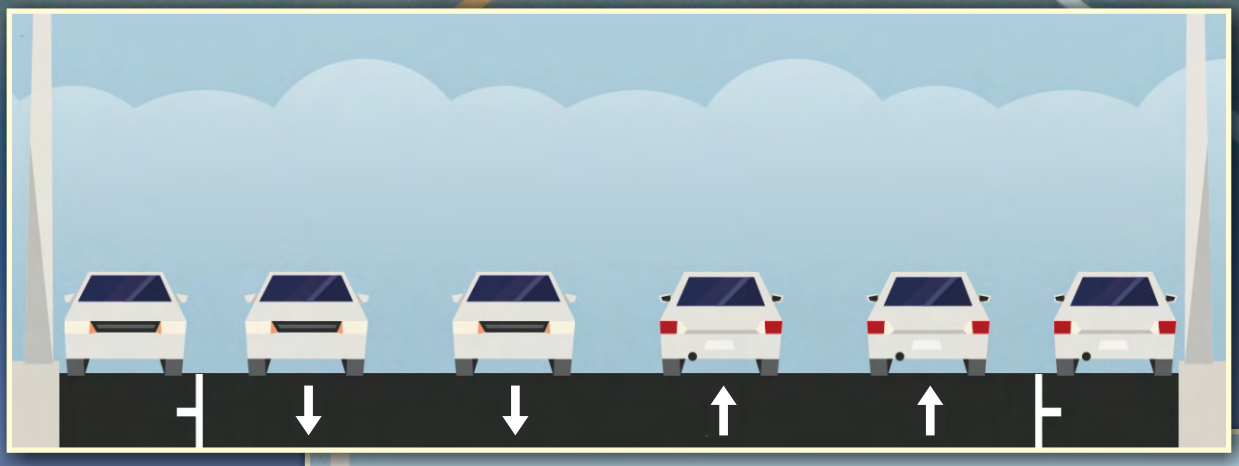
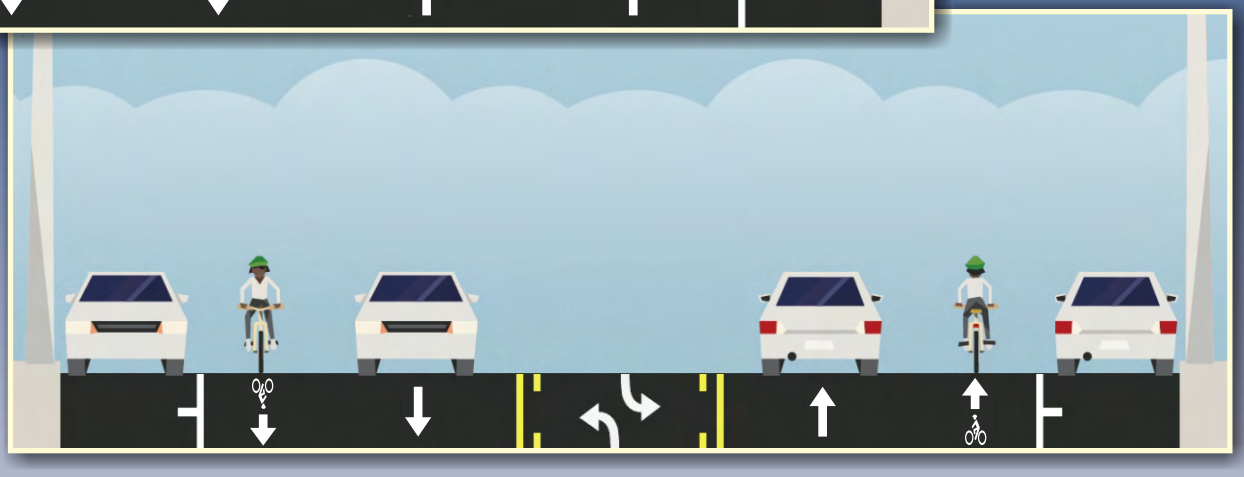
Philadelphia Pike Road Diet Before/After Study





Prepared for:

DelDOT

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I. Study Purpose and Background

The Delaware Department of Transportation (DelDOT) requested that RK&K conduct a study of the Philadelphia Pike Corridor in order to quantify the operational and safety impacts of a Road Diet project (vehicular capacity reduction project) completed in 2012 in Claymont, Delaware.

A Road Diet is generally described as a roadway reconfiguration solution that consists of removing vehicle lanes from a roadway and repurposing the extra space for other uses or travelling modes, such as parking, sidewalks, bicycle lanes, transit use, reversible turn lanes, medians or pedestrian refuge islands. Road Diets, when applied in appropriate locations, often on four- or five-lanes roadways with light or moderate traffic volumes, have the potential to improve safety, provide operational benefits, and diversify transportation modes to better accommodate all road users[1]. Road Diets are typically accomplished primarily by restriping pavement. Therefore, they are often a low-cost improvement, particularly when planned in conjunction with reconstruction or resurfacing projects.

In May 2009, DelDOT conducted a study to determine the feasibility of reducing the capacity of a one-mile segment of Philadelphia Pike between Governor Printz Boulevard and Rolling Road. The project also included the provision of medians, left turn lanes, bicycle lanes and on-street parking. The 2009 study included data collection, historical crash data analysis, and operational analyses of both the existing roadway configuration and a conceptual road diet configuration (with then-existing 2008 volumes, and projected 2033 volumes). **Figure 1** shows the study area.

The previously completed study concluded that the one-mile segment of Philadelphia Pike was suitable for the implementation of a Road Diet. Key intersections along the corridor proved to have unused capacity and were expected to operate at suitable Levels of Service (LOS) under a reduced cross section. These intersections were not expected to experience severe congestion or large delays. Operational analyses also indicated that none of the signalized intersections along the study corridor would be affected by excessive queue lengths, and all intersections would operate with acceptable Volume to Capacity (V/C) ratios. The May 2009 study also included the examination of historical crash data that demonstrated that a large percentage of crashes were of types (angle, head-on, sideswipe, and rear-end) that could be reduced or eliminated with the implementation of a Road Diet. The study also stated that the implementation of a Road Diet could likely result in reduced vehicular speeds along the corridor, which could decrease the severity of collisions, especially pedestrian and bicycle crashes.

Based on the favorable findings of the May 2009 feasibility study, DelDOT decided to proceed with the Road Diet project. Construction of the project began in the Spring of 2012 and was completed in the fall of 2012.

[1] FHWA, *Road Diet Informational Guide*. FHWA-SA-14-028 (Washington, DC: 2014)

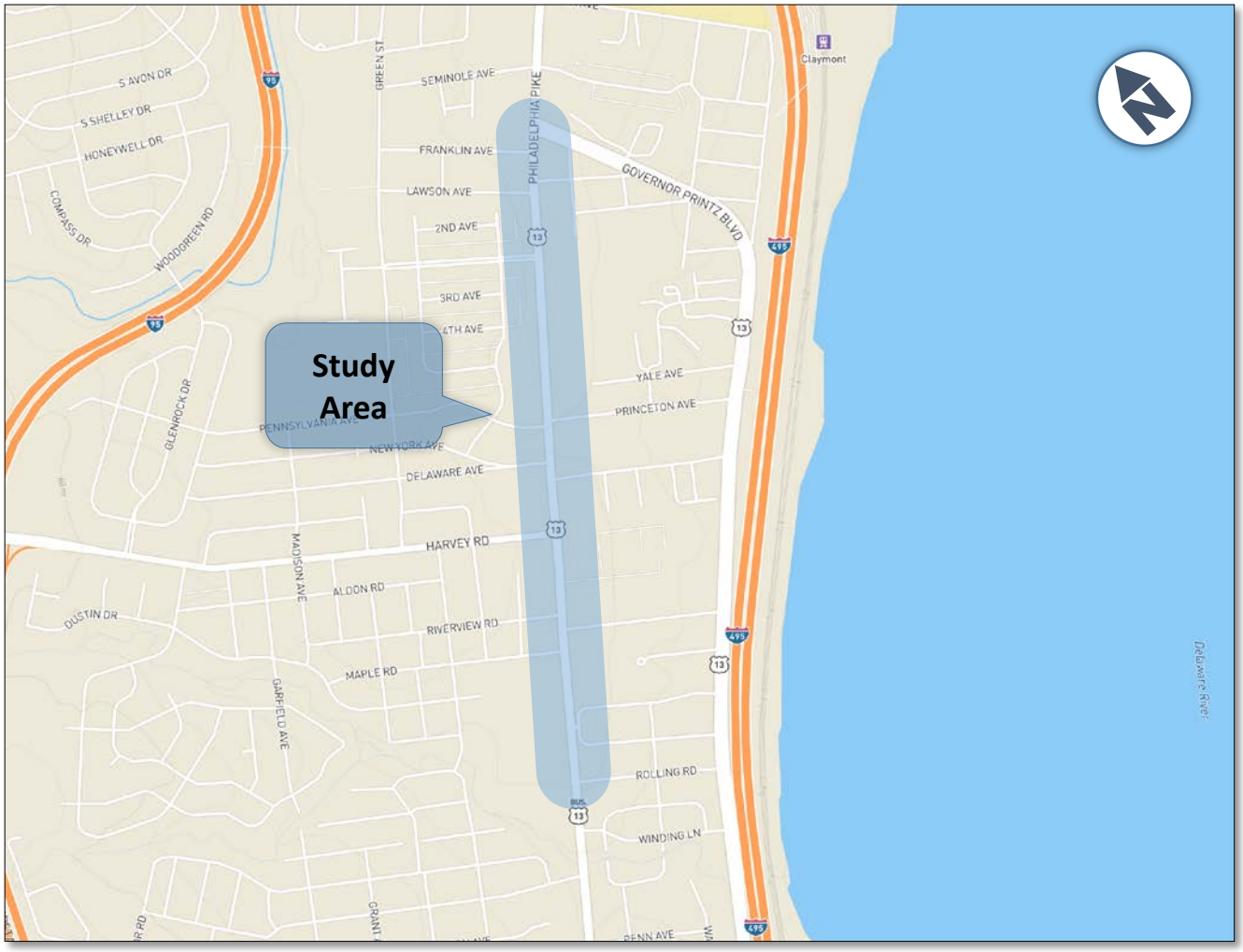


Figure 1 – Study Area

The goals of the current study include:

- Evaluating the changes in daily traffic volumes and peak hour traffic volumes along Philadelphia Pike and the parallel Governor Printz Boulevard to determine if the Road Diet project resulted in any traffic volume changes or diversion
- Determining the changes in travel speeds and speed variability before and after the completion of the Road Diet
- Evaluating the overall Level of Service (LOS) at key intersections along the study corridor to determine how the Road Diet affected key intersections in terms of both queues and delay
- Assessing the safety impacts associated with the implementation of the road diet by comparing crash trends and crash rates before and after the completion of the Road Diet

II. Existing Conditions

Before the implementation of the Road Diet, the study corridor consisted of a typical four-lane configuration with two driving lanes and a parking lane (also used for bus stops) in addition to sidewalks in each direction. While a few short sections of the study corridor had separate left turn lanes, the predominant cross section had four travel lanes and left turns were made from a shared through-left turn lane. **Figure 2** illustrates a typical cross section of the study corridor before the implementation of the Road Diet.

The now-implemented Road Diet reduced the study corridor's typical cross section to a single travel lane, a bike lane, and a parking lane in each direction, separated by a reversible left turn lane (often called a Two-Way Left Turn Lane (TWLTL)). **Figure 3** shows the current typical cross section of the study corridor.

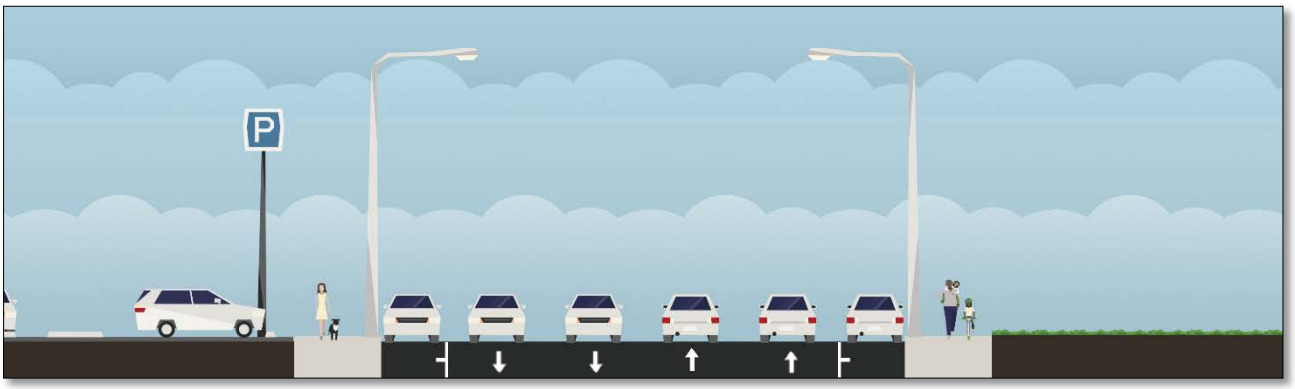


Figure 2 – Typical Cross Section of the Study Corridor before Implementation of the Road Diet

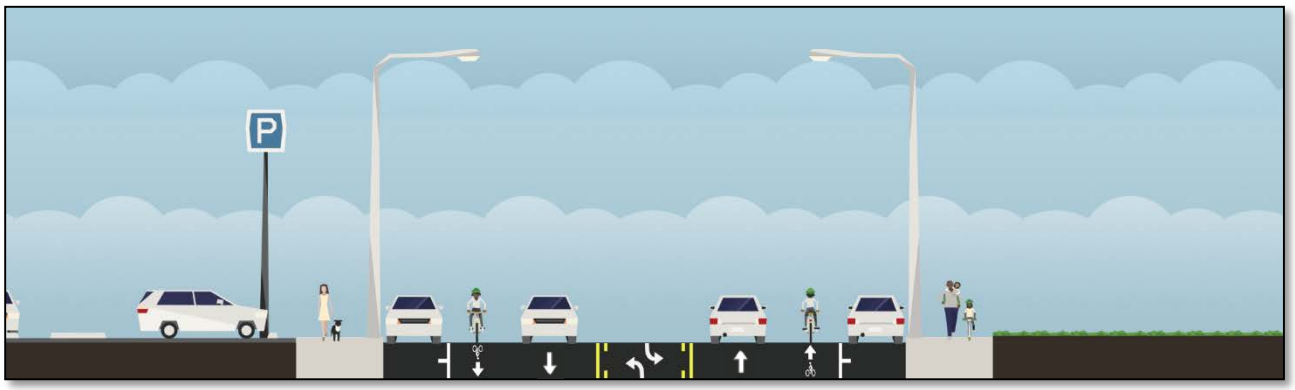


Figure 3 – Typical Cross Section of the Study Corridor after Implementation of the Road Diet

III. Methodology

A. Operational Analysis

RK&K performed traffic counts during the month of May 2016. Intersection turning movement counts were performed from 6:30 AM to 8:30 AM and from 4:30 PM to 6:30 PM on a typical weekday and under normal weather conditions at the intersections of Philadelphia Pike at Harvey Road (May 17, 2016) and Philadelphia Pike at Governor Printz Boulevard (May 10, 2016). **Figure 4** and **Figure 5** illustrate the AM and PM peak hour turning movement counts at both intersections.

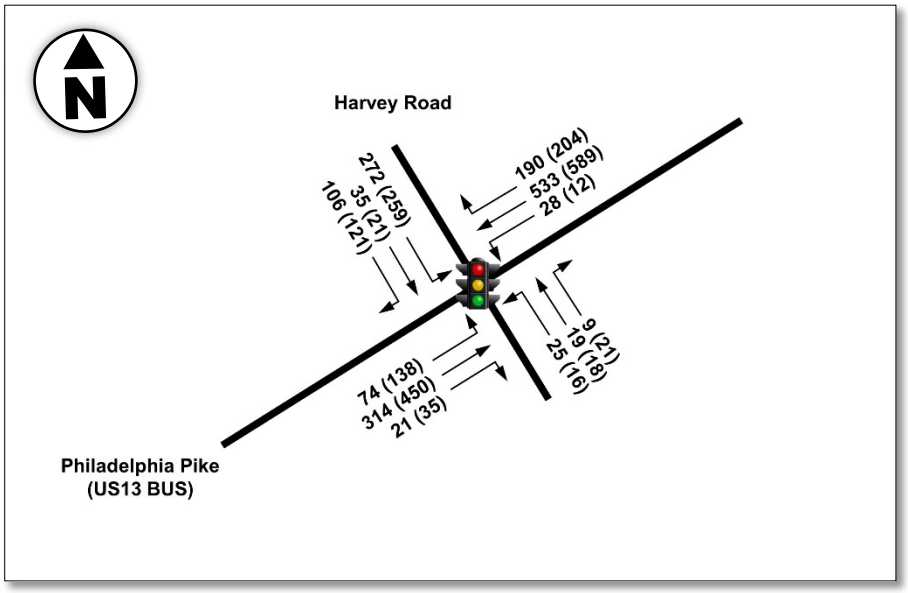


Figure 4 – AM (PM) Peak Hour Turning Movements at Philadelphia Pike and Harvey Road

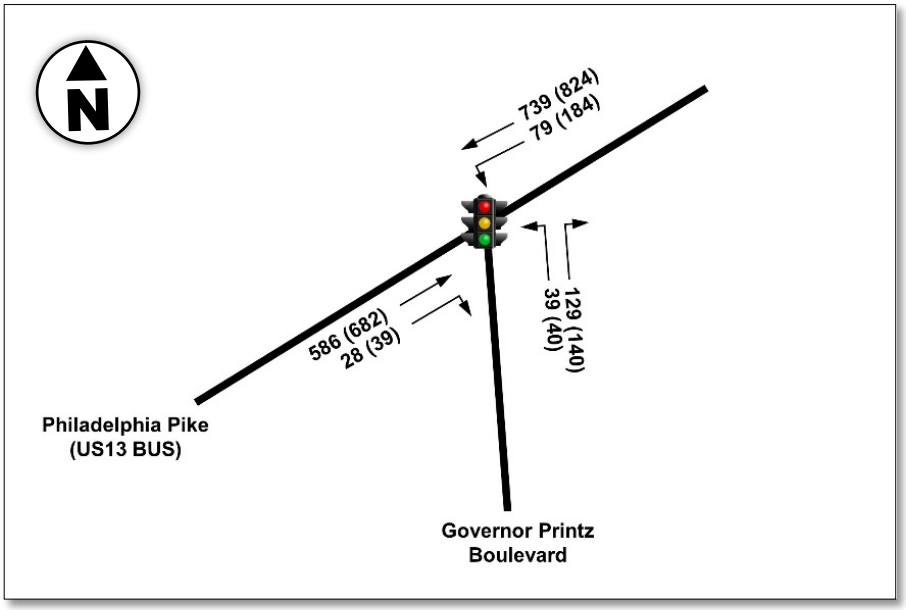


Figure 5 – AM (PM) Peak Hour Turning Movements at Philadelphia Pike and Governor Printz Blvd

Current traffic operations at the intersections of Philadelphia Pike at Harvey Road and Philadelphia Pike at Governor Printz Boulevard were evaluated using Synchro (v9), a macroscopic traffic analysis and optimization software application. Synchro was used to measure overall level of service (LOS) and queue lengths for key movements. Results of the operational analysis were compared to the 2008 results from the previously conducted study to evaluate any changes in operations of the two intersections. Overall intersection traffic operations were also analyzed using DelDOT's preferred critical movement summation (CMS) method.

The existing signal timing plans supplied by DelDOT (including cycle lengths, splits and offsets) at the two key intersections were held constant for existing conditions. Therefore, a comparison of the analysis results shown in this report only reflects the effects of traffic volume growth, the implemented Road Diet along Philadelphia Pike, and any changes in signal timings that have occurred within the project corridor between 2008 and 2016. Synchro was not used to optimize or otherwise adjust the original signal timing plans for the current year traffic analysis.

B. Vehicle Diversion Analysis

RK&K conducted a vehicle classification count at the following two locations along the study corridor:

- Philadelphia Pike just South of Commonwealth Avenue
- Governor Printz Boulevard just East of Philadelphia Pike

These counts were conducted over a seven-day period between May 5, 2016 and May 11, 2016 using pneumatic road tubes to determine traffic volumes along Philadelphia Pike and Governor Printz Boulevard, and identify possible traffic diversions, by vehicle type, that may have resulted from the implementation of the Road Diet. Each travel lane and direction was counted independently. Seasonal adjustment factors provided by DelDOT were used to estimate the Annual Average Daily Traffic along Philadelphia Pike and Governor Printz Boulevard.

C. Speed Analysis

RK&K collected spot-speed data using a radar gun along Philadelphia Pike at the following four locations:

- Philadelphia Pike between Penn Avenue and Winding Lane on June 22, 2016
- Philadelphia Pike between Rolling Road and Maple Road on May 5, 2016
- Philadelphia Pike between Delaware Avenue and Governor Printz Boulevard on May 5, 2016
- Philadelphia Pike between Manor Avenue and Darley Road on June 22, 2016

At each of these locations, speed data was collected in both directions for one (1) hour or until a sample size of 100 free-flowing vehicles was obtained.

One of the primary objectives of this study was to determine the effect the implementation of the Road Diet has had on travel speeds along Philadelphia Pike. The speed data was used to determine the average speed, speed variability, the 85th and 15th percentile speeds, and speed paces in 10 mph increments. Vehicles were also classified based on their speed at both locations in both the northbound and southbound directions of travel. The following classifications were

used: (1) Not speeding, (2) Exceeding the speed limit by less than 5 mph, (3) Exceeding the speed limit between 5-10 mph, and (4) Exceeding the speed limit by more than 10 mph. These categories were selected to ascertain how effective the Road Diet was in reducing the number of drivers above the speed limit, especially those travelling significantly above the posted speed limit.

D. Safety Analysis

DelDOT provided RK&K with crash records along the study corridor from the 3-year time periods between October 1, 2005 and September 30, 2008 and between October 1, 2012 and September 30, 2015. The provided data included both crash history summaries and detailed crash records for all the crashes that occurred during the before and after 3-year periods. Electronic copies of the police reports were used to examine the crash diagrams and narratives to determine which crashes from the dataset were located on Philadelphia Pike, excluding crashes on nearby streets or parking lots. This exclusion of non-related crash data reduced the total number of crashes included in the analyses from 195 (as shown in Appendix E) to 160 during the "before" period and from 173 (as shown in Appendix E) to 139 during the "after" period.

A before-and-after crash data analysis was conducted to evaluate the safety effects of the implemented Road Diet. The crash data collected after the implementation of the road diet was analyzed to obtain information related to crash frequency and dominant crash types during both the before and after 3-year periods.

It should be noted that following the completion of this study, DelDOT plans to develop a Crash Reduction Factor (CRF) for the segment of Philadelphia Pike where the Road Diet was implemented. This CRF for a Delaware-specific Road Diet project will be compared to national values published on FHWA's Crash Modification Factors Clearinghouse website.

IV. Before/After Analysis Results

A. Operational Analysis

1. Level of Service

The results of the traffic operational analyses described in the previous section are summarized in the following tables. **Table 1** summarizes the traffic operations at both of the key signalized intersections along the study corridor.

Table 1 - Before and After Level of Service at Signalized Intersections

Philadelphia Pike at Harvey Road - Peak Hour LOS						
	AM PEAK			PM PEAK		
	Before (2008)	After (Synchro) (2016)	After (CMS) (2016)	Before (2008)	After (Synchro) (2016)	After (CMS) (2016)
Philadelphia Pike at Harvey Road	B	C	B	B	C	C
Philadelphia Pike at Governor Printz Boulevard	B	B	A	B	A	A

- Philadelphia Pike at Harvey Road: According to the previous study, the intersection was operating at level of service (LOS) B during both the AM and PM peak hours. Based on the Synchro analysis results, the intersection now operates at LOS C during both and AM and PM peak hours. Based on the Critical Summation Method results, the intersection currently operates at LOS B during the AM peak hour and at LOS C during the PM peak hours. Collectively, these analyses indicate that the intersection operates similarly to the pre-Road Diet condition, still acceptably, with only a small amount of additional delay for motorists.

- Philadelphia Pike at Governor Printz Boulevard: According to the previous study, the intersection was operating at LOS B during both the AM and PM peak hours. Based on the Synchro analysis results, the intersection now operates at LOS B during the AM peak hour and at LOS A during the PM peak hour. Based on the Critical Summation Method results, the intersection currently operates at LOS A during both the AM and PM peak hours. Overall, these analyses show that the intersection operates similarly to or slightly better than it did during the pre-Road Diet condition.

2. Queue Lengths

Table 2 and **Table 3** summarize results of the queue length analysis at the intersections of Philadelphia Pike at Harvey Road and Philadelphia Pike at Governor Printz Boulevard, respectively:

Table 2 - Queue Lengths at Philadelphia Pike and Harvey Road

	2008 Calculated Queues (feet)		2016 Calculated Queues (feet)		2016 Observed Queues (feet)
	50th Percentile	95th Percentile	50th Percentile	95th Percentile	Maximum Queue Length
AM Peak					
NB Through	154	267	190	285	135
SB Through	279	371	210	278	175
PM Peak					
NB Through	209	341	205	406	190
SB Through	327	420	209	314	230

Table 3 - Queue Lengths at Philadelphia Pike and Governor Printz Boulevard

	2008 Calculated Queues (feet)		2016 Calculated Queues (feet)		2016 Observed Queues (feet)
	50th Percentile	95th Percentile	50th Percentile	95th Percentile	Maximum Queue Length
AM Peak					
NB Through	380	468	82	132	270
SB Through	97	100	145	265	190
PM Peak					
NB Through	270	408	119	185	300
SB Through	141	148	184	327	285

- Philadelphia Pike at Harvey Road: During the AM peak hour, based on theoretical analysis results from Synchro, the northbound 95th percentile queue slightly increased by approximately 20' (approximately 1 vehicle) since 2008 while the southbound 95th percentile queue decreased by less than 100' (approximately 4 vehicles). During the PM peak hour, the theoretical northbound 95th percentile queue increased by approximately 65' (approximately 3 vehicles) while the southbound 95th percentile queue decreased by approximately 100' (4 vehicles). However, the maximum observed queue lengths were all less than the theoretical 95th percentile queues during both the AM and PM peak hours in 2016, with the longest queue being 230' (approximately 9 vehicles).

- Philadelphia Pike at Governor Printz Boulevard: During the AM peak hour, based on theoretical analysis results from Synchro, the northbound 95th percentile queues decreased by less than 350' (14 vehicles) while the southbound 95th percentile increased by approximately 175' (7 vehicles). During the PM peak period, the theoretical northbound 95th percentile queue decreased by approximately 250' (10 vehicles) while the southbound 95th percentile queue increased by approximately 175' (7 vehicles). During both the AM and PM peak hours, the maximum observed northbound and southbound queue lengths were greater and less than the theoretical 95th percentile queues, respectively.

B. Vehicle Diversion Analysis

Table 4 and **Table 5** summarize the results of the vehicle classification counts performed along Philadelphia Pike south of Commonwealth Avenue and along Governor Printz Boulevard east of Philadelphia Pike.

Table 4 - Traffic Volumes on Philadelphia Pike just South of Commonwealth Avenue

Vehicle Type	Before (2008)		After (2016)	
	Volume	Percentage	Volume	Percentage
ADT				
Passenger Cars	15,683	93.0%	16,456	96.1%
Buses	156	0.9%	188	1.1%
HD Trucks	207	1.2%	401	2.3%
Total Trucks	1028	6.1%	472	2.8%
Total	**16,867**	**100.0%**	**17,116**	**100.0%**
AADT	**14,490**	**-**	**15,918**	**-**
AM Peak Hour				
Passenger Cars	1094	91.5%	1022	94.7%
Buses	15	1.3%	22	2.0%
HD Trucks	22	1.8%	30	2.8%
Total Trucks	86	7.2%	36	3.3%
Total	**1,195**	**100.0%**	**1,080**	**100%**
PM Peak Hour				
Passenger Cars	1,351	93.8%	1,355	97.1%
Buses	6	0.4%	10	0.7%
HD Trucks	21	1.5%	25	1.8%
Total Trucks	84	5.8%	30	2.2%
Total	**1,441**	**100.0%**	**1,395**	**100.0%**

Table 5 - Traffic Volumes along Governor Printz Boulevard just East of Philadelphia Pike

Vehicle Type	Before (2008)		After (2016)	
	Volume	Percentage	Volume	Percentage
ADT				
Passenger Cars	4,840	95.0%	4,292	95.0%
Buses	52	1.0%	64	1.4%
HD Trucks	35	0.7%	116	2.6%
Total Trucks	203	4.0%	160	3.5%
Total	**5,095**	**100.0%**	**4,515**	**100.0%**
AADT	**6,598**	-	**4,199**	-
AM Peak Hour				
Passenger Cars	343	93.2%	230	92.9%
Buses	4	1.1%	7	2.7%
HD Trucks	2	0.5%	9	3.6%
Total Trucks	21	5.7%	11	4.4%
Total	**368**	**100.0%**	**247**	**100.0%**
PM Peak Hour				
Passenger Cars	464	96.5%	353	96.4%
Buses	2	0.4%	3	0.8%
HD Trucks	1	0.2%	7	1.9%
Total Trucks	15	3.1%	10	2.8%
Total	**481**	**100.0%**	**366**	**100.0%**

The current (2016) daily traffic volume for both the northbound and southbound directions combined along Philadelphia Pike is approximately 17,100 vehicles per day. Trucks comprise approximately 3% of the total volume in each direction. The directional split of the daily traffic on Philadelphia Pike is approximately 49% northbound/51% southbound. Compared to the 2008 count data, the seasonally adjusted AADT along Philadelphia Pike increased by approximately 1,400 vpd (+10%), from 14,490 in 2008 to 15,918 in 2016. The current ADT along Philadelphia Pike remains within the intervals specified by FHWA as suitable ADT values to implement Road Diet conversions. While the daily traffic volumes have increased between 2008 and 2016, the 2016 AM and PM peak hour traffic volumes are approximately 50 to 100 vehicles per hour (5 to 10%) lower than the 2008 peak hour volumes.

The current (2016) daily traffic volume for both the northbound and southbound directions combined along Governor Printz Boulevard is approximately 4,500 vehicles per day. Trucks comprise approximately 3.5% of the total volume in each direction. The directional split of the daily traffic on Governor Printz Boulevard is approximately 53% northbound/47% southbound. The seasonally adjusted AADT along Governor Printz Boulevard decreased by approximately 2,400 vpd (-36%) from 6,600 vpd in 2008 to 4,200 vpd in 2016. Similarly, to Philadelphia Pike, the 2016 AM and PM peak hour traffic volumes along Governor Printz Boulevard are approximately 100 vehicles per hour less than the 2008 peak hour volumes.

The traffic diversion analysis suggests that, contrary to expectations, more drivers are now using Philadelphia Pike than before the implementation of the Road Diet, rather than less. Furthermore, traffic volumes on Governor Printz Boulevard, which could potentially have been used as a route to bypass Philadephia Pike, decreased by more than 30% per day. It is, therefore, possible that

the implementation of the Road Diet could have resulted in a small shift in traffic *to* Philadelphia Pike. However, the changes in traffic volumes on both roads may also be attributed to other factors such as regional shifts in travel patterns or land use changes in the surrounding area.

C. Speed Analysis

The 2009 study did not include a speed study, so no "before" data is available to show the speeds of vehicles using Philadelphia Pike prior to construction of the Road Diet project. Therefore, rather than performing a before/after study of speeds, RK&K performed a spot speed study along the study corridor to evaluate the speed characteristics of drivers (e.g., how well they complied with the posted speed limits) approaching, within, and after the Road Diet segment of Philadelphia Pike. **Table 6** and **Table 7** summarize the results of the spot speed study at four (4) different locations along the corridor in both the northbound and southbound directions of travel. **Figure 6** and **Figure 7** illustrate the speed distributions in a graphical format.

Table 6 - Speed Characteristics in the Northbound Direction of Travel along Philadelphia Pike

Northbound Direction of Travel				
	Between Penn Avenue and Winding Lane	Between Rolling Road and Maple Road (Road Diet)	Between Delaware Avenue and Governor Printz Boulevard (Road Diet)	Between Manor Avenue and Darley Road
Posted Speed Limit (mph)	**40**	**40**	**40**	**35**
Average Speed (mph)	47	42	40	38
Median Speed (mph)	47	42	40	37
15th Percentile Speed (mph)	42	35	35	35
85th Percentile Speed (mph)	52	47	44	41
Percent Over Speed Limit	91%	56%	45%	77%
Pace (mph)	42-51	39-48	35-44	33-42
Percent in Pace	70%	65%	77%	87%

Table 7 - Speed Characteristics in the Southbound Direction of Travel along Philadelphia Pike

Southbound Direction of Travel				
	Between Darley Road and Manor Avenue	Between Governor Printz Boulevard and Delaware Avenue (Road Diet)	Between Maple Road and Rolling Road (Road Diet)	Between Winding Lane and Penn Avenue
Posted Speed Limit	**35**	**35**	**40**	**40**
Average Speed (mph)	40	38	43	48
Median Speed (mph)	40	38	42	48
15th Percentile Speed (mph)	35	33	37	42
85th Percentile Speed (mph)	44	43	48	52
Percent Over Speed Limit	82%	75%	62%	92%
Pace (mph)	35-44	34-43	37-46	44-53
Percent in Pace	75%	75%	70%	71%

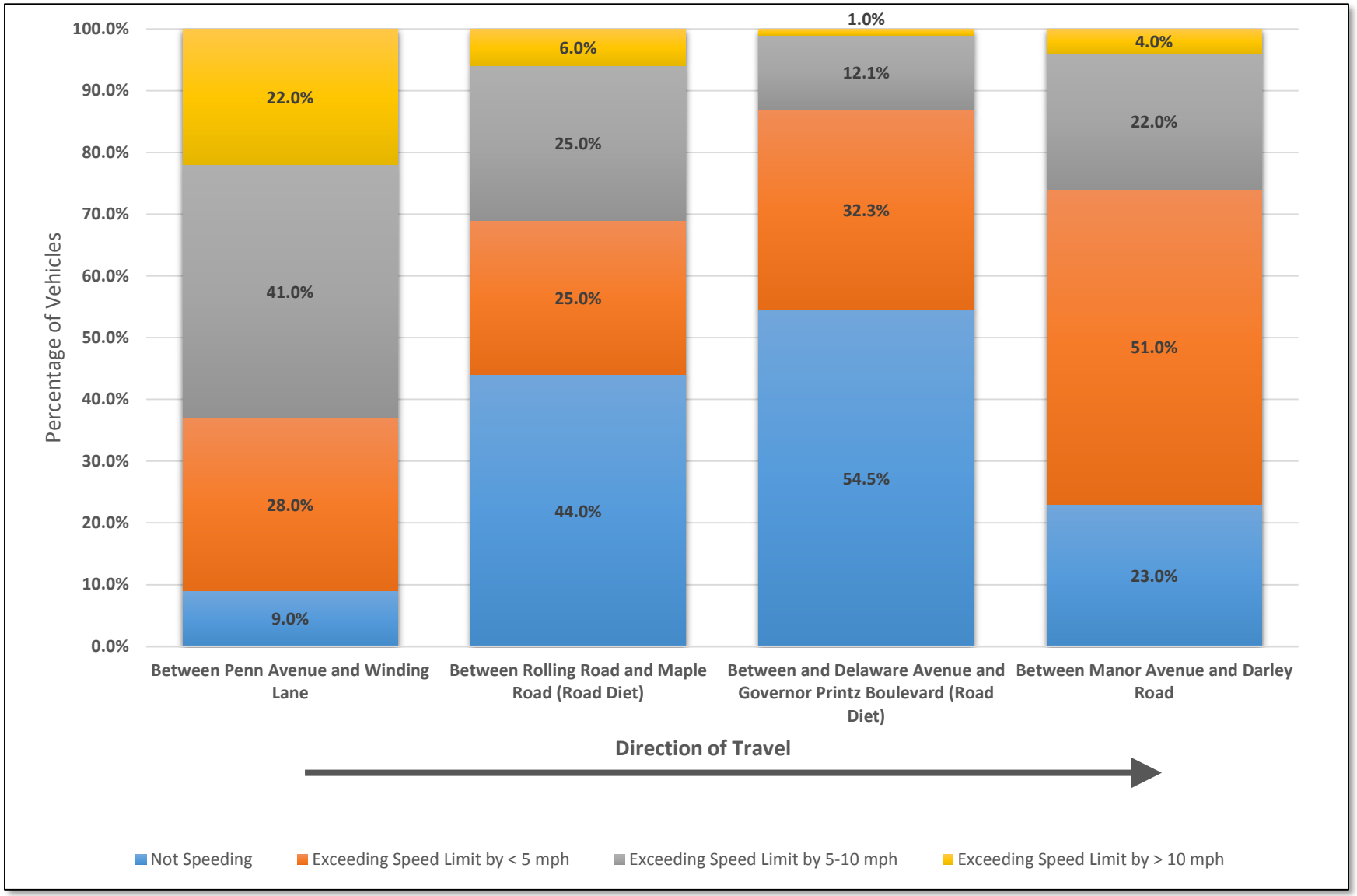


Figure 6 - Vehicle Speed Distribution in the Northbound Direction of Travel

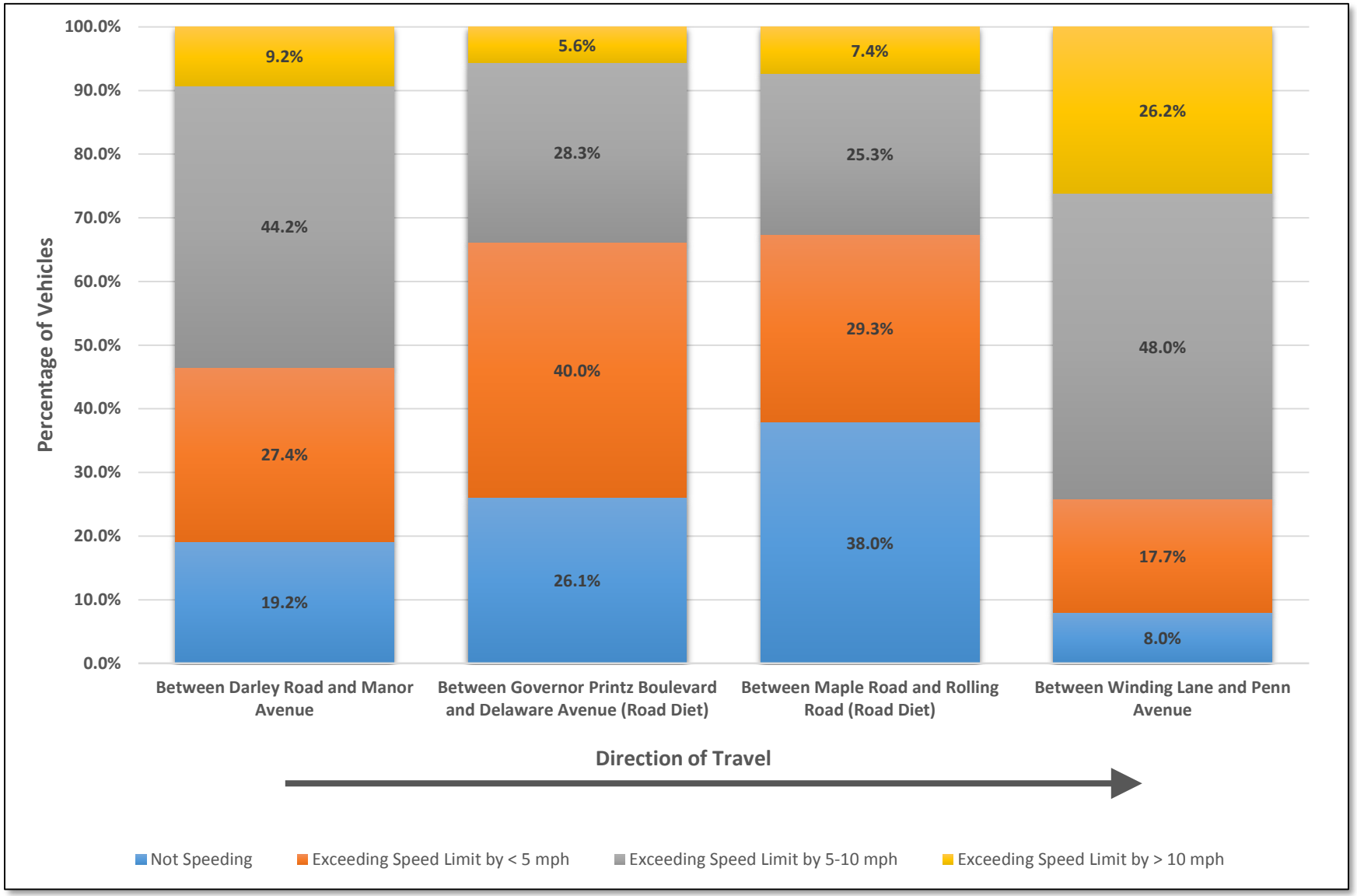


Figure 7 - Vehicle Speed Distribution in the Southbound Direction of Travel

The results of the speed study indicate that the average speed, median speed, and the 15th and 85th percentile speeds are all lower within the Road Diet section in both directions of travel compared to speeds entering the Road Diet segment. Moreover, the percentage of drivers travelling at or below the posted speed limit is higher within the road diet section, than it is approaching the section, an indication that the road diet is effective in encouraging compliance with the posted speed limit.

In terms of general speed limit compliance:

- ***Approaching*** **the Road Diet section, 91% of the northbound motorists and 82% of the southbound motorists travel above the posted speed limit**
- ***Within*** **the Road Diet section, only 51% of the northbound motorists and 68% of southbound motorists travel above the posted speed limit**
- ***After*** **the Road Diet section, 77% of the northbound motorists and 92% of the southbound motorists travel above the speed limit**

In terms of excessive speeds (motorists exceeding the speed limit by 5mph or more):

- ***Approaching*** **the Road Diet section, 63% of the northbound motorists and 53% of the southbound motorists travel 5mph or more above the posted speed limit**
- ***Within*** **the Road Diet section, only 22% of the northbound motorists and 33% of southbound motorists travel 5mph or more above the posted speed limit**
- ***After*** **the Road Diet section, *26% of the northbound motorists and 74% of the southbound motorists travel 5mph or more above the posted speed limit***

It is important to note that the section south of (outside of) the study corridor has the highest speed limit (40 mph) within the project area along Philadelphia Pike. It also has the lowest percentage of compliant drivers and the highest percentage of high-end speeders. This is possibly due to a combination of the following reasons:

- Geometric differences in the cross-section: The southern section of the corridor does not include a center two-way left turn lane.
- Proximity of traffic signals: The southern section of the corridor does not have as many closely-spaced traffic signals as the northern section, which could cause the higher speeds due to uninterrupted traffic flow.
- Adjacent land use: Land uses along the northern section of the corridor has a semi-urban feel, mainly because of the existence of a shopping center and apartment buildings. These land uses may generate more traffic than the lower-density land uses along the section south of the Road Diet corridor, and therefore cause traffic speeds to decrease.
- Roadway grade: The existence of moderate grades south of the study section in both directions may promote higher driving speeds.

D. Crash Analysis

Figure 8 and Figure 9 illustrate the crash composition along Philadelphia Pike between October 2005 and September 2008 and between October 2012 and September 2015, respectively. Table 8 shows the difference in crashes between the time periods before and after the implementation of the Road Diet.

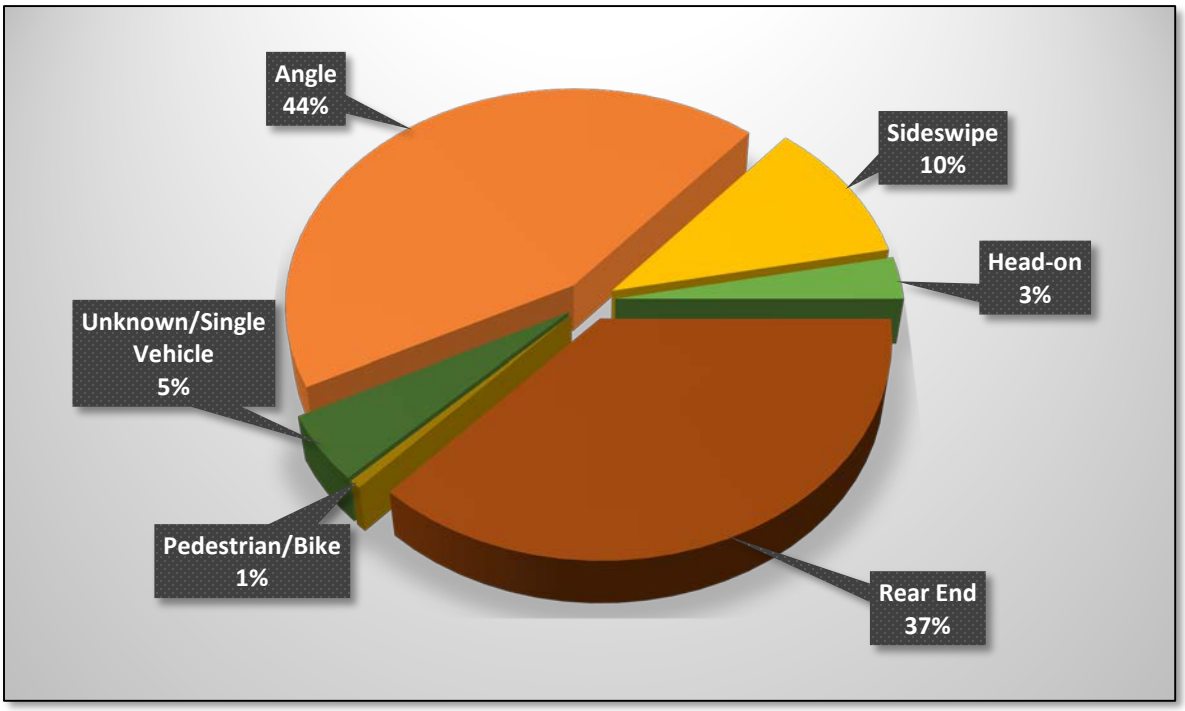


Figure 8 - Crash Composition along Philadelphia Pike: October 2005-September 2008

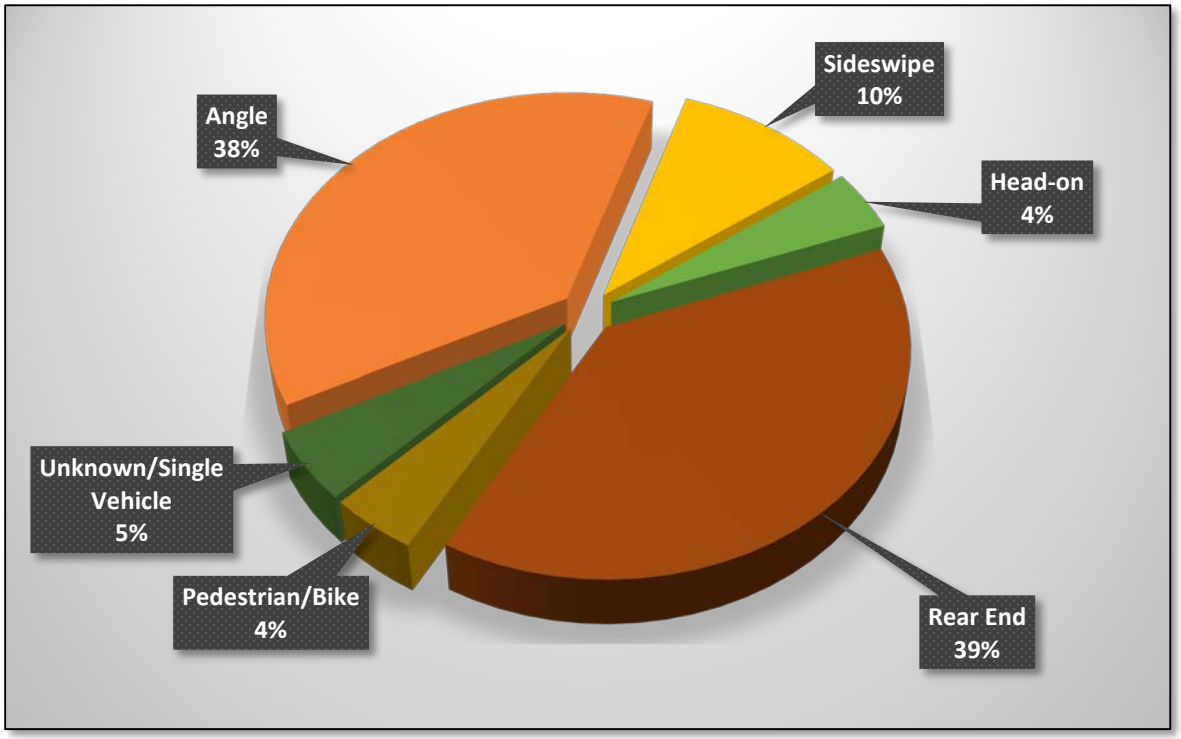


Figure 9 - Crash Composition along Philadelphia Pike: October 2012-September 2015

Table 8 - Before and After Crash Comparison

Crash Type	Before (2005-2008)	After (2012-2015)	Change
Angle	**70**	**52**	-26%
Sideswipe	17	14	-18%
Head-on	5	6	20%
Rear End	59	54	-8%
Pedestrian/Bike	1	6	500%
Unknown/Single Vehicle*	8	7	-13%
Total	**160**	**139**	**-13%**
Crash Rate (Crashes per 100 Million Vehicle-Miles of Travel)	**917**	**817**	**-11%**

* Does not include pedestrian crashes

The data summarized in Table 8 shows that the number of total number of crashes has decreased by 13% in the 3-year period following construction of the Road Diet project. Additionally, all of the individual crash types have decreased in the "after" period with the exception of head-on crashes, which increased by 1 crash (a 20% increase) and pedestrian/bike crashes which increased by 5 crashes (there was only a single pedestrian crash in the "before" period). Additional detail on the pedestrian crashes is provided below. Similar to the crash trends for seen for the number of crashes, the crash *rate* along the study corridor has also decreased. Specifically, the crash rate decreased by 11%, from 917 crashes per 100 million vehicle-miles of travel during the "before" period to 817 crashes per 100 million vehicle-miles of travel during the "after" period.

The decrease in both the total number of crashes and the crash rate indicates that the implementation of the Road Diet has helped to improve overall vehicular safety along the study corridor, in spite of traffic volumes increasing by 10% since the Road Diet project was implemented.

However, following the implementation of the Road Diet, a number of pedestrian crashes have occurred. There was a single pedestrian-involved crash in the 3-year "before" study period, resulting in a fatality. This crash was located near the northern end of the study area near Stockdale Ave involving a pedestrian crossing the previously 4-lane section at a mid-block, unmarked location. During the "after" study period, there were six (6) pedestrian-related crashes, all resulting in injury. None of these crashes resulted in a fatality. One of these pedestrian crashes occurred at the northern end of the study area at Governor Printz Blvd within the transition area in/out of the northern end of the road diet project. The other five (5) pedestrian crashes occurred within a 850' segment of Philadephia Pike in the mostly commercial section between Princeton Ave and Harvey Road, which is within the transition area in/out of the southern end of the road diet project. All six (6) of these pedestrian crashes occurred during nighttime (dark) hours.

It should be noted that the crash data in the Appendix show eight (8) pedestrian crashes during the "after" period. However, upon closer inspection of the police reports for these crashes, two (2) were found to have been improperly categorized as pedestrian crashes for the corridor.

Since 2006, a total of three (3) pedestrian fatalities have occurred within the study area. The first, as described previously, occurred in 2006 (during the 3-year "before" period) near Stockdale Avenue, which involved a pedestrian crossing mid-block. The other two (2) pedestrian fatalities occurred in 2016 after the Road Diet was implemented, and also after the 3-year "after" period used for this study. Both of these fatalities occurred at mid-block locations near the Claymont Liquor store, approximately 500 feet south of Harvey Road and outside of the limits of the road diet project. One of the 2016 fatalities involved an intoxicated person. All three (3) of the pedestrian fatalities that have occurred within the study area in the past 10 years happened during nighttime hours.

V. Summary

This before/after study evaluated the operational and safety impacts of a Road Diet project that DelDOT implemented along a one-mile section of Philadelphia Pike between Rolling Road and Governor Printz Boulevard. The following is a brief summary of the key findings:

- **Safety:** Crash data indicate that the total number of vehicular crashes has decreased by 13% in the 3-year period after the project was completed. Similarly, the crash rate has decreased by 11% in the same period. There have been six pedestrian-involved crashes in the 3-year "after" period following the implementation of the Road Diet, however, all 6 of these pedestrian crashes occurred in the transition areas in/out of the southern and northern ends of the road diet project.

  Within the past 10 years, three (3) pedestrian fatalities have occurred within the study area, one prior to and two following the implementation of the Road Diet. Of the two (2) fatal pedestrian crashes that occurred after the Road Diet project (both of which occurred in 2016), one involved an intoxicated pedestrian, and both occurred in the study area but outside the southern limits of the road diet project.

  It should be noted that, based on the pedestrian crash data analysis from this study, DelDOT intends to further review pedestrian enhancements for Philadelphia Pike in the road diet section, including options for roadway lighting improvements, and consideration of mid-block pedestrian islands. Additionally, DelDOT is currently performing a pedestrian safety audit along a 6-mile section of Philadelphia Pike that includes the road diet project area. Based on that project, DelDOT is considering extending the road diet project up to 3 miles farther south.

- **Speeds:** Speed data shows that motorists within the 1-mile Road Diet segment show considerably higher compliance to the posted speed limit than approaching or departing it. Approximately 85% of motorists exceed the speed limit approaching the Road Diet segment, yet only 60% of motorists exceed the speed limit within the project limits. After departing the Road Diet segment, approximately 85% of motorists exceed the speed limit again.

- **Volumes & Diversions**: Traffic volume data indicate that, contrary to expectations, daily traffic volumes have *increased* on Philadelphia Pike by approximately 10% after implementation of the Road Diet project. Furthermore, traffic volumes on a potential diversion route, Governor Printz Boulevard, have *decreased* since the implementation of the project.

- **Operations**: Operational Analyses indicate minor increases in the overall delay at the intersection of Philadelphia Pike and Harvey Road, however the intersection still operates acceptably with relatively low delay and little change to maximum queue lengths. The intersection of Philadelphia Pike and Governor Printz Boulevard operates slightly better today than it did prior to implementation of the Road Diet, due possibly to improved signal timings and/or shifts in traffic volumes among the various turning movements.

Appendix A – Turning Movement Counts

RKK
81 Mosher Street
Baltimore, MD 21217

Loc: Philadelphia Pike & Harvey Rd
County: New Castle
Weather: Drizzle off & on
Counter: RMF, DR

File Name : Philadelphia Pike@Harvey Rd
Site Code : 14144.18
Start Date : 5/17/2016
Page No : 1

Groups Printed- Vehicles - Trucks

	Philadelphia Pike From North					McDonalds Entrance/Exit From East					Philadelphia Pike From South					Harvey Road From West					
Start Time	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Int. Total
06:30 AM	28	55	3	0	86	4	5	2	0	11	4	66	12	0	82	18	8	46	0	72	251
06:45 AM	33	82	6	0	121	2	5	1	0	8	4	83	16	0	103	13	4	54	0	71	303
Total	61	137	9	0	207	6	10	3	0	19	8	149	28	0	185	31	12	100	0	143	554
07:00 AM	39	91	6	0	136	2	1	2	0	5	1	73	9	0	83	24	6	63	0	93	317
07:15 AM	47	101	4	0	152	3	5	4	0	12	7	78	23	0	108	12	7	69	0	88	360
07:30 AM	55	118	6	0	179	2	6	3	0	11	5	87	18	0	110	31	15	101	0	147	447
07:45 AM	53	134	6	0	193	2	3	4	0	9	3	78	21	0	102	30	3	76	0	109	413
Total	194	444	22	0	660	9	15	13	0	37	16	316	71	0	403	97	31	309	0	437	1537
08:00 AM	35	116	4	0	155	1	1	7	0	9	6	75	16	0	97	22	7	48	0	77	338
08:15 AM	47	165	12	0	224	4	9	11	0	24	7	74	19	0	100	23	10	47	0	80	428
08:30 AM	44	158	5	0	207	4	2	12	0	18	9	91	24	0	124	28	12	37	0	77	426
08:45 AM	35	128	6	0	169	6	3	6	0	15	9	71	26	0	106	31	4	48	0	83	373
Total	161	567	27	0	755	15	15	36	0	66	31	311	85	0	427	104	33	180	0	317	1565
*** BREAK ***																					
04:00 PM	36	132	7	0	175	2	6	2	0	10	8	98	36	0	142	23	8	62	0	93	420
04:15 PM	60	140	7	0	207	1	1	8	0	10	8	80	18	0	106	27	6	73	0	106	429
04:30 PM	70	127	7	0	204	5	7	3	0	15	7	120	30	0	157	17	5	55	0	77	453
04:45 PM	45	140	3	0	188	3	4	4	0	11	12	90	19	0	121	25	5	72	0	102	422
Total	211	539	24	0	774	11	18	17	0	46	35	388	103	0	526	92	24	262	0	378	1724
05:00 PM	59	161	3	0	223	5	2	4	0	11	12	109	36	0	157	29	5	69	0	103	494
05:15 PM	61	122	2	0	185	6	6	7	0	19	9	117	31	0	157	30	4	59	0	93	454
05:30 PM	39	137	2	0	178	6	6	2	0	14	9	101	36	0	146	30	10	72	0	112	450
05:45 PM	45	169	5	0	219	4	4	3	0	11	5	123	35	0	163	32	2	59	0	93	486
Total	204	589	12	0	805	21	18	16	0	55	35	450	138	0	623	121	21	259	0	401	1884
06:00 PM	60	170	6	0	236	6	7	6	0	19	8	102	26	0	136	21	6	53	0	80	471
06:15 PM	41	138	3	0	182	2	2	6	0	10	7	91	30	0	128	16	3	53	0	72	392
Grand Total	932	2584	103	0	3619	70	85	97	0	252	140	1807	481	0	2428	482	130	1216	0	1828	8127
Apprch %	25.8	71.4	2.8	0		27.8	33.7	38.5	0		5.8	74.4	19.8	0		26.4	7.1	66.5	0		
Total %	11.5	31.8	1.3	0	44.5	0.9	1	1.2	0	3.1	1.7	22.2	5.9	0	29.9	5.9	1.6	15	0	22.5	
Vehicles	918	2561	103	0	3582	69	85	97	0	251	138	1786	478	0	2402	476	129	1207	0	1812	8047
% Vehicles	98.5	99.1	100	0	99	98.6	100	100	0	99.6	98.6	98.8	99.4	0	98.9	98.8	99.2	99.3	0	99.1	99
Trucks	14	23	0	0	37	1	0	0	0	1	2	21	3	0	26	6	1	9	0	16	80
% Trucks	1.5	0.9	0	0	1	1.4	0	0	0	0.4	1.4	1.2	0.6	0	1.1	1.2	0.8	0.7	0	0.9	1

RKK
81 Mosher Street
Baltimore, MD 21217

Loc: Philadelphia Pike & Harvey Rd
County: New Castle
Weather: Drizzle off & on
Counter: RMF, DR

File Name : Philadelphia Pike@Harvey Rd
Site Code : 14144.18
Start Date : 5/17/2016
Page No : 2

	Philadelphia Pike From North					McDonalds Entrance/Exit From East					Philadelphia Pike From South					Harvey Road From West					
Start Time	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 12:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	**55**	118	6	0	179	2	6	3	0	11	5	**87**	18	0	**110**	**31**	**15**	**101**	0	**147**	**447**
07:45 AM	53	134	6	0	193	2	3	4	0	9	3	78	**21**	0	102	30	3	76	0	109	413
08:00 AM	35	116	4	0	155	1	1	7	0	9	6	75	16	0	97	22	7	48	0	77	338
08:15 AM	47	**165**	**12**	0	**224**	**4**	**9**	**11**	0	**24**	**7**	74	19	0	100	23	10	47	0	80	428
Total Volume	190	533	28	0	751	9	19	25	0	53	21	314	74	0	409	106	35	272	0	413	1626
% App. Total	25.3	71	3.7	0		17	35.8	47.2	0		5.1	76.8	18.1	0		25.7	8.5	65.9	0		
PHF	.864	.808	.583	.000	.838	.563	.528	.568	.000	.552	.750	.902	.881	.000	.930	.855	.583	.673	.000	.702	.909
Peak Hour Analysis From 06:30 AM to 12:30 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	07:45 AM					08:00 AM					08:00 AM					07:00 AM					
+0 mins.	**53**	134	6	0	193	1	1	7	0	9	6	75	16	0	97	24	6	63	0	93	
+15 mins.	35	116	4	0	155	4	**9**	11	0	**24**	7	74	19	0	100	12	7	69	0	88	
+30 mins.	47	**165**	**12**	0	**224**	4	2	**12**	0	18	**9**	**91**	24	0	**124**	**31**	**15**	**101**	0	**147**	
+45 mins.	44	158	5	0	207	**6**	3	6	0	15	9	71	**26**	0	106	30	3	76	0	109	
Total Volume	179	573	27	0	779	15	15	36	0	66	31	311	85	0	427	97	31	309	0	437	
% App. Total	23	73.6	3.5	0		22.7	22.7	54.5	0		7.3	72.8	19.9	0		22.2	7.1	70.7	0		
PHF	.844	.868	.563	.000	.869	.625	.417	.750	.000	.688	.861	.854	.817	.000	.861	.782	.517	.765	.000	.743	
Peak Hour Analysis From 12:45 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	59	161	3	0	**223**	5	2	4	0	11	**12**	109	**36**	0	157	29	5	69	0	103	**494**
05:15 PM	**61**	122	2	0	185	**6**	**6**	**7**	0	**19**	9	117	31	0	157	30	4	59	0	93	454
05:30 PM	39	137	2	0	178	6	6	2	0	14	9	101	36	0	146	30	**10**	**72**	0	**112**	450
05:45 PM	45	**169**	**5**	0	219	4	4	3	0	11	5	**123**	35	0	**163**	**32**	2	59	0	93	486
Total Volume	204	589	12	0	805	21	18	16	0	55	35	450	138	0	623	121	21	259	0	401	1884
% App. Total	25.3	73.2	1.5	0		38.2	32.7	29.1	0		5.6	72.2	22.2	0		30.2	5.2	64.6	0		
PHF	.836	.871	.600	.000	.902	.875	.750	.571	.000	.724	.729	.915	.958	.000	.956	.945	.525	.899	.000	.895	.953

RKK
81 Mosher Street
Baltimore, MD 21217

Loc: Philadelphia Pike & Harvey Rd
County: New Castle
Weather: Drizzle off & on
Counter: RMF, DR

File Name : Philadelphia Pike@Harvey Rd
Site Code : 14144.18
Start Date : 5/17/2016
Page No : 1

Groups Printed- Peds

	Philadelphia Pike From North					McDonalds Entrance/Exit From East					Philadelphia Pike From South					Harvey Road From West					
Start Time	Right	Ped/bike	Left	Sch Child	App. Total	Right	Ped/bike	Left	Sch Child	App. Total	Right	Ped/bike	Left	Sch Child	App. Total	Right	Ped/bike	Left	Sch Child	App. Total	Int. Total
06:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	3
*** BREAK ***																					
Total	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	3
07:00 AM	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
07:15 AM	0	0	0	0	0	0	2	0	0	2	0	1	0	0	1	0	3	0	0	3	6
07:30 AM	0	2	0	0	2	0	2	0	0	2	0	2	0	0	2	0	4	0	0	4	10
07:45 AM	0	0	0	0	0	0	1	0	2	3	0	0	0	0	0	0	0	0	0	0	3
Total	0	2	0	1	3	0	5	0	2	7	0	3	0	0	3	0	7	0	0	7	20
08:00 AM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
08:15 AM	0	0	0	0	0	0	3	0	1	4	0	0	0	0	0	0	0	0	0	0	4
08:30 AM	0	1	0	0	1	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	4
08:45 AM	0	2	0	0	2	0	2	0	0	2	0	2	0	0	2	0	2	0	0	2	8
Total	0	5	0	0	5	0	7	0	1	8	0	3	0	0	3	0	3	0	0	3	19
*** BREAK ***																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
04:15 PM	0	1	0	0	1	0	0	0	2	2	0	2	0	0	2	0	0	0	0	0	5
04:30 PM	0	4	0	0	4	0	4	0	0	4	0	2	0	0	2	0	4	0	0	4	14
04:45 PM	0	1	0	0	1	0	2	0	4	6	0	5	0	0	5	0	0	0	0	0	12
Total	0	6	0	0	6	0	6	0	6	12	0	9	0	0	9	0	5	0	0	5	32
05:00 PM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	2	0	0	2	5
05:15 PM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	3
05:30 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	0	0	1	3
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	2	0	0	2	4
Total	0	5	0	0	5	0	0	0	0	0	0	4	0	0	4	0	6	0	0	6	15
06:00 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
06:15 PM	0	0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	5
Grand Total	0	19	0	5	24	0	19	0	9	28	0	19	0	0	19	0	24	0	0	24	95
Apprch %	0	79.2	0	20.8		0	67.9	0	32.1		0	100	0	0		0	100	0	0		
Total %	0	20	0	5.3	25.3	0	20	0	9.5	29.5	0	20	0	0	20	0	25.3	0	0	25.3	

RKK
81 Mosher Street
Baltimore, MD 21217

Loc: Philadelphia Pike & Harvey Rd
County: New Castle
Weather: Drizzle off & on
Counter: RMF, DR

File Name : Philadelphia Pike@Harvey Rd
Site Code : 14144.18
Start Date : 5/17/2016

	Philadelphia Pike From North					McDonalds Entrance/Exit From East					Philadelphia Pike From South					Harvey Road From West					
Start Time	Right	Ped/bike	Left	Sch Child	App. Total	Right	Ped/bike	Left	Sch Child	App. Total	Right	Ped/bike	Left	Sch Child	App. Total	Right	Ped/bike	Left	Sch Child	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 12:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	0	0	0	0	0	**2**	0	0	2	0	1	0	0	1	0	3	0	0	3	6
07:30 AM	0	**2**	0	0	**2**	0	2	0	0	2	0	**2**	0	0	**2**	0	**4**	0	0	**4**	**10**
07:45 AM	0	0	0	0	0	0	1	0	**2**	**3**	0	0	0	0	0	0	0	0	0	0	3
08:00 AM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
Total Volume	0	4	0	0	4	0	5	0	2	7	0	4	0	0	4	0	7	0	0	7	22
% App. Total	0	100	0	0		0	71.4	0	28.6		0	100	0	0		0	100	0	0		
PHF	.000	.500	.000	.000	.500	.000	.625	.000	.250	.583	.000	.500	.000	.000	.500	.000	.438	.000	.000	.438	.550

	08:00 AM					07:30 AM					07:15 AM					06:45 AM					
Peak Hour Analysis From 06:30 AM to 12:30 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
+0 mins.	0	**2**	0	0	**2**	0	2	0	0	2	0	1	0	0	1	0	0	0	0	0	
+15 mins.	0	0	0	0	0	0	1	0	**2**	3	0	**2**	0	0	**2**	0	0	0	0	0	
+30 mins.	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	
+45 mins.	0	2	0	0	2	0	**3**	0	1	**4**	0	1	0	0	1	0	**4**	0	0	**4**	
Total Volume	0	5	0	0	5	0	6	0	3	9	0	4	0	0	4	0	7	0	0	7	
% App. Total	0	100	0	0		0	66.7	0	33.3		0	100	0	0		0	100	0	0		
PHF	.000	.625	.000	.000	.625	.000	.500	.000	.375	.563	.000	.500	.000	.000	.500	.000	.438	.000	.000	.438	
Peak Hour Analysis From 12:45 PM to 06:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	1	0	0	1	0	0	0	2	2	0	2	0	0	2	0	0	0	0	0	5
04:30 PM	0	**4**	0	0	**4**	0	**4**	0	0	4	0	2	0	0	2	0	**4**	0	0	**4**	**14**
04:45 PM	0	1	0	0	1	0	2	0	**4**	**6**	0	**5**	0	0	**5**	0	0	0	0	0	12
05:00 PM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	2	0	0	2	5
Total Volume	0	8	0	0	8	0	6	0	6	12	0	10	0	0	10	0	6	0	0	6	36
% App. Total	0	100	0	0		0	50	0	50		0	100	0	0		0	100	0	0		
PHF	.000	.500	.000	.000	.500	.000	.375	.000	.375	.500	.000	.500	.000	.000	.500	.000	.375	.000	.000	.375	.643

RKK
81 Mosher Street
Baltimore, MD 21217

Loc: Philadelphia Pike & Gov. Printz Rd
County: New Castle
Weather: Cloudy
Counter: DR, BB

File Name : Philadephia Pike@Gov.Printz Blvd
Site Code : 13162B
Start Date : 5/10/2016
Page No : 1

Groups Printed- Vehicles - Trucks

	Philadelphia Pike From North					Governor Printz Blvd From East					Philadelphia Pike From South					- From West					
Start Time	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Int. Total
07:00 AM	0	99	14	0	113	39	0	10	0	49	4	151	0	0	155	0	0	0	0	0	317
07:15 AM	0	119	20	0	139	36	0	8	0	44	11	150	0	0	161	0	0	0	0	0	344
07:30 AM	0	134	14	0	148	44	0	19	0	63	4	146	0	0	150	0	0	0	0	0	361
07:45 AM	0	182	31	0	213	34	0	10	0	44	11	209	0	0	220	0	0	0	0	0	477
Total	0	534	79	0	613	153	0	47	0	200	30	656	0	0	686	0	0	0	0	0	1499
08:00 AM	0	196	18	0	214	34	0	8	0	42	4	141	0	0	145	0	0	0	0	0	401
08:15 AM	0	168	10	0	178	28	0	10	0	38	7	120	0	0	127	0	0	0	0	0	343
08:30 AM	0	193	20	0	213	33	0	11	0	44	6	116	0	0	122	0	0	0	0	0	379
08:45 AM	0	142	19	0	161	28	0	10	0	38	10	143	0	0	153	0	0	0	0	0	352
Total	0	699	67	0	766	123	0	39	0	162	27	520	0	0	547	0	0	0	0	0	1475
*** BREAK ***																					
11:00 AM	0	109	21	0	130	29	0	4	0	33	3	107	0	0	110	0	0	0	0	0	273
11:15 AM	0	106	9	0	115	23	0	3	0	26	5	104	0	0	109	0	0	0	0	0	250
11:30 AM	0	92	20	0	112	15	0	1	0	16	5	113	0	0	118	0	0	0	0	0	246
11:45 AM	0	119	23	0	142	24	0	6	0	30	6	114	0	0	120	0	0	0	0	0	292
Total	0	426	73	0	499	91	0	14	0	105	19	438	0	0	457	0	0	0	0	0	1061
12:00 PM	0	128	19	0	147	22	0	4	0	26	5	116	0	0	121	0	0	0	0	0	294
12:15 PM	0	131	17	1	149	21	0	7	0	28	3	141	0	0	144	0	0	0	0	0	321
12:30 PM	0	107	15	0	122	29	0	10	0	39	5	132	0	0	137	0	0	0	0	0	298
12:45 PM	0	113	21	0	134	20	0	7	0	27	5	106	0	0	111	0	0	0	0	0	272
Total	0	479	72	1	552	92	0	28	0	120	18	495	0	0	513	0	0	0	0	0	1185
*** BREAK ***																					
04:00 PM	0	163	37	0	200	40	0	11	0	51	4	137	0	0	141	0	0	0	0	0	392
04:15 PM	0	151	28	0	179	34	0	11	0	45	4	129	0	0	133	0	0	0	0	0	357
04:30 PM	0	204	33	0	237	34	0	9	0	43	4	157	0	0	161	0	0	0	0	0	441
04:45 PM	0	207	36	0	243	38	0	9	0	47	11	185	0	0	196	0	0	0	0	0	486
Total	0	725	134	0	859	146	0	40	0	186	23	608	0	0	631	0	0	0	0	0	1676
05:00 PM	0	236	61	0	297	27	0	8	0	35	9	182	0	0	191	0	0	0	0	0	523
05:15 PM	0	193	35	0	228	43	0	10	0	53	6	146	0	0	152	0	0	0	0	0	433
05:30 PM	0	188	52	0	240	32	0	13	0	45	13	169	0	0	182	0	0	0	0	0	467
05:45 PM	0	229	40	0	269	37	0	6	0	43	6	163	0	0	169	0	0	0	0	0	481
Total	0	846	188	0	1034	139	0	37	0	176	34	660	0	0	694	0	0	0	0	0	1904

RKK
81 Mosher Street
Baltimore, MD 21217

Loc: Philadelphia Pike & Gov. Printz Rd
County: New Castle
Weather: Cloudy
Counter: DR, BB

File Name : Philadephia Pike@Gov.Printz Blvd
Site Code : 13162B
Start Date : 5/10/2016

Groups Printed- Vehicles - Trucks

	Philadelphia Pike From North					Governor Printz Blvd From East					Philadelphia Pike From South					- From West					
	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Int. Total
Grand Total	0	3709	613	1	4323	744	0	205	0	949	151	3377	0	0	3528	0	0	0	0	0	8800
Apprch %	0	85.8	14.2	0		78.4	0	21.6	0		4.3	95.7	0	0		0	0	0	0		
Total %	0	42.1	7	0	49.1	8.5	0	2.3	0	10.8	1.7	38.4	0	0	40.1	0	0	0	0	0	
Vehicles	0	3662	588	1	4251	730	0	205	0	935	149	3337	0	0	3486	0	0	0	0	0	8672
% Vehicles	0	98.7	95.9	100	98.3	98.1	0	100	0	98.5	98.7	98.8	0	0	98.8	0	0	0	0	0	98.5
Trucks	0	47	25	0	72	14	0	0	0	14	2	40	0	0	42	0	0	0	0	0	128
% Trucks	0	1.3	4.1	0	1.7	1.9	0	0	0	1.5	1.3	1.2	0	0	1.2	0	0	0	0	0	1.5

RKK
81 Mosher Street
Baltimore, MD 21217

Loc: Philadelphia Pike & Gov. Printz Rd
County: New Castle
Weather: Cloudy
Counter: DR, BB

File Name : Philadephia Pike@Gov.Printz Blvd
Site Code : 13162B
Start Date : 5/10/2016

	Philadelphia Pike From North					Governor Printz Blvd From East					Philadelphia Pike From South					- From West					
Start Time	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	182	**31**	0	213	**34**	0	10	0	**44**	**11**	**209**	0	0	**220**	0	0	0	0	0	**477**
08:00 AM	0	**196**	18	0	**214**	34	0	8	0	42	4	141	0	0	145	0	0	0	0	0	401
08:15 AM	0	168	10	0	178	28	0	10	0	38	7	120	0	0	127	0	0	0	0	0	343
08:30 AM	0	193	20	0	213	33	0	**11**	0	44	6	116	0	0	122	0	0	0	0	0	379
Total Volume	0	739	79	0	818	129	0	39	0	168	28	586	0	0	614	0	0	0	0	0	1600
% App. Total	0	90.3	9.7	0		76.8	0	23.2	0		4.6	95.4	0	0		0	0	0	0		
PHF	.000	.943	.637	.000	.956	.949	.000	.886	.000	.955	.636	.701	.000	.000	.698	.000	.000	.000	.000	.000	.839

	Philadelphia Pike From North					Governor Printz Blvd From East					Philadelphia Pike From South					- From West					
Peak Hour Analysis From 07:00 AM to 09:45 AM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	07:45 AM					07:00 AM					07:00 AM					07:00 AM					
+0 mins.	0	182	**31**	0	213	39	0	10	0	49	4	151	0	0	155	0	0	0	0	0	
+15 mins.	0	**196**	18	0	**214**	36	0	8	0	44	**11**	150	0	0	161	0	0	0	0	0	
+30 mins.	0	168	10	0	178	**44**	0	**19**	0	**63**	4	146	0	0	150	0	0	0	0	0	
+45 mins.	0	193	20	0	213	34	0	10	0	44	11	**209**	0	0	**220**	0	0	0	0	0	
Total Volume	0	739	79	0	818	153	0	47	0	200	30	656	0	0	686	0	0	0	0	0	
% App. Total	0	90.3	9.7	0		76.5	0	23.5	0		4.4	95.6	0	0		0	0	0	0		
PHF	.000	.943	.637	.000	.956	.869	.000	.618	.000	.794	.682	.785	.000	.000	.780	.000	.000	.000	.000	.000	
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 11:45 AM																					
11:45 AM	0	119	**23**	0	142	24	0	6	0	30	**6**	114	0	0	120	0	0	0	0	0	292
12:00 PM	0	128	19	0	147	22	0	4	0	26	5	116	0	0	121	0	0	0	0	0	294
12:15 PM	0	**131**	17	**1**	**149**	21	0	7	0	28	3	**141**	0	0	**144**	0	0	0	0	0	**321**
12:30 PM	0	107	15	0	122	**29**	0	**10**	0	**39**	5	132	0	0	137	0	0	0	0	0	298
Total Volume	0	485	74	1	560	96	0	27	0	123	19	503	0	0	522	0	0	0	0	0	1205
% App. Total	0	86.6	13.2	0.2		78	0	22	0		3.6	96.4	0	0		0	0	0	0		
PHF	.000	.926	.804	.250	.940	.828	.000	.675	.000	.788	.792	.892	.000	.000	.906	.000	.000	.000	.000	.000	.938

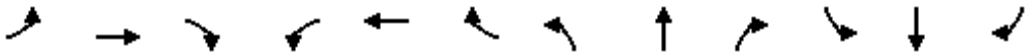
RKK
81 Mosher Street
Baltimore, MD 21217

Loc: Philadelphia Pike & Gov. Printz Rd
County: New Castle
Weather: Cloudy
Counter: DR, BB

File Name : Philadephia Pike@Gov.Printz Blvd
Site Code : 13162B
Start Date : 5/10/2016

	Philadelphia Pike From North					Governor Printz Blvd From East					Philadelphia Pike From South					- From West					
Start Time	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Right	Thru	Left	U-turn	App. Total	Int. Total
Peak Hour Analysis From 02:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	207	36	0	243	38	0	9	0	47	11	**185**	0	0	**196**	0	0	0	0	0	486
05:00 PM	0	**236**	**61**	0	**297**	27	0	8	0	35	9	182	0	0	191	0	0	0	0	0	**523**
05:15 PM	0	193	35	0	228	**43**	0	10	0	**53**	6	146	0	0	152	0	0	0	0	0	433
05:30 PM	0	188	52	0	240	32	0	**13**	0	45	**13**	169	0	0	182	0	0	0	0	0	467
Total Volume	0	824	184	0	1008	140	0	40	0	180	39	682	0	0	721	0	0	0	0	0	1909
% App. Total	0	81.7	18.3	0		77.8	0	22.2	0		5.4	94.6	0	0		0	0	0	0		
PHF	.000	.873	.754	.000	.848	.814	.000	.769	.000	.849	.750	.922	.000	.000	.920	.000	.000	.000	.000	.000	.913

Appendix B – Operational Analysis Reports

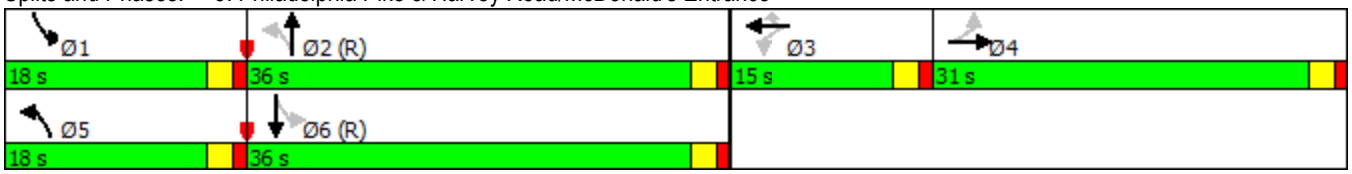


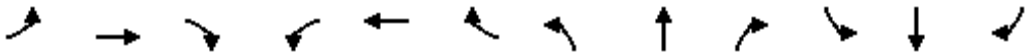
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	272	35	106	25	19	9	74	314	21	28	533	190
Future Volume (vph)	272	35	106	25	19	9	74	314	21	28	533	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	250		0	200		400
Storage Lanes	1		1	0		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Frt		0.887				0.850		0.991			0.960	
Flt Protected	0.950				0.973		0.950			0.950		
Satd. Flow (prot)	1770	1652	0	0	1812	1583	1770	1846	0	1770	3398	0
Flt Permitted	0.726				0.260		0.172			0.314		
Satd. Flow (perm)	1352	1652	0	0	484	1583	320	1846	0	585	3398	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		115				65		4			54	
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		488			218			547			558	
Travel Time (s)		11.1			5.0			9.3			9.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	296	38	115	27	21	10	80	341	23	30	579	207
Shared Lane Traffic (%)												
Lane Group Flow (vph)	296	153	0	0	48	10	80	364	0	30	786	0
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			3		5	2		1	6	
Permitted Phases	4			3		3	2			6		
Total Split (s)	31.0	31.0		15.0	15.0	15.0	18.0	36.0		18.0	36.0	
Total Lost Time (s)	3.0	3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Act Effct Green (s)	28.0	28.0			12.0	12.0	48.0	33.0		48.0	33.0	
Actuated g/C Ratio	0.28	0.28			0.12	0.12	0.48	0.33		0.48	0.33	
v/c Ratio	0.78	0.28			0.83	0.04	0.22	0.60		0.07	0.68	
Control Delay	49.4	10.3			122.5	0.3	14.2	32.5		12.7	30.4	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	49.4	10.3			122.5	0.3	14.2	32.5		12.7	30.4	
LOS	D	B			F	A	B	C		B	C	
Approach Delay		36.1			101.5			29.2			29.7	
Approach LOS		D			F			C			C	
Queue Length 50th (ft)	174	18			30	0	25	190		9	210	
Queue Length 95th (ft)	#306	66			#100	0	49	285		24	278	
Internal Link Dist (ft)		408			138			467			478	
Turn Bay Length (ft)							250			200		
Base Capacity (vph)	378	545			58	247	371	611		458	1157	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.78	0.28			0.83	0.04	0.22	0.60		0.07	0.68	

Intersection Summary	
Area Type:	Other
Cycle Length: 100	

Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Pretimed
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 33.6 Intersection LOS: C
Intersection Capacity Utilization 56.6% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Philadelphia Pike & Harvey Road/McDonald's Entrance



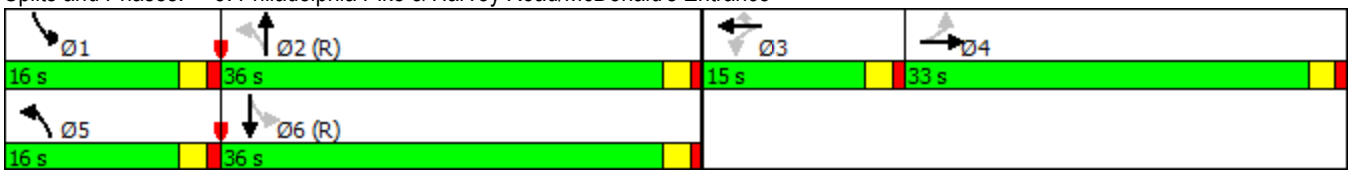


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	259	21	121	16	18	21	138	450	35	12	589	204
Future Volume (vph)	259	21	121	16	18	21	138	450	35	12	589	204
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		250	0		0	250		0	200		400
Storage Lanes	1		1	0		1	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95
Frt		0.872				0.850		0.989			0.961	
Flt Protected	0.950				0.978		0.950			0.950		
Satd. Flow (prot)	1770	1624	0	0	1822	1583	1770	1842	0	1770	3401	0
Flt Permitted	0.733				0.328		0.199			0.383		
Satd. Flow (perm)	1365	1624	0	0	611	1583	371	1842	0	713	3401	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		132				65		4			51	
Link Speed (mph)		35			30			40			40	
Link Distance (ft)		488			218			547			558	
Travel Time (s)		9.5			5.0			9.3			9.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	282	23	132	17	20	23	150	489	38	13	640	222
Shared Lane Traffic (%)												
Lane Group Flow (vph)	282	155	0	0	37	23	150	527	0	13	862	0
Turn Type	Perm	NA		Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			3		5	2		1	6	
Permitted Phases	4			3		3	2			6		
Total Split (s)	33.0	33.0		15.0	15.0	15.0	16.0	36.0		16.0	36.0	
Total Lost Time (s)	3.0	3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Act Effct Green (s)	24.9	24.9			10.0	10.0	57.8	55.9		51.1	45.1	
Actuated g/C Ratio	0.25	0.25			0.10	0.10	0.58	0.56		0.51	0.45	
v/c Ratio	0.83	0.31			0.61	0.11	0.43	0.51		0.03	0.55	
Control Delay	55.6	8.5			81.4	1.0	16.2	19.2		13.2	23.3	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	55.6	8.5			81.4	1.0	16.2	19.2		13.2	23.3	
LOS	E	A			F	A	B	B		B	C	
Approach Delay		38.9			50.6			18.6			23.1	
Approach LOS		D			D			B			C	
Queue Length 50th (ft)	169	11			23	0	46	205		4	209	
Queue Length 95th (ft)	254	57			#67	0	89	406		14	314	
Internal Link Dist (ft)		408			138			467			478	
Turn Bay Length (ft)							250			200		
Base Capacity (vph)	409	579			73	247	396	1031		543	1563	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.69	0.27			0.51	0.09	0.38	0.51		0.02	0.55	

Intersection Summary	
Area Type:	Other
Cycle Length: 100	

Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 25.8 Intersection LOS: C
Intersection Capacity Utilization 61.5% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: Philadelphia Pike & Harvey Road/McDonald's Entrance





Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø3
Lane Configurations							
Traffic Volume (vph)	39	129	586	28	79	739	
Future Volume (vph)	39	129	586	28	79	739	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	12	12	12	12	
Grade (%)	0%		0%			0%	
Storage Length (ft)	0	0		300	300		
Storage Lanes	1	1		1	1		
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	0.95	0.95	0.97	1.00	
Ped Bike Factor							
Frt		0.850	0.993				
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1770	1583	3514	0	3433	1863	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1770	1583	3514	0	3433	1863	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		140	6				
Link Speed (mph)	40		35			35	
Link Distance (ft)	818		547			371	
Travel Time (s)	13.9		10.7			7.2	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Adj. Flow (vph)	42	140	637	30	86	803	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	42	140	667	0	86	803	
Turn Type	Prot	Perm	NA		Prot	NA	
Protected Phases	4		2		1	6	3
Permitted Phases		4					
Minimum Initial (s)	5.0	5.0	15.0		5.0	15.0	5.0
Minimum Split (s)	11.0	11.0	47.0		10.0	22.0	10.0
Total Split (s)	21.0	21.0	48.0		18.0	66.0	13.0
Total Split (%)	21.0%	21.0%	48.0%		18.0%	66.0%	13%
Maximum Green (s)	15.0	15.0	41.0		13.0	59.0	8.0
Yellow Time (s)	4.0	4.0	5.0		3.0	5.0	3.0
All-Red Time (s)	2.0	2.0	2.0		2.0	2.0	2.0
Total Lost Time (s)	6.0	6.0	7.0		5.0	7.0	
Lead/Lag	Lag	Lag	Lag		Lead		Lead
Lead-Lag Optimize?	Yes	Yes	Yes		Yes		Yes
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0		3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0		0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0		0.0	0.0	0.0

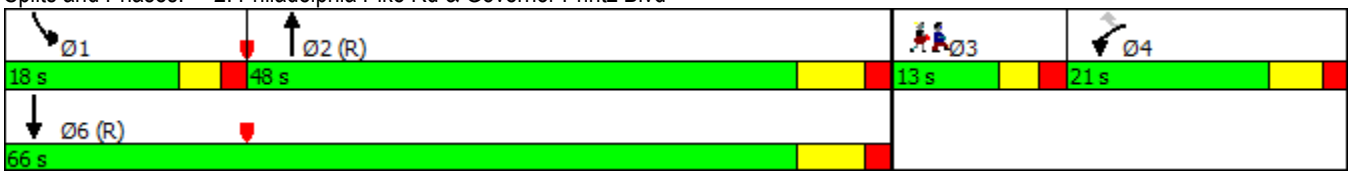


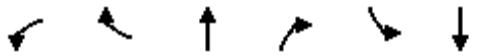
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø3
Recall Mode	None	None	C-Max		None	C-Max	None
Walk Time (s)			7.0				
Flash Dont Walk (s)			33.0				
Pedestrian Calls (#/hr)			0				
Act Effct Green (s)	8.1	8.1	68.2		7.9	78.9	
Actuated g/C Ratio	0.08	0.08	0.68		0.08	0.79	
v/c Ratio	0.29	0.55	0.28		0.32	0.55	
Control Delay	47.6	15.8	7.4		46.2	5.9	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	47.6	15.8	7.4		46.2	5.9	
LOS	D	B	A		D	A	
Approach Delay	23.1		7.4			9.8	
Approach LOS	C		A			A	
Queue Length 50th (ft)	26	0	82		27	145	
Queue Length 95th (ft)	58	55	132		50	265	
Internal Link Dist (ft)	738		467			291	
Turn Bay Length (ft)					300		
Base Capacity (vph)	265	356	2397		446	1469	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.16	0.39	0.28		0.19	0.55	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 10.3 Intersection LOS: B
Intersection Capacity Utilization 53.9% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 2: Philadelphia Pike Rd & Governor Printz Blvd





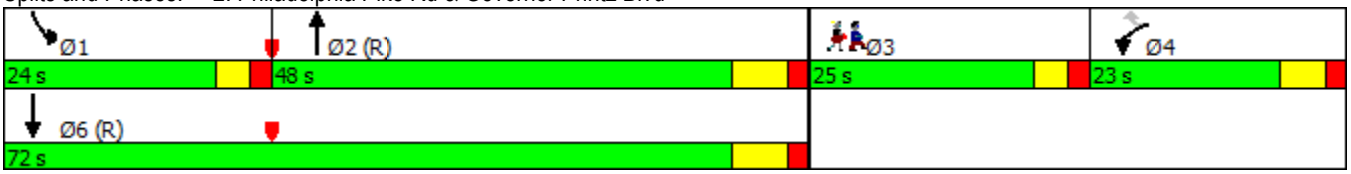
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø3
Lane Configurations							
Traffic Volume (vph)	40	140	682	39	184	824	
Future Volume (vph)	40	140	682	39	184	824	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	
Lane Width (ft)	12	12	12	12	12	12	
Grade (%)	0%		0%			0%	
Storage Length (ft)	0	0		300	300		
Storage Lanes	1	1		1	1		
Taper Length (ft)	25				25		
Lane Util. Factor	1.00	1.00	0.95	0.95	0.97	1.00	
Ped Bike Factor							
Frt		0.850	0.992				
Flt Protected	0.950				0.950		
Satd. Flow (prot)	1770	1583	3511	0	3433	1863	
Flt Permitted	0.950				0.950		
Satd. Flow (perm)	1770	1583	3511	0	3433	1863	
Right Turn on Red		Yes		Yes			
Satd. Flow (RTOR)		152	5				
Link Speed (mph)	40		35			35	
Link Distance (ft)	818		547			371	
Travel Time (s)	13.9		10.7			7.2	
Confl. Peds. (#/hr)							
Confl. Bikes (#/hr)							
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Growth Factor	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	
Bus Blockages (#/hr)	0	0	0	0	0	0	
Parking (#/hr)							
Mid-Block Traffic (%)	0%		0%			0%	
Adj. Flow (vph)	43	152	741	42	200	896	
Shared Lane Traffic (%)							
Lane Group Flow (vph)	43	152	783	0	200	896	
Turn Type	Prot	Perm	NA		Prot	NA	
Protected Phases	4		2		1	6	3
Permitted Phases		4					
Total Split (s)	23.0	23.0	48.0		24.0	72.0	25.0
Total Lost Time (s)	6.0	6.0	7.0		5.0	7.0	
Act Effct Green (s)	8.6	8.6	81.1		12.3	98.4	
Actuated g/C Ratio	0.07	0.07	0.68		0.10	0.82	
v/c Ratio	0.34	0.60	0.33		0.57	0.59	
Control Delay	59.2	18.3	9.1		57.5	5.9	
Queue Delay	0.0	0.0	0.0		0.0	0.0	
Total Delay	59.2	18.3	9.1		57.5	5.9	
LOS	E	B	A		E	A	
Approach Delay	27.3		9.1			15.3	
Approach LOS	C		A			B	
Queue Length 50th (ft)	32	0	119		77	184	
Queue Length 95th (ft)	68	63	185		113	327	
Internal Link Dist (ft)	738		467			291	



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT	Ø3
Turn Bay Length (ft)					300		
Base Capacity (vph)	250	354	2374		543	1527	
Starvation Cap Reductn	0	0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0	
Storage Cap Reductn	0	0	0		0	0	
Reduced v/c Ratio	0.17	0.43	0.33		0.37	0.59	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.60			
Intersection Signal Delay: 14.1		Intersection LOS: B	
Intersection Capacity Utilization 58.4%		ICU Level of Service B	
Analysis Period (min) 15			

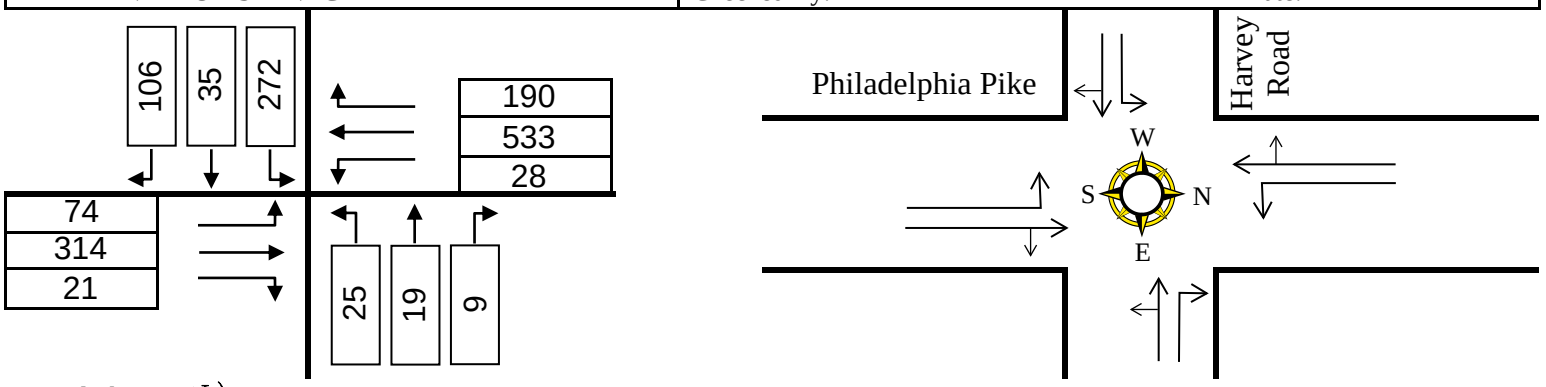
Splits and Phases: 2: Philadelphia Pike Rd & Governor Printz Blvd



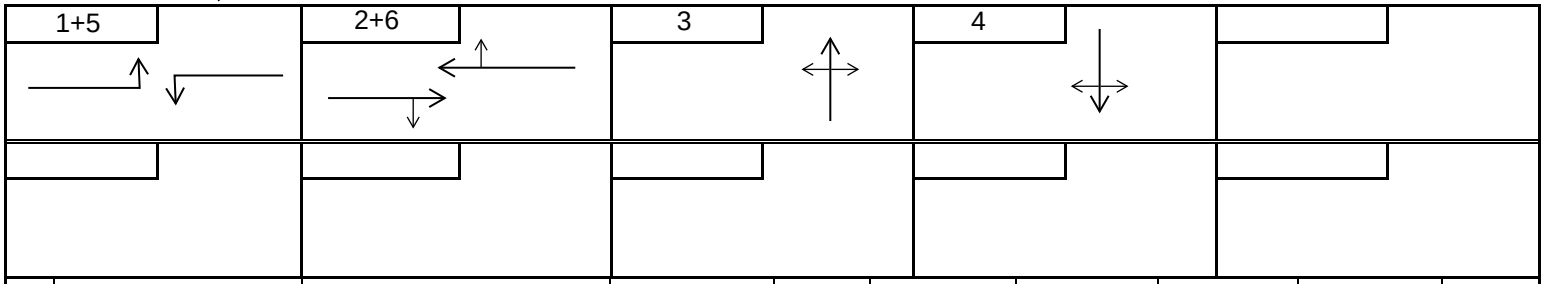
DelDOT

CRITICAL LANE MOVEMENT SUMMATION
AND LEVEL OF SERVICE

Location:	Philadelphia Pike and Harvey Road
Count Date:	05/17/2016
Scenario:	AM PEAK
Computed By:	MAB Date: 05/25/2016
Checked By:	JAB Date: 07/05/2016



Signal Phasing (Φ)



Φ	Movement	Volume		LU	Lane Volume	OL (Add)	LTC (Subtract)	Critical Lane Volume	CM (*)
1	Philly Pike LTSB	28		1	28			28	
5	Philly Pike LTNB	74		1				74	
2	Philly Pike NB	314 + 21		1	335		46	289	
6	Philly Pike SB	533 + 190		1	723	74		797	*
				1					
				1					
3	Harvey Road WB	272		1	272			272	*
4	Harvey Road EB	25 + 19		1	44			44	*

Remarks:

TOTAL:	1113
LEVEL OF SERVICE:	B

Level	Critical Movement Volume
A	Less than 1,000 veh/hr
B	1,000 to 1,150 veh/hr
C	1,151 to 1,300 veh/hr
D	1,301 to 1,450 veh/hr
E	1,451 to 1,600 veh/hr
F	More than 1,600 veh/hr

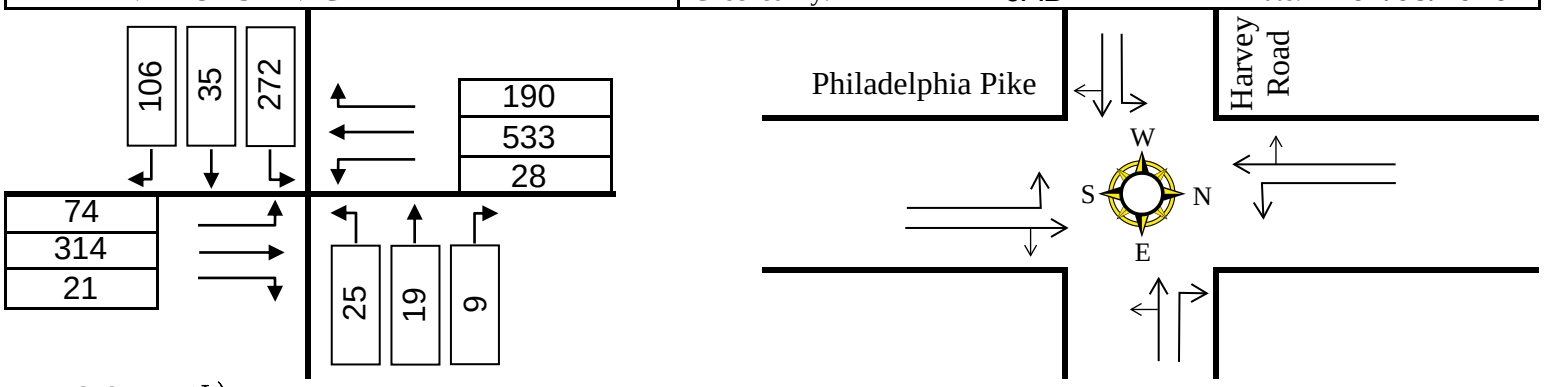
No. of Lanes	Lane Use factor (LU)
1	1.00
2	0.55
3	0.40
4	0.30

LEGEND	
OL =	Opposing Lefts
LTC =	Left Turn Credit

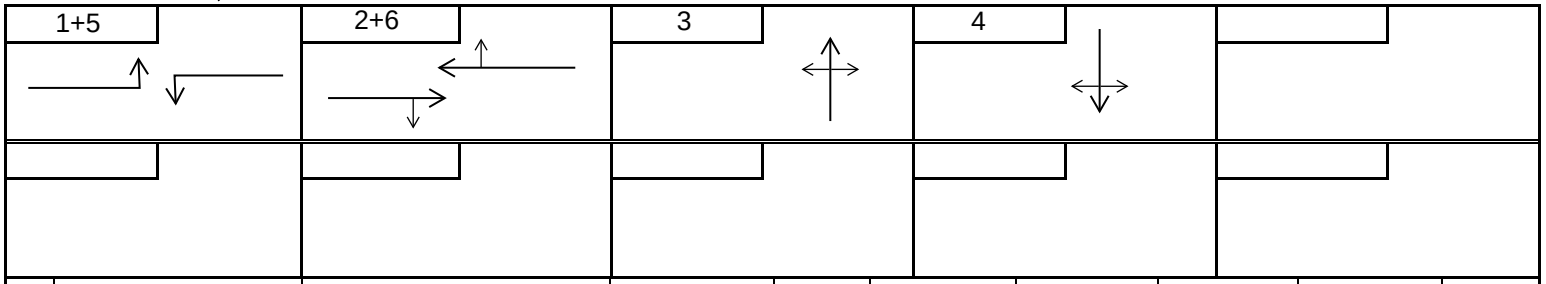
DelDOT

CRITICAL LANE MOVEMENT SUMMATION
AND LEVEL OF SERVICE

Location:	Philadelphia Pike and Harvey Road
Count Date:	05/17/2016
Scenario:	PM PEAK
Computed By:	MAB Date: 05/25/2016
Checked By:	JAB Date: 07/05/2016



Signal Phasing (Φ)



Φ	Movement	Volume		LU	Lane Volume	OL (Add)	LTC (Subtract)	Critical Lane Volume	CM (*)
1	Philly Pike LTSB	12		1	28			28	
5	Philly Pike LTNB	138		1	138			138	
2	Philly Pike NB	450 + 35		1	485		126	359	
6	Philly Pike SB	589 + 204		1	793	138		931	*
				1					
				1					
3	Harvey Road WB	18 + 16		1	34			34	*
4	Harvey Road EB	259		1	259			259	*

Remarks:

TOTAL:	1224
LEVEL OF SERVICE:	C

Level	Critical Movement Volume
A	Less than 1,000 veh/hr
B	1,000 to 1,150 veh/hr
C	1,151 to 1,300 veh/hr
D	1,301 to 1,450 veh/hr
E	1,451 to 1,600 veh/hr
F	More than 1,600 veh/hr

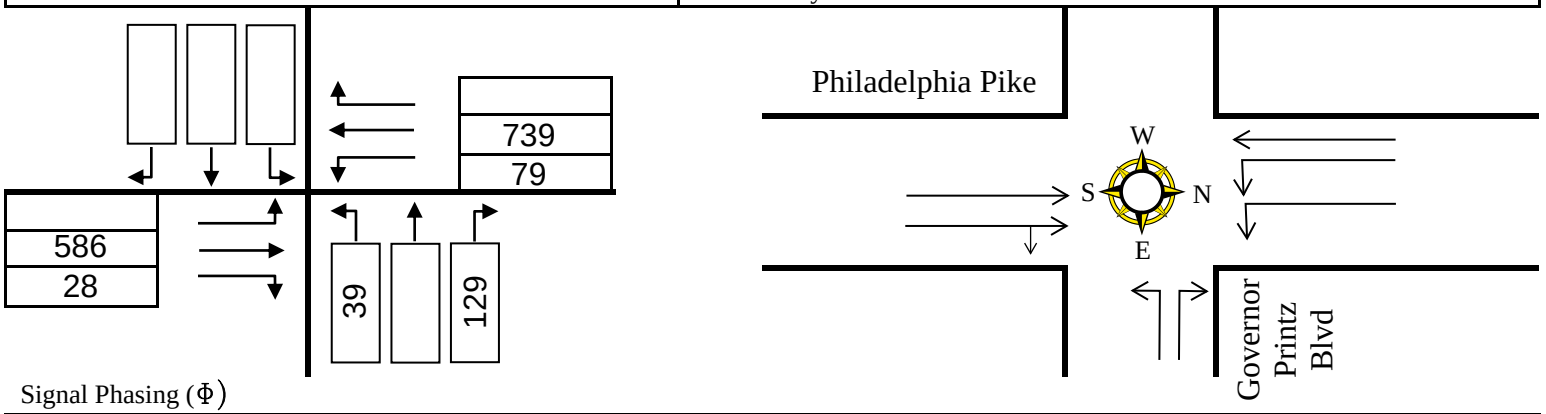
No. of Lanes	Lane Use factor (LU)
1	1.00
2	0.55
3	0.40
4	0.30

LEGEND	
OL =	Opposing Lefts
LTC =	Left Turn Credit

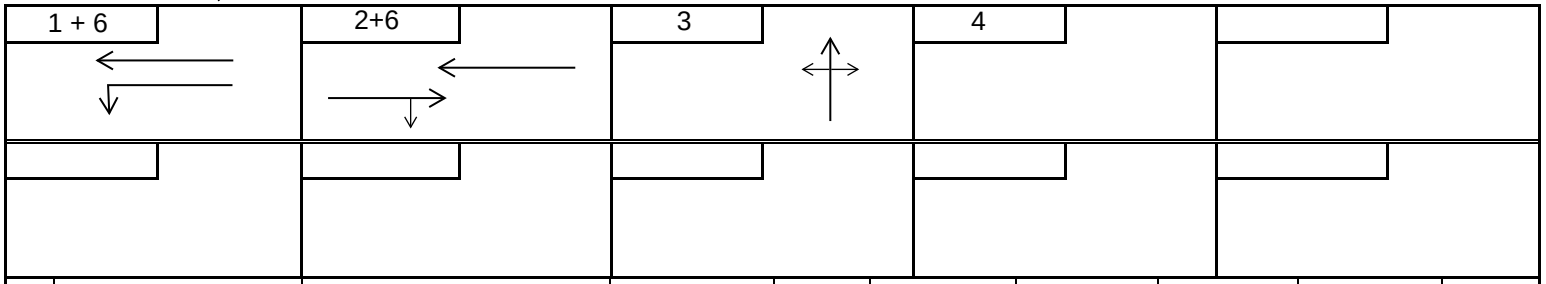
DelDOT

CRITICAL LANE MOVEMENT SUMMATION
AND LEVEL OF SERVICE

Location:	Philadelphia Pike and Gov. Printz Blvd
Count Date:	05/10/2016
Scenario:	AM PEAK
Computed By:	MAB Date: 05/25/2016
Checked By:	JAB Date: 07/05/2016



Signal Phasing (Φ)



Φ	Movement	Volume		LU	Lane Volume	OL (Add)	LTC (Subtract)	Critical Lane Volume	CM (*)
1	Philly Pike LTSB	79		0.55	43			43	
6	Philly Pike SB	739		1	739			739	*
2	Philly Pike NB	586 + 28		0.55	338			338	
4	Harvey Road WBR	65		1	65			65	
4	Harvey Road WBL	39		1	39			39	*

Remarks:

TOTAL:	778
LEVEL OF SERVICE:	A

Level	Critical Movement Volume
A	Less than 1,000 veh/hr
B	1,000 to 1,150 veh/hr
C	1,151 to 1,300 veh/hr
D	1,301 to 1,450 veh/hr
E	1,451 to 1,600 veh/hr
F	More than 1,600 veh/hr

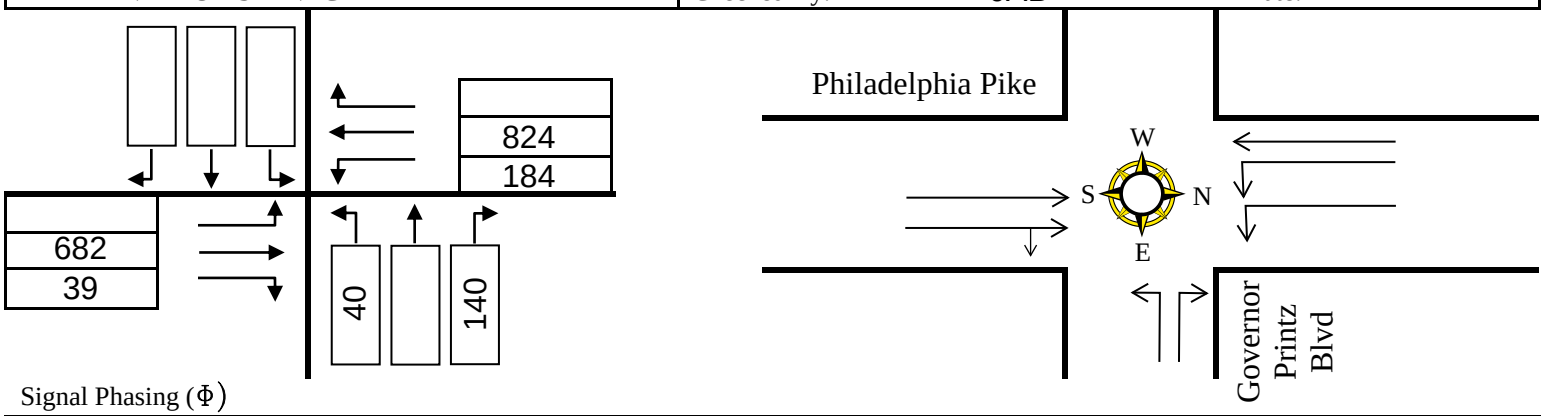
No. of Lanes	Lane Use factor (LU)
1	1.00
2	0.55
3	0.40
4	0.30

LEGEND	
OL =	Opposing Lefts
LTC =	Left Turn Credit

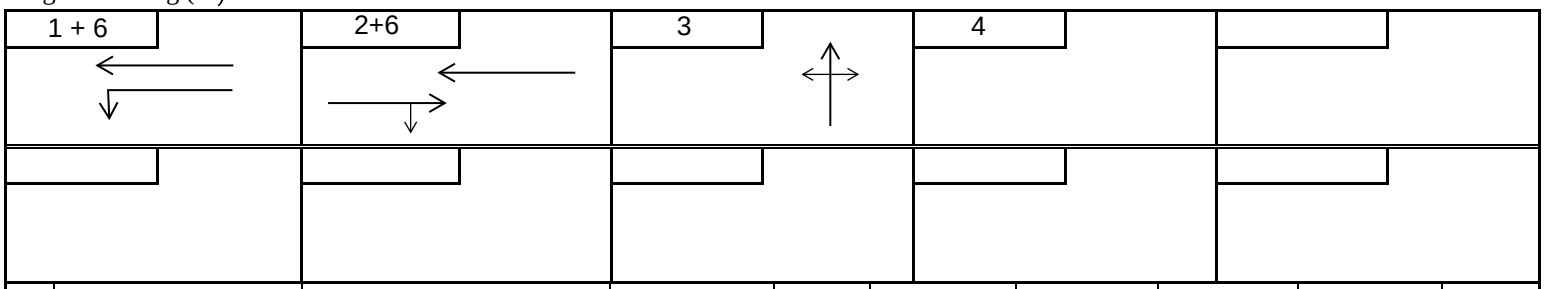
DelDOT

CRITICAL LANE MOVEMENT SUMMATION
AND LEVEL OF SERVICE

Location:	Philadelphia Pike and Gov. Printz Blvd
Count Date:	05/10/2016
Scenario:	PM PEAK
Computed By:	MAB Date: 05/25/2016
Checked By:	JAB Date: 07/05/2016



Signal Phasing (Φ)



Φ	Movement	Volume		LU	Lane Volume	OL (Add)	LTC (Subtract)	Critical Lane Volume	CM (*)
1	Philly Pike LTSB	184		0.55	101			101	
6	Philly Pike SB	824		1	824			824	*
2	Philly Pike NB	682 + 39		0.55	397			397	
4	Harvey Road WBR	70		1	70			70	
4	Harvey Road WBL	40		1	40			40	*

Remarks:

TOTAL:	864
LEVEL OF SERVICE:	A

Level	Critical Movement Volume
A	Less than 1,000 veh/hr
B	1,000 to 1,150 veh/hr
C	1,151 to 1,300 veh/hr
D	1,301 to 1,450 veh/hr
E	1,451 to 1,600 veh/hr
F	More than 1,600 veh/hr

No. of Lanes	Lane Use factor (LU)
1	1.00
2	0.55
3	0.40
4	0.30

LEGEND	
OL =	Opposing Lefts
LTC =	Left Turn Credit

Appendix C – Daily Traffic Volumes

ADT Philadelphia Pike

Seasonal Adjustment Factor 0.93

Date May 5 - May 11, 2016

Categories	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	ADT
Motorcycles	25	21	32	83	39	23	49	39
Passenger Cars	15209	15266	14112	11757	14332	14475	14897	14293
Other Two Axle, 4 Tire Single Units	2290	2365	1848	1545	2280	2258	2285	2124
Buses	237	251	88	42	211	248	242	188
Two Axle, 6 Tire Single Units	486	462	290	207	458	462	442	401
Three Axle Single Units	18	31	17	4	35	28	18	22
Four or More Axle Single Units	5	3	1	1	5	3	3	3
Four or Less Axle Single Trailers	28	14	15	10	21	26	26	20
Five Axle Single Trailers	30	25	21	14	27	32	23	25
Six or More Axle Single	3	3	2	0	2	2	0	2
Five or Less Axle Multi-Trailers	0	0	0	0	0	0	0	0
Six Axle Multi-Trailers	0	0	0	0	0	0	0	0
Seven or More Axle Multi-Trailers	0	0	0	0	0	0	0	0
All	18328	18441	16426	13663	17410	17557	17985	17116
AADT	-	-	-	-	-	-	-	15918

ADT Governor Printz Boulevard

Seasonal Adjustment Factor 0.93

Date May 5 - May 11, 2016

Categories	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	ADT
Motorcycles	14	14	18	31	18	14	24	19
Passenger Cars	3892	3942	3627	3444	3738	3715	3929	3755
Other Two Axle, 4 Tire Single Units	633	506	445	330	544	596	568	517
Buses	75	100	21	6	85	76	86	64
Two Axle, 6 Tire Single Units	134	124	73	66	150	127	141	116
Three Axle Single Units	19	19	7	5	31	25	36	20
Four or More Axle Single Units	8	3	1	0	4	5	2	3
Four or Less Axle Single Trailers	14	12	7	4	15	14	14	11
Five Axle Single Trailers	10	10	3	10	8	12	5	8
Six or More Axle Single	0	0	0	0	0	0	0	0
Five or Less Axle Multi-Trailers	0	0	0	0	0	0	0	0
Six Axle Multi-Trailers	0	0	0	0	0	0	0	0
Seven or More Axle Multi-Trailers	0	0	0	0	0	0	0	0
All	4797	4730	4202	3896	4593	4584	4805	4515
AADT	-	-	-	-	-	-	-	4199

Appendix D – Speed Data

Rummel, Klepper & Kahl

110 S. Poplar St. Suite 102
Wilmington, DE 19801

File Name : Phila Pike (NB) between Penn Ave & Clayton Ave
Site Code : 14144.18
Start Date : 6/22/2016
Page No : 1

Class	Vehicle Count	Average Speed	10 MPH Pace Speed	Number in Pace	Percent in Pace	15 Percentile	True Median (50th Percentile)	85 Percentile
Class 1	100	47	42 - 51	70	70	42	47	52

Rummel, Klepper & Kahl

110 S. Poplar St. Suite 102
Wilmington, DE 19801

File Name : Phila Pike (SB) between Penn Ave & Clayton Ave
Site Code : 14144.18
Start Date : 6/22/2016
Page No : 1

Class	Vehicle Count	Average Speed	10 MPH Pace Speed	Number in Pace	Percent in Pace	15 Percentile	True Median (50th Percentile)	85 Percentile
Class 1	100	48	44 - 53	71	71	42	48	52

Rummel, Klepper & Kahl

110 S. Poplar St. Suite 102
Wilmington, DE 19801

File Name : Phila Pike (NB) between US 13 & Delaware Ave
Site Code : 14144.18
Start Date : 5/5/2016
Page No : 1

Class	Vehicle Count	Average Speed	10 MPH Pace Speed	Number in Pace	Percent in Pace	15 Percentile	True Median (50th Percentile)	85 Percentile
Class 1	100	40	35 - 44	77	77	35	40	44

Rummel, Klepper & Kahl

110 S. Poplar St. Suite 102
Wilmington, DE 19801

File Name : Phila Pike (SB) between Maple Rd & Rolling Rd
Site Code : 14144.18
Start Date : 5/5/2016
Page No : 1

Class	Vehicle Count	Average Speed	10 MPH Pace Speed	Number in Pace	Percent in Pace	15 Percentile	True Median (50th Percentile)	85 Percentile
Class 1	100	43	37 - 46	70	70	37	42	48

Rummel, Klepper & Kahl

110 S. Poplar St. Suite 102
Wilmington, DE 19801

File Name : Phila Pike (NB) between US 13 & Delaware Ave
Site Code : 14144.18
Start Date : 5/5/2016
Page No : 1

Class	Vehicle Count	Average Speed	10 MPH Pace Speed	Number in Pace	Percent in Pace	15 Percentile	True Median (50th Percentile)	85 Percentile
Class 1	100	40	35 - 44	77	77	35	40	44

Rummel, Klepper & Kahl

110 S. Poplar St. Suite 102
Wilmington, DE 19801

File Name : Phila Pike (SB) between US 13 & Delaware Ave
Site Code : 14144.18
Start Date : 5/5/2016
Page No : 1

Class	Vehicle Count	85 Percentile	10 MPH Pace Speed	Number in Pace	Percent in Pace	Number of Vehicles Over 55 MPH	Percent of Vehicles Over 55 MPH	Average Speed	Number of Vehicles Over 55 MPH	Percent of Vehicles Over 55 MPH
Class 1	96	43	34 - 43	72	75	0	0	38	0	0

Rummel, Klepper & Kahl

110 S. Poplar St. Suite 102
Wilmingotn, DE 19801

File Name : Phila Pike (NB) between Darley Rd & Manor Ave
Site Code : 14144.18
Start Date : 6/22/2016
Page No : 1

Class	Vehicle Count	Average Speed	10 MPH Pace Speed	Number in Pace	Percent in Pace	15 Percentile	True Median (50th Percentile)	85 Percentile
Class 1	100	38	33 - 42	87	87	34	37	41

Rummel, Klepper & Kahl

110 S. Poplar St. Suite 102
Wilmingotn, DE 19801

File Name : Phila Pike (SB) between Darley Rd & Manor Ave
Site Code : 14144.18
Start Date : 6/22/2016
Page No : 1

Class	Vehicle Count	Average Speed	10 MPH Pace Speed	Number in Pace	Percent in Pace	15 Percentile	True Median (50th Percentile)	85 Percentile
Class 1	100	40	35 - 44	75	75	35	40	44

Rummel, Klepper & Kahl

110 S. Poplar St. Suite 102
Wilmingotn, DE 19801

File Name : Phila Pike (NB) between Darley Rd & Manor Ave
Site Code : 14144.18
Start Date : 6/22/2016
Page No : 1

Class	Vehicle Count	Average Speed	10 MPH Pace Speed	Number in Pace	Percent in Pace	15 Percentile	True Median (50th Percentile)	85 Percentile
Class 1	100	38	33 - 42	87	87	34	37	41

Appendix E – Crash Data

Delaware Crash Analysis Reporting System

Crash Study Time Period:	10/1/2005 - 9/30/2008
Query Type:	CrashBufferTool
Description:	Road Segment Buffer - Philadelphia Pike US13, (N0024) between Governor Printz Boulevard (N050) and Winding Lane (1723-101370) @ 400' radius
Study Requested By:	Guy Pusey, Rummel, Klepper & Kahl, LLP
Study Generated By:	TDTSLXP
Number of Crashes:	195
Includes Non-Reportable Crashes:	N
Study Code:	



Disclaimer for CARS: Crash data and associated police reports are intended for DelDOT use only and shall not be transmitted, copied, distributed or provided to any entity other than DelDOT unless written approval is received from the DelDOT Legal Section. Police reports are the property of the Delaware State Police.

Delaware Crash Analysis Reporting System

Crash Study Time Period:	10/1/2005 - 9/30/2008
Query Type:	CrashBufferTool
Description:	Road Segment Buffer - Philadelphia Pike US13, (N0024) between Governor Printz Boulevard (N050) and Winding Lane (1723-101370) @ 400' radius
Study Requested By:	Guy Pusey, Rummel, Klepper & Kahl, LLP
Study Generated By:	TDTSLXP
Number of Crashes:	195
Includes Non-Reportable Crashes:	N
Study Code:	



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State of Delaware Crash Study

Summary	
	# of Crashes
Total Crashes	195
Fatal Crashes	1
Total Alcohol-Related Crashes	14
Total Non Alcohol-Related Crashes	175
Total Fatalities	1
Total Pedestrian Fatalities	1
Total Pedestrian Injuries	1
Total Pedestrian Crashes	1
Total Motorcycle Crashes	0
Total Pedalcyclist Crashes	0

Classification		
	# of Crashes	**% of Total Crashes**
Non-Reportable	0	0.00%
Reportable	138	70.77%
Personal Injury	56	28.72%
Fatality	1	0.51%
Total	**195**	

Manner of Impact		
	# of Crashes	**% of Total Crashes**
Front to rear	71	36.41%
Front to front	7	3.59%
Angle	83	42.56%
Sideswipe, same direction	16	8.21%
Sideswipe, opposite direction	5	2.56%
Rear to side	0	0.00%
Rear to rear	1	0.51%
Other	0	0.00%
Unknown	1	0.51%
Not a collision between two vehicles	11	5.64%
Total	**195**	

Alcohol Related Crashes By Classification					
	Non-reportable	Reportable	Personal Injury	Fatality	**Total**
Alcohol Related	0	7	7	0	**14**
Non-Alcohol Related	0	126	48	1	**175**
Total	**0**	**133**	**55**	**1**	**189**

Manner of Impact By Classification					
	Non-Reportable	Reportable	Personal Injury	Fatality	**Total**
Front to rear	0	56	15	0	**71**
Front to front	0	3	4	0	**7**
Angle	0	54	29	0	**83**
Sideswipe, same direction	0	13	3	0	**16**
Sideswipe, opposite direction	0	5	0	0	**5**
Rear to side	0	0	0	0	**0**
Rear to rear	0	1	0	0	**1**
Other	0	0	0	0	**0**
Unknown	0	0	1	0	**1**
Not a collision between two vehicles	0	6	4	1	**11**
Total	**0**	**138**	**56**	**1**	**195**

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Day Of Week		
	# of Crashes	% of Total Crashes
Sunday	14	7.18%
Monday	20	10.26%
Tuesday	30	15.38%
Wednesday	33	16.92%
Thursday	35	17.95%
Friday	38	19.49%
Saturday	25	12.82%
Total	**195**	

Time Of Day (AM)		
	# of Crashes	% of Total Crashes
00:00 - 00:59	1	0.51%
01:00 - 01:59	1	0.51%
02:00 - 02:59	0	0.00%
03:00 - 03:59	0	0.00%
04:00 - 04:59	1	0.51%
05:00 - 05:59	1	0.51%
06:00 - 06:59	4	2.05%
07:00 - 07:59	12	6.15%
08:00 - 08:59	7	3.59%
09:00 - 09:59	5	2.56%
10:00 - 10:59	9	4.62%
11:00 - 11:59	9	4.62%
Total	**50**	

Time Of Day (PM)		
	# of Crashes	% of Total Crashes
12:00 - 12:59	16	8.21%
13:00 - 13:59	16	8.21%
14:00 - 14:59	16	8.21%
15:00 - 15:59	20	10.26%
16:00 - 16:59	14	7.18%
17:00 - 17:59	21	10.77%
18:00 - 18:59	21	10.77%
19:00 - 19:59	6	3.08%
20:00 - 20:59	5	2.56%
21:00 - 21:59	3	1.54%
22:00 - 22:59	4	2.05%
23:00 - 23:59	3	1.54%
Total	**145**	
Unknown Time	0	

Surface Conditions		
	# of Crashes	% of Total Crashes
Dry	139	71.28%
Wet	56	28.72%
Snow	0	0.00%
Ice/Frost	0	0.00%
Sand	0	0.00%
Water (standing, moving)	0	0.00%
Slush	0	0.00%
Oil	0	0.00%
Mud, Dirt, Gravel	0	0.00%
Other	0	0.00%
Unknown	0	0.00%
Total	**195**	

Lighting Conditions		
	# of Crashes	% of Total Crashes
Daylight	146	74.87%
Dawn	3	1.54%
Dusk	2	1.03%
Dark-Lighted	30	15.38%
Dark-Not Lighted	13	6.67%
Dark-Unknown Lighting	0	0.00%
Other	1	0.51%
Unknown	0	0.00%
Total	**195**	

Weather Conditions		
	# of Crashes	% of Total Crashes
Clear	122	62.56%
Cloudy	30	15.38%
Fog, Smog, Smoke	3	1.54%
Rain	41	21.03%
Sleet, Hail (freezing rain or drizzle)	2	1.03%
Snow	0	0.00%
Blowing Snow	0	0.00%
Severe Crosswinds	0	0.00%
Blowing Sand, Soil, Dirt	0	0.00%
Other	0	0.00%
Unknown	0	0.00%
Total	**198**	

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Delaware Crash Analysis Reporting System

Crash Study Time Period:	10/1/2012 - 9/30/2015
Query Type:	CrashBufferTool
Description:	Road Segment Buffer - Philadelphia Pike, US13, (N024) between Governor Printz Boulevard (N050) and Winding Lane (1723-101370) @ 400' radius
Study Requested By:	Guy Pusey, Rummel, Klepper & Kahl, LLP,
Study Generated By:	TDTSLXP
Number of Crashes:	173
Includes Non-Reportable Crashes:	N
Study Code:	



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State of Delaware Crash Study

Summary	
	# of Crashes
Total Crashes	173
Fatal Crashes	0
Total Alcohol-Related Crashes	10
Total Non Alcohol-Related Crashes	163
Total Fatalities	0
Total Pedestrian Fatalities	0
Total Pedestrian Injuries	8
Total Pedestrian Crashes	8
Total Motorcycle Crashes	1
Total Pedalcyclist Crashes	1

Classification		
	# of Crashes	**% of Total Crashes**
Non-Reportable	0	0.00%
Reportable	118	68.21%
Personal Injury	55	31.79%
Fatality	0	0.00%
Total	**173**	

Manner of Impact		
	# of Crashes	**% of Total Crashes**
Front to rear	65	37.57%
Front to front	6	3.47%
Angle	60	34.68%
Sideswipe, same direction	18	10.40%
Sideswipe, opposite direction	3	1.73%
Rear to side	1	0.58%
Rear to rear	1	0.58%
Other	2	1.16%
Unknown	4	2.31%
Not a collision between two vehicles	13	7.51%
Total	**173**	

Alcohol Related Crashes By Classification					
	Non-reportable	Reportable	Personal Injury	Fatality	**Total**
Alcohol Related	0	4	6	0	**10**
Non-Alcohol Related	0	114	49	0	**163**
Total	**0**	**118**	**55**	**0**	**173**

Manner of Impact By Classification					
	Non-Reportable	Reportable	Personal Injury	Fatality	**Total**
Front to rear	0	49	16	0	**65**
Front to front	0	2	4	0	**6**
Angle	0	40	20	0	**60**
Sideswipe, same direction	0	13	5	0	**18**
Sideswipe, opposite direction	0	2	1	0	**3**
Rear to side	0	1	0	0	**1**
Rear to rear	0	1	0	0	**1**
Other	0	0	2	0	**2**
Unknown	0	4	0	0	**4**
Not a collision between two vehicles	0	6	7	0	**13**
Total	**0**	**118**	**55**	**0**	**173**

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Day Of Week		
	# of Crashes	% of Total Crashes
Sunday	23	13.29%
Monday	20	11.56%
Tuesday	26	15.03%
Wednesday	23	13.29%
Thursday	28	16.18%
Friday	28	16.18%
Saturday	25	14.45%
Total	**173**	

Time Of Day (AM)		
	# of Crashes	% of Total Crashes
00:00 - 00:59	1	0.58%
01:00 - 01:59	0	0.00%
02:00 - 02:59	0	0.00%
03:00 - 03:59	0	0.00%
04:00 - 04:59	0	0.00%
05:00 - 05:59	0	0.00%
06:00 - 06:59	1	0.58%
07:00 - 07:59	13	7.51%
08:00 - 08:59	11	6.36%
09:00 - 09:59	12	6.94%
10:00 - 10:59	8	4.62%
11:00 - 11:59	11	6.36%
Total	**57**	

Time Of Day (PM)		
	# of Crashes	% of Total Crashes
12:00 - 12:59	9	5.20%
13:00 - 13:59	12	6.94%
14:00 - 14:59	7	4.05%
15:00 - 15:59	18	10.40%
16:00 - 16:59	17	9.83%
17:00 - 17:59	16	9.25%
18:00 - 18:59	13	7.51%
19:00 - 19:59	7	4.05%
20:00 - 20:59	6	3.47%
21:00 - 21:59	5	2.89%
22:00 - 22:59	3	1.73%
23:00 - 23:59	3	1.73%
Total	**116**	
Unknown Time	0	

Surface Conditions		
	# of Crashes	% of Total Crashes
Dry	147	84.97%
Wet	24	13.87%
Snow	0	0.00%
Ice/Frost	1	0.58%
Sand	0	0.00%
Water (standing, moving)	0	0.00%
Slush	0	0.00%
Oil	0	0.00%
Mud, Dirt, Gravel	0	0.00%
Other	0	0.00%
Unknown	1	0.58%
Total	**173**	

Lighting Conditions		
	# of Crashes	% of Total Crashes
Daylight	130	75.14%
Dawn	0	0.00%
Dusk	1	0.58%
Dark-Lighted	27	15.61%
Dark-Not Lighted	14	8.09%
Dark-Unknown Lighting	0	0.00%
Other	0	0.00%
Unknown	1	0.58%
Total	**173**	

Weather Conditions		
	# of Crashes	% of Total Crashes
Clear	130	75.14%
Cloudy	22	12.72%
Fog, Smog, Smoke	1	0.58%
Rain	18	10.40%
Sleet, Hail (freezing rain or drizzle)	1	0.58%
Snow	0	0.00%
Blowing Snow	0	0.00%
Severe Crosswinds	0	0.00%
Blowing Sand, Soil, Dirt	0	0.00%
Other	0	0.00%
Unknown	3	1.73%
Total	**175**	

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