation from the prior year. In October 2014, Hatem A Discount Plan participation increased by roughly 250,000 transactions, compared to the prior year. This appears to have been a one-time impact, with October 2015 transactions decreasing over the prior year by roughly 250,000, suggesting that FY 2016 represents a return to normal monthly patterns. Transactions using other methods of payment increased by 7.5 percent in FY 2016, a growth rate consistent with that of FY 2014 and FY 2015. FY 2017 transactions were slightly higher, increasing by a modest 0.2 percent. Overall, average annual transaction growth was just under 1.0 percent per year between FY 1996 and FY 2017. And, more recently, between FY 2013 and FY 2017, annual transaction growth averaged 2.6 percent per year. This more recent growth may be the result of lower and stable gasoline prices, the continuing economic recovery and the positive impacts of the toll reduction in FY 2016.

Revenue increased steadily between FY 1996 and FY 2002 at an average annual rate of 13.0 percent, and over the next three years, a series of toll increases resulted in an average annual increase of about 25 percent per year. Revenues then remained relatively stable between FY 2004 and FY 2008, at about \$3.8 million. After experiencing a large dip between FY 2008 and FY 2009 because of the decrease in transactions associated with the Great Recession, revenue has steadily grown, reaching \$12.1 million in FY 2017. This growth has been aided by a series of toll increases indicated by increases in average toll rates, and led to an average annual revenue growth rate of 24.6 percent between FY 2010 and FY 2017. Toll revenue increased by 2.4 percent in FY 2017. The increase was primarily the result of shifts in the passenger car method of payment from the discount plan to E-ZPass®. Overall average annual In-Lane Toll Revenue growth was 11.2 percent between FY 1996 and FY 2017, with the primary growth in revenues occurring as a result of a series of toll increases implemented during the last five years.

Figure 2-1
Historical Transactions and In-Lane Toll Revenue, FY 1996 through FY 2017
Thomas J. Hatem Memorial Bridge



2.2.3 John F. Kennedy Memorial Highway

Historical transactions and revenue on the John F. Kennedy Memorial Highway (JFK) between FY 1996 and FY 2017 are provided in Figure 2-2. Between FY 1996 and FY 2002, transactions grew at an average annual rate of 3.0 percent, despite the 2001 recession. Between FY 2002 and FY 2007, transactions remained at about 15.0 million, but declined in FY 2008 by 1.3 percent, and again in FY 2009 by 0.1 percent, as a result of the impacts of the Great Recession. Transactions then recovered and reached a peak of 15.4 million in FY 2011, despite the FY 2010 toll increase. The toll increases in FY 2012 through FY 2014 were likely the impetus for the annual decreases in transactions to 14.4 million in FY 2014. The number of transactions rebounded in FY 2015 to 14.7 million, a growth of 2.1 percent over FY 2014. In FY 2016, transactions increased by another 3.4 percent, with the majority of growth occurring in all E-ZPass® payment categories, but primarily Maryland E-ZPass®. Transactions increased by 2.5 percent in FY 2017, most notably among E-ZPass® customers. These method of payment shifts and growths in transactions are likely the result of the FY 2016 toll rate decrease, especially considering long-term historical growth rates. Notwithstanding individual years of robust growth over the last 21 years, average annual transaction growth was 1.0 percent per year between FY 1996 and FY 2017. And more recently, between FY 2013 and FY 2017, average annual transaction growth was 1.5 percent per year.

Revenue increased steadily between FY 1996 and FY 2002 at an average annual rate of 11.3 percent. Over the next three years, a series of toll increases resulted in an average annual revenue increase of 32.3 percent per year. Revenues then increased to \$94.6 million in FY 2005 and generally remained at that level until FY 2009. This included a 2.0 percent decrease in FY 2008, associated with the impacts of the Great Recession, and a 2.6 percent recovery in FY 2009. Since FY 2009, revenues have grown steadily, reaching \$175.8 million in FY 2017. This growth has been aided by a series of toll increases evidenced by the increases in average toll rate provided in Figure 2-2. The increases have resulted in an average annual growth rate of 7.3 percent between FY 2010 and FY 2017.

In FY 2017, toll revenues increased by 2.7 percent. Passenger vehicles increased by 2.6 percent and commercial vehicles increased by 2.3 percent, a decrease from the prior year where commercial vehicles grew by 4.5 percent. Overall, average annual In-Lane Toll Revenue growth was 8.2 percent per year between FY 1996 and FY 2017.

2.2.4 Baltimore Harbor Tunnel

Historical transactions and revenue for Baltimore Harbor Tunnel between FY 1996 and FY 2017 are shown in Figure 2-3. Transactions increased every year between FY 1996 and FY 2002, except for a one-year decrease in FY 1998. This was despite the impacts of the 2001 recession and three toll increases. The average annual growth rate for this period was 3.6 percent. Transactions declined in FY 2005 by 1.7 percent and in FY 2007 by 2.0, possibly as a result of the considerable increases in the average price of gasoline that occurred in those years. Even with these setbacks, transactions reached a pre-recession peak of 25.8 million in FY 2008, before declining by 0.9 percent in FY 2009 in the wake of the Great Recession. Despite a 1.2 percent decrease in FY 2010, transaction growth recovered in FY 2011 and reached 26.1 million. Transactions of 27.1 million were recorded in FY 2015, an increase of 8.9 percent over FY 2014. This considerable increase is in part the result of traffic diversions from deck rehabilitation on I-95 south of the Fort McHenry Tunnel. Transactions at the Baltimore Harbor Tunnel increased by 4.4 percent in FY 2016. Almost all of this growth occurred in Maryland E-ZPass® transactions. While commuter discount transactions decreased by more than 1.0 million, Maryland E-ZPass® transactions increased by almost 1.4 million. This may reflect the preference of less frequent

Figure 2-2
Historical Transactions and In-Lane Toll Revenue, FY 1996 through FY 2017
John F. Kennedy Memorial Highway

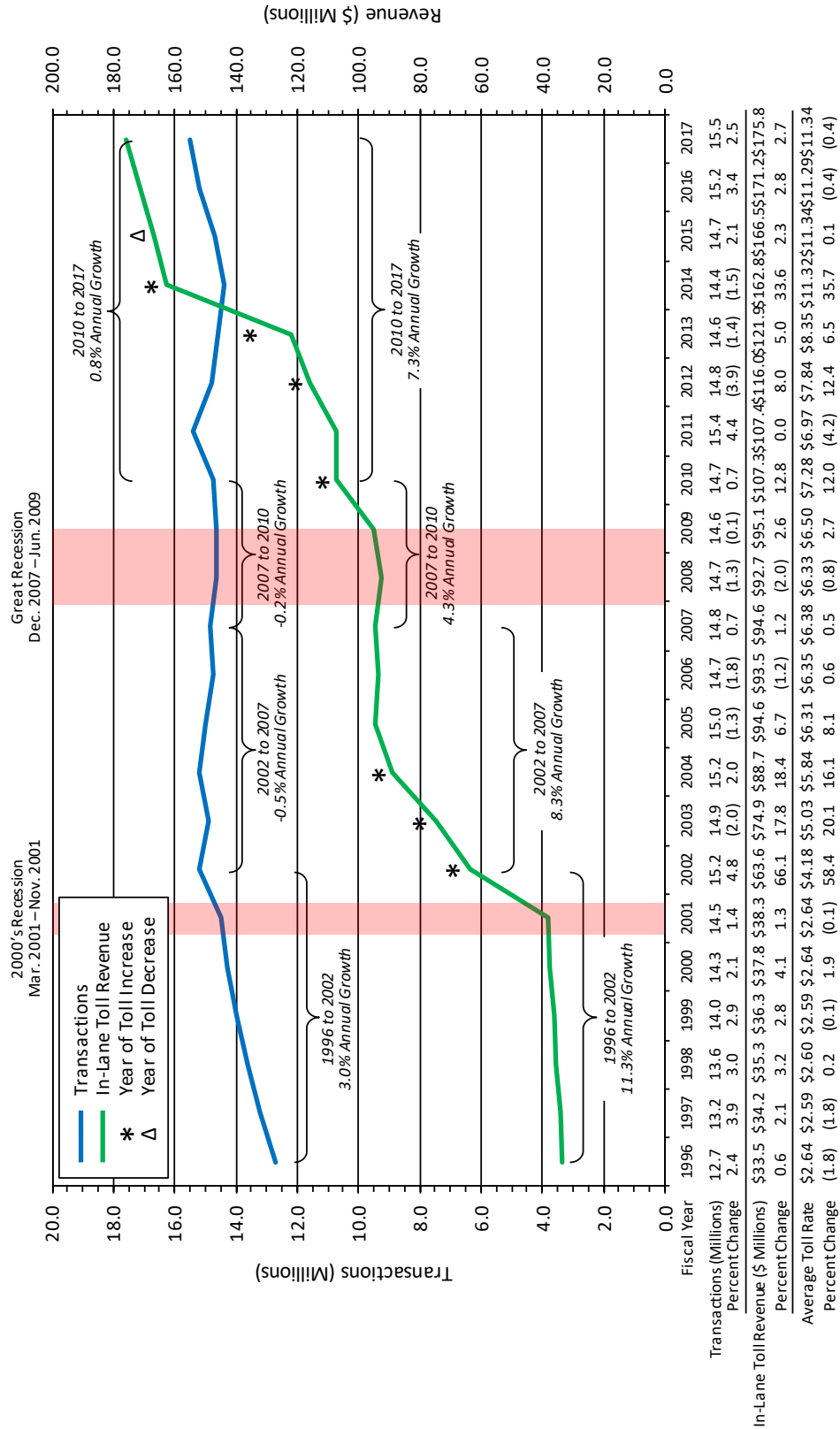
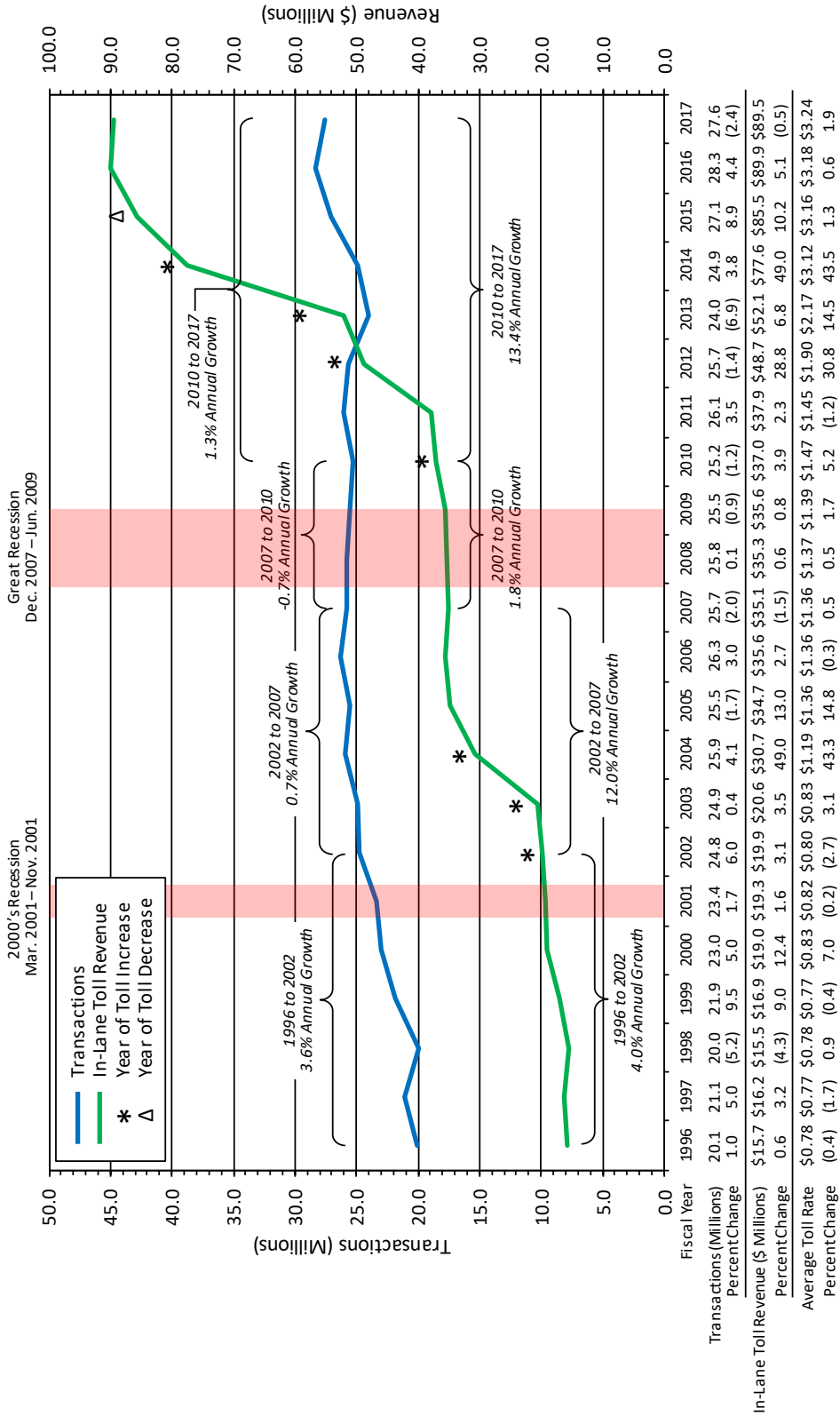


Figure 2-3
Historical Transactions and In-Lane Toll Revenue, FY 1996 through FY 2017
Baltimore Harbor Tunnel



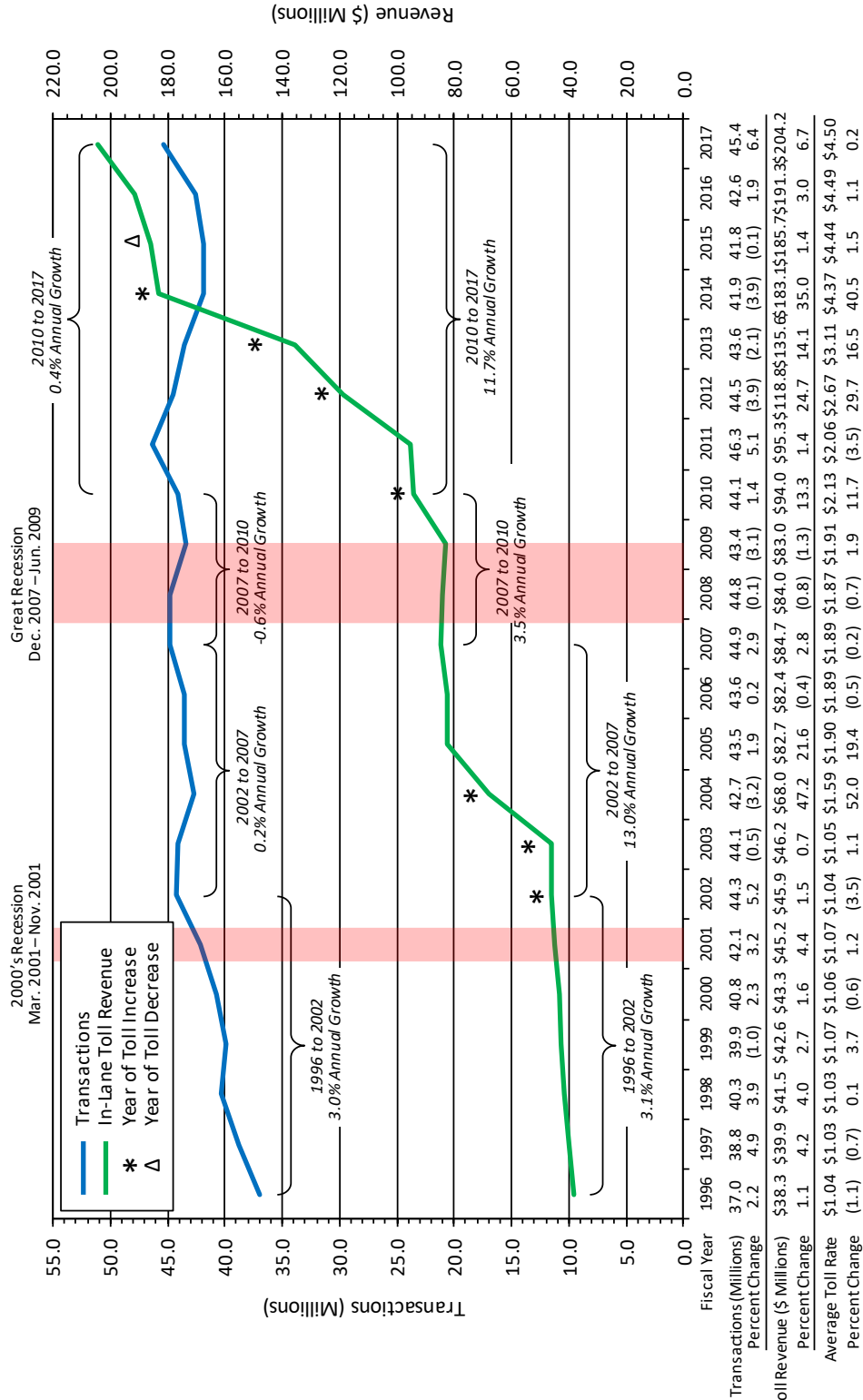
commuter discount program customers to save the time of purchasing a new plan every 45 days considering the lower Maryland E-ZPass® toll rates following the FY 2016 toll decrease. Full fare E-ZPass® also increased by over 500,000 transactions in FY 2016. In FY 2017, transactions decreased by 2.4 percent, making it the only Legacy facility to experience a decrease in transactions. This impact can be attributed to the deck and superstructure replacement on I-895. This project reduced the number of lanes to one in each direction at times, restricting traffic flow to the Baltimore Harbor Tunnel. Along with the reduction in transactions, there was also a shift in method of payment, as some traffic diverted to other facilities or eliminated discretionary trips. Commuter transactions decreased by just over 1.0 million, while E-ZPass® transactions increased by around 580,000. Full-fare transactions were reduced by just over 300,000. On average, transactions at the Baltimore Harbor Tunnel have grown by 1.5 percent per annum between FY 1996 and FY 2017, and more recently, by 3.6 percent per annum between FY 2013 and FY 2017.

Aside from a one-year decline in FY 1998, annual revenue increased each year between FY 1996 and FY 2002 by 4.0 percent. Over the next five years, a series of toll increases resulted in an average annual revenue increase of 12.0 percent. Between FY 2007 and FY 2010, toll revenues increased from \$35.1 million to \$37.0 million, despite declines related to the impacts of the Great Recession. Since FY 2010, revenues have grown steadily to \$89.9 million in FY 2016, aided by a series of toll increases and the aforementioned traffic diversions. In FY 2016, toll revenues increased by 5.1 percent, primarily the result of shifts in passenger car method of payment and growth in commercial vehicle transactions. Commercial vehicle transactions increased by 7.8 percent in FY 2016, with revenue increasing by 8.4 percent, most likely resulting from the continued economic recovery, lower and stable fuel prices, and the FY 2016 toll reductions for trucks with a high trip frequency. In FY 2017, revenue decreased by 0.5 percent. This was due to the decrease in transactions from the previously mentioned construction impacts. The average annual growth rate in revenue between FY 2013 and FY 2017 was 14.5 percent. The average annual In-Lane Toll Revenue growth was 8.6 percent per year between FY 1996 and FY 2017. This was primarily the result of toll increases between FY 2001 and FY 2004, and during the last five years.

2.2.5 Fort McHenry Tunnel

Historical transactions and revenue at the Fort McHenry Tunnel between FY 1996 and FY 2017 are provided in Figure 2-4. Aside from a 1.0 percent decrease in FY 1999, transactions increased each year between FY 1996 and FY 2002 at an average annual rate of 3.0 percent despite the 2001 recession. In FY 2003 and FY 2004, transactions decreased to 42.7 million, due to the impacts of the FY 2002 to FY 2004 toll increases. By FY 2007, transactions had recovered to FY 2002 levels. However, transactions then declined in FY 2008 by 0.1 percent, and again in FY 2009 by 3.1 percent, because of the impacts of the Great Recession. Transactions then recovered and reached a peak of 46.3 million in FY 2011, notwithstanding the FY 2010 toll increase. The toll increases in FY 2012 through FY 2014 were likely the primary impetus for the annual decreases in transactions to 41.9 million by FY 2014. Transactions declined slightly in FY 2015 to 41.8 million, the result of the deck rehabilitation on I-95 south of the tunnel. Transactions increased in FY 2016 by 1.9 percent. Similar to the FY 2016 growth patterns at the Baltimore Harbor Tunnel, almost all of the growth at the Fort McHenry Tunnel occurred in Maryland E-ZPass® transactions. In FY 2017, transactions increased by 6.4 percent, the largest year-over-year growth in the past 21 years. Passenger cars and commercial vehicles both increased by 6.4 percent, with strong growth exhibited in E-ZPass transactions, with an additional 1.5 million Maryland E-ZPass® transactions and 1.2 million non-Maryland E-ZPass® transactions. This robust growth can be attributed, in part, to diversions from the construction on I-

Figure 2-4
Historical Transactions and In-Lane Toll Revenue, FY 1996 through FY 2017
Fort McHenry Tunnel



895 and its related impact on the Baltimore Harbor Tunnel. Despite individual years of robust growth, transactions grew by a modest average of 0.9 percent per year between FY 1996 and FY 2017.

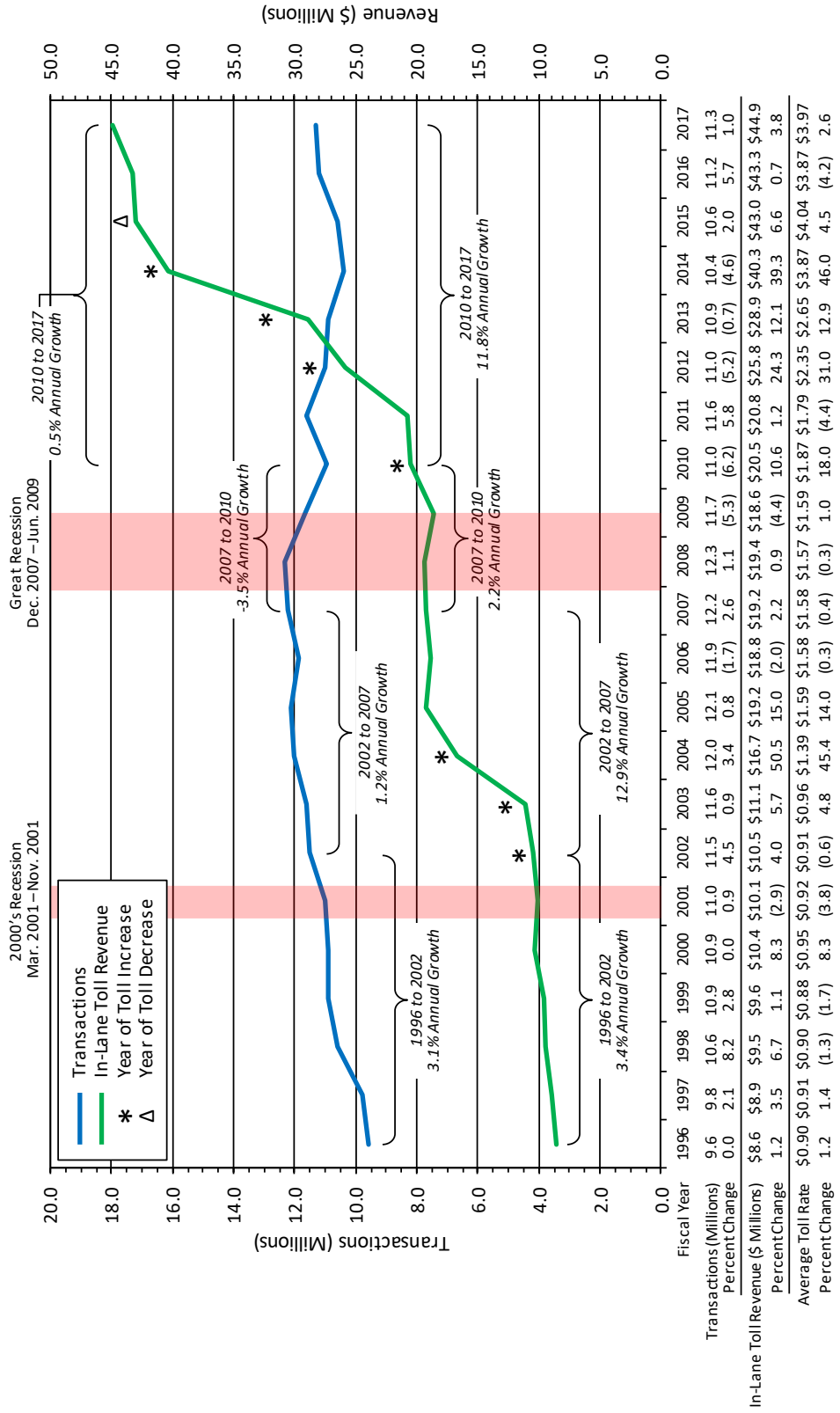
Revenue has continually grown in the last 21 years, with minor declines in FY 2006, FY 2008, and FY 2009. Between FY 1996 and FY 2002, revenues grew at an average annual rate of 3.1 percent. Over the next three years, a series of toll increases resulted in an average annual revenue increase of 14.6 percent per year. Revenues then increased to \$82.7 million in FY 2005 and remained at about that level until FY 2009. Since FY 2010, aided by a series of toll increases, revenues have grown steadily and have reached \$204.2 million in FY 2017. Toll revenues increased by 6.7 percent in FY 2017, double the growth over the prior year. This growth may have been the result of traffic shifting from the Baltimore Harbor Tunnel due to construction activities in that corridor. Overall average annual In-Lane Toll Revenue growth was 8.3 percent per year between 1996 and 2017.

2.2.6 Francis Scott Key Bridge

Historical transactions and revenue at the Francis Scott Key Bridge between FY 1996 and FY 2017 are provided in Figure 2-5. Transactions increased between FY 1996 through FY 2005 at an average annual rate of 2.6 percent. Following a decrease of 1.7 percent in FY 2006, transactions peaked at 12.3 million in FY 2008. Transactions then declined by 5.3 percent in FY 2009 as a result of the impacts of the Great Recession. Following this, transactions decreased again in FY 2010 by 6.2 percent, most likely due to a combination of the lingering impacts of the Great Recession and the impacts of the FY 2010 toll increase. Transactions recovered in FY 2011 before decreasing each year from FY 2012 through FY 2014, the result of toll increases in each of those years. Transactions increased by 2.0 percent to 10.6 million in FY 2015, and by 5.7 percent to 11.2 million in FY 2016. In FY 2016, the primary growth on the Francis Scott Key Bridge occurred in the commuter discount program where an increase of 380,000 commuter discount transactions occurred. In FY 2017, transactions increased by a more modest 1.0 percent to 11.3 million. This growth was comprised mostly of commercial vehicles, with transactions increasing by 4.4 percent, and passenger cars increasing by 0.7 percent. Some diversion of traffic from the other Harbor crossings was assumed, as motorists sought to avoid delays associated with construction. Without this assumed diversion, some slight reductions in traffic on the Francis Scott Key Bridge may have occurred. Method of toll payment distributions differed slightly from FY 2016, with Maryland E-ZPass® transactions increasing by 545,000, and commuter transactions decreasing by 460,000. This varied from the large commuter increase experienced in FY 2016. In the long-term, transactions grew at an average annual rate of 0.8 percent between FY 1996 and FY 2017. Over the past four years between FY 2013 through FY 2017 transactions increased at an average annual rate of 0.9 percent.

In-Lane Toll Revenue increased each year between FY 1996 and FY 2005, with the exception of a one-year drop in FY 2001. Between FY 1996 and FY 2002, revenues grew at an average annual rate of 3.4 percent. Over the next three years, a series of toll increases resulted in average annual increases of 18.2 percent. Revenues then increased to \$19.2 million in FY 2005, and remained at about that level until FY 2008. After experiencing a 4.4 percent decrease in FY 2009, a result of the Great Recession, revenues have grown steadily, reaching \$44.9 million in FY 2017. The recent growth in In-Lane Toll Revenue is primarily due to a series of toll increases, as well as an increasing percentage of commercial vehicles. Revenue grew at an average annual rate of 3.7 percent between FY 2014 and FY 2017. The long-term average annual In-Lane Toll Revenue growth has been 8.2 percent between FY 1996 and FY 2017.

Figure 2-5
Historical Transactions and In-Lane Toll Revenue, FY 1996 through FY 2017
Francis Scott Key Bridge



2.2.7 William Preston Lane Jr. Memorial (Bay) Bridge

Historical transaction and revenue data for the William Preston Lane Jr. Memorial (Bay) Bridge between FY 1996 and FY 2017 are provided in Figure 2-6. Transactions increased each year from FY 1996 to FY 2007, at an average of 2.5 percent per year, except for a one-year decrease between FY 2002 and FY 2003, likely related to the toll increase in that year. Transactions declined in FY 2008 by 0.9 percent and again in FY 2009 by 4.6 percent, a result of the Great Recession. Transactions then recovered and reached a peak of 13.7 million in FY 2012 despite a toll increase. The toll increases in FY 2012 through FY 2014 were the primary impetus for the decline in transactions to 12.8 million in FY 2014. Transactions then increased by 0.8 percent to 12.9 million in FY 2015, and again in FY 2016 by 3.1 percent, following a 53.7 percent reduction in the Maryland E-ZPass® toll rate and a 33.3 percent reduction in all other toll categories. Almost all of the growth occurred in Maryland E-ZPass® transactions. Of the approximately 560,000 increase in E-ZPass® transactions, roughly 240,000 were estimated to have shifted from the commuter discount program. This may reflect the preference of less frequent commuter discount program customers to save the time of purchasing a new plan every 45 days in light of the lower Maryland E-ZPass® toll rates. In FY 2017, transactions increased by 2.4 percent to 13.6 million. Between FY 2013 and FY 2017, transactions increased by an average of 1.7 percent, while between FY 1996 to FY 2017 transactions grew by an average of 1.3 percent per year.

In-Lane Toll Revenue increased each year from FY 1996 to FY 2003, except for FY 2001 and FY 2003, when no growth occurred. Between FY 1996 and FY 2002, revenues grew at an average annual rate of 3.4 percent. Over the next three years, a series of toll increases had limited impact on toll revenue, with revenue increasing by a modest 3.5 percent per year. After a small decrease of 0.3 percent in FY 2005, due to the increases in gasoline prices in that year, revenue continued to grow at about 1.3 percent through FY 2007. Annual decreases in FY 2008 and FY 2009 were related to the impacts of the Great Recession. Since FY 2009, revenue has grown steadily due, in part, to a series of toll increases, reaching \$81.2 million in FY 2015. Despite the increases in Maryland E-ZPass® transactions, total toll revenue decreased by 35.0 percent in FY 2016 due to the magnitude of the toll decreases at the Bay Bridge. While other facilities experienced decreases in Maryland E-ZPass® or 3- and 4-axle commercial vehicle toll rates only, Maryland E-ZPass® toll rates were reduced by 53.7 percent and all other toll rates were reduced by 33.3 percent. This, coupled with the shift in traffic from the commuter discount program to Maryland E-ZPass®, contributed to the decrease in revenue. Due primarily to the FY 2016 toll reductions, revenues on the Bay Bridge are currently at FY 2013 levels. Revenue reached \$54.0 million in FY 2017, an increase of 2.2 percent over the prior year. While revenue has grown at an extremely modest rate of 0.8 percent per annum between FY 2013 and FY 2017, the long-term growth between FY 1996 and FY 2017 has been 3.5 percent.

2.2.8 Harry W. Nice Memorial Bridge

Historical transaction and revenue data for the Harry W. Nice Memorial Bridge between FY 1996 and FY 2016 are provided in Figure 2-7. Transactions declined in FY 1996 and experienced no change in FY 1997, before recovering and steadily growing through FY 2007. Between FY 1997 and FY 2007, transactions grew at an average annual rate of 3.1 percent, despite the 2001 recession and three toll increases. FY 2007 represented the peak transaction level of 3.4 million. Transactions declined in FY 2008 by 0.8 percent and in FY 2009 by 1.3 percent, because of the impacts of the Great Recession.

Figure 2-6
Historical Transactions and In-Lane Toll Revenue, FY 1996 through FY 2017
William Preston Lane Jr. Memorial (Bay) Bridge

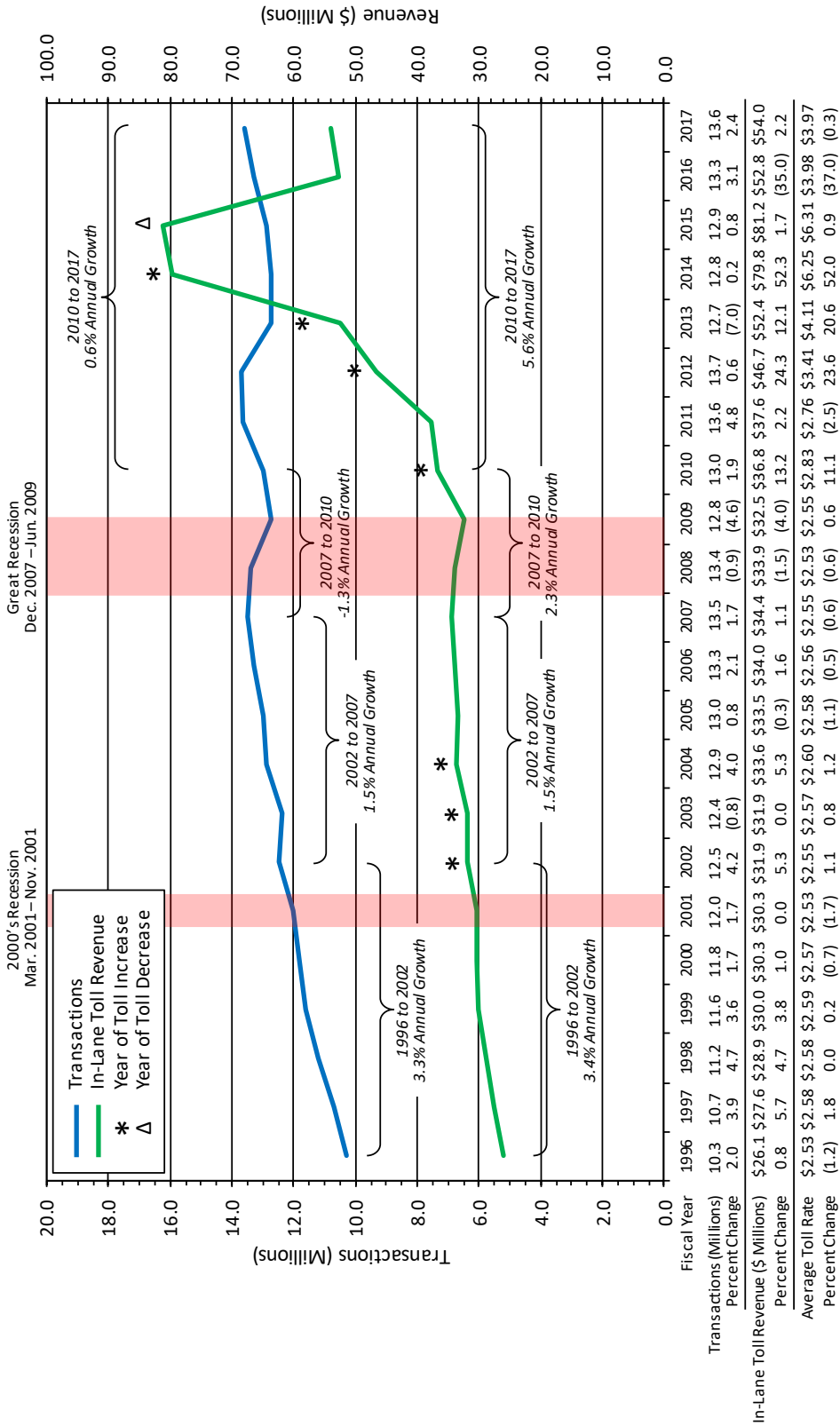
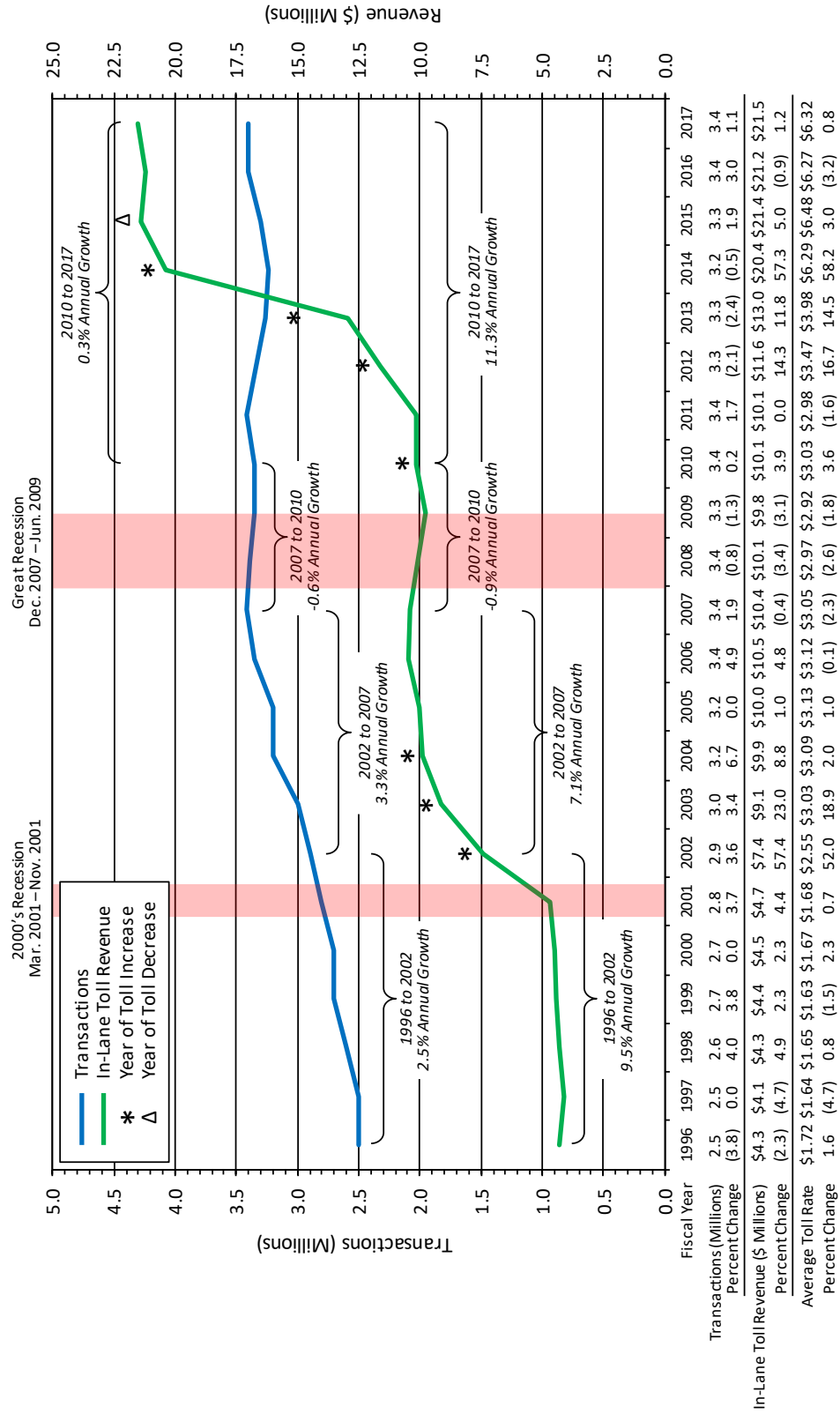


Figure 2-7
Historical Transactions and In-Lane Toll Revenue, FY 1996 through FY 2017
Harry W. Nice Memorial Bridge



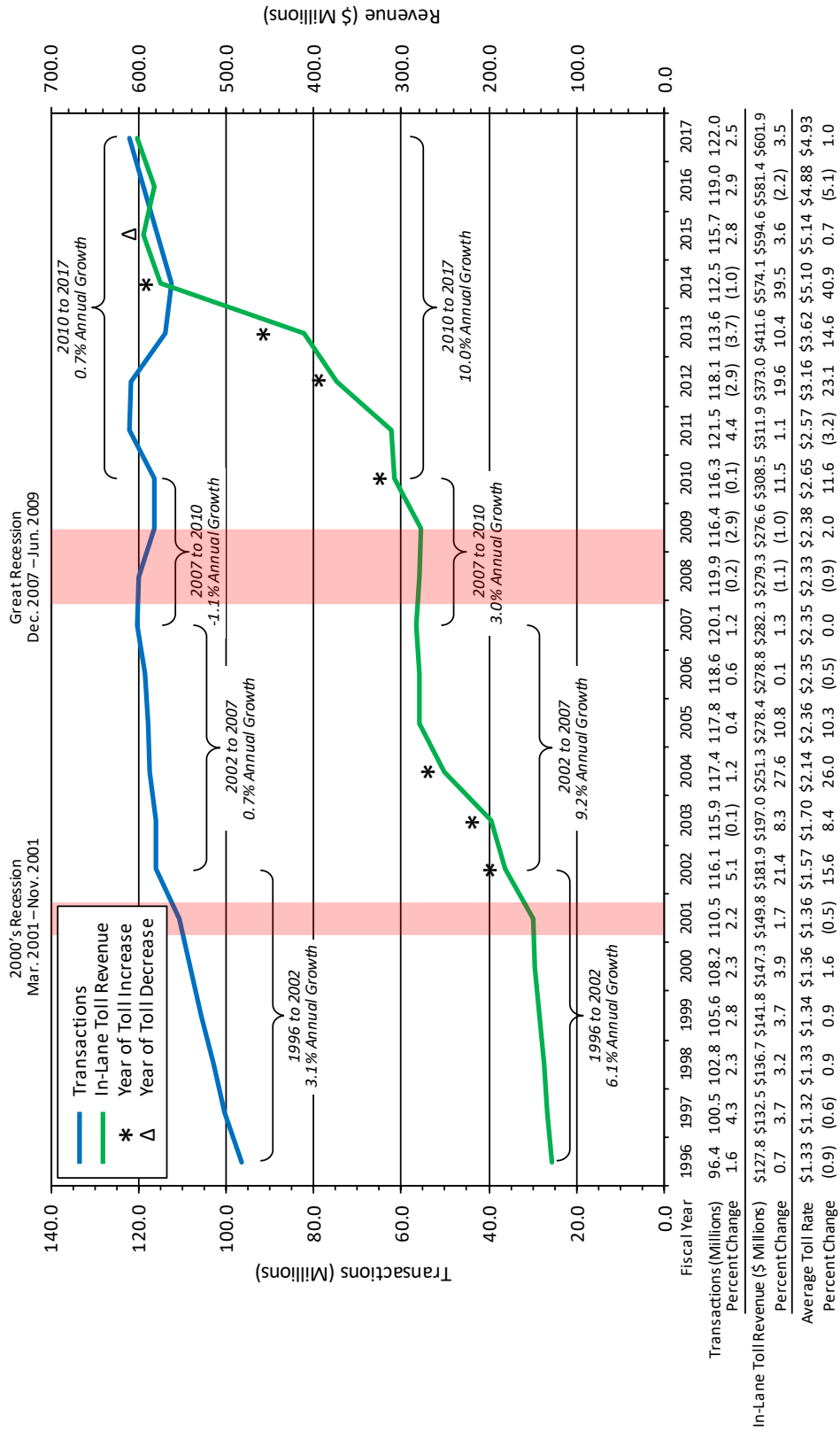
The toll increases from FY 2012 through FY 2014 were the primary impetus for the decline in transactions to 3.2 million by FY 2014. Transactions increased by 1.9 percent to 3.3 million in FY 2015 and by 3.0 percent to 3.4 million in FY 2016, with growth occurring in commuter discount and E-ZPass® transactions. In FY 2017, transactions reached 3.4 million, a 1.1 percent increase over FY 2016. Commuter and full-fare transactions decreased, with all the growth occurring in E-ZPass® transactions. Average annual transaction growth was 1.5 percent between FY 1996 and FY 2017, although in the last four years (FY 2013 through FY 2017) transactions increased by a more modest average of 0.7 percent.

In-Lane Toll Revenue displayed a similar pattern of growth to those of transactions between FY 1996 and FY 2001, decreasing in both FY 1996 and FY 1997, before growing steadily through FY 2006. Between FY 1996 and FY 2002, revenues grew at an average annual rate of 9.5 percent. Over the next three years, a series of toll increases resulted in an average annual increase of 28.2 percent. As a result of the decreases in transactions related to the Great Recession, revenues declined between FY 2007 and FY 2010 by an average of 0.9 percent per year. Revenues have recovered in recent years, aided by series of toll increases. Revenues have grown to \$21.2 million in FY 2016, representing an average annual growth rate of 1.9 percent since FY 2014. Despite the increases in commuter discount and Maryland E-ZPass® transactions, toll revenues decreased by 0.9 percent in FY 2016. This was due to the shift of transactions from cash to Maryland E-ZPass® due to the toll reduction. In FY 2017, revenue increased by 1.2 percent to \$21.5 million. Overall average annual toll revenue growth was 8.0 percent between 1996 and 2017.

2.2.9 MDTA Legacy Facilities Total

Transaction and revenue data for the legacy system between FY 1996 and FY 2017 are provided in Figure 2-8. Transactions increased each year between FY 1996 and FY 2007 at an average annual rate of 2.0 percent, except for a very minor decline in FY 2003, possibly related to the toll increase that year. However, following this steady growth, transactions declined between FY 2007 and FY 2010 by an average of 1.1 percent per year, due to the impacts of the Great Recession and the FY 2010 toll increase. Transactions recovered in FY 2011, reaching a system high of 121.5 million, before decreasing annually through FY 2014. The decline in transactions through FY 2014 to 112.5 million were likely the result of successive toll increases implemented each year from FY 2012 through FY 2014. Transactions increased by 2.8 percent to 115.7 million in FY 2015. The higher level of growth in FY 2015 was due to a delayed recovery from the Great Recession and other short-term factors, such as the historically low gas prices in FY 2015. There may also have been recovery from the impacts of the toll increases from FY 2012 through FY 2014, as some motorists returned to the legacy facilities. In addition to the positive impacts of the FY 2016 toll reduction, FY 2016 transaction growth continued to be impacted by many of the same economic factors occurring in FY 2015, such as the continued economic recovery and continued low gasoline prices. The MDTA legacy facility transactions increased by 2.9 percent in FY 2016. This included the estimated impacts of the additional day in the leap year (0.2 percent), the toll rate reduction (0.3 percent), gas price reductions (0.50-0.75 percent) and normal growth (1.65-1.90 percent). In FY 2017, transactions increased by 2.5 percent to 122.0 million. Long-term average annual transaction growth on the legacy facilities was 1.1 percent between FY 1996 and FY 2017.

Figure 2-8
Historical Transactions and In-Lane Toll Revenue, FY 1996 through FY 2017
Legacy System



Systemwide In-Lane Toll Revenue increased each year between FY 1996 and FY 2017, except for fiscal years 2008, 2009, and 2016. Between FY 1996 and FY 2002, revenues grew at an average annual rate of 6.1 percent. Over the next three years, during which a series of toll increases were implemented, revenue increased at an average of 18.8 percent per year. Because of the decreases in transaction growth related to the Great Recession, revenues declined in FY 2008 by 1.1 percent and again in FY 2009 by 1.0 percent. Revenue has recovered in recent years, aided by a series of toll increases. Revenues increased by 3.5 percent to \$594.6 million in FY 2015, resulting in an average annual growth rate of 14.0 percent since FY 2010. In FY 2016, toll revenue decreased by 2.2 percent following the implementation of select toll rate reductions. The majority of this decrease was due to the toll rate decreases on the Bay Bridge. The Northern and Central Regions, where trips tend to be more commuter- and business-related than discretionary, were able to offset the losses in toll revenue resulting from the toll decrease, with additional revenues generated by shifts in method of payment. In FY 2017, In-Lane Toll Revenue increased by 3.5 percent, reaching \$601.9 million. Annual In-Lane Toll Revenue growth has averaged 7.7 percent per year between FY 1996 and FY 2017.

Legacy facility In-Lane Toll Revenue has increased significantly more than the growth in transactions because of the adjustments to toll rates in recent years. Had these toll rate adjustments not been made, it is reasonable to assume that transactions would have been higher, while growth in In-Lane Revenues would have more closely tracked the rate of growth in transactions. Long-term historical growth, based on transaction and revenue data in those years without toll rate increases or economic downturns, is estimated to be roughly 0.5 percent per year.

2.2.10 Vehicle Class Distribution

Table 2-6 presents a summary of the distribution of annual transactions by vehicle class for FY 2017 for each of the legacy facilities and on a total system basis. Two-axle vehicles, which include passenger cars, motorcycles, vans and SUVs, comprised 92.8 percent of all transactions. Vehicles with three-or-more-axles, which include trucks, buses and other commercial vehicles, accounted for the remaining 7.2 percent. The John F. Kennedy Memorial Highway (I-95) had the greatest percentage of commercial vehicle transactions with 11.6 percent, while the Baltimore Harbor Tunnel had the lowest percentage with 2.3 percent of total transactions.

2.2.11 E-ZPass® Market Share

In recent years, electronic toll collection has played an increasingly important role in transaction processing for toll agencies across the nation. MDTA collects electronic tolls via E-ZPass®. Toll collection through E-ZPass® provides faster toll processing and decreased collection costs. As such, increases in E-ZPass® market share represent potential increases in total paid (net) revenues.

Table 2-7 provides a concise summary of FY 2017 transactions by method of payment. They are shown individually for each of the seven legacy facilities, as well as on a total system basis. E-ZPass® transactions accounted for 73.2 percent of all transactions, an increase of 1.3 percent over the prior year. Of these, 65.4 percent were made by Maryland E-ZPass® customers, including in-state E-ZPass® customers, commuter plans, shopper plans and Hatem Bridge plans. In terms of individual facilities, the Thomas J. Hatem Memorial Bridge had the greatest percentage of E-ZPass® customers at 92.6 percent of total transactions, primarily due to the Hatem Bridge Toll Plans. The Hatem Bridge Toll

**Table 2-6
Vehicle Class Distribution for the MDTA Legacy Facilities**

Vehicle Class	FY 2017 Transactions (000) ⁽¹⁾										Total	
	John F. Kennedy Mem. Highway	Thomas J. Hatem Mem. Bridge	Baltimore Harbor Tunnel	Francis Scott Key Bridge	Fort McHenry Tunnel	William P. Lane, Jr. Mem. (Bay) Bridge	Harry W. Nice Mem. Bridge					
2-Axle	13,745	4,893	26,974	10,257	41,381	12,692	3,209					113,149
Percent of Total	88.4	95.9	97.7	90.7	91.2	93.4	93.8					92.8
3+-Axle	1,803	210	639	1,054	3,999	895	210					8,810
Percent of Total	11.6	4.1	2.3	9.3	8.8	6.6	6.2					7.2
Total	15,548	5,102	27,612	11,311	45,380	13,587	3,419					121,959
Percent of Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0					100.0

Source: MDTA

⁽¹⁾ Includes Violation Transactions

Table 2-7
Method of Payment Distribution for the MDTA Legacy Facilities

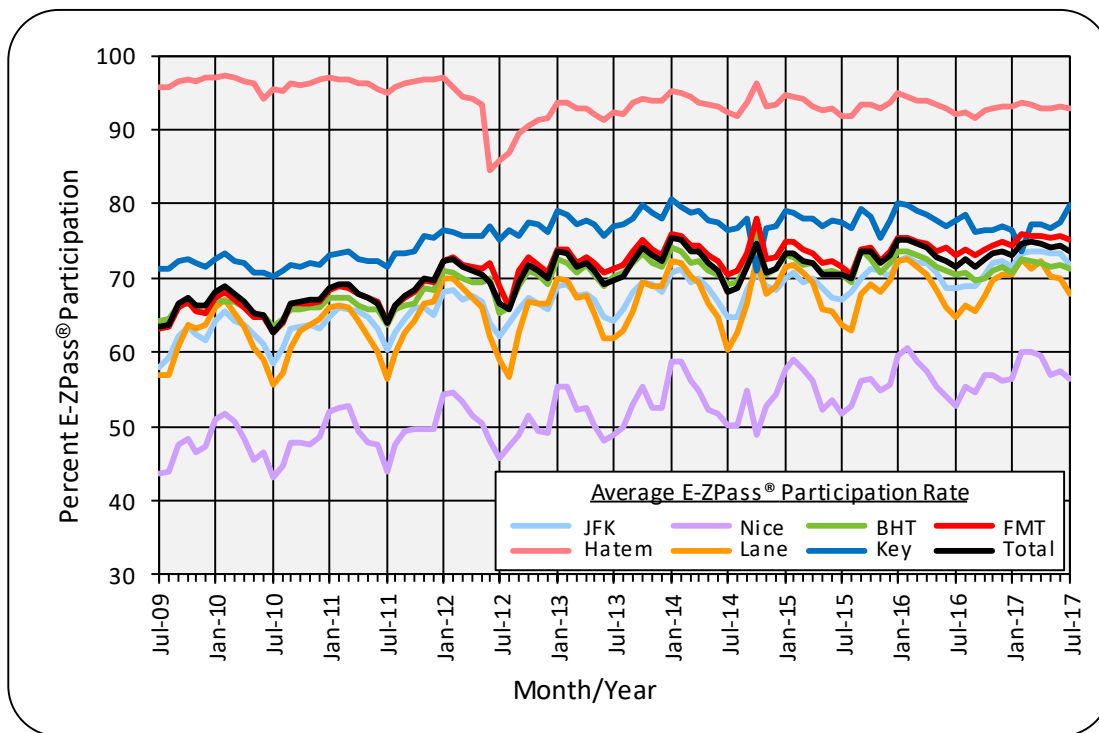
Method of Payment	FY 2017 Transactions (000)								Total
	John F. Kennedy Mem. Highway	Thomas J. Hatem Mem. Bridge	Baltimore Harbor Tunnel	Francis Scott Key Bridge	Fort McHenry Tunnel	William P. Lane, Jr. Mem. (Bay) Bridge	Harry W. Nice Mem. Bridge		
E-ZPass									
Commuter / Shopper / Hatem Plans	810	4,131	8,043	4,727	12,287	3,365	773		34,134
Percent of Total	5.2	81.0	29.1	41.8	27.1	24.8	22.6		28.0
MD (2-axle and 3+ axle)	2,137	212	6,162	2,557	9,036	3,629	484		24,218
Percent of Total	13.7	4.2	22.3	22.6	19.9	26.7	14.1		19.9
Non-MD (2-axle and 3+axle)	8,209	384	5,400	1,382	12,505	2,374	681		30,935
Percent of Total	52.8	7.5	19.6	12.2	27.6	17.5	19.9		25.4
Total E-ZPass	11,156	4,727	19,604	8,667	33,827	9,368	1,938		89,287
Percent of Total	71.7	92.6	71.0	76.6	74.5	69.0	56.7		73.2
Cash									
2-axle and 3+axle	4,098	292	7,101	2,169	10,291	3,936	1,414		29,299
Percent of Total	26.4	5.7	25.7	19.2	22.7	29.0	41.3		24.0
Non-Revenue									
Official Duty	99	47	402	271	448	116	32		1,416
Percent of Total	0.6	0.9	1.5	2.4	1.0	0.9	0.9		1.2
Video									
Video	196	37	506	203	814	167	35		1,958
Percent of Total	1.3	0.7	1.8	1.8	1.8	1.2	1.0		1.6
Total	15,548	5,102	27,612	11,311	45,380	13,587	3,419		121,959
Percent of Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0		100.0

Source: Schedule of Toll Transactions (Unaudited) for FY 2017, MDTA.

Plans provide local residents and commuters with greater access to local businesses and employment centers while also providing the convenience of E-ZPass® and significant travel cost savings. The Harry W. Nice Memorial Bridge had the smallest percentage of E-ZPass® transactions at 56.7 percent. On a total system basis, cash transactions accounted for a combined 24.0 percent of all transactions, a decrease of 1.4 percent over FY 2016. Transactions made by non-revenue vehicles accounted for 1.2 percent of all transactions, while video transactions accounted for 1.6 percent.

While Table 2-7 presents a snapshot of the FY 2017 E-ZPass® market share, Figure 2-9 provides a graphic summary for each of the seven legacy facilities and the system as a whole from July 2009 through July 2017.

Figure 2-9
E-ZPass® Market Share Trends



As shown, the E-ZPass® market share has gradually increased since FY 2010. In FY 2010, the E-ZPass® share ranged from a low of approximately 47 percent at the Harry W. Nice Memorial Bridge to a high of 96 percent at the Thomas J. Hatem Memorial Bridge. By Region, the E-ZPass® shares were 59 percent for the combined Southern Region facilities, 67 percent for the combined Central Region facilities and 71 percent for the Northern Region facilities. For all legacy facilities combined the E-ZPass® share was 66 percent. In FY 2017, the E-ZPass® market share for all legacy facilities combined increased to 73 percent and ranged from a low of 57 percent at the Harry W. Nice Memorial Bridge to a high of 93 percent at the Thomas J. Hatem Memorial Bridge. By Region, the FY 2017 E-ZPass® shares increased in the range of 1 to 2 percent over FY 2016. Approximately one-quarter (24.0 percent) of all transactions were made by customers that still prefer the cash and video options.

Chapter 3

Socioeconomic Review

3.1 Introduction

Trips are made on Maryland's tolled facilities for many purposes including commuting, work-related business, personal business, recreation and commerce, to name a few. Forecasting facility traffic is a function of evaluating socioeconomic variables that drive trip purposes, such as population, employment, and income, etc. Hence, socioeconomic forecasts comprise critical input elements to traffic forecasts. This chapter describes historical and forecasted socioeconomic trends in the study area as context for updating travel demand growth forecasts. Such data includes different public and private sourced socioeconomic variables, measured at different geographic levels, across different timeframes.

Socioeconomic Variables – Socioeconomic trends of likely relevance to the MDTA facilities include seven socioeconomic measures: population, employment, unemployment, real income per capita, real gross regional product (GRP), inflation, and fuel prices.

Geographies – Socioeconomic profiling herein begins with a national and census division level overview (Mid-Atlantic, South Atlantic), and narrows to the State of Maryland with sub-state regions. The various profile regions are shown in Figure 3-1.

Data Sources – Sourced government agencies and private sector forecasting companies:

- United States Census Bureau
- United States Bureau of Labor Statistics (BLS)
- United States Bureau of Economic Analysis (BEA)
- Energy Information Administration (EIA)
- Maryland State Data Center (MD SDC)
- Woods and Poole Economics, Inc., 2017 (WP17)⁽¹⁾
- Moody's Analytics
- Congressional Budget Office (CBO)
- Federal Open Market Committee (FOMC)
- Office of Management and Budget (OMB)

Analysis Horizon - Socioeconomic data trends are presented as compound average annual growth rates (CAAGR); historical data is presented for each respective variable for years 2000, 2005, 2010, and 2016, with corresponding CAAGRs between such years, followed by forecasts in five-year increments from 2016 through 2031. Aggregate historical (2000 to 2016) and forecast (2016 to 2031) growth rates are also discussed.

⁽¹⁾ Woods & Poole Economics, Inc. Washington, D.C. Copyright 2017. Complete Economic and Demographic Data Source (CEDDS). Woods & Poole does not guarantee the accuracy of this data. The use of this data and the conclusion drawn from it are solely the responsibility of the Consultant.

**Figure 3-1
National and Maryland Geographies Profiled**



3.2 Socioeconomic Variables

The seven socioeconomic variables evaluated herein are outlined in Table 3-1 by term, source, and forecast date. The following subsections detail each variable's historical and forecast trends by geography and source(s).

Table 3-1
Socioeconomic Variables by Term, Source, and Forecast Date

Variable	Terms	History	Forecast
Population	Persons	Census Bureau	Woods and Poole, 2017 Moody's, August 2017 MD SDC, August 2017
Employment	Persons	Bureau of Economic Analysis Bureau of Labor Statistics	Woods and Poole, 2017 Moody's, August 2017 MD SDC, January 2015
Unemployment	Percentage	Bureau of Labor Statistics	CBO, June 2017 FOMC, March 2017 OMB, March 2017 Moody's, August 2017
Real Income/Capita	2009 Dollars	Woods and Poole, 2017	Woods and Poole, 2017 Moody's, August 2017 MD SDC, January 2015
Real GRP	2009 Dollars	Bureau of Economic Analysis Woods and Poole, 2017	CBO, June 2017 FOMC, March 2017 OMB, March 2017 Moody's, August 2017 Woods and Poole, 2017
Inflation	Annual % Δ	Bureau of Labor Statistics	CBO, June 2017 FOMC, March 2017 OMB, March 2017 Moody's, August 2017
Fuel Prices	Price per Gallon, Price per Barrel	Energy Information Administration	Moody's, August 2017

3.2.1 Population

Historical – Historical population, sourced from the United States Census Bureau, are presented in Table 3-2. Population in the United States grew from over 281 million in the year 2000 to over 323 million in 2016, an average growth of 0.9 percent per annum. Comparatively, the South Atlantic Region, which includes Maryland, grew at a faster pace of 1.3 percent, while the Mid-Atlantic Region lagged at a relatively fractional growth of 0.3 percent per year.

Maryland population grew by over 0.7 million from almost 5.3 million in 2000 to over 6.0 million in 2016, or 0.8 percent annually. The largest region in the State, Baltimore, grew relatively slowly at 0.6 percent annually, while Southern Maryland grew almost three times faster at 1.6 percent per year. Population per annum growth rates in the remaining regions ranged from a high of 1.0 percent in Washington Suburban to a low of 0.4 percent in Western Maryland.

Table 3-2
Historical Population

Geography	Population				CAAGR			
	2000	2005	2010	2016	2000-2005	2005-2010	2010-2016	2000-2016
United States	281,421,906	295,516,599	308,745,538	323,127,513	1.0%	0.9%	0.8%	0.9%
Mid Atlantic	39,671,861	40,234,574	40,872,375	41,473,985	0.3%	0.3%	0.2%	0.3%
South Atlantic	51,769,160	56,145,779	59,777,037	63,923,309	1.6%	1.3%	1.1%	1.3%
Maryland	5,296,486	5,592,379	5,773,552	6,016,447	1.1%	0.6%	0.7%	0.8%
Baltimore	2,512,431	2,599,352	2,662,691	2,749,957	0.7%	0.5%	0.5%	0.6%
Lower Eastern Shore	186,608	199,904	209,275	212,207	1.4%	0.9%	0.2%	0.8%
Southern Maryland	281,320	321,725	340,439	361,543	2.7%	1.1%	1.0%	1.6%
Upper Eastern Shore	209,295	229,249	239,951	241,390	1.8%	0.9%	0.1%	0.9%
Washington Suburban	1,870,133	1,996,003	2,068,582	2,199,503	1.3%	0.7%	1.0%	1.0%
Western Maryland	236,699	246,146	252,614	251,847	0.8%	0.5%	-0.1%	0.4%

Source: United States Census Bureau

Forecast – While WP forecasts US population growth to continue at 0.9 percent per annum over the next fifteen years, Moody’s forecasts a notably slower growth rate of 0.6 percent. Similarly, Moody’s Mid-Atlantic forecast of 0.0 percent is notably smaller than the WP17 estimate of 0.4 percent. However, both Moody’s and WP South Atlantic annual forecasts hover around 1.3 percent (depending on 5-year increment).

WP also forecasts a higher aggregate (year 2016 to 2031) Maryland statewide population annual growth rate of 0.9 percent than the alternative MD SDC rate of 0.6 percent, as shown by five-year increments in Table 3-3. Both sources foresee the highest growth rates in Southern Maryland (1.5% by WP, 1.3% for MD SDC). Regarding the two metro areas, WP forecasts higher annual growth rates in both Baltimore (0.8%) and Washington Suburban (0.9%) than MD SDC (0.4%, 0.6%, respectively).

Table 3-3
Forecast Population

Geography	WP17			Moody's			MD SDC		
	2016-2021	2021-2026	2026-2031	2016-2021	2021-2026	2026-2031	2016-2021	2021-2026	2026-2031
United States	0.9%	0.9%	0.9%	0.7%	0.7%	0.6%	-	-	-
Mid Atlantic	0.4%	0.4%	0.4%	0.0%	0.0%	0.0%	-	-	-
South Atlantic	1.3%	1.2%	1.2%	1.4%	1.3%	1.2%	-	-	-
Maryland	0.9%	0.9%	0.8%	-	-	-	0.5%	0.6%	0.6%
Baltimore	0.8%	0.8%	0.8%	-	-	-	0.4%	0.4%	0.3%
Lower Eastern Shore	0.9%	0.9%	0.8%	-	-	-	0.9%	1.0%	0.9%
Southern Maryland	1.5%	1.5%	1.4%	-	-	-	1.3%	1.2%	1.3%
Upper Eastern Shore	1.1%	1.1%	1.1%	-	-	-	0.7%	1.0%	1.1%
Washington Suburban	0.9%	0.9%	0.8%	-	-	-	0.5%	0.7%	0.6%
Western Maryland	0.4%	0.4%	0.3%	-	-	-	0.7%	0.8%	0.7%

Source: Woods and Poole Economics 2017, Moody's Economics, and the Maryland State Data Center

3.2.2 Employment

Historical – BEA employment data through year 2015⁽²⁾ was extrapolated to year 2016 using annual BLS employment growth rates. Employment trends presented in Table 3-4 are typically more volatile than population and more closely resemble overall economic cycles, with relatively higher growth during pre-recession years (2000-2005), followed by notable declines in the recession period (2005-2010), and a subsequent ongoing recovery (2010-2015). Overall, the South Atlantic Region experienced average annual growth in employment of about 1.3 percent between 2000 and 2016, while the Mid-Atlantic region experienced a slower overall growth of 0.8 percent per year, and the overall US grew by 1.0 percent per annum.

Employment in Maryland grew considerably slower than population in the 2000 to 2016 period, which included the impacts of the Great Recession⁽³⁾. Statewide employment change averaged 1.1 percent per year, which included a low of only 0.2 percent annually in the 2005-2010 recessionary period, as presented in Table 3-4. Employment in the Baltimore Region also grew at 1.0 percent on average, while employment in Maryland’s Washington suburbs increased at a 1.1 percent annual rate. Western Maryland performed the weakest, increasing at 0.5 percent per year, while Southern Maryland saw the fastest rate of employment growth at 1.6 percent per annum.

Table 3-4
Historical Employment

Geography	Employment				CAAGR			
	2000	2005	2010	2016	2000-2005	2005-2010	2010-2016	2000-2016
United States	165,370,800	172,557,400	173,034,700	193,204,024	0.9%	0.1%	1.9%	1.0%
Mid Atlantic	22,078,567	22,723,036	23,105,935	25,064,466	0.6%	0.3%	1.4%	0.8%
South Atlantic	30,518,405	32,955,422	32,899,967	37,374,785	1.5%	0.0%	2.1%	1.3%
Maryland	3,092,788	3,315,028	3,347,915	3,658,593	1.4%	0.2%	1.5%	1.1%
Baltimore	1,526,659	1,605,021	1,624,590	1,793,824	1.0%	0.2%	1.7%	1.0%
Lower Eastern Shore	110,766	118,346	114,232	121,466	1.3%	-0.7%	1.0%	0.6%
Southern Maryland	125,688	144,654	150,463	162,074	2.9%	0.8%	1.2%	1.6%
Upper Eastern Shore	100,012	114,691	115,293	124,229	2.8%	0.1%	1.3%	1.4%
Washington Suburban	1,098,455	1,194,181	1,206,743	1,314,180	1.7%	0.2%	1.4%	1.1%
Western Maryland	131,208	138,135	136,594	142,747	1.0%	-0.2%	0.7%	0.5%

Source: United States Bureau of Economic Analysis and Bureau of Labor Statistics

Forecast – Employment in the Nation is projected to grow by an average of 1.3 percent per year through 2031 according to WP17, while Moody’s Analytics expects growth of 0.7 percent annually through 2031, as shown by five-year increments in Table 3-5. According to Moody’s, South Atlantic Region growth (1.0 percent) is expected to outperform both the Nation (0.7 percent) and the Mid-Atlantic Region (0.3 percent). A similar trend is forecast by WP17. The forecasts call for growth rates higher than the corresponding averages experienced during the recessionary period (2005-2010), but below those in the recent post-recessionary period.

Like the national trends, employment in Maryland is expected to continue rebounding relative to both its historical trend and population growth. According to the MD SDC, statewide employment growth is forecasted to fall from 1.0 percent (year 2016 to 2021) to 0.5 percent (year 2026 to 2031), as shown in Table 3-5. Comparatively, WP forecasts statewide growth at 1.4 percent and 1.2 percent,

⁽²⁾ BEA had not published year 2016 data as of August 2017.

⁽³⁾ 2007-2009. National Bureau of Economic Research.

respectively. While most other sub-state regions are projected to grow similar to the statewide average, Southern Maryland and the Upper Eastern Shore are forecasted to grow fastest.

**Table 3-5
Forecast Employment**

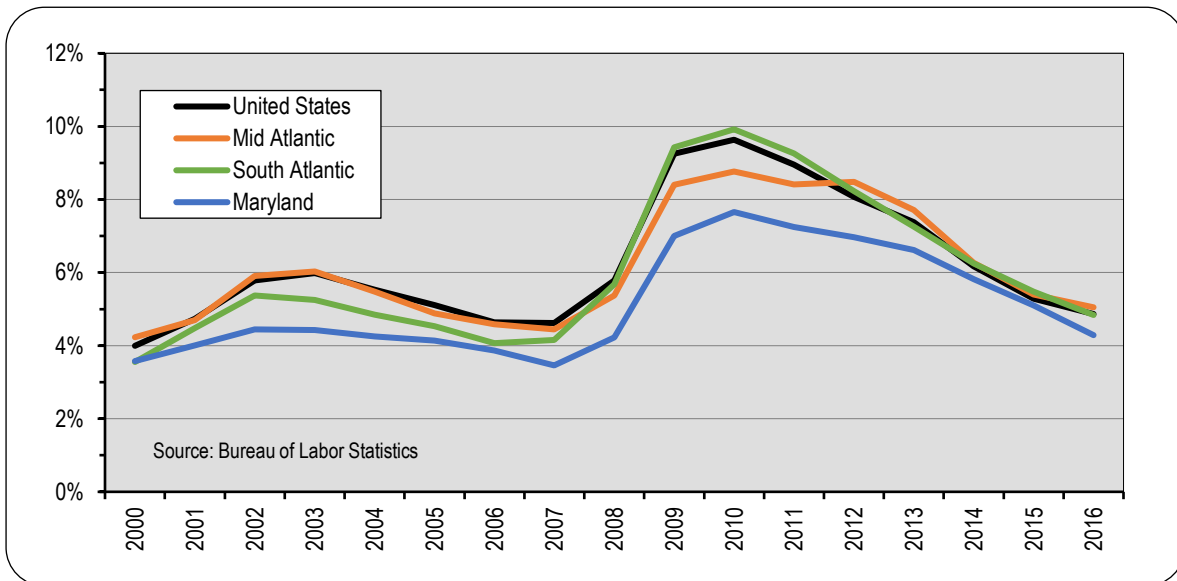
Geography	WP17			Moody's			MD SDC		
	2016-2021	2021-2026	2026-2031	2016-2021	2021-2026	2026-2031	2016-2021	2021-2026	2026-2031
United States	1.4%	1.3%	1.2%	0.7%	0.7%	0.5%	-	-	-
Mid Atlantic	1.1%	1.0%	0.9%	0.5%	0.3%	0.1%	-	-	-
South Atlantic	1.6%	1.5%	1.4%	1.4%	1.0%	0.7%	-	-	-
Maryland	1.4%	1.3%	1.2%	-	-	-	1.0%	0.6%	0.5%
Baltimore	1.4%	1.3%	1.2%	-	-	-	0.9%	0.6%	0.4%
Lower Eastern Shore	1.3%	1.2%	1.1%	-	-	-	1.1%	0.6%	0.5%
Southern Maryland	1.6%	1.5%	1.4%	-	-	-	1.3%	1.1%	0.7%
Upper Eastern Shore	1.5%	1.4%	1.2%	-	-	-	1.4%	1.0%	0.6%
Washington Suburban	1.3%	1.2%	1.1%	-	-	-	1.0%	0.7%	0.5%
Western Maryland	1.0%	0.9%	0.8%	-	-	-	0.9%	0.8%	0.4%

Source: Woods and Poole Economics 2017, Moody's Economics, and the Maryland State Data Center

3.2.3 Unemployment

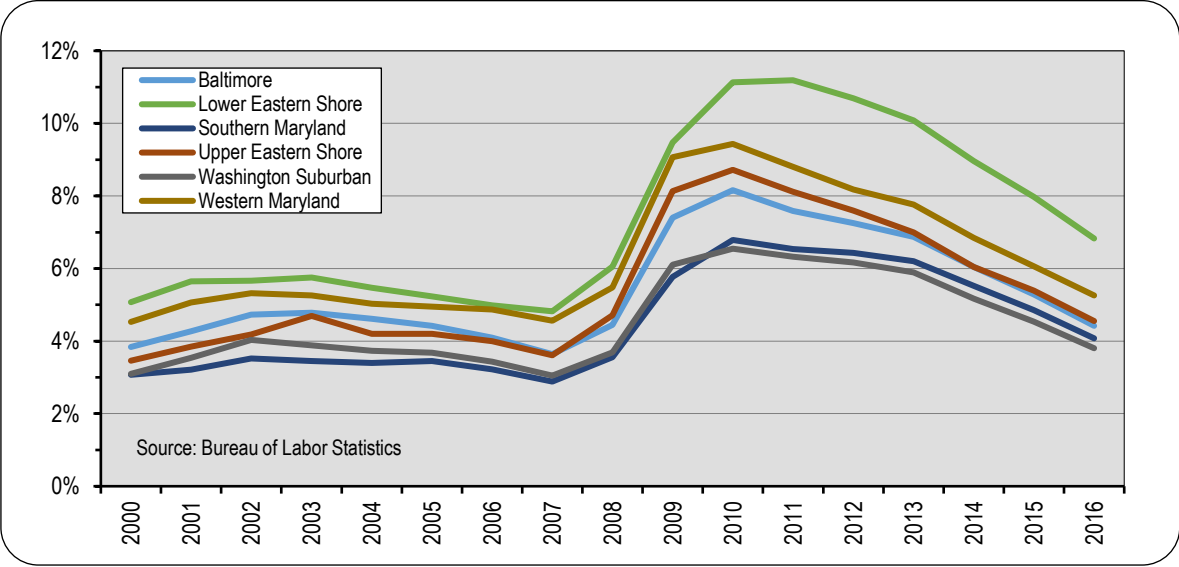
Historical – Figure 3-2 presents annual unemployment rates over the 2000 through 2016 period, based on BLS data. Unemployment rates for the South and Mid-Atlantic Regions have generally tracked closely with those for the Nation, with the South Atlantic Region showing wider moves in both directions. Unemployment rates were all around 4 percent to 6 percent during the pre-recession years. The unemployment rates then spiked closer to 10 percent in 2010, and gradually decreased to near 5 percent by the end of 2016. In fact, the national unemployment rate dropped slightly below 5 percent as of September 2016.

**Figure 3-2
Historical Unemployment Rates (Macro Geographies)**



Sub-state annual unemployment rates track similar to one another, as well as to the national and multi-state regions. Figure 3-3 presents annual unemployment rates over the 2000 through 2016 period, based on BLS data. Of these, the Lower Eastern Shore are highest, and lag the other regions. Unemployment rates spiked in 2010, ranging from 6.8 percent in Southern Maryland to 11.1 percent along the Lower Eastern Shore. After which, unemployment rates improved steadily through 2016 ranging between a low of 4.1 percent (Southern Maryland) to 6.8% along the Lower Eastern Shore.

**Figure 3-3
Historical Unemployment Rates (Sub-State Maryland Geographies)**

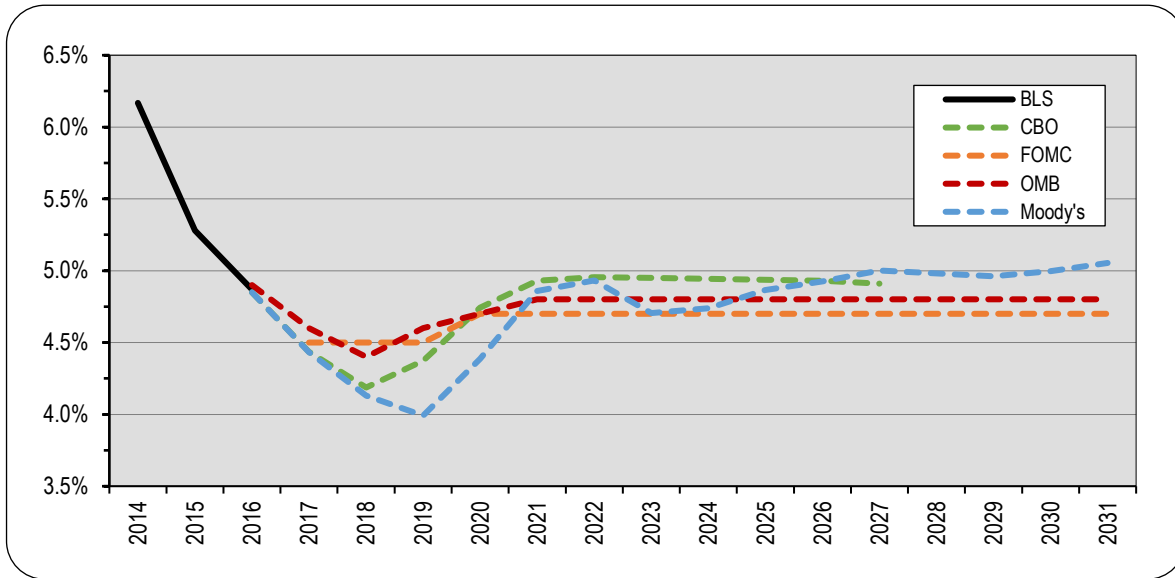


Forecast – As employment grows in the coming years, the national unemployment rate is also forecasted to improve and approach full employment. According to a handful of key national sources that forecast medium to long-term US unemployment, the average rates through year 2031 are projected to inch down from the 2016 average rate of 4.9 percent to a low of between 4.0 percent (Moody’s) and 4.4 percent (FOMC) in year 2019. After 2019, unemployment rates are anticipated to level-off around 4.8 percent (varies slightly by source) in year 2021, as shown in Figure 3-4.

3.2.4 Real Income Per Capita

Historical – Historical real income per capita is presented in Table 3-6. Nationwide, per capita annual income stood at over \$44,600 (in 2009 constant dollars) in 2016, which represents real growth of 1.2 percent per annum during the 2000-2016 period. The corresponding income level in the South Atlantic Region is about \$2,900 less than the national average, and has recently grown at or below 0.9 percent per annum, which is also below the national average. Per capita income levels are substantially higher in the Mid-Atlantic Region, averaging about \$7,600 per year more than the national average in 2016, and have also increased faster than the South Atlantic Region and the US average during the 2000-2016 period.

Figure 3-4
Forecast National Unemployment Rates



Historical per capita real income in Maryland stood at about \$51,700 in 2016 (in 2009 dollars), having increased by about 1.2 percent per year in real terms since 2000. The Washington Suburban level (\$56,100) surpasses the statewide average, while faster Baltimore income level growth (1.2 percent) has brought the area to par with the statewide averages, as presented in Table 3-6. Per capita incomes in Southern Maryland grew at the relatively highest pace of 1.7 percent per year, reaching over \$48,800 in 2016.

Table 3-6
Historical Real Income Per Capita (2009\$)

Geography	Real Income per Capita				CAAGR			
	2000	2005	2010	2016	2000-2005	2005-2010	2010-2016	2000-2016
United States	36,833	38,916	39,622	44,637	1.1%	0.4%	2.0%	1.2%
Mid Atlantic	42,204	44,095	46,161	52,209	0.9%	0.9%	2.1%	1.3%
South Atlantic	35,862	38,770	38,375	41,719	1.6%	-0.2%	1.4%	0.9%
Maryland	42,829	46,934	49,071	51,703	1.8%	0.9%	0.9%	1.2%
Baltimore	40,960	45,449	47,774	51,481	2.1%	1.0%	1.3%	1.4%
Lower Eastern Shore	30,685	34,383	35,265	38,034	2.3%	0.5%	1.3%	1.4%
Southern Maryland	37,537	42,864	47,242	48,839	2.7%	2.0%	0.6%	1.7%
Upper Eastern Shore	38,183	42,298	42,375	45,955	2.1%	0.0%	1.4%	1.2%
Washington Suburban	49,475	53,030	54,974	56,057	1.4%	0.7%	0.3%	0.8%
Western Maryland	30,047	33,012	34,544	37,203	1.9%	0.9%	1.2%	1.3%

Source: Wood and Poole Economics, 2017

Forecast – According to WP17, US per capita real income is forecast to grow at an average annual rate of around 1.5 percent through 2021, then decelerate to 1.2 percent through 2031, (as shown in Table 3-7). Conversely, Moody’s Analytics projects faster growth in the later five-year period. For example, the South Atlantic Region is forecast to grow 1.2 percent between 2016 to 2021, and over 1.6 percent

thereafter through year 2031. Mid-Atlantic Region growth is forecast to outpace both the national average and the South Atlantic by both sources.

In line with national trends, Maryland per capita real income is projected to grow faster through 2031 than in the recent past. WP17 forecasts statewide growth of 1.3 percent annually, while MD SDC forecasts 1.2 percent. However, the temporal growth also differs between the two sources. The MD SDC predicts a notable deceleration of growth past 2021, while the WP17 forecast calls for a relatively steady pace through 2026, as shown in Table 3-7.

Table 3-7
Forecast Real Income Per Capita Growth

Geography	WP17			Moody's			MD SDC		
	2016-2021	2021-2026	2026-2031	2016-2021	2021-2026	2026-2031	2016-2021	2021-2026	2026-2031
United States	1.5%	1.4%	1.2%	1.2%	1.3%	1.4%	-	-	-
Mid Atlantic	1.6%	1.5%	1.3%	1.4%	1.8%	1.7%	-	-	-
South Atlantic	1.5%	1.5%	1.2%	1.2%	1.7%	1.6%	-	-	-
Maryland	1.4%	1.4%	1.2%	-	-	-	1.7%	1.1%	0.8%
Baltimore	1.5%	1.5%	1.3%	-	-	-	1.8%	1.1%	0.8%
Lower Eastern Shore	1.5%	1.5%	1.2%	-	-	-	1.6%	1.0%	0.9%
Southern Maryland	1.1%	1.0%	0.9%	-	-	-	1.7%	1.1%	0.9%
Upper Eastern Shore	1.3%	1.3%	1.0%	-	-	-	1.8%	1.1%	0.9%
Washington Suburban	1.3%	1.3%	1.1%	-	-	-	1.5%	1.0%	0.7%
Western Maryland	1.5%	1.5%	1.3%	-	-	-	1.9%	1.2%	0.9%

3.2.5 Real Gross Domestic Product (GDP)

Historical – BEA data shows that national real gross domestic product (GDP) growth averaged 1.6 percent annually from 2000-2016. The Mid-Atlantic Region also grew at the same 1.6 percent annual rate, while the South Atlantic Region GDP grew slightly slower at 1.3 percent. Annual growth rates are presented by five-year increments in Table 3-8. Maryland GDP, \$333 billion (in 2009\$) in 2016, grew 2.0 percent per annum from 2000 to 2016. All Maryland sub-state region growth rates exceeded the national average except Western Maryland (1.2 percent), with Southern Maryland expanding at a more robust real annual rate of 3.3 percent.

Table 3-8
Historical Real GRP (millions of 2009\$)

Geography	Real GRP				CAAGR		
	2000	2005	2010	2016	2000-2005	2005-2010	2010-2016
United States	\$12,616,533	\$14,203,241	\$14,628,165	\$16,342,925	2.4%	0.6%	1.9%
Mid Atlantic	\$ 2,253,764	\$ 2,647,477	\$ 2,662,539	\$ 2,914,751	3.3%	0.1%	1.5%
South Atlantic	\$ 1,989,727	\$ 2,171,145	\$ 2,262,843	\$ 2,437,682	1.8%	0.8%	1.2%
Maryland	\$ 242,282	\$ 290,581	\$ 310,702	\$ 333,336	3.7%	1.3%	1.2%
Baltimore	\$ 118,197	\$ 141,551	\$ 150,944	\$ 166,744	4.3%	1.5%	2.1%
Lower Eastern Shore	\$ 6,138	\$ 7,377	\$ 7,262	\$ 7,846	4.3%	-0.1%	1.7%
Southern Maryland	\$ 8,117	\$ 10,663	\$ 12,137	\$ 12,911	6.2%	2.8%	1.4%
Upper Eastern Shore	\$ 5,792	\$ 7,350	\$ 7,436	\$ 8,005	5.5%	0.4%	1.6%
Washington Suburban	\$ 95,573	\$ 114,072	\$ 123,735	\$ 128,216	4.2%	1.8%	1.0%
Western Maryland	\$ 8,464	\$ 9,568	\$ 9,188	\$ 9,614	3.1%	-0.6%	1.1%

Source: Bureau of Economic Analysis and Woods and Poole Economics 2017

Forecast – WP17 forecasts the US GRP growth rate to go from 2.2 percent between 2016 and 2021 to 2.0 percent between 2026 to 2031, as shown in Table 3-9. Alternatively, Moody’s forecasts fluctuate with a year 2018 high of 2.8 percent to a year 2020 low of 1.3 percent, as charted in Figure 3-5. The CBO and FOMC mostly vacillate between 2.1 percent (years 2017 and 2018) to a more modest rate of 1.8 in the after 2021. OMB forecasts of 3.0 percent by year 2021 through year 2027 provide a high growth outlier.

According to WP, Maryland’s Statewide GRP is forecast to slightly lag US totals by 0.1 percentage point through year 2031. The Baltimore, Lower Eastern Shore, Upper Eastern Shore, and Washington Suburban planning regions’ GRP growth rates are projected to mirror that of the State, while the Southern Maryland and Western Maryland growth rates are expected to lag by 0.3 to 0.4 percentage points.

Table 3-9
Forecast Real GRP Growth

Geography	WP17			Moody's		
	2016-2021	2021-2026	2026-2031	2016-2021	2021-2026	2026-2031
United States	2.2%	2.1%	2.0%	2.1%	2.1%	1.9%
Mid Atlantic	1.9%	1.8%	1.7%	-	-	-
South Atlantic	2.2%	2.1%	2.0%	-	-	-
Maryland	2.1%	2.0%	1.9%	-	-	-
Baltimore	2.0%	2.0%	1.9%	-	-	-
Lower Eastern Shore	2.2%	2.1%	2.0%	-	-	-
Southern Maryland	1.8%	1.8%	1.6%	-	-	-
Upper Eastern Shore	2.2%	2.1%	1.9%	-	-	-
Washington Suburban	2.2%	2.1%	2.0%	-	-	-
Western Maryland	1.7%	1.6%	1.5%	-	-	-

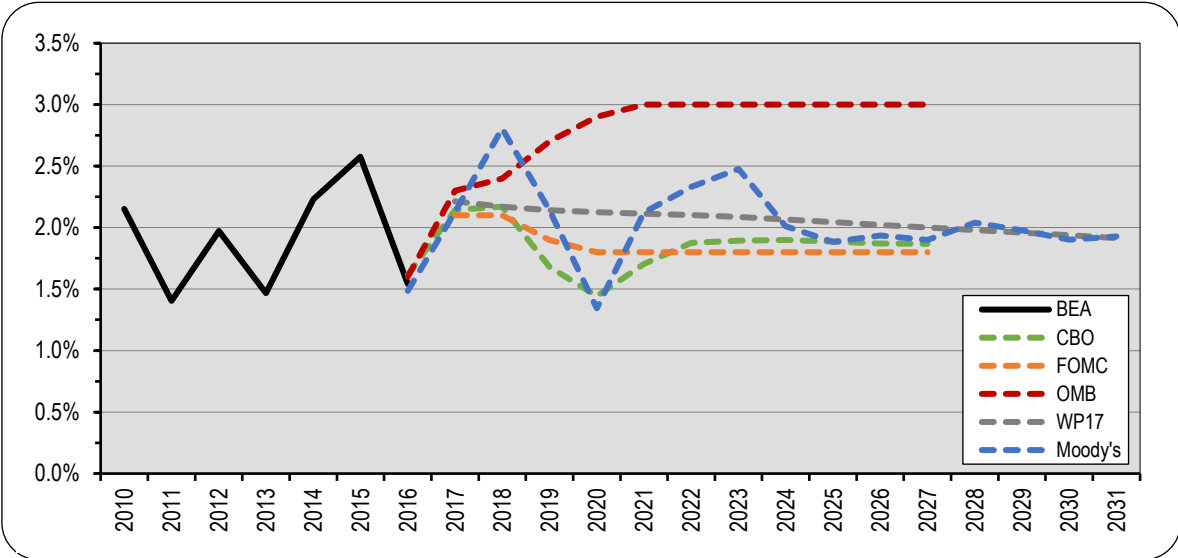
Source: Woods and Poole Economics 2017

3.2.6 Inflation

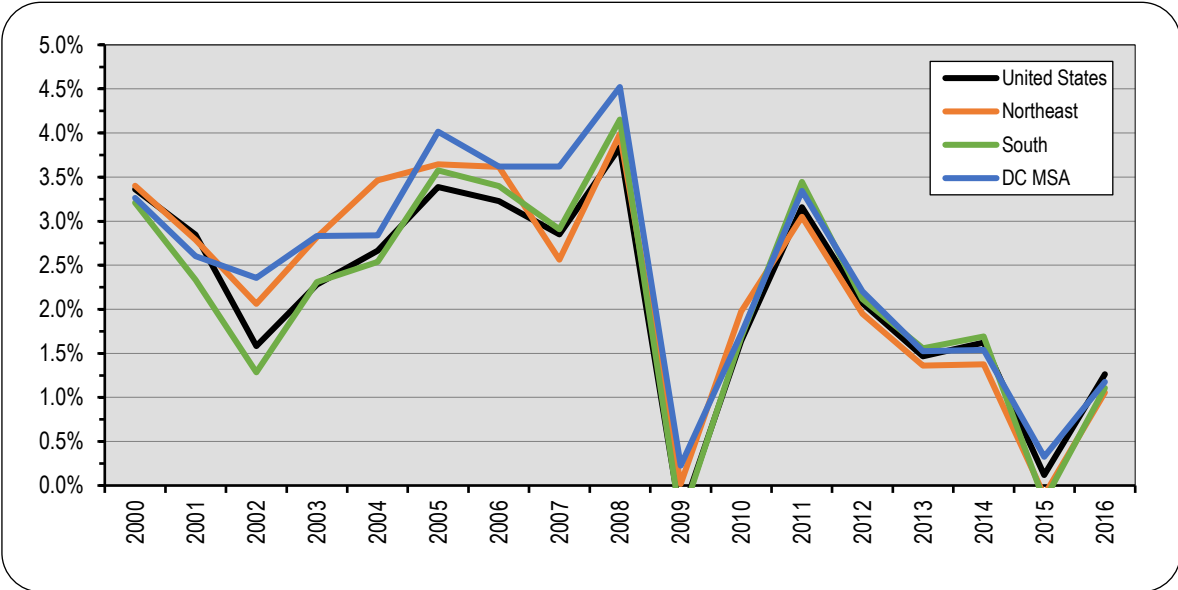
Historical – Inflation, as measured by the popular Consumer Price Index, gyrated notably between years 2000 to 2016, as shown in Figure 3-6. Prior to the 2008 recession, US inflation peaked at 3.8 percent. It then dropped sharply in 2009 (to -0.4 percent) before increasing to 3.2 percent by year 2011, and then declined gradually through year 2014. After plummeting to 0.1 percent in 2015, the CPI stabilized at 1.3 in 2016. Overall, US inflation averaged about 2.1 percent annually during the sixteen-year period.

Inflation in the Northeast Region (proxy for Mid-Atlantic States) followed a similar up/down cycle, averaging 2.2 percent annually, which was slightly higher than the national rate. In the South, including Maryland, prices trended at 2.1 percent annually, closely aligned to the national average since 2000. The Washington-Baltimore Metro area, however, experienced a higher inflation rate compared to the rest of the South and the Nation, averaging 2.4 percent during the same period.

**Figure 3-5
Forecast National Real GDP Growth**

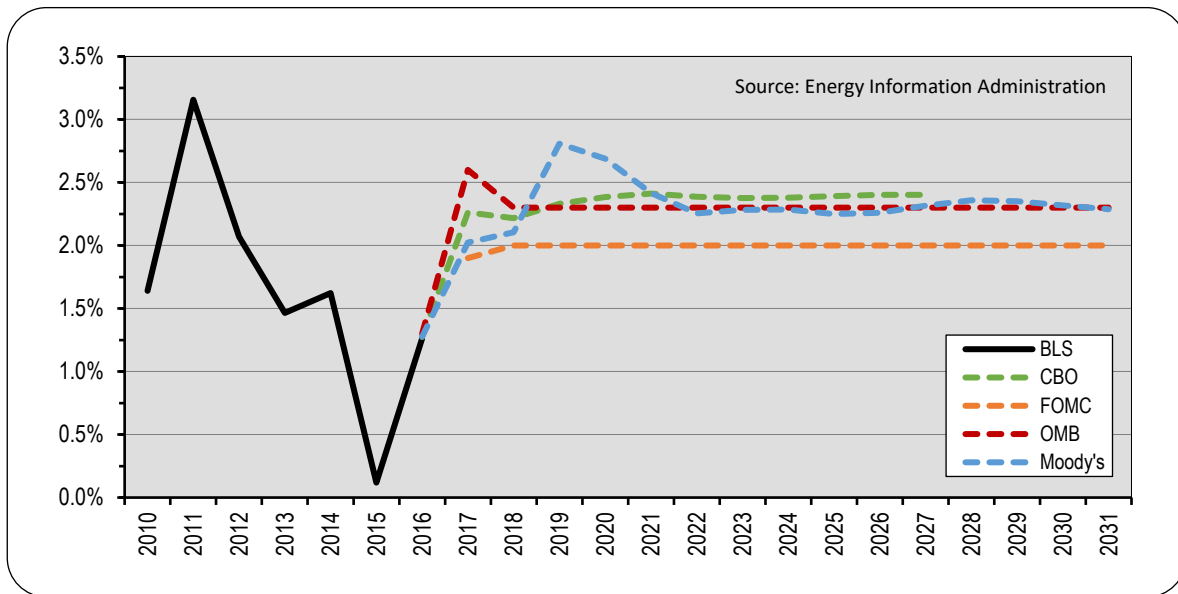


**Figure 3-6
Historical Inflation (CPI-U) Growth**



Forecast – Inflation is expected to inch upward in the near term, per Figure 3-7, but needs to be monitored for potential medium- to longer-term increases. Further removal of spare capacity in the labor markets may lead to increased pressures on wages as markets tighten and approach full employment later in the business cycle. Additionally, as volatile energy prices approach an equilibrium, they are expected to add somewhat to the general increases in prices as well. A sample of major macroeconomic forecasters expect US annual inflation to stabilize around 2.3 percent between 2019 and 2021, depending on source. However, FOMC forecasts a notably lower inflation rate of 2.0.

Figure 3-7
Forecast National Inflation Growth



3.2.7 Fuel Prices

Historical – Gasoline prices can also influence travel demand. Figure 3-8 illustrates the monthly change in crude and retail gasoline prices from years 2000 to 2015. Whereas crude oil reflects price per barrel and gasoline reflects cost per gallon (unleaded, all grades, all formulations), both are in nominal retail prices (i.e., current dollars).

Historical EIA-tracked gasoline-prices vary little between US regions (the nation, Central Atlantic Region⁽⁴⁾ and Lower Atlantic Region⁽⁵⁾), with the Central Atlantic Region costing slightly more (typically \$0.02 to \$0.10 more per gallon). Nationally, gasoline prices per gallon ranged from a low of \$1.07 (December, 2001) to a high of \$4.00 (July, 2008). However, recent national gasoline prices have stabilized below \$2.50 per gallon since August 2015.

Retail gasoline prices are strongly influenced by larger trends in crude oil prices, which can be quite volatile and challenging to forecast. Since 2000, monthly crude oil prices (West Texas Intermediate [WTI] benchmark) fluctuated between \$19.40 (in December 2001) to \$133.90 per barrel (June 2008), as illustrated in Figure 3-8. Recent volatility shows, a 50 percent fall in crude oil prices from \$93.20 (September 2014) to \$45.18 (June 2017).

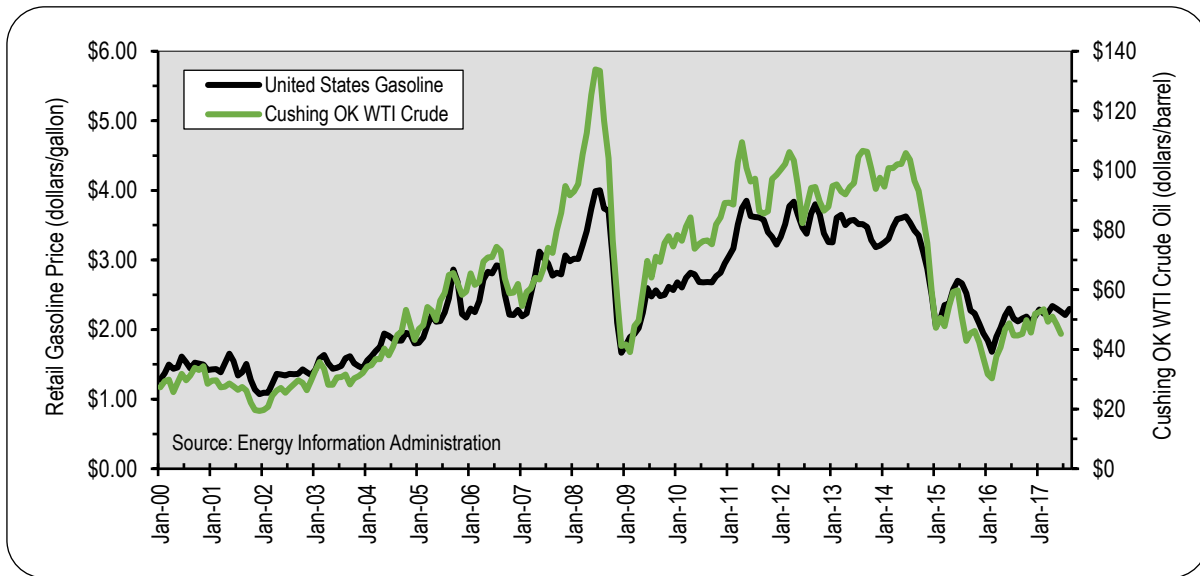
The relatively low oil prices of late reflect an imbalance between global oil supply and demand, with additional oil exploration in North America and slower global economic growth, particularly in major overseas markets such as China and Brazil. Additionally, fuel efficiency gains and environmental concerns continue to lessen crude oil demand.

Forecasts – Consequently, there are winners (energy consumers/importers) and losers (producers/exporters) stemming from the recent crude oil price decline. US retail prices, which hovered around

⁽⁴⁾ Central Atlantic region includes: Delaware, District of Columbia, Maryland, New Jersey, New York and Pennsylvania.

⁽⁵⁾ Lower Atlantic region includes: Florida, Georgia, North Carolina, South Carolina, Virginia and West Virginia.

Figure 3-8
Historical Fuel Prices (Current \$)



\$2.25 per gallon in the third quarter of 2017, are expected to remain below the \$2.50 per gallon through 2018, according to Moody's recent (September 2017) projection. Long term, average annual prices are forecast to rise 1.9 percent per annum to about \$3.12 per gallon by the year 2031, as illustrated in Figure 3-9 (inclusive of seasonal fluctuations). This future price level would still be far below the previous national annual peak of \$3.55 per gallon (in nominal terms) reached in 2012.

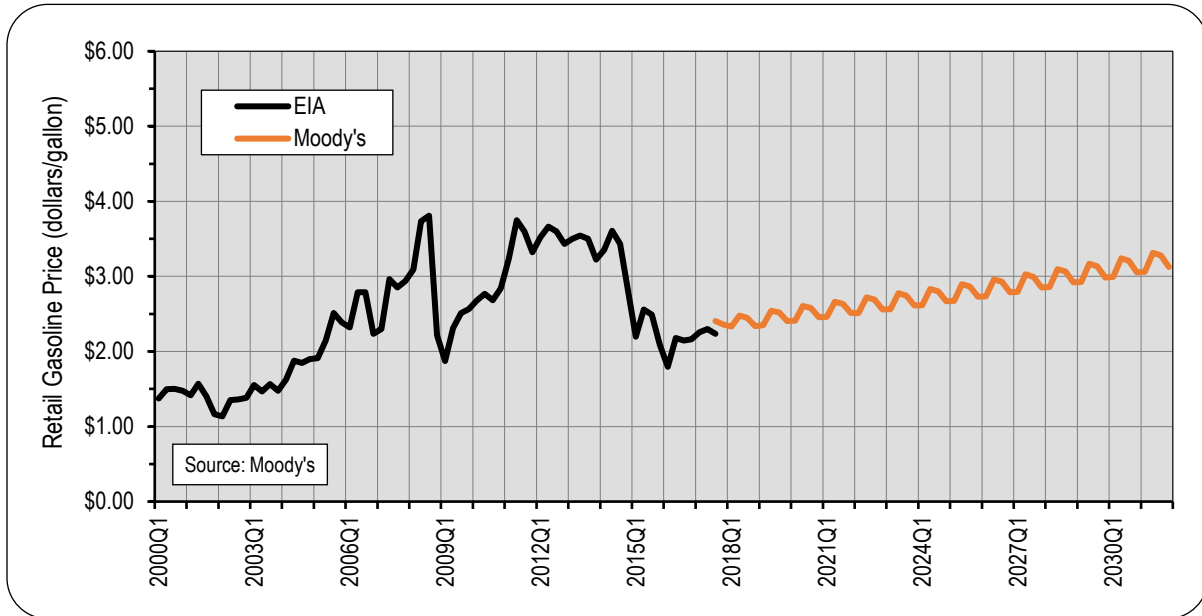
3.3 Summary and Conclusion

Having endured the Great Recession and the relatively delayed recovery, the general macroeconomic environment in the US, Maryland, and the South and Mid-Atlantic Regions are strengthening, which bodes well for the near future. Within Maryland, the Southern sub-state planning region is projected to experience particularly strong growth amongst the analyzed geographies.

Most credible forecasting agencies (both public and private) now expect continued economic output, employment, and income expansion, accompanied by only moderate increases in gasoline prices and general inflation over the short- to medium-term. While labor markets along with the larger economic activity measures continue to improve into 2018, uneven strengthening persists. Many risks also persist, such as the fragile economic landscapes of trading partners (European, Asian, and Latin American), exacerbated threats of Middle East extremism, commodity fluctuations (especially gasoline), currency markets fluctuations, and public sector fiscal difficulties and constraints. Such headwinds continue to constrain short-term growth, as the larger US and global economies strive towards a stronger expansionary momentum.

While the growth momentum in Maryland and the surrounding regional economies has generally strengthened and broadened, one can be cautiously optimistic about the ongoing economic expansion likely in the MDTA geographic influence area. However, the favorable factors behind the strong traffic increases since 2014, such as relatively robust labor market growth combined with the unexpected declines in fuel prices, are unlikely to prove sustainable over the upcoming decade. Nevertheless, the

Figure 3-9
Forecast Fuel Prices (Current \$)



moderate socioeconomic growth in the influence area may translate into continued modest increases in traffic demand on the MDTA legacy facilities over the coming decade. Moreover, other factors, e.g., toll rates and/or transportation network changes, etc., beyond the overall socioeconomic growth will also influence traffic growth on the legacy system.

Chapter 4

Traffic and Revenue Forecast

This chapter summarizes the development of the forecasts of future year transactions and toll revenue for the seven legacy toll facilities of the MDTA. These 10-year annual forecasts have been prepared by facility and vehicle category through FY 2027, and include monthly forecasts for FY 2018 and 2019.

4.1 Traffic and Toll Revenue Forecasts

This section provides an overview of the development of the traffic and toll revenue forecasts including a description of how the traffic and toll revenue model was developed and the major model data inputs. These data inputs including toll rates by payment method, traffic growth forecasts, E-ZPass® participation percentages, and the impacts associated with planned roadway improvements on the legacy facilities.

4.1.1 Traffic and Toll Revenue Forecast Model

The traffic and toll revenue model with resulting transaction and toll revenue forecasts were made independently by facility based on actual transaction and revenue data from FY 2010 through June 2017. The model developed for this study uses actual transaction and toll revenue data provided by the MDTA as the foundation. The data was provided by facility, month and vehicle classification. The end-product of the model was forecasts of transactions by the following vehicle and payment classes:

- **Passenger Cars:**
 - Cash
 - MD E-ZPass®
 - Non-MD E-ZPass®
 - Video
 - Commuter / Shopper
 - Hatem A and B
 - Official Duty / Non-Revenue
- **Commercial Vehicles (3+ axles):**
 - Cash
 - MD E-ZPass®
 - Non-MD E-ZPass®
 - Video

A passenger car is defined as a two-axle vehicle, while commercial vehicles are those having 3-or-more axles. Passenger car and commercial vehicle transactions were forecasted independently by facility based upon growth rates of the historical and projected correlation with the economic variables described in more detail in Chapter 3. The forecasts by vehicle type were then disaggregated into applicable payment categories based upon historical and projected participation trends. These forecasted transactions by payment type were then converted to toll revenue estimates based on existing toll rates for the respective vehicle and payment classes. Following this, the transaction and revenue impacts of planned roadway improvements were then incorporated.

The major traffic and toll revenue model data input variables are discussed below.

4.1.1.1 Toll Rates and Fee Adjustments

The transaction and toll revenue forecast model used the toll rates shown previously in Tables 1-1 through 1-3. These rates incorporate select toll reductions effective as of July 1, 2015. As part of prior studies, it was estimated that the FY 2016 toll reduction would increase MDTA legacy facility transactions by approximately 0.2 percent and decrease toll revenue by 6.5 percent, compared to estimated FY 2016 levels without the toll decrease. These impacts have been carried forward into the current short-term forecast by means of the actual FY 2016 and FY 2017 transactions as the base from which future growth estimates were applied.

4.1.1.2 Normal Traffic Growth

Economic growth is an important driving force for the region and is also linked with traffic growth. Growth in regional population and employment will generally result in an increase in traffic volumes for commuting purposes, as well as for other activities like shopping and recreation. Data for gross regional product, both state and the Baltimore region, were procured as a measure to reflect the relationship with the increasing trend of toll transactions at the legacy facilities. Historic and forecast data were also obtained from:

- The United States Census Bureau;
- The United States Bureau of Economic Analysis (BEA);
- The United States Energy Information Administration (EIA);
- Maryland State Data Center (MD SDC);
- Woods & Poole Economics (W&P); and
- Moody's Analytics.

Population, employment, gross regional product (GRP), and gasoline prices were obtained from these sources and were used for evaluation of the inputs used in deriving traffic growth forecasts as a function of these measures.

The econometric models developed and used for the traffic growth forecasts in the March 2015 Traffic and Revenue Study sought to establish correlative relationships between various independent variables (such as population, employment, GRP, etc.) and the dependent variable (transactions). The selected independent variables were then used in the forecasting process together with the available-at-the-time future year forecast data. In some cases, adjustments that would have a more local effect on the traffic volumes of the toll facilities were also incorporated. This included localized construction impacts associated with major planned highway improvements.

The latest historical and forecasts of socioeconomic/independent variable-related data were collected and analyzed in this update, with the findings summarized in Chapter 3. As a result of this analysis, it was concluded that while some of the latest socioeconomic growth projections for the next 10 years were slightly higher and some slightly lower (depending on the variable and geography) than those developed for the earlier forecasts, overall the two sets of socioeconomic forecasts balanced to be about the same. Consequently, this update resulted in only minor adjustments, mostly based on the newly-released historical transaction data, to the early years of the forecasts horizon. These updated growth forecasts were incorporated into the traffic and toll revenue forecast model.

4.1.1.3 Planned Roadway Improvements

The five major improvements expected to impact traffic and revenue on the MDTA legacy facilities, and included in the forecast model are described below. In reviewing these projects and estimating

the traffic impacts, it was estimated that during the construction periods, some traffic would divert to the next best alternative crossing, if possible, while a small portion of more discretionary trips would be suppressed.

- **Baltimore Harbor Tunnel (I-895)** - Replace the deck and superstructure of the bridge over the Patapsco Flats (north of MD 295 to the I-895 Spur merge). Construction began in August 2016 and will extend through May 2019. One lane in each direction is being maintained throughout the construction period;
- **Fort McHenry Tunnel (I-95)** - This project involves improvements from the tunnel to the I-895 merge. When completed, continuous 4-lanes in each direction will be provided. Construction began in March 2017, and will continue through December 2018, and will involve off-peak lane closures and full-time shoulder closures. This project will also provide capacity on I-95 allowing for some diversion from I-895 when the I-895 Canton Viaduct replacement project begins.
- **Canton Viaduct Replacement (I-895)** - This project, extending from the tunnel to Interstate Avenue, will be replacing the Canton Viaduct and ramp to Holabird Avenue. Construction is scheduled to run from June 2018 to July 2021. One lane in each direction will be maintained from January 2019 to July 2021. As part of the considerations of this project, lane closures would not occur until January 2019, allowing for the I-95 improvements to be completed to help facilitate any traffic diversions to I-95.
- **William Preston Lane, Jr Memorial Bridge (US-50)** – This project will rehabilitate the deck of the eastbound span of the William Preston Lane (Bay) Bridge. Construction is scheduled to extend from October 2021 to May 2023. Plans call for single lane closures in off-peak and complete eastbound bridge closures overnight. While the eastbound span is fully closed, the existing contra-flow lane on the westbound span will be used to carry eastbound traffic.
- **Rehabilitate Decks of Three Bridges on I-95 in Cecil County (I-95)** – This project will rehabilitate the bridge decks of three bridges in Cecil County. One of these bridges is located just north of the toll plaza on the John F. Kennedy Memorial Highway and is anticipated to have minor impacts on traffic during the construction period. Construction is scheduled to extend from March 2019 to October 2020. Plans call for all lanes to be maintained throughout construction, though all lanes will be narrowed and shifted in the construction zone.

Additional construction projects on the MDTA facilities and competing arterials, were also reviewed. These include the I-95 improvements between MD 152 and MD 24 and the deck replacement of the I-95 bridge over Little NE Creek. Given the location and details of these additional projects, it was determined that the construction activity associated with these projects will result in minimal, if any, impacts on traffic and toll revenue.

4.2 Basic Assumptions

Transaction and revenue estimates for the MDTA legacy toll facilities were predicated upon the following assumptions, which are considered reasonable by CDM Smith for purposes of the forecast:

1. This study is limited to the seven MDTA legacy facilities and does not include forecasts for the Intercounty Connector or the I-95 Express Toll LanesSM ;

2. The seven legacy toll facilities and approach roads will continue to be well-maintained and effectively signed;
3. No competing highway projects other than those identified in this report will be constructed or significantly improved during the forecast period;
4. MDTA will continue to operate within its business rules and practices;
5. The existing toll collection concept and toll schedules will be in effect throughout the forecast period;
6. For the purposes of this report, it is assumed that no toll adjustments will be made during the forecasting period and that any conversion of facilities to all-electronic tolling will be revenue neutral;
7. Annual revenue estimates are expressed in future year dollars (nominal);
8. No major recession, natural disasters or other significant exogenous events will occur that would significantly reduce travel in the region;
9. Population and employment growth will occur as presented in this study; and
10. Motor fuel will remain in adequate supply, and future price increases will not significantly exceed the long-term rate of inflation.

Any significant departure from these basic assumptions could materially affect forecasted transactions and toll revenue for the seven facilities.

4.3 Transaction and In-Lane Toll Revenue Forecasts

4.3.1 Annual Transactions and In-Lane Toll Revenue by Facility

A summary of estimated transactions and In-Lane Toll Revenue forecasts from FY 2018 through FY 2027 for each of the seven MDTA legacy facilities by passenger car and commercial vehicle classes is presented in this section in Tables 4-1 through 4-7. The forecasts were developed based on the previously described spreadsheet model and modeling process, which in addition to incorporating existing FY 2017 traffic as its base input, included estimated normal traffic growth, estimated traffic impacts from major construction projects on the legacy facilities, and adjustments associated with the impacts of leap year. It should be noted that the forecasts include slightly higher growth rates in FY 2020 and FY 2024, accounting for the positive impact of an extra day in these leap years. Transactions in the following year have been forecasted to grow at slightly lower rates, adding a negative adjustment to account for the higher number of transactions in the leap year.

4.3.1.1 John F. Kennedy Memorial Highway (I-95)

Forecasts of annual transactions and In-Lane Toll Revenue for the John F. Kennedy Memorial Highway (I-95) are provided in Table 4-1. The John F. Kennedy Memorial Highway processed 15.6 million transactions in FY 2017, an increase of 2.5 percent over FY 2016. In-Lane Toll Revenue increased by 2.7 percent in FY 2017 from \$171.2 million in FY 2016 to \$175.8 million. Additionally, commercial vehicles, which accounted for 12 percent of transactions in FY 2017, generated more than 42 percent of the revenue. With the positive impacts of the economic recovery and lower fuel prices already

Table 4-1
John F. Kennedy Memorial Highway (I-95)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year	Transactions (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	13.74		1.80		15.55	
2018	14.08	2.5%	1.85	2.5%	15.93	2.5%
2019 ⁽²⁾	14.26	1.2%	1.87	1.0%	16.12	1.2%
2020 ⁽²⁾	14.30	0.3%	1.87	0.4%	16.18	0.3%
2021	14.47	1.2%	1.89	0.9%	16.36	1.1%
2022	14.67	1.4%	1.92	1.4%	16.59	1.4%
2023	14.80	0.9%	1.93	0.7%	16.73	0.9%
2024	14.98	1.2%	1.94	0.7%	16.92	1.1%
2025	15.07	0.6%	1.95	0.3%	17.02	0.6%
2026	15.21	0.9%	1.97	0.9%	17.18	0.9%
2027	15.34	0.9%	1.98	0.6%	17.32	0.9%

Fiscal Year	In-Lane Toll Revenues (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	\$101.36		\$74.45		\$175.81	
2018	103.50	2.1%	76.18	2.3%	179.68	2.2%
2019 ⁽²⁾	104.74	1.2%	76.98	1.0%	181.73	1.1%
2020 ⁽²⁾	105.07	0.3%	77.30	0.4%	182.37	0.4%
2021	106.27	1.1%	77.97	0.9%	184.25	1.0%
2022	107.72	1.4%	79.06	1.4%	186.78	1.4%
2023	108.67	0.9%	79.62	0.7%	188.28	0.8%
2024	109.92	1.2%	80.16	0.7%	190.08	1.0%
2025	110.57	0.6%	80.43	0.3%	191.00	0.5%
2026	111.54	0.9%	81.15	0.9%	192.70	0.9%
2027	112.52	0.9%	81.65	0.6%	194.16	0.8%

⁽¹⁾ Average Annual Percent Change

⁽²⁾ Construction begins on various bridge deck rehabilitations in Cecil County in Mar 2019, and ends Oct 2020.

accounted for in the FY 2016 and FY 2017 transaction growth, FY 2018 transactions were estimated to increase at a normal growth rate of 2.5 percent to 15.9 million.

Several construction projects are anticipated on I-95 during the forecast period. One of these projects involves the rehabilitation of bridges is located just north of the toll plaza on the John F. Kennedy Memorial Highway and is anticipated to have some minor impacts during the construction period. Construction is scheduled to extend from March 2019 to October 2020, during which time it has been established that approximately 500 vehicles per day will avoid using the John F. Kennedy Memorial Highway either through trip diversion or suppression.

Between FY 2018 to FY 2027, transactions have been estimated to increase by 0.9 percent per annum, reaching 17.3 million by FY 2027. In-Lane Toll Revenue has been forecasted to increase by 0.9 percent per annum from \$179.7 million in FY 2018 to \$194.2 million in FY 2027.

4.3.1.2 Thomas J. Hatem Memorial Bridge

Forecasts of annual transactions and In-Lane Toll Revenue for the Thomas J. Hatem Memorial Bridge (US 40) are provided in Table 4-2. The Hatem Bridge processed 5.1 million transactions in FY 2017, an increase of 0.2 percent over FY 2016 transactions of 5.1 million (rounded up). In-Lane Toll Revenue increased by 2.4 percent from \$11.8 million in FY 2016 to \$12.1 million in FY 2017. The difference in growth between transactions and revenue is due to a faster growth in commercial vehicles than passenger cars. Commercial vehicle transactions increased by 1.6 percent in FY 2017, while passenger car transactions increased by 0.1 percent.

With the positive impacts of the economic recovery and lower fuel prices already accounted for in the FY 2016 and FY 2017 transaction growth, FY 2018 transactions were estimated to increase at a normal growth rate of 1.1 percent to 5.2 million. During the FY 2018 to FY 2027 forecast period, transactions have been estimated to increase by 0.8 percent per annum, reaching 5.5 million by FY 2027. In-Lane Toll Revenue has been forecasted to increase by 0.7 percent per annum from \$12.3 million in FY 2018 to \$13.1 million in FY 2027.

4.3.1.3 Baltimore Harbor Tunnel

Baltimore Harbor Tunnel transactions and In-Lane Toll Revenue are presented in Table 4-3. Transactions in FY 2017 were 27.6 million, a 2.4 percent decrease over FY 2016. This decrease is related to the on-going construction activities to replace the deck and superstructure of the bridge over the Patapsco Flats (north of MD 295 to the I-895 Spur merge), just south of the Baltimore Harbor Tunnel. Roughly 5 percent of traffic, or approximately 3,500 vehicles per day, were estimated to have shifted to the Fort McHenry Tunnel and the Francis Scott Key Bridge to avoid the construction. These impacts have been moderated in the last four months of FY 2017 as construction activities on the approaches to the Fort McHenry Tunnel have also begun. Some traffic is assumed to have remained on the Francis Scott Key Bridge to avoid the construction on the other facilities, while some discretionary trips are assumed to have not been made. In-Lane Toll Revenue of \$89.5 million was collected in FY 2017, a decrease of 0.5 percent over FY 2016.

In the forecast years between FY 2018 and FY 2022, the impacts of various planned construction projects have been incorporated into the estimates of transactions and revenue on the Baltimore Harbor Tunnel and the Fort McHenry Tunnel and the Francis Scott Key Bridge. These include the Patapsco Flats bridge reconstruction, which is currently underway and is scheduled to end in May 2019, and the Canton Viaduct project, which is scheduled to run from June 2018 to July 2021 with major lane closures beginning in January 2019. These projects are anticipated to have a negative

Table 4-2
Thomas J. Hatem Memorial Bridge (US 40)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year	Transactions (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	4.89		0.21		5.10	
2018	4.94	1.0%	0.21	2.0%	5.16	1.1%
2019	4.99	0.9%	0.22	1.2%	5.20	0.9%
2020	5.04	1.0%	0.22	1.0%	5.25	1.0%
2021	5.06	0.4%	0.22	0.1%	5.28	0.4%
2022	5.10	0.8%	0.22	0.8%	5.32	0.8%
2023	5.14	0.8%	0.22	0.4%	5.36	0.8%
2024	5.19	1.1%	0.22	0.3%	5.42	1.0%
2025	5.22	0.5%	0.22	0.1%	5.44	0.5%
2026	5.26	0.8%	0.22	0.8%	5.49	0.8%
2027	5.30	0.8%	0.22	0.4%	5.53	0.8%

Fiscal Year	In-Lane Toll Revenues (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	\$5.62		\$6.47		\$12.09	
2018	5.72	1.7%	6.58	1.7%	12.29	1.7%
2019	5.77	0.9%	6.65	1.2%	12.42	1.0%
2020	5.82	1.0%	6.72	1.0%	12.54	1.0%
2021	5.85	0.4%	6.73	0.1%	12.57	0.3%
2022	5.89	0.8%	6.78	0.8%	12.67	0.8%
2023	5.94	0.8%	6.81	0.4%	12.75	0.6%
2024	6.00	1.1%	6.83	0.3%	12.83	0.6%
2025	6.04	0.5%	6.84	0.1%	12.87	0.3%
2026	6.08	0.8%	6.89	0.8%	12.97	0.8%
2027	6.13	0.8%	6.92	0.4%	13.05	0.6%

⁽¹⁾ Average Annual Percent Change

Table 4-3
Baltimore Harbor Tunnel (I-895)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year		Transactions (millions)					
		Passenger Cars		Commercial Vehicles		Total	
		Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	⁽²⁾	26.97		0.64		27.61	
2018	⁽²⁾	25.13	-6.8%	0.61	-4.5%	25.74	-6.8%
2019	^(2,3)	22.76	-9.4%	0.56	-8.9%	23.32	-9.4%
2020	⁽³⁾	22.00	-3.3%	0.54	-2.9%	22.54	-3.3%
2021	⁽³⁾	21.99	0.0%	0.54	0.0%	22.53	0.0%
2022	⁽³⁾	26.92	22.4%	0.66	22.4%	27.58	22.4%
2023		27.45	2.0%	0.67	2.0%	28.12	2.0%
2024		27.58	0.5%	0.68	0.5%	28.25	0.5%
2025		27.56	-0.1%	0.68	-0.1%	28.23	-0.1%
2026		27.61	0.2%	0.68	0.2%	28.29	0.2%
2027		27.67	0.2%	0.68	0.2%	28.35	0.2%
Fiscal Year		In-Lane Toll Revenues (millions)					
		Passenger Cars		Commercial Vehicles		Total	
		Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	⁽²⁾	\$80.21		\$9.25		\$89.46	
2018	⁽²⁾	73.99	-7.8%	8.84	-4.4%	82.83	-7.4%
2019	^(2,3)	66.95	-9.5%	8.06	-8.8%	75.01	-9.4%
2020	⁽³⁾	64.69	-3.4%	7.84	-2.8%	72.52	-3.3%
2021	⁽³⁾	64.57	-0.2%	7.83	-0.1%	72.40	-0.2%
2022	⁽³⁾	78.95	22.3%	9.59	22.4%	88.54	22.3%
2023		80.42	1.9%	9.77	2.0%	90.19	1.9%
2024		80.72	0.4%	9.82	0.5%	90.54	0.4%
2025		80.58	-0.2%	9.81	-0.1%	90.40	-0.2%
2026		80.67	0.1%	9.83	0.2%	90.50	0.1%
2027		80.75	0.1%	9.85	0.2%	90.60	0.1%

⁽¹⁾ Average Annual Percent Change.
⁽²⁾ Construction begins on Patapsco Flats Bridge in August 2016 and ends May 2019.
⁽³⁾ Construction begins on Canton Viaduct replacement in June 2018 and ends July 2021.
Major lane closures are assumed to begin in January 2019.

impact on the Baltimore Harbor Tunnel and, in combination with the construction activities on the approach to the Fort McHenry Tunnel, are estimated to shift some traffic to the Francis Scott Key Bridge and to continue to suppress some discretionary travel.

In FY 2021, transactions are forecasted to decline to 22.5 million, primarily the result of traffic diversions due to various construction projects. Due in part to the construction impacts, revenue in FY 2021 is forecasted at \$72.4 million. Following the end of the various planned construction projects on the Harbor crossings and approaches, transactions and toll revenues are estimated to increase as normal traffic patterns and discretionary trips return. By FY 2027, transactions are forecasted to increase to 28.4 million generating \$90.6 million in toll revenue. Throughout the forecast period, commercial vehicles represent approximately 2 percent of total transaction, but over 10 percent of in-lane toll revenue.

4.3.1.4 Fort McHenry Tunnel

The Fort McHenry Tunnel transactions and In-Lane Toll Revenue forecasts are presented in Table 4-4. This facility recorded the highest total transactions of all the legacy toll facilities at 45.4 million in FY 2017, an increase of 6.4 percent over FY 2016. This increase is partly due to the shift of traffic from the Baltimore Harbor Tunnel related to on-going construction activities on I-895, as previously mentioned. In-Lane Toll Revenue of \$204.2 million was collected in FY 2017, an increase of 6.7 percent over FY 2016.

Transactions are forecasted to grow to an estimated 52.4 million by FY 2021, partly the result of traffic diversions from the construction activities at the Baltimore Harbor Tunnel. With the return of normal traffic patterns following completion of construction activities, transactions in FY 2022 were forecasted to decline by almost 6 percent to 49.5 million. By FY 2027, transactions are forecasted at 51.3 million, a growth of 0.8 percent over the forecast period. This level of transactions resulted in the highest estimated toll revenue among the legacy facilities, forecasted to reach \$226.1 million by FY 2027. Throughout the forecast period, commercial vehicles represent approximately 9 percent of total transaction, but 39 percent of in-lane toll revenue.

4.3.1.5 Francis Scott Key Bridge

Table 4-5 provides forecasts of transactions and In-Lane Toll Revenue for the Francis Scott Key Bridge. In 2017, total transactions processed were 11.3 million, an increase of 1.0 percent over FY 2016. In-Lane Toll Revenue of \$44.9 million was collected in FY 2017, an increase of 3.8 percent over FY 2016. Revenues increased at a faster rate than transactions due to greater growth in commercial vehicles than passenger cars, possibly the result of the construction-related traffic diversions from the Baltimore Harbor Tunnel.

By FY 2021 transactions are forecasted to increase to 12.8 million, partly the result of traffic diversions from the construction activities at the Baltimore Harbor and Fort McHenry Tunnels, as previously mentioned. In the following year, traffic volumes are forecasted to return to more normal levels following the completion of these construction activities, decreasing to 11.9 million transactions. Transactions are then forecasted to reach 12.1 million by FY 2027, representing an average annual percent growth of 0.6 over the ten-year forecast period. Revenue is forecasted to reach \$47.7 million by FY 2027, an average annual percent growth of 0.6 percent over the forecast period. Throughout the forecast period, commercial vehicles represent approximately 9 percent of total transactions, and over 43 percent of in-lane toll revenue.

Table 4-4
Fort McHenry Tunnel (I-95)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year	Transactions (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017 ^(2,3)	41.38		4.00		45.38	
2018 ^(2,3)	43.51	5.1%	4.26	6.6%	47.77	5.3%
2019 ^(2,3,4)	46.14	6.0%	4.53	6.3%	50.67	6.1%
2020 ⁽⁴⁾	47.47	2.9%	4.67	3.0%	52.14	2.9%
2021 ⁽⁴⁾	47.69	0.5%	4.68	0.2%	52.37	0.4%
2022 ⁽⁴⁾	45.06	-5.5%	4.42	-5.5%	49.48	-5.5%
2023	45.22	0.4%	4.40	-0.5%	49.62	0.3%
2024	45.75	1.2%	4.37	-0.7%	50.12	1.0%
2025	46.04	0.6%	4.35	-0.3%	50.39	0.5%
2026	46.45	0.9%	4.39	0.9%	50.84	0.9%
2027	46.87	0.9%	4.39	0.0%	51.26	0.8%

Fiscal Year	In-Lane Toll Revenues (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017 ^(2,3)	\$124.26		\$79.92		\$204.18	
2018 ^(2,3)	129.67	4.4%	84.98	6.3%	214.65	5.1%
2019 ^(2,3,4)	137.39	6.0%	90.37	6.4%	227.76	6.1%
2020 ⁽⁴⁾	140.98	2.6%	91.32	1.1%	232.31	2.0%
2021 ⁽⁴⁾	141.55	0.4%	91.51	0.2%	233.05	0.3%
2022 ⁽⁴⁾	133.78	-5.5%	87.20	-4.7%	220.97	-5.2%
2023	134.15	0.3%	86.79	-0.5%	220.95	0.0%
2024	135.61	1.1%	87.03	0.3%	222.64	0.8%
2025	136.33	0.5%	86.80	-0.3%	223.12	0.2%
2026	137.43	0.8%	87.58	0.9%	225.01	0.8%
2027	138.54	0.8%	87.58	0.0%	226.12	0.5%

⁽¹⁾ Average Annual Percent Change
⁽²⁾ Construction begins on Patapsco Flats Bridge in August 2016 and ends May 2019.
⁽³⁾ Construction begins on I-95 improvements in March 2017 and ends December 2018.
⁽⁴⁾ Construction begins on Canton Viaduct replacement in June 2018 and ends July 2021.
Major lane closures are assumed to begin in January 2019.

Table 4-5
Francis Scott Key Bridge (I-695)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year		Transactions (millions)					
		Passenger Cars		Commercial Vehicles		Total	
		Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	(2,3)	10.26		1.05		11.31	
2018	(2,3)	11.09	8.1%	1.11	5.7%	12.21	7.9%
2019	(2,3,4)	11.55	4.1%	1.15	3.2%	12.70	4.0%
2020	(4)	11.62	0.6%	1.16	0.8%	12.78	0.6%
2021	(4)	11.64	0.2%	1.16	0.2%	12.80	0.2%
2022	(4)	10.76	-7.6%	1.10	-5.2%	11.86	-7.4%
2023		10.72	-0.3%	1.10	0.0%	11.82	-0.3%
2024		10.81	0.8%	1.11	0.8%	11.92	0.8%
2025		10.83	0.2%	1.11	0.2%	11.94	0.2%
2026		10.89	0.5%	1.12	0.5%	12.00	0.5%
2027		10.94	0.5%	1.12	0.5%	12.06	0.5%

Fiscal Year		In-Lane Toll Revenues (millions)					
		Passenger Cars		Commercial Vehicles		Total	
		Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	(2,3)	\$25.48		\$19.46		\$44.94	
2018	(2,3)	27.65	8.5%	20.58	5.8%	48.24	7.3%
2019	(2,3,4)	28.75	4.0%	21.24	3.2%	50.00	3.6%
2020	(4)	29.29	1.9%	21.12	-0.6%	50.41	0.8%
2021	(4)	29.30	0.1%	21.17	0.2%	50.47	0.1%
2022	(4)	26.69	-8.9%	20.32	-4.0%	47.01	-6.9%
2023		26.53	-0.6%	20.33	0.1%	46.86	-0.3%
2024		26.69	0.6%	20.49	0.8%	47.19	0.7%
2025		26.71	0.1%	20.54	0.2%	47.25	0.1%
2026		26.80	0.3%	20.65	0.5%	47.45	0.4%
2027		26.90	0.3%	20.75	0.5%	47.65	0.4%

⁽¹⁾ Average Annual Percent Change

⁽²⁾ Construction begins on Patapsco Flats Bridge in August 2016 and ends May 2019.

⁽³⁾ Construction begins on I-95 improvements in March 2017 and ends December 2018.

⁽⁴⁾ Construction begins on Canton Viaduct replacement in June 2018 and ends July 2021.
Major lane closures are assumed to begin in January 2019.

4.3.1.6 William Preston Lane Jr. Memorial (Bay) Bridge

As shown in Table 4-6, the William Preston Lane Jr. Memorial (Bay) Bridge processed a total of 13.6 million transactions in FY 2017, an increase of 2.4 percent over FY 2016. Of these, 6.6 percent or 0.9 million were commercial vehicle transactions. Total In-Lane Toll Revenue increased by 2.2 percent from \$52.8 million in FY 2016 to \$54.0 million in FY 2017. This represents a return to more normal revenue growth trends following the toll decrease implemented in FY 2016.

Rehabilitation of the deck on the eastbound span is currently planned to commence in October 2021 and end by May 2023. Plans call for single lane closures in off-peak hours, with complete eastbound bridge closures overnight. The existing contra-flow lane on the westbound span will be used to carry eastbound traffic during peak periods and during full closures of the eastbound span. Due to the recreational nature of many trips made on this facility, and the lack of competing alternative routes, a negative impact of approximately 400 vehicles per day has been estimated. This impact could have been greater, but it has also been assumed that some motorists will shift their trips to other, less congested times of day. As a result of the construction, transactions are estimated to decrease from 13.9 million in FY 2020 to 13.8 million in FY 2023. Following the end of construction, discretionary trips are expected to return and more normal patterns of traffic growth have been forecasted.

Going forward, transactions are forecasted to reach an estimated 14.0 million by FY 2027, representing an average annual growth rate of 0.2 percent over the forecast period. In-Lane Toll Revenue is forecasted to increase from \$54.5 million in FY 2018 to \$56.6 million by FY 2027, an average annual increase of 0.4 percent. Throughout the forecast period, commercial vehicles represent approximately 7 percent of total transaction, and over 32 percent of in-lane toll revenue.

4.3.1.7 Harry W. Nice Memorial Bridge

Estimates of transactions and In-Lane Toll Revenue for the Harry W. Nice Memorial Bridge are provided in Table 4-7. The Bridge produced the lowest number of total transactions of the seven legacy facilities, reaching 3.4 million in FY 2017, a growth of 1.1 percent over FY 2016. Commercial vehicles accounted for 6 percent of the total. Passenger car transactions increased by 1.1 percent in FY 2017, while commercial vehicles experienced an increase of 2.9 percent, for a total increase over FY 2016. This facility is estimated to have an average annual growth in transactions of 0.7 percent through FY 2027, when transactions are expected to reach 3.7 million. Revenue in FY 2017 was \$21.5 million, a 1.2 percent increase from FY 2016. Revenue is forecasted to grow by 0.8 percent per year on average to FY 2027, when revenue of \$23.4 million is forecasted.

4.3.2 Systemwide Annual Transactions and In-Lane Toll Revenue Forecasts

Table 4-8 presents historical and forecasted In-Lane Toll Revenue from FY 2007 to FY 2027. Systemwide transactions have fluctuated between FY 2007 and FY 2015, but overall have decreased from 120.1 million in FY 2007 to 115.7 million in FY 2015, a decrease of 3.7 percent, or 0.4 percent per annum. The historical fluctuations are largely due to both the negative effects of the Great Recession and a series of toll increases, most recently in FY 2012, FY 2013 and FY 2014. The combined effects of normal traffic growth, the continued economic recovery from the Great Recession, historically low gasoline prices, and the toll decreases in FY 2016, have resulted in transactions growing by 2.9 percent in FY 2016 and then by 2.5 percent in FY 2017. During the FY 2007 to FY 2017 period, the number of systemwide transactions peaked at 121.5 million in FY 2011 and then again in FY 2017 at 122.0 million. This resulted in revenue of \$311.9 million in FY 2011 and \$601.9 in FY 2017.

Table 4-6
William Preston Lane Jr. Memorial Bridge (US 50/301)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year	Transactions (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	12.69		0.89		13.59	
2018	12.86	1.3%	0.92	3.0%	13.78	1.4%
2019	12.94	0.7%	0.94	2.1%	13.88	0.8%
2020	12.98	0.3%	0.96	1.8%	13.94	0.4%
2021	12.94	-0.3%	0.97	0.8%	13.91	-0.2%
2022 ⁽²⁾	12.85	-0.7%	0.96	-0.7%	13.81	-0.7%
2023 ⁽²⁾	12.83	-0.2%	0.97	1.2%	13.80	-0.1%
2024	12.98	1.2%	1.01	3.6%	13.98	1.3%
2025	12.94	-0.3%	1.01	0.7%	13.96	-0.2%
2026	12.94	0.0%	1.01	0.0%	13.96	0.0%
2027	12.94	0.0%	1.02	1.0%	13.97	0.1%

Fiscal Year	In-Lane Toll Revenues (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	\$36.56		\$17.40		\$53.96	
2018	36.64	0.2%	17.88	2.8%	54.52	1.0%
2019	36.86	0.6%	18.26	2.1%	55.12	1.1%
2020	36.94	0.2%	18.59	1.8%	55.53	0.7%
2021	36.82	-0.3%	18.74	0.8%	55.56	0.1%
2022 ⁽²⁾	36.54	-0.8%	18.61	-0.7%	55.15	-0.7%
2023 ⁽²⁾	36.45	-0.2%	18.83	1.2%	55.29	0.2%
2024	36.86	1.1%	19.52	3.6%	56.37	2.0%
2025	36.74	-0.3%	19.66	0.7%	56.39	0.0%
2026	36.72	-0.1%	19.66	0.0%	56.37	0.0%
2027	36.69	-0.1%	19.85	1.0%	56.55	0.3%

⁽¹⁾ Average Annual Percent Change

⁽²⁾ Construction begins on deck rehabilitation of the eastbound span in October 2021 and ends May 2023

Table 4-7
Harry W. Nice Memorial Bridge (US 301)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year	Transactions (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	3.21		0.21		3.42	
2018	3.26	1.5%	0.22	2.3%	3.47	1.5%
2019	3.29	1.0%	0.22	1.8%	3.51	1.1%
2020	3.32	0.9%	0.22	1.7%	3.54	0.9%
2021	3.33	0.3%	0.22	0.8%	3.55	0.4%
2022	3.35	0.7%	0.23	0.7%	3.58	0.7%
2023	3.38	0.7%	0.23	1.4%	3.61	0.7%
2024	3.41	1.0%	0.23	2.0%	3.64	1.0%
2025	3.42	0.4%	0.24	0.7%	3.66	0.4%
2026	3.45	0.7%	0.24	0.7%	3.69	0.7%
2027	3.47	0.7%	0.24	1.0%	3.71	0.7%

Fiscal Year	In-Lane Toll Revenues (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	\$15.42		\$6.05		\$21.47	
2018	15.57	1.0%	6.20	2.6%	21.77	1.4%
2019	15.73	1.0%	6.32	1.8%	22.04	1.2%
2020	15.86	0.8%	6.43	1.7%	22.28	1.1%
2021	15.89	0.2%	6.48	0.9%	22.37	0.4%
2022	15.99	0.6%	6.53	0.7%	22.52	0.6%
2023	16.09	0.6%	6.62	1.4%	22.71	0.8%
2024	16.23	0.9%	6.76	2.0%	22.99	1.2%
2025	16.28	0.3%	6.81	0.8%	23.09	0.5%
2026	16.38	0.6%	6.86	0.7%	23.24	0.6%
2027	16.48	0.6%	6.93	1.0%	23.41	0.7%

⁽¹⁾ Average Annual Percent Change

In FY 2018, the initial year of the forecast, transactions of 124.1 million have been forecasted, a 1.7 percent increase over FY 2017. In-Lane Toll Revenue is estimated at \$614.0 million, a 2.0 percent increase over FY 2017. Recent observed historical growth trends are carried through to FY 2019, before transactions and revenue growth are assumed to increase at rates more consistent with long-term historical trends. Total transactions are forecasted to grow to 132.2 million by FY 2027, or a total of 8.4 percent during the FY 2017 to FY 2027 forecast period. This equates to a growth rate of 0.8 percent per annum. In-Lane Toll Revenue are estimated to increase by a total of 8.2 percent from \$601.9 million in FY 2017 to \$651.5 million in FY 2027, an average annual change of 0.8 percent.

4.4 Other Revenue

In addition to In-Lane Toll Revenue, MDTA also collects Other Revenue associated with the operation of its facilities. These have been summarized into six categories:

1. Unused Commuter and Shoppers Plan Trips
2. Transponder Fees and Sales
 - a. Transponder sales (legacy and ICC)
 - b. Monthly Service Fees (legacy and ICC)
3. Hatem E-ZPass® program
4. Violation Recovery
5. Commercial Vehicles Fees and Discounts
 - a. Post-Usage Discount
 - b. High Frequency Discount
 - c. Over-Size Permit Fee
6. Concession Revenues

The following provides a description of each of the Other Revenue categories. The forecasts of these annual revenue streams are provided in Tables 4-9 through 4-11.

4.4.1 Unused Commuter and Shoppers Plan Trips

MDTA provides customers the option to enroll in commuter plans which provide discounts for frequent trips. MDTA offers three Commuter Plans based on the facilities included in the plan. The first plan allows commuters to pay \$1.40 per trip for 50 trips at the Fort McHenry Tunnel, Baltimore Harbor Tunnel, Francis Scott Key Bridge, JFK Memorial Highway, and the Hatem Bridge. However, these trips must be used within 45 days. Another plan gives customers the option to pay \$2.10 per trip for 25 trips at the Nice Bridge, and similar to the first plan must be used within 45 days. As of July 1, 2015, the toll per trip for this plan at the Bay Bridge was reduced by one-third from \$2.10 to \$1.40.

The Shoppers Plan is slightly different. As of July 1, 2015, MDTA gives customers the option to pay \$2.00 per trip for 10 trips crossing the Bay Bridge that can be used Sunday through Thursday, with an expiration of 90 days. Prior to July 1, 2015 the toll was \$3.00 per trip.

Any remaining balance after the time period from the Commuter or Shoppers Plans have expired is added to a separate account and referred to as Unused Toll Revenue. As seen in Table 4-9, this value is expected to increase gradually through FY 2027 as participation in the program increases due to normal traffic growth.

4.4.2 Transponder Fees and Sales

As of July 1, 2016, the cost of an E-ZPass® transponder is \$7.50 for the Standard, \$15.00 for the Exterior, and \$50.00 for the Fusion. The Standard is the more typical windshield mounted transponder, the Exterior is mounted to a passenger car's front license plate, and the Fusion is for commercial vehicles such as trucks and RVs. The forecast of future sales revenue is based on data provided by MDTA showing historical trends and the share of each transponder type as a percent of total sales.

In addition to transponder fees, prior to July 1, 2015, account holders were subject to a monthly account fee of \$1.50. Accounts making three-or-more transactions per month were exempt from this fee, but any user with less than three transactions were charged. As of July 1, 2015, this monthly account fee was eliminated for Maryland residents. The estimates for these fees for both the ICC and the legacy facilities are presented separately in Tables 4-9 and 4-10. Table 4-11 summarizes these estimates for both legacy and new facilities for in-lane and other toll revenue.

4.4.3 Hatem E-ZPass® Program

The Hatem Bridge E-ZPass® Program provides drivers with two possible plan options. Choice A allows drivers with a two-axle vehicle to pay \$20 per year for unlimited trips plus a transponder fee without any additional fees or prepaid toll deposits. However, this plan allows the E-ZPass® to only be used on the Hatem Bridge, and cannot be used at other toll facilities or with other E-ZPass® discount plans. Choice B is an add-on to a standard Maryland E-ZPass® account. This allows drivers to pay \$20 per year for unlimited trips at the Hatem Bridge, plus a transponder charge if it's a new account. There are associated account maintenance fees for non-Maryland accounts as well as a pre-paid toll balance, but this plan also gives drivers a discount off the cash rate for two-axle vehicles at all Maryland toll facilities, excluding the Intercountry Connector and I-95 Express Toll Lanes, and can be combined with other discount plans. The discount provided is 37.5 percent for the Bay Bridge and 25 percent for all other facilities.

4.4.4 Violation Recovery

Prior to FY 2016, violation fees were charged to drivers who choose not to initially pay their toll. Historical data through FY 2017 have been provided by MDTA. Since video customers are no longer assessed violations fees, but are instead assessed civil penalties if they do not pay their video tolls within 45 days, no estimates of future violation fee revenue for the legacy facilities, the ICC and I-95 Express Toll LanesSM are included in Tables 4-9 and 4-10. Moving forward, in order to assume a conservative estimate of future civil penalty fees, legacy facility civil penalties were forecasted to increase by 1 percent per year and ICC civil penalties by 0.5 percent per year.

4.4.5 Commercial Vehicles Fees and Discounts

There are two available discount programs for commercial vehicles with five-or-more-axles. The first plan is the post-usage plan, which is account specific and can be used on all eligible facilities. With this plan, each account is assessed after 30 days and the post-usage discount is calculated based on the total toll usage. The fee estimates for this program were developed from existing data and historical trends.

The other available discount plan is similar in that it is account specific and can be used on all eligible facilities. With this plan however, the account assessment after 30 days calculates the discount based on the total trips per transponder.

**Table 4-11
Historical and Forecasted In-Lane and "Other Toll Revenue"**

Fiscal Year	In-Lane Toll Revenue		"Other Toll Revenue"		Total Revenue ⁽⁴⁾
	Legacy Facilities	Legacy Facilities	New Facilities ⁽³⁾	Total ⁽⁴⁾	
2007	\$ 282.30	\$ 10.30	\$ -	\$ 10.30	\$ 292.60
2008	279.30	10.30	-	10.30	289.60
2009	276.60	9.60	-	9.60	286.20
2010	⁽¹⁾ 308.50	23.40	-	23.40	331.90
2011	312.00	23.00	-	23.00	335.00
2012	⁽¹⁾ 373.00	22.20	-	22.20	395.20
2013	⁽¹⁾ 411.60	23.10	-	23.10	434.70
2014	⁽¹⁾ 574.08	29.48	3.37	32.85	606.93
2015	594.58	35.66	6.72	42.38	636.96
2016	⁽²⁾ 581.41	32.64	8.77	41.41	622.82
2017	601.91	38.88	21.60	60.48	662.39
2018	613.99	38.09	21.46	59.55	673.53
2019	624.08	38.37	21.57	59.93	684.01
2020	627.96	38.65	21.67	60.32	688.28
2021	630.68	38.93	21.78	60.71	691.38
2022	633.65	39.25	21.89	61.14	694.79
2023	637.03	39.96	22.00	61.95	698.99
2024	642.64	40.25	22.11	62.36	704.99
2025	644.13	40.54	22.22	62.76	706.89
2026	648.24	40.84	22.33	63.17	711.41
2027	651.54	41.13	22.44	63.58	715.12

Source: Historical data from MdTA

⁽¹⁾ Year of toll increase.

⁽²⁾ Year of select toll rate reductions.

⁽³⁾ Intercounty Connector and I-95 ETLs

⁽⁴⁾ Summations may not match total due to rounding.

- Represents actual data.

In addition to the two discount plans available to commercial vehicles, there is a fee for over-sized and/or overweight vehicles. As of May 1, 2009, a \$25 permit fee was charged and covered all Authority maintained roadways along the vehicle's route. This fee is a one-time charge and will not be applied at any tolling location.

4.4.6 Concession Revenues

There are two travel plazas along the JFK Highway that provide additional revenue to MDTA through concessions. Both facilities were newly renovated and reopened to the public in 2014. The Maryland House Travel Plaza opened on January 16, 2014 and the Chesapeake House Travel Plaza opened on August 5, 2014. In 2012, the MDTA entered into a public private partnership with Areas USA for the redevelopment and long-term operation of the travel plazas. While the MDTA continues to own the facilities, Areas USA will operate the facilities through 2047 under a revenue-sharing agreement.

As can be seen in Table 4-9, concession revenue was lower in 2014, a result of closures due to construction activity. However, revenue increased by approximately \$1.8 million in FY 2015 and has continued to increase annually since then. Concession revenue is forecasted to increase slightly in FY 2018, to \$6.4 million, and then to increase through 2027 by approximately 3.8 percent per annum. The data and information used to develop the concession revenue forecast was provided by MDTA based on revenue projections developed by Areas USA MDTP, LLC, the company that redeveloped and currently operates the two travel plazas. For purposes of this report, revenues paid to MDTA by Areas USA are assumed to be approximately 90 percent of Areas USA's original concession growth estimates.

4.5 Total Annual Revenue Forecasts

A summary of the total systemwide In-Lane Toll Revenue and Other Revenue forecast for FY 2018 through FY 2027, as well as historical data from FY 2012 to FY 2017, are presented in Figure 4-1 and Table 4-12. The historical data presented in the figure sets the forecast in perspective relative to recent actual trends. Total revenues increased considerably between FY 2012 and FY 2014, growing from \$395.2 million to \$607.0 million, primarily because of the toll increases implemented in these years. Revenues in FY 2015 then increased by 4.9 percent to \$637.0 million. This growth was higher than the average annual increase in revenue in previous years not impacted by toll increases. In those years, growth averaged less than 1 percent. The higher level of growth in FY 2015 was likely related to both the delayed economic recovery from the Great Recession of 2008-2009 and historically low gasoline prices. In FY 2016, revenues decreased by 2.4 percent from \$637.0 million to \$622.8 million, or by \$15.0 million. This was primarily the effect of the toll rate reductions which resulted in In-Lane Toll Revenue declining by \$13.2 million, or 88 percent of the total \$15.0 million decrease. Revenues in FY 2017 increased by 6.4 percent to \$662.4 million. This growth was likely related to higher commercial vehicle traffic, due perhaps to the improving economic conditions, along with continued low and stable gasoline prices, as well as a 46.1 percent increase in Other Revenue.

In FY 2018, the initial year of the forecast, total revenues are estimated at \$673.5 million, a 1.7 percent increase over FY 2017. In the absence of any toll rate changes, annual revenue growth rates going forward has been estimated to increase at more moderate rates ranging from 0.3 to 1.6 percent. In-Lane Toll Revenue is forecasted to increase to \$633.6 million by FY 2022, and to \$651.5 million by FY 2027. Other Revenue, representing approximately 9 percent of the total revenue, is forecasted to grow from \$60.5 million in FY 2017, to \$61.1 million in FY 2022, and to \$63.6 million in FY 2027. Both In-Lane Toll Revenue and Other Revenue are forecasted to increase by 0.7 percent per annum over the 10-year forecast period.

Figure 4-1
Historical and Forecasted Transactions and Total Toll Revenue

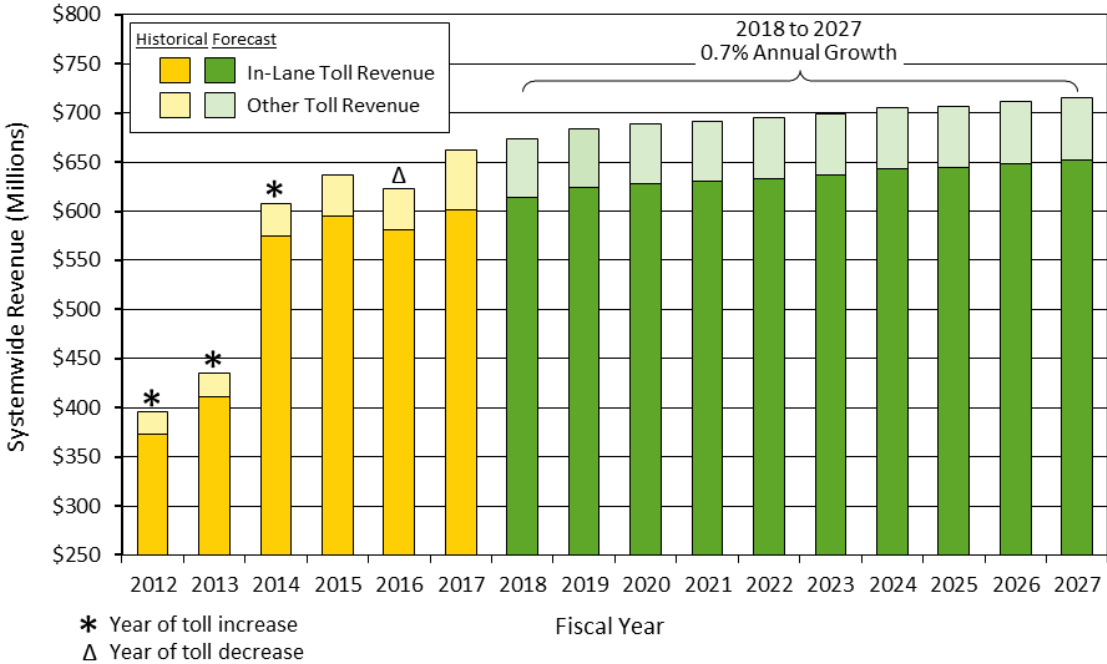
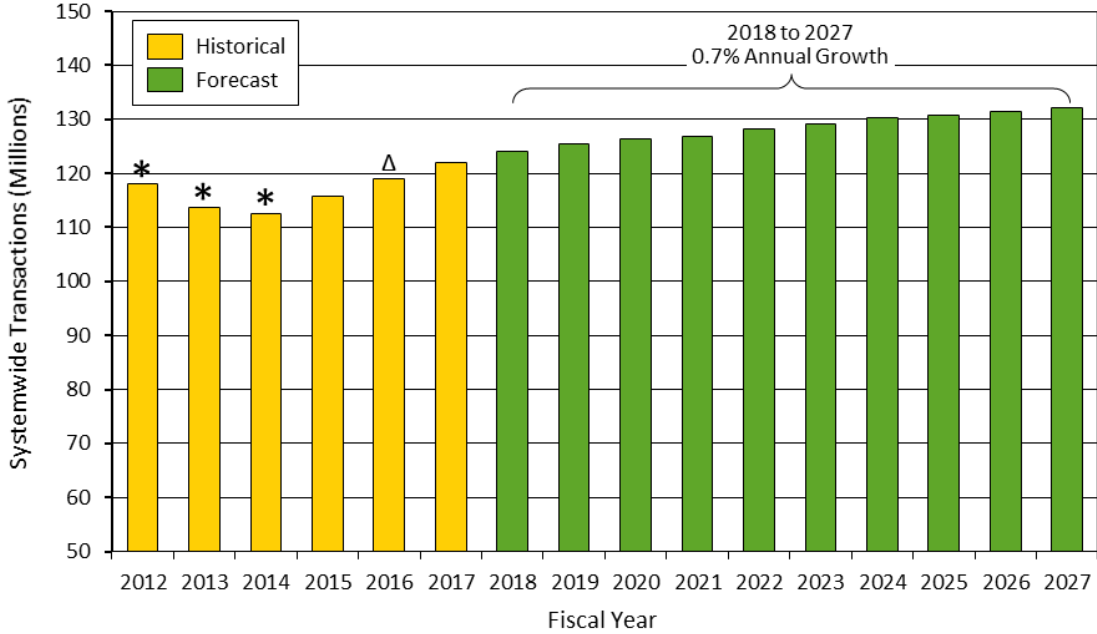


Table 4-12
In-Lane, “Other” and Total Revenue Forecasts

Fiscal Year	Toll Revenue (\$ Millions)					
	In-Lane	Percent Change	Other ⁽¹⁾	Percent Change	Total	Percent Change
2012	373.0	19.6	22.2	(3.5)	395.2	18.0
2013	411.6	10.3	23.1	4.1	434.7	10.0
2014	574.1	39.5	32.9	42.2	606.9	39.6
2015	594.6	3.6	42.4	29.0	637.0	4.9
2016	581.4	(2.2)	41.4	(2.3)	622.8	(2.2)
2017	601.9	3.5	60.5	46.1	662.4	6.4
2018	614.0	2.0	59.5	(1.5)	673.5	1.7
2019	624.1	1.6	59.9	0.6	684.0	1.6
2020	628.0	0.6	60.3	0.6	688.3	0.6
2021	630.7	0.4	60.7	0.6	691.4	0.5
2022	633.6	0.5	61.1	0.7	694.8	0.5
2023	637.0	0.5	62.0	1.3	699.0	0.6
2024	642.6	0.9	62.4	0.6	705.0	0.9
2025	644.1	0.2	62.8	0.6	706.9	0.3
2026	648.2	0.6	63.2	0.6	711.4	0.6
2027	651.5	0.5	63.6	0.6	715.1	0.5

⁽¹⁾ Includes "Other Revenue" from the ICC and I-95 ETL

- Represents actual data.

4.6 Total Monthly Transaction and Toll Revenue Forecasts

For purposes of budgeting and the tracking of actual versus forecasted transactions and revenue, monthly forecasts of transactions and In-Lane Toll Revenue were also developed for FY 2018 and FY 2019. Tables 4-13 and 4-14 summarize the forecasts of transactions and In-Lane Toll Revenue for the seven legacy facilities.

August was estimated to have the greatest number of transactions with 11.3 million in FY 2018 and 11.5 million in FY 2019. Alternatively, February represents the month with the fewest number of transactions at 8.8 million in FY 2018 and 8.9 million in FY 2019. In both years, the total number of E-ZPass® transactions (including commuters, shoppers, and Hatem A&B Plans) is approximately 171 percent greater than the cash/video transactions for two-axle vehicles. Additionally, in both FY 2018 and FY 2019, E-ZPass® transactions represent approximately 73 percent of all two-axle vehicle transactions, and 87 percent of all three-or-more-axle vehicle transactions.

The highest In-Lane Toll Revenue is forecasted to occur in August of FY 2018 and FY 2019, with totals of \$55.8 million and \$56.6 million, respectively. Further, the lowest revenue is forecasted in February FY 2018 and FY 2019 at \$43.4 million and \$44.3 million, respectively. The total forecasted In-Lane Toll Revenue is \$614.0 million in FY 2018 and \$624.1 million in FY 2019.

Table 4-15 provides a summary of the monthly transactions and In-Lane Toll Revenue, as well as "Other Toll Revenue" and Total Toll Revenue.

Table 4-15
Monthly Forecasted Transactions, In-Lane and "Other" Toll Revenue

	Month	Transactions (millions)	Toll Revenue (\$ millions)		
			In-Lane	Other ⁽¹⁾	Total
Fiscal Year 2018	Jul-17	11.18	\$ 54.83	\$ 5.32	\$ 60.15
	Aug-17	11.31	55.83	5.42	61.25
	Sep-17	10.28	50.56	4.90	55.47
	Oct-17	10.47	51.64	5.01	56.65
	Nov-17	10.17	50.25	4.87	55.12
	Dec-17	10.06	49.58	4.81	54.39
	Jan-18	9.06	45.13	4.38	49.51
	Feb-18	8.79	43.42	4.21	47.63
	Mar-18	9.98	49.95	4.84	54.80
	Apr-18	10.67	52.63	5.10	57.73
	May-18	10.99	54.85	5.32	60.17
	Jun-18	11.10	55.31	5.36	60.68
	Total	124.06	\$ 613.99	\$ 59.55	\$ 673.53
Fiscal Year 2019	Jul-18	11.33	\$ 55.60	\$ 5.34	\$ 60.94
	Aug-18	11.46	56.63	5.44	62.07
	Sep-18	10.42	51.29	4.93	56.22
	Oct-18	10.61	52.39	5.03	57.42
	Nov-18	10.30	50.98	4.90	55.88
	Dec-18	10.20	50.31	4.83	55.14
	Jan-19	9.12	46.06	4.42	50.49
	Feb-19	8.87	44.35	4.26	48.61
	Mar-19	10.05	50.86	4.88	55.74
	Apr-19	10.76	53.54	5.14	58.68
	May-19	11.08	55.86	5.36	61.23
	Jun-19	11.22	56.20	5.40	61.60
Total	125.41	\$ 624.08	\$ 59.93	\$ 684.01	

⁽¹⁾ Includes "Other Toll Revenue" from the ICC and I-95 ETL

4.7 Disclaimer

CDM Smith used currently-accepted professional practices and procedures in the development of the traffic and revenue estimates in this report. However, as with any forecast, it should be understood that differences between forecasted and actual results may occur, as caused by events and circumstances beyond the control of the forecasters. In formulating the estimates, CDM Smith reasonably relied upon the accuracy and completeness of information provided (both written and oral) by the Maryland Transportation Authority. CDM Smith also relied upon the reasonable assurances of independent parties and is not aware of any material facts that would make such information misleading.

CDM Smith made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue estimates that must be considered as a whole; therefore, selecting portions of any individual result without consideration of the intent of the whole may create a misleading or incomplete view of the results and the underlying methodologies used to obtain the results. CDM Smith gives no opinion as to the value or merit of partial information extracted from this report.

All estimates and projections reported herein are based on CDM Smith's experience and judgment and on a review of information obtained from multiple agencies, including the Maryland Transportation Authority. These estimates and projections may not be indicative of actual or future values, and are therefore subject to substantial uncertainty. Future developments, economic conditions cannot be predicted with certainty, and may affect the estimates or projections expressed in this report, such that CDM Smith does not specifically guarantee or warrant any estimate or projection contained within this report.

While CDM Smith believes that the projections and other forward-looking statements contained within the report are based on reasonable assumptions as of the date of the report, such forward-looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted. Therefore, following the date of this report, CDM Smith will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the report, as they pertain to socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential improvements to the regional transportation network.

The report and its contents are intended solely for use by the Maryland Transportation Authority and designated parties approved by the Maryland Transportation Authority and CDM Smith. Any use by third-parties, other than as noted above, is expressly prohibited. In addition, any publication of the report without the express written consent of CDM Smith is prohibited.

CDM Smith is not, and has not been, a municipal advisor as defined in Federal law (the Dodd Frank Bill) to the Maryland Transportation Authority and does not owe a fiduciary duty pursuant to Section 15B of the Exchange Act to the Maryland Transportation Authority with respect to the information and material contained in this report. CDM Smith is not recommending and has not recommended any action to the Maryland Transportation Authority. The Maryland Transportation Authority should discuss the information and material contained in this report with any and all internal and external advisors that it deems appropriate before acting on this information.

Appendix A

Detailed Traffic and Revenue Forecasts by Facility

Table A-1
John F. Kennedy Memorial Highway (I-95)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year	Transactions (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	13.74		1.80		15.55	
2018	14.08	2.5%	1.85	2.5%	15.93	2.5%
2019 ⁽²⁾	14.26	1.2%	1.87	1.0%	16.12	1.2%
2020 ⁽²⁾	14.30	0.3%	1.87	0.4%	16.18	0.3%
2021	14.47	1.2%	1.89	0.9%	16.36	1.1%
2022	14.67	1.4%	1.92	1.4%	16.59	1.4%
2023	14.80	0.9%	1.93	0.7%	16.73	0.9%
2024	14.98	1.2%	1.94	0.7%	16.92	1.1%
2025	15.07	0.6%	1.95	0.3%	17.02	0.6%
2026	15.21	0.9%	1.97	0.9%	17.18	0.9%
2027	15.34	0.9%	1.98	0.6%	17.32	0.9%

Fiscal Year	In-Lane Toll Revenues (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	\$101.36		\$74.45		\$175.81	
2018	103.50	2.1%	76.18	2.3%	179.68	2.2%
2019 ⁽²⁾	104.74	1.2%	76.98	1.0%	181.73	1.1%
2020 ⁽²⁾	105.07	0.3%	77.30	0.4%	182.37	0.4%
2021	106.27	1.1%	77.97	0.9%	184.25	1.0%
2022	107.72	1.4%	79.06	1.4%	186.78	1.4%
2023	108.67	0.9%	79.62	0.7%	188.28	0.8%
2024	109.92	1.2%	80.16	0.7%	190.08	1.0%
2025	110.57	0.6%	80.43	0.3%	191.00	0.5%
2026	111.54	0.9%	81.15	0.9%	192.70	0.9%
2027	112.52	0.9%	81.65	0.6%	194.16	0.8%

⁽¹⁾ Average Annual Percent Change

⁽²⁾ Construction begins on various bridge deck rehabilitations in Cecil County in Mar 2019, and ends Oct 2020.

Table A-2
Thomas J. Hatem Memorial Bridge (US 40)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year	Transactions (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	4.89		0.21		5.10	
2018	4.94	1.0%	0.21	2.0%	5.16	1.1%
2019	4.99	0.9%	0.22	1.2%	5.20	0.9%
2020	5.04	1.0%	0.22	1.0%	5.25	1.0%
2021	5.06	0.4%	0.22	0.1%	5.28	0.4%
2022	5.10	0.8%	0.22	0.8%	5.32	0.8%
2023	5.14	0.8%	0.22	0.4%	5.36	0.8%
2024	5.19	1.1%	0.22	0.3%	5.42	1.0%
2025	5.22	0.5%	0.22	0.1%	5.44	0.5%
2026	5.26	0.8%	0.22	0.8%	5.49	0.8%
2027	5.30	0.8%	0.22	0.4%	5.53	0.8%

Fiscal Year	In-Lane Toll Revenues (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	\$5.62		\$6.47		\$12.09	
2018	5.72	1.7%	6.58	1.7%	12.29	1.7%
2019	5.77	0.9%	6.65	1.2%	12.42	1.0%
2020	5.82	1.0%	6.72	1.0%	12.54	1.0%
2021	5.85	0.4%	6.73	0.1%	12.57	0.3%
2022	5.89	0.8%	6.78	0.8%	12.67	0.8%
2023	5.94	0.8%	6.81	0.4%	12.75	0.6%
2024	6.00	1.1%	6.83	0.3%	12.83	0.6%
2025	6.04	0.5%	6.84	0.1%	12.87	0.3%
2026	6.08	0.8%	6.89	0.8%	12.97	0.8%
2027	6.13	0.8%	6.92	0.4%	13.05	0.6%

⁽¹⁾ Average Annual Percent Change

Table A-3
Baltimore Harbor Tunnel (I-895)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year	Transactions (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017 ⁽²⁾	26.97		0.64		27.61	
2018 ⁽²⁾	25.13	-6.8%	0.61	-4.5%	25.74	-6.8%
2019 ^(2,3)	22.76	-9.4%	0.56	-8.9%	23.32	-9.4%
2020 ⁽³⁾	22.00	-3.3%	0.54	-2.9%	22.54	-3.3%
2021 ⁽³⁾	21.99	0.0%	0.54	0.0%	22.53	0.0%
2022 ⁽³⁾	26.92	22.4%	0.66	22.4%	27.58	22.4%
2023	27.45	2.0%	0.67	2.0%	28.12	2.0%
2024	27.58	0.5%	0.68	0.5%	28.25	0.5%
2025	27.56	-0.1%	0.68	-0.1%	28.23	-0.1%
2026	27.61	0.2%	0.68	0.2%	28.29	0.2%
2027	27.67	0.2%	0.68	0.2%	28.35	0.2%

Fiscal Year	In-Lane Toll Revenues (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017 ⁽²⁾	\$80.21		\$9.25		\$89.46	
2018 ⁽²⁾	73.99	-7.8%	8.84	-4.4%	82.83	-7.4%
2019 ^(2,3)	66.95	-9.5%	8.06	-8.8%	75.01	-9.4%
2020 ⁽³⁾	64.69	-3.4%	7.84	-2.8%	72.52	-3.3%
2021 ⁽³⁾	64.57	-0.2%	7.83	-0.1%	72.40	-0.2%
2022 ⁽³⁾	78.95	22.3%	9.59	22.4%	88.54	22.3%
2023	80.42	1.9%	9.77	2.0%	90.19	1.9%
2024	80.72	0.4%	9.82	0.5%	90.54	0.4%
2025	80.58	-0.2%	9.81	-0.1%	90.40	-0.2%
2026	80.67	0.1%	9.83	0.2%	90.50	0.1%
2027	80.75	0.1%	9.85	0.2%	90.60	0.1%

⁽¹⁾ Average Annual Percent Change.

⁽²⁾ Construction begins on Patapsco Flats Bridge on August 2016 and ends May 2019.

⁽³⁾ Construction begins on Canton Viaduct replacement on June 2018 and ends July 2021.
Major lane closures are assumed to begin January 2019.

Table A-4
Fort McHenry Tunnel (I-95)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year		Transactions (millions)					
		Passenger Cars		Commercial Vehicles		Total	
		Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	(2,3)	41.38		4.00		45.38	
2018	(2,3)	43.51	5.1%	4.26	6.6%	47.77	5.3%
2019	(2,3,4)	46.14	6.0%	4.53	6.3%	50.67	6.1%
2020	(4)	47.47	2.9%	4.67	3.0%	52.14	2.9%
2021	(4)	47.69	0.5%	4.68	0.2%	52.37	0.4%
2022	(4)	45.06	-5.5%	4.42	-5.5%	49.48	-5.5%
2023		45.22	0.4%	4.40	-0.5%	49.62	0.3%
2024		45.75	1.2%	4.37	-0.7%	50.12	1.0%
2025		46.04	0.6%	4.35	-0.3%	50.39	0.5%
2026		46.45	0.9%	4.39	0.9%	50.84	0.9%
2027		46.87	0.9%	4.39	0.0%	51.26	0.8%

Fiscal Year		In-Lane Toll Revenues (millions)					
		Passenger Cars		Commercial Vehicles		Total	
		Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	(2,3)	\$124.26		\$79.92		\$204.18	
2018	(2,3)	129.67	4.4%	84.98	6.3%	214.65	5.1%
2019	(2,3,4)	137.39	6.0%	90.37	6.4%	227.76	6.1%
2020	(4)	140.98	2.6%	91.32	1.1%	232.31	2.0%
2021	(4)	141.55	0.4%	91.51	0.2%	233.05	0.3%
2022	(4)	133.78	-5.5%	87.20	-4.7%	220.97	-5.2%
2023		134.15	0.3%	86.79	-0.5%	220.95	0.0%
2024		135.61	1.1%	87.03	0.3%	222.64	0.8%
2025		136.33	0.5%	86.80	-0.3%	223.12	0.2%
2026		137.43	0.8%	87.58	0.9%	225.01	0.8%
2027		138.54	0.8%	87.58	0.0%	226.12	0.5%

⁽¹⁾ Average Annual Percent Change

⁽²⁾ Construction begins on Patapsco Flats Bridge on August 2016 and ends May 2019.

⁽³⁾ Construction begins on I-95 improvements on March 2017 and ends December 2018.

⁽⁴⁾ Construction begins on Canton Viaduct replacement on June 2018 and ends July 2021. Major lane closures are assumed to begin January 2019.

Table A-5
Francis Scott Key Bridge (I-695)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year		Transactions (millions)					
		Passenger Cars		Commercial Vehicles		Total	
		Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	(2,3)	10.26		1.05		11.31	
2018	(2,3)	11.09	8.1%	1.11	5.7%	12.21	7.9%
2019	(2,3,4)	11.55	4.1%	1.15	3.2%	12.70	4.0%
2020	(4)	11.62	0.6%	1.16	0.8%	12.78	0.6%
2021	(4)	11.64	0.2%	1.16	0.2%	12.80	0.2%
2022	(4)	10.76	-7.6%	1.10	-5.2%	11.86	-7.4%
2023		10.72	-0.3%	1.10	0.0%	11.82	-0.3%
2024		10.81	0.8%	1.11	0.8%	11.92	0.8%
2025		10.83	0.2%	1.11	0.2%	11.94	0.2%
2026		10.89	0.5%	1.12	0.5%	12.00	0.5%
2027		10.94	0.5%	1.12	0.5%	12.06	0.5%

Fiscal Year		In-Lane Toll Revenues (millions)					
		Passenger Cars		Commercial Vehicles		Total	
		Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	(2,3)	\$25.48		\$19.46		\$44.94	
2018	(2,3)	27.65	8.5%	20.58	5.8%	48.24	7.3%
2019	(2,3,4)	28.75	4.0%	21.24	3.2%	50.00	3.6%
2020	(4)	29.29	1.9%	21.12	-0.6%	50.41	0.8%
2021	(4)	29.30	0.1%	21.17	0.2%	50.47	0.1%
2022	(4)	26.69	-8.9%	20.32	-4.0%	47.01	-6.9%
2023		26.53	-0.6%	20.33	0.1%	46.86	-0.3%
2024		26.69	0.6%	20.49	0.8%	47.19	0.7%
2025		26.71	0.1%	20.54	0.2%	47.25	0.1%
2026		26.80	0.3%	20.65	0.5%	47.45	0.4%
2027		26.90	0.3%	20.75	0.5%	47.65	0.4%

⁽¹⁾ Average Annual Percent Change

⁽²⁾ Construction begins on Patapsco Flats Bridge on August 2016 and ends May 2019.

⁽³⁾ Construction begins on I-95 improvements on March 2017 and ends December 2018.

⁽⁴⁾ Construction begins on Canton Viaduct replacement on June 2018 and ends July 2021. Major lane closures are assumed to begin January 2019.

Table A-6
William Preston Lane Jr. Memorial Bridge (US 50/301)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year	Transactions (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	12.69		0.89		13.59	
2018	12.86	1.3%	0.92	3.0%	13.78	1.4%
2019	12.94	0.7%	0.94	2.1%	13.88	0.8%
2020	12.98	0.3%	0.96	1.8%	13.94	0.4%
2021	12.94	-0.3%	0.97	0.8%	13.91	-0.2%
2022 ⁽²⁾	12.85	-0.7%	0.96	-0.7%	13.81	-0.7%
2023 ⁽²⁾	12.83	-0.2%	0.97	1.2%	13.80	-0.1%
2024	12.98	1.2%	1.01	3.6%	13.98	1.3%
2025	12.94	-0.3%	1.01	0.7%	13.96	-0.2%
2026	12.94	0.0%	1.01	0.0%	13.96	0.0%
2027	12.94	0.0%	1.02	1.0%	13.97	0.1%

Fiscal Year	In-Lane Toll Revenues (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	\$36.56		\$17.40		\$53.96	
2018	36.64	0.2%	17.88	2.8%	54.52	1.0%
2019	36.86	0.6%	18.26	2.1%	55.12	1.1%
2020	36.94	0.2%	18.59	1.8%	55.53	0.7%
2021	36.82	-0.3%	18.74	0.8%	55.56	0.1%
2022 ⁽²⁾	36.54	-0.8%	18.61	-0.7%	55.15	-0.7%
2023 ⁽²⁾	36.45	-0.2%	18.83	1.2%	55.29	0.2%
2024	36.86	1.1%	19.52	3.6%	56.37	2.0%
2025	36.74	-0.3%	19.66	0.7%	56.39	0.0%
2026	36.72	-0.1%	19.66	0.0%	56.37	0.0%
2027	36.69	-0.1%	19.85	1.0%	56.55	0.3%

⁽¹⁾ Average Annual Percent Change

⁽²⁾ Construction begins on deck rehabilitation of the eastbound span in October 2021 and ends May 2023

Table A-7
Harry W. Nice Memorial Bridge (US 301)
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year	Transactions (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	3.21		0.21		3.42	
2018	3.26	1.5%	0.22	2.3%	3.47	1.5%
2019	3.29	1.0%	0.22	1.8%	3.51	1.1%
2020	3.32	0.9%	0.22	1.7%	3.54	0.9%
2021	3.33	0.3%	0.22	0.8%	3.55	0.4%
2022	3.35	0.7%	0.23	0.7%	3.58	0.7%
2023	3.38	0.7%	0.23	1.4%	3.61	0.7%
2024	3.41	1.0%	0.23	2.0%	3.64	1.0%
2025	3.42	0.4%	0.24	0.7%	3.66	0.4%
2026	3.45	0.7%	0.24	0.7%	3.69	0.7%
2027	3.47	0.7%	0.24	1.0%	3.71	0.7%

Fiscal Year	In-Lane Toll Revenues (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	\$15.42		\$6.05		\$21.47	
2018	15.57	1.0%	6.20	2.6%	21.77	1.4%
2019	15.73	1.0%	6.32	1.8%	22.04	1.2%
2020	15.86	0.8%	6.43	1.7%	22.28	1.1%
2021	15.89	0.2%	6.48	0.9%	22.37	0.4%
2022	15.99	0.6%	6.53	0.7%	22.52	0.6%
2023	16.09	0.6%	6.62	1.4%	22.71	0.8%
2024	16.23	0.9%	6.76	2.0%	22.99	1.2%
2025	16.28	0.3%	6.81	0.8%	23.09	0.5%
2026	16.38	0.6%	6.86	0.7%	23.24	0.6%
2027	16.48	0.6%	6.93	1.0%	23.41	0.7%

⁽¹⁾ Average Annual Percent Change

Table A-8
Total Legacy Facilities
Transactions and In-Lane Toll Revenue Estimates by Vehicle Class

Fiscal Year	Transactions (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾	Transactions	AAPC ⁽¹⁾
2017	113.15		8.81		121.96	
2018	114.87	1.5%	9.19	4.3%	124.06	1.7%
2019	115.93	0.9%	9.48	3.2%	125.41	1.1%
2020	116.73	0.7%	9.64	1.7%	126.37	0.8%
2021	117.13	0.3%	9.68	0.4%	126.81	0.3%
2022	118.71	1.3%	9.50	-1.8%	128.21	1.1%
2023	119.54	0.7%	9.52	0.2%	129.06	0.7%
2024	120.69	1.0%	9.56	0.4%	130.25	0.9%
2025	121.08	0.3%	9.56	0.1%	130.65	0.3%
2026	121.81	0.6%	9.63	0.7%	131.44	0.6%
2027	122.54	0.6%	9.66	0.3%	132.20	0.6%

Fiscal Year	In-Lane Toll Revenues (millions)					
	Passenger Cars		Commercial Vehicles		Total	
	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾	Revenue	AAPC ⁽¹⁾
2017	\$388.91		\$213.00		\$601.91	
2018	392.74	1.0%	221.25	3.9%	613.99	2.0%
2019	396.19	0.9%	227.90	3.0%	624.08	1.6%
2020	398.65	0.6%	229.32	0.6%	627.96	0.6%
2021	400.25	0.4%	230.43	0.5%	630.68	0.4%
2022	405.57	1.3%	228.08	-1.0%	633.65	0.5%
2023	408.25	0.7%	228.78	0.3%	637.03	0.5%
2024	412.03	0.9%	230.61	0.8%	642.64	0.9%
2025	413.25	0.3%	230.88	0.1%	644.13	0.2%
2026	415.62	0.6%	232.62	0.8%	648.24	0.6%
2027	418.01	0.6%	233.53	0.4%	651.54	0.5%

⁽¹⁾ Average Annual Percent Change