Pennsylvania Turnpike 2018 Traffic and Revenue Forecast Study

April 2018

PENNA TURN PIKE

Pennsylvania Turnpike Commission

CDM Smith

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Introduction

This report summarizes the analyses conducted by CDM Smith in developing updated traffic and toll revenue estimates for the various toll facilities operated by the Pennsylvania Turnpike Commission (PTC). CDM Smith forecasts have been used by PTC for more than 20 years in support of the issuance of bond financing and for internal financial planning. In light of the current economic climate, it is more important than ever to have up-to-date traffic and revenue forecasts based on the most current information available.

CDM Smith last developed a detailed investment grade traffic and toll revenue study in March 2015. Since that time additional "bring down" letters have also been developed to update forecasts developed in the 2015 Study. Bring down letters were developed in March 2016 and May 2017. The purpose of a bring down letter is to update actual traffic and revenue experience since the last study and to adjust short term (2 to 5 year) forecasts based on recent trends. Detailed economic analyses are not conducted as part of a bring down letter and therefore longer-term forecasts are not adjusted from those originally developed as part of the latest investment grade study.

This current study included a comprehensive evaluation of the most currently available long term socioeconomic forecasts, and is, therefore, meant to be an update of the March 2015 investment grade study. This forecast includes updated long-term traffic and revenue forecasts through FY 2047-48. PTC's most recent assumptions regarding future toll rate increases, discount levels for the Commercial Volume Discount Program, and future committed capital improvements have been incorporated into this study. CDM Smith also developed and incorporated estimates of future year E-ZPass penetration for cars and trucks on the PTC's toll facilities.

PTC has been studying the possible implementation of all electronic tolling (AET) on its facilities. CDM Smith has been a member of the study team analyzing both the potential traffic and toll revenue impacts as well as the potential capital, and maintenance and operating (M&O) cost impacts AET may have on the Turnpike System. AET was implemented on the Delaware River Bridge (plaza 359) in January 2016, and on the Beaver Valley Expressway in May 2017. The traffic and revenue forecasts included in this study also assume the implementation of AET on the Northeast Extension barrier toll plazas, and on the Southern Beltway, both in late April 2018. Over time, all remaining toll facilities will be converted to AET, but toll rates have not yet been set. It is assumed that all future AET conversions will be net revenue neutral.

1.1 Report Structure

This report is comprised of four chapters, including the following:

Chapter 1: Introduction
Chapter 2: Turnpike Characteristics
Chapter 3: Socioeconomic Trends and Forecasts
Chapter 4: Transaction and Toll Revenue Forecasts

The following is a brief description of each chapter following this introduction.

Chapter 2 (Turnpike Characteristics) provides a review of monthly and annual transaction and toll revenue trends. Data are provided for passenger cars and commercial vehicles separately. Information is provided for the entire Turnpike System as well as for each of the individual toll facilities (Ticket System, Turnpike 43, etc.) that make up the Turnpike System. E-ZPass market share trends, historical toll rate adjustments, and changes to the Commercial Volume Discount Program are also summarized in Chapter 2.

Chapter 3 (Socioeconomic Trends and Forecasts) summarizes trends and forecasts in key socioeconomic variables, including population, employment, retail sales, and gross regional product. This data is broken down (at a county level) to reflect the actual market share for the various interchanges on the Turnpike System. Pennsylvania statewide data, as well as data for surrounding states and the United States, are also provided for each of these variables. Trends and forecasts in motor fuel prices are also covered in this chapter. The methodology used to estimate future traffic growth is described in detail. The ultimate product of Chapter 3 is a table showing the assumed normal growth rates used to develop traffic and toll revenue estimates for passenger cars and commercial vehicles for each Turnpike toll facility.

Chapter 4 (Transaction and Toll Revenue Forecasts) begins with a review of the assumed roadway improvement program for the Pennsylvania Turnpike. Planned toll rate adjustments throughout the 30-year forecast period are identified. Because of the toll differential that now exists between cash and E-ZPass, assumptions regarding future E-ZPass market share are important. All assumptions regarding E-ZPass market share throughout the forecast period are discussed in this chapter. Finally, estimates of traffic and gross toll revenue are provided through FY 2047-48. Forecasts are provided for passenger cars and commercial vehicles, for both the Ticket System and the total Barrier System, as well as for the total Turnpike System. Lastly, adjustments are made to the toll revenue forecasts to accounting for video bad debt expenses. Video bad debt expenses is the term PTC uses to describe the portion of toll by plate invoices that are not paid. This is associated with the implementation of AET on the Delaware River Bridge, the Beaver Valley Expressway, the Northeast Extension barrier toll plazas, and the Southern Beltway.

Chapter 2
Turnpike Characteristics

This chapter presents historical transaction and gross toll revenue trends on the Turnpike facilities. It also presents actual trends in the E-ZPass market share and historical toll increases. A comparison is presented between the current Turnpike per-mile toll rate on the Mainline I-76/I-276 and other toll road facilities. Lastly, the PTC's Commercial Volume Discount Program is described.

2.1 The Pennsylvania Turnpike Facilities

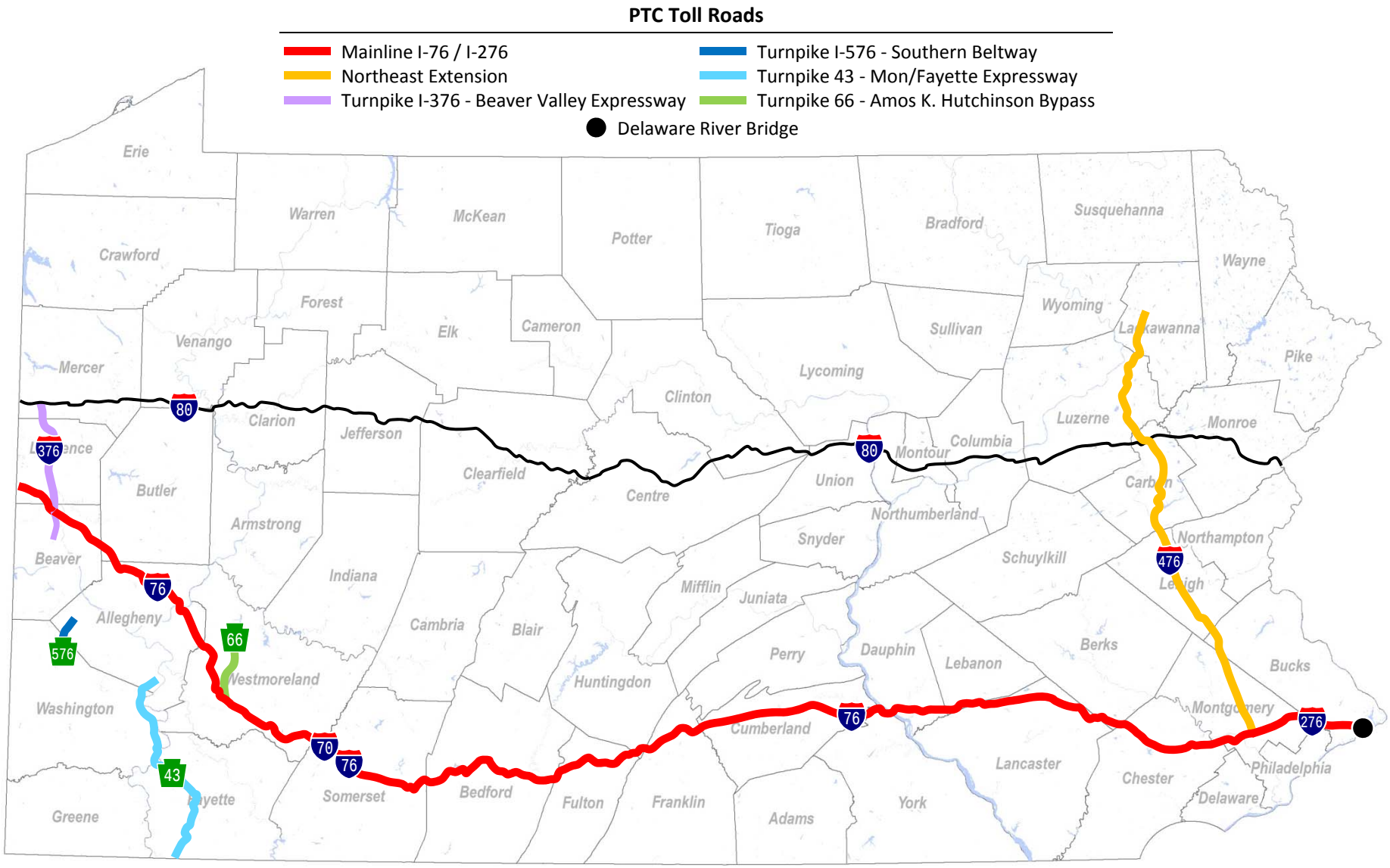
Figure 2-1 provides an overview of the Turnpike System, identifying each of its six toll facilities:

1. Mainline I-76/-276 from Ohio to New Jersey (359 miles) – This description includes the barrier plazas Gateway and Delaware River Bridge.
2. Northeast Extension I-476 (110 miles) – This includes the Clarks Summit and Keyser Avenue barrier plazas.
3. Turnpike 43 – Mon/Fayette Expressway (48 miles)
4. Turnpike 66 – Amos K. Hutchinson Bypass (13 miles)
5. Turnpike I-376 – Beaver Valley Expressway (16 miles)
6. Turnpike I-576 - Southern Beltway – Findlay Connector Section (6 miles)

There are two toll collection systems on the Turnpike System; a Ticket System, and a Barrier System. The Ticket System is comprised of the majority of Mainline I-76/I-276 (from Interchange 30, Warrendale, in western Pennsylvania to Interchange 353, Neshaminy Falls, near the New Jersey border) and the majority of the Northeast Extension (from Interchange 20, Mid-County, to Interchange 131, Wyoming Valley). On the Ticket System, the toll rate is charged by the individual movement on the toll road. The motorist picks up a ticket when entering the Ticket System and pays for the trip upon exiting the Ticket System.

The Barrier System is comprised of Turnpikes I-376 (Beaver Valley Expressway), Turnpike 66 (Amos K. Hutchinson Bypass), Turnpike 43 (Mon/Fayette Expressway) and Turnpike I-576 (Southern Beltway). There are also two barrier plazas on the Mainline I-76/I-276; Gateway (Plaza 2) and the Delaware River Bridge (DRB) (plaza 359). Both Gateway and DRB were converted from Ticket System plazas to Barrier System plazas; DRB in January 2016, and Gateway in June 2003. At Barrier plazas, a defined toll rate is charged for each vehicle class and payment type. The toll is not dependent on a trip.

The Ticket System is by far the largest component of the Turnpike System. As seen in Figure 2-2, the Ticket System accounted for 90.3% of the Turnpike System's total gross toll revenue, and 78.3% of the total transactions in calendar year 2017. Fixed barrier locations accounted for only 9.7% of gross toll revenue and 21.7% of transactions.



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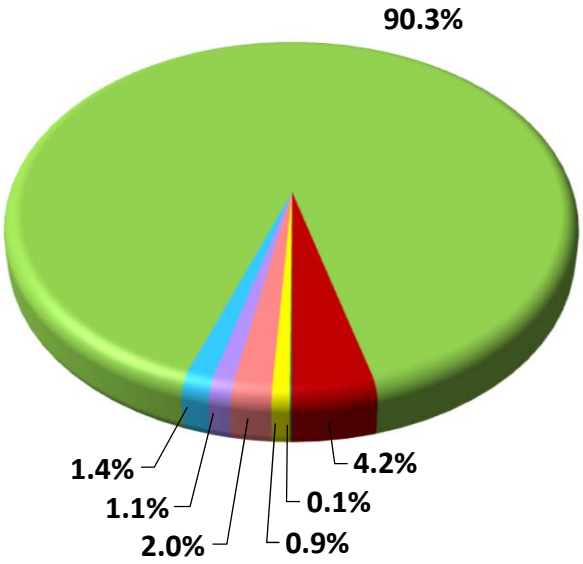
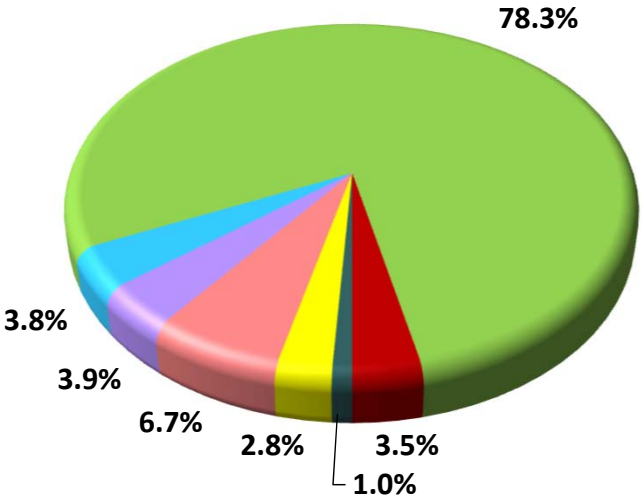
PENNSYLVANIA TURNPIKE COMMISSION (PTC) TOLL ROAD FACILITIES

FIGURE 2-1

Gross Toll Revenue



Transactions



- Ticket System (Including Gateway Plaza)
- Delaware River Toll Bridge
- Turnpike I-576 - Southern Beltway
- Northeast Extension Barrier Plazas
- Turnpike 43 - Mon / Fayette Expressway
- Turnpike I-376 - Beaver Valley Expressway
- Turnpike 66 - Amos K. Hutchinson Bypass

PERCENT OF CALENDAR YEAR 2017 TRANSACTIONS AND GROSS TOLL REVENUE BY FACILITY

FIGURE 2-2

2.2 Toll Rates and Commercial Volume Discount Program

2.2.1 Payment Options

Various payment options are available on the PTC's toll facilities. Most of the Turnpike System accepts payment by electronic toll collection (ETC) via an E-ZPass transponder, and by cash or credit card. A few toll plazas accept only E-ZPass transactions. A recent development, initiated in 2016, is the conversion of some facilities or plazas to All Electronic Tolling (AET). AET facilities or toll locations accept payment through E-ZPass or by a License Plate Tolling system called Toll By Plate (TBP). Traditional cash customers passing through an AET tolling location receive a Toll By Plate invoice. E-ZPass customers are be billed as usual. There are no physical toll plazas on AET facilities. Transactions are identified either by an E-ZPass transponder or by the video capture of a license plate. Toll collection equipment is located on gantries, near or over the roadway. The following toll locations or facilities were converted to AET since 2016:

- Delaware River Bridge (Plaza 359) in January 2016
- Beaver Valley Expressway in May 2017

2.2.2 Historical Toll Rate Increases and E-ZPass/Cash Toll Differential

Since 2009, the PTC has implemented annual toll rate increases on, or close to January 1. Prior to 2009, toll rates were increased at irregular intervals. Table 2-1 shows the toll rate since 1987. The rate increases were generally systemwide, with a few exceptions, as noted.

Table 2-1
Historical Toll Rate Increases
Pennsylvania Turnpike

Date	Percent Increase		Comment
	Cash/TBP	E-ZPass	
1/2/1987	40.0	NA	E-ZPass was not implemented until 2001
6/1/1991	32.0	NA	E-ZPass was not implemented until 2001
8/1/2004	42.5	42.5	
1/4/2009	25.0	25.0	No increase on Turnpike I-576 or Turnpike 43 between Uniontown and Brownsville
1/3/2010	3.0	3.0	No increase on Turnpike I-576
1/2/2011	10.0	3.0	No increase on Turnpike I-576
1/1/2012	10.0	0.0	No increase on Turnpike I-576
1/6/2013	10.0	2.0	
1/5/2014	12.0	2.0	No increase on Turnpike I-576
1/4/2015	5.0	5.0	No increase on Turnpike I-576
1/3/2016	6.0	6.0	No increase on Turnpike I-576
1/8/2017	6.0	6.0	No increase on Turnpike I-576 or Delaware River Bridge (Plaza 359)
1/7/2018	6.0	6.0	No increase on Turnpike I-576 or Delaware River Bridge (Plaza 359)

E-ZPass was phased in beginning in 2001. Initially, E-ZPass tolls and cash tolls were identical, but in 2011, cash tolls were increased by 10.0% over 2010, and E-ZPass tolls were increased by 3.0%, creating a toll differential between the two methods of payment. In 2011, cash tolls were about 7%

greater than E-ZPass tolls. The toll differential was increased through 2014, when the cash toll was about 40% more than the E-ZPass toll. This percent differential has been maintained through 2018. The toll rate differential between E-ZPass and cash incentivizes E-ZPass participation.

The PTC plans to continue annual toll rate increases through the forecast period, and the toll rate increases will be the same for E-ZPass and cash/TBP. The planned annual rate increases are shown in Table 4-2.

2.2.3 Per-Mile Toll Rates

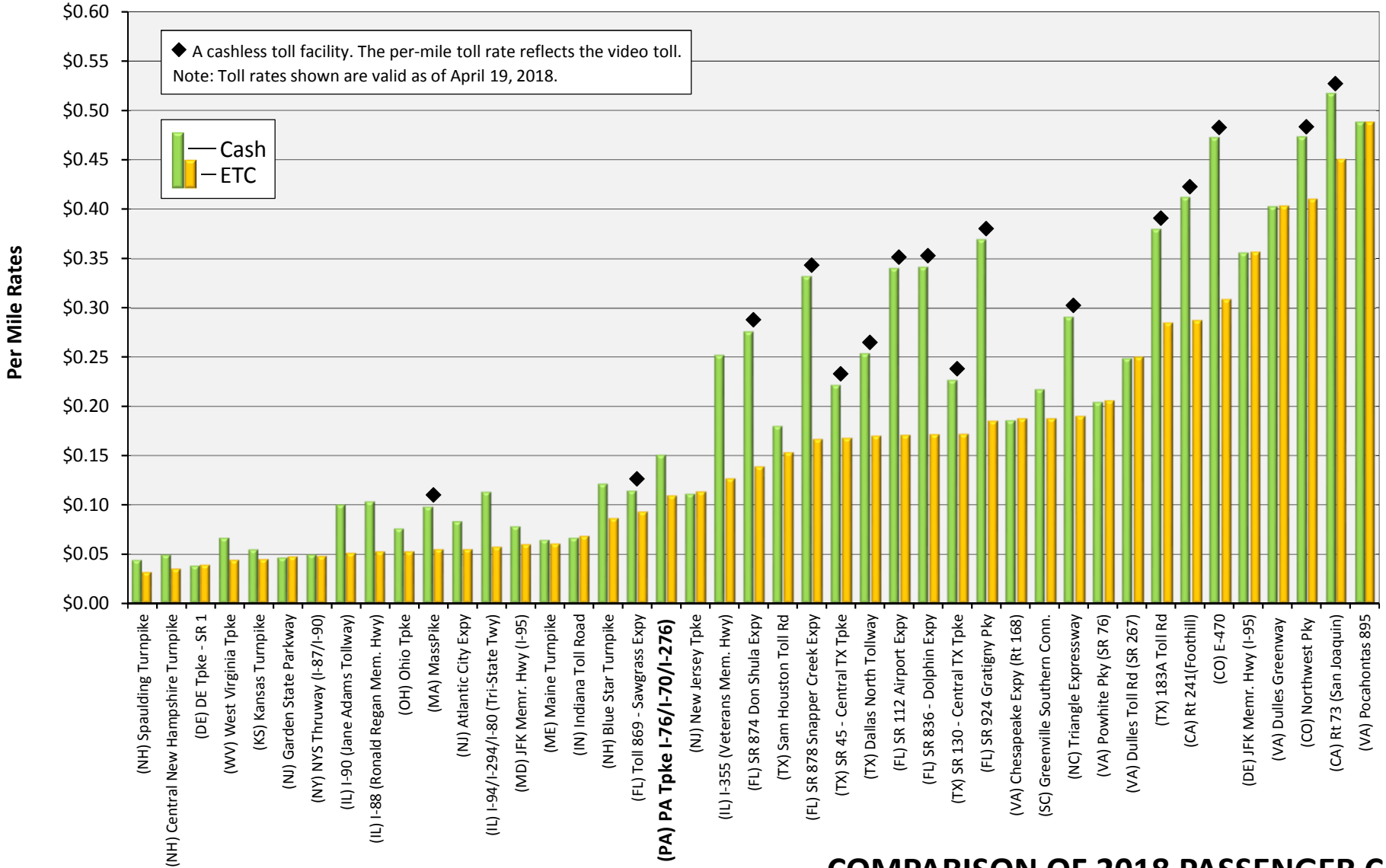
In 2018, a passenger car using cash pays $0.15 per-mile to travel the length of the Mainline, from the Delaware River Bridge through Gateway compared to $0.11 per mile for the same trip using E-Zpass. Figure 2-3 compares 2018 passenger-car per-mile toll rates for a through trip on 44 U.S. toll facilities. The Pennsylvania Turnpike is represented by a through trip on the Mainline I-76/I-276 from Delaware River Bridge through Gateway, which is shown in bold text. The per-mile rates are provided for ETC and cash payments. If the facility is AET, the license plate or video per-mile toll is represented in the cash column. The data is sorted from low to high by the ETC per-mile toll rates. A through trip on the Pennsylvania Mainline I-76/I-276 by a passenger car paying by ETC costs $0.11 per mile, which is comparable to $0.11 per mile on the New Jersey Turnpike.

Figure 2-4 presents a similar comparison of five-axle commercial-vehicle per-mile toll rates for through trips on the same 43 U.S. toll facilities. A trip on the Pennsylvania Mainline I-76/I-276 costs $0.58 per mile for E-ZPass compared to $0.41 on the New Jersey Turnpike in 2018.

Figures 2-3 and 2-4 show the 2018 per-mile rate on the PA Turnpike System falls approximately in the middle of the 43 U.S. toll facilities.

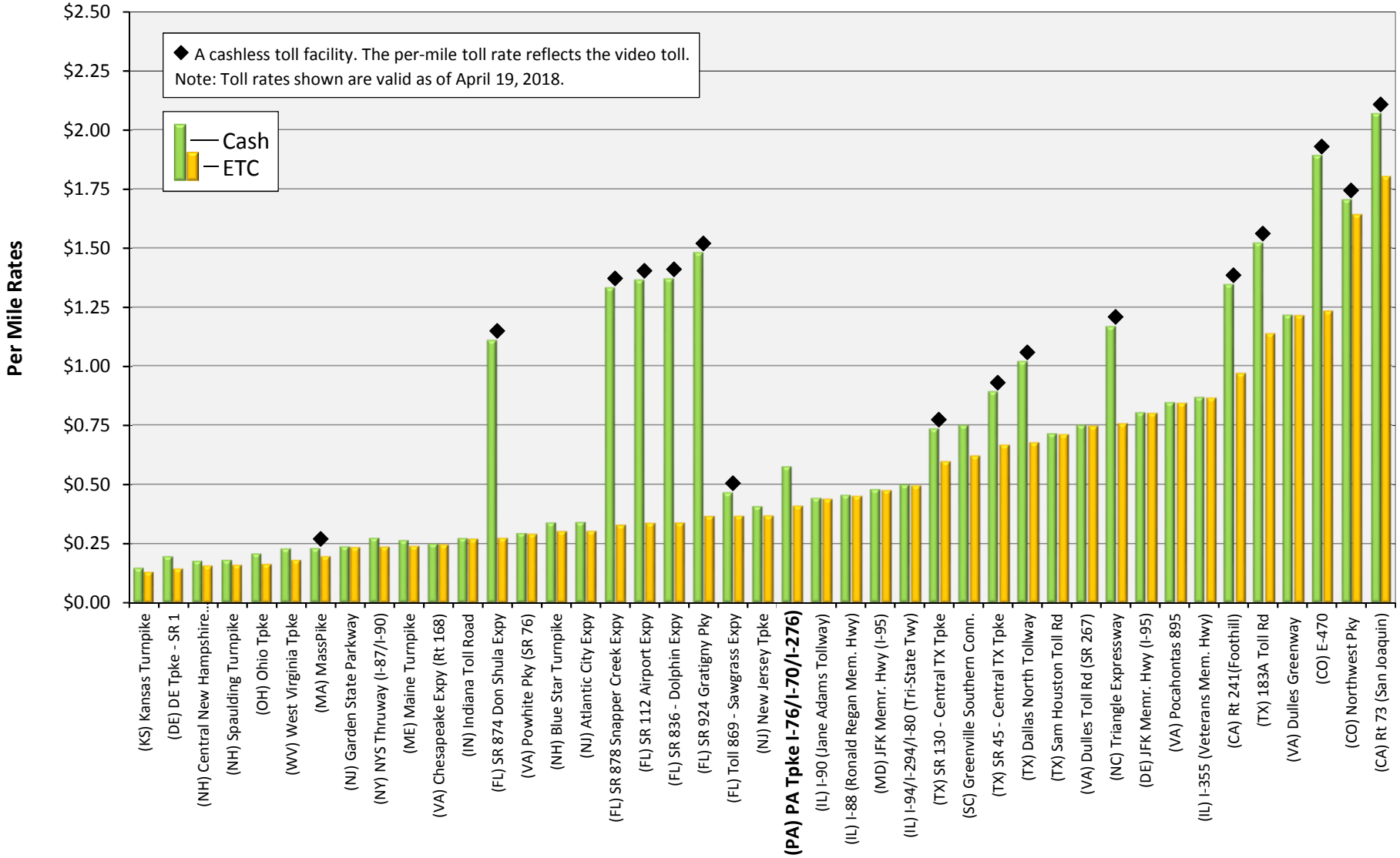
2.2.4 Commercial Volume Discount Program

The PTC operates a Commercial Volume Discount Program. Prior to the implementation of system wide toll rates favorable to E-ZPass customers, a post-paid, commercial volume-discount program was established for high-volume, commercial E-ZPass accounts. Post-paid commercial E-ZPass customers could receive the varying levels of discounts based on the amount of their monthly tolls. With the implementation of E-ZPass and the large toll savings offered to E-ZPass customers, the Commercial Volume Discount Program was modified over the years. Currently, in 2018, commercial accounts that accrue greater than $20,000.00 per month on tolls receive a three percent discount.



COMPARISON OF 2018 PASSENGER CAR PER-MILE THROUGH TRIP TOLL RATES (DATA SORTED BY ETC TOLL RATES)

FIGURE 2-3



COMPARISON OF 2018 FIVE-AXLE VEHICLE PER-MILE THROUGH TRIP TOLL RATES (DATA SORTED BY ETC TOLL RATES)

FIGURE 2-4

2.3 Annual Transaction Trends by Plaza

This section presents long-term annual transaction trends on the Ticket and Barrier Systems by toll plaza. Data is provided from 2003 through 2017 for Ticket and Barrier System toll plazas.

2.3.1 Ticket System Transaction Trends

Average annual daily transactions at the Ticket System's exiting toll plazas are shown in Tables 2-2 through 2-4 for passenger cars, commercial vehicles and total vehicles, respectively. The transactions include both revenue and non-revenue vehicles. Gateway (plaza 2) transactions are included in this table.

Some important changes occurred on the Ticket System that are reflected in the tables. In January 2016, the eastern terminus of the Ticket System was changed from the existing Delaware River Bridge (plaza 359) to the new Neshaminy Falls (plaza 353). Tolled transactions at Neshaminy Falls are collected in the eastbound direction, exiting the Ticket System, and are reported as part of the Ticket System. When Neshaminy Falls opened, the DRB was converted from the Ticket system to a barrier plaza with toll collection in the westbound direction. DRB transactions were counted under the Ticket System until January 2016, when they were reported on the Barrier System. Associated with moving the Ticket System's eastern terminus to Neshaminy Falls, toll collection was ended at Delaware Valley (plaza 358).

It should be noted that the Delaware River Bridge (plaza 359) was closed from January 20 through March 9, 2017 due to a fracture in one of the structural support beams. Although the DRB is on the Barrier System, the closure also negatively affected Ticket System traffic and revenue in January, February, and March 2017.

New access to the Ticket System is also shown in Tables 2-2 through 2-4. Since 2004, four new interchanges opened on the Ticket System; Virginia Drive (Milepost 340) in 2002, Street Road (Milepost 352) in 2010, SR 29 (Milepost 320) in 2012, and Route 903 (Milepost 87) in 2015. These were opened as E-ZPass-only interchanges. No cash is accepted.

In Tables 2-2 through 2-4, transaction trends are summarized by average annual growth rates into the following three periods:

1) The 5-year period from 2007-2012,
2) The 5-year period from 2012-2017, and
3) The 14-year period from 2003-2017.

Passenger-car transaction growth, shown in Table 2-2, averaged 0.3% annually from 2007-2012, and 0.9% annually from 2012-2017. Growth was impacted by the Great Recession which lasted from December 2007 through of June 2009, slow economic recovery, annual toll rate increases, and the closure of the DRB in 2017.

Table 2-3 shows commercial-vehicle transaction trends on the Ticket System. Commercial vehicle transactions averaged annual growth of 0.2% from 2007-2012, and 2.6% growth from 2012-2017. Total-vehicle transaction trends are shown in Table 2-4. Because passenger cars make up about 86% of total Ticket System toll transactions, the trends and growth rates for total vehicles closely mirror those for passenger cars. Total transactions averaged growth of 0.2% from 2007-2012, and 1.0% growth from 2012-2017.

Table 2-2
Passenger Cars - Average Daily Transactions on the Turnpike Ticket System At Exiting Toll Plazas
Includes Revenue and Non-Revenue Vehicles, and Gateway Barrier Plaza

Interchange	Calendar Year															Average Annual Percent Change		
(Milepost)	2003	2004[1]	2005	2006	2007	2008	2009[1]	2010[1]	2011[1]	2012[1]	2013[1]	2014[1]	2015[1]	2016[1]	2017[1]	2007-12	2012-17	2003-17
2 (2)	13,828	16,379	15,873	8,194	8,183	8,096	8,441	8,716	8,743	8,820	8,967	8,942	9,209	9,469	9,494	0.8	1.5	(2.6)
30	7,374	11,585	11,269	11,419	11,940	12,056	12,232	12,118	12,023	11,939	12,413	12,339	12,542	12,704	12,844	(0.0)	1.5	4.0
39	5,448	5,417	5,154	5,181	5,613	5,627	5,495	5,527	5,333	5,416	5,832	5,855	5,540	5,821	5,699	(0.4)	1.0	0.3
48	9,505	9,377	9,101	9,129	9,406	9,226	9,087	8,879	8,576	8,734	9,171	9,147	8,882	9,101	8,889	(0.7)	0.4	(0.5)
57	18,770	18,598	18,087	18,290	18,198	18,305	18,083	17,452	17,172	17,130	17,399	17,336	17,792	17,660	17,576	(0.6)	0.5	(0.5)
67	10,303	10,054	9,437	9,582	9,614	9,068	8,674	8,776	8,718	8,955	8,870	8,783	9,037	8,807	8,675	(0.7)	(0.6)	(1.2)
75	9,394	9,191	8,880	8,779	8,806	8,522	8,433	8,550	8,246	8,539	8,556	8,701	8,861	8,545	8,405	(0.3)	(0.3)	(0.8)
91	2,253	2,239	2,257	2,237	2,478	2,395	2,351	2,371	2,279	2,352	2,393	2,344	2,403	2,385	2,447	(0.5)	0.8	0.6
110	2,061	1,948	1,892	1,927	2,067	2,119	2,104	2,136	2,159	2,156	2,048	2,027	2,101	2,048	2,065	0.4	(0.9)	0.0
146	3,290	3,370	3,163	3,037	3,059	2,994	2,972	2,945	2,848	2,779	2,715	2,773	2,803	2,746	2,707	(1.0)	(0.5)	(1.4)
161	6,820	6,713	6,517	6,356	6,216	6,005	6,356	6,262	6,064	6,023	6,057	6,000	6,087	5,916	5,777	(0.3)	(0.8)	(1.2)
180	715	761	691	676	711	675	655	658	645	610	593	586	608	608	627	(1.5)	0.5	(0.9)
189	488	483	448	443	440	426	409	418	409	391	378	385	406	421	442	(1.2)	2.5	(0.7)
201	670	679	649	658	662	614	603	642	634	628	625	594	605	650	669	(0.5)	1.3	(0.0)
226	5,365	5,262	4,939	4,959	4,973	4,736	4,628	4,899	4,705	4,541	4,637	4,667	4,813	4,541	4,642	(0.9)	0.4	(1.0)
236	4,804	4,796	4,567	4,562	4,661	4,507	4,470	5,074	4,883	4,689	4,762	4,846	5,181	5,128	5,207	0.1	2.1	0.6
242	5,781	5,734	5,352	5,196	5,265	6,068	5,894	5,476	5,371	5,159	5,295	5,530	5,823	5,615	5,656	(0.2)	1.9	(0.2)
247	10,217	10,256	9,917	9,553	9,902	10,073	9,952	10,478	10,155	9,948	10,074	10,175	10,598	10,521	10,535	0.0	1.2	0.2
266	3,663	3,695	3,643	3,602	3,740	3,577	3,484	3,571	3,442	3,519	3,621	3,640	3,815	3,940	4,066	(0.6)	2.9	0.7
286	6,954	7,207	6,969	7,185	7,397	7,060	6,910	6,937	6,766	6,736	6,886	7,026	7,393	7,545	7,713	(0.9)	2.7	0.7
298	7,201	7,359	7,335	7,457	7,446	7,448	7,176	7,018	6,789	6,588	6,737	7,022	7,383	7,501	7,564	(1.2)	2.8	0.4
312	10,421	10,455	10,291	10,558	11,011	10,635	10,234	10,353	10,315	10,347	10,444	10,692	10,522	10,186	9,963	(0.6)	(0.8)	(0.3)
320 (3)										113	3,539	4,667	5,223	5,292	5,453	-	117.1	-
326	26,928	28,231	28,201	28,173	27,069	26,975	27,783	29,284	28,965	28,780	28,066	28,423	29,777	30,197	30,737	0.6	1.3	0.9
333	12,297	12,586	11,861	11,455	11,312	11,848	11,904	12,166	12,093	11,860	11,811	11,598	11,235	11,319	11,313	0.5	(0.9)	(0.6)
20	34,130	35,753	35,452	36,060	36,659	35,518	34,961	35,236	35,478	36,231	36,441	36,305	37,726	38,010	37,978	(0.1)	0.9	0.8
339	22,140	22,015	21,709	21,561	21,203	20,312	20,989	22,973	23,265	23,582	23,852	23,849	24,711	24,709	24,910	1.1	1.1	0.8
340 (4)	1,318	1,541	1,570	1,581	1,537	1,521	1,370	1,422	1,447	1,409	1,484	1,627	1,721	1,842	1,913	(0.9)	6.3	2.7
343	24,850	25,716	25,152	24,609	26,054	25,277	25,165	26,569	26,178	25,858	25,323	24,896	25,105	25,628	25,447	(0.1)	(0.3)	0.2
351	29,503	30,084	29,563	29,433	29,917	29,315	29,196	29,690	28,170	27,512	27,316	26,689	27,226	27,475	27,137	(0.8)	(0.3)	(0.6)
352 (5)								158	1,805	2,146	2,384	2,676	2,949	3,111	3,826	-	12.3	-
353														19,957	18,783	-	-	-
358 (6)	5,755	6,011	5,856	5,854	5,917	5,964	5,767	5,716	5,538	5,386	5,090	4,950	4,951			-	-	-
359 (7)	17,532	18,086	17,844	17,635	17,727	17,274	16,943	17,255	16,846	16,164	16,333	16,608	17,943			-	-	-
31	12,939	13,166	12,941	13,034	13,304	13,389	13,431	13,432	12,950	12,742	12,669	12,472	12,853	13,033	13,741	(0.4)	1.5	-
44	7,378	7,926	7,950	8,149	8,235	8,313	8,399	8,478	8,157	8,040	8,021	7,953	8,091	8,248	8,090	(0.2)	0.1	-
56	14,528	15,392	15,064	15,318	15,581	14,950	15,339	16,008	15,365	15,028	15,012	14,785	15,013	15,093	15,218	(0.4)	0.3	-
74	4,442	4,691	4,562	4,657	4,796	4,811	4,723	4,722	4,580	4,490	4,459	4,385	4,354	4,179	4,256	(0.7)	(1.1)	-
87 (8)													708	1,564	1,779	-	-	-
95	4,599	5,020	4,722	4,750	4,761	4,709	5,021	5,200	4,859	4,640	4,639	4,633	4,693	4,511	4,432	(0.3)	(0.9)	-
105	2,946	3,243	3,033	3,060	3,188	3,062	3,232	3,337	3,234	3,152	3,099	3,102	3,248	3,195	3,291	(0.1)	0.9	-
115	4,013	4,256	4,051	4,047	4,043	4,128	4,289	4,067	3,948	3,856	3,890	3,861	4,036	3,904	3,992	(0.5)	0.7	-
Total	370,623	385,275	375,967	368,356	373,089	367,599	367,153	374,969	369,153	366,989	371,905	372,889	383,965	383,123	383,961	0.3	0.9	0.3
Percent Change Over Prior Year		4.0	(2.4)	(2.0)	1.3	(1.5)	(0.1)	2.1	(1.6)	(0.6)	1.3	0.3	3.0	(0.2)	0.2			

(1) A toll increase occurred on or close to January 1. Refer to table 2-1 for the rate change.
(2) On 6/1/2003 Gateway was a barrier toll plaza with two-way toll collection. On 1/2/2006, toll collection changed from two-way to eastbound toll collection. This reduced the number of toll transactions.
(3) Interchange 320 (Route 29) Opened in December 2012 as an E-ZPass only interchange.
(4) Interchange 340 (Virginia Drive) opened in December 2000 as an E-ZPass only interchange.
(5) Interchange 352 (Street Road) opened in November 2010 as an eastbound only ,E-ZPass only interchange.
(6) Neshaminy Falls opened as the new eastern terminus of the East-West Mainline Ticket System in January 2016.
(7) The Delaware River Bridge mainline toll plaza became part of the Barrier System in January 2016. Toll collection changed from bi-directional to westbound only.
(8) Interchange 87 (Route 903) opened June 2015 as an E-ZPass only interchange.

Table 2-3
Commercial Vehicles - Average Daily Transactions on the Turnpike Ticket System At Exiting Toll Plazas
Includes Revenue and Non-Revenue Vehicles, and Gateway Barrier Plaza

Interchange	Calendar Year															Average Annual Percent Change		
(Milepost)	2003	2004[1]	2005	2006	2007	2008	2009[1]	2010[1]	2011[1]	2012[1]	2013[1]	2014[1]	2015[1]	2016[1]	2017[1]	2007-12	2012-17	2003-17
2 (2)	4,259	5,447	5,760	2,644	2,702	2,621	2,259	2,432	2,515	2,457	2,539	2,650	2,731	2,720	2,779	(0.9)	2.5	(3.0)
30	1,865	3,196	3,340	3,371	3,505	3,412	2,994	3,060	3,116	3,192	3,276	3,428	3,582	3,666	3,805	(0.9)	3.6	5.2
39	513	536	552	527	575	571	544	565	552	560	596	579	586	606	609	(0.3)	1.7	1.2
48	1,048	1,075	1,072	1,081	1,177	1,185	1,104	1,153	1,058	1,073	1,092	1,132	1,223	1,237	1,229	(0.9)	2.8	1.1
57	1,591	1,653	1,680	1,706	1,735	1,636	1,498	1,590	1,606	1,623	1,652	1,694	1,730	1,805	1,838	(0.7)	2.5	1.0
67	837	849	857	853	894	895	869	847	816	857	866	883	912	931	926	(0.4)	1.5	0.7
75	4,255	4,345	4,348	4,389	4,478	4,389	3,902	3,854	3,828	3,830	3,857	3,977	4,123	4,096	4,189	(1.6)	1.8	(0.1)
91	267	318	262	286	306	287	314	334	323	313	311	326	324	317	339	0.2	1.6	1.7
110	729	729	710	715	743	738	652	669	690	690	701	723	728	695	719	(0.7)	0.8	(0.1)
146	1,375	1,454	1,350	1,332	1,327	1,151	1,009	1,077	1,056	1,035	1,024	1,030	1,087	1,105	1,135	(2.4)	1.9	(1.4)
161	2,840	2,888	2,902	2,835	2,910	2,616	2,261	2,440	2,431	2,381	2,338	2,361	2,378	2,416	2,417	(2.0)	0.3	(1.1)
180	173	198	205	218	230	203	169	207	215	210	216	225	239	243	275	(0.9)	5.6	3.4
189	108	106	106	107	108	96	85	100	101	109	105	103	106	116	131	0.1	3.8	1.4
201	161	186	215	214	229	219	193	212	265	291	286	251	258	295	350	2.4	3.7	5.7
226	3,359	3,471	3,430	3,483	3,548	3,350	2,893	2,886	2,889	2,826	2,871	2,990	3,135	3,130	3,200	(2.2)	2.5	(0.3)
236	619	632	668	723	774	690	646	751	774	756	792	811	877	925	974	(0.2)	5.2	3.3
242	995	1,070	1,119	1,154	1,194	1,243	1,146	1,105	1,100	1,003	1,114	1,170	1,237	1,303	1,338	(1.7)	5.9	2.1
247	1,718	1,812	1,895	1,854	1,863	1,817	1,653	1,749	1,743	1,706	1,792	1,885	2,018	2,140	2,178	(0.9)	5.0	1.7
266	499	501	518	538	549	523	469	486	482	481	494	534	537	581	598	(1.3)	4.5	1.3
286	1,437	1,492	1,461	1,507	1,572	1,491	1,325	1,354	1,364	1,350	1,415	1,496	1,593	1,696	1,697	(1.5)	4.7	1.2
298	1,146	1,194	1,160	1,187	1,188	1,084	936	963	995	1,005	1,023	1,137	1,253	1,330	1,336	(1.7)	5.9	1.1
312	935	971	967	996	1,058	908	806	904	929	948	990	1,068	1,119	1,171	1,141	(1.1)	3.8	1.4
320 (3)										6	286	334	356	446	495	-	141.7	-
326	3,137	3,360	3,408	3,486	3,446	3,190	2,902	3,118	3,105	2,993	2,984	3,069	3,249	3,443	3,467	(1.4)	3.0	0.7
333	598	618	626	611	636	663	597	644	629	630	633	660	645	687	678	(0.1)	1.5	0.9
20	3,839	4,124	4,187	4,320	4,433	4,114	3,751	3,883	3,961	4,037	4,150	4,309	4,554	4,798	4,765	(0.9)	3.4	1.6
339	1,373	1,408	1,453	1,424	1,403	1,343	1,260	1,329	1,417	1,437	1,518	1,564	1,678	1,802	1,746	0.2	4.0	1.7
340 (4)	11	13	16	19	20	19	18	20	24	24	30	48	61	63	61	1.6	20.2	12.9
343	1,877	2,040	2,102	2,119	2,210	2,109	1,999	2,109	2,116	2,102	2,130	2,205	2,255	2,396	2,330	(0.5)	2.1	1.6
351	3,204	3,268	3,338	3,374	3,397	3,384	3,111	3,178	3,151	3,105	3,146	3,174	3,323	3,457	3,601	(0.9)	3.0	0.8
352 (5)								4	54	68	84	117	130	143	174	-	20.7	-
353														3,743	3,489			
358 (6)	1,624	1,737	1,807	1,810	1,812	1,529	1,410	1,654	1,571	1,442	1,458	1,514	1,553	0	0	-	-	-
359 (7)	3,296	3,613	3,754	3,790	3,949	4,137	3,768	3,474	3,389	3,231	3,330	3,491	3,740	0	0	-	-	-
31	1,319	1,387	1,409	1,429	1,505	1,495	1,453	1,498	1,450	1,431	1,436	1,562	1,672	1,742	1,660	(0.5)	3.0	-
44	842	869	897	951	990	958	929	965	943	958	998	1,048	1,094	1,120	1,129	(0.3)	3.3	-
56	2,592	2,833	2,909	3,051	3,139	3,118	3,039	3,147	3,114	3,136	3,211	3,309	3,496	3,647	3,644	(0.0)	3.1	-
74	465	496	526	546	596	484	480	527	536	523	530	547	551	582	559	(1.3)	1.3	-
87 (8)													50	133	155	-	-	-
95	1,169	1,235	1,227	1,292	1,336	1,264	1,226	1,337	1,329	1,336	1,385	1,424	1,497	1,547	1,485	(0.0)	2.1	-
105	176	205	209	210	218	400	396	200	209	205	207	209	238	244	235	(0.6)	2.8	-
115	1,250	1,336	1,340	1,329	1,358	1,204	1,167	1,268	1,266	1,258	1,287	1,300	1,420	1,391	1,412	(0.8)	2.3	-
Total	57,500	62,662	63,786	61,480	63,114	60,535	55,230	57,093	57,112	56,614	58,154	60,336	63,340	63,909	64,287	0.2	2.6	0.8
Percent Change Over Prior Year		9.0	1.8	(3.6)	2.7	(4.1)	(8.8)	3.4	0.0	(0.9)	2.7	3.8	5.0	0.9	0.6			

(1) A toll increase occurred on or close to January 1. Refer to table 2-1 for the rate change.
(2) On 6/1/2003 Gateway was a barrier toll plaza with two-way toll collection. On 1/2/2006, toll collection changed from two-way to eastbound toll collection. This reduced the number of toll transactions.
(3) Interchange 320 (Route 29) Opened in December 2012 as an E-ZPass only interchange.
(4) Interchange 340 (Virginia Drive) opened in December 2000 as an E-ZPass only interchange.
(5) Interchange 352 (Street Road) opened in November 2010 as an eastbound only ,E-ZPass only interchange.
(6) Neshaminy Falls opened as the new eastern terminus of the East-West Mainline Ticket System in January 2016.
(7) The Delaware River Bridge mainline toll plaza became part of the Barrier System in January 2016. Toll collection changed from bi-directional to westbound only.
(8) Interchange 87 (Route 903) opened June 2015 as an E-ZPass only interchange.

Table 2-4
Total Vehicles - Average Daily Transactions on the Turnpike Ticket System At Exiting Toll Plazas
Includes Revenue and Non-Revenue Vehicles, and Gateway Barrier Plaza

Interchange	Calendar Year															Average Annual Percent Change		
(Milepost)	2003	2004[1]	2005	2006	2007	2008	2009[1]	2010[1]	2011[1]	2012[1]	2013[1]	2014[1]	2015[1]	2016[1]	2017[1]	2007-12	2012-17	2003-17
2 (2)	18,087	21,826	21,633	10,838	10,884	10,717	10,700	11,148	11,258	11,276	11,506	11,592	11,939	12,189	12,273	0.4	1.7	(2.7)
30	9,239	14,781	14,609	14,791	15,445	15,468	15,226	15,178	15,140	15,131	15,689	15,767	16,124	16,370	16,649	(0.2)	1.9	4.3
39	5,961	5,953	5,706	5,709	6,188	6,198	6,039	6,092	5,885	5,976	6,428	6,434	6,126	6,426	6,309	(0.3)	1.1	0.4
48	10,553	10,452	10,173	10,210	10,583	10,411	10,191	10,032	9,634	9,806	10,263	10,278	10,106	10,338	10,119	(0.8)	0.6	(0.3)
57	20,361	20,251	19,767	19,996	19,933	19,941	19,581	19,042	18,778	18,753	19,051	19,030	19,522	19,465	19,415	(0.6)	0.7	(0.3)
67	11,140	10,902	10,294	10,435	10,507	9,963	9,543	9,623	9,534	9,813	9,737	9,667	9,949	9,738	9,601	(0.7)	(0.4)	(1.1)
75	13,650	13,537	13,228	13,168	13,284	12,912	12,334	12,404	12,074	12,369	12,413	12,678	12,984	12,641	12,594	(0.7)	0.4	(0.6)
91	2,520	2,556	2,520	2,523	2,784	2,681	2,665	2,705	2,602	2,665	2,705	2,670	2,726	2,702	2,786	(0.4)	0.9	0.7
110	2,789	2,676	2,602	2,642	2,810	2,857	2,755	2,805	2,849	2,847	2,750	2,750	2,829	2,743	2,784	0.1	(0.4)	(0.0)
146	4,665	4,824	4,514	4,369	4,386	4,146	3,981	4,022	3,904	3,814	3,739	3,802	3,890	3,851	3,842	(1.4)	0.1	(1.4)
161	9,661	9,601	9,419	9,191	9,126	8,621	8,617	8,702	8,495	8,404	8,396	8,361	8,465	8,333	8,194	(0.8)	(0.5)	(1.2)
180	888	959	896	894	941	878	824	865	860	820	809	811	847	851	902	(1.4)	1.9	0.1
189	596	589	555	550	548	522	494	518	510	500	484	488	512	537	573	(0.9)	2.8	(0.3)
201	831	865	863	872	891	832	796	854	899	919	911	844	863	945	1,019	0.3	2.1	1.5
226	8,724	8,733	8,369	8,442	8,521	8,085	7,521	7,785	7,594	7,367	7,508	7,656	7,948	7,671	7,842	(1.4)	1.3	(0.8)
236	5,422	5,428	5,235	5,285	5,435	5,197	5,116	5,825	5,657	5,445	5,554	5,657	6,057	6,054	6,181	0.0	2.6	0.9
242	6,777	6,803	6,471	6,350	6,459	7,311	7,040	6,581	6,471	6,162	6,409	6,700	7,060	6,918	6,994	(0.5)	2.6	0.2
247	11,936	12,068	11,812	11,407	11,765	11,890	11,604	12,227	11,898	11,654	11,866	12,060	12,616	12,661	12,713	(0.1)	1.8	0.5
266	4,163	4,196	4,161	4,140	4,289	4,100	3,954	4,057	3,924	4,000	4,116	4,173	4,352	4,521	4,664	(0.7)	3.1	0.8
286	8,391	8,699	8,430	8,691	8,969	8,551	8,235	8,291	8,130	8,086	8,301	8,522	8,986	9,241	9,409	(1.0)	3.1	0.8
298	8,347	8,552	8,495	8,644	8,634	8,532	8,112	7,981	7,784	7,593	7,760	8,159	8,636	8,830	8,901	(1.3)	3.2	0.5
312	11,355	11,426	11,259	11,554	12,069	11,543	11,039	11,257	11,244	11,295	11,434	11,760	11,641	11,357	11,103	(0.7)	(0.3)	(0.2)
320 (3)										120	3,826	5,001	5,001	5,001	5,001	-	110.9	-
326	30,064	31,591	31,609	31,659	30,515	30,165	30,685	32,402	32,070	31,773	31,050	31,492	33,026	33,640	34,203	0.4	1.5	0.9
333	12,895	13,204	12,487	12,066	11,948	12,511	12,501	12,810	12,722	12,490	12,445	12,258	11,881	12,006	11,991	0.4	(0.8)	(0.5)
20	37,969	39,877	39,640	40,381	41,091	39,631	38,712	39,119	39,439	40,268	40,590	40,614	42,280	42,808	42,743	(0.2)	1.2	0.8
339	23,513	23,422	23,162	22,984	22,606	21,655	22,249	24,302	24,683	25,019	25,371	25,413	26,389	26,511	26,657	1.0	1.3	0.9
340 (4)	1,329	1,554	1,587	1,599	1,558	1,540	1,388	1,442	1,471	1,433	1,513	1,676	1,782	1,905	1,974	(0.8)	6.6	2.9
343	26,727	27,756	27,254	26,728	28,264	27,385	27,163	28,678	28,294	27,960	27,453	27,102	27,360	28,024	27,777	(0.1)	(0.1)	0.3
351	32,707	33,352	32,900	32,807	33,315	32,700	32,307	32,868	31,321	30,616	30,462	29,863	30,549	30,932	30,738	(0.8)	0.1	(0.4)
352 (5)								162	1,859	2,214	2,467	2,792	3,079	3,254	4,000	-	12.6	-
353														23,700	22,272	-	-	-
358 (6)	7,380	7,748	7,663	7,664	7,728	7,494	7,177	7,370	7,109	6,828	6,548	6,464	6,504	0	0	-	-	-
359 (7)	20,828	21,699	21,598	21,425	21,676	21,411	20,712	20,729	20,235	19,395	19,662	20,100	21,683	0	0	-	-	-
31	14,258	14,553	14,350	14,463	14,809	14,885	14,884	14,930	14,400	14,172	14,105	14,034	14,525	14,776	14,816	(0.4)	0.9	-
44	8,220	8,796	8,848	9,099	9,225	9,271	9,328	9,443	9,100	8,998	9,019	9,001	9,185	9,368	9,219	(0.2)	0.5	-
56	17,120	18,225	17,973	18,369	18,720	18,068	18,378	19,155	18,480	18,164	18,224	18,094	18,508	18,740	18,862	(0.3)	0.8	-
74	4,907	5,188	5,088	5,204	5,393	5,295	5,204	5,249	5,116	5,014	4,989	4,932	4,905	4,761	4,815	(0.7)	(0.8)	-
87 (8)																-	-	-
95	5,768	6,255	5,949	6,042	6,097	5,973	6,247	6,537	6,188	5,976	6,025	6,057	6,190	6,057	5,918	(0.2)	(0.2)	-
105	3,122	3,448	3,242	3,269	3,406	3,463	3,627	3,537	3,443	3,357	3,306	3,311	3,486	3,440	3,526	(0.1)	1.0	-
115	5,263	5,592	5,391	5,377	5,401	5,332	5,456	5,335	5,214	5,114	5,178	5,161	5,456	5,296	5,405	(0.5)	1.1	-
Total	428,123	447,937	439,753	429,836	436,203	428,134	422,383	432,062	426,266	423,604	430,060	433,225	445,969	444,598	444,782	0.2	1.0	0.3
Percent Change Over Prior Year		4.6	(1.8)	(2.3)	1.5	(1.8)	(1.3)	2.3	(1.3)	(0.6)	1.5	0.7	2.9	(0.3)	0.0			

(1) A toll increase occurred on or close to January 1. Refer to table 2-1 for the rate change.
(2) On 6/1/2003 Gateway was a barrier toll plaza with two-way toll collection. On 1/2/2006, toll collection changed from two-way to eastbound toll collection. This reduced the number of toll transactions.
(3) Interchange 320 (Route 29) Opened in December 2012 as an E-ZPass only interchange.
(4) Interchange 340 (Virginia Drive) opened in December 2000 as an E-ZPass only interchange.
(5) Interchange 352 (Street Road) opened in November 2010 as an eastbound only ,E-ZPass only interchange.
(6) Neshaminy Falls opened as the new eastern terminus of the East-West Mainline Ticket System in January 2016.
(7) The Delaware River Bridge mainline toll plaza became part of the Barrier System in January 2016. Toll collection changed from bi-directional to westbound only.
(8) Interchange 87 (Route 903) opened June 2015 as an E-ZPass only interchange.

2.3.2 Barrier System Transaction Trends

Average annual daily traffic trends at the Barrier System's toll plazas are shown in Tables 2-5 through 2-7 for passenger cars, commercial vehicles and total vehicles, respectively. Note that the Delaware River Bridge (Plaza 359) transactions are counted as part of the Barrier System beginning in 2016.

Total Barrier System transactions have been increasing at a faster rate than the Ticket System's. Passenger-car transactions averaged annual growth of 2.8% from 2007-2012, and 3.2% growth from 2012-2017. Higher Barrier System growth rates occur because of the following reasons: 1) these tend to be younger facilities that have historically been adding additional lane miles and sometimes additional interchanges and toll plazas. These facilities also tend to be on the fringe of urban areas and are benefiting from increasing development in their corridors. Lastly, Turnpike I-576 was exempt from scheduled toll increases in 2009 through 2012, and 2014 through 2018. The DRB was exempt from scheduled toll increases in 2017 and 2018. Overall, growth on the Barrier System was also impacted by the Great Recession, slow economic recovery, annual toll rate increases, and the temporary closure of the DRB in 2017.

Commercial-vehicle average daily transaction trends are shown in Table 2-6. They also show stronger annual growth compared to the Ticket System. Commercial-vehicle transactions averaged annual growth of 4.6% from 2007-2012, and 3.3% growth from 2012-2017.

Total Barrier System transactions increased annually by 3.0% from 2007-2012, and 3.2% from 2012-2017, as shown in Table 2-7. Growth would have been higher in 2017 if the Delaware River Bridge (plaza 359) had not been closed from January 20 through March 9, 2017.

2.4 Monthly Transactions and Gross Toll Revenue Trends

This section discusses monthly transactions and toll revenue trends by fiscal year (FY) from FY 2013-14 through FY 2017-18 for the Ticket System, Barrier System, and the total Turnpike System. The last actual data point is February 2018. Trend data is provided separately for passenger cars and commercial vehicles. The transaction data includes only toll transactions at exiting toll plazas; non-revenue transactions are not included. These tables present the relationship between the transactions and toll revenue, highlight differenced in seasonal variation. And isolate shorter-term impacts that may not be apparent in annual trends.

2.4.1 Ticket System Monthly Trends

Monthly transaction and toll revenue trends for the Ticket System are presented in Table 2-8 from FY 2014-15 through February of FY 2017-18. Passenger-car transactions increased by 2.1% in FY 2014-15 and decreased by 0.9% in FY 2016-17 compared to the previous year. The decline can be partially attributed to the leap year in 2016, resulting in one less day of transactions in February 2017 compared to 2016. Also, as previously mentioned, the DRB was closed on January 20, 2017 through March 9, 2017 due to a fracture in one of the structural support beams. Although the DRB transactions are not included in the Ticket System, negative traffic impacts were still felt on parts of the Ticket System. Prior to January 2016, the DRB transactions were reported on the Ticket System.

Table 2-5
Passenger Cars - Average Daily Transactions on the Turnpike Barrier System
Includes Revenue and Non-Revenue Vehicles

Toll Location	Calendar Year (1)															Average Annual Percent Change		
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2007-12	2012-17	2007-17
Northeast Extension Barrier Plazas																		
Keyser Ave.	6,274	6,719	6,489	6,573	6,736	6,782	7,012	6,935	6,970	6,960	7,156	7,017	7,037	6,653	6,575	0.7	(1.1)	(0.2)
Clarks Summit	6,492	6,747	6,519	6,545	6,740	6,790	6,850	6,670	6,673	6,702	7,270	7,135	6,842	6,337	6,104	(0.1)	(1.9)	(1.0)
Subtotal	12,766	13,466	13,008	13,117	13,476	13,572	13,862	13,605	13,643	13,662	14,426	14,152	13,879	12,990	12,679	0.3	(1.5)	(0.6)
Turnpike I-376 - Beaver Valley Expressway (1)																		
East Toll 376	9,782	9,821	9,896	9,854	10,334	10,288	9,897	9,884	9,940	9,685	9,235	8,971	8,918	8,477	8,386	(1.3)	(2.8)	(2.1)
Beaver Falls Rte. 551					434	458	430	455	430	437	425	387	410	391	414	0.1	(1.1)	(0.5)
Moravia Rte. 168					756	808	706	674	778	775	728	712	700	667	656	0.5	(3.3)	(1.4)
West Toll 376	6,176	6,385	6,812	7,047	7,524	7,633	7,617	7,738	7,632	7,430	7,178	7,292	7,333	7,239	7,434	(0.3)	0.0	(0.1)
Mt. Jackson Rte. 108					1,277	1,557	1,390	1,236	1,173	1,094	1,019	953	981	982	1,021	(3.1)	(1.4)	(2.2)
Subtotal	15,958	16,206	16,708	16,901	20,326	20,744	20,040	19,987	19,953	19,419	18,587	18,315	18,342	17,756	17,912	(0.9)	(1.6)	(1.3)
Turnpike 66 - Amos K. Hutchinson Bypass (2)																		
Rte. 136				217	597	806	727	742	731	738	708	749	786	754	755	4.3	0.5	2.4
AKH Mainline	10,476	10,858	11,123	12,053	12,308	12,327	12,114	12,276	11,947	11,843	11,721	11,728	11,623	11,102	11,203	(0.8)	(1.1)	(0.9)
Route 30				861	2,889	4,617	4,645	4,921	4,809	4,686	4,625	4,625	4,599	4,544	4,496	10.2	(0.8)	4.5
Route 130				226	1,260	1,370	1,370	1,397	1,459	1,336	1,326	1,377	1,335	1,325	1,323	1.2	(0.2)	0.5
Route 66				117	580	762	738	752	774	754	753	834	815	850	827	5.4	1.9	3.6
Subtotal	10,476	10,858	11,123	13,473	17,633	19,883	19,594	20,088	19,719	19,356	19,133	19,313	19,158	18,576	18,605	1.9	(0.8)	0.5
Turnpike 43 - Mon/Fayette Expressway (3)																		
Ramp M4	30	29	26	32	39	32	22	22	147	299	315	308	313	295	292	50.7	(0.5)	22.5
M5	1,794	1,884	1,973	2,060	2,151	2,257	2,301	2,477	3,467	4,933	5,224	5,663	6,042	6,055	6,073	18.1	4.2	10.9
Ramp M15								13	109	86	81	77	88	81	82	-	(0.8)	-
Ramp M18								114	228	281	290	284	327	317	296	-	1.0	-
M19								275	3,543	4,537	4,896	5,079	5,587	5,744	5,564	-	4.2	-
Ramp M22											186	160	170	151	149	-	-	-
Ramp M26											740	769	842	796	836	-	-	-
M35 California	2,728	9,365	9,366	9,754	10,224	10,530	10,318	10,515	10,407	10,605	10,587	10,649	11,074	10,635	10,265	0.7	(0.6)	0.0
Ramp M39	1,766	906	868	963	1,030	1,052	1,050	1,067	1,073	1,056	1,046	1,006	1,015	1,026	988	0.5	(1.3)	(0.4)
Ramp M44		736	720	758	745	749	703	692	665	651	641	647	685	670	704	(2.7)	1.6	(0.6)
Ramp M48		2,543	2,790	2,936	3,213	3,301	3,356	3,471	3,478	3,537	3,511	3,579	4,054	3,812	3,830	1.9	1.6	1.8
M52	5,689	6,326	6,746	7,099	7,179	7,351	7,181	7,161	7,149	7,464	7,233	7,033	6,906	6,740	6,802	0.8	(1.8)	(0.5)
Subtotal	12,006	21,789	22,489	23,602	24,581	25,273	24,931	25,807	30,266	33,450	34,751	35,255	37,104	36,325	35,881	6.4	1.4	3.9
I-576 - Southern Beltway																		
SB Rte. 30				80	166	223	262	298	364	555	303	311	305	278	390	27.3	(6.8)	8.9
SB Westport Rd.				59	125	130	153	160	163	190	191	249	348	340	339	8.8	12.3	10.5
Rte. 22				533	2,914	3,320	3,727	3,897	4,135	4,209	4,005	4,154	4,232	4,290	4,363	7.6	0.7	4.1
Subtotal				671	3,204	3,673	4,142	4,355	4,662	4,954	4,498	4,714	4,885	4,909	5,093	9.1	0.6	4.7
Delaware River Bridge (4, 5)																		
DRB														18,450	16,234	-	-	-
All Barrier Facilities																		
Total	51,205	62,320	63,328	67,765	79,221	83,146	82,569	83,842	88,244	90,841	91,394	91,749	93,368	109,004	106,404	2.8	3.2	3.0
Percent Change Over Prior Year	10.2	21.7	1.6	7.0	16.9	5.0	(0.7)	1.5	5.2	2.9	0.6	0.4	1.8	16.7	(2.4)			

(1) Toll rate increases were generally implemented annually from 2009 through 2017. Oftentimes, I-576 was exempted from the programed toll increases. Refer to Table 2-1 for details.
(1) Toll 60 (Turnpike 376) ramp counts were not available from 2002 to 2006.
(2) Toll 66 ramp counts were not available from 2002 to 2005.
(3) On July 11, 2011, the West Virginia section of Turnpike 43 was opened.
(4) In January of 2016, toll collection on the Delaware River Bridge was converted from bidirectional to westbound only, and became a barrier plaza instead of the eastern terminus of the Ticket System.
(5) Transactions were negatively impacted from 1/1/2017 through 3/9/2017 due to the closure of the bridge because of a fracture in a structural support beam.

Table 2-6
Commercial Vehicles - Average Daily Transactions on the Turnpike Barrier System
Includes Revenue and Non-Revenue Vehicles

Toll Location	Calendar Year (1)															Average Annual Percent Change		
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2007-12	2012-17	2007-17
Northeast Extension Barrier Plazas																		
Keyser Ave.	918	938	1,092	1,227	1,408	1,363	1,306	1,365	1,492	1,532	1,606	1,643	1,687	1,690	1,751	1.7	2.7	2.2
Clarks Summit	957	931	1,038	1,112	1,162	1,096	1,047	1,082	1,149	1,228	1,369	1,436	1,404	1,391	1,429	1.1	3.1	2.1
Subtotal	1,875	1,869	2,130	2,339	2,570	2,459	2,353	2,447	2,641	2,759	2,975	3,079	3,091	3,081	3,180	1.4	2.9	2.2
Turnpike I-376 - Beaver Valley Expressway (1)																		
East Toll 376	1,304	1,328	1,353	1,311	1,490	1,548	1,342	1,506	1,621	1,693	1,729	1,830	1,859	1,826	1,871	2.6	2.0	2.3
Beaver Falls Rte. 551					36	39	31	48	59	59	50	48	51	43	54	10.2	(1.7)	4.1
Moravia Rte. 168					96	145	60	73	92	86	73	97	82	61	76	(2.2)	(2.6)	(2.4)
West Toll 376	870	911	915	998	1,133	1,170	1,034	1,196	1,211	1,226	1,202	1,279	1,272	1,244	1,299	1.6	1.2	1.4
Mt. Jackson Rte. 108					98	108	113	98	133	164	135	148	154	152	163	11.0	(0.1)	5.3
Subtotal	2,174	2,239	2,268	2,309	2,854	3,010	2,580	2,921	3,116	3,228	3,190	3,402	3,418	3,326	3,463	2.5	1.4	2.0
Turnpike 66 - Amos K. Hutchinson Bypass (2)																		
Rte. 136				126	211	183	146	165	183	178	177	749	197	171	168	(3.3)	(1.2)	(2.3)
AKH Mainline	1,813	1,818	1,872	1,935	2,070	2,146	2,010	2,261	2,333	2,348	2,372	2,603	2,514	2,397	2,495	2.6	1.2	1.9
Route 30				142	290	282	265	300	292	315	313	306	283	279	298	1.7	(1.1)	0.3
Route 130				17	38	29	30	26	26	26	28	32	27	29	30	(7.1)	2.8	(2.3)
Route 66				5	15	16	17	18	19	22	19	21	18	18	19	7.2	(3.1)	1.9
Subtotal	1,813	1,818	1,872	2,226	2,623	2,656	2,468	2,770	2,853	2,890	2,908	3,710	3,040	2,893	3,009	2.0	0.8	1.4
Turnpike 43 - Mon/Fayette Expressway (3)																		
Ramp M4	1	1	1	1	1	2	1	1	4	7	8	8	8	7	8	40.1	2.8	20.0
M5	151	135	136	150	140	196	240	275	366	529	665	819	838	742	777	30.4	8.0	18.7
Ramp M15								0	6	7	9	13	14	8	9	-	3.4	-
Ramp M18								6	16	19	20	17	36	16	15	-	(4.4)	-
M19								182	302	437	605	679	751	661	705	-	10.1	-
Ramp M22											29	24	40	15	14	-	-	-
Ramp M26											18	22	27	21	23	-	-	-
M35 California	84	314	303	321	384	478	532	573	574	694	827	1,002	974	871	934	12.6	6.1	9.3
Ramp M39	52	23	23	26	32	34	35	40	45	44	55	61	74	64	85	6.6	14.0	10.3
Ramp M44		37	34	42	46	68	33	29	53	47	53	56	107	100	96	0.0	15.5	7.5
Ramp M48		107	82	59	65	66	60	73	85	97	102	128	165	125	132	8.4	6.4	7.4
M52	92	107	118	108	111	127	125	143	156	173	183	197	210	212	224	9.4	5.3	7.3
Subtotal	382	724	697	707	779	971	1,025	1,322	1,607	2,053	2,573	3,026	3,244	2,842	3,022	21.4	8.0	14.5
I-576 - Southern Beltway																		
SB Rte. 30				2	18	27	31	36	29	38	26	31	37	29	37	16.6	(0.5)	7.7
SB Westport Rd.				1	6	14	56	58	33	37	45	84	146	183	183	44.3	37.6	40.9
Rte. 22				24	210	249	287	311	312	322	356	391	470	426	444	8.9	6.6	7.8
Subtotal				28	234	290	375	405	375	397	427	506	653	637	664	11.2	10.8	11.0
Delaware River Bridge																		
DRB														3,127	2,836	-	-	-
All Barrier Facilities																		
Total	6,244	6,650	6,967	7,608	9,060	9,385	8,801	9,865	10,592	11,328	12,072	13,722	13,446	12,780	13,338	4.6	3.3	3.9
Percent Change Over Prior Year	(0.9)	6.5	4.8	9.2	19.1	3.6	(6.2)	12.1	7.4	6.9	6.6	13.7	(2.0)	(5.0)	4.4			

(1) Toll rate increases were generally implemented annually from 2009 through 2017. Oftentimes, I-576 was exempted from the programed toll increases. Refer to Table 2-1 for details.
(1) Toll 60 (Turnpike 376) ramp counts were not available from 2002 to 2006.
(2) Toll 66 ramp counts were not available from 2002 to 2005.
(3) On July 11, 2011, the West Virginia section of Turnpike 43 was opened.
(4) In January of 2016, toll collection on the Delaware River Bridge was converted from bidirectional to westbound only, and became a barrier plaza instead of the eastern terminus of the Ticket System.
(5) Transactions were negatively impacted from 1/1/2017 through 3/9/2017 due to the closure of the bridge because of a fracture in a structural support beam.

Table 2-7
Total Vehicles - Average Daily Transactions on the Turnpike Barrier System
Includes Revenue and Non-Revenue Vehicles

Toll Location	Calendar Year (1)															Average Annual Percent Change		
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2007-12	2012-17	2007-17
Northeast Extension Barrier Plazas																		
Keyser Ave.	7,192	7,657	7,581	7,800	8,144	8,144	8,318	8,300	8,462	8,492	8,761	8,660	8,724	8,343	8,326	0.8	(0.4)	0.2
Clarks Summit	7,449	7,678	7,557	7,656	7,903	7,887	7,897	7,752	7,822	7,930	8,639	8,571	8,246	7,728	7,533	0.1	(1.0)	(0.5)
Subtotal	14,641	15,335	15,138	15,456	16,047	16,031	16,215	16,052	16,284	16,422	17,401	17,231	16,970	16,071	15,859	0.5	(0.7)	(0.1)
Turnpike I-376 - Beaver Valley Expressway (1)																		
East Toll 376	11,086	11,149	11,249	11,165	11,824	11,836	11,239	11,390	11,561	11,377	10,965	10,801	10,777	10,303	10,257	(0.8)	(2.1)	(1.4)
Beaver Falls Rte. 551					471	497	461	503	490	496	476	435	461	434	469	1.0	(1.1)	(0.0)
Moravia Rte. 168					853	953	766	747	869	861	801	809	782	728	732	0.2	(3.2)	(1.5)
West Toll 376	7,046	7,296	7,727	8,044	8,658	8,803	8,651	8,934	8,844	8,655	8,381	8,572	8,605	8,483	8,733	(0.0)	0.2	0.1
Mt. Jackson Rte. 108					1,375	1,665	1,503	1,334	1,306	1,258	1,154	1,101	1,135	1,134	1,184	(1.8)	(1.2)	(1.5)
Subtotal	18,132	18,445	18,976	19,210	23,180	23,754	22,620	22,908	23,070	22,648	21,776	21,717	21,760	21,082	21,375	(0.5)	(1.1)	(0.8)
Turnpike 66 - Amos K. Hutchinson Bypass (2)																		
Rte. 136				343	808	989	873	907	914	916	885	1,497	982	926	923	2.5	0.1	1.3
AKH Mainline	12,288	12,676	12,995	13,988	14,378	14,473	14,124	14,537	14,280	14,191	14,093	14,331	14,137	13,499	13,697	(0.3)	(0.7)	(0.5)
Route 30				1,003	3,178	4,899	4,910	5,221	5,101	5,001	4,938	4,930	4,883	4,823	4,795	9.5	(0.8)	4.2
Route 130				243	1,298	1,399	1,400	1,423	1,485	1,362	1,354	1,409	1,362	1,354	1,354	1.0	(0.1)	0.4
Route 66				122	595	778	754	770	793	776	771	855	833	868	846	5.5	1.7	3.6
Subtotal	12,288	12,676	12,995	15,699	20,256	22,539	22,062	22,858	22,572	22,245	22,041	23,022	22,198	21,469	21,614	1.9	(0.6)	0.7
Turnpike 43 - Mon/Fayette Expressway (3)																		
Ramp M4	31	30	28	33	40	34	23	23	151	306	323	316	321	303	300	50.4	(0.4)	22.4
M5	1,945	2,020	2,110	2,210	2,292	2,453	2,541	2,752	3,833	5,462	5,889	6,482	6,879	6,797	6,850	19.0	4.6	11.6
Ramp M15								13	115	93	90	91	102	89	91	-	(0.4)	-
Ramp M18								120	244	300	310	301	363	333	311	-	0.7	-
M19								457	3,845	4,974	5,501	5,758	6,338	6,406	6,269	-	4.7	-
Ramp M22											215	184	210	166	163	-	-	-
Ramp M26											758	791	869	817	858	-	-	-
M35 California	2,812	9,679	9,669	10,075	10,608	11,008	10,849	11,088	10,981	11,298	11,414	11,651	12,047	11,506	11,199	1.3	(0.2)	0.5
Ramp M39	1,819	929	891	989	1,062	1,087	1,085	1,107	1,118	1,101	1,101	1,067	1,089	1,090	1,073	0.7	(0.5)	0.1
Ramp M44		773	753	799	792	817	736	721	718	698	694	703	793	770	800	(2.5)	2.8	0.1
Ramp M48		2,649	2,872	2,995	3,277	3,368	3,416	3,544	3,563	3,634	3,613	3,707	4,219	3,937	3,962	2.1	1.7	1.9
M52	5,781	6,433	6,863	7,208	7,289	7,478	7,306	7,304	7,305	7,637	7,415	7,230	7,116	6,952	7,027	0.9	(1.7)	(0.4)
Subtotal	12,387	22,513	23,186	24,309	25,360	26,245	25,956	27,129	31,873	35,503	37,324	38,281	40,348	39,167	38,903	7.0	1.8	4.4
I-576 - Southern Beltway																		
SB Rte. 30				82	184	250	293	334	394	593	328	342	342	307	427	26.4	(6.4)	8.8
SB Westport Rd.				60	131	144	209	218	196	227	236	333	494	523	522	11.7	18.1	14.9
Rte. 22				557	3,124	3,569	4,014	4,208	4,447	4,531	4,361	4,546	4,702	4,716	4,807	7.7	1.2	4.4
Subtotal				699	3,438	3,963	4,517	4,760	5,037	5,351	4,925	5,220	5,538	5,546	5,756	9.3	1.5	5.3
Delaware River Bridge																		
DRB														18,450	16,234	-	-	-
All Barrier Facilities																		
Total	57,448	68,970	70,295	75,373	88,281	92,531	91,371	93,707	98,836	102,169	103,467	105,471	106,814	121,785	119,741	3.0	3.2	3.1
Percent Change Over Prior Year	8.9	20.1	1.9	7.2	17.1	4.8	(1.3)	2.6	5.5	3.4	1.3	1.9	1.3	14.0	(1.7)			

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(1) Toll 60 (Turnpike 376) ramp counts were not available from 2002 to 2006.
(2) Toll 66 ramp counts were not available from 2002 to 2005.
(3) On July 11, 2011, the West Virginia section of Turnpike 43 was opened.
(4) In January of 2016, toll collection on the Delaware River Bridge was converted from bidirectional to westbound only, and became a barrier plaza instead of the eastern terminus of the Ticket System.
(5) Transactions were negatively impacted from 1/1/2017 through 3/9/2017 due to the closure of the bridge because of a fracture in a structural support beam.

Table 2-8
Ticket System (Including Gateway Barrier Plaza) - Monthly Transaction and Revenue Trends
Transactions Include Only Toll Transactions - Non-Revenue Transactions Are Not Included

Toll Transactions (in 1,000s)

	Passenger Cars							Commercial Vehicles							Total Vehicles						
Month	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18
June	11,720	2.3	11,995	0.1	12,013	0.1	12,029	1,852	6.7	1,976	2.6	2,028	(0.1)	2,025	13,572	2.9	13,971	0.5	14,041	0.1	14,054
July	12,128	3.8	12,583	(3.1)	12,196	(1.4)	12,020	1,910	4.6	1,998	(3.5)	1,927	(1.5)	1,898	14,039	3.9	14,581	(3.1)	14,123	(1.4)	13,919
August	12,285	2.0	12,525	(1.4)	12,348	0.1	12,357	1,862	4.8	1,951	6.7	2,082	0.1	2,084	14,147	2.3	14,476	(0.3)	14,430	0.1	14,441
September	11,123	2.2	11,362	1.0	11,480	(0.8)	11,386	1,838	4.7	1,925	0.8	1,941	(2.0)	1,903	12,961	2.5	13,287	1.0	13,421	(1.0)	13,289
October	11,876	1.6	12,064	(1.9)	11,836	(0.1)	11,826	1,960	1.9	1,997	(3.4)	1,930	3.6	2,000	13,836	1.6	14,061	(2.1)	13,766	0.4	13,826
November	10,760	4.8	11,281	0.2	11,301	(1.0)	11,185	1,648	6.1	1,748	1.6	1,777	3.3	1,835	12,408	5.0	13,029	0.4	13,078	(0.4)	13,019
December	10,902	3.7	11,302	(2.6)	11,005	(2.5)	10,725	1,700	3.7	1,763	(1.7)	1,732	(1.1)	1,713	12,602	3.7	13,065	(2.5)	12,738	(2.3)	12,439
January	9,619	(0.1)	9,605	4.4	10,033	(1.8)	9,851	1,606	(3.3)	1,552	5.8	1,642	5.8	1,738	11,225	(0.6)	11,158	4.6	11,675	(0.7)	11,588
February	9,101	7.0	9,738	(5.3)	9,226	1.2	9,339	1,518	5.8	1,606	(5.8)	1,514	6.6	1,614	10,619	6.8	11,345	(5.3)	10,740	2.0	10,953
March	10,627	5.1	11,168	(5.2)	10,589			1,763	6.0	1,869	(3.9)	1,796			12,390	5.2	13,037	(5.0)	12,384		
April	11,381	(3.8)	10,953	2.7	11,247			1,863	(0.3)	1,858	(2.8)	1,807			13,244	(3.3)	12,812	1.9	13,054		
May	11,978	(2.2)	11,717	1.2	11,855			1,910	0.9	1,927	3.9	2,003			13,888	(1.8)	13,644	1.6	13,858		
Total Year	133,500	2.1	136,294	(0.9)	135,128			21,430	3.5	22,172	0.0	22,179			154,930	2.3	158,466	(0.7)	157,307		
June - Feb	99,514	3.0	102,456	(1.0)	101,437	(0.7)	100,717	15,894	3.9	16,517	0.3	16,573	1.4	16,811	115,408	3.1	118,973	(0.8)	118,010	(0.4)	117,528

Toll Revenue (in $1,000s)

	Passenger Cars							Commercial Vehicles							Total Vehicles						
Month	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18
June	$44,313	6.9	$47,358	6.4	$50,374	8.9	$54,875	$32,122	12.1	$36,014	8.7	$39,137	4.7	$40,969	$76,435	9.1	$83,371	7.4	$89,511	7.1	$95,844
July	47,889	10.2	52,753	5.5	55,659	5.0	58,459	32,910	9.5	36,048	4.1	37,543	2.5	38,493	80,798	9.9	88,801	5.0	93,201	4.0	96,952
August	49,295	5.9	52,191	1.3	52,888	8.1	57,199	32,392	9.1	35,345	12.5	39,776	6.6	42,397	81,686	7.2	87,536	5.9	92,665	7.5	99,596
September	39,577	10.7	43,823	9.6	48,028	3.7	49,807	31,894	9.2	34,839	7.8	37,555	3.4	38,829	71,471	10.1	78,662	8.8	85,583	3.6	88,636
October	42,096	8.2	45,567	5.9	48,264	5.5	50,936	33,863	6.5	36,072	1.3	36,541	12.0	40,913	75,959	7.5	81,639	3.9	84,805	8.3	91,850
November	39,415	10.7	43,632	5.6	46,084	5.9	48,799	28,909	9.5	31,665	7.0	33,896	10.8	37,560	68,323	10.2	75,297	6.2	79,980	8.0	86,360
December	38,616	9.0	42,110	5.4	44,375	3.9	46,096	29,865	6.8	31,906	6.0	33,828	6.0	35,866	68,480	8.1	74,016	5.7	78,203	4.8	81,962
January	33,269	8.1	35,973	9.8	39,489	4.0	41,070	30,336	3.4	31,378	9.0	34,189	14.2	39,045	63,605	5.9	67,351	9.4	73,678	8.7	80,116
February	30,588	15.0	35,190	2.0	35,898	9.1	39,149	28,569	13.2	32,343	(2.2)	31,628	17.3	37,084	59,157	14.2	67,533	(0.0)	67,526	12.9	76,233
March	38,006	13.9	43,273	(0.9)	42,900			33,479	10.8	37,096	2.3	37,948			71,485	12.4	80,369	0.6	80,848		
April	42,423	1.4	42,999	14.5	49,234			34,384	6.6	36,662	1.8	37,308			76,807	3.7	79,661	8.6	86,542		
May	47,368	1.7	48,163	7.4	51,721			34,854	7.7	37,552	6.9	40,145			82,222	4.2	85,715	7.2	91,866		
Total Year	$492,853	8.2	$533,031	6.0	$564,915			$383,576	8.7	$416,919	5.4	$439,495			$876,429	8.4	$949,950	5.7	$1,004,410		
June - Feb	$365,056	9.2	$398,596	5.6	$421,060	6.0	$446,391	$280,859	8.8	$305,610	6.0	$324,093	8.4	$351,157	$645,915	9.0	$704,206	5.8	$745,154	7.0	$797,547

NOTES:

(1) Toll increases occur every year with exceptions. Refer to Table 2-1 for details.

(2) Leap year occurred in 2016, resulting in negative traffic and toll revenue impacts in February 2017 compared to February 2016.

(3) Abnormally severe winter weather negatively impacted traffic and toll revenue in January and February 2014, particularly among passenger cars.

(4) The Delaware River Bridge was closed due to structural integrity concerns from January 20, 2017 to March 9, 2017.

(5) Before January 2016, Delaware River Bridge traffic and revenue were included in Ticket System reporting.

In FY 2017-18, through February, passenger-car transactions decreased by 0.7% compared to the same period in FY 2016-17. The months of September and December in 2017 both had one less weekday compared to the same months in 2016. The months of November 2017 through January 2018 were negatively impacted by abnormally severe winter weather.

Growth in passenger-car toll revenue was much stronger than growth in transactions due to annual toll rate increases. Passenger-car toll revenue increased 8.2% in FY 2015-16 and 6.0% in FY 2016-17. In the current fiscal year, passenger-car toll revenue on the Ticket System increased by 6% through February 2018 compared to the same period in the previous year.

Commercial-vehicle transactions increased 3.5% in in FY 2014-15, and 0.0% in FY 2015-16. Year-to-date, FY 2017-18 commercial-vehicle transactions increased by 1.4% over the same period in the prior year. Annual toll revenue increased 8.7% in FY 2015-16, 5.4% in FY 2016-17, and 8.4% in FY 2017-18 through February 2018. These increases in toll revenue were driven primarily by annual toll rate increases and by increased transactions.

Total Ticket System transactions increased by 2.3% in FY 2015-16 and decreased by 0.7% in FY 2016-17. In FY 2017-18, transactions through February 2018 decreased compared to the same period in the prior year by 0.4%. Total Ticket System toll revenue increased by 8.4% in FY 2015-16, and by 5.7% in FY 2016-17. Toll revenue year to date in FY 2017-18 (through February 2018) increased by 7% compared to the same period in the prior year.

2.4.2 Barrier System Monthly Trends

Table 2-9 presents monthly transaction and toll revenue trends for the Barrier System. Passenger-car transactions increased by 1.5% in FY 2014-15, by 7.9% in FY 2015-16, and by 6.8% in FY 2016-17. Passenger-car transactions increased by 1.5% in FY 2017-18 year-to-date compared to the previous year. A positive impact in toll transactions can be seen from January 2016 through December 2016 due to the addition of the Delaware River Bridge (plaza 359) transactions to the Barrier System. The negative impact associated with the temporary DRB closure can be seen in January through March 2017. The large percent increases in transactions in January and February 2018 compared to the prior year are due to the returned traffic on the DRB. September and December 2017 had one less weekday compared to the same months in 2016.

Passenger-car toll revenue increased by 37.5% in FY 2015-16, and by 33.7% in FY 2016-17. In the FY 2017-18, passenger-car toll revenue increased by 6.4% through February 2018 compared to the same period in the previous year. These large toll revenue increases are due to the annual toll rate increases and to inclusion of the DRB toll revenue into the Barrier System.

Commercial-vehicle transactions increased 9.2% in FY 2015-16, and by 7.3% in FY 2016-17. Year-to-date, FY 2017-18 commercial-vehicle transactions increased 9.7% over the same period in the prior year. Commercial-vehicle toll revenue increased by 49.9% in FY 2015-16, and by 39.0% in FY 2016-17. FY 2017-18 commercial-vehicle toll revenue increased by 13.8% through February 2018. These increases in toll revenue were driven by increased transactions, particularly the inclusion of the DRB, and by annual toll increases.

Table 2-9
Combined Barrier Facilities - Monthly Transaction and Revenue Trends
Transactions Include Only Toll Transactions - Non-Revenue Transactions Are Not Included

Toll Transactions (in 1,000s)

	Passenger Cars							Commercial Vehicles							Total Vehicles						
Month	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18
June	2,816	1.3	2,854	18.5	3,382	0.8	3,409	409	3.0	421	23.9	522	5.2	549	3,225	1.6	3,275	19.2	3,904	1.4	3,958
July	3,009	1.7	3,060	17.2	3,587	(2.4)	3,502	441	(2.1)	431	14.1	492	5.9	521	3,450	1.2	3,491	16.9	4,079	(1.4)	4,023
August	3,140	(2.6)	3,059	18.3	3,619	(0.5)	3,600	439	(0.0)	439	21.7	534	8.1	578	3,579	(2.3)	3,498	18.7	4,154	0.6	4,178
September	2,851	0.3	2,858	16.8	3,337	0.0	3,338	437	0.5	439	14.1	501	5.5	529	3,288	0.3	3,297	16.4	3,839	0.7	3,867
October	3,001	0.1	3,004	13.2	3,399	(0.1)	3,395	452	0.2	452	10.4	500	9.5	547	3,452	0.1	3,456	12.8	3,899	1.1	3,942
November	2,597	3.3	2,684	17.7	3,158	(0.8)	3,133	363	3.8	377	21.9	459	6.2	488	2,960	3.4	3,060	18.2	3,617	0.1	3,620
December	2,589	2.7	2,658	14.6	3,046	(0.8)	3,021	347	2.0	353	19.1	421	2.7	432	2,936	2.6	3,011	15.1	3,467	(0.4)	3,453
January	2,286	16.8	2,670	(3.5)	2,576	4.5	2,692	329	19.8	394	(5.7)	372	17.7	438	2,616	17.2	3,065	(3.8)	2,948	6.2	3,129
February	2,148	27.5	2,738	(20.3)	2,181	20.1	2,619	304	28.0	389	(22.5)	302	39.2	420	2,453	27.5	3,127	(20.6)	2,483	22.4	3,039
March	2,585	22.3	3,160	(10.5)	2,827			379	23.7	468	(10.3)	420			2,963	22.5	3,629	(10.5)	3,247		
April	2,728	15.5	3,152	0.0	3,152			399	19.0	475	(2.8)	462			3,127	16.0	3,627	(0.4)	3,614		
May	2,942	14.8	3,378	0.8	3,405			415	22.1	507	6.5	539			3,357	15.7	3,885	1.5	3,945		
Total Year	32,692	7.9	35,274	6.8	37,671			4,714	9.2	5,147	7.3	5,524			37,406	8.1	40,422	6.9	43,195		
June - Feb	24,437	4.7	25,584	10.6	28,286	1.5	28,708	3,521	5.0	3,697	11.0	4,103	9.7	4,501	27,958	4.7	29,281	10.6	32,389	2.5	33,209

Toll Revenue (in $1,000s)

	Passenger Cars							Commercial Vehicles							Total Vehicles						
Month	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18
June	$3,445	5.5	$3,633	89.9	$6,899	1.5	$7,002	$1,516	5.6	$1,601	120.1	$3,524	4.3	$3,674	$4,961	5.5	$5,234	99.1	$10,423	2.4	$10,677
July	3,638	6.5	3,873	88.9	7,316	(0.7)	7,263	1,627	0.3	1,631	104.3	3,333	3.6	3,454	5,265	4.5	5,504	93.5	10,649	0.6	10,717
August	3,771	2.9	3,881	87.9	7,291	1.7	7,413	1,602	2.2	1,638	117.4	3,561	7.1	3,813	5,373	2.7	5,518	96.6	10,851	3.4	11,226
September	3,465	3.8	3,596	87.5	6,741	1.1	6,813	1,596	2.3	1,634	109.9	3,429	3.3	3,543	5,062	3.3	5,229	94.5	10,171	1.8	10,355
October	3,615	4.1	3,764	79.4	6,754	1.7	6,870	1,644	4.3	1,714	95.6	3,353	9.9	3,686	5,259	4.2	5,478	84.5	10,107	4.4	10,556
November	3,120	8.4	3,381	87.9	6,352	(0.5)	6,323	1,341	6.7	1,432	123.8	3,204	5.6	3,384	4,461	7.9	4,812	98.6	9,556	1.6	9,706
December	3,151	5.9	3,336	85.5	6,187	1.0	6,249	1,290	5.2	1,357	124.9	3,053	2.7	3,133	4,440	5.7	4,693	96.9	9,240	1.5	9,382
January	2,869	78.8	5,130	(4.8)	4,885	16.1	5,671	1,273	114.4	2,728	(11.7)	2,408	32.0	3,177	4,141	89.7	7,858	(7.2)	7,293	21.3	8,848
February	2,695	102.0	5,443	(43.8)	3,059	77.4	5,428	1,184	134.8	2,779	(53.1)	1,305	133.5	3,046	3,879	112.0	8,222	(46.9)	4,364	94.2	8,474
March	3,271	90.0	6,215	(17.4)	5,133			1,461	120.9	3,227	(17.2)	2,671			4,732	99.5	9,442	(17.3)	7,804		
April	3,449	81.9	6,276	2.8	6,449			1,529	115.1	3,288	(1.7)	3,232			4,978	92.1	9,563	1.2	9,680		
May	3,711	81.5	6,736	1.0	6,806			1,559	116.6	3,378	7.2	3,622			5,271	91.9	10,114	3.1	10,427		
Total Year	$40,201	37.5	$55,263	33.7	$73,872			$17,621	49.9	$26,406	39.0	$36,694			$57,822	41.2	$81,670	35.4	$110,566		
June - Feb	$29,769	21.1	$36,037	54.0	$55,484	6.4	$59,030	$13,072	26.3	$16,514	64.5	$27,169	13.8	$30,911	$42,841	22.7	$52,550	57.3	$82,654	8.8	$89,941

NOTES:

(1) Toll increases occur every year with exceptions. Refer to Table 2-1 for details.

(2) Leap year occurred in 2016, resulting in negative traffic and toll revenue impacts in February 2017 compared to February 2016.

(3) Abnormally severe winter weather negatively impacted traffic and toll revenue in January and February 2014, particularly among passenger cars.

(4) The Delaware River Bridge was closed due to structural integrity concerns from January 20, 2017 to March 9, 2017.

(5) Before January 2016, Delaware River Bridge traffic and revenue were included in Ticket System reporting.

Total Barrier System transactions increased by 8.1% in FY 2015-16, and by 6.9% in FY 2016-17. In FY 2017-18, transactions through February 2018 increased over the same time-period in the prior year by 2.5%. Total Barrier System toll revenue increased by 41.2% in FY 2015-16, and by 35.4% in FY 2016-17. Toll revenue year to date in FY 2017-18 has increased by 8.8% compared to the same period in the prior year. Positive impacts to the Barrier System are seen from January 2016 through December 2016 due to adding the Delaware River Bridge transactions to Barrier System (they were previously counted in the Ticket System). The recovery of traffic on the DRB is seen in January and February 2017 compared to the same period in the prior year.

2.4.3 Total Turnpike System Monthly Trends

Table 2-10 presents the monthly transaction and toll revenue trends for the total Turnpike System. Passenger-car transactions increased by 3.2% in FY 2015-16, and 0.7% in FY 2016-17. Passenger-car transactions decreased by 0.2% in FY 2017-18 year-to-date compared to the previous year. Passenger-car toll revenue increased at a faster annual rate than transactions due to toll increases that were implemented each year. Passenger-car toll revenue increased 10.4% in FY 2015-16, 8.6% in FY 2016-17, and 6.1% through February 2018 compared to the same time-period in the previous year.

Commercial-vehicle transactions increased 4.5% in FY 2015-16, 1.4% in FY 2016-17, and 3.1% in FY 2017-18 over the same period in the prior year. Toll revenue increased 10.5% in FY 2015-16, 7.4% in FY 2016-17, and 8.8% in FY 2017-18 through February 2018.

Total transactions increased 3.4% in FY 2015-16, 0.8% in FY 2016-17, and 0.2% in FY 2017-18 over the same period in the prior year. Toll revenue increased 10.4% in FY 2015-16, 8.1% in FY 2016-17, and 7.2% in FY 2017-18 through February 2018.

Transactions and toll revenue were negatively impacted by the temporary closure of the DRB from January 20 through March 9, 2017. CDM Smith estimated that the DRB closure caused a total Systemwide decrease of 1.5 million transactions and $12.1 million in toll revenue in FY 2016-17.

2.5 Comparison of Commercial Activity and Total Turnpike Toll Transactions

Table 2-11 presents a comparison between three measures of economic growth, and transaction growth on the Turnpike System from 2010 through 2017. Annual percent changes in Turnpike System transactions over the prior year are compared to annual percent changes in the U.S. gross domestic product (GDP), the Tri-State (NJ, NY, PA) gross regional product (GRP), and the PA gross state product (GSP). U.S. gross domestic product (GDP) is actual through 2017, while the gross regional product and gross state product data for 2017 are estimates.

Passenger-car transactions increased by 2.3 percent in 2015, 3.1 percent in 2016 and decreased by 1.1 percent in 2017. Commercial vehicle growth, increased 3.9 percent in 2015, 4.2 percent in 2016 and 0.2 percent in 2017. The U.S. GDP, Tri-State GRP, and PA GSP all experienced growth in 2017.

While there is a correlation between economic activity and Turnpike System toll transactions, it is likely that transactions are also being dampened by the annual toll rate increases that have been implemented since 2009. 2017 Turnpike transactions were also negatively impacted by the temporary closure of the DRB from January 20, 2017 through March 9, 2017.

Table 2-10
Total Turnpike System - Monthly Transaction and Revenue Trends
Transactions Include Only Toll Transactions - Non-Revenue Transactions Are Not Included

Toll Transactions (in 1,000s)

	Passenger Cars							Commercial Vehicles							Total Vehicles						
Month	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18
June	14,535	2.2	14,849	3.7	15,395	0.3	15,438	2,261	6.0	2,398	6.4	2,550	1.0	2,575	16,797	2.7	17,246	4.1	17,945	0.4	18,013
July	15,138	3.3	15,643	0.9	15,783	(1.7)	15,522	2,351	3.3	2,429	(0.4)	2,419	(0.0)	2,419	17,489	3.3	18,072	0.7	18,202	(1.4)	17,942
August	15,425	1.0	15,584	2.5	15,967	(0.1)	15,957	2,301	3.9	2,390	9.5	2,616	1.7	2,662	17,726	1.4	17,974	3.4	18,583	0.2	18,619
September	13,974	1.8	14,220	4.2	14,817	(0.6)	14,724	2,275	3.9	2,364	3.3	2,442	(0.4)	2,431	16,249	2.1	16,584	4.1	17,260	(0.6)	17,156
October	14,876	1.3	15,067	1.1	15,236	(0.1)	15,221	2,412	1.6	2,450	(0.8)	2,429	4.9	2,547	17,288	1.3	17,517	0.8	17,665	0.6	17,768
November	13,358	4.5	13,965	3.5	14,458	(1.0)	14,317	2,011	5.7	2,125	5.2	2,236	3.9	2,323	15,368	4.7	16,090	3.8	16,695	(0.3)	16,640
December	13,491	3.5	13,960	0.7	14,051	(2.2)	13,746	2,046	3.4	2,116	1.7	2,153	(0.4)	2,146	15,537	3.5	16,076	0.8	16,204	(1.9)	15,891
January	11,905	3.1	12,276	2.7	12,609	(0.5)	12,542	1,935	0.6	1,947	3.4	2,014	8.0	2,175	13,840	2.8	14,222	2.8	14,622	0.7	14,718
February	11,249	10.9	12,477	(8.6)	11,407	4.8	11,958	1,822	9.5	1,996	(9.0)	1,815	12.0	2,034	13,072	10.7	14,472	(8.6)	13,223	5.8	13,992
March	13,211	8.5	14,328	(6.4)	13,416			2,142	9.2	2,338	(5.2)	2,216			15,353	8.5	16,666	(6.2)	15,632		
April	14,109	(0.0)	14,105	2.1	14,400			2,262	3.1	2,333	(2.8)	2,268			16,371	0.4	16,438	1.4	16,668		
May	14,921	1.2	15,095	1.1	15,260			2,325	4.7	2,434	4.5	2,542			17,245	1.6	17,529	1.6	17,802		
Total Year	166,192	3.2	171,569	0.7	172,799			26,144	4.5	27,319	1.4	27,703			192,336	3.4	198,887	0.8	200,501		
June - Feb	123,951	3.3	128,040	1.3	129,723	(0.2)	129,425	19,415	4.1	20,214	2.3	20,676	3.1	21,312	143,366	3.4	148,254	1.4	150,399	0.2	150,737

Toll Revenue (in $1,000s)

	Passenger Cars							Commercial Vehicles							Total Vehicles						
Month	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18	2014-15	% Chg	2015-16	% Chg	2016-17	% Chg	2017-18
June	$47,759	6.8	$50,991	12.3	$57,273	8.0	$61,877	$33,638	11.8	$37,614	13.4	$42,661	4.6	$44,643	$81,397	8.9	$88,606	12.8	$99,935	6.6	$106,521
July	51,527	9.9	56,625	11.2	62,975	4.4	65,722	34,536	9.1	37,680	8.5	40,876	2.6	41,947	86,063	9.6	94,305	10.1	103,851	3.7	107,669
August	53,065	5.7	56,072	7.3	60,179	7.4	64,611	33,994	8.8	36,983	17.2	43,337	6.6	46,210	87,060	6.9	93,054	11.2	103,516	7.1	110,821
September	43,042	10.2	47,419	15.5	54,770	3.4	56,620	33,490	8.9	36,472	12.4	40,984	3.4	42,371	76,532	9.6	83,891	14.1	95,754	3.4	98,991
October	45,711	7.9	49,331	11.5	55,018	5.1	57,806	35,507	6.4	37,786	5.6	39,895	11.8	44,599	81,218	7.3	87,117	8.9	94,912	7.9	102,405
November	42,534	10.5	47,013	11.5	52,436	5.1	55,122	30,250	9.4	33,096	12.1	37,100	10.4	40,944	72,785	10.1	80,109	11.8	89,536	7.3	96,066
December	41,766	8.8	45,446	11.3	50,563	3.5	52,345	31,154	6.8	33,264	10.9	36,880	5.7	39,000	72,921	7.9	78,709	11.1	87,443	4.5	91,344
January	36,138	13.7	41,103	8.0	44,374	5.3	46,741	31,609	7.9	34,106	7.3	36,597	15.4	42,222	67,747	11.0	75,209	7.7	80,971	9.9	88,964
February	33,282	22.1	40,633	(4.1)	38,957	14.4	44,576	29,753	18.0	35,122	(6.2)	32,933	21.9	40,130	63,035	20.2	75,755	(5.1)	71,890	17.8	84,707
March	41,277	19.9	49,488	(2.9)	48,033			34,940	15.4	40,322	0.7	40,619			76,218	17.8	89,811	(1.3)	88,653		
April	45,872	7.4	49,275	13.0	55,683			35,912	11.2	39,950	1.5	40,540			81,784	9.1	89,224	7.8	96,223		
May	51,080	7.5	54,899	6.6	58,526			36,413	12.4	40,930	6.9	43,767			87,493	9.5	95,829	6.7	102,293		
Total Year	$533,054	10.4	$588,295	8.6	$638,787			$401,197	10.5	$443,325	7.4	$476,188			$934,251	10.4	$1,031,620	8.1	$1,114,975		
June - Feb	$394,825	10.1	$434,633	9.6	$476,545	6.1	$505,421	$293,931	9.6	$322,123	9.0	$351,263	8.8	$382,067	$688,756	9.9	$756,756	9.4	$827,807	7.2	$887,488

NOTES:

(1) Toll increases occur every year with exceptions. Refer to Table 2-1 for details.

(2) Leap year occurred in 2016, resulting in negative traffic and toll revenue impacts in February 2017 compared to February 2016.

(3) Abnormally severe winter weather negatively impacted traffic and toll revenue in January and February 2014, particularly among passenger cars.

(4) The Delaware River Bridge was closed due to structural integrity concerns from January 20, 2017 to March 9, 2017.

(5) Before January 2016, Delaware River Bridge traffic and revenue were included in Ticket System reporting.

Table 2-11
Near-term Measures of Commercial Activity and Growth in Total Turnpike System Transactions

Percent Change over Prior Year

Calendar Year	Gross Domestic Product Growth[1] (U.S.)	Gross Regional Product Growth[1] (NJ, NY, PA)	Gross State Product Growth[1] (PA)	PA Turnpike System Percent Transaction Growth[2]		
				Passenger Cars	Commercial Vehicles	All Vehicles
2010	2.5%	2.6%	2.7%	1.0%	4.0%	1.3%
2011	1.6%	0.4%	1.3%	-1.1%	1.0%	-0.9%
2012	2.2%	2.5%	1.6%	0.3%	0.6%	0.3%
2013	1.7%	0.6%	1.6%	0.6%	3.0%	0.9%
2014	2.6%	1.5%	2.0%	0.0%	4.2%	0.5%
2015	2.9%	1.9%	2.3%	2.3%	3.9%	2.5%
2016	1.5%	0.5%	0.6%	3.1%	4.2%	3.3%
2017	2.3%	1.6%	1.9%	-1.1%	0.2%	-0.9%

(1) The percent changes in U.S. GDP, GRP, and GSP are based on chained 2009 dollars. The U.S. GDP is actual through 2017. The GRP and GSP are actual through 2016. Actual data was obtained from the U.S. Bureau of Economic Analysis. Forecast data was from Moody's Analytics baseline forecast (April 2018 for regional, February 2018 for Pennsylvania).

(2) Turnpike System growth rates are actual through 2017.

2.6 Annual Transaction and Gross Toll Revenue Trends

Table 2-12 provides a summary of annual total Turnpike System transactions and adjusted gross toll revenue trends from FY 1996-97 through FY 2016-17. Note that transactions and adjusted toll revenue in Table 2-12 reflect final audited Turnpike System totals including adjustments and discounts available from the Commercial Volume Discount Program described earlier in this chapter.

The Turnpike System has experienced decreasing annual growth in transactions and consistent growth in toll revenue. Transaction growth likely decreased in response to the Great Recession, which officially lasted from December 2007 to June 2009, a slow economic recovery, and annual toll rate increases since 2009. Toll revenue increase annually primarily due to the toll rate increases.

Between FY 1996-97 and FY 2006-07, total Turnpike System transactions increased from 144.1 million to 185.4 million, an average annual increase of 2.6%. From FY 2006-07 to FY 2016-17, total turnpike transactions grew from 185.4 million to 200.5 million, an average annual increase of 0.8%. In the 20 years between FY 1996-97 and FY 2016-17, total Turnpike System transactions increased by an annual average of 1.7%. Adjusted Turnpike System toll revenue increased by 6.4% per year from FY 1996-97 through FY 2006-07, by 6.5% per year from FY 2006-07 through FY 2016-17, and by 6.4% per year from FY 1996-97 through FY 2016-17.

Table 2-12
Annual Systemwide Traffic and Adjusted Toll Revenue Trends
Pennsylvania Turnpike System
(Values in Thousands)

	Transactions						Adjusted Toll Revenue					
Fiscal Year [1]	Cars	Percent Change Over Prior Year	Trucks	Percent Change Over Prior Year	Total	Percent Change Over Prior Year	Cars	Percent Change Over Prior Year	Trucks	Percent Change Over Prior Year	Total	Percent Change Over Prior Year
1996-97	126,654		17,479		144,133		179,303		140,837		320,140	
1997-98	132,472	4.6	18,627	6.6	151,099	4.8	186,290	3.9	149,036	5.8	335,326	4.7
1998-99	136,399	3.0	19,833	6.5	156,232	3.4	191,804	3.0	158,761	6.5	350,565	4.5
1999-00	138,762	1.7	21,341	7.6	160,103	2.5	195,301	1.8	172,035	8.4	367,336	4.8
2000-01	141,033	1.6	21,278	(0.3)	162,311	1.4	193,563	(0.9)	172,337	0.2	365,900	(0.4)
2001-02	150,496	6.7	22,298	4.8	172,794	6.5	212,650	9.9	163,101	(5.4)	375,751	2.7
2002-03	156,220	3.8	23,179	4.0	179,399	3.8	219,201	3.1	168,021	3.0	387,222	3.1
2003-04	163,612	4.7	24,407	5.3	188,019	4.8	228,515	4.2	180,229	7.3	408,744	5.6
2004-05 [1]	163,316	(0.2)	25,109	2.9	188,425	0.2	309,032	35.2	236,126	31.0	545,158	33.4
2005-06	160,590	(1.7)	25,311	0.8	185,901	(1.3)	321,268	4.0	267,369	13.2	588,637	8.0
2006-07	160,107	(0.3)	25,316	0.0	185,423	(0.3)	322,781	0.5	269,861	0.9	592,642	0.7
2007-08	164,097	2.5	25,455	0.5	189,552	2.2	332,035	2.9	265,637	(1.6)	597,672	0.8
2008-09 [1]	162,638	(0.9)	23,583	(7.4)	186,220	(1.8)	356,345	7.3	260,047	(2.1)	616,392	3.1
2009-10 [1]	163,599	0.6	22,933	(2.8)	186,531	0.2	415,981	16.7	302,057	16.2	718,038	16.5
2010-11 [1]	165,231	1.0	23,812	3.8	189,043	1.3	435,752	4.8	328,105	8.6	763,856	6.4
2011-12 [1]	164,955	(0.2)	24,125	1.3	189,080	0.0	455,133	4.4	342,646	4.4	797,779	4.4
2012-13 [1]	163,690	(0.8)	24,207	0.3	187,897	(0.6)	471,514	3.6	350,226	2.2	821,740	3.0
2013-14 [1]	163,788	0.1	24,891	2.8	188,679	0.4	497,671	5.5	368,395	5.2	866,066	5.4
2014-15 [1]	166,192	1.5	26,144	5.0	192,336	1.9	533,054	7.1	401,197	8.9	934,251	7.9
2015-16 [1]	171,569	3.2	27,319	4.5	198,887	3.4	588,295	10.4	443,325	10.5	1,031,620	10.4
2016-17 [1]	172,799	0.7	27,703	1.4	200,501	0.8	638,787	8.6	476,188	7.4	1,114,975	8.1

Average Annual Percent Change

	Transactions			Adjusted Toll Revenue		
Fiscal Year	Cars	Trucks	Total	Cars	Trucks	Total
FY 1996-97 - FY 2006-07	2.4	3.8	2.6	6.1	6.7	6.4
FY 2006-07 - FY 2016-17	0.8	0.9	0.8	7.1	5.8	6.5
FY 1996-97 - FY 2016-17	1.6	2.3	1.7	6.6	6.3	6.4

(1) PTC Fiscal Years begin June 1 and end May 31.
(2) A toll increase occurred during this fiscal year. Refer to table 2-1.

Figure 2-5 illustrates Turnpike System historical transactions and adjusted gross toll revenue on an annual basis from FY 1997-98 to FY 2016-17. Toll increases are represented by a black star over the fiscal year in which the increase was implemented. Figure 2-5 clearly shows the greater rate of growth in Turnpike System toll revenue compared to the comparatively flat growth in toll transactions since 2009. The low transaction growth rates are attributed to annual toll rate increases since 2009 and a slow economic recovery from the Great recession of 2007.

2.7 E-ZPass Market Share

Table 2-13 shows the historical growth in E-ZPass transactions as a percent of total toll transactions on the Turnpike System. Over the past 12 years, passenger-car E-ZPass market share has increased by 35.5 percentage points, from 40.4% to 76.9% of total toll transactions. Commercial-vehicle market share growth has been nearly as large, increasing by 29.4 percentage points, from 60.2% in FY 2005-06 to 89.6% in FY 2016-17. Total Turnpike System E-ZPass usage has grown from 43.2% to 78.7 percent from FY 2005-06 to FY 2016-17.

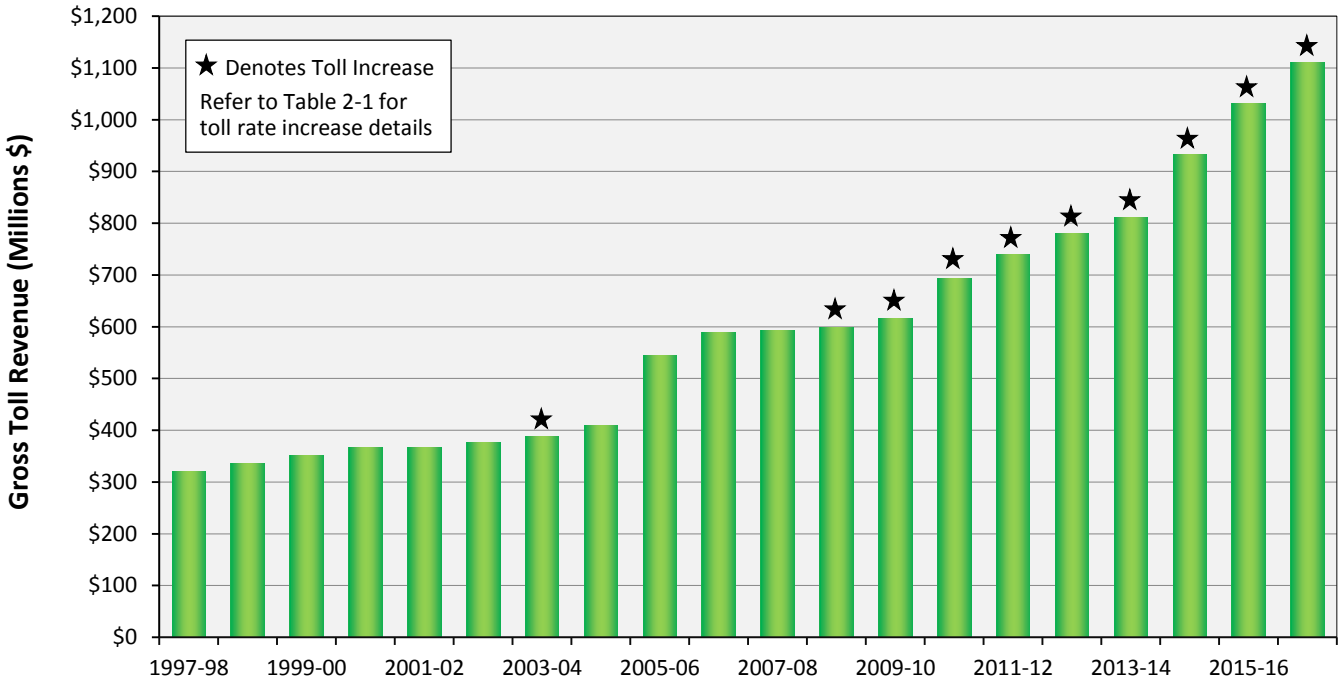
Table 2-14 presents monthly E-ZPass market share trends on the Ticket System for FY 2016-17. It is apparent from a comparison of Tables 2-13 and 2-14 that the E-ZPass participation was slightly higher on the Ticket System than on the Turnpike System as a whole. Ticket System E-ZPass penetration averaged 78.4% for passenger cars, 89.6% for commercial vehicles, and 80% for all vehicles. Monthly trend data shows that E-ZPass penetration is lowest in the summer months, and peaks in the winter months of January and February. There is less variation in Commercial-vehicle E-ZPass market share by month compared to passenger cars.

Table 2-13
Annual E-ZPass Market Share: Turnpike System
Based on Toll Transactions

Fiscal[1] Year	Annual Percent E-ZPass Market Share By Vehicle Class		
	Passenger Cars	Commercial Vehicles	Total
2005-06	40.4 %	60.2 %	43.2 %
2006-07	44.3	67.9	47.6
2007-08	46.8	71.1	50.1
2008-09[2]	50.4	74.3	53.4
2009-10[2]	53.9	76.1	56.6
2010-11[2,3]	57.5	77.7	60.1
2011-12[2,3]	61.8	80.0	64.1
2012-13[2,3]	66.1	82.7	68.2
2013-14[2,3]	70.1	85.0	72.0
2014-15[2,3]	72.8	86.7	74.7
2015-16[2]	74.8	88.4	76.7
2016-17[2]	76.9	89.6	78.7

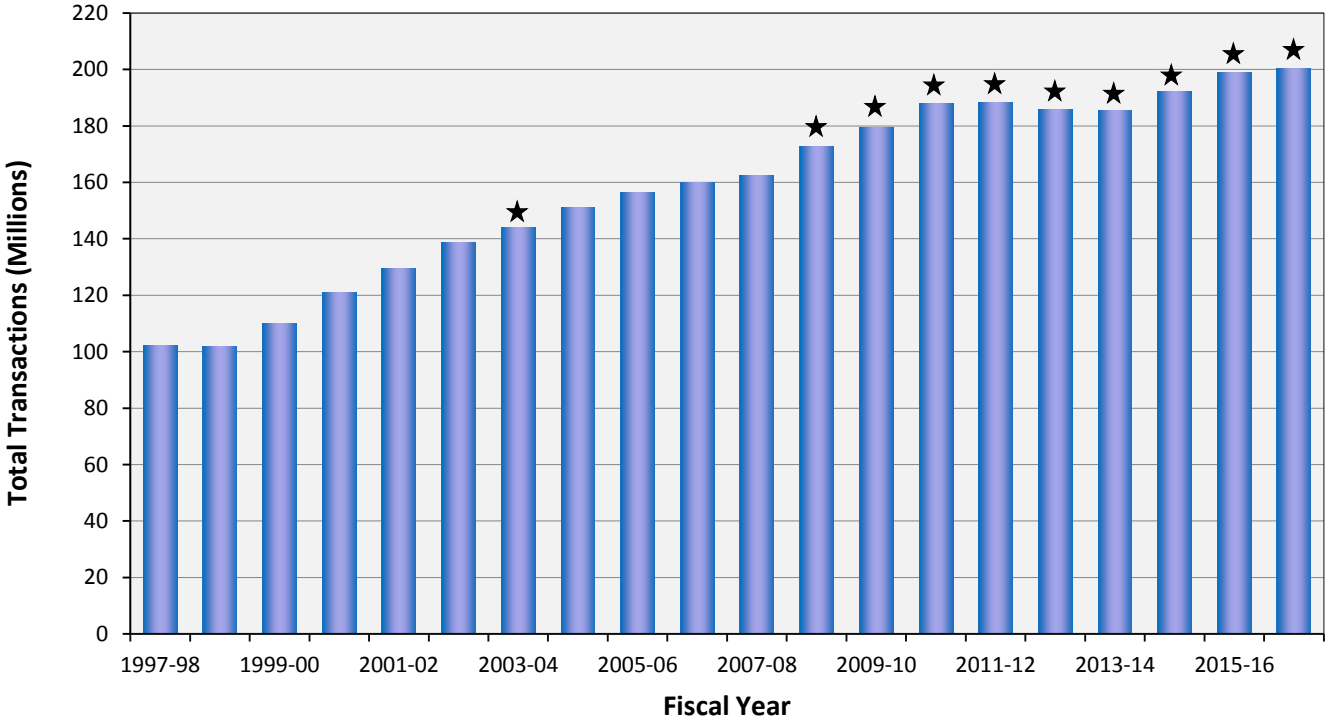
(1) PTC Fiscal Years begin June 1 and end May 31.
(2) A toll increase occurred during this year. Refer to table 2-1.
(3) The toll differential increased between E-ZPass and cash.

Gross Toll Revenue



Note: Toll revenue includes the adjustments associated with the Commercial Vehicle Volume Discount Program.

Total Transactions



PENNSYLVANIA TURNPIKE SYSTEM HISTORICAL TRANSACTIONS AND ADJUSTED GROSS TOLL REVENUE

FIGURE 2-5

Table 2-14
Monthly E-ZPass Market Share: Ticket System
Based on Toll Transactions Including Gateway Plaza

Month	FY 2016-17 (1) Percent E-ZPass Market Share By Vehicle Class: Passenger Cars	Commercial Vehicles	Total Vehicles
June 2016	76.2 %	88.3 %	77.9 %
July	74.4	87.8	76.2
August	76.4	88.5	78.1
September	77.8	88.7	79.3
October	78.3	89.2	79.8
November	78.9	90.1	80.4
December	79.2	90.6	80.7
January 2017	81.0	91.1	82.4
February	80.9	90.9	82.3
March	80.5	90.6	81.9
April	79.3	90.0	80.7
May	79.4	89.7	80.9
FY Total	78.4 %	89.6 %	80.0 %

(1) PTC Fiscal Years begin June 1 and end May 31.

Chapter 3

Socioeconomic Trends and Growth Forecasts

Historical and forecast socioeconomic data was collected and evaluated to understand how the state and the major sub-regions are growing. Discussions with local Metropolitan Planning Organization (MPO) representatives was also conducted to confirm and substantiate the socioeconomic data and understand underlying trends. This information was then used in an econometric analysis to estimate long-term baseline travel demand on the Pennsylvania Turnpike.

3.1 Socioeconomic Trends and Forecasts

An evaluation of long-term socioeconomic trends and forecasts for the areas along and surrounding the Pennsylvania Turnpike provided context and inputs for the traffic growth analysis. The tables and figures that follow, summarize the socioeconomic data which were reviewed, including population, employment, unemployment rates, retail sales, gross regional product, and retail gasoline prices.

An economic growth analysis identified any potential explanatory factors that may have influenced historical growth in toll transactions. Such explanatory factors were tested and applied within a regression-based econometric analysis to derive traffic growth forecasts.

In the subsequent tables, socioeconomic trends are presented as compound average annual percent change (AAPC), mostly in decade increments from 1980 through 2050. It should be noted that year 2016 was the last year in which a full year of historical data was available at the time the analysis was performed. Geographically, the United States is presented along with the Commonwealth of Pennsylvania and the surrounding states of New Jersey, New York, Ohio, and West Virginia. Additionally, the Pennsylvania counties along the Pennsylvania Turnpike are presented in Figure 3-1, and grouped for ease of presentation into four aggregations:

- **Pittsburgh Area Counties:** Allegheny, Armstrong, Beaver, Butler, Indiana, Lawrence, Washington, and Westmoreland;
- **Interurban Area Counties:** Adams, Bedford, Blair, Cambria, Cumberland, Dauphin, Franklin, Fulton, Huntingdon, Juniata, Lancaster, Lebanon, Mifflin, Perry, Somerset, and York;
- **Philadelphia Area Counties:** Berks, Bucks, Chester, Delaware, Montgomery, and Philadelphia; and,
- **Northeastern Corridor Counties:** Carbon, Lackawanna, Lehigh, Luzerne, Northampton, and Wyoming.

3.1.1 Population Trends and Forecasts

Historical population growth trends and forecasts for the study area are presented in Table 3-1 and Figure 3-2. The historical trends were extracted from data available from the United States Census Bureau (census years and intercensal 2016 estimates), while forecasts of population growth rates are

from the Woods & Poole, Inc. 2017 Complete Economic and Demographic Data Source (CEDDS)[1], available through year 2050.

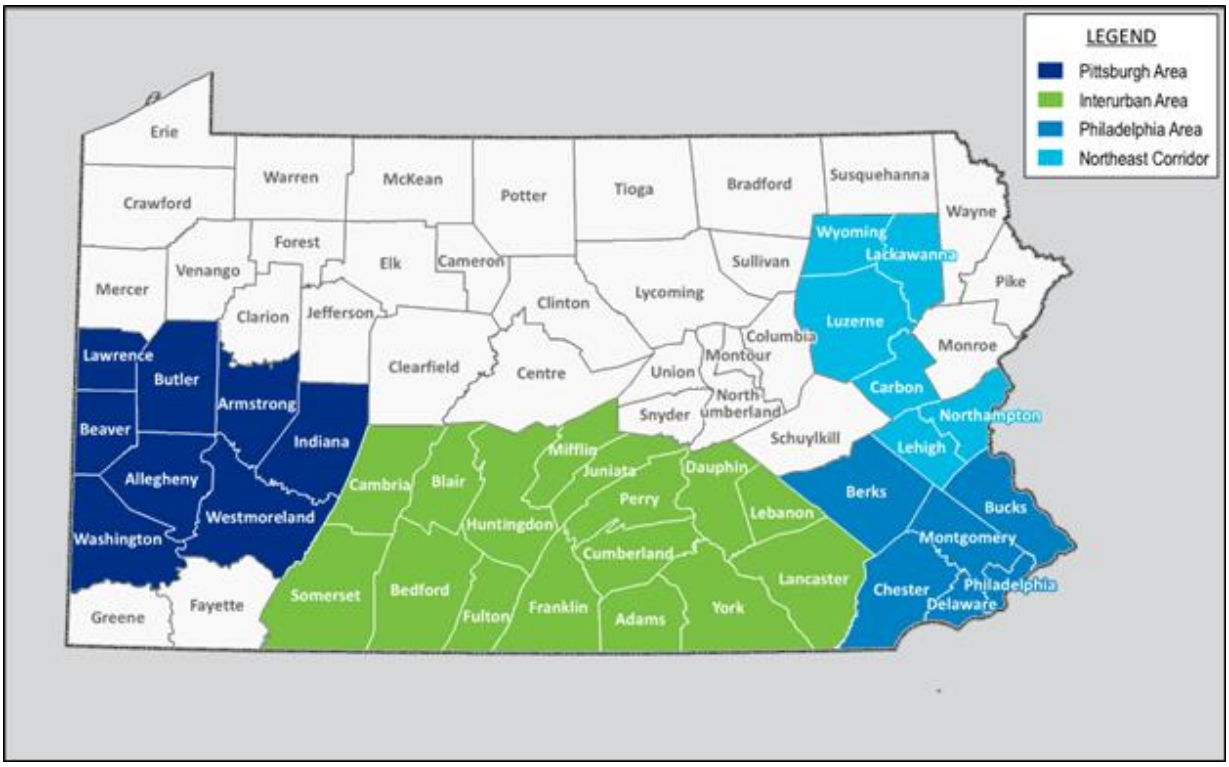


Figure 3-1
Pennsylvania County Groupings

Historic population growth along the Pennsylvania Turnpike and the surrounding states has generally been considerably lower, relative to the US. Pennsylvania's population has increased slowly since 1980, with no growth in that decade, followed by 0.3% annually from 1990 through 2010. Since 2010, the growth declined to 0.1% per year through 2016. In contrast, the U.S. growth rate has been at least three times the rate in Pennsylvania during all time periods.

Population growth along the Pennsylvania Turnpike corridor was similar to statewide growth. This is reasonable considering that the counties in the four aggregations referenced above constitute more than 80% of the statewide total. Within the Pennsylvania Turnpike corridor counties, the Pittsburgh Area has experienced a continuous population decline since the 1980s, whereas the other areas to the east of Pittsburgh experienced modest population growth.

Population is forecasted to generally continue the historical trends, with relatively modest growth rates in Pennsylvania, the surrounding states, and the counties along and surrounding the Turnpike. Pennsylvania population growth is forecasted to average 0.4% annually through 2030, and thereafter decelerate to 0.1% through 2050. Within the Commonwealth, Pittsburgh is forecast to continue contracting; the Northeast Corridor and the Philadelphia Area are forecast to exhibit population

[1] Woods & Poole Economics, Inc. Washington, D.C. Copyright 2017. 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.

growth like Pennsylvania, and the Interurban counties between Pittsburgh and Philadelphia are forecast to grow relatively faster.

Table 3-1
Population Trends and Forecasts

Geography	History				Forecast		
	1980-'90	1990-'00	2000-'10	2010-'16	2016-'30	2030-'40	2040-'50
Pittsburgh Area	(0.7%)	(0.2%)	(0.3%)	(0.1%)	(0.1%)	(0.2%)	(0.3%)
Interurban Area	0.5%	0.7%	0.8%	0.3%	0.8%	0.6%	0.5%
Philadelphia Area	0.2%	0.4%	0.5%	0.3%	0.4%	0.2%	0.1%
Northeast Corridor	0.2%	0.2%	0.6%	0.1%	0.4%	0.3%	0.2%
Subtotal PA	0.0%	0.3%	0.4%	0.2%	0.4%	0.2%	0.1%
Maryland	1.3%	1.0%	0.9%	0.7%	0.9%	0.7%	0.6%
New Jersey	0.5%	0.8%	0.4%	0.4%	0.5%	0.4%	0.2%
New York	0.2%	0.5%	0.2%	0.4%	0.4%	0.2%	0.1%
Ohio	0.0%	0.5%	0.2%	0.1%	0.3%	0.2%	0.1%
Pennsylvania	0.0%	0.3%	0.3%	0.1%	0.4%	0.2%	0.1%
West Virginia	(0.8%)	0.1%	0.2%	(0.2%)	0.3%	0.2%	0.1%
Subtotal States	0.2%	0.5%	0.3%	0.3%	0.4%	0.3%	0.2%
United States	0.9%	1.2%	0.9%	0.8%	0.9%	0.8%	0.7%

Source: United States Census Bureau and Woods & Poole Economics, Inc. 2017

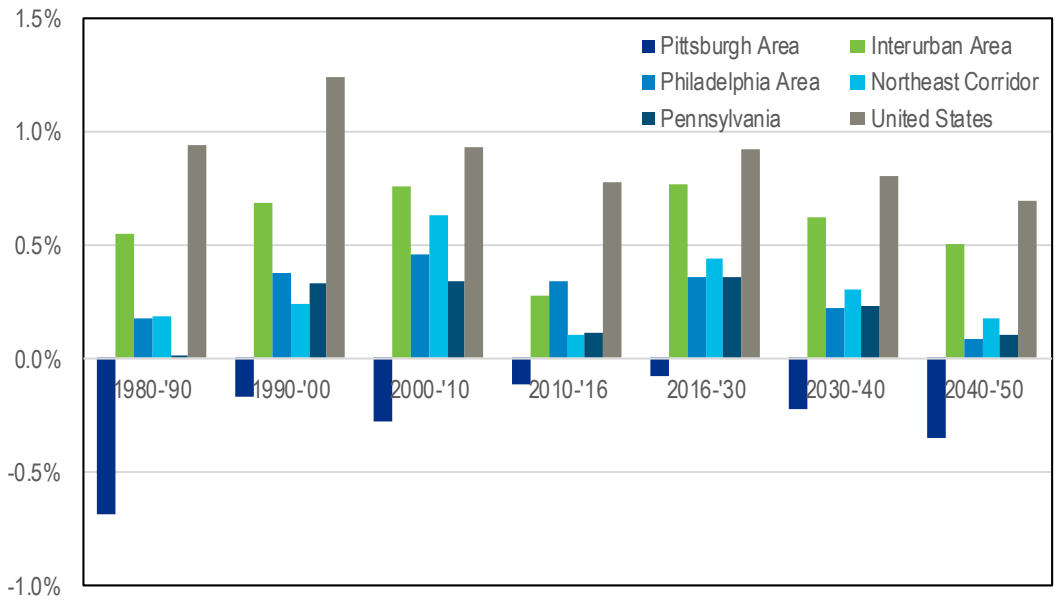


Figure 3-2
Population Trends and Forecasts

3.1.2 Employment and Unemployment Trends and Forecasts

The historical employment trends were extracted from data available from the United States Department of Commerce (Bureau of Economic Analysis from 1980 through 2016), while future growth rates are based on Woods & Poole data. Additional Bureau of Labor Statistics (BLS) unemployment data for the three major metro areas (which differs from the four Pennsylvania Turnpike socioeconomic groupings) is also compared/contrasted to state and national levels.

Employment - Historical employment growth generally decelerated from 1980 through 2010, with the pronounced reduction in average growth during the 2000-2010 decade, reflective of the recession that officially occurred from December 2007 through June 2009. Since 2010, employment growth has rebounded to longer-term historical averages, with Pennsylvania exhibiting 1.1% average growth since 2010. As with population, employment growth within Pennsylvania was historically slower than the nation (about half the rate). The Pittsburgh Area experienced the slowest relative historical employment growth, while the Interurban and Philadelphia Areas experienced the highest relative growth. Historical employment growth trends and forecasts for the study area are presented in Table 3-2 and Figure 3-3.

Although employment since 2010 (e.g., the recession) rebounded to longer-term historical growth patterns, the forecast is for decelerating growth. Average annual growth for Pennsylvania and the United States is forecast to grow at 1.0% and 1.3%, respectively, through 2030, then decelerate to 0.8% and 1.1%, respectively, between 2030 and 2040, then to 0.6% and 1.0% through 2050.

Table 3-2
Employment Trends and Forecasts

Geography	History				Forecast		
	1980-'90	1990-'00	2000-'10	2010-'16	2016-'30	2030-'40	2040-'50
Pittsburgh Area	0.4%	0.9%	0.1%	0.8%	0.7%	0.5%	0.4%
Interurban Area	1.8%	1.2%	0.4%	1.0%	1.2%	0.9%	0.7%
Philadelphia Area	1.3%	0.7%	0.4%	1.5%	1.0%	0.8%	0.7%
Northeast Corridor	1.1%	0.9%	0.5%	1.4%	1.1%	0.8%	0.7%
Subtotal PA	1.1%	0.9%	0.4%	1.2%	1.0%	0.8%	0.6%
Maryland	2.8%	1.2%	0.8%	1.5%	1.3%	1.1%	1.0%
New Jersey	1.8%	1.0%	0.4%	1.4%	1.1%	0.8%	0.7%
New York	1.2%	0.7%	0.6%	1.8%	1.0%	0.8%	0.7%
Ohio	1.2%	1.5%	(0.6%)	1.3%	0.9%	0.7%	0.6%
Pennsylvania	1.1%	0.9%	0.3%	1.1%	1.0%	0.8%	0.6%
West Virginia	(0.1%)	1.2%	0.3%	(0.1%)	0.9%	0.7%	0.6%
Subtotal States	1.4%	1.0%	0.3%	1.4%	1.0%	0.8%	0.7%
United States	2.0%	1.8%	0.5%	1.9%	1.3%	1.1%	1.0%

Source: United States Bureau of Economic Analysis and Woods & Poole Economics, Inc. 2017

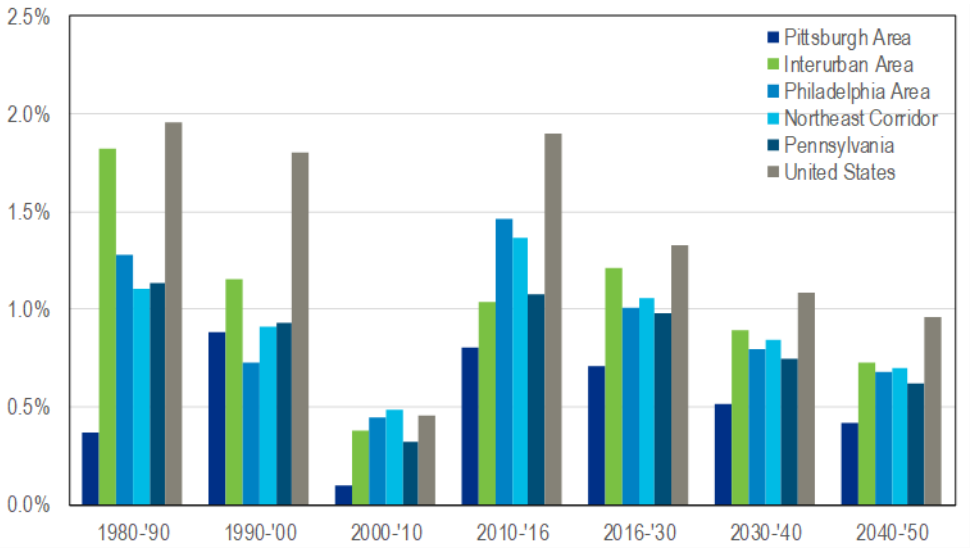


Figure 3-3
Employment Trends and Forecasts

Unemployment - Seasonally-unadjusted monthly unemployment rates prior to the last recession (January 2007 through November/December 2017) are presented in Figure 3-4 for the three major Metropolitan Statistical Areas (MSA) in Pennsylvania located along the Turnpike Mainline. These are the Philadelphia-Camden-Wilmington MSA, the Harrisburg-Carlisle MSA, and the Pittsburgh MSA. Additionally, unemployment data for the Commonwealth of Pennsylvania and the United States are also presented for comparison purposes. As the data are seasonally-unadjusted, the graph depicts both the seasonal cyclicality, and the longer-term trends.

Unemployment rates for the Commonwealth and MSAs generally parallel the nation, with a steep increase in 2008 and 2009, followed by a decade of steady decline to around 4.0%. Although the trends parallel, the Pennsylvania rates for most of the recent decade were below the United States. Harrisburg-Carlisle generally exhibited the lowest relative unemployment rates, reflective of the more stable government employment in the State Capitol (compared to more volatile private-sector employment). Philadelphia-Camden-Wilmington exhibited slightly higher unemployment rates than either Pittsburgh or Pennsylvania for most of the last decade. However, since the end of 2015, the unemployment rate in the Philadelphia MMSA has generally been slightly lower than Pennsylvania, whereas the unemployment rate in the Pittsburgh MSA has tracked slightly higher than the Commonwealth.

3.1.3 Real Retail Sales

Retail sales (in real, or constant dollar terms) trends and forecasts for the study area are presented in Table 3-3 and Figure 3-5. These data were extracted from data available from Woods & Poole. Nationally, growth in real retail sales grew 2.0% in the 1980s, accelerated to 3.4% in the 1990s, and was a tepid 0.6% in the decade from 2000 to 2010 (due to recession in 2008/09). Since the recession, annual growth nationally has rebounded to 2.8%. Pennsylvania trends in real retail sales paralleled the national historical trend, albeit at a relatively slower pace, with recent, post-recession annual growth of 2.3%. Within the Commonwealth, the Pittsburgh Area experienced the lowest post-recession relative growth (2.0%), while the Northeast Corridor experienced the highest (2.8%).

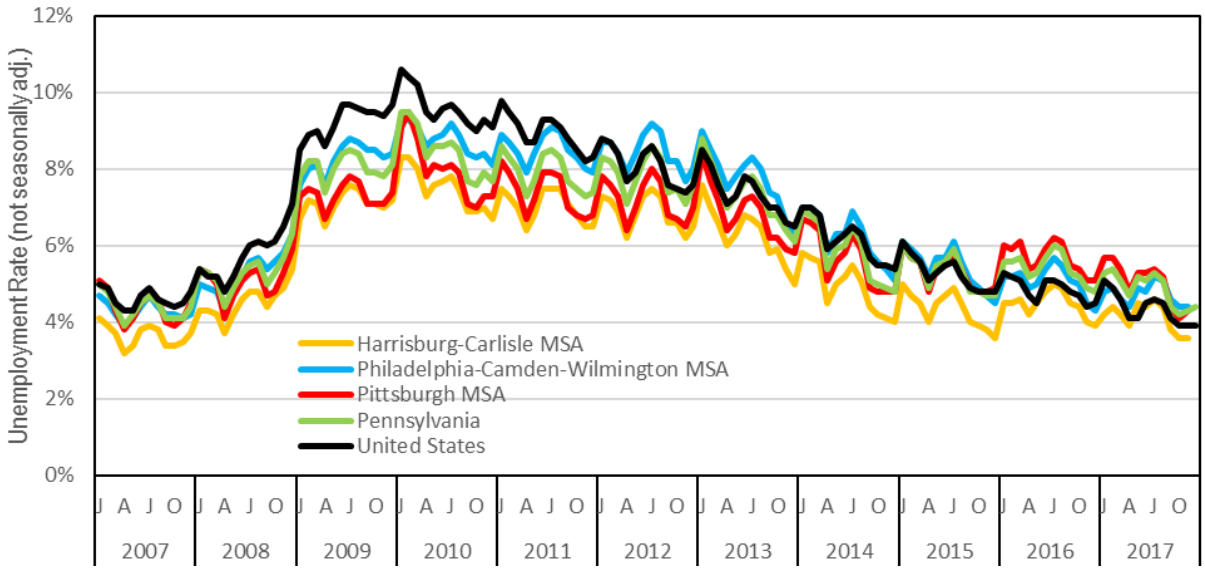


Figure 4-4
Trends in Unemployment Rates

Growth in real retail sales is forecast to decelerate from the recent rebounded growth since the recession. Nationally, Woods & Poole forecasts an average annual growth of about 1.5% through the end of the forecast period. Pennsylvania is forecast to grow at a slower relative pace, at 1.0% or lower. Within the Commonwealth, growth in retail sales within the Interurban Area are forecasted to be slightly higher than those of the other three clustered areas surrounding the Turnpike; and of these three, the Pittsburgh Area is forecast to grow at the slowest relative average rate.

Table 3-3
Real Retail Sales Trends and Forecasts

Geography	History				Forecast		
	1980-'90	1990-'00	2000-'10	2010-'16	2016-'30	2030-'40	2040-'50
Pittsburgh Area	0.3%	2.4%	0.1%	2.0%	0.5%	0.3%	0.4%
Interurban Area	2.2%	2.7%	(0.0%)	2.4%	1.3%	1.2%	1.3%
Philadelphia Area	2.1%	2.6%	0.3%	2.1%	1.1%	0.9%	1.0%
Northeast Corridor	1.6%	2.5%	1.7%	2.8%	0.9%	0.8%	0.9%
Subtotal PA	1.6%	2.5%	0.4%	2.2%	1.0%	0.8%	0.9%
Maryland	2.5%	2.7%	0.2%	2.4%	1.5%	1.3%	1.4%
New Jersey	2.2%	2.7%	0.2%	2.4%	1.1%	0.9%	1.0%
New York	1.5%	2.4%	0.9%	2.6%	1.0%	0.8%	0.9%
Ohio	1.2%	3.0%	(0.6%)	2.5%	0.9%	0.8%	0.9%
Pennsylvania	1.6%	2.5%	0.3%	2.3%	1.0%	0.8%	0.9%
West Virginia	(0.2%)	2.9%	0.2%	2.2%	0.9%	0.8%	0.9%
Subtotal States	1.6%	2.6%	0.3%	2.4%	1.0%	0.9%	1.0%
United States	2.0%	3.4%	0.6%	2.8%	1.5%	1.4%	1.5%

Source: Woods & Poole Economics, Inc. 2017

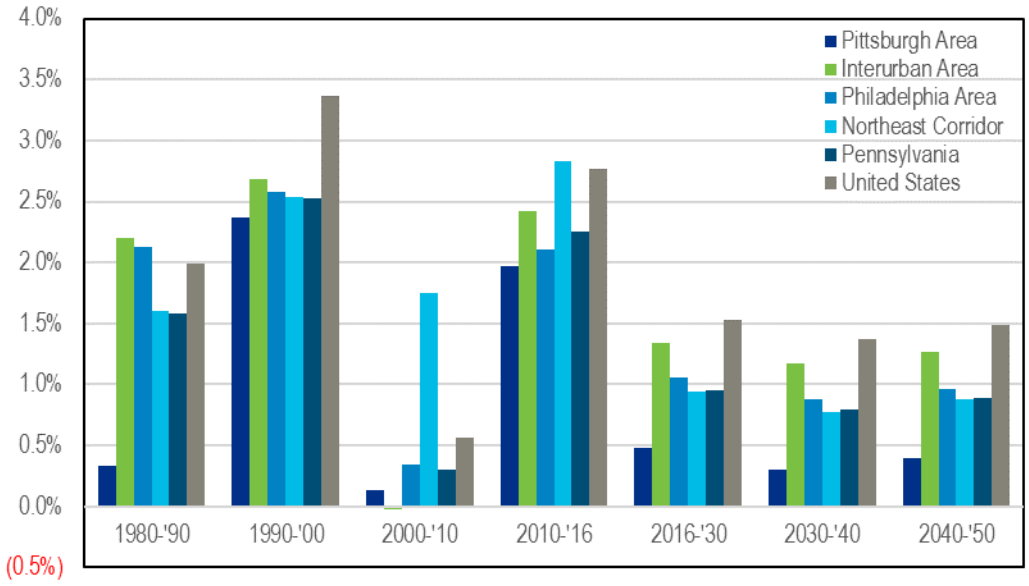


Figure 5-5
Real Retail Sales Trends and Forecasts

3.1.4 Real Gross Regional Product (GRP)

Real gross regional product (or gross state product/gross domestic product, depending on the geographic focus) is the inflation-adjusted standard metric for total economic activity in an area. Real GRP trends and forecasts for the study area are presented in Table 3-4 and Figure 3-6 and are sourced to Woods & Poole, based on data from the Bureau of Economic Analysis.

National real gross domestic product (GDP) decelerated from an annual average of 3.6% in the 1990s to less than half that (1.7%) in the decade from 2000 to 2010 (reflective of the recession). Since the recession, national real GDP increased 2.5% annually. Pennsylvania's real gross state product (GSP) growth pattern was similar, with 2.7% in the 1990's, decelerating to 1.8% from 2000 to 2010 and increasing slightly to 2.0% per annum from 2010 to 2016. Within the Commonwealth, the two major MSAs (Pittsburgh and Philadelphia) historically exhibited the highest relative growth rates in real GRP.

Real GRP growth forecasts are for 2.1% per annum for the United States through 2030 and 1.8% for Pennsylvania. As with the growth forecasts for other socioeconomic variables, a general deceleration in growth is forecast for GRP. In the corridor counties, like the entire Commonwealth, real GRP growth is projected to average 1.8% through 2030, with a general deceleration thereafter. And, within the Pennsylvania Turnpike corridor, the Pittsburgh and Philadelphia Areas are forecast to have the slowest relative growth.

Table 3-4
Real Gross Regional Product Trends and Forecasts

Geography	History				Forecast		
	1980-'90	1990-'00	2000-'10	2010-'16	2016-'30	2030-'40	2040-'50
Pittsburgh Area	0.9%	2.8%	1.7%	2.4%	1.5%	1.4%	1.3%
Interurban Area	2.8%	2.6%	1.5%	1.8%	2.0%	1.7%	1.5%
Philadelphia Area	3.2%	2.8%	2.0%	1.9%	1.8%	1.7%	1.7%
Northeast Corridor	2.1%	2.7%	1.6%	1.5%	1.7%	1.5%	1.3%
Subtotal PA	2.4%	2.7%	1.8%	2.0%	1.8%	1.6%	1.5%
Maryland	4.5%	2.9%	2.9%	1.6%	2.0%	1.8%	1.7%
New Jersey	4.7%	2.7%	1.0%	1.4%	1.7%	1.5%	1.4%
New York	3.2%	2.5%	1.7%	1.8%	1.9%	1.7%	1.6%
Ohio	2.0%	3.2%	0.3%	2.8%	1.8%	1.6%	1.4%
Pennsylvania	2.3%	2.7%	1.8%	2.0%	1.8%	1.6%	1.5%
West Virginia	(0.2%)	2.2%	2.6%	0.8%	1.1%	1.0%	0.8%
Subtotal States	3.0%	2.7%	1.5%	1.9%	1.8%	1.6%	1.5%
United States	3.1%	3.6%	1.7%	2.5%	2.1%	1.8%	1.7%

Source: Woods & Poole Economics, Inc. 2017

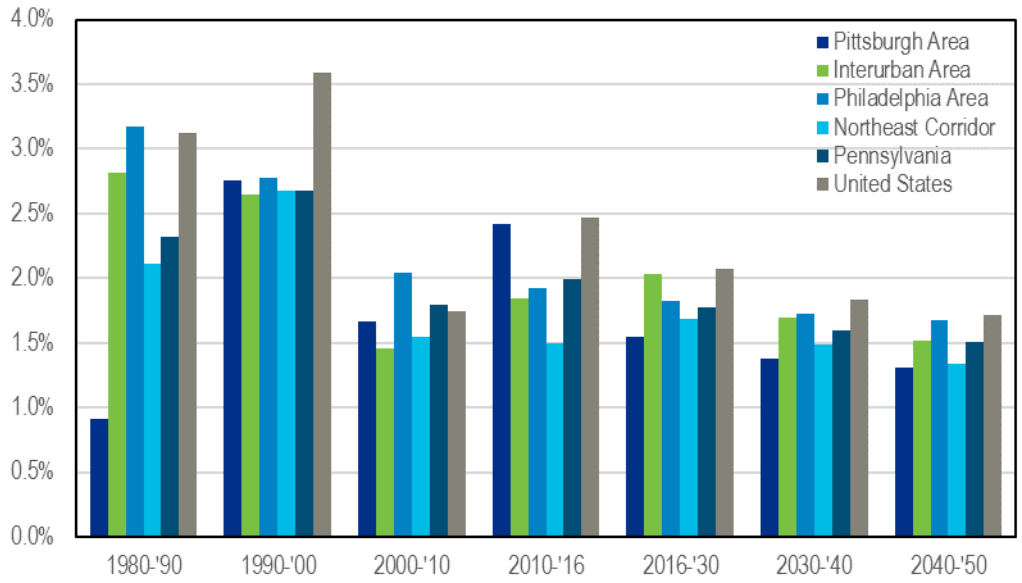
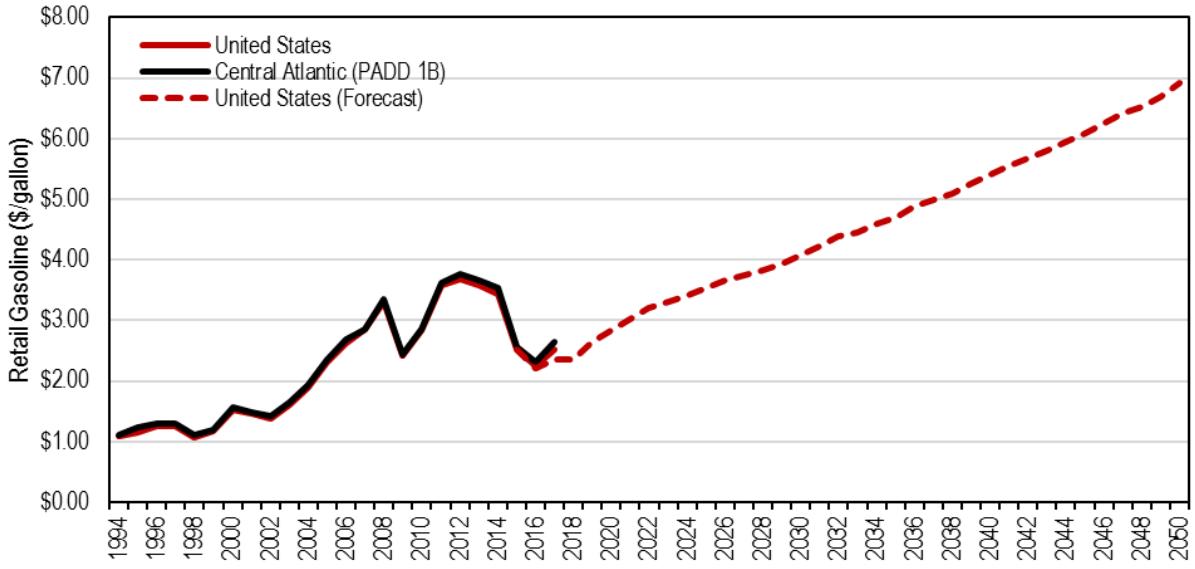


Figure 6-6
Real Gross Regional Product Trends and Forecasts

3.1.5 Motor Fuel Prices

Historical gasoline prices (in current dollars/gallon for all grades, all formulations) for the Central-Atlantic region (NY, NJ, PA, DE, and D.C.) and the United States are presented in Figure 3-7. The data was obtained from the U.S. Energy Information Administration (EIA). Average annual gasoline prices for the United States and the Central-Atlantic region were nearly identical historically, with the Central Atlantic region between $0.01 and $0.11 per gallon above the national price. Prices peaked at

close to $3.70 per gallon in 2012[2], and declined through 2016. Prices in 2017 increased by more than $.025/gallon over 2016, and that upward trend is forecast to continue through 2050. According to the EIA Annual Energy Outlook 2017, future average national gasoline prices are forecasted to steadily increase to $7.00/gallon by 2050 in current dollars.



Source: Energy Information Administration

Figure 7-7
Gasoline Prices

3.2 MPO Outreach and Regional Economic Conditions

To supplement the socioeconomic data analysis, additional qualitative inputs were collected for the geographic areas represented by four of the five major metropolitan planning organizations (MPO) within, or near, the Pennsylvania Turnpike corridors. The inputs were collected via discussions with representatives from the MPOs. As shown in Figure 3-8, the geographic areas covered by these five MPOs partially overlap with the four Pennsylvania Turnpike areas analyzed in the previous subsection. While characteristics reviewed and discussed varied by MPO, they generally include: housing and residential, employment and industry, and freight and shipping. The five MPOs include:

- Southwestern Pennsylvania Commission (SPC)
- Delaware Valley Regional Planning Commission (DVRPC)
- Tri-County Regional Planning Commission (TCRPC)
- Lackawanna-Luzerne Metropolitan Planning Organization (LLMPO)
- Lehigh Valley Planning Commission (LVPC)

[2] Please note that in sub-annual terms, gas prices reached their high for the last two decades of around $4.15 per gallon in July of 2008 (not shown in the Figure).

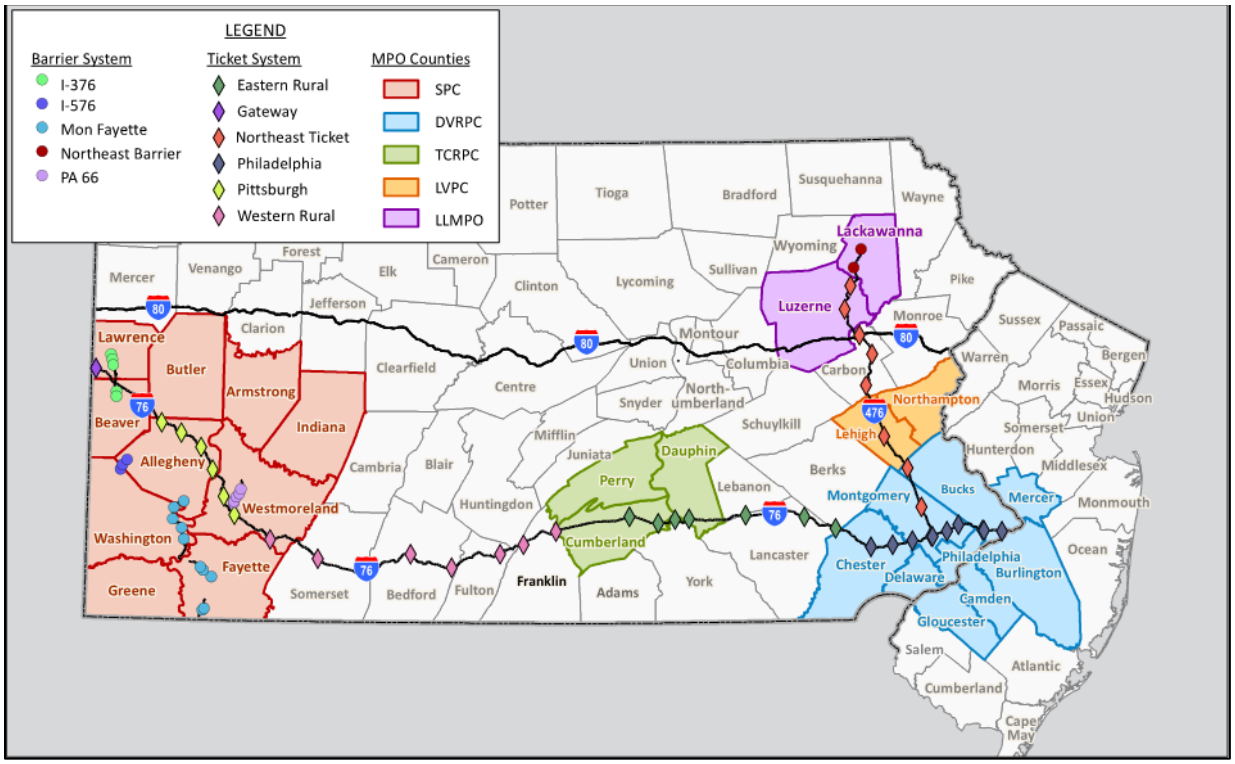


Figure 8-8
Pennsylvania MPOs

3.2.1 Southwestern Pennsylvania Commission

The Southwestern Pennsylvania Commission includes the eight Pittsburgh area counties as well as the two counties bordering West Virginia (Fayette and Greene).

Housing and Residential – Residential development continues to be led by Cranberry Township in Butler County, north of downtown Pittsburg. West of Pittsburg, residential (and commercial) development continues in Westmorland County (east of Monroeville) as the Southern Beltway (Route 576) nears completion. Southwest of Pittsburg, the residential development is growing to support the Southpoint commercial development (Washington County). Downtown Pittsburg also continues to develop as several properties shift from commercial to residential use. Such downtown residential properties accommodate smaller household size than the suburbs.

Employment and Industry – The Southpoint suburban business park in in Cecil Township, 17 miles south of Pittsburg, accommodates over 300 businesses. Marcellus Shale oriented energy firms include and Noble Energy, Rice Energy, Range Resources, CONSOL Energy, DPS Property, Chesapeake Energy, Columbia Gas. Other high technology (telecom/engineering specialty service) firms include: Southpointe Telecom, Ansys, Crown Castle, Mylan Labs, etc. While coal output and employment continue to decline, gas related activity associated with fracking continues to produce high volumes despite area wells being generally built-out.

Freight and Shipping – Local distribution facilities, including Amazon, continue to expand throughout the area. In fact, the Pittsburg area made the narrowed list of 20-cities seeking to attract the new Amazon headquarters, which would significantly affect growth trends.

3.2.2 Delaware Valley Regional Planning Commission

The Delaware Valley Regional Planning Commission includes five of the six Philadelphia area Pennsylvania Turnpike counties (excludes Berks), and four neighboring New Jersey counties (Burlington, Camden, Gloucester, and Mercer).

Housing and Residential – Both the urban core (Philadelphia) and the suburbs are growing. Recent residential increase in central Philadelphia and adjacent zip codes reflect millennials demand for urban rental and multi-family housing. Similarly, suburban counties, townships and boroughs are also booming. These especially include: Conshohocken Borough (*Montgomery County*), Upper Makefield Township (*Bucks County*), Spring City (*Chester County*), and *Washington Township* (Mercer County) NJ. While housing prices are increasing, potential solutions include regional transit improvements and inclusionary zoning policies. Further, private developers are increasingly pressured to provide more incentives beyond low-income housing tax credits[i].

Employment and Industry – Regionally, the largest industry sectors include services, retail, manufacturing, FIRE[3], and freight transport. Growth continues in both the Philadelphia core and the suburban area. In Philadelphia, employment is led by education, healthcare, and technology – with Comcast operations growing the fastest. Additionally, the Philadelphia International Airport (PHL) and the American Airlines hub-operations are major employers. Downtown, University of Pennsylvania (UPENN) and Drexel University enroll over 50,000 students and employ thousands of staff.

Amtrak and SEPTA rail lines converge at the 30th street station, close to UPENN, where development continues, including possibly an Amazon facility. However, many physical constraints, (e.g., many at-grade rail lines) require large-scale development/planning. Such development would significantly affect the City and region. Also, Naval Yard redevelopment (South Philly) of 1,200 acres is expected to average about 1,000 new jobs per year for the next 15-20 years, which will affect the I-95 corridor but is not close to the Pennsylvania Turnpike.

While downtown office development is static, the market is growing in the suburbs, such as a new office park in Blue Bell. An old golf course in the King of Prussia Mall area is also being redeveloped as a casino with mixed-use conversion (housing/commercial). And, an 800-acre redevelopment in Willow Grove (Montgomery County) is anticipated to attract 30,000 jobs and several thousand residents, depending on proposal adopted.

Freight and Shipping – With a major international port and commercial service airport along the eastern seaboard, the region accommodates a large volume of directional freight (inbound, outbound, internal, and through) by all four modes (truck, rail, port, and air). At the Port of Philadelphia, larger cranes and harbor deepening (45') facilitate larger Panamax vessels, increased containerization, and recent automobile imports (Hyundai/Kia). At PHL, air cargo operations continue to expand (Cargo City and UPS), despite new runway expansion delays (10+ years). In neighboring New Jersey, freight center growth continues along the New Jersey Turnpike (NJTP) interchange 8A. Similarly, freight center growth in Leigh Valley also affects traffic volumes in the northern DVRPC.

Growth Summary – City-Center redevelopment will generate minor effects on future traffic due to mixed city-center trends and transport improvements. Current employment levels of around 300,000

[3] Financial, insurance, and real estate services

continues to fall, as the 60,000-population level continues to rise as offices and big-box stores convert to housing. Envisioned urban-core transport improvements (both Turnpike and transit) will help accommodate Philadelphia population growth and employment trends.

Suburban growth appears stronger as employment continues to branch-out from the core. Specific development is anticipated along the Turnpike's I-76 corridor. Suburban growth will also increase suburb-to-suburb commuting with heavy reliance on limited access roadway facilities such as I-76 and the Northeast Extension. High growth suburban counties include Bucks (north of core) and Chester (west). Montgomery (northwest), which grew rapidly over the past twenty years, has little vacant land available, and is turning to mixed-use and redevelopment.

3.2.3 Tri-County Regional Planning Commission

Within the sixteen-county Interurban Turnpike area, the Tri-County Regional Planning Commission comprises the three central counties of Cumberland, Dauphin, and Perry. While each reflects distinct socioeconomic conditions, the region continues transitioning to a post-manufacturing economy.

Housing and Residential – Anchored by Harrisburg, the state capitol, is the densest and most populous of the three counties. However, its population decline between 1970 and 2000 reflected a relocation to the suburbs of Cumberland County. Comparatively, Perry County remains very rural with low population levels and growth rates.

Employment and Industry – Regional iron and steel manufacturing centered in Harrisburg (Dauphin County) has been replaced by the Penn State Hershey Medical Center, the Giant Food Stores corporate headquarters, and the Hershey Company Resort and Factory. Recent Harrisburg development has been constrained by fiscal financial issues and the reality that half of assessed city property is exempt from current taxes (capitol and other state-owned facilities). Such development constraints spurred a 10-year tax abatement redevelopment incentive package, an updated future land use plan, zoning code changes, and other measures. Resultant development prospects include talk of new large-scale office and residential projects.

In Cumberland County, the Department of Defense is the major employer, which supports the New Cumberland Army Depot and the Naval Support Activity in Mechanicsburg – largest inland supply depot in the U.S. Comparatively, Perry County has an agriculture-based economy, which exhibits slow to moderate growth as the retail/commercial sector expands slowly.

Freight and Shipping – A UPS regional hub in suburban Harrisburg lies just north of the Harrisburg International Airport (MDT), which is undergoing an air cargo apron expansion. A FedEx shipment center is also located in Middletown (north of I-76). Also, a major rail intermodal facility (3rd largest east of Mississippi River) located in Dauphin County accommodates a diverse commodity mix and has major roadway connections.

Other – Local toll rates are considered very high by local commuters, which has led to toll road avoidance commute patterns. I-83 reconstruction over the next decade will stress such commutes and the overall Harrisburg highway system. This illustrates potential externality effects in historical toll transactions, as well as in future transaction growth.

3.2.4 Lackawanna-Luzerne Metropolitan Planning Organization

The MPO lies within the Northeast Pennsylvania Turnpike analysis area and comprises the two northern counties of Lackawanna and Luzerne.

Housing and Residential – With the oldest housing stock in the nation, reuse has been limited to the urban cores of Scranton and Wilkes-Barre (W/B). Urban land redevelopment initiatives (Keystone Opportunity Zone, State Land Bank), continue to help remove troubled properties and stem the cycle of vacancy/abandonment/foreclosure. However, such initiatives struggle to successfully stimulate property demand. Nonetheless, population remains stable with residential in-migration into downtown Scranton induced by the Medical College enrollment and reverse suburbanization trends of older residents seeking more-urbanized access to retail, entertainment, medical, etc.

Suburban population is also increasing slightly, although undercounted due to the Latino immigrants and a significant Bhutanese community. Anecdotal observations by local community leaders of suburban housing, retail, school enrolment, etc. suggest that the immigrant enclaves are expected to continue expanding.

Employment and Industry – Both counties continue to transition to a post-manufacturing, post-coal economy. Additionally, Scranton financial issues constraining development include pension payments, struggling school district budgets, and disproportionate local service taxes on low-income workers. Nonetheless, freight distribution and shipping (see below), the Casino, and other development facilitate modest economic growth in the region.

Located between Scranton and W/B, the Mohegan Sun Pocono Casino continues to expand (new 8-story hotel) with much land held for future development (e.g., golf course, water park, etc.). With continued traffic volume increases, the Casino seeks a new I-81 interchange. Noteworthy, concerns about a negative Casino impact downtown business has not arisen.

The Humboldt Industrial Park, south of W/B in Hazel Township along I-81, continues to develop, and currently employees around 10,000. North of the I-476 Turnpike terminus, Clark Summit continues to evolve as parcel land use turns commercial (banks, restaurants, pharmacies, etc.), which addresses previously underserved local service needs.

Freight and Shipping – A very strong and growing sector of the regional economy. Several regional distribution-centers and box-warehouses lie in the valley between Scranton and W/B along the Turnpike (I-476) and I-81. These centers/warehouses serve the whole northeast U.S. Over two dozen facilities range in size from 0.3 million to over 1.2 million sq. ft. Major distributors include Chewy, Adidas, Patagonia, Lowes, etc. Continued successful growth of the facilities have also led to expanded back-office support operations. Such growth led to planned expansion of Highway 6, north of the I-81/I-84 interchange. Further, the Wilkes-Barre/Scranton Int'l Airport (AVP) continues to support the regional freight and shipping sector. The recent airport master plan focuses on developing vacant parcels for air-based warehousing/manufacturing (0.5 million sq. ft. mixed-use) and distribution.

3.2.5 Lehigh Valley Planning Commission

The Lehigh Valley Planning Commission lies within the Northeast Turnpike analysis area and comprises the two southern counties of Lehigh and Northampton. We reached out to the MPO several times but were unable to engage. Located between the DVRPC and LLMPO, regional characteristics reflect a cross between the small urban LLMPO and the suburban fringe of the DVRPC, which confirms the historical socioeconomic trends and growth forecast findings.

3.2.6 Conclusion

The qualitative MPO outreach discussions of local economic conditions confirmed the quantitative analysis of socioeconomic trends that went into the subsequent econometric growth analysis. The due-diligence outreach found nothing that would alter the quantitative forecasting process. Rather, the outreach corroborated and substantiated the socioeconomic trends with local depictions of where residential and/or business growth was (or was not) occurring and why.

3.3 Economic Growth Analysis

An econometric analysis was conducted to estimate long-term baseline travel demand on the Pennsylvania Turnpike. Historical travel demand was econometrically estimated via regression equations for groups of toll plazas, the rationale for which will be explained in Section 3.3.1.2. Regional socioeconomics and other variables were tested as explanatory factors. With statistically-significant historical equations, independent variable forecasts were applied to the equation coefficients to estimate future travel demand. Twenty demand equations were tested for either individual plazas or groups of proximate plazas, for both passenger cars (PC) and commercial vehicles (CV). A majority of the twenty plaza-vehicle grouping equations yielded statistically-significant, defensibly-logical results. Forecasts were conducted through 2050.

Subsequent toll modeling analyses conditionally incorporates these econometrically-derived baseline travel demand forecasts, which consider a range of future toll policies and rate structures in estimating future revenue potential.

3.3.1 Econometric Modeling

CDM Smith developed an econometric model for the PA Turnpike System, using multivariate regression analysis to develop long-term toll-transaction growth forecasts. In the econometric modeling, the objective is to identify an independent variable (or variables) with historical trends that can explain, by way of statistical significance, corresponding traffic trends on the Turnpike. A resulting correlative relationship between historical trends in corridor traffic and one or more independent variables is, in turn, applied in forecasting future Turnpike transaction growth, given available and credible forecasts for the independent variable(s). CDM Smith regression-tested annual transaction data for 10 plaza groupings, described in Section 3.3.1.2, against geographically-weighted independent socioeconomic data, (for passenger cars and commercial vehicles) to derive long-term transaction forecasts.

3.3.1.1 Regression Testing

Highway travel occurs for myriad reasons, such as recreation, commuting, trade, etc., and is influenced by factors such as fuel prices, other travel costs, weather, trip urgency, and economics. Aggregate highway travel, however, typically trends closely with regional socioeconomic variables. As such, conceptually-relevant socioeconomic data were hypothesized, compiled, and regression-tested for explaining annual travel demand. These data include population, employment, real gross regional product, and real retail sales, compiled at various geographic levels. In addition to regional socioeconomic variables, average fuel prices and an indexed toll variable were tested as explanatory factors for historical travel.

Multiple regression equations were tested and evaluated for each toll plaza-vehicle grouping to account for the numerous possible combinations of relevant geographies (county clusters) for each possible socioeconomic variable, and combinations with either/both fuel and toll index factors. A

single "best fit" equation was identified for each toll-plaza grouping and used in the developing transactions forecasts.

3.3.1.2 Toll Plaza Groupings (Dependent Variables)

Toll plazas were clustered into the ten groupings (from 69 individual plazas) to reduce regression testing to a reasonably manageable data universe, based-on geographic proximity, similarities in historical travel demand patterns, data availability, and other characteristics such as operating history. These toll plaza groupings are identified in Table 3-5 and shown graphically in Figure 3-9. Some individual toll plazas were excluded from the groupings due to data gaps (e.g., I-376 and PA 66), staggered plaza openings/closings (e.g., Mon Fayette), or too short annual data (e.g., I-576), as inclusion would artificially distort the historical demand trends. Of the 69 individual toll plazas, 39 were included in the groupings. The 30 toll plazas excluded from the ten groups mostly pertain to the barrier-system facilities.

Note that the Delaware River Bridge (DRB) and the Southern Beltway (I-576) were not econometrically tested similarly to other groupings. The DRB changed operations recently, therefore, the historical trend may not appropriately correspond with current and future conditions. The I-576 opened in 2006, and the relatively short historical data includes a ramp-up trend that does not statistically correspond to any regional socioeconomic characteristics.

Where available, historical traffic data were used as continuous annual time series from 1987 through 2016. Annualized data were available for most of the ticket-system facilities, exempting a few toll plazas that opened after 1987 (and thus excluded). However, the barrier-system data were more limited; available only since 1994 with data gaps, or toll plazas that were opened too recently to provide a statistically defensible trend (insufficient number of data points). Many of the 30 excluded toll plazas from the groupings are barrier toll plazas with shorter historical operating timeframes than 1994 to 2016.

Table 3-5
Toll Plaza Groupings

	Plaza Grouping	Type	Included	Excluded
1	Gateway	Ticket	1	0
2	Pittsburgh	Ticket	5	1
3	Western Rural	Ticket	7	0
4	Eastern Rural	Ticket	7	0
5	Philadelphia	Ticket	6	5
6	Northeast Ticket	Ticket	7	2
7	Northeast Barrier	Barrier	2	0
8	I-376	Barrier	2	3
9	PA 66	Barrier	1	4
10	Mon Fayette	Barrier	1	11

Source: CDM Smith

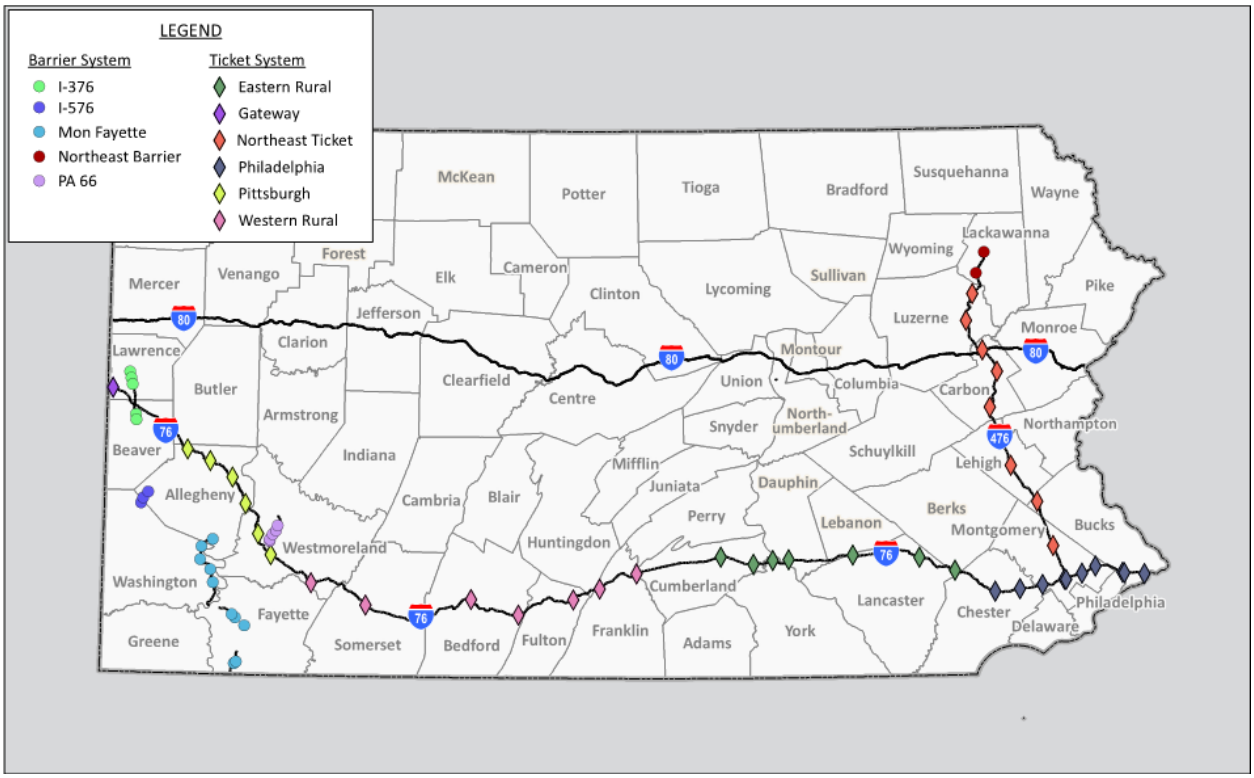


Figure 9-9
Toll Plaza Groupings

3.3.1.3 Socioeconomic Data (Independent Variables)

Data inputs include historical and forecasts data for the possible explanatory independent variables, which include socioeconomics for geographies surrounding the Turnpike (i.e., Pennsylvania and surrounding states' counties). Data compiled for regression testing included:

- Pennsylvania Turnpike Commission – historical transactions and toll rate schedule
- United States Census Bureau – historical population
- United States Bureau of Economic Analysis (BEA) – historical employment
- United States Energy Information Administration (EIA) – historical and forecast fuel prices
- Woods & Poole Economics, Inc. – historical and forecast population, employment, real gross regional product (GRP), and real retail sales
- Moody's Analytics – historical and forecast real gross regional product (GRP)

Socioeconomic data was tested as an explanatory variable at various combinations of counties surrounding the toll plazas groupings. Data was compiled for all counties in Pennsylvania, New York, New Jersey, Delaware, Maryland, Virginia, West Virginia, and Ohio.

3.3.1.4 Regression Caveats

Econometrically-derived long-term demand forecasts served as basis for further transaction and toll revenues estimates. Growth forecasts from the regressions do not explicitly consider route choice assumptions, the existing roadway network and planned improvements, existing and anticipated roadway capacities, origin-destination pairing, peak and directional factors, or traffic diversions. As such, the regression-based forecast growth rates are conditionally incorporated into further traffic and revenue modeling.

As this regression analysis attempted to estimate aggregate travel demand, the equations cannot account for all potentially influencing factors, especially any small-scale, qualitative/difficult-to-quantify, and/or irregularly occurring factors. Also, a regression analysis is incapable of forecasting unprecedented factors (positive or negative influence) such as catastrophic climate change, health epidemics, terrorism, natural disasters, or any other significantly destabilizing factors.

Forecasts are estimates, limited by the availability and robustness of input data, both historical and projected. Data unavailability, discrepancies, aberrations, and inaccuracies can hinder the robustness and results of econometric forecasting.

3.3.1.5 Regression Equations and Forecasting

A final regression equation was estimated for each toll plaza/vehicle grouping, relating historical annual travel demand with a regional socioeconomic variable, and sometimes with a toll index and/or fuel prices as additional explanatory factors. A regression summary for the ten-toll plaza/vehicle groupings is provided in Table 3-6. After testing the compiled socioeconomics at various regional county clusters, it was determined that real GRP was the best-suited explanatory variable for most equations, and population for a couple of equations.

Geographically, regional combinations of contiguous counties in Pennsylvania, New Jersey, Delaware, Maryland, West Virginia, and Ohio served as logical and statistically-acceptable catchment areas. Although each equation has a unique county combination, anchored around the respective plaza groupings, the counties included in each equation are along and adjacent to the Pennsylvania Turnpike system. Catchment areas regionalize socioeconomic variables as related to travel demand; however, the catchment areas should not imply that travel demand is only from those geographies, but rather that the catchment is a logical, statistically-valid representation for the aggregate demand.

Most of the twenty equations exhibited sensible relationships with acceptable statistics; however, despite concerted due-diligence, a few equations could not be improved upon while yielding poor statistics or questionable relationships. In such instances, the historical travel demand patterns did not trend well with any regional socioeconomics and/or the toll rate factors, and are instead probably more influenced by localized, sub-county factors such as toll plaza operating characteristics, diversion potentials, construction closures, etc. Such historical transaction volatility disjointed from regional socioeconomic trends was encountered for single toll plaza equations (i.e., Gateway CV) and the smaller barrier-system facilities (i.e., Northeast Barrier PC and CV, and I-376 PC). Contrastingly, the ticket-system groupings with multiple major toll plazas that contribute to a significant majority of the total Pennsylvania Turnpike transactions and revenues (I-76 and the Northeast Extension/I-476) exhibited statistically-significant equations and coefficients, with consistent relationships across adjacent groupings and logical results.

Table 3-6
Regression Summary

Grouping/Vehicles	Start Yr.	Adj. R2	Independent Variables			PA	Non-PA	Counties
Gateway PV	1987	91.90%	GDP			4	4	8
Pittsburgh PV	1987	95.10%	GDP	Toll Index		13	10	23
Western Rural PV	1987	92.10%	GDP	Toll Index		12	7	19
Eastern Rural PV	1987	97.80%	GDP	Toll Index		12	9	21
Philadelphia PV	1987	93.10%	GDP	Toll Index		13	12	25
Northeast Ticket PV	1987	99.10%	Population	Toll Index	Fuel Price	10	5	15
Northeast Barrier PV	1994	44.70%	Population			7	0	7
I-376 PV	1994	85.40%	GDP	Toll Index		2	0	2
PA 66 PV	1994	92.10%	GDP	Toll Index		2	0	2
Mon Fayette PV	1994	95.40%	GDP	Toll Index		2	3	5
Gateway CV	1987	68.40%	GDP	Toll Index		1	4	5
Pittsburgh CV	1987	95.20%	GDP	Toll Index		18	15	33
Western Rural CV	1987	94.70%	GDP	Toll Index		15	12	27
Eastern Rural CV	1987	97.80%	GDP	Toll Index		14	13	27
Philadelphia CV	1987	91.70%	GDP	Toll Index		5	7	12
Northeast Ticket CV	1987	99.60%	GDP			14	2	16
Northeast Barrier CV	1994	77.30%	GDP			3	0	3
I-376 CV	1994	96.00%	GDP			5	0	5
PA 66 CV	1994	95.70%	GDP	Toll Index		2	0	2
Mon Fayette CV	1994	92.40%	GDP			3	2	5

Source: CDM Smith

Aside from the four abovementioned equations at single- and small barrier-system toll plaza groupings with poor statistical fits, the remaining equations that correspond to a significant majority of Pennsylvania Turnpike toll transactions and revenues exhibit robust adjusted R^2 statistics, ranging between 91.6% and 99.6%. Such relatively high statistical fits indicate good relationships.

With the final equations, socioeconomic, toll index, and fuel price forecasts were applied to the regression coefficients, as appropriate, to estimate future long-term travel demand. Socioeconomic forecasts were obtained from both Woods & Poole Economics, Inc. at a detailed county level and Moody's Analytics at a more macroscopic statewide and metropolitan statistical area (MSA) level. Both sources forecast almost identical long-term annual real GRP trends for comparable statewide and MSA geographies, with very minor average growth rate differentials through 2035 and slight divergence thereafter. Given the availability of Woods & Poole forecasts at a granular county level, it was applied to equations to forecast baseline travel demand. Fuel price forecasts were applied to the Northeast passenger car equation, sourced from the EIA; and, the toll index forecast assumes a 6% annually-recurring increase through 2020, 5% thereafter through 2025, and a deceleration to 3% in 2028 and thereafter.

In further traffic and revenue modeling, it was decided that forecast growth estimates from the four sub-par equations fits not be applied. Instead, it was decided that alternative growth forecasts from a simpler, non-econometric based extrapolation of most recent historical trends be employed. A similar recommendation to consider simpler, alternative forecasts for the remaining barrier-system forecasts

was also made because of the more localized characteristics of such facilities. Given the acceptable logic and statistical significance of the ticket-system equations, it was recommended that the econometric-based growth forecasts be applied in further traffic and revenue modeling for those major facilities.

3.3.2 Demand Growth Results

Econometrically-derived travel demand forecasts for the Pennsylvania Turnpike are summarized in Table 3-7 below, based on applied forecasts for the regional socioeconomics, toll index, and fuel prices to the respective regression coefficients. Compound average growth rates (CAGR) for the plaza groupings are shown for three historical timeframes as comparative context, and generally in ten-year future increments through year 2050. The last column in Table 3-7 presents the average growth over the entire 2016 through 2050 forecast period.

Table 3-7
Transaction Growth Summary

Grouping/Vehicles	'87-'16	'94-'16	'07-'16	'16-'30	'30-'40	'40-'50	'16-'50
Gateway PV	1.7%	1.4%	1.7%	1.2%	1.0%	1.0%	1.1%
Pittsburgh PV	0.8%	0.7%	-0.3%	0.4%	0.6%	0.5%	0.5%
Western Rural PV	0.9%	0.8%	-0.6%	0.4%	0.6%	0.5%	0.5%
Eastern Rural PV	2.2%	1.9%	0.4%	1.7%	1.6%	1.5%	1.6%
Philadelphia PV	2.1%	1.4%	0.3%	0.9%	1.0%	0.8%	0.9%
Northeast Ticket PV	3.0%	2.0%	-0.3%	2.5%	2.2%	1.2%	2.0%
Northeast Barrier PV	#N/A	0.4%	-0.4%	0.8%	0.5%	0.2%	0.5%
I-376 PV	#N/A	1.7%	-1.4%	2.0%	1.4%	0.8%	1.5%
PA 66 PV	#N/A	3.0%	-1.1%	1.0%	0.8%	0.4%	0.8%
Mon Fayette PV	#N/A	3.1%	0.5%	0.5%	0.6%	0.3%	0.5%
Gateway CV	0.6%	0.7%	0.1%	0.5%	0.6%	0.5%	0.5%
Pittsburgh CV	1.4%	1.4%	-0.2%	0.9%	1.0%	0.9%	1.0%
Western Rural CV	1.4%	1.5%	-1.3%	0.6%	1.0%	0.9%	0.8%
Eastern Rural CV	2.6%	2.6%	0.5%	2.1%	2.0%	1.8%	2.0%
Philadelphia CV	1.8%	2.3%	0.7%	1.2%	1.3%	1.2%	1.2%
Northeast Ticket CV	4.1%	3.6%	1.3%	2.8%	2.3%	2.1%	2.5%
Northeast Barrier CV	#N/A	1.6%	2.1%	0.8%	0.8%	0.8%	0.8%
I-376 CV	#N/A	4.7%	1.8%	3.1%	2.1%	1.7%	2.4%
PA 66 CV	#N/A	4.5%	1.7%	1.3%	0.7%	0.2%	0.8%
Mon Fayette CV	#N/A	6.3%	9.6%	2.1%	1.7%	1.5%	1.8%

Source: CDM Smith

Average annual growth rates vary by toll plaza grouping, vehicle category, and period (hence, subcategorizing the facilities as conducted); consequently, it is challenging to concisely summarize. However, generally, passenger car growth was historically slower than commercial vehicle growth. Barrier-system facilities' transactions generally grew relatively faster than the older ticket-system facilities. Also, for the major ticket-system groupings, the western portions (Gateway, Pittsburgh, and Western Rural) grew slower than the eastern portions (Eastern Rural, Philadelphia, and the Northeast Extension). All three generalized relativities are expected to continue through the econometric-based growth forecasts. Additionally, the future growth in transactions is universally forecasted to decelerate relative to historical trends.

A refined traffic and revenue analysis is the last component of the forecasting analysis. Growth rates developed from this econometric regression analysis are conditionally applied to further traffic and

revenue modeling. Some post-processing adjustments to the econometric forecasts (e.g., converging 2017 forecasts with actual observations, etc.) prior to further modeling are expected, which consider additional factors such as long-term roadway capacities, etc. Also, some of the econometrically-based forecasts for smaller, barrier-system facilities may be dismissed due to relatively weak descriptor statistics and supplanted with alternative growth assumptions via recent trend extrapolations or other non-econometric means.

[i] Arvedlund, E. (2014, December 7). Conference to look at region's affordable housing. Retrieved from: http://articles.philly.com/2014-12-07/real_estate/56807054_1_affordable-housing-low-income-housing-tax-credits-affordability

Chapter 4

Transaction and Toll Revenue Forecasts

Traffic and gross toll revenue forecasts are presented in this chapter for the Ticket System, the Barrier System, and the total Turnpike System. Forecasts are presented by fiscal year from 2017-18 through 2047-48. Also presented in this chapter are important inputs to the forecasts, including committed roadway projects, assumed future toll rate increases and assumed future E-ZPass market shares.

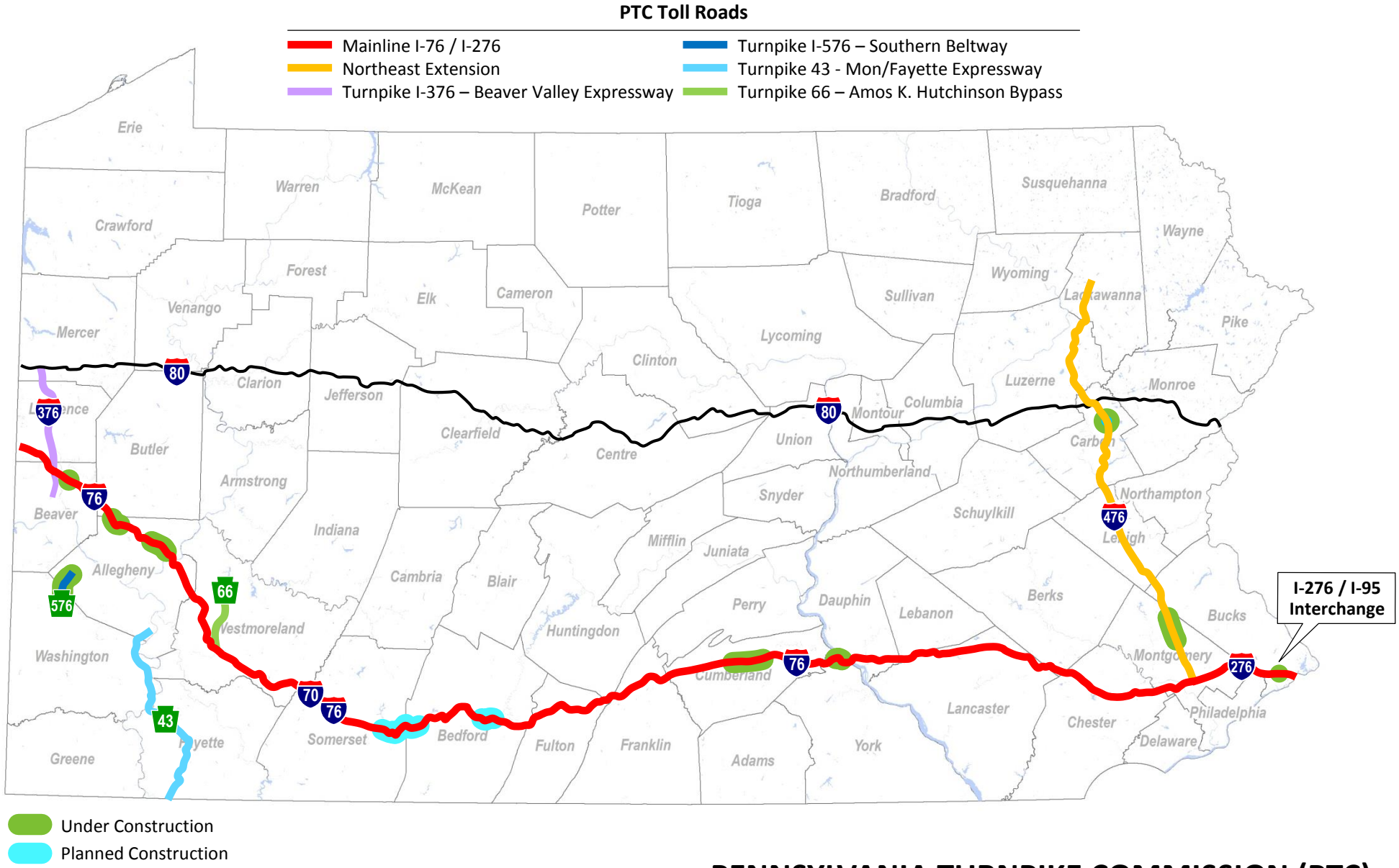
4.1 Committed Turnpike System Roadway Improvements

Through discussions with PTC personnel and by reviewing both the PTC Construction website and the State Transportation Improvement Plan (STIP) and Twelve-Year Program (TYP), CDM Smith identified the major committed roadway improvements that would potentially impact traffic and toll revenue on the Turnpike System. Projects were identified on the Mainline I-76/276 and the Northeast Extension. **Table** 4-1 lists the identified projects and Figure 4-1 presents the locations of the projects. A brief description of each project is provided below.

Table 4-1
Major Committed Roadway Improvements on the Pennsylvania Turnpike Sytem [1]

Milepost	Location	Description	Actual or Assumed Start Date	Assumed Completion Date
Mainline I-76/I-276				
12-14	Beaver County	Reconstruct and widen to 3 lanes in each direction	September 2013	December 2020
28-31	Alleghany and Butler Counties	Reconstruct and widen to 3 lanes in each direction	2019	2021
40-48	Alleghany County	Replace 6 overhead bridges and widen to 6 lanes in each direction	February 2013	Fall 2019
124-134	Somerset and Bedford Counties	Reconstruct and widen to 3 lanes in each direction	To be determined	To be determined
149-155	Bedford County	Reconstruct and widen to 3 lanes in each direction	To be determined	To be determined
202-206	Cumberland County	Reconstruct and widen to 3 lanes in each direction	September 2016	December 2018
242-245	York County	Reconstruct and widen to 3 lanes in each direction	Spring 2015	Spring 2018
Mainline I-76/I-276 and I-95 Interchange				
356-360	I-95 to Delaware River Bridge (Bucks County)	•Widen I-276 to 3 lanes in each direction	Fall 2014	December 2017
		•Construct and open new ramps between I-95 and I-276	Fall 2015	September 2018
Northeast Extension I-476				
A31-A38	Montgomery County	Reconstruct and widen to 3 lanes in each direction	Early 2018	Late 2020
A89	Hawk Falls Bridge (Carbon County)	Completely replace two existing bridges	June 2012	June 2022
Southern Beltway Toll 576				
I-376 to U.S. 22	Washington and Allegheny Counties	Convert the existing Findlay Connector to a cashless tolling facility	2017	Spring 2018
US-22 to I-79	Washington and Allegheny Counties	Construct a 12.5-mile cashless tolling extension of Toll 576 from the southern terminus of the Findlay Connector at US-22 to I-79 including four new interchanges	December 2016	Summer 2021

(1) The roadway improvement projects shown in this table are a small subset of the projects listed in the PTC's Major Design and Construction Projects website and listed in the Proposed Twelve Year Program



PENNSYLVANIA TURNPIKE COMMISSION (PTC)
MAJOR ROADWAY IMPROVEMENT PROJECTS

CDM Smith

FIGURE 4-1

4.1.1 Mainline I-76/I-276 Roadway Improvement Projects

Milepost (MP) 12 to 14 Roadway and Bridge Reconstruction – This two-phase project involves the total reconstruction and widening of two miles of the mainline Interstate 76 between Milepost 12 and Milepost 14. Upon completion of this project the existing four-lane facility, will be upgraded to include six 12-foot travel lanes, three in each direction, 12-foot shoulders and 10-foot medians in each direction. In order to accommodate the new six lane facility, three early action bridges including, two overhead Norfolk Southern railroad bridges will be replaced prior to the start of construction of the Turnpike mainline. Stage 1 of the project was completed in November 2017. Stage 2 is anticipated to be completed in December 2020.

MP 28 to MP 31 Reconstruction and Widening – This project involves the full-depth reconstruction and widening of the Pennsylvania Turnpike from four travel lanes to six travel lanes from Milepost 28 to Milepost 31 in Cranberry Township, Butler County and Marshall Township, Allegheny County. The project will begin on the east side of the Cranberry Interchange, tying into the eastbound acceleration lane and westbound deceleration lane. The project will end on the west side of the Warrendale Toll Plaza and result in two lanes of Express E-ZPass in each direction. Project design is scheduled to be completed in spring 2019, with construction lasting from summer 2019 to 2021.

MP 40 to MP 48 Reconstruction and Widening – Beginning in early 2013, the PTC started total roadway reconstruction and widening of eight miles of the PA Turnpike and replacement of six bridges crossing over the highway. With more than 40,000 cars and trucks traveling this stretch per day, it is one of the busiest parts of the Turnpike in the region. When complete, this project will tie directly into the newly constructed, three-lane Allegheny River Bridges completed in October 2010. The project is scheduled to be completed in late 2019.

MP 124 to MP 134 Reconstruction and Widening – This project includes the reconstruction and widening of approximately nine miles of the PA Turnpike, including some curve flattening on the mainline, replacement of three overhead bridges and three mainline bridges. Also included is the New Baltimore Slope Remediation project located from Milepost 127.9 (Tunnel Road) to Milepost 128.7 (0.3 miles West of Findley Street) in Allegheny Township, Somerset County. The widening of the Turnpike mainline will be completed in two construction contracts, one from Milepost 124.5 to Milepost 130.5 and one from Milepost 130.5 to Milepost 133.8. Upon completion of the projects, the Turnpike will be widened from 82 feet to 122 feet and will consist of six travel lanes (three in each direction) with a 26-foot median and 12-foot outside shoulders. The three overhead bridges have been replaced and the New Baltimore Slope Remediation is substantially complete. The turnpike widening schedule has yet to be determined.

MP 149.5 to MP 155.5 Reconstruction and Widening – The PTC plans to invest $150 million to provide for the total roadway reconstruction and widening of six miles of the PA Turnpike, which includes replacing or eliminating bridges. The project area begins at Milepost 149.5 east of the Bedford Interchange (Exit 146) and continues to Milepost 155.5 west of the Breezewood Interchange (Exit 161), in Snake Spring and West Providence Townships, Bedford County.

MP 202 to MP 206 Reconstruction and Widening – This project will reconstruct the existing roadway, shoulders, and median and add a third travel lane in each direction for a five-mile stretch just east of the Blue Mountain interchange in Cumberland County. Phase 1, which included construction of a third lane and shoulders in each direction was completed in December 2017. Phase

2, during which traffic will be shifted onto these outside lanes while the median and interior lanes are excavated and reconstructed, is ongoing and expected to be completed in December 2018.

MP 242 to MP 245 Reconstruction and Widening – This project involves widening the existing 4-lane highway to six lanes (three in each direction) with a 26-foot median from just east of the Harrisburg West interchange (MP 242) to the tie in to the new Susquehanna River Bridge Project (MP 245.4), which will complete six lanes from the Harrisburg West Interchange to the Harrisburg East Interchange (Exit 247). Two lanes of traffic in each direction will be maintained on the Turnpike at most times during construction. All mainline work being is expected to be completed in 2018.

4.1.2 Pennsylvania Turnpike I-276/I-95 Interchange Project

This is a major project that will be completed in three stages. The project includes the construction of a high-speed, full-access interchange between I-276 and a re-designated I-95, making I-95 continuous through the mid-Atlantic region. The project also includes roadway widening on I-276 from immediately west of Interchange 351 (Bensalem) eastward to the western side of the Delaware River Bridge. A new parallel bridge on I-276 will be constructed over the Delaware River. In addition, the project includes changes to the tolling locations and toll structure on I-276.

The following describes the three stages of the I-276/I-95 Interchange Project. Only Stage 1 is under active construction. Estimated traffic and toll revenue impacts associated with Stage 1 are included in this study. Stages 2 and 3 are described below only for informational purposes.

Stage 1: (Mile post 356 to 360), expected completion in 2018

- The new westbound mainline toll plaza on I-276 just west of the Delaware River Bridge was opened in January 2016. Tolls are collected based on a vehicle's number of axles.
- Simultaneously with the opening of the new westbound toll plaza, a new eastern terminus of the I-276/I-76 Ticket System opened. This new mainline toll plaza is located between the Street Road Interchange and I-95.
- I-276 roadway widening from Interchange 351 to the Delaware River Bridge was completed in 2017.
- New high-speed ramps between I-95 and I-276 (northbound I-95 to eastbound I-276, and westbound I-276 to southbound I-95) are anticipated to open in September 2018.

Stage 2 (MP 351 to MP 356) includes the remaining six ramp movements of the new interchange and completion of the mainline widening. This stage is not currently funded, although final design has continued on some contracts.

Stage 3 (MP 320) brings an additional bridge over the Delaware River parallel to the existing bridge. This stage is not funded and is unlikely to begin construction until after 2025.

4.1.3 Northeast Extension (I-476) Roadway Improvement Projects

MP A31 to MP A38 Total Reconstruction Project - This section of the Turnpike will be completely reconstructed from the ground up and widened from two lanes in each direction with limited shoulders to three lanes in each direction with 12-foot right and left shoulders. The overhead bridges along the project corridor are only wide enough to accommodate the current roadway width, so they need to be replaced before the mainline Turnpike widening can occur. Construction on the overhead bridges began in the spring of 2013. Construction on the mainline Turnpike recently began; the

opening of northbound and southbound traffic to three lanes in each direction is scheduled for late fall 2020. The anticipated completion of the entire project is expected to occur by early summer 2021.

Hawk Falls Bridge Replacement Project (MP 89) – The goal of this project is to completely replace the Hawk Falls Bridge and the Hickory Run Bridge. The bridge carries two lanes of Turnpike traffic, in each direction, over Mud Run in Penn Forest Township and Kidder Township, Carbon County. The new bridge will carry two traffic lanes and shoulders in each direction. The existing Hickory Run Bridge, directly to the north of the Hawk Falls Bridge, will also be replaced. This three-span mainline bridge, measuring 111' in length, carries the Turnpike over Hickory Run Road (SR 0534). Estimated project completion is June 2022.

4.1.4 Southern Beltway (Toll 576)

Findlay Connector Cashless Tolling Conversion - This project will convert the Findlay Connector (Toll 576) to a cashless tolling facility by constructing overhead gantries and demolishing existing toll facilities on exit ramps. This work is part of the PA Turnpike's conversion to cashless tolling on Toll 576, which will eventually connect to the Southern Beltway once work there is complete.

Southern Beltway – The current Toll 576, referred to as the Findlay Connector, runs six miles south from I-76 at Pittsburgh International Airport to U.S. 22. This section of highway was opened in 2006. The Southern Beltway project will extend Toll 576 another 13 miles southeast from U.S. 22 to I-79 near the Allegheny/Washington County line and include four new interchanges. The project is divided into nine construction segments, with the last one expected to be completed in summer 2021, when the highway will be opened to traffic. The entire length of Toll 576 will be a cashless tolling facility.

4.2 Construction Related Impacts on Turnpike System Traffic

Ongoing construction related impacts stemming from roadway widening and reconstruction projects on the Turnpike System are expected to be minimal. Construction projects on the Turnpike System are planned to minimize lane closures or any restrictions to the Turnpike. When such measures are necessary, they are conducted overnight to avoid interfering with heavier daytime traffic volumes. Generally, preference is given to Turnpike mainline traffic and construction-related disruptions are more likely to affect cross streets and Turnpike access points. Two travel lanes are maintained in both directions during construction activities.

For purposes of conservatism, the only positive traffic and toll revenue impacts that are included as part of this study are for the Mainline I-76/I-276 and I-95 Interchange Project and the opening of the Southern Beltway to I-79. As shown in Table 4-1, the partial I-95 Interchange project is assumed to open in September 2018; it is estimated to add approximately $6.5 million to total System toll revenue in the first full year of operation. The Southern Beltway toll road extension to I-79 is currently assumed to open in the summer of 2021. To be conservative from a toll revenue perspective, we have assumed a January 2022 opening date for this project. It is expected to add approximately $6.7 million to total System toll revenue in 2022.

4.3 Assumed Toll Rate Increases on the Turnpike

At the direction of the PTC, annual toll rate increases are assumed to occur on the entire Turnpike System. The toll rate increases are assumed to occur within several days of January 1 of each year. Table 4-2 presents actual and assumed percent increases in toll rates for each calendar year from 2015 through 2048.

As shown in Table 4-2, the assumed percent increases in toll rates are identical for cars and trucks, and for E-ZPass and cash transactions throughout the forecast period. Future toll-rate increases range from 3.0 to 6.0% per year between 2019 and 2048. Consistent with the PTC tolling policy, all E-ZPass tolls are rounded to the nearest cent, and cash toll rates are rounded up to the nearest nickel.

At the direction of the PTC, the toll rate increases shown in Table 4-2 were used in the development of the traffic and toll revenue forecasts, including the assumption that the percent toll rate increases are the same for both E-ZPass and cash transactions. The PTC reserves the right to implement toll rate differentials between E-ZPass and cash in future years.

Table 4-2
Actual and Assumed Future Toll Rate Increases (1)

Calendar Year	Percent Increase For Cars and Trucks		Sample Toll Rates (2)					
			$1.00 Toll		$2.50 Toll		$10.00 Toll	
	Cash	E-ZPass	Cash	E-ZPass	Cash	E-ZPass	Cash	E-ZPass
2015 (3)	5.0	5.0	$1.00	$1.00	$2.50	$2.50	$10.00	$10.00
2016 (3)	6.0	6.0	1.10	1.06	2.65	2.65	10.60	10.60
2017 (3)	6.0	6.0	1.20	1.12	2.85	2.81	11.25	11.24
2018 (3)	6.0	6.0	1.30	1.19	3.05	2.98	11.95	11.91
2019	6.0	6.0	1.40	1.26	3.25	3.16	12.70	12.62
2020	6.0	6.0	1.50	1.34	3.45	3.35	13.50	13.38
2021	5.0	5.0	1.60	1.41	3.65	3.52	14.20	14.05
2022	5.0	5.0	1.70	1.48	3.85	3.70	14.95	14.75
2023	5.0	5.0	1.80	1.55	4.05	3.89	15.70	15.49
2024	5.0	5.0	1.90	1.63	4.30	4.08	16.50	16.26
2025	5.0	5.0	2.00	1.71	4.55	4.28	17.35	17.07
2026	4.0	4.0	2.10	1.78	4.75	4.45	18.05	17.75
2027	3.5	3.5	2.20	1.84	4.95	4.61	18.70	18.37
2028	3.0	3.0	2.30	1.90	5.10	4.75	19.30	18.92
2029	3.0	3.0	2.40	1.96	5.30	4.89	19.90	19.49
2030	3.0	3.0	2.50	2.02	5.50	5.04	20.50	20.07
2031	3.0	3.0	2.60	2.08	5.70	5.19	21.15	20.67
2032	3.0	3.0	2.70	2.14	5.90	5.35	21.80	21.29
2033	3.0	3.0	2.80	2.20	6.10	5.51	22.50	21.93
2034	3.0	3.0	2.90	2.27	6.30	5.68	23.20	22.59
2035	3.0	3.0	3.00	2.34	6.50	5.85	23.90	23.27
2036	3.0	3.0	3.10	2.41	6.70	6.03	24.65	23.97
2037	3.0	3.0	3.20	2.48	6.95	6.21	25.40	24.69
2038	3.0	3.0	3.30	2.55	7.20	6.40	26.20	25.43
2039	3.0	3.0	3.40	2.63	7.45	6.59	27.00	26.19
2040	3.0	3.0	3.55	2.71	7.70	6.79	27.85	26.98
2041	3.0	3.0	3.70	2.79	7.95	6.99	28.70	27.79
2042	3.0	3.0	3.85	2.87	8.20	7.20	29.60	28.62
2043	3.0	3.0	4.00	2.96	8.45	7.42	30.50	29.48
2044	3.0	3.0	4.15	3.05	8.75	7.64	31.45	30.36
2045	3.0	3.0	4.30	3.14	9.05	7.87	32.40	31.27
2046	3.0	3.0	4.45	3.23	9.35	8.11	33.40	32.21
2047	3.0	3.0	4.60	3.33	9.65	8.35	34.45	33.18
2048	3.0	3.0	4.75	3.43	9.95	8.60	35.50	34.18

(1) Future toll rate increases are assumed to be implemented within several days of January 1.
(2) By PTC Policy, cash toll rates are rounded up to the nearest nickel and E-ZPass rates are rounded to the nearest penny.
(3) Reflects actual toll rate increases on the Turnpike System.

4.4 Estimated E-ZPass Market Shares in Future Years

Because a price differential has been established between cash and E-ZPass toll rates, it is important to estimate future year E-ZPass market shares in order to forecast gross toll revenues. Historically, cash and E-ZPass toll rates were virtually identical until 2011, differing only because cash rates were rounded up to the nearest nickel while E-ZPass rates were rounded up to the nearest cent. There was no reason for a customer to choose E-ZPass over cash based solely on the toll rate.

In 2011, 2012, 2013 and 2014, differential toll rate increases were implemented. As a result of these differential rate increases, cash toll rates are theoretically 39.5% greater than E-ZPass rates. The actual differential is even greater for lower price tolls due to the effect of rounding up to the nearest nickel for cash rates. The differential creates incentives for cash customers to shift to E-ZPass, and for new accounts to favor E-ZPass over cash.

Future year E-ZPass market shares were developed based on the assumed future toll rate increases shown in Table 4-2, and the historic trends in E-ZPass market share. Table 4-3 presents the actual percent E-ZPass market shares from calendar years 2011 through 2017, and the estimated percent E-ZPass market shares from 2018 through 2048 for passenger cars and commercial vehicles. Also shown are the percentage point increases in the E-ZPass market share over the prior year.

In 2011, the E-ZPass market share totaled 60.2% for passenger cars and 79.0% for commercial vehicles. By 2017, those values increased to 78.3% for passenger cars and 90.1% for commercial vehicles. A large portion of those increases were the direct result of increasing discounts for E-ZPass trips versus cash trips implemented from 2011 through 2014.

The estimated E-ZPass market shares for calendar years 2018 through 2048 continues to increase, but at a lower rate than in the recent past. This is because the toll differential is assumed to remain constant over this time period and because the E-ZPass market share is reaching its saturation point. In practical terms, there will likely always be customers who choose not to use E-ZPass. As shown in Table 4-3, by 2048 passenger car E-ZPass market share is estimated at 89.7% and the commercial vehicle market share is estimated to be 95.0%. For purposes of this analysis, it was assumed that the maximum E-ZPass market share would be 95.0%. Given the already high participation rate by commercial vehicles, they reach this level by 2030.

Table 4-3
Actual and Estimated E-ZPass Market Share
Pennsylvania Turnpike System

Calendar Year	Passenger Cars		Commercial Vehicles		Total Vehicles	
	Percent Market Share	Percent Increase in Market Share	Percent Market Share	Percent Increase in Market Share	Percent Market Share	Percent Increase in Market Share
2011 (1)	60.2		79.0		62.6	
2012 (1)	64.3	4.1	81.6	2.6	66.5	3.9
2013 (1)	68.8	4.5	84.2	2.6	70.8	4.3
2014 (1)	72.0	3.2	86.0	1.8	73.9	3.1
2015 (1)	73.9	1.9	87.8	1.8	75.8	1.9
2016 (1)	76.2	2.3	89.2	1.4	78.0	2.2
2017 (1)	78.3	2.1	90.1	0.9	79.9	1.9
2018 (2)	80.5	2.2	91.1	1.0	82.0	2.1
2019 (2)	81.9	1.4	91.9	0.8	83.3	1.3
2020 (2)	83.2	1.3	92.6	0.7	84.5	1.2
2021 (2)	84.2	1.0	93.1	0.5	85.5	1.0
2022 (2)	84.3	0.1	93.6	0.5	85.6	0.1
2023 (2)	85.0	0.7	94.1	0.5	86.3	0.7
2024 (2)	85.6	0.6	94.6	0.5	86.9	0.6
2025 (2)	86.2	0.6	94.8	0.2	87.4	0.5
2026 (2)	86.7	0.5	94.8	0.0	87.9	0.5
2027 (2)	87.2	0.5	94.9	0.1	88.3	0.4
2028 (2)	87.7	0.5	94.9	0.0	88.7	0.4
2029 (2)	88.1	0.4	94.9	0.0	89.1	0.4
2030 (2)	88.6	0.5	95.0	0.1	89.5	0.4
2031 (2)	88.9	0.3	95.0	0.0	89.8	0.3
2032 (2)	89.0	0.1	95.0	0.0	89.9	0.1
2033 (2)	89.1	0.1	95.0	0.0	90.0	0.1
2034 (2)	89.2	0.1	95.0	0.0	90.1	0.1
2035 (2)	89.3	0.1	95.0	0.0	90.1	0.0
2036 (2)	89.3	0.0	95.0	0.0	90.2	0.1
2037 (2)	89.4	0.1	95.0	0.0	90.2	0.0
2038 (2)	89.4	0.0	95.0	0.0	90.2	0.0
2039 (2)	89.5	0.1	95.0	0.0	90.3	0.1
2040 (2)	89.5	0.0	95.0	0.0	90.3	0.0
2041 (2)	89.5	0.0	95.0	0.0	90.3	0.0
2042 (2)	89.5	0.0	95.0	0.0	90.4	0.1
2043 (2)	89.6	0.1	95.0	0.0	90.4	0.0
2044 (2)	89.6	0.0	95.0	0.0	90.4	0.0
2045 (2)	89.6	0.0	95.0	0.0	90.4	0.0
2046 (2)	89.6	0.0	95.0	0.0	90.4	0.0
2047 (2)	89.7	0.1	95.0	0.0	90.5	0.1
2048 (2)	89.7	0.0	95.0	0.0	90.5	0.0

(1) Actual E-ZPass market share.
(2) Estimated E-ZPass market share.

4.5 Transaction and Gross Toll Revenue Forecasts

This section summarizes the forecasts of toll transactions and toll revenue based on the information provided in the preceding sections of this report. All previously discussed information regarding future transaction growth rates in the various Turnpike corridors (Chapter 3) as well as assumed toll rates, E-ZPass market share, etc. are all brought together to develop the following forecasts.

A more detailed approach was taken in developing the short term forecast over the next two calendar years (2018 and 2019). Forecasts were developed on monthly basis during these two years for passenger cars and commercial vehicles and for each Turnpike toll facility (Ticket System, Beaver Valley, Mon/Fayette Expressway, etc.). This accomplished two things. First it allowed us to take into account the most recent growth trends on all facilities. Second, it allowed us to create a "normal" calendar year by 2019, correcting for such things as adverse weather, the number of weekdays and weekend days in a month, and unique impacts such as the closure of the DRB in early 2017. Once a normalized 2019 was developed, the longer-term growth rates established through the socioeconomic analysis described in Chapter 3 were applied to it and all future years throughout the forecast period.

Table 4-4 shows the historical and near term forecast of toll transaction growth rates on the Turnpike in relation to actual and estimated GDP, GRP and GSP between 2010 and 2020. As shown, the recent low growth experience in 2017 (-0.9%) is estimated to continue over the short term, with total toll transactions forecasted to grow by only 0.0% in 2018 and -0.5% in 2019. This is in spite of estimated positive GDP, GRP and GSP growth (between 2.0% and 3.0%) over this same period. The low growth in 2017 was impacted by the 7-week closure of the DRB, but it is also likely that the effect of recent toll increases also dampened traffic growth. CDM Smith factored in continued low growth in 2018 and 2019 to account for the continued impact of toll increases. In addition, we have factored in negative growth in January and February 2019 to reflect more normal negative weather impacts. After 2019, we begin to factor in the longer-term growth rates established in Chapter 3, and factoring in the programed toll increases throughout the forecast period. Overall, total Turnpike System toll transaction growth is estimated to average just under 0.9% over the entire 30-year forecast period.

Table 4-4

Actual and Forecasted Measures of Commercial Activity and Growth in Total Turnpike System Transactions

Percent Change over Prior Year

				PA Turnpike System Percent Transaction Growth[2]		
Calendar Year	Gross Domestic Product Growth[1] (U.S.)	Gross Regional Product Growth[1] (NJ, NY, PA)	Gross State Product Growth[1] (PA)	Passenger Cars	Commercial Vehicles	All Vehicles
2010 (actual)	2.5%	2.6%	2.7%	1.0%	4.0%	1.3%
2011 (actual)	1.6	0.4	1.3	-1.1	1.0	-0.9
2012 (actual)	2.2	2.5	1.6	0.3	0.6	0.3
2013 (actual)	1.7	0.6	1.6	0.6	3.0	0.9
2014 (actual)	2.6	1.5	2.0	0.0	4.2	0.5
2015 (actual)	2.9	1.9	2.3	2.3	3.9	2.5
2016 (actual)	1.5	0.5	0.6	3.1	4.2	3.3
2017 (actual)	2.3	1.6	1.9	-1.1	0.2	-0.9
2018 (forecast)	3.0	3.0	3.0	-0.2	1.6	0.0
2019 (forecast)	2.6	2.0	2.2	-0.7	0.1	-0.5
2020 (forecast)	0.9	0.2	0.3	0.0	0.9	0.1

(1) The percent changes in U.S. GDP, GRP, and GSP are based on chained 2009 dollars. The U.S. GDP is actual through 2017. The GRP and GSP are actual through 2016. Actual data was obtained from the U.S. Bureau of Economic Analysis. Forecast data was from Moody's Analytics baseline forecast (April 2018 for regional, February 2018 for Pennsylvania).

Table 4-5 shows estimated Ticket System transactions and gross toll revenue through FY 2047-48. Actual data is shown for FY 2016-17 and for the first nine months of FY 2017-18 (through February 2018). As shown, total ticket toll transactions are estimated to increase from about 157.3 million in FY 2016-17 (the latest full year of actual experience) to just over 198.2 million by FY 2047-48; this represents a total increase over this period of 26.0% or an average annual growth rate of 0.75%. Annual gross toll revenue is estimated to increase from $1.0 billion in FY 2016-17 to just over $4.0 billion by FY 2047-48. This represents an average annual increase of about 4.6% and includes the impacts of normal growth, annual toll rate increases, and the impact of the I-95 Interchange.

Table 4-6 identifies the same transaction and gross toll revenue information for the Barrier System. As shown, total transactions are estimated to increase from about 43.2 million in FY 2016-17 to 62.1 million by FY 2047-48; this represents a total increase over this period of 43.7% or an average annual increase of about 1.18%. This is slightly greater than the rate of growth for the Ticket System but is positively impacted by the addition of the Southern Beltway extension to I-79 in January 2022. This adds two more mainline tolling zones to this corridor. Absent these two new tolling zones, average annual growth over the forecast period would have been about 0.70%. Estimated annual toll revenue is expected to increase from about $110.6 million in FY 2016-17 to $450.4 million by the end of the forecast period. This represents a 4.6% annual rate of increase. Again, this is influenced by normal growth, toll increases, and the impact of the Southern Beltway extension to I-79.

Table 4-7 identifies total combined transactions and gross toll revenue and also factors in estimated toll discounts and adjustments. The vast majority of the discounts and adjustments results from commercial account toll adjustments due to the Turnpike's volume discount program. The volume discount program allows for a 3.0% discount to be provided to accounts that accrue $20,000 or more in monthly tolls. Discounts and adjustments shown in Table 4-7 assume no further changes to the post-paid commercial volume discount program during the forecast period. The result is that the current forecasts have a negative adjustment applied for FY 2017-18 and beyond that equals 1.3% of the commercial vehicle gross toll revenue, which is based on the most recent 12 months of actual experience.

As shown in Table 4-7, total transactions increase from 200.5 million in FY 2016-17 to just over 260.3 million by FY 2047-48; this represents a total increase of about 30.0%, or an average annual increase of 0.85%, over the forecast period. Total net toll revenue, after discounts and adjustments, is estimated to grow from approximately $1.1 billion in FY 2016-17 to just under $4.5 billion by FY 2047-48, representing a 4.6% average annual rate of growth. This includes normal growth, toll increase impacts, additional revenue from the I-95 Interchange and Southern Beltway projects, and toll discounts and adjustments.

Table 4-5
Ticket System: Estimated Annual Transactions and Gross Toll Revenue (1)
Pennsylvania Turnpike Commission

Traffic and Toll Revenue in Thousands

Fiscal Year	Annual Traffic			Annual Gross Toll Revenue		
	Passenger Cars	Commercial Vehicles	Total Vehicles	Passenger Cars	Commercial Vehicles	Total Vehicles
2016-17 (2) (4)	135,128	22,179	157,307	$564,915	$439,495	$1,004,410
2017-18 (3)	134,129	22,408	156,537	598,105	472,972	1,071,077
2018-19 (5)	133,599	22,374	155,973	633,248	499,276	1,132,524
2019-20	133,412	22,527	155,939	671,305	531,859	1,203,164
2020-21	133,773	22,728	156,501	711,251	565,746	1,276,997
2021-22	134,685	22,978	157,663	751,554	599,878	1,351,432
2022-23	135,928	23,256	159,183	795,590	636,850	1,432,440
2023-24	137,132	23,532	160,664	841,671	676,000	1,517,670
2024-25	138,413	23,818	162,231	890,797	717,976	1,608,773
2025-26	139,936	24,125	164,061	940,670	760,445	1,701,115
2026-27	141,553	24,430	165,983	985,925	799,239	1,785,164
2027-28	143,137	24,720	167,857	1,027,955	835,336	1,863,291
2028-29	144,685	25,009	169,695	1,067,694	870,468	1,938,162
2029-30	146,203	25,298	171,501	1,108,561	906,942	2,015,504
2030-31	147,687	25,587	173,274	1,151,269	944,806	2,096,076
2031-32	149,157	25,875	175,033	1,197,183	984,113	2,181,296
2032-33	150,613	26,163	176,776	1,245,743	1,024,916	2,270,659
2033-34	152,018	26,451	178,469	1,295,726	1,067,273	2,362,999
2034-35	153,382	26,739	180,120	1,347,237	1,111,254	2,458,491
2035-36	154,707	27,027	181,734	1,400,330	1,156,926	2,557,256
2036-37	156,009	27,310	183,318	1,455,206	1,204,091	2,659,296
2037-38	157,224	27,584	184,808	1,511,294	1,252,670	2,763,964
2038-39	158,398	27,859	186,257	1,569,031	1,303,100	2,872,131
2039-40	159,554	28,134	187,688	1,628,713	1,355,455	2,984,168
2040-41	160,689	28,410	189,099	1,690,343	1,409,816	3,100,159
2041-42	161,796	28,687	190,483	1,753,937	1,466,264	3,220,202
2042-43	162,870	28,965	191,835	1,819,457	1,524,879	3,344,336
2043-44	163,916	29,244	193,160	1,887,030	1,585,753	3,472,783
2044-45	164,936	29,524	194,460	1,956,723	1,648,967	3,605,690
2045-46	165,928	29,805	195,733	2,028,563	1,714,605	3,743,168
2046-47	166,905	30,087	196,992	2,102,783	1,782,770	3,885,552
2047-48	167,869	30,371	198,240	2,179,492	1,853,568	4,033,060

(1) Annual toll rate increases are implemented in January of each year (see Table 4-2).

(2) Reflects actual traffic and revenue experience.

(3) Reflects actual experience through February 2018.

(4) The Delaware River Bridge was closed due to structural integrity concerns from January 20, 2017 to March 9, 2017.

(5) Reflects the impacts for I-95 Interchange Stage 1 beginning in September 2018.

Table 4-6
Barrier Systems: Estimated Annual Transactions and Gross Toll Revenue (1)
Pennsylvania Turnpike Commission

Traffic and Toll Revenue in Thousands

	Annual Traffic			Annual Gross Toll Revenue		
Fiscal Year	Passenger Cars	Commercial Vehicles	Total Vehicles	Passenger Cars	Commercial Vehicles	Total Vehicles
2016-17 (2) (4)	37,671	5,524	43,195	$73,872	$36,694	$110,566
2017-18 (3) (5)	38,035	5,955	43,989	78,464	41,223	119,687
2018-19 (6)	37,302	5,950	43,252	81,686	43,778	125,464
2019-20	37,065	6,020	43,084	86,357	47,391	133,748
2020-21	36,984	6,089	43,073	91,059	50,866	141,925
2021-22 (7)	39,380	6,423	45,803	97,662	54,886	152,548
2022-23	43,538	6,982	50,520	106,192	59,651	165,844
2023-24	44,579	7,159	51,738	112,616	63,672	176,288
2024-25	45,478	7,318	52,796	119,363	67,894	187,257
2025-26	46,198	7,448	53,646	126,061	71,996	198,058
2026-27	46,818	7,561	54,379	132,178	75,666	207,844
2027-28	47,202	7,641	54,843	137,722	78,999	216,721
2028-29	47,585	7,721	55,306	143,030	82,241	225,271
2029-30	47,945	7,799	55,744	148,412	85,603	234,015
2030-31	48,286	7,876	56,162	153,936	89,086	243,022
2031-32	48,619	7,952	56,571	159,617	92,690	252,308
2032-33	48,941	8,028	56,969	165,446	96,415	261,861
2033-34	49,254	8,103	57,357	171,451	100,275	271,726
2034-35	49,559	8,178	57,737	177,687	104,279	281,967
2035-36	49,855	8,253	58,108	184,160	108,434	292,594
2036-37	50,143	8,327	58,470	190,827	112,727	303,553
2037-38	50,420	8,400	58,820	197,668	117,147	314,815
2038-39	50,695	8,473	59,168	204,724	121,725	326,449
2039-40	50,969	8,546	59,516	212,023	126,474	338,497
2040-41	51,240	8,619	59,860	219,566	131,401	350,966
2041-42	51,505	8,692	60,198	227,337	136,507	363,845
2042-43	51,762	8,765	60,527	235,334	141,800	377,134
2043-44	52,013	8,837	60,850	243,568	147,287	390,855
2044-45	52,257	8,909	61,166	252,049	152,975	405,024
2045-46	52,494	8,981	61,475	260,776	158,871	419,647
2046-47	52,725	9,052	61,777	269,765	164,983	434,748
2047-48	52,951	9,124	62,075	279,034	171,319	450,353

(1) Annual toll rate increases are implemented in January of each year (see Table 4-2).
(2) Reflects actual traffic and revenue experience.
(3) Reflects actual experience through February 2018.
(4) The Delaware River Bridge was closed due to structural integrity concerns from January 20, 2017 to March 9, 2017.
(5) Reflects Northeast Extension Barrier and PA I-576 conversion to cashless tolling beginning in April 2018.
(6) Reflects the impacts for I-95 Interchange Stage 1 beginning in September 2018.
(7) Reflects opening of the Southern Beltway between US 22 and I-79 beginning in January 2022.

Table 4-7
Total System: Estimated Annual Transactions and Gross Toll Revenue (1)
Pennsylvania Turnpike Commission

Traffic and Toll Revenue in Thousands

	Annual Traffic			Annual Gross Toll Revenue			Discounts	
Fiscal Year	Passenger Cars	Commercial Vehicles	Total Vehicles	Passenger Cars	Commercial Vehicles	Total Vehicles	and Adjustments (8)	Net Toll Revenue
2016-17 (2) (4)	172,799	27,703	200,501	$638,787	$476,188	$1,114,975	($3,915)	$1,111,061
2017-18 (3) (5)	172,164	28,363	200,527	676,570	514,194	1,190,764	(6,685)	1,184,080
2018-19 (6)	170,901	28,324	199,225	714,934	543,054	1,257,989	(7,060)	1,250,929
2019-20	170,477	28,547	199,024	757,662	579,250	1,336,913	(7,530)	1,329,382
2020-21	170,757	28,817	199,574	802,310	616,612	1,418,922	(8,016)	1,410,906
2021-22 (7)	174,066	29,401	203,467	849,216	654,764	1,503,980	(8,512)	1,495,468
2022-23	179,466	30,237	209,703	901,782	696,502	1,598,284	(9,055)	1,589,229
2023-24	181,712	30,691	212,402	954,287	739,671	1,693,958	(9,616)	1,684,343
2024-25	183,891	31,136	215,027	1,010,161	785,869	1,796,030	(10,216)	1,785,814
2025-26	186,134	31,573	217,707	1,066,731	832,441	1,899,172	(10,822)	1,888,350
2026-27	188,371	31,991	220,362	1,118,104	874,905	1,993,009	(11,374)	1,981,635
2027-28	190,339	32,361	222,700	1,165,677	914,335	2,080,013	(11,886)	2,068,126
2028-29	192,271	32,730	225,001	1,210,723	952,709	2,163,433	(12,385)	2,151,047
2029-30	194,148	33,097	227,245	1,256,973	992,545	2,249,518	(12,903)	2,236,615
2030-31	195,974	33,463	229,436	1,305,205	1,033,893	2,339,098	(13,441)	2,325,657
2031-32	197,776	33,827	231,603	1,356,800	1,076,804	2,433,604	(13,998)	2,419,605
2032-33	199,554	34,191	233,745	1,411,190	1,121,330	2,532,520	(14,577)	2,517,943
2033-34	201,272	34,554	235,826	1,467,177	1,167,548	2,634,725	(15,178)	2,619,547
2034-35	202,940	34,917	237,857	1,524,924	1,215,534	2,740,458	(15,802)	2,724,656
2035-36	204,562	35,280	239,842	1,584,489	1,265,360	2,849,849	(16,450)	2,833,400
2036-37	206,151	35,637	241,788	1,646,032	1,316,818	2,962,850	(17,119)	2,945,731
2037-38	207,644	35,984	243,628	1,708,962	1,369,817	3,078,779	(17,808)	3,060,971
2038-39	209,093	36,332	245,424	1,773,755	1,424,825	3,198,580	(18,523)	3,180,057
2039-40	210,524	36,680	247,204	1,840,736	1,481,930	3,322,666	(19,265)	3,303,400
2040-41	211,929	37,030	248,959	1,909,909	1,541,216	3,451,125	(20,036)	3,431,090
2041-42	213,302	37,379	250,681	1,981,275	1,602,771	3,584,046	(20,836)	3,563,210
2042-43	214,632	37,730	252,362	2,054,791	1,666,679	3,721,470	(21,667)	3,699,804
2043-44	215,929	38,081	254,010	2,130,598	1,733,040	3,863,638	(22,530)	3,841,108
2044-45	217,194	38,433	255,627	2,208,771	1,801,942	4,010,714	(23,425)	3,987,289
2045-46	218,422	38,786	257,208	2,289,339	1,873,476	4,162,815	(24,355)	4,138,460
2046-47	219,630	39,140	258,770	2,372,548	1,947,752	4,320,300	(25,321)	4,294,979
2047-48	220,821	39,495	260,315	2,458,526	2,024,887	4,483,412	(26,324)	4,457,089

(1) Annual toll rate increases are implemented in January of each year (see Table 4-2).
(2) Reflects actual traffic and revenue experience.
(3) Reflects actual experience through February 2018.
(4) The Delaware River Bridge was closed due to structural integrity concerns from January 20, 2017 to March 9, 2017.
(5) Reflects Northeast Extension Barrier and PA I-576 conversion to cashless tolling beginning in April 2018.
(6) Reflects the impacts for I-95 Interchange Stage 1 beginning in September 2018.
(7) Reflects opening of the Southern Beltway between US 22 and I-79 beginning in January 2022.
(8) No changes are assumed in the commercial discount program throughout the forecast period. Impacts are assumed to remain constant at -1.3% of total gross commercial toll revenue, which is based on actual experience during the most recent fiscal year.

Fiduciary Disclaimer

Current accepted professional practices and procedures were used in the development of these updated traffic and revenue forecasts. However, as with any forecast of the future, there may be differences between forecasted and actual results caused by events and circumstances beyond the control of CDM Smith. In formulating its forecasts, CDM Smith has reasonably relied upon the accuracy and completeness of information provided (both written and oral) by the PTC and other local and state agencies. CDM Smith also has relied upon the reasonable assurances of some independent parties and is not aware of any facts that would make such information misleading.

CDM Smith has made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue forecasts 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 to partial information extracted from this report.

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

While CDM Smith believes that some of the projections or other forward-looking statements contained within the report are based on reasonable assumptions as of the date in 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.

CDM Smith is not, and has not been, a municipal advisor as defined in Federal law (the Dodd Frank Bill) to the PTC and does not owe a fiduciary duty pursuant to Section 15B of the Exchange Act to PTC with respect to the information and material contained in this report. CDM Smith is not recommending and has not recommended any action to the PTC. PTC 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.