Appendix B:

ADDRESSING US 422 USER NEEDS: THE HIGHWAY COMPONENT REPORT

WHITE PAPER

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422 CORRIDOR plus

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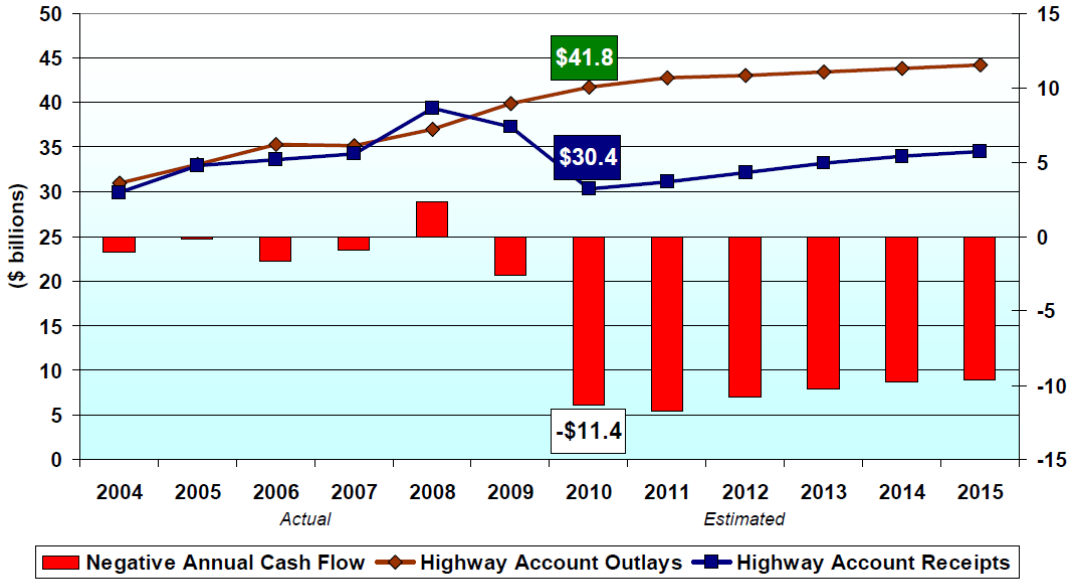
1 Introduction

1.1 Introduction

The Pennsylvania Department of Transportation (PennDOT) must regularly refine priorities to allocate the limited transportation dollars in the Commonwealth. The US 422 corridor is constantly competing with other facilities in the state for significant capital improvements to maintain aging infrastructure. Pennsylvania relies on both state and federal dollars for a significant share of its yearly highway program. In recent years available funding has fluctuated widely in a downward trend, reflecting the economy, swings in gas prices, construction costs, diminishing fuel tax revenues and increasing vehicle fuel economy. Figure 1.1-1 demonstrates the gap between dedicated federal transportation revenue versus total amount of expended for Highway Trust Fund purposes.

Figure 1.1-1: Highway Account for the Highway Trust Fund: Receipts and Outlay Discrepancy[1]



*Excludes $8.017 billion transfer from General Fund to Highway Account of HTF in September 2008.
**Excludes $7 billion transfer from General Fund to Highway Account of HTF in August 2009.

State highways comprise about 1/3 of the roads (but 76% of the daily miles traveled) in the Commonwealth. Every state in the United States has its own combination of taxes to fund its transportation projects and provide the necessary match to secure federal dollars. In Pennsylvania funding for highways and bridges is primarily derived from a mix of user-fees and other dedicated and non-dedicated general revenues. The State Motor License Fund (MLF) is a dedicated transportation fund that collects a variety of

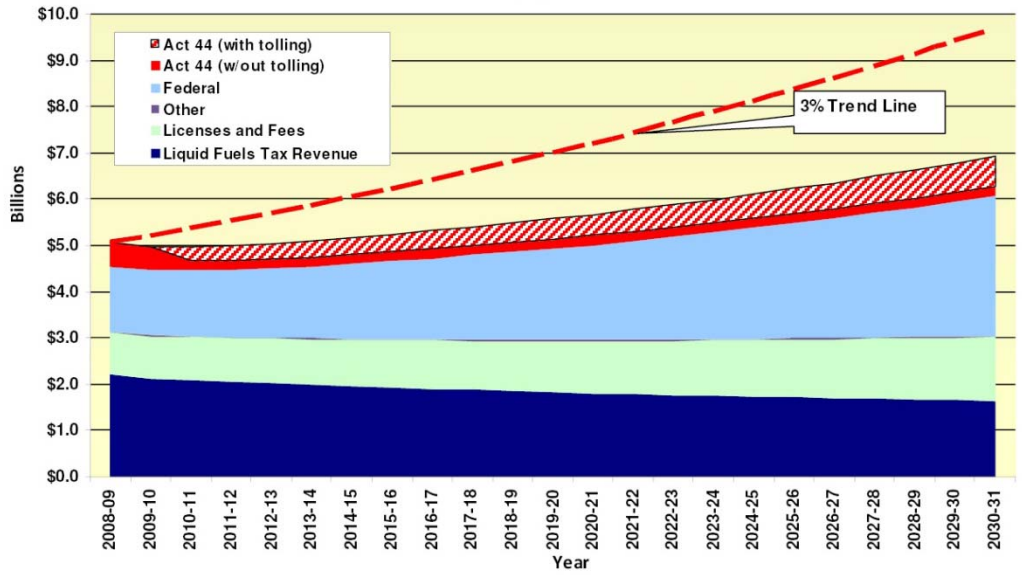
[1] Lee, Joung H. January 20, 2010. "AASHTO Update on Funding and Authorization." Presentation given as part of the NARC Transportation Finance Subcommittee Webinar.

revenue sources including gas tax, aviation fuel tax, diesel fuel tax, oil company franchise taxes and motor licenses and fees as well as, since 2007, contributions from the Pennsylvania Turnpike Commission. The Pennsylvania Constitution prohibits the use of fund revenues for any transit or rail improvements. Funds from toll revenue are outside of this prohibition and can be used on transit or rail capital improvements.

The Pennsylvania State Transportation Advisory Committee's (STAC) 2010 Transportation Funding Study documented a **$3.5 billion annual shortfall** between what is needed for the state's transportation infrastructure and what can be expected today from existing funding sources. Two regionally initiated studies released in 2009, the *US 422 Corridor Master Plan* and the *R6 Norristown Line Service Extension Study*, each sounded an alarm that increasing congestion and growing mobility needs along the US 422 corridor would not be adequately addressed in a timely manner if the region solely relied on traditional sources of state and federal funds. The STAC study listed potential additional revenue generators including raising, broadening application, and/or indexing to inflation state sales taxes, tolling more roads, fuel taxes and vehicle fees and charging individuals fees based on vehicle miles traveled. It should be noted that if actions were taken on any of these options the revenue generated would not be exclusive to the US 422 corridor.

As shown in Figure 1.1-2 fuel tax revenues are expected to decline over the next 20 to 25 years while the trend line for needed transportation improvements creates a wider and wider gap with available funds. It should be noted that the gap is anticipated to increase due to the federal government not permitting tolling on interstate highways.

Figure 1.1-2: Pennsylvania Highway Revenue Projections for 2008 to 2030[2]



[2] Pennsylvania State Transportation Advisory Committee. May 2010. Transportation Funding Study.

If resources to improve and maintain the 25 miles of US 422 between US 202 and PA 662 (Old Swede Road) were unconstrained by current programmed public dollars, US 422 would likely see substantial operational, capacity and maintenance improvements over the next 50 years.

The Highway Capital Improvement Program (HCIP) outlined in this document was developed in consultation with Berks, Chester and Montgomery Counties along with PennDOT based on the priorities established through the current transportation development process. The HCIP, which could be implemented by a new tolling authority, is an accelerated improvement program aimed at increasing safety and reducing congestion within the US 422 corridor. If toll revenue were to be dedicated to improving the US 422 corridor, substantial improvements to relieve traffic congestion and improve the current road conditions would be advanced much more quickly than the projects programmed under the PennDOT's federally-approved Transportation Improvement Program (TIP).

Design and construction of two key safety and capacity improvement projects in the corridor, the Pottstown Bypass in the west and the River Crossing Complex (RCC) in the east, have been delayed for several years due to lack of funding for highway infrastructure in the region. Over the next several decades, maintenance, rehabilitation and reconstruction will be required for US 422, consisting of 25 miles of roadway and 60 structures.

1.2 Project History

In 1964, the Pennsylvania Department of Highways proposed the "Relocated US 422" (or "Schuylkill Expressway Extension"), which was to follow the Schuylkill River from the I-76 / US 202 interchange near Valley Forge National Historic Park northwest to Pottstown and Reading. The Delaware Valley Regional Planning Commission (DVRPC) recommended the US 422 Expressway, which was to feature three bridges over the Schuylkill River, for immediate construction as a high-priority route.

Conceived as a bypass for the existing US 422, the $58 million expressway was to relieve congestion along Ridge Pike and Germantown Pike, both two-lane roads that run from Pottstown through Montgomery County to Philadelphia. The expressway was designed with four 12-foot-wide lanes (two in each direction), standard-width shoulders and a variable median.

Construction of the highway began in 1965 on the 2.5-mile-long section from the US 202 Expressway in King of Prussia to PA 363 (Trooper Road) in Betzwood, along with the Betzwood Bridge over the Schuylkill River. The four-lane expressway opened to traffic in 1967 along with a second section called the "Pottstown Bypass", an 8.4 mile portion connecting the existing US 422 in Douglassville, Berks County with Evergreen Road in Sanatoga (Pottstown), Montgomery County. This section, which dips for several miles into Chester County, included the completion of the Kenilworth and Bramcote bridges over the Schuylkill River.[3]

PennDOT began construction of a 5.4-mile-long section from PA 29 (Phoenixville / Collegeville) in Collegeville west to Limerick / Linfield (Lewis Road) in Linfield (Royersford) in 1975. This section opened to traffic three years later. Construction began for the two missing links on US 422 in 1981 - the 6.4-mile-long section from PA 363 (Trooper Road) to PA 29 (Phoenixville / Collegeville), and the 2.6-mile-long section from Limerick / Linfield (Lewis Road) to Sanatoga (Evergreen Road).[4] In 1984, the Betzwood-Collegeville section opened to traffic, followed one year later by the completion of the Linfield-Sanatoga section.[5]

The portion of US 422 approaching the US 202 Interchange in Tredyffrin Township was widened from two to four eastbound lanes during the early 2000's, when the US 202 and US 422 Interchange was rebuilt.[6] During the 1990's, PennDOT made improvements to the existing four-lane divided arterial between the western end of the Pottstown Expressway in Douglasville and the eastern end of the West Shore Bypass in Reading. This project included the installation of a new concrete ("Jersey") barrier, improvements to signalized intersections, and the construction of new jug handles to eliminate left-turn movements.

Exhibit 14, US 422 Project History, in Appendix G, *Supplemental Exhibits*, identifies the limited access highway and the projects that have been constructed from the years 1967 to 2010.

1.3 Purpose and Need

The overall goal of 422*plus* is to investigate whether a new funding source, specifically tolling, could generate sufficient revenue along the 25-mile corridor to advance highway improvements and invest in the infrastructure necessary for a new transit extension project to relieve congestion within Berks, Chester and Montgomery Counties.

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[3] "Six-Year Improvement Program (1967-1973)," Pennsylvania Department of Highways (1967).

[4] "Panel OK's Use of Road Funds," The Philadelphia Inquirer (7/17/1981).

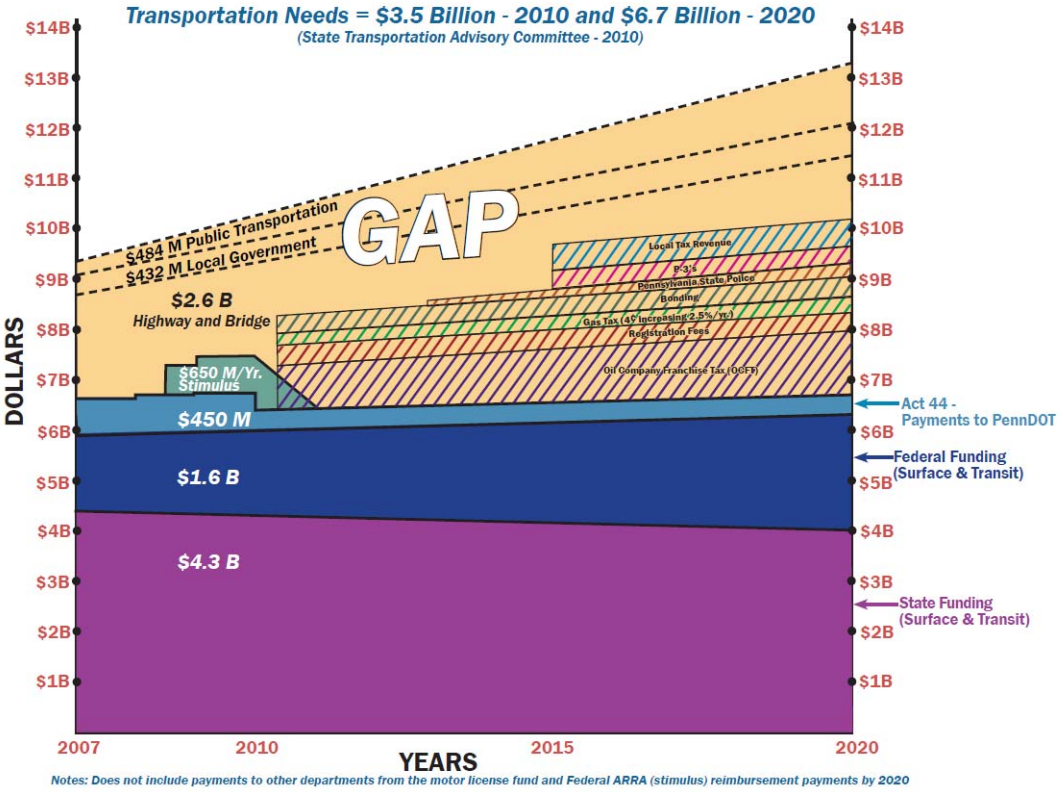
[5] "Schuylkill Carries the Load of Many Roads Left Unbuilt" by Paul Nussbaum, The Philadelphia Inquirer (8/19/1984).

[6] "Rebuilding US 202 (Section 400) Today for a Better Tomorrow," Pennsylvania Department of Transportation (1997).

Traditionally, as noted previously, the primary funding source for the MLF is the gas tax. Although gas prices have steadily increased, the Pennsylvania gas tax, which does not adjust with inflation, has not increased since 1997. Less gas tax revenue is collected as vehicles become increasingly more fuel efficient. Gas consumption has decreased at 1.3% annually since 2004 while the cost of construction and land acquisition has steadily increased. This results in an increasingly larger gap between available revenues and needed funds.[7]

Short term revenue sources, such as, the American Recovery and Reinvestment Act (ARRA) provided some relief in recent years, but the funding gap is anticipated to be $6.7 billion by the year 2020.[8] Figure 1.3-1 illustrates the funding gap in the Commonwealth of Pennsylvania if no additional funding source is identified

Figure 1.3-1: Commonwealth of Pennsylvania Transportation Funding Needs



[7] Rendell, Edward G. and Daniel Hassell, Pennsylvania Tax Compendium, Pennsylvania Department of Revenue, December 2010.

[8] Pennsylvania State Transportation Advisory Committee, Transportation Funding Study: Executive Summary, May 2010.

According to the *Transportation Funding Study*, a $3.1 billion and $5.4 billion funding gap was identified for highway and bridge projects in the Years 2010 and 2020, respectively. The gaps were identified by focusing on highways, bridges and public transportation needs, evaluating current funding practices and economic conditions. Table 1.3-1 further categorizes the funding gaps demonstrating the variety of projects that will not be constructed under current fiscal constraints.[9]

Table 1.3-1: Unmet Funds for Highway and Bridge Needs

Summary of Existing Annual Unmet Highway and Bridge Needs (millions)			
State System			
Category	FY 2010-11	FY 2019-2020	FY 2029-2030
Pavements	$1,761	$2,731	$4,450
Bridges	$370	$1,290	$920
Congestion Management	$70	$91	$227
Safety	$75	$116	$190
Capacity	$300	$465	$758
TOTAL	$2,576	$4,693	$6,545
Local System			
Category	FY 2010-11	FY 2019-2020	FY 2029-2030
Roads & Bridges	$250	$388	$632
Traffic Signals	$182	$282	$460
TOTAL	$432	$670	$1,092

The current funding for PennDOT projects on the *DVRPC FY 2011-2014 Transportation Improvement Program (TIP) for Pennsylvania*[10] includes anticipated funding for highway improvements between the years 2011 and 2022. Projects identified in the first eight years of the TIP are constrained. Funding for the following 9 to 12 years, in this case years 2019 to 2022, are projected to prioritize future projects. Due to future projects not being fiscally constrained, the level of certainty that the funding will be available diminishes with each year. The Pennsylvania TIP is updated every two years to reassess fiscal constraints and planned projects.

For the purposes of this study, given (1) the long lead time and long standing commitment to current projects underway from concept through construction and (2) the lead time and additional investments necessary to firmly establish a new tolling authority, it was presumed that projects in the first eight (8) year period will continue to be funded in the typical PennDOT TIP process. Six (6) projects within the US 422

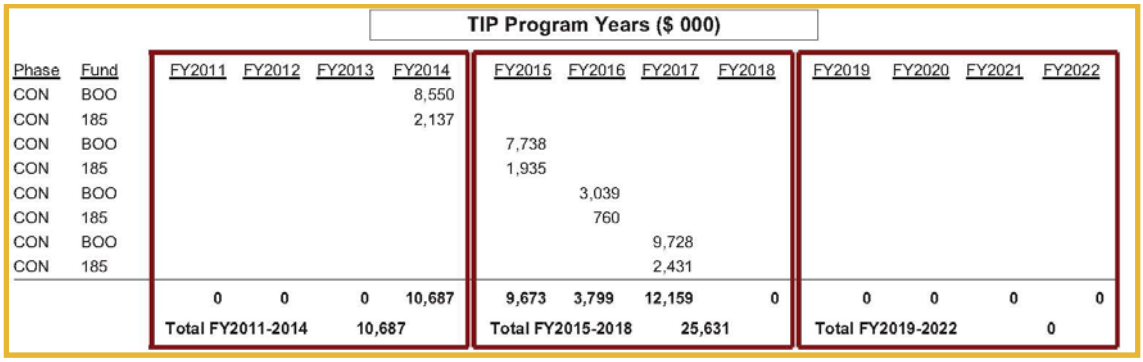
[9] Pennsylvania State Transportation Advisory Committee, Transportation Funding Study: Final Report, May 2010.

[10] Statewide FY2011 Transportation Improvement Program (STIP), July 2010.

corridor are funded on the current TIP from the years 2011 to 2018, and therefore are assumed to be PennDOT funded in the context of the US 422 HCIP.

Figures 1.3-2 to 1.3-7, below and on the following pages, are a duplication of the current TIP information for the six (6) projects assumed to be PennDOT funded. These projects account for approximately a $243 million investment in US 422 highway improvements.

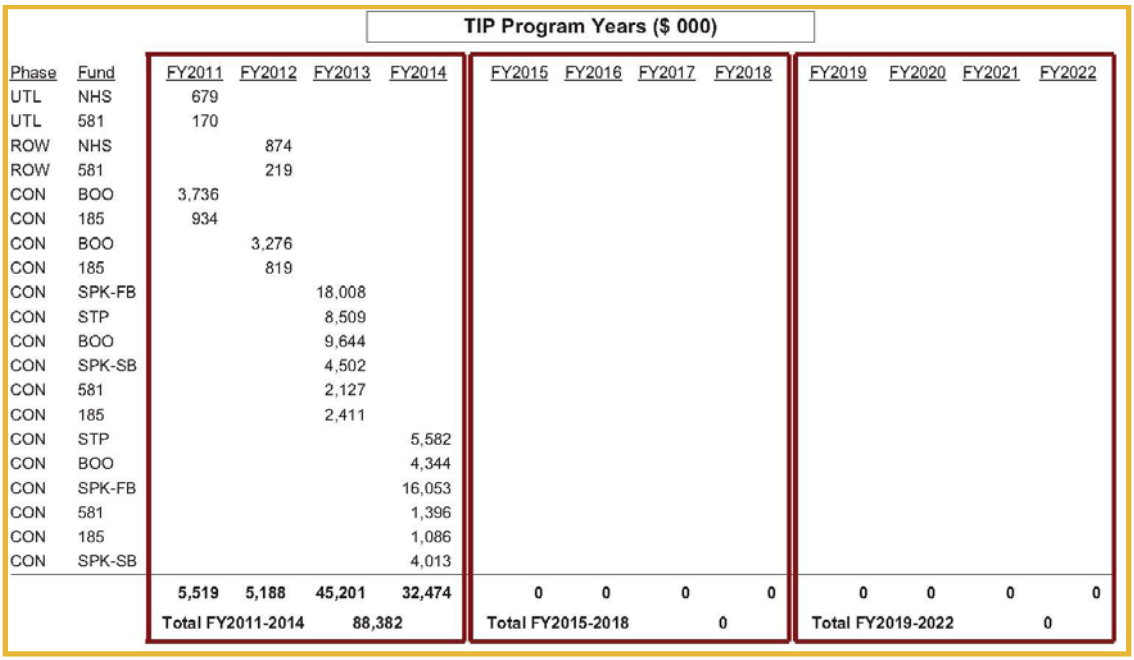
Figure 1.3-2: MPMS #66986 – US 422 over Schuylkill River (M2A)



TIP Program Years ($ 000)

Phase	Fund	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
CON	BOO				8,550								
CON	185				2,137								
CON	BOO					7,738							
CON	185					1,935							
CON	BOO						3,039						
CON	185						760						
CON	BOO							9,728					
CON	185							2,431					
		0	0	0	10,687	9,673	3,799	12,159	0	0	0	0	0
		Total FY2011-2014			10,687	Total FY2015-2018			25,631	Total FY2019-2022			0

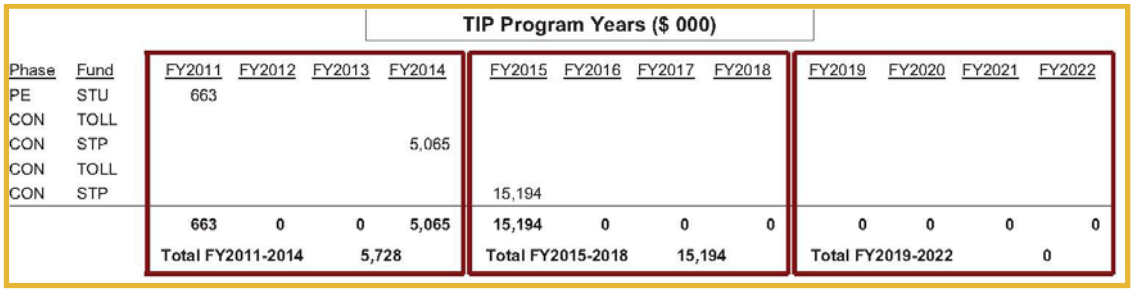
Figure 1.3-3: MPMS #64222 – US 422 Reconstruction (M1A)



TIP Program Years ($ 000)

Phase	Fund	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
UTL	NHS	679											
UTL	581	170											
ROW	NHS		874										
ROW	581		219										
CON	BOO	3,736											
CON	185	934											
CON	BOO		3,276										
CON	185		819										
CON	SPK-FB			18,008									
CON	STP			8,509									
CON	BOO			9,644									
CON	SPK-SB			4,502									
CON	581			2,127									
CON	185			2,411									
CON	STP				5,582								
CON	BOO				4,344								
CON	SPK-FB				16,053								
CON	581				1,396								
CON	185				1,086								
CON	SPK-SB				4,013								
		5,519	5,188	45,201	32,474	0	0	0	0	0	0	0	0
		Total FY2011-2014			88,382	Total FY2015-2018			0	Total FY2019-2022			0

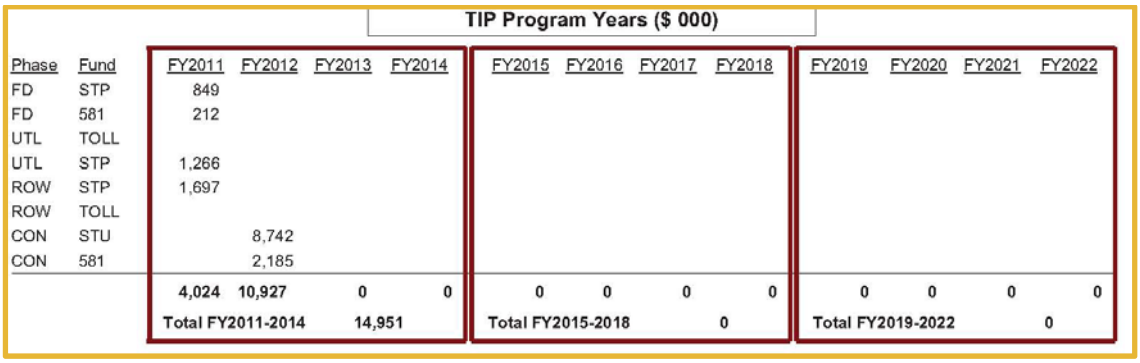
Figure 1.3-4: MPMS #86924 – US 422 Reconstruction (PM2)



TIP Program Years ($ 000)

Phase	Fund	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
PE	STU	663											
CON	TOLL												
CON	STP				5,065								
CON	TOLL												
CON	STP					15,194							
		663	0	0	5,065	15,194	0	0	0	0	0	0	0
		Total FY2011-2014			5,728	Total FY2015-2018			15,194	Total FY2019-2022			0

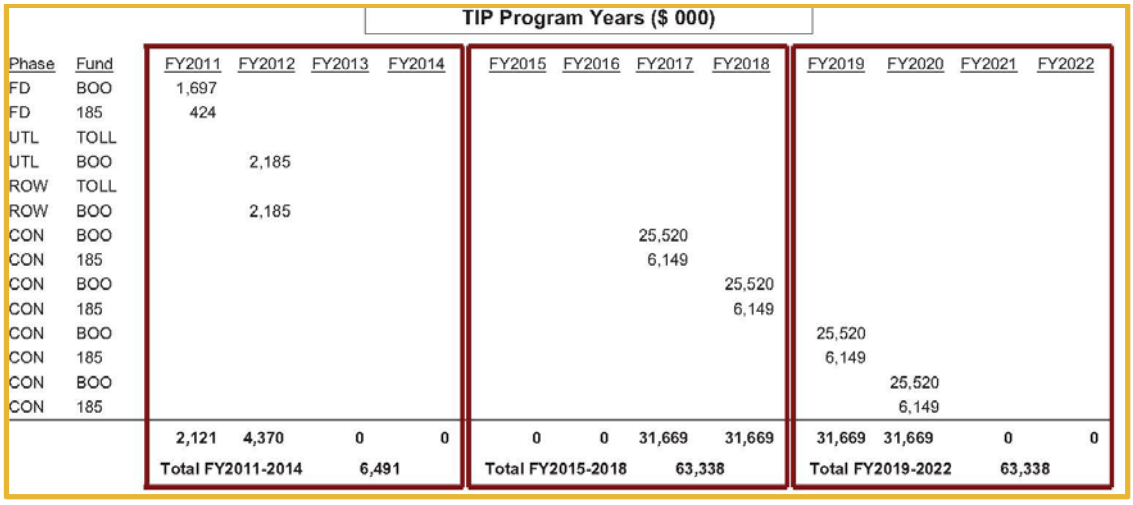
Figure 1.3-5: MPMS #64796 – US 422 / PA 363 (Trooper Road) Interchange (4TR)



TIP Program Years ($ 000)

Phase	Fund	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
FD	STP	849											
FD	581	212											
UTL	TOLL												
UTL	STP	1,266											
ROW	STP	1,697											
ROW	TOLL												
CON	STU		8,742										
CON	581		2,185										
		4,024	10,927	0	0	0	0	0	0	0	0	0	0
		Total FY2011-2014			14,951	Total FY2015-2018			0	Total FY2019-2022			0

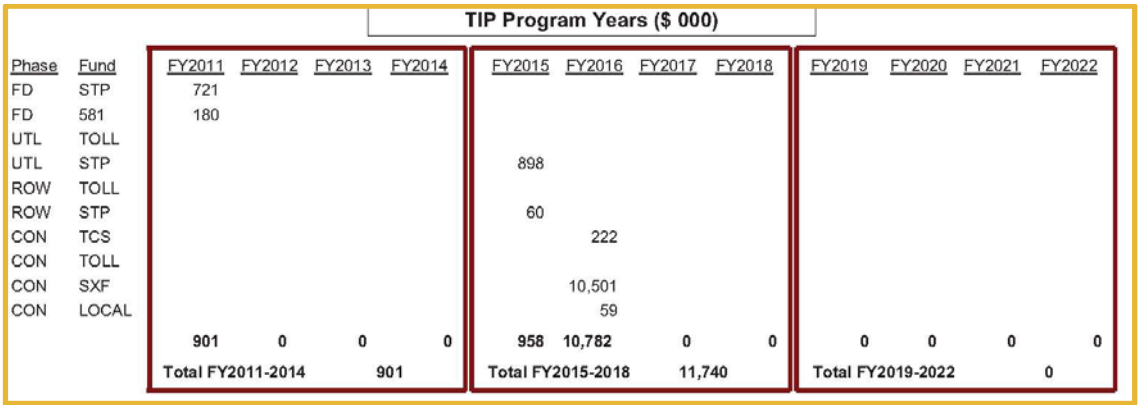
Figure 1.3-6: MPMS #70197 – US 422 over the Schuylkill River (SRB)



TIP Program Years ($ 000)

Phase	Fund	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
FD	BOO	1,697											
FD	185	424											
UTL	TOLL												
UTL	BOO		2,185										
ROW	TOLL												
ROW	BOO		2,185										
CON	BOO							25,520					
CON	185							6,149					
CON	BOO								25,520				
CON	185								6,149				
CON	BOO									25,520			
CON	185									6,149			
CON	BOO										25,520		
CON	185										6,149		
		2,121	4,370	0	0	0	0	31,669	31,669	31,669	31,669	0	0
		Total FY2011-2014			6,491	Total FY2015-2018			63,338	Total FY2019-2022			63,338

Figure 1.3-7: MPMS #66952 – PA 23 (Valley Forge Road) (2NG)

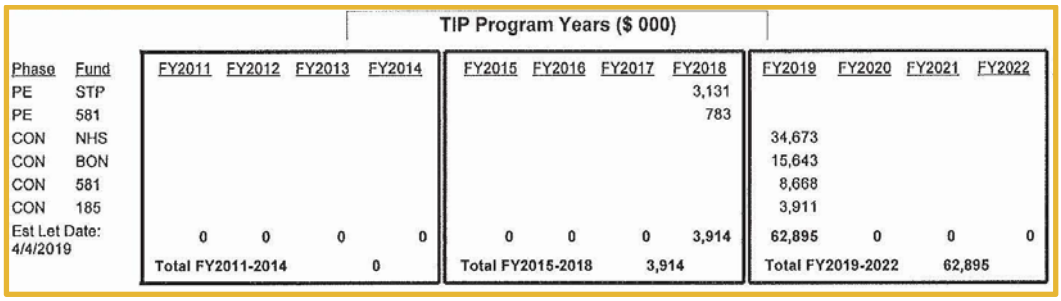


TIP Program Years ($ 000)

Phase	Fund	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
FD	STP	721											
FD	581	180											
UTL	TOLL												
UTL	STP					898							
ROW	TOLL												
ROW	STP					60							
CON	TCS						222						
CON	TOLL												
CON	SXF						10,501						
CON	LOCAL						59						
		901	**0**	**0**	**0**	**958**	**10,782**	**0**	**0**	**0**	**0**	**0**	**0**
		Total FY2011-2014			**901**	**Total FY2015-2018**			**11,740**	**Total FY2019-2022**			**0**

The FY 2011-2014 TIP became official for Montgomery and Chester Counties on October 1, 2010. Three (3) preliminary identified projects were not included on the current TIP due to lack of identified funding sources. Figures 1.3-8 to 1.3-10 demonstrate the funding required for the three (3) projects. In addition, Figure 1.3-6, on the previous page, includes $63 Million of funding still needed from the years 2019 to 2022 to fully fund the Schuylkill River Bridge (SRB). Two (2) additional projects have been identified and are not included on the current TIP, MPMS #84308 – US 422 Reconstruction (M2C) and MPMS #88404 – US 422 Resurfacing (PM3).

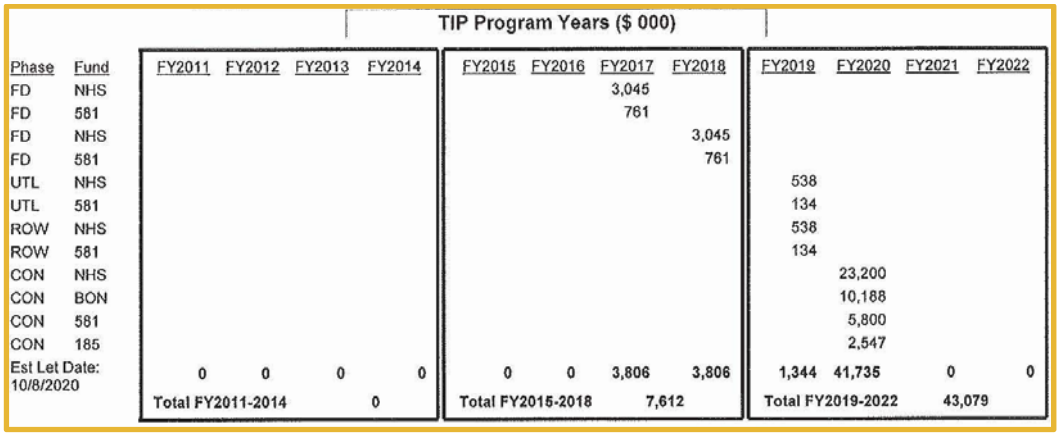
Figure 1.3-8: MPMS #14698 – US 422 Reconstruction (M2B)



TIP Program Years ($ 000)

Phase	Fund	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
PE	STP								3,131				
PE	581								783				
CON	NHS									34,673			
CON	BON									15,643			
CON	581									8,668			
CON	185									3,911			
Est Let Date: 4/4/2019		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3,914**	**62,895**	**0**	**0**	**0**
		Total FY2011-2014			**0**	**Total FY2015-2018**			**3,914**	**Total FY2019-2022**			**62,895**

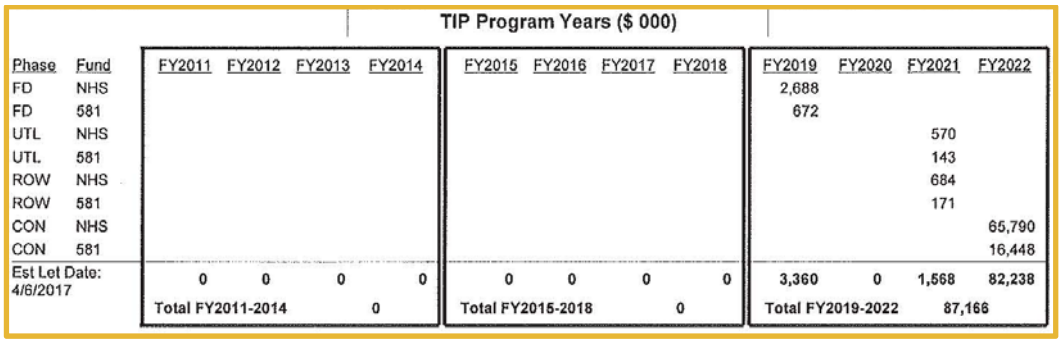
Figure 1.3-9: MPMS #64220 – US 422 Reconstruction (MO3)



TIP Program Years ($ 000)

Phase	Fund	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
FD	NHS							3,045					
FD	581							761					
FD	NHS								3,045				
FD	581								761				
UTL	NHS									538			
UTL	581									134			
ROW	NHS									538			
ROW	581									134			
CON	NHS										23,200		
CON	BON										10,188		
CON	581										5,800		
CON	185										2,547		
Est Let Date: 10/8/2020		0	0	0	0	0	0	3,806	3,806	1,344	41,735	0	0
		Total FY2011-2014			0	Total FY2015-2018			7,612	Total FY2019-2022		43,079	

Figure 1.3-10: MPMS #16738 – US 422 Reconstruction (M1B)



TIP Program Years ($ 000)

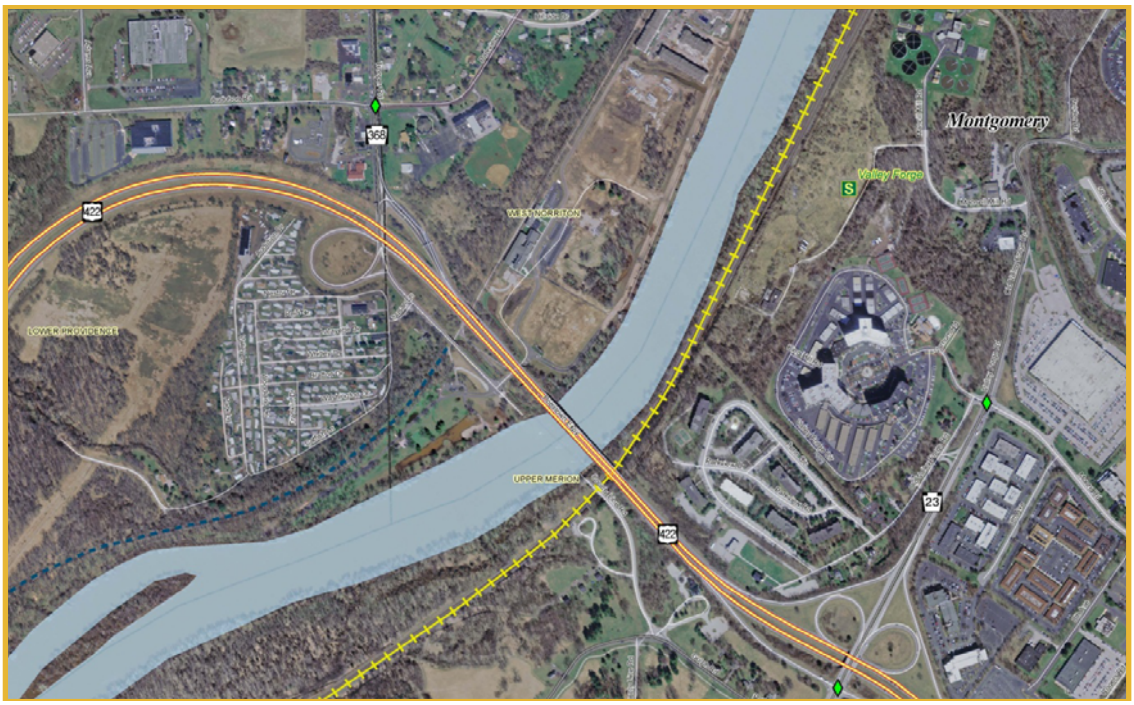
Phase	Fund	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
FD	NHS									2,688			
FD	581									672			
UTL	NHS											570	
UTL	581											143	
ROW	NHS											684	
ROW	581											171	
CON	NHS												65,790
CON	581												16,448
Est Let Date: 4/6/2017		0	0	0	0	0	0	0	0	3,360	0	1,568	82,238
		Total FY2011-2014			0	Total FY2015-2018			0	Total FY2019-2022		87,166	

These improvement projects seek to address a range of concerns with respect to the conditions and operation of the roadway in order to address current traffic conditions as well as volumes projected into the future. Along the US 422 corridor today, the area experiencing the most severe congestion is in and around the Schuylkill River Bridge on US 422 between PA 363 (Trooper Road) and PA 23 (Valley Forge Road), referred to as the River Crossing Complex. Figure 1.3-11 is an aerial view of the River Crossing Complex.

To alleviate the most severe congestion at the River Crossing Complex, a compilation of four (4) distinguishable improvement projects are proposed including, improvements at two (2) interchanges and the twin bridges over the Schuylkill River, totaling $197 million. Construction funding for only a portion of the River Crossing Complex improvement projects are committed within the years 2011 through 2018. Currently, only half of SRB project is currently funded for construction, resulting in a gap of $63 million. Given the trends in transportation funding at both the federal and state levels, an additional source of funding is necessary for establishing with certainty when completion of this congestion relieving project will occur.

While the River Crossing Complex represents one of the major projects along the US 422 corridor where additional capacity is desired, there are also substantial needs for congestion relief on the western end of US 422 including the Pottstown Bypass area. With limited funding to address the current transportation needs, congestion will continue to worsen along US 422 and the surrounding roadways as discussed in detail in Appendix A, *Traffic and Revenue Forecasts*.

Figure 1.3-11: Aerial of River Crossing Complex

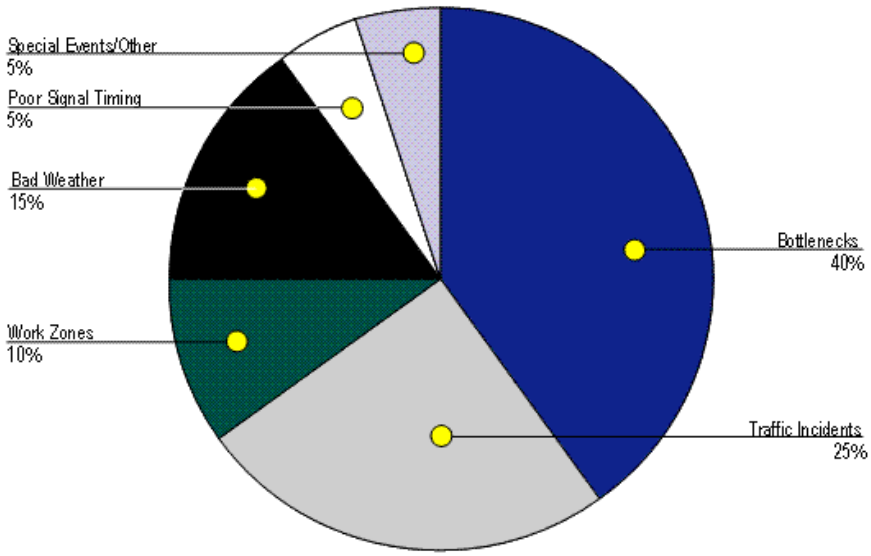


Insufficient roadway capacity is not the only cause of increasing congestion. The Federal Highway Administration notes seven root causes for congestion. These include:

1) Physical bottlenecks such as the number and width of lanes and shoulders, merge areas at interchanges and roadway alignments (grades and curves);
2) Traffic incidents which disrupt the normal flow of traffic;
3) Work zones which result in physical changes to the highway environment;
4) Weather;
5) Traffic control devices on or adjacent to the roadway in question;
6) Special events causing surges in traffic demand that overwhelm the system; and
7) Fluctuations in normal day to day demand.

Figure 1.3-12, illustrates the relative impact of each of these causes of congestion.

Figure 1.3-12: Causes of Increasing Congestion[11]



The HCIP identifies highway projects that will increase safety and reduce congestion on an accelerated construction schedule with consideration of the root causes of congestion. Along with a regional traffic demand model to determine future traffic patterns and a toll revenue study to determine future available funding, the HCIP set out to define an aggressive, but realistic highway improvement program comprised of projects critical to the future of US 422 as a safer and less congested corridor.

[11] Federal Highway Administration Office of Operations. Traffic Congestion and Reliability: Trends and Advanced Strategies for Congestion Mitigation. Accessed online at: http://ops.fhwa.dot.gov/congestion_report/executive_summary.htm

2 Existing US 422 Network and Operations

2.1 Study Area

US 422 consists of a four-lane divided highway running east / west from Valley Forge to Pottstown to Reading in Berks, Chester and Montgomery Counties. US 422 is a limited access roadway from US 202 in Valley Forge to Benjamin Franklin Highway in Amity. Thirteen (13) interchanges are located within the limited access facility, including the following:

- US 202
- PA 23 (Valley Forge Road)
- PA 363 (Trooper Road)
- Oaks (Egypt Road)
- PA 29 (Phoenixville / Collegeville)
- Royersford / Trappe (Township Line Road)
- Limerick / Linfield (Lewis Road)
- Sanatoga (Evergreen Road)
- Armand Hammer Boulevard
- PA 724
- Keim Street / Hanover Street
- PA 100
- Stowe (Grosstown Road)

Several major arterial routes run parallel to US 422 including the following:

- Ridge Pike
- PA 23 (Valley Forge Road)
- PA 724 (E. Schuylkill Road)

Congestion occurs on mainline US 422 during both the AM and PM peaks with the heaviest congestion occurring on US 422 eastbound during the AM commute. Currently, daily backups are noted on traffic reports from PA 363 (Trooper Road) to PA 29 (Phoenixville / Collegeville) and occasionally as far west as Royersford / Trappe (Township Line Road).

During the AM peak, queues extend from PA 23 (Valley Forge Road) to PA 29 (Phoenixville / Collegeville) as a result of several pinch points including the Schuylkill River Bridge between PA 23 (Valley Forge Road) and PA 363 (Trooper Road) and the eastbound on ramps at these interchanges. During the PM peak, congestion occurs in the westbound direction between PA 363 (Trooper Road) and US 202 and between Royersford / Trappe (Township Line Road) and PA 23 (Valley Forge Road). Congestion occurs as a result of the Schuylkill River Bridge and westbound on ramps at several interchanges including, PA 23 (Valley Forge Road), PA 363 (Trooper Road), Oaks (Egypt Road) and PA 29 (Phoenixville / Collegeville).

Most interchanges have deficient storage and taper lengths, according to the *AASHTO, A Policy on Geometric Design of Highways and Streets*, resulting in congestion and safety concerns during the peak hours. For example, at the interchange of US 422 and Oaks (Egypt Road), the recommended acceleration lane is approximately 900'; however existing interchange acceleration lanes at this location vary from 250' to 500'. Evidence of this can be found in Appendix G, Exhibits 15-20.

Figure 2.1-1: Daily AM Congestion Observed on 422 Eastbound

The level of congestion can be inferred by observing daily capacity of the roadway as well as driver travel times. A roadway can be determined as over capacity, when a driver experiences stop and go traffic, waiting in queues or the time it takes to get from one destination to another is increased due to driving at a lower speed limit. As shown previously in Appendix A, *Traffic and Revenue Forecasts*, Table 2.1-1 demonstrates that the roadway capacity currently used is expected to increase between the years 2010 and 2035. Comparing the number of lanes to both the existing and anticipated traffic volumes, the lane capacity used in the western end and eastern ends of US 422 is anticipated to increase from approximately 60% to 75% and from approximately 80 – 90% to over 100%, respectively.

Table 2.1-1: Existing Demand (2010) vs. Year 2035 No-Build

Location/Limits	Lanes	Daily Capacity	Year 2010		Year 2035	
			Volume	Capacity Used	Volume	Capacity Used
Between Grosstown Road and PA 100	4	88,280	54,960	62%	65,440	74%
Between Sanatoga (Evergreen Road) and Limerick / Linfield (Lewis Road)	4	85,800	53,090	62%	84,110	98%
Between PA 29 (Phoenixville / Collegeville) and Oaks (Egypt Road)	4	85,800	66,410	77%	93,470	109%
Schuylkill River Bridge	5	113,110	99,095	88%	118,660	105%

Projections for travel times in the year 2035 show that both AM and PM travel times are anticipated to almost double. For example, to travel between Hanover Street and US 202 in the morning, currently it will take about 32 minutes, but by 2035, the same distance will take almost 53 minutes. Additional travel time comparisons from the year 2010 to the year 2035 are shown in Table 2.1-2.

Table 2.1-2: Existing Travel Times (2010) vs. Year 2035 No-Build

Location/Limits	AM - Eastbound		PM - Westbound	
	2010	2035	2010	2035
Hanover Street - Sanatoga (Evergreen Road)	4.3	8.8	4.1	8.5
Sanatoga (Evergreen Road) – Limerick / Linfield (Lewis Road)	2.4	4.1	2.1	4.1
Limerick / Linfield (Lewis Road) - Royersford / Trappe (Township Line Road)	2.9	6.1	1.8	3.4
Royersford / Trappe (Township Line Road) - PA 29 (Phoenixville / Collegeville)	5.8	9.2	3.3	4.9
PA 29 (Phoenixville / Collegeville) - PA 363 (Trooper Road)	13.7	19.1	10.9	14.5
PA 363 (Trooper Road) - US 202	3.3	5.2	5.2	10.7
TOTAL	**32.4**	**52.5**	**32.5**	**56.1**

Note: Travel times are in minutes and represent the average over the respective peak period; 7-9 AM or 3-6 PM.

2.2 Existing Traffic Volumes

Year 2010 average annual daily traffic (AADT) were obtained from DVRPC on US 422 within the project limits. Existing US 422 AADTs vary from approximately 40,000 near Grosstown Road to 100,000 at the Schuylkill River Bridge. Year 2035 AADTs are anticipated to be approximately 55,000 near Grosstown Road to 120,000 at the Schuylkill River Bridge.

Exhibits 4 and 5, US 422 Corridor Traffic Volumes, in Appendix G, *Supplemental Exhibits*, identifies the Average Daily Traffic (ADT) volumes key locations on US 422 and the primary parallel and perpendicular routes.

3 Highway Capital Improvement Program (HCIP)

3.1 Goal

The purpose of the HCIP is to identify capital projects that provide long term improvements to address operational deficiencies due to existing and future traffic congestion as well as the implementation of tolling facilities. In addition, historic scheduling of these improvements has been constrained by the amount of annual federal and state funding available for a obligation within a given year. Project timing for the 422*plus* HCIP was not established based upon availability of constrained dollars but based on the quantity of work which could be reasonably executed with an acceptable level of impact on the ongoing traffic on the roadway. Overall, the aim of HCIP is to accelerate the construction of these projects based on the new funding source available.

3.2 Toll System and Locations

Open road tolling of the limited access portion of US 422, from US 202 to Ben Franklin Parkway, was considered for this study. Today's drivers expect non-stop reliable and safe travel. Today's tolling technology can meet that expectation. Electronic tolling allows drivers to pay tolls without stopping at toll plazas and to do so at prevailing traffic speeds. Open road tolling enables electronic toll collection through the use of tag readers and cameras typically mounted on overhead gantries. The result is improved safety with no need for vehicles to weave to access toll lanes, improved traffic flow over traditional toll collection systems with non-stop travel for all drivers and improved air quality with no idling while waiting to pay a toll or go through a lane blocked by a driver who mistakenly doesn't have a tag or lost their ticket. This free flow movement of vehicles through the tolling area is similar to the express E-Z Pass lanes at the Mid-County Interchange between the Blue Route and the Northeast Extension of the Pennsylvania Turnpike.

As previously discussed in Appendix A, *Traffic and Revenue Forecasts,* the toll locations were determined by identifying locations that maximized traffic capture, minimized traffic diversions to local roads, and provided an equitable distribution of tolling facilities along US 422. Four (4) mainline and seven (7) ramp toll gantry locations were considered. Ramp gantries are located in proximity to the mainline gantries to minimize traffic exiting and entering US 422 to avoid a toll, resulting in the following four (4) tolling locations (See Appendix G, Exhibit 3):

- Schuylkill River Bridge
  - Mainline US 422, east of PA 23 (Valley Forge Road)
  - PA 23 (Valley Forge Road) Eastbound Off Ramp
  - PA 23 (Valley Forge Road) Westbound On Ramps
- PA 29 (Phoenixville / Collegeville) and Oaks (Egypt Road)
  - Mainline US 422, east of PA 29 (Phoenixville / Collegeville)
  - PA 29 (Phoenixville / Collegeville) Eastbound Off Ramp
  - PA 29 (Phoenixville / Collegeville) Westbound On Ramp
- Between Sanatoga (Evergreen Road) and Limerick / Linfield (Lewis Road)
  - Mainline US 422, west of Limerick / Linfield (Lewis Road)
  - Limerick / Linfield (Lewis Road) Eastbound On Ramp
  - Limerick / Linfield (Lewis Road) Westbound Off Ramp
- Between Grosstown Road and PA 100
  - Mainline US 422, west of PA 100

3.3 Traffic Modeling

To determine the impacts of tolling on the US 422 corridor several travel demand model scenarios were analyzed including, Year 2035 No-Build, Year 2035 No-Build with Tolls and Year 2035 Build with Tolls. A brief summary of the travel demand model scenarios is included. Additional information can be found in Appendix A, *Traffic and Revenue Forecasts*.

3.3.1 Year 2035 No-Build

The Year 2035 No-Build travel demand model was developed to evaluate projected traffic conditions along the US 422 corridor in the Year 2035. This study assumes that PennDOT would continue to fund the projects included on the Delaware Valley Regional Planning Commission (DVRPC) Transportation Improvement Program (TIP) from the years 2011 to 2018. Table 3.3.1-1, on the following page, lists the PennDOT funded projects included in the Year 2035 No-Build scenario.

Table 3.3.1-1: Projects Included in Year 2035 No-Build Scenario

MPMS	County	Township	Project Name	Section	Description
66986	Montgomery	West Pottsgrove / North Coventry	US 422 over Schuylkill River	M2A	Reconstruct US 422 over Schuylkill River
64222	Chester / Montgomery	Lower Pottsgrove / North Coventry	US 422 Reconstruction	M1A	Reconfiguration of Armand Hammer Blvd. Interchange, signal replacement and optimization at intersection of Ramps E & F and Armand Hammer Blvd
86924	Montgomery	Lower Pottsgrove / Limerick	US 422 Reconstruction	PM2	Resurface 6 miles of US 422 EB and WB from Walnut Street to Pleasant Street
64796	Montgomery	West Norriton / Lower Providence	US 422 / PA 363 (Trooper Road) Interchange	4TR	Interchange improvements to provide a full-movement interchange at US 422 and PA 363 (Trooper Road)
66952	Montgomery	Upper Merion	PA 23 (Valley Forge Road)	2NG	Relocation of PA 23 (Valley Forge Road) and North Gulph Road

In addition, a Year 2035 No-Build with Tolls scenario including the same highway improvements as the 2035 No-Build scenario and four (4) mainline toll gantries on US 422 was performed to test driver behavior and response to tolls absent the Highway Capital Improvement Program. Results of both the Year 2035 No-Build travel demand models can be found in Appendix A, *Traffic and Revenue Forecasts.*

3.3.2 Year 2035 Build with Tolls

Using the 2035 No-Build with Tolls as a foundation, the 2035 Build with Tolls was developed. Toll funded projects were added to this scenario including a new bridge span at the Schuylkill River and widening US 422 to a 6-lane section from PA 29 (Phoenixville / Collegeville) to US 202. Table 3.3.2-1 demonstrates the additional capital projects assumed to be constructed in the Year 2035 Build scenario.

Table 3.3.2-1: Projects Included in Year 2035 Build Scenario

MPMS	County	Township	Project Name	Section	Description
70197	Montgomery	West Norriton / Upper Merion	New Schuylkill River Bridge	SRB	New bridge construction and bridge replacement over the Schuylkill River
LRP ID #98	Chester / Montgomery	Tredyffrin / Upper Merion / Lower Providence / Upper Providence	US 422 Widen from 4 to 6 lanes from US 202 to PA 363	NA	Widen US 422 from Trooper Road to US 202
NA	Montgomery	Lower Providence / Upper Providence	US 422 Widening (Trooper to Oaks)	NA	US 422 widened from four (4) lanes to six (6) lanes from Trooper Road to the Oaks interchange
NA	Montgomery	Upper Providence	US 422 Widening (Oaks to PA 29 (Phoenixville / Collegeville)	NA	US 422 widened from four (4) lanes to six (6) lanes from the Oaks Interchange to PA 29 (Phoenixville / Collegeville)
84308	Montgomery	West Pottsgrove	US 422 Reconstruction	M2C	New Stowe Interchange and relocated 4-way intersection
16738	Montgomery	Lower Pottsgrove / North Coventry	US 422 Reconstruction	M1B	Reconstruct US 422 East of Norfolk Southern Railroad to Park Road
14698	Chester	North Coventry	US 422 Reconstruction	M2B	Reconstruct US 422 East of the Schuylkill River to East of Hanover Street Interchange
64220	Chester	North Coventry	US 422 Reconstruction	MO3	Reconstruct US 422 East of Hanover Street Interchange to PA 724 (E Schuylkill Road) Interchange
88404	Montgomery	Upper Providence	US 422 Resurfacing	PM3	Resurface 6 miles of US 422
NA	Berks	Douglass / Amity / Union	US 422 Resurfacing	PM4	Resurface 3 miles of US 422 in Berks County
NA	Montgomery	Limerick	Sanatoga Interchange	NA	Interchange improvements at Sanatoga Interchange

Results of the Year 2035 Build travel demand model can be found in Appendix A, *Traffic and Revenue Forecasts.*

3.4 PennDOT Funded Highway Projects

The HCIP identifies projects under two categories: PennDOT Funded and Toll Funded. The TIP identifies projects anticipated to be funded between the years 2011 and 2022 with traditional federal, state and local revenue. For the purposes of this study, it is assumed that projects from the years 2011 to 2018 will continue to proceed in the typical PennDOT TIP process and will be PennDOT Funded, but in coordination with a newly created tolling authority. Table 3.3.1-1 lists projects included on the PennDOT TIP for years 2011 to 2018 and therefore presumed to be PennDOT funded for the US 422 HCIP. The projects included on the PennDOT TIP years 2011 to 2018 consist of portions of the Schuylkill River Crossing Complex and US 422 Reconstruction. River Crossing Complex includes the following projects:

- US 422 over the Schuylkill River (partially funded)
- US 422 and PA 363 (Trooper Road) Interchange Improvements
- PA 23 (Valley Forge Road) Interchange Improvements

Funding for several of the River Crossing Complex projects are within the years 2011 to 2018; however $63 million additional funding is still required to fully fund the Schuylkill River Bridges. Without the additional $63 million in additional funding, this project will not proceed to construction. The US 422 Reconstruction projects that have current funding are on the western end of US 422 and consist of the following:

- US 422 Bridge over the Schuylkill River between the PA 100 and Stowe Interchanges
- US 422 Bridge over the Schuylkill River between the PA 724 and Armand Hammer Interchanges

3.5 Toll Funded Highway Projects

The Toll Funded projects are projects needed within the limits of the US 422 corridor to improve safety and reduce congestion with no currently identified funding source. The Toll Funded projects are classified as Early Action, Secondary, Capital Program and Toll Infrastructure. The following is a brief description of each project category:

- **Toll Funded-Early Action** – quick-fix, prior to tolling, primarily acceleration and deceleration lanes at interchanges.
- **Toll Funded-Secondary** – intersection improvements to mitigate traffic diversion as a result of tolls, primarily at parallel and perpendicular routes to US 422.
- **Toll Funded-Capital Program** – previously identified projects from the DVRPC TIP and *Connections 2035 – Regional Plan for Sustainable Future (LRP)*[12] that are not currently funded.
- **Toll Infrastructure** – toll gantries and infrastructure necessary to toll and collect revenue on US 422

[12] Connections 2035 – The Regional Plan for a Sustainable Future, Delaware Valley Regional Planning Commission, October 2009.

3.5.1 Toll Funded-Early Action & Secondary Projects

Toll Funded-Early Action are projects identified within the US 422 corridor that improve safety and traffic operations prior to the tolling of US 422. The purpose of Early Action projects is to provide immediate improvements to the corridor by performing quick implementation projects. Intelligent Transportation System (ITS) and interchange improvements will be the focus of Early Action projects, due to the nature of the projects being quick fix, low cost improvements.

ITS allows for increased efficiency, travel options, and real time information, by installing digital message systems, etc., to provide drivers the real-time information about roadway conditions.[13] The installation of ITS is proposed prior to the tolling of US 422. Under a separate study, ITS improvements were proposed throughout the US 422 corridor. Improvements consist of 10 existing and 18 proposed Closed Circuit Televisions (CCTV), 15 proposed non-toll related E-ZPass readers and three (3) existing and nine (9) proposed Digital Message Systems (DMS). Figure 3.5.1-1, demonstrates an example of existing DMS equipment on a nearby roadway.

Figure 3.5.1-1: Real time road sign on nearby roadway, US 202[14]

[13] Smart Mobility for 21st Century America: Strategies for Maximizing Technology to Minimize Congestion Reduce Emissions and Increase Efficiency, Transportation for America, ITS America, Association for Commuter Transportation, University of Michigan SMART Initiative, October 2010.

[14] Kelly IV, Tom, "Severe Winter Storm expected Sunday," Daily Local News: Serving Chester County, February 2010.

Several interchange improvement projects are included on the TIP to be constructed between the years 2011 and 2018, such as the Armand Hammer Boulevard, PA 363 (Trooper Road), Stowe and PA 23 (Valley Forge Road) Interchanges, therefore, these projects were not included in the Toll Funded-Early Action projects.

Through evaluation of prior studies, related project information and windshield surveys of traffic congestion along the US 422 corridor, several US 422 Interchanges were identified for potential Toll Funded-Early Action projects. During the field visits, vehicle queuing was observed that appeared to be unrelated to mainline traffic operations, therefore, it was determined that interchange improvements could enhance traffic operations at these locations. Physical constraints, such as existing structures or buildings, were also taken into account due to the quick-fix nature of these projects.

Key locations identified as potential Toll Funded-Early Action projects to provide longer US 422 acceleration lanes include the following:

- Eastbound Acceleration Lane at Royersford / Trappe (Township Line Road)
- Eastbound Acceleration Lane at PA 29 (Phoenixville / Collegeville)
- Westbound Acceleration Lane at PA 29 (Phoenixville / Collegeville)
- Westbound Acceleration Lane at Oaks (Egypt Road)

In addition, Toll Funded-Secondary projects consist of improvements required on the roadway network surrounding US 422 due to interchange access and potential for diversion. Secondary projects consist primarily of new traffic signals, improved traffic signal timings and/or additional turn lanes at intersections. Toll Funded-Secondary projects were determined from the results of travel demand models by comparing traffic volumes on parallel and perpendicular routes before and after tolling on US 422.

While some projects were identified base on the modeling efforts, additional funding was set aside and dedicated to secondary projects after the tolling is in place and the road network adjusts to the tolling of US 422. The specifics of these projects would be determined by the Authority in coordination with local municipalities.

The projects identified as potential Toll Funded-Secondary, include the following:

- Hanover Street and US 422 Westbound Off Ramp
- PA 724 (E. Schuylkill Road) and Hanover Street
- River Bridge Road and PA 724 (E. Schuylkill Road)
- US 422 and River Bridge Road
- PA 29 (Phoenixville / Collegeville) and Black Rock Road
- PA 29 (Phoenixville / Collegeville) and Ridge Pike
- Signal Optimization on Ridge Pike in Pottstown Borough, Lower Pottsgrove Township, Limerick Township, Upper Providence Township, Trappe Borough, Collegeville Borough and Lower Providence Township.

To determine cost estimates for Toll Funded-Early Action and Secondary projects, the primary construction items required to build the improvements were estimated. Due to the large amount of construction projects performed in the area, the estimated unit cost of these construction items were obtained from bid prices of similar PennDOT projects. This cost information was used in the roll-up of the overall conceptual cost estimates for the Toll Funded-Early Action and Secondary projects.

The Early Action and Secondary projects are conceptual at this stage in terms of scope and exact locations but sufficiently defined to quantify the type of mobility improvements required to successfully transition US 422 to a tolled facility. Given the level of detail, percentages were applied to the construction costs to account for utilities, contingencies, signing and striping, maintenance of traffic, mobilization, drainage, clearing and grubbing, soil erosion and sediment control and landscaping. Traffic signal improvements assumed no drainage, clearing and grubbing, soil erosion and sediment control and landscaping. In addition, 10% was applied to the construction cost to estimate the Design and Construction Engineering project costs.

None of Toll Funded-Early Action and Secondary project improvements are expected to require additional Right of Way acquisition.

3.5.2 Toll-Funded-Capital Program Projects

Several projects within the US 422 corridor are planned but currently lack sufficient funding, including fully funding the River Crossing Complex and US 422 Reconstruction (Pottstown Bypass) projects on the western end of US 422. The following section further describes the toll funded capital projects that are needed to achieve the goal of a safe and efficient US 422.

3.5.2.1 Previously Identified But Unfunded Projects

Projects identified on DVRPC's TIP but scheduled for the years 2019 to 2022 will become part of the Toll Funded program. The uncertainty of traditional public dollars available for projects in the years 2019 and 2022 is a primary factor in this assumption. In addition, projects identified on *Connections 2035 – Regional Plan for Sustainable Future* are assumed to fall within the funding gap between needs and available funding sources and will also be included in the Toll Funded portion of the HCIP.

For projects identified on the DVRPC's TIP and Long Range Plan (LRP), current programmed project costs were adjusted using a 3% inflation rate. The projects included on DVRPC's TIP and LRP are as follows:

- River Crossing Complex (unfunded portion)
- US 422 Widening, West of PA 363 (Trooper Road) to US 202
- US 422 Reconstruction (West Pottsgrove, Lower Pottsgrove and North Coventry)
- US 422 Resurfacing
    - 6 miles in Upper Providence
    - 3 miles in Berks County

3.5.2.2 US 422 Widening

As part of the HCIP, additional US 422 widening projects were identified: widening US 422 from four (4) lanes to six (6) lanes from PA 363 (Trooper Road) to Oaks (Egypt Road), and from Oaks (Egypt Road) to PA 29 (Phoenixville / Collegeville). To determine the cost of the US 422 widening from PA 363 (Trooper Road) to Oaks (Egypt Road), and from Oaks (Egypt Road) to PA 29 (Phoenixville / Collegeville) construction unit costs were obtained from bid prices of similar PennDOT construction projects.

Due to the large amount of construction projects performed in the area, the cost of the construction items from similar construction projects were obtained from PennDOT's Engineering and Construction Management System (ECMS) Item Price History.

Several structures will require widening as part of the US 422 widening. Structural ratings were obtained from PennDOT for structures on and over US 422. The structures within the US 422 widening sections have good structural ratings. Therefore, it was assumed that these structures will only require deck replacement to accommodate the additional lane.

The US 422 Widening projects are conceptual at this stage. Several assumptions underlie these estimates given the level of detail. Percentages were applied to the construction item costs to account for utilities, contingencies, signing and striping, maintenance of traffic, mobilization, drainage, clearing and grubbing, soil erosion and sediment control and landscaping. In addition, 15% was applied to the to the construction cost to estimate Preliminary Engineering and Final Design. Since the

widening would likely take place within the existing median, the US 422 Widening projects assumed no additional Right of Way acquisition.

3.5.2.3 US 422 Bridge Rehabilitation

Any future bridge rehabilitation required within the US 422 corridor, while the toll authority is maintaining the roadway, is anticipated to be paid by toll funding. In order to estimate the cost of US 422 Bridge Rehabilitation work and widening of structures, several assumptions were made. The cost assumptions used similar projects as references to develop costs on a linear foot or square foot basis.

Cost estimates including barrier replacement on bridges assume that an exterior barrier will be used on either side with a median barrier in the center of the roadway, which most often is the case along US 422. Cost of rehabilitation was assumed to consist of minor repairs, and only constitute about 15% of the relacement cost.

3.5.2.4 US 422 Resurfacing

The US 422 Resurfacing projects consist of resurfacing six (6) miles of US 422 in Upper Providence and three (3) miles of roadway in Berks County. Two other resurfacing projects were recently designed and / or constructed on US 422 within the project limits; using the information from these projects a unit cost per mile was determined.

3.5.3 Toll Infrastructure

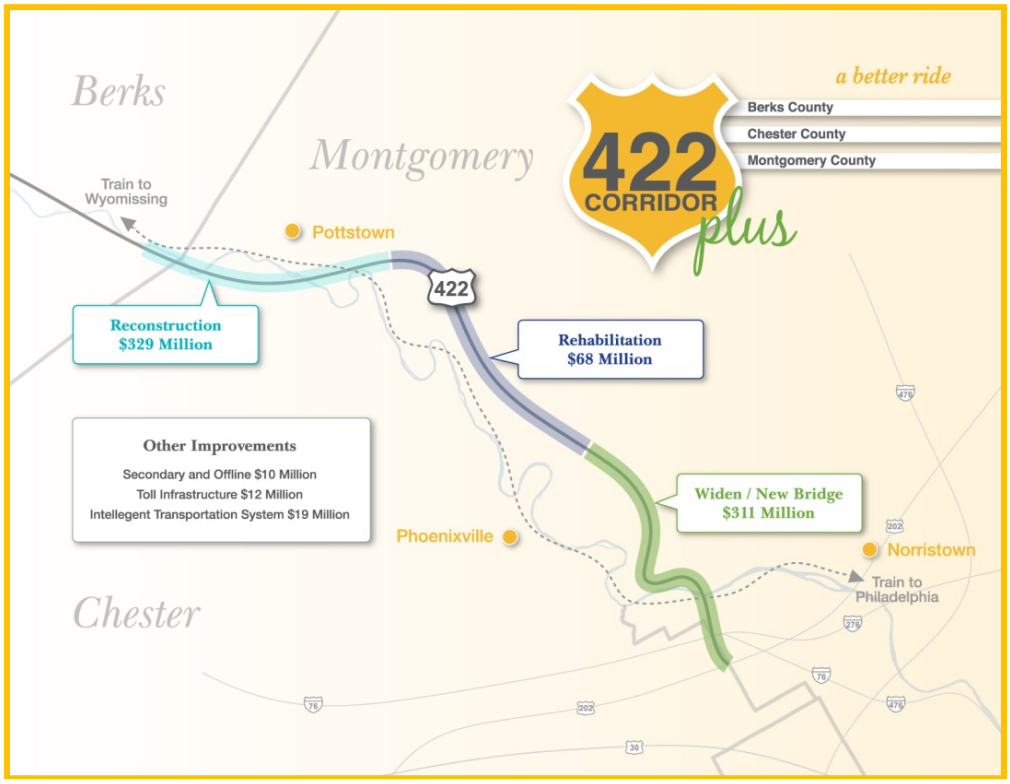
Four (4) mainline and seven (7) ramp toll gantry locations are proposed to provide open road tolling along US 422 and at selected interchange ramp locations. At each location, gantries will be built along with cameras and detection equipment. A utility building housing electrical and communication equipment will be constructed along with signing and lighting at each toll gantry location. Costs for the Toll Infrastructure were estimated from similar costs with the PA Turnpike.

3.5.4 HCIP Summary

The HCIP includes the following projects:

- DVRPC TIP funded projects from the year 2011 to year 2018.
- Toll Funded-Capital Program projects including the Pottstown Bypass, River Crossing Complex and US 422 widening from US 202 to PA 29 (Phoenixville / Collegeville).
- Toll Funded-Early Action Improvements including acceleration and deceleration lanes, intersection improvements to improve traffic operations and safety before tolling begins.
- Toll Funded-Secondary project improvements include intersection improvements, signal optimization on potential diversion routes due to the tolls.
- Toll infrastructure including gantries and software.

Figure 3.5.4-1: HCIP Summary by Segment



The following summarizes the anticipated cost of each HCIP category in 2010 dollars. It should be noted that the Schuylkill River Crossing Complex appears in both the PennDOT Funded and Toll Funded categories due to current $63 million funding gap for the project.

PENNDOT Funded **$243.4 M***

- US 422 and PA 363 (Trooper Road) Interchange (4TR) and PA 23 (Valley Forge Road) & North Gulph Road (2NG)
- US 422 Schuylkill River Bridge (SRB) – partially funded
- US 422 – Pottstown Bypass Reconstruction Project (M1A & M2A)
- US 422 Resurfacing (PM2)

Toll Funded **$505.4 M**

- Toll Funded-Early Action & Secondary Projects $36.6 M
  - ITS – Real Time Traffic Info
  - Selected Interchange Ramp Improvements
  - Selected Intersection Improvements
  - Selected Signal Interconnection
- Capital Program Projects $456.1 M
  - US 422 Schuylkill River Bridge (SRB) – remaining funding
  - US 422 – Pottstown Bypass Reconstruction Project (MO3,
  - M1B, M2B & M2C)
  - US 422 Resurfacing (PM3 & PM4)
  - US 422 Widening (202 to 29)
  - US 422 Structure Rehabilitation
  - Sanatoga Interchange
- Toll Infrastructure $12.7 M
  - Gantry & Ancillary Items

Total HCIP Capital Program **$748.8 M**

* As currently reflected in DVRPC FY 2011-2014 Transportation Improvement Program for Pennsylvania

It should be noted that if additional future capital improvement projects are identified by the Authority (e.g., potentially extending the US 422 widening to the Sanatoga Interchange), an additional phase of the HCIP could be advanced.

4 Highway operation and maintenance costs

Operation and maintenance costs were determined for the 25 mile, limited access section of the US 422 corridor through coordination with PennDOT and the Montgomery County Maintenance Unit. PennDOT District 6-0 and Montgomery County Maintenance Unit maintains the 23 mile segment of roadway from US 202 to the Berks County Line. A two (2) mile segment of the limited access highway in Berks County is maintained by PennDOT, District 5-0. Table 4-1 indicates the length of roadway within each County and the respective PennDOT District Office.

Table 4-1: Length of US 422 within Each County

COUNTY/ DISTRICT	FROM	TO	DISTANCE (MILES)
Chester/6-0	US 202	First Avenue Overpass	1.2
Montgomery/6-0	First Avenue Overpass	Bridge over Schuylkill River	18.7
Chester/6-0	Bridge over Schuylkill River	Bridge over Schuylkill River	2.5
Montgomery /6-0	Bridge over Schuylkill River	Montgomery/Berks County Line	1.0
Berks/5-0	Montgomery/Berks County Line	East of PA 662 (Old Swede Road)	1.7
		TOTAL LENGTH (MILES)	**25.1**

To account for the additional two miles of roadway in Berks County, the team prorated the annual costs for the additional roadway length based on the calculated cost per mile for the maintenance of US 422 in PennDOT District 6-0.

The annual maintenance costs are broken into two categories for purposes of this evaluation; standard roadway maintenance and winter services. Standard roadway maintenance includes pavement repair, guiderail maintenance, mowing, landscaping, drainage repair, trash/graffiti removal. Winter service includes equipment, material personnel, and tends to vary to a greater degree because it is weather dependent.

4.1.1 Standard Roadway Maintenance

The overall Montgomery County Maintenance Budget for all services in Fiscal Year 2010 was $33 Million. A cursory assessment of the length of US 422 within the County roadway system indicates that US 422 would conservatively account for just under 4% ($1.3 million) of the overall county roadway system and budget. For some maintenance items, corridor specific costs are not included in the County Maintenance accounting processes. The detailed numbers for the corridor that were extractable appear to be consistent with this percentage of the overall county maintenance costs.[15]

For example, PennDOT provided a detailed three year summary of the pavement repair costs completed on US 422 by Montgomery County from 2007 through 2009. The information provided indicates PennDOT spent approximately $410,000 in 2007, $346,000 in 2008 and $302,000 in 2009 for a three year annual average of about $353,000 per year. These costs include personnel, material, equipment rental and Department equipment costs for these services.

The Montgomery County Maintenance Unit estimated the two year total cost for guiderail repairs done on US 422 from October 2008 to October 2010 is approximately $530,000, which averages to about $265,000 per year.[16]

Regular management of the US 422 corridor includes: mowing ($10,000/per year), trash/graffiti removal ($15,000/year), landscaping ($7,000/ year) and other maintenance such as storm clean up, emergency mobilization, pruning, etc. ($50,000/year).The total estimated cost for regular maintenance of the corridor is approximately $82,000/year.

In summary, Roadway Maintenance Costs for US 422 on an annual basis is as follows:

	Average Annual Cost
Pavement Repair Costs	$353,000
Guiderail Repairs	$265,000
Regular Maintenance (mowing, etc.)	$ 82,000
Subtotal Standard Roadway Maintenance	$700,000

[15] Through discussion with PennDOT District 6-0 Roadside Specialist.

[16] Through discussion with PennDOT District 6-0 Construction Unit.

4.1.2 Winter Service Maintenance

The 2009-10 winter provided record breaking snowfall accumulation totals in the Delaware Valley. The total winter costs ($4.8 million) for last year in Montgomery County were almost 40% greater than the costs for the 2008-09 winter season at $3.5 million. The 2009-10 costs included: materials costs (Salt, Anti-Skid, Brine, etc) at $1.5 million, personnel costs at $1.7 million and equipment costs (Department & Rental) at $1.6 million.

For the winter of 2008-09, costs for these items included: materials costs (Salt, Anti-Skid, Brine, etc.) at $900,000, personnel costs at $1.6 million and equipment costs (Department & Rental) at $1.0 million.

To account for the unusually harsh winter season last year, the annual costs for the two years were averaged to arrive at an annual cost for winter services at $4.2 Million for the maintenance cost to serve US 422 in Chester and Montgomery Counties.

There are no specific winter cost breakdowns for individual state roads such as US 422. However, US 422 has 100 snow lane miles (SLM) and there are 1,472 SLM in Montgomery County. Therefore, approximately 7% of the SLM in Montgomery County are on US 422. Based on the average annual winter cost of $4.2 million, the estimated cost for US 422 (at 7%) is approximately $300,000.[17]

[17] Through discussion with PennDOT District 6-0 Press Office.

4.1.3 Summary of Maintenance Costs for the Corridor

The total maintenance costs for US 422 roadway repairs and winter services in Montgomery and Chester Counties is approximately $1 million ($700,000 + $300,000).

For purposes of this study, a 10% contingency is included for other costs and facilities not listed in this evaluation. In addition, the Berks County segment (1.7 miles) of roadway would be maintained by the tolling authority. Below is a summary of the total costs to fund and/or maintain the 25 mile limited access facility under the jurisdiction of a tolling authority:

Total Maintenance Costs for Montgomery and Chester Counties:	$1,000,000	
10% Contingency	$ 100,000	
Total for Montgomery and Chester Counties:	$1,100,000	
Prorated Maintenance Costs for Berks County: (1.7/25.1 miles or 7%)	$ 77,000	
GRAND TOTAL US 422 MAINTENANCE	$1,177,000	Approx. $1.2 million

While the annual maintenance costs for the US 422 limited access facility are estimated at $1.2 million per year, it is recommended that toll revenue supplement the current maintenance budget to enhance the ability of the tolling authority to provide a premium service in roadway maintenance. Therefore, the proposed annual budget for maintenance in the base year (2015) is $2.0 million per year, which represents a 67% increase over the estimated 2010 annual maintenance budget.

The total estimated annual costs for the limited access facility expected to be funded and/or maintained by a tolling authority is approximately $2.0 million per year in 2010 dollars. As part of the financial analysis, the annual maintenance costs were escalated to year of expenditure cost using the inflation rate stated in the financial analysis.

5 Toll Collection Costs

The costs of toll collection breakdown into the following categories: transactions, maintenance, general administration and insurance. Transaction costs were determined by applying a transaction rate to the anticipated number of users from the travel demand model. Maintenance costs were applied per lane-mile and number of interchange locations being tolled on US 422. General administration and insurance costs were determined to be a percentage of transaction and maintenance costs. Table 5-1 demonstrates the anticipated cost of transactions, maintenance, general administration and insurance due to tolling US 422.

Table 5-1: Toll Cost Summary[18]

Total Transaction Cost	$24,599
Total Maintenance Cost	$2,520,000
General Administration	$50,892
Insurance	$252,000
TOTAL COST OF TOLLS	**$2,847,491**

As shown in Table 5-1, the cost to maintain the tolls is anticipated to be approximately $2.9 million annually in year 2010 dollars.

Figure 5-1: Toll Gantry

[18] Transaction costs are based on a 2007 analysis by the IBI Group for the Virginia Department of Transportation. General administration costs are based on a relationship contained in the *Southeastern Parkway and Greenbelt Toll Feasibility Study*, URS Corporation, May 2006.

6 Conclusions

In conclusion, the HCIP is an answer to improve and maintain 25 miles of US 422, unconstrained by current funding. By providing funding through tolling the following will occur:

- US 422 eastbound and westbound will be widened from US 202 to PA 29 (Phoenixville/ Collegeville)
- The entire River Crossing Complex can be constructed, including the New Schuylkill River Bridge
- Four (4) US 422 Reconstruction projects
- Three (3) Resurfacing projects
- Improvements to Sanatoga Interchange
- Intelligent Transportation Systems (ITS)
- Acceleration and deceleration lane improvements at four (4) locations
- Intersection improvements on routes parallel and perpendicular to US 422

The result of advancing these projects through toll funding is that the amount of money invested in US 422 from 2015 to 2030 triples (in year 2010 dollars) from that which can reasonably be anticipated for the next eight years under the PennDOT's federally-approved TIP.

7 Supporting Documentation

A collection of figures and supporting information referenced in the development of the HCIP can be found in Appendix G, *Supplemental Exhibits*. The materials are provided as supporting documentation for reference purposes.