TRAFFIC SIGNAL DESIGN REPORT

WEST CHESTER PIKE (SR 0003)
AND LANGFORD RUN ROAD

MARPLE TOWNSHIP
DELAWARE COUNTY

Prepared for

Pennsylvania Department of Transportation
Engineering District 6-0
7000 Geerdes Blvd.
King of Prussia, PA 19406

November 5, 2013
Resubmitted January 15, 2014

Orth-Rodgers & Associates, Inc.
TRANSPORTATION ENGINEERS AND PLANNERS

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Table of Contents

Executive Summary

National Realty Corporation intends to develop a 26-acre site in the southwest quadrant of the I-476/West Chester Pike interchange in Marple Township, Delaware County. Two access points will be provided for the proposed development. The primary access point is a proposed new full-movement signalized intersection of West Chester Pike and Langford Run Road, located at the site's existing right-in, right-out only driveway. The second site access is located at the existing unsignalized intersection of South Lawrence Road and Langford Run Road, which provides left-and-right turn entry and right-turn-only exit.

This document identifies the signalization improvements required along the West Chester Pike (SR 0003) frontage and the necessary signalization components to the following intersections:

West Chester Pike (SR 0003) & Malin Road
West Chester Pike (SR 0003) & Sproul Road (SR 0320)
West Chester Pike (SR 0003) & Church Road (SR 1028)/Berkley Road
West Chester Pike (SR 0003) & New Ardmore Avenue
West Chester Pike (SR 0003) & Langford Run Road
West Chester Pike (SR 0003) & I-476 SB Ramps (SR 8037)
West Chester Pike (SR 0003) & I-476 NB Ramps (SR 8037)
West Chester Pike (SR 0003) & South Lawrence Road (SR 1020)

Two significant improvements have been identified for the signalization of the aforementioned intersections:

- Traffic Adaptive system implementation along existing corridor from Malin Rd to S. Lawrence Rd

- New traffic signal at Langford Run Road with median break

The Department was provided a copy of the July 11, 2011 *Traffic Impact Study* for the Marple Associates Development from which all supporting analyses we performed along the corridor. Additionally, the March 29, 2010 *Point of Access Study* prepared for Marple Township, Delaware County for the I-476 Southbound Ramp at West Chester Pike was also provided documenting the requested revisions to the ramp configuration.

An additional October 10, 2013 memorandum was provided documenting additional traffic counts that verified that the TIS volumes represented appropriate 2015 conditions.

This document accounts for all signalization calculations required for the adaptive system implementation as well as the new traffic signal at Langford Run Road.

TE-150 (8-10)

TRAFFIC SIGNAL WARRANT ANALYSIS ENGINEERING AND TRAFFIC STUDY

PLEASE TYPE OR PRINT ALL INFORMATION IN BLUE OR BLACK INK

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

A - LOCATION INFORMATION

COUNTY	MUNICIPALITY(S)
DELAWARE	MARPLE TOWNSHIP

MAJOR STREET INFORMATION

SR#/LOCAL HIGHWAY	SEGMENT	OFFSET
SR 0003	0120/0121	2585/2601

STREET NAME: WEST CHESTER PIKE

MINOR STREET INFORMATION

SR#/LOCAL HIGHWAY	SEGMENT	OFFSET
	NA	NA

STREET NAME: LANGFORD RUN ROAD

B - REFERENCE INFORMATION

REFERENCE	SECTION(S)
Chapter 212	212.302
MUTCD	4C.01 THROUGH 4C.09
Vehicle Code Title 75 Pa. C.S.	§3111

C - STUDY ELEMENTS

FROM MUTCD AND PENNDOT PUBLICATION 212:

- ☐ WARRANT 1-Eight-Hour (Section 4C.02)
- ☐ WARRANT 2-Four-Hour (Section 4C.03)
- ■ WARRANT 3-Peak-Hour (Section 4C.04)
- ☐ WARRANT 4-Pedestrian Volume (Section 4C.05)
- ☐ WARRANT 5-School Crossing (Section 4C.06)
- ☐ WARRANT 6-Coordinated Signal System (Section 4C.07)
- ☐ WARRANT 7-Crash Experience (Section 4C.08)
- ☐ WARRANT 8-Roadway Network (Section 4C.09)
- ☐ WARRANT 9-ADT Volume (§212.302 (b)(3))

FROM PENNDOT PUBLICATION 212 APPENDIX:

- ☐ Crash Analysis (1)
- ☐ Capacity Analysis (6)
- ☐ Geometric Review (8)
- ☐ Pedestrian Volumes (12)
- ☐ Sight Distance (16)
- ☐ Speed Data (17)
- ☐ Traffic Signals (19)
- ☐ Traffic Volumes (20)
- ☐ Other _____

D - ATTACHMENTS LISTING

Check those that apply and attach to this form in the order listed below:

- ☐ 1. Municipal Letter or Memo Requesting Study
- ■ 2. Completed Application (TE-952)
- ☐ 3. Financial Commitment Letter
- ☐ 4. Location Map
- ☐ 5. Photographs
- ☐ 6. Straight Line Diagram
- ☐ 7. Fieldview Drawing or Condition Diagram
- ☐ 8. Crash Extract
- ☐ 9. Crash Rate
- ☐ 10. Collision Diagram Plot
- ☐ 11. Speed Study and Speed Limit Information
- ■ 12. Warrant Analysis
- ☐ 13. Capacity Analysis
- ☐ 14. RMS/STAMPP Identification Data
- ☐ 15. Traffic/Pedestrian Volumes
- ■ 16. Traffic Signal Permit Plan
- ☐ 17. Other _____

E - SITE OBSERVATION CHECKLIST

1. Study Information:

   Study performed by: DJK Date Study was performed: 12/29/2013

   Company Name: Orth-Rodgers & Associates, Inc. Phone Number: (610) 407-9700

2. Were other alternatives considered as indicated in the Manual on Uniform Traffic Control Devices (MUTCD) Section 4B.04 "Alternatives to Traffic Control Signals" and the Transportation Impact Study (TIS) Guidelines? (Explain) . . . . . ■ YES ☐ No

   Exceeding high traffic volumes for the minor street approach not amenable to two-way stop control

3. Was this intersection previously signalized? . . . . . ☐ YES ■ No

   If yes, please indicate last date intersection was studied or Signal Permit Date. _____

4. Was the intersection visited before the Traffic Signal Warrant Analysis was completed? . . . . . ■ YES ☐ No

5. Traffic Signal Warrant Analysis is based on the National Realty Development (Project/Development) that is expected to be completed on 06/01/2015 (date).

6. Automated Traffic Recorder (ATR) Counts:

   Type of Count Device: _____ Date: _____

   Company Performing Count: _____

7. Manual Vehicular Turning Movement Counts:

   Individual Performing Count: _____ Date: 01/26/2010

   Company Performing Count: Orth-Rodgers & Assoc.

   Count Parameters: _____

8. Pedestrian Counts (if applicable):

   Individual Performing Count: _____ Date: 01/26/2010

   Company Performing Count: Orth-Rodgers & Assoc.

9. Warrant 1 (MUTCD Section 4C.02)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
10. Warrant 2 (MUTCD Section 4C.03)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
11. Warrant 3 (MUTCD Section 4C.04)	■ Satisfied	☐ Unsatisfied	☐ Not Evaluated
12. Warrant 4 (MUTCD Section 4C.05)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
13. Warrant 5 (MUTCD Section 4C.06)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
14. Warrant 6 (MUTCD Section 4C.07)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
15. Warrant 7 (MUTCD Section 4C.08)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
16. Warrant 8 (MUTCD Section 4C.09)	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated
17. Warrant 9 (§212.302 (b)(3))	☐ Satisfied	☐ Unsatisfied	■ Not Evaluated

F - SITE DATA

mix of retail, office and residential uses,

including 260,000 sq.ft. retail shopping center, a drive-in bank, fitness center, day care,
40,000 sq.ft. of office
and 150 townhomes.

G - REMARKS

Warrant 3 (PEAK HOUR) is met based on the following criteria:

AM Peak - 3,054 total major street volume, 326 minor street volume exceeds Figure 4C-4, >2 major st lanes/>2 minor st lanes and 45 mph speeds

PM Peak - 3,654 total major street volume, 828 minor street volume exceeds Figure 4C-4, >2 major st lanes/>2 minor st lanes and 45 mph speeds

SAT Peak - 2,894 total major street volume, 865 minor street volume exceeds Figure 4C-4, >2 major st lanes/>2 minor st lanes and 45 mph speeds

H - ENGINEERING JUDGMENT

Based on development traffic, it is anticipated that site volumes will exceed minor street volume thresholds for additional periods (around the peak hours)

I - APPROVALS

Comments:

Reviewed and Approved by Signature (Signals Supervisor or Manager)	Name/Title	Date
Reviewed and Approved by Signature (District Executive)	Name/Title	Date

Traffic Signal Warrant Analysis Workbook

STUDY AND ANALYSIS INFORMATION

Municipality:	Marple Township	**Analysis Date:**	12/30/2013
County:	Delaware County	**Conducted By:**	DJK
PennDOT Engineering District:	6	**Agency/Company Name:**	Orth-Rodgers

Analysis Information

Data Collection Date:	1/26/2010
Day of the Week:	Tuesday

Is the intersection in a built-up area of an isolated community of <10,000 population? No

Major Street Information

Major Street Name and Route Number:	West Chester Pike (SR 0003)
Major Street Approach #1 Direction:	E-Bound
Major Street Approach #2 Direction:	W-Bound

Number of Lanes for Moving Traffic on Each Major Street Approach:	3	**LANE(S)**
Speed Limit or 85th Percentile Speed on the Major Street:	45	**MPH**

Minor Street Information

Minor Street Name and Route Number:	Langford Run Road
Minor Street Approach #1 Direction:	N-Bound
Minor Street Approach #2 Direction:	N/A

Number of Lanes for Moving Traffic on Each Minor Street Approach:	3	**LANE(S)**

TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS

	Applicable?	Warrant Met?
Warrant 1, Eight-Hour Vehicular Volume	**No**	**N/A**
Warrant 2, Four-Hour Vehicular Volume	**No**	**N/A**
Warrant 3, Peak Hour	**Yes**	**Yes**
Warrant 4, Pedestrian Volume	**No**	**N/A**
Warrant 5, School Crossing	**No**	**N/A**
Warrant 6, Coordinated Signal System	**No**	**N/A**
Warrant 7, Crash Experience	**No**	**N/A**
Warrant 8, Roadway Network	**No**	**N/A**
Warrant 9, Intersection Near a Grade Crossing	**No**	**N/A**
Warrant PA-1, ADT Volume Warrant	**No**	**N/A**
Warrant PA-2, Midblock and Trail Crossings	**No**	**N/A**

ENTER VOLUME DATA PER 15 MINUTE INTERVAL, PER APPROACH

Time Interval		Major Street Approach #1 (E-Bound)	Major Street Approach #2 (W-Bound)	Major Street Combined	Minor Street Approach #1 (N-Bound)	Minor Street Approach #2 (N/A)
Begin At	End Of	Volume	Volume	Total Volume	Volume	Volume
12:00 AM	12:14 AM			0		
12:15 AM	12:29 AM			0		
12:30 AM	12:44 AM			0		
12:45 AM	12:59 AM			0		
1:00 AM	1:14 AM			0		
1:15 AM	1:29 AM			0		
1:30 AM	1:44 AM			0		
1:45 AM	1:59 AM			0		
2:00 AM	2:14 AM			0		
2:15 AM	2:29 AM			0		
2:30 AM	2:44 AM			0		
2:45 AM	2:59 AM			0		
3:00 AM	3:14 AM			0		
3:15 AM	3:29 AM			0		
3:30 AM	3:44 AM			0		
3:45 AM	3:59 AM			0		
4:00 AM	4:14 AM			0		
4:15 AM	4:29 AM			0		
4:30 AM	4:44 AM			0		
4:45 AM	4:59 AM			0		
5:00 AM	5:14 AM			0		
5:15 AM	5:29 AM			0		
5:30 AM	5:44 AM			0		
5:45 AM	5:59 AM			0		
6:00 AM	6:14 AM			0		
6:15 AM	6:29 AM			0		
6:30 AM	6:44 AM			0		
6:45 AM	6:59 AM			0		
7:00 AM	7:14 AM	400	350	750	80	
7:15 AM	7:29 AM	420	325	745	85	
7:30 AM	7:44 AM	435	340	775	78	
7:45 AM	7:59 AM	415	369	784	83	
8:00 AM	8:14 AM			0		
8:15 AM	8:29 AM			0		
8:30 AM	8:44 AM			0		
8:45 AM	8:59 AM			0		
9:00 AM	9:14 AM			0		
9:15 AM	9:29 AM			0		
9:30 AM	9:44 AM			0		
9:45 AM	9:59 AM			0		
10:00 AM	10:14 AM			0		
10:15 AM	10:29 AM			0		
10:30 AM	10:44 AM			0		
10:45 AM	10:59 AM			0		
11:00 AM	11:14 AM			0		
11:15 AM	11:29 AM			0		
11:30 AM	11:44 AM			0		
11:45 AM	11:59 AM			0		

ENTER VOLUME DATA PER 15 MINUTE INTERVAL, PER APPROACH

Time Interval		Major Street Approach #1 (E-Bound)	Major Street Approach #2 (W-Bound)	Major Street Combined	Minor Street Approach #1 (N-Bound)	Minor Street Approach #2 (N/A)
Begin At	End Of	Volume	Volume	Total Volume	Volume	Volume
12:00 PM	12:14 PM			0		
12:15 PM	12:29 PM			0		
12:30 PM	12:44 PM			0		
12:45 PM	12:59 PM			0		
1:00 PM	1:14 PM			0		
1:15 PM	1:29 PM			0		
1:30 PM	1:44 PM			0		
1:45 PM	1:59 PM			0		
2:00 PM	2:14 PM			0		
2:15 PM	2:29 PM			0		
2:30 PM	2:44 PM			0		
2:45 PM	2:59 PM			0		
3:00 PM	3:14 PM			0		
3:15 PM	3:29 PM			0		
3:30 PM	3:44 PM			0		
3:45 PM	3:59 PM			0		
4:00 PM	4:14 PM			0		
4:15 PM	4:29 PM			0		
4:30 PM	4:44 PM			0		
4:45 PM	4:59 PM			0		
5:00 PM	5:14 PM	420	480	900	215	
5:15 PM	5:29 PM	430	495	925	210	
5:30 PM	5:44 PM	410	475	885	205	
5:45 PM	5:59 PM	442	502	944	198	
6:00 PM	6:14 PM			0		
6:15 PM	6:29 PM			0		
6:30 PM	6:44 PM			0		
6:45 PM	6:59 PM			0		
7:00 PM	7:14 PM			0		
7:15 PM	7:29 PM			0		
7:30 PM	7:44 PM			0		
7:45 PM	7:59 PM			0		
8:00 PM	8:14 PM			0		
8:15 PM	8:29 PM			0		
8:30 PM	8:44 PM			0		
8:45 PM	8:59 PM			0		
9:00 PM	9:14 PM			0		
9:15 PM	9:29 PM			0		
9:30 PM	9:44 PM			0		
9:45 PM	9:59 PM			0		
10:00 PM	10:14 PM			0		
10:15 PM	10:29 PM			0		
10:30 PM	10:44 PM			0		
10:45 PM	10:59 PM			0		
11:00 PM	11:14 PM			0		
11:15 PM	11:29 PM			0		
11:30 PM	11:44 PM			0		
11:45 PM	11:59 PM			0		
	Approach Totals:	3372	3336	6708	1154	0

MUTCD WARRANT 3, PEAK HOUR

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	2 or More Lanes
Minor Street:	2 or More Lanes

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	Yes

Is this signal warrant being applied for an unusual case, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time?	Yes

Indicate whether all three of the following conditions for the same 1 hour (any four consecutive 15-minute periods) of an average day are present*	
Does the total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equal or exceed 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach?	Yes
Does the volume on the same minor-street approach (one direction only) equal or exceed 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes?	Yes
Does the total entering volume serviced during the hour equal or exceed 650 vehicles per hour for intersection with three approaches or 800 vehicles per hour for intersections with four or more approaches?	Yes
**If applicable, attach all supporting calculations and documentation.*	

Total Number of Unique Hours Met On Figure 4C-4
4

Hourly Vehicular Volume			
Hour Interval Beginning At	**Major Street Combined Vehicles Per Hour (VPH)**	**Highest Minor Street Approach Vehicles Per Hour (VPH)**	**Hour Met?**
12:00 AM	0	0	
12:15 AM	0	0	
12:30 AM	0	0	
12:45 AM	0	0	
1:00 AM	0	0	
1:15 AM	0	0	
1:30 AM	0	0	
1:45 AM	0	0	
2:00 AM	0	0	
2:15 AM	0	0	
2:30 AM	0	0	
2:45 AM	0	0	
3:00 AM	0	0	
3:15 AM	0	0	

Hourly Vehicular Volume			
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
3:30 AM	0	0	
3:45 AM	0	0	
4:00 AM	0	0	
4:15 AM	0	0	
4:30 AM	0	0	
4:45 AM	0	0	
5:00 AM	0	0	
5:15 AM	0	0	
5:30 AM	0	0	
5:45 AM	0	0	
6:00 AM	0	0	
6:15 AM	750	80	
6:30 AM	1495	165	Met
6:45 AM	2270	243	Met
7:00 AM	3054	326	Met
7:15 AM	2304	246	Met
7:30 AM	1559	161	Met
7:45 AM	784	83	
8:00 AM	0	0	
8:15 AM	0	0	
8:30 AM	0	0	
8:45 AM	0	0	
9:00 AM	0	0	
9:15 AM	0	0	
9:30 AM	0	0	
9:45 AM	0	0	
10:00 AM	0	0	
10:15 AM	0	0	
10:30 AM	0	0	
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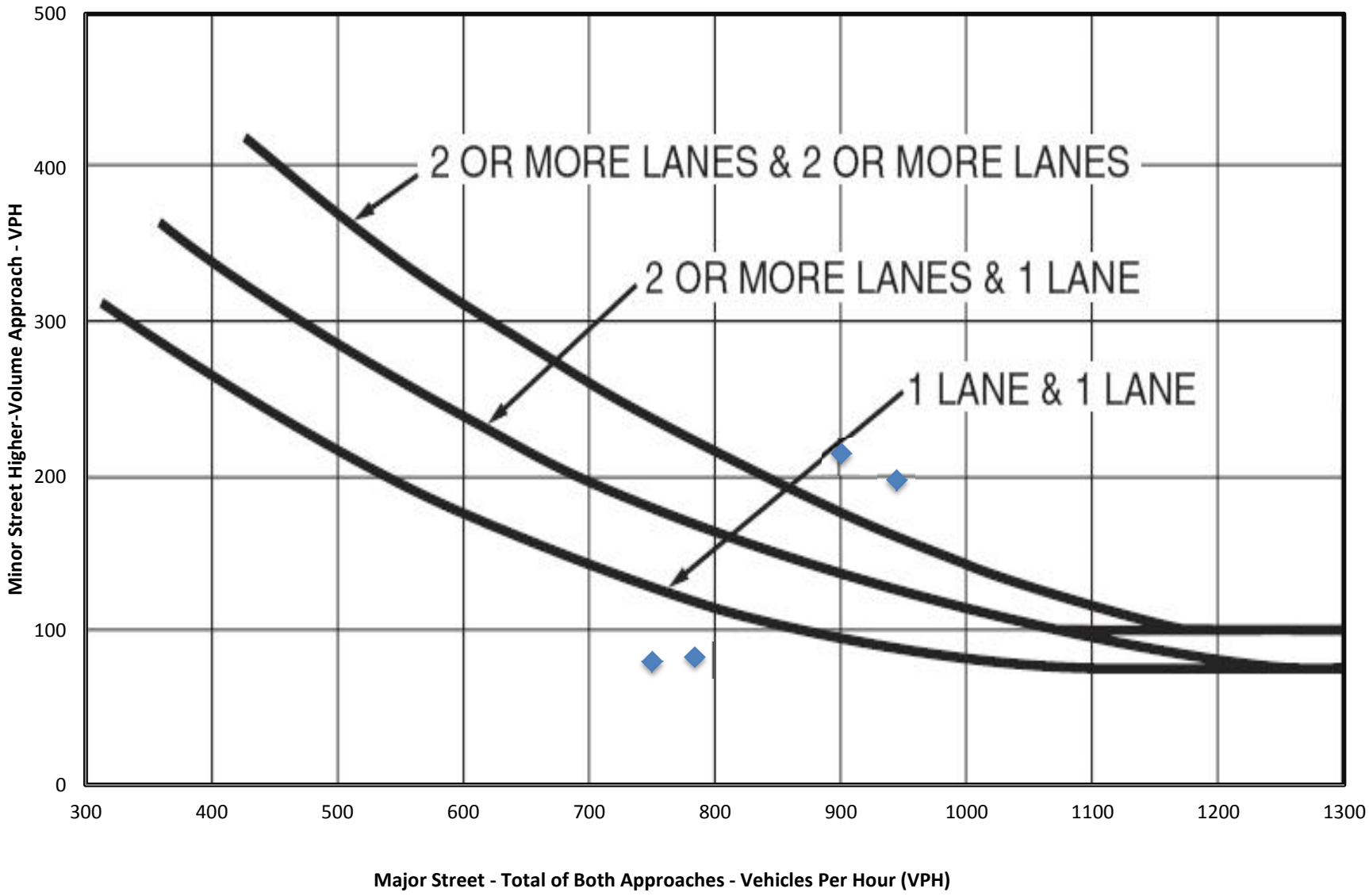
12:30 PM	0	0	
12:45 PM	0	0	
1:00 PM	0	0	
1:15 PM	0	0	
1:30 PM	0	0	
1:45 PM	0	0	
2:00 PM	0	0	
2:15 PM	0	0	
2:30 PM	0	0	
2:45 PM	0	0	
3:00 PM	0	0	

Hourly Vehicular Volume			
Hour Interval Beginning At	Major Street Combined Vehicles Per Hour (VPH)	Highest Minor Street Approach Vehicles Per Hour (VPH)	Hour Met?
3:15 PM	0	0	
3:30 PM	0	0	
3:45 PM	0	0	
4:00 PM	0	0	
4:15 PM	900	215	Met
4:30 PM	1825	425	Met
4:45 PM	2710	630	Met
5:00 PM	3654	828	Met
5:15 PM	2754	613	Met
5:30 PM	1829	403	Met
5:45 PM	944	198	Met
6:00 PM	0	0	
6:15 PM	0	0	
6:30 PM	0	0	
6:45 PM	0	0	
7:00 PM	0	0	
7:15 PM	0	0	
7:30 PM	0	0	
7:45 PM	0	0	
8:00 PM	0	0	
8:15 PM	0	0	
8:30 PM	0	0	
8:45 PM	0	0	
9:00 PM	0	0	
9:15 PM	0	0	
9:30 PM	0	0	
9:45 PM	0	0	
10:00 PM	0	0	
10:15 PM	0	0	
10:30 PM	0	0	
10:45 PM	0	0	
11:00 PM	0	0	

MUTCD Figure 4C-4. Warrant 3, Peak Hour (70% Factor)



Turn Lane Warrant and Length Analysis Workbook

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	Marple Township	**Analysis Date:**	12/30/2013
County:	Delaware County	**Conducted By:**	DJK
PennDOT Engineering District:	6	**Checked By:**	NK
		Agency/Company Name:	Orth-Rodgers & Assoc., Inc.

Intersection & Approach Description: Wwest Chester Pike (SR 0003) & Langford Run Road

Analysis Period:	2015 Build	**Number of Approach Lanes:**	2
Design Hour:	PM Peak Hour	**Undivided or Divided Highway:**	Divided
Intersection Control:	Signalized		
Posted Speed Limit (MPH):	45		**Type of Analysis**
Type of Terrain:	Rolling	**Left or Right-Turn Lane Analysis?:**	Left Turn Lane

VOLUME CALCULATIONS

Left Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	Yes	401	0.0%	401
	Through	-	1551	5.0%	1668
	Right	Yes	0	0.0%	0
Opposing	Left	No	0	0.0%	N/A
	Through	-	1438	5.0%	1546
	Right	Yes	268	0.0%	268

Advancing Volume:	2069
Opposing Volume:	1814
Left Turn Volume:	401
% Left Turns in Advancing Volume:	19.38%

Right Turn Lane Volume Calculations

Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No	0	0.0%	N/A
	Through	-	0	0.0%	N/A
	Right	-	0	0.0%	N/A

Advancing Volume:	N/A
Right Turn Volume:	N/A

TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings

Applicable Warrant Figure: Figure 8

Warrant Met?: Yes

Right Turn Lane Warrant Findings

Applicable Warrant Figure: N/A

Warrant Met?: N/A

TURN LANE LENGTH CALCULATIONS

Intersection Control:	Signalized
Design Hour Volume of Turning Lane:	401
Cycles Per Hour (Assumed):	Known
Cycles Per Hour (If Known):	40

Average # of Vehicles/Cycle: 10.0

PennDOT Publication 46, Exhibit 11-6

Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

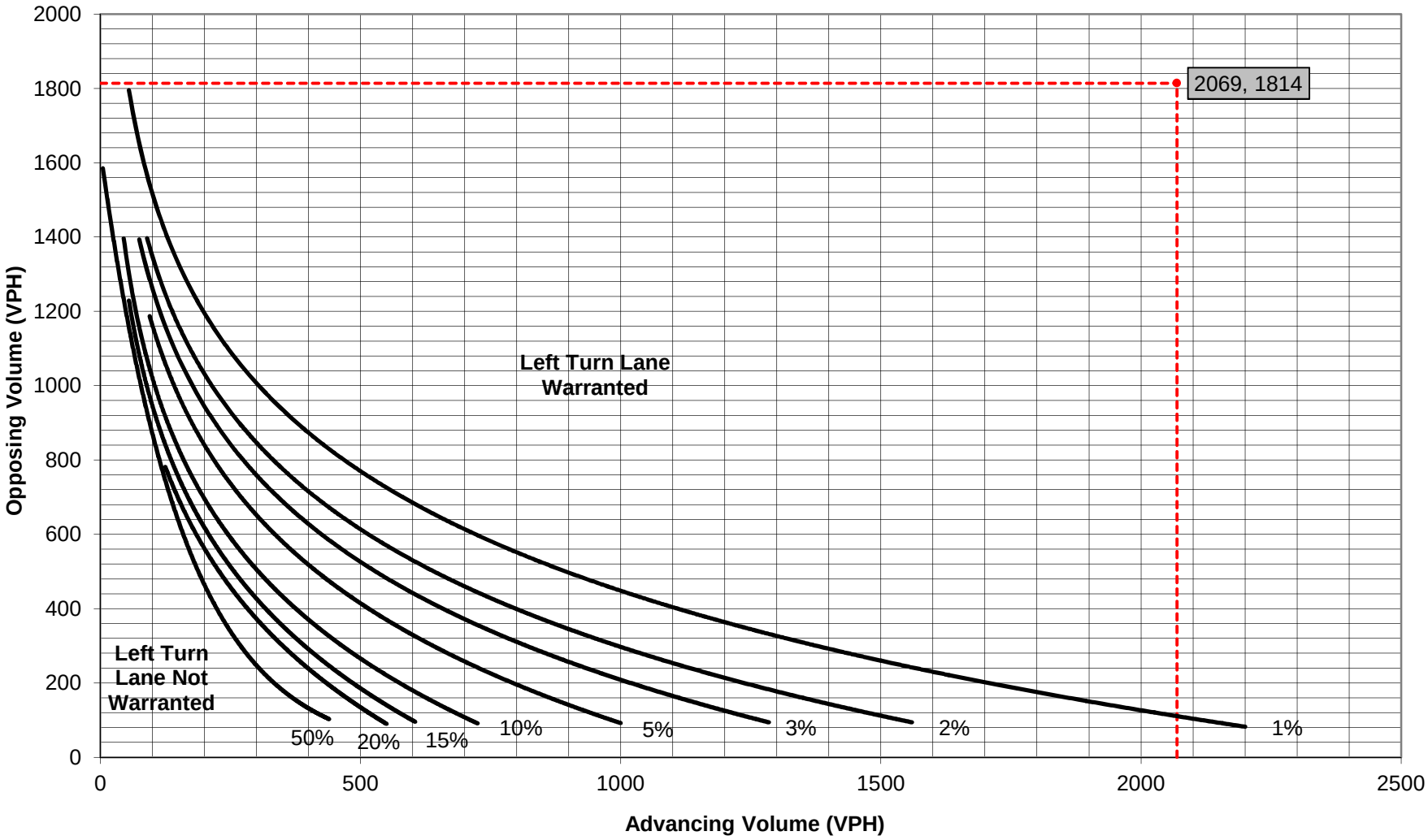
Left Turn Lane Storage Length, Condition A:	N/A	Feet
Condition B:	125	Feet
Condition C:	450	Feet
Required Left Turn Lane Storage Length:	450	Feet

Additional Findings:

Consider Dual Left Turn Lanes and Operational Analyses

Additional Comments / Justifications:

Figure 8. Warrant for left turn lanes on four-lane, divided highways (unsignalized and signalized intersections)
(L = % Left Turns in Advancing Volume)



Left Turn Conflict Factor

Separate Left Turn Lane (WB West Chester Pike) and:

Two opposing lanes exist, CF needs to be greater than 65,000

WB Left Turn Volume*		Opposing Volume*	CF
AM Peak	171	1670	285,570
PM Peak	401	1702	682,502
SAT Peak	545	1398	761,910

** Based on 2015 expected volumes*

CRASH ANALYSIS REPORT
for Roadways in Vicinity of MARPLE ASSOCIATES

West Chester Pike (S.R. 0003) between Edgewood Road and Robinson Avenue
&
Lawrence Road (S.R. 1020) between Hillside Lane and Brighton Village Road

MARPLE and HAVERFORD TOWNSHIPS
DELAWARE COUNTY, PA

pennsylvania
DEPARTMENT OF TRANSPORTATION

Prepared for

Pennsylvania Department of Transportation
7000 Geerdes Boulevard
King of Prussia, PA 19406-1525

September 2010
ORA Job No. 1984052

Orth-Rodgers & Associates, Inc.
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Phone (610) 407 9700 | Fax: 610-407-9600 | www.orth-rodgers.com

Orth-Rodgers & Associates, Inc.
TRANSPORTATION ENGINEERS AND PLANNERS

CRASH DATA SUMMARY

Orth-Rodgers & Associates, Inc. (ORA) has prepared a crash analysis in conjunction with the Traffic Impact Study for the proposed Marple Associates development on West Chester Pike at I-476. Specifically, ORA reviewed intersection and midblock collisions along West Chester Pike (S.R. 0003) between Edgewood Road and Robinson Avenue and on Lawrence Road (S.R. 1020) between Hillside Lane/Canterbury Drive and Brighton Village Road in Marple Township, Delaware County, Pennsylvania.

Below please find a summary of the findings.

Crash data along the study area roadways was obtained for calendar years 2005 to 2009 from the PennDOT Bureau of Highway Safety and Traffic Engineering (BHSTE) Crash Records System. PennDOT defines a crash as a motor vehicle collision that involves a fatality, an injury, or requires towing of one or more vehicles. The crash system includes data from those "reportable" incidents. Review of the data revealed that a total of 142 reported motor vehicle collisions occurred within the five-year analysis period. One-hundred eight crashes (76%) occurred at intersections, and 34 collisions (24%) occurred at midblock locations. Pedestrians were involved in four of the 142 crashes, and there were no fatalities. The crash data was examined to determine trends for the study roadways.

As previously noted, a total of one-hundred forty-two (142) reportable crashes occurred within the five-year analysis period. Eighty-three collisions (58%) occurred during daylight conditions, fifty-two crashes (37%) occurred while the street lights were on, and the remaining seven crashes (5%) occurred at dawn, dusk, or under unknown lighting conditions. One hundred ten crashes (78%) were on dry road surfaces, 29 crashes (20%) were on wet road surfaces, and three crashes (2%) occurred under slushy and icy road surface conditions. Sixty-eight (48%) of the collisions were rear-end crashes, 36 crashes (25%) were angle crashes, 19 crashes (13%) involved vehicles hitting a fixed object, eight crashes (5%) were sideswipe collisions, five head-on collisions (4%), four (3%) pedestrian collisions, two crashes (2%) whose collision type was unknown.

Evaluation of the data indicated that the following locations had more than five reported crashes within the five-year analysis period):

- <u>West Chester Pike (S.R. 0003) & Old West Chester Pike (S.R. 1033)</u>

  Seven crashes occurred at the signalized intersection of West Chester Pike and Old West Chester Pike during the study years. Four of the collisions were rear end crashes, and two crashes involved vehicles hitting a pedestrian. Both of the pedestrian crashes occurred in the rain with wet road surface conditions.

- West Chester Pike (S.R. 0003) & North Lawrence Road (S.R. 1016)

  Thirty-four motored vehicle collisions occurred at the signalized T-intersection of West Chester Pike (S.R. 0003) and Lawrence Road (S.R. 1016) within the analysis period. Fifteen of the thirty-four collisions (44%) occurred under evening conditions with the street lights on. Collision types included fourteen (41%) angle collision, fifteen (44%) rear end crashes, two head-on collisions (6%), and two crashes (6%) involving a vehicle hitting a fixed object, and one sideswipe (3%). As with the other Lawrence Road intersection, a number of crashes were attributed to red light running. Specifically, thirteen out of twenty-seven crashes (48%) had red light running as either a top or secondary contributing factor to the crash. Other contributing factors included driver distraction and improper driving actions.

- West Chester Pike (S.R. 0003) & South Lawrence Road (S.R. 1020)

  Nineteen reportable motor vehicle crashes occurred at the signalized T-intersection of West Chester Pike (S.R. 0003) and Lawrence Road (S.R. 1020). Twelve of the nineteen crashes occurred during daylight conditions. Eleven crashes (58%) involved vehicles being rear-ended, six (32%) were angle crashes, and two (10%) crashes involved vehicles hitting a fixed object. Six (32%) of the crashes were attributed to red light running. Tailgating, sudden slowing/stopping, and driving too fast for conditions were the other key contributing factors.

- West Chester Pike & I-476 NB Off Ramp Intersection

  Eleven reported motor vehicle collisions occurred at the intersection of West Chester Pike and the I-476 northbound off ramp during the study period. Six of the eleven crashes occurred with the street lights on. The collision types include: five angle crashes (46%), two head-on collisions (18%), two rear end collisions (18%), and two collisions (18%) involving a vehicle hitting a fixed object. Red light running was the key contributing factor in six (55%) of the eleven crashes. The remaining crashes were the result of improper driving actions and speeding. Nine of the eleven crashes occurred either at dusk or when the street lights were turned on.

- West Chester Pike & I-476 SB On-Off Ramps Intersection

  Four crashes occurred at this intersection, and one occurred within 170 feet of the intersection within the analysis period. There were specifically three rear-end crashes, one angle collision, and one crash that involved hitting a deer. The angle crash occurred as a result of red light running, and the remaining crashes appear to be the result of improper driving actions.

- West Chester Pike (S.R. 0003) & New Ardmore Avenue

  A total of nine reportable crashes occurred at the four-way signalized intersection of West Chester Pike (S.R. 0003) and New Ardmore Avenue during the study period. Five of the crashes occurred during daylight conditions, and four crashes occurred while the street lights

were on. Four rear-end collisions, three angle crashes, one collision involving a vehicle hitting a fixed object, and one opposite direction sideswipe occurred within the analysis period. Driver distraction, tailgating, and sudden slowing/stopping were driving factors contributing to these collisions. One of the nine crashes was attributed to red light running.

- Lawrence Road (S.R. 1020) & Sussex Boulevard

  Six recorded collisions occurred at the four-way signalized intersection of Lawrence Road (S.R. 1020) and Sussex Boulevard within the analysis period. Four of the crashes occurred during daylight hours, and two crashes occurred with the street lights on. The types of collisions included three angle crashes, one rear-end collision, one same direction sideswipe, and on head-on collision. Improper/careless turning and driving actions contributed to five of the six collisions.

- Lawrence Road (S.R. 1020) & Hillside Lane/Canterbury Drive

  There were five recorded crashes at this four-way unsignalized intersection located approximately 1,350 feet south of Sussex Boulevard within the five-year analysis period. The types of collisions included two rear-end crashes, two angle crashes, and one opposite direction sideswipe. Driving actions varied from driver distraction, to improper/careless turning, to driving too fast for conditions and proceeding without clearance. No specific patterns to the crashes were identified at this location.

A crash summary for the combined study area is provided in table format on the following page.

Orth-Rodgers & Associates, Inc.
TRANSPORTATION ENGINEERS AND PLANNERS

Table – Crash Data Summary:
West Chester Pike (S.R. 0003) between Edgewood Road and Robinson Avenue
&
Lawrence Road (S.R. 1020) between Hillside Lane and Brighton Village Road

YEAR	Total
2006	35
2009	31
2008	27
2007	25
2005	24
Grand Total	**142**

ILLUMINATION	Total
Daylight	83
Street Lights	52
Dusk	4
Dawn	2
Unknown Lighting	1
Grand Total	**142**

ROAD SURFACE	Total
Dry	110
Wet	29
Slush	2
Ice	1
Grand Total	**142**

WEATHER	Total
Clear	116
Rain	25
Snow	1
Grand Total	**142**

COLLISION TYPE	Total
Rear-End	68
Angle	36
Hit Fixed Object	19
Same Direction Sideswipe	5
Head-On	5
Pedestrian	4
Opposite Direction Sideswipe	3
Non-collision	1
Unknown	1
Grand Total	**142**

SEVERITY	Total
Property Damage Only	59
Unknown Severity	36
Minor Injury	34
Moderate Injury	12
Major Injury	1
Grand Total	**142**

DRIVING ACTIONS	Total
Driver Distraction	30
Other Improper Driving Actions	24
Running Red Light	24
Too Fast For Conditions	11
Affected by Physical Conditions	10
Improper/Careless Turn	10
No Contributing Action	9
Tailgating	9
Sudden Slowing/Stopping	8
Proceed without Clearance	2
Careless Pass or Lane Change	1
Improper Exit from Highway	1
Driver Inexperienced	1
Over/Under Compensate Curve Speeding	1
Making Illegal U-Turn	1
Grand Total	**142**

TE-672 (9-10)

PEDESTRIAN ACCOMMODATION AT INTERSECTIONS CHECKLIST

PLEASE TYPE OR PRINT ALL INFORMATION IN BLUE OR BLACK INK

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

As specified in the MUTCD, Section 4E, an engineering study shall be conducted to determine the need for pedestrian accommodation at signalized intersections and the related design and operational features. Based on the engineering study and engineering judgment, proper documentation shall be made at all new signalized intersections and modifications to existing signalized intersections. This documentation shall be provided with guidance from this checklist.

When pedestrian accommodations will not be provided at an intersection, signalized or not, proper justification must be documented. Below is a checklist of information that may be relevant in the determination of pedestrian needs and warranted accommodations at an intersection. Not all of the information below is required to make a determination. This form can be used to summarize the needs and accommodations of a corridor or a single intersection.

Intersection Background Information

DATE	DISTRICT	COUNTY
12/31/2013	6-0	DELAWARE

MUNICIPALITY	INTERSECTION
TOWNSHIP OF MARPLE	WEST CHESTER PIKE & LANGFORD RUN ROAD

SUBMITTED BY	STREET ADDRESS
Orth-Rodgers & Assosiates, Inc.	301 Lindenwood Drive

CITY	STATE	ZIP	TELEPHONE NUMBER
Malvern	PA	19355	610-407-9700

Project Overview

Provide a Project Description and Scope of the Project. HOP for Intersection Improvements

Bike/Ped Checklist Completed. ☑ Yes ☐ No

Existing Facility Description

Yes	No	
☑	☐	Are pedestrian facilities present (i.e., sidewalks, curb ramps, crosswalks, pedestrian signals, etc.)?
☑	☐	Are there descriptions of each quadrant of the existing intersection (photos are strongly recommended)?
☑	☐	Are near-by land uses documented?
☐	☑	Are pedestrian facilities near the intersection (i.e., sidewalks, bus stops, trails, etc.)?
☐	☑	Is there current evidence of pedestrians using the intersection (worn paths, observed activity)?
☐	☑	Were special accommodations made in the past for pedestrians at the intersection?
☐	☑	Are restrictions for pedestrians present? (No Ped signs, limited crossings)
☐	☑	Is this a defined walking route or safe route to school route?
☐	☑	Are physical restrictions or right-of-way restrictions present?
☐	☑	If pedestrian signals are present, is proper traffic signal timing designated for pedestrians at the intersection?

Proposed Facility Description

Yes	No	
☐	☑	Will the proposed improvements generate new or additional pedestrian traffic?
☑	☐	Does the proposed facility introduce possible additional restrictions for pedestrians?
☑	☐	Are new or existing pedestrian signals proposed at the intersection?
☐	☑	Are sidewalks proposed as part of the project?
☑	☐	Are detailed descriptions of changes to each quadrant documented?
☑	☐	Do near-by land uses change as part of the project?
☑	☐	Are additional pedestrian facilities proposed for the intersection?

Outreach Efforts

Has contact and discussion concerning pedestrian accommodations at the intersection been made with the following?

Yes	No	
☑	☐	Municipality (s)
☐	☑	Transit Organization (s)
☐	☑	School District (s)
☐	☑	Public Meeting (s)
☐	☑	Emergency Services
☐	☑	Advocacy Groups
☐	☐	Other (s) HOP for Intersection Improvements

Intersection Details

(The information below may be useful in the determination of pedestrian needs and warranted accommodations at uncontrolled intersections. Not all of the information is required to make a determination. The minor roadway information may also be needed in some situations.)

Roadway classification: Urban Principal Arterial

Roadway Typology: Urban Town Center/Regional Arterial

Speed Limit (MPH): 45

Design Speed: 55

ADT: 45,049

Percentage of Trucks: 5

Travel lanes: 6

Is there a sight distance deficiency? ☐ Yes ☒ No

If yes, explain. _____

Sidewalk: ☐ Yes ☒ No Shoulders: ☒ Yes ☐ No Curb: ☒ Yes ☐ No

Is parking permitted on the roadway? ☐ Yes ☒ No

Municipal recommendation: _____

Pedestrian generators? None

Distance to next available crossing: 675' to New Ardmore Ave, 661' to I-476 SB Ramps

Was a crash analysis completed? ☒ Yes ☐ No

Are there pedestrian crashes? ☐ Yes ☒ No

Has a pedestrian gap analysis been performed at the location? ☐ Yes ☒ No

ftp://ftp.dot.state.pa.us/transfer/Traffic Signals/Unsignalized Intersection Ped Calcs from HCS.xlsx

Are there other geometric concerns? If yes, explain: Wide roadway (West Chester Pike), no sidewalks, retaining wall/barrier on SW corner. No median refuge for West Chester Pike crossing (due to east side crossing)

Pedestrian Traffic Signals (if applicable)

Yes	No	
☒	☐	Is there proper pedestrian timing established at the intersection?
☐	☒	Is an all-pedestrian phase recommended in the study?
☒	☐	Are the crosswalks in alignment with curb ramps?
☒	☐	Are pedestrian signals visible from the proposed crosswalk/curb ramp locations?
☒	☐	Are countdown pedestrian signals present?
☐	☒	Has the need for Accessible Pedestrian Signals (APS) been determined from the study?
☒	☐	Are pushbuttons proposed to be within the current ADA criteria?
☒	☐	Are all pushbutton locations accessible to all pedestrians?
☒	☐	Do all features satisfy applicable state and federal requirements?

Recommendations/Justification
Provide one crosswalk across NB Langford Run Road approach and one crosswalk on east side of langford Run Road
across West Chester Pike. Provide ADA accessible features, ramps, push buttons and pedestrian countdown signal heads

District Traffic Engineer Approval	Assistant District Executive Approval
District Traffic Engineer Date	District ADE of Design, Maintenance or Services Date

Planning and Programming Section

Project HOP Application 42543
SR 0003 Segment 0120/0121 Offset 2585/2601
Team Members
Date December 31, 2013

Item	Considerations	Check	Comments
1. Consistency with Bicycle/Pedestrian Planning Documents	Is the transportation facility included in or related to bicycle and pedestrian facilities identified in a master plan? • MPO/LDD bike/ped plan. • Local planning documents. • Bicycle PA Routes. • Statewide Bicycle and Pedestrian Master Plan.	YES	DelCo's Bike Network along West Chester Pike
	Will the transportation facility provide continuity and linkages with existing or proposed bicycle/pedestrian facilities?	YES	
	Is the transportation facility included in or related to a regional/local recreational plan? • Rails-to-Trails. • Greenways. • Local, State, National Parks.	YES	
2. Existing and Future Usage	Do bicycle/pedestrian groups regularly use the transportation facility? • Bike clubs. • Bicycle commuters. • Hiking, walking, or running clubs. • Skateboarding or rollerblading groups. • Bicycle touring groups. • General tourism/sightseeing.	YES	Bicyclists use, no pedestrians
	Does the existing transportation facility provide the only convenient transportation connection/linkage between land uses in the local area or region?	NO	Part of an active regional transportation network.
	Could the transportation facility have favorable or unfavorable impacts upon the bike tourism/economy of an area/ region? Consider: • Local businesses • Chamber of Commerce • Tourism Promotion Agencies.	NO	
	Are there physical or perceived impediments to bicycle or pedestrian use of the transportation facility?	YES	No sidewalks for pedestrians, but shoulders for bicyclists
	Is there a higher than normal incidence of bicycle/pedestrian crashes in the area?	NO	
3. Safety	Is the transportation facility in a high-density land use area that has pedestrian/ bike/motor vehicle traffic?	YES	

Item	Considerations	Check	Comments
3. Safety (con't.)	Is there a high amount of crossing activity at intersections? • Midblock • Night crossing activity • Adequate lighting.	YES	Several of the other unaffected intersections see higher volumes of pedestrian activity
	Would the transportation facility (and all users) benefit from widened or improved shoulders or improved markings (shoulders, crosswalks)?	YES	
4. Community and Land Use	Is the transportation facility in a city, town, or village?	YES	Township of Marple, Delaware County
	Is the transportation facility within/near a community or neighborhood?	YES	Broomall, PA
	Is the transportation facility the "main street" in a community or town?	NO	
	Could bicycle or pedestrian usage impact economic development?	NO	
	Are sidewalks needed in the area? • Presence of worn paths along the facility. • Adjacent land uses generate pedestrian traffic. • Possible linkages/continuity with other pedestrian facilities.	N/A	Significant distance to east, people either drive or take public transportation
	Is the transportation facility a link between complimentary land uses? • Residential and commercial. • Residential and business.	YES	
	Is the transportation facility in close proximity to hospitals, elderly care facilities, or the residences or businesses of persons with disabilities?	YES	No facilities are directly adjacent, but does serve uses outside the project area.
	Is the transportation facility within or near educational buildings?	NO	
	Is the transportation facility in close proximity to transit stops or multi-modal centers (including airports, rail stations, intercity bus terminals, and water ports)?	YES	Yes – within walking distance of SEPTA bus stops
5. Transit	Is the transportation facility on a transit route?	YES	SEPTA's bus routes 104, 112, 115, 120.
	Is the transportation facility near park-and-ride lots?	NO	
	Are there existing or proposed bicycle racks, shelters or parking available? Are there bike racks on buses?	NO	SEPTA buses have bike racks.
6.Traffic Calming	Is the community considering traffic calming as a possible solution to speeding and cut-through traffic?	N/A	

Scoping Section

Project HOP Application 42543
SR 0003 Segment 0120/0121 Offset 2585/2601
Team Members
Date December 31, 2013

Pedestrian Facilities

Item	Considerations	Check	Comments
1. Sidewalks	Appropriate width: • 1.5 m – 2.1 m (5'-7') for residential and commercial • 2.5 m (8') minimum for high use areas/CBD. • 2.1 m (7') width for bridges. • 0.6 m (2') shy distance for vertical barriers. • 1.2 m – 2.1 m (4'-7')barrier separating traffic from pedestrians on bridges.	 NO NO NO N/A NO	 Do not exist near Pike & Langford Run Rd intersection.
	Applicability of planter or buffer strips.	N/A	
	Connectivity with other pedestrian facilities.	N/A	
	Proximity to transit bike/ped generators: • Transit stops. • Schools. • Park & rides. • Nursing homes. • Offices. • Business environments. • Athletic fields. • Recreation facilities.	N/A	
	Observe pedestrian patterns for special needs such as: • Midblock crossings. • Islands and refuges. • Night crossing activity.	N/A	
	ADA needs and concerns.	N/A	.

Item	Considerations		Check	Comments
2. Signalized Intersections	Crosswalks provided and marked.		YES	Existing crosswalks will be maintained.
	Intersection bike/ped crash history reviewed.		YES	No reported crashes
	Is there a dedicated pedestrian phase, if so how long?		NO	
	Crossing distance is minimized.		YES	Where applicable
	Ped heads and ped pushbuttons provided.		YES	At new signalized intersection
	ADA needs and concerns.	Retirement homes	NO	
		Schools	NO	
		Medical facilities	NO	Adjacent to corridor only
3. Traffic Calming	Is the community considering traffic calming as a means to curb speeding and cut-through traffic?		NO	

Bicycle Facilities

Item	Considerations	Check	Comments
1. Bike lanes/Paved Shoulders	Appropriate width of bike lane: • 1.5m (5') adjacent to curb • 1.8m (6') standard.	N/A	Bike route is shared in vehicular lane
	Connectivity with other facilities. • Bike lanes • Shared use trails • Trail heads/parking areas.	N/A	Bike lanes - No separate lane Shared use trails - None Trail heads/parking areas - None
	Maximize width of shoulders and provide appropriate markings as per *AASHTO Green Book*.	N/A	
	3 m (10') vertical clearance from fixed obstructions (excluding road signs).	N/A	
	Angle and smoothness of railroad crossings. Avoid angles of incidence of <70 degrees or re-design.	N/A	
	Bridge accesses provided/pinch points avoided.	N/A	
	Parking parallel or angled.	N/A	
2. Signalized intersections	Inventory existing bicycle facilities.	N/A	
	Intersection bike/ped crash history reviewed.	YES	
	Crossing distance is minimized.	YES	
	Considerations for bikes making turns.	N/A	Bike route not provided
	Bike detection.	N/A	Bike route not provided
	Elevated push buttons.	YES	ADA compliant push buttons will be provided
3. Traffic Calming	Is the community considering traffic calming as a means to curb speeding and cut-through traffic?	NO	

Final Design Section

Project HOP Application 42543
SR 0003 Segment 0120/0121 Offset 2585/2601
Team Members
Date December 31, 2013

Item	Considerations	Check	Comments
1. Sidewalks and Signalized Intersections	Crosswalks are at least 3 m (10') wide.	NO	Proposed crosswalks are minimum 8' wide
	Crosswalks are prominently marked using at least 6" line.	YES	Signalized intersections using 2' wide
	Pedestrian signals are provided.	YES	
	Pushbuttons are provided and accessible.	YES	
	Minimize crossing distance.	YES	
	Maximize pedestrian visibility at crossings.	YES	
	Coordination of turn phases with walk/don't walk signs.	YES	
	Proper lighting type and placement.	YES	
2. ADA Requirements	Pushbuttons accessible.	YES	
	Pushbuttons height 1.0m – 1.1m (3.5'-4.0').	YES	
	Large pushbuttons used.	YES	
	1.5m (5') recommended passage (sidewalks).	YES	
	5% maximum grade recommended (sidewalks).	N/A	
	2% cross-slope maximum.	YES	
	Textured curb cuts.	YES	
	2 curb cuts per corner at intersections.	YES	
	Curb cuts flush with street surface 0.6cm (1/4" tolerance).	YES	
	Running slope of new curb cuts 1 in 12 max.	YES	
	Longer signal cycles.	YES	Ped clearances included in cycle length
	Audible crossing signals.	NO	
	Level landings on perpendicular curb ramps.	YES	
	Proper head/shoulder clearance for visually impaired.	YES	
	Coordinate utilities with ADA requirements.	YES	
	Proper lighting.	YES	
	Analyze landscaping growth potential for future obstructions.	YES	
	Any conflicts with minimal distance that should be included in the project.	NO	
	Coordinate and minimize signage conflicts.	YES	Existing conflicting signs will be removed.
3. Traffic Calming	Consider traffic calming as a means to improve pedestrian and general traffic safety.	NO	

Bicycle Facilities

Item	Considerations	Check	Comments
1. Bike lanes/Bikeways	Bicycle safe grates, RC-34, Sheet 3 of 9.	YES	
	Manhole covers flush with roadway surface.	YES	
	Inlets flush with roadway surface.	YES	
	Rumble strips type and placement.	N/A	
	Driveway aprons.	N/A	
	Conflicts eliminated with: • Turns at intersections. • Through movements. • Bicycle and pedestrian conflicts. • Parked cars, angled vs. parallel. • Driveway aprons.	N/A	
2. Signage	3m (10') vertical clearance from signs and structures.	N/A	No proposed bike lanes or bikeways for this project.
	"Share the Road Signs."	YES	Existing
	"Wrong Way Signs."	N/A	
	Lane stenciling.	N/A	
	Bike lane designation signs.	N/A	
	No parking signs.	N/A	
	Bike lane striped.	N/A	
	Transition from bike lane to bikeway.	N/A	
	Consistent width on roadways, bridges, and intersections.	N/A	
	Overlap bike lane/shoulder stripe over pavement joints.	N/A	
	Meet or exceed AASHTO criteria.	N/A	
3. Traffic calming	Consider traffic calming as a means to improve pedestrian and general traffic safety.	N/A	

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	MARPLE TOWNSHIP	**Analysis Date:**	1/2/2014 update
County:	Delaware County	**Conducted By:**	DJK
PennDOT Engineering District:	6	**Checked By:**	NK
		Agency/Company Name:	Orth-Rodgers & Associates, Inc.

Intersection Description: West Chester Pike (SR 0003) & Malin Road

VEHICLE AND PEDESTRIAN INTERVAL FINDINGS

Vehicle Change and Clearance Interval Findings

Approach Description	Direction	Calculated Yellow Change Interval, Y	User Defined Yellow Change Interval, Y	Calculated All-Red Clearance Interval, AR	User Defined All-Red Clearance Interval, AR	To Be Implemented	
						Y (s)	AR (s)
SR 0003 (Phase 2)	EB	4.4	5	2	2	**5**	**2**
SR 0003 (Phase 6)	WB	4.3	5	1.6	2	**5**	**2**
Malin Rd (Phase 4)	SB	2.9	3	4.7	5	**3**	**5**
Malin Rd (Phase 8)	NB	2.9	3	3.5	4	**3**	**4**
SR 0003 (Phase 1)	WB	2.9	3	3.4	4	**3**	**4**

Additional Comments/Justifications:

Pedestrian Interval Findings

WITH PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Walk Interval, T_w	User Defined Walk Interval, T_w	Calculated Ped. Change Interval, T_{pc}	User Defined Ped. Change Interval, T_{pc}	Greater than $(T_w+T_{pc})_{min}$?	To Be Implemented	
						T_w (s)	T_{pc} (s)
Crossing of EB SR 0003 (2 Stage)	13	7	20	20	Yes	**7**	**20**

WITHOUT PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Min. Green Interval, T_p
Crossing of NB Malin	19.9
Crossing of SB Malin	24.8

Additional Comments/Justifications:

VEHICLE CHANGE AND CLEARANCE INTERVALS

Assumptions and Calibration Inputs

Change and Clearance Intervals (CCI, seconds)

$$CCI = Y + AR$$

Yellow Change Interval (Y, seconds)

$$Y = t + \frac{1.47V}{2a \pm 64.4(g/100)}$$ (typ. 3-6 seconds)

- t = Perception-reaction time, s (1 second) ← 1
- V = Approach speed, MPH
- a = Deceleration rate (10 ft/s^2) ← 10
- g = Grade of approach, %

All-Red Clearance Interval (AR, seconds)

$$AR = \frac{(W + L)}{1.47V}$$

- W = Width of the intersection, ft (from the stop bar to the end of the farthest traveled lane)
- L = Length of Vehicle (20 ft) ← 20
- V = Approach speed, MPH

Calculations

Through Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 2)	EB	45	-0.68	110	4.4	2.0	6.4	use 5+2=7
SR 0003 (Phase 6)	WB	45	0.34	80	4.3	1.6	5.9	5+2=7
Malin Rd (Phase 4)	SB	25	-0.5	150	2.9	4.7	7.6	use 3+5=8
Malin Rd (Phase 8)	NB	25	0.5	105	2.9	3.5	6.4	3+4=7
Left-Turn Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 1)	WB	25	0.34	102	2.9	3.4	6.3	use 3+4=7

PEDESTRIAN INTERVALS

Assumptions and Calibration Inputs

Walk Interval[1]

(T_w, seconds)

$$T_w = \frac{\left(\frac{1}{2}L\right)}{S_w} + 3$$

Pedestrian Change Interval

(T_{pc}, seconds)

$$T_{PC} = \frac{L}{S_w}$$

Minimum Duration

($(T_w+T_{pc})_{min}$, seconds)

$$(T_w + T_{pc})_{min} = \frac{(L+6)}{3}$$

1) The walk interval should be at least 7 seconds, but where justified, a minimum 4 second interval may be used.

Pedestrian Interval Variables

L = Pedestrian walking distance from the curb or edge of shoulder to the far edge of the traveled way, ft

S_w = Walking Speed, ft/s (3.5 ft/s) ← 3.5

Minimum Green Interval[2]

(T_p, seconds)

$$T_p = \frac{L}{S_w} + 3$$

2) Minimum green interval when no pedestrian signals are present or proposed

Calculations

Description of Pedestrian Crossing	Ped Signal	L	T_w	T_{pc}	$(T_w+T_{pc})_{min}$	T_p	Comments
Crossing of EB SR 0003 (2 Stage)	Yes	70	13	20	25.4	N/A	use 7 & 20
Crossing of NB Malin	No	59	N/A	N/A	N/A	19.9	7 & 17
Crossing of SB Malin	No	76	N/A	N/A	N/A	24.8	need 25

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	MARPLE TOWNSHIP	**Analysis Date:**	1/2/2014 update
County:	Delaware County	**Conducted By:**	DJK
PennDOT Engineering District:	6	**Checked By:**	NK
		Agency/Company Name:	Orth-Rodgers & Associates, Inc.

Intersection Description: West Chester Pike (SR 0003) & Sproul Road (SR 0320)

VEHICLE AND PEDESTRIAN INTERVAL FINDINGS

Vehicle Change and Clearance Interval Findings

Approach Description	Direction	Calculated Yellow Change Interval, Y	User Defined Yellow Change Interval, Y	Calculated All-Red Clearance Interval, AR	User Defined All-Red Clearance Interval, AR	To Be Implemented	
						Y (s)	AR (s)
SR 0003 (Phase 2)	EB	4.4	5	1.6	2	**5**	**2**
SR 0003 (Phase 6)	WB	3.9	4	1.6	2	**4**	**2**
Sproul Rd (Phase 4)	SB	3.7	4	2.6	3	**4**	**3**
Sproul Rd (Phase 8)	NB	3.6	4	2.6	3	**4**	**3**
SR 0003 (Phase 1)	WB	2.6	3	2.5	3	**3**	**3**
SR 0003 (Phase 5)	EB	2.9	3	3.1	4	**3**	**4**
320 (Phase 3)	NB	2.9	3	3.5	4	**3**	**4**

Additional Comments/Justifications:

Pedestrian Interval Findings

WITH PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Walk Interval, T_w	User Defined Walk Interval, T_w	Calculated Ped. Change Interval, T_{pc}	User Defined Ped. Change Interval, T_{pc}	Greater than $(T_w+T_{pc})_{min}$?	To Be Implemented	
						T_w (s)	T_{pc} (s)
Crossing of EB SR 0003 (2 Stage)	10.5	7	14.9	15	Yes	**7**	**15**
Crossing of WB SR 0003 (2 Stage)	9.6	7	13.2	14	Yes	**7**	**14**
		7		20			**20**
		7		16			**16**

WITHOUT PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Min. Green Interval, T_p
Crossing of NB Sproul	23
Crossing SB Sproul	19

Additional Comments/Justifications:

VEHICLE CHANGE AND CLEARANCE INTERVALS

Assumptions and Calibration Inputs

Change and Clearance Intervals (CCI, seconds)

$$CCI = Y + AR$$

Yellow Change Interval (Y, seconds)

$$Y = t + \frac{1.47V}{2a \pm 64.4(g/100)}$$ (typ. 3-6 seconds)

t = Perception-reaction time, s (1 second) ← 1

V = Approach speed, MPH

a = Deceleration rate (10 ft/s^2) ← 10

g = Grade of approach, %

All-Red Clearance Interval (AR, seconds)

$$AR = \frac{(W + L)}{1.47V}$$

W = Width of the intersection, ft
(from the stop bar to the end of the farthest traveled lane)

L = Length of Vehicle (20 ft) ← 20

V = Approach speed, MPH

Calculations

Through Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 2)	EB	45	-0.34	80	4.4	1.6	6.0	use 5+2=7
SR 0003 (Phase 6)	WB	45	4.9	80	3.9	1.6	5.5	4+2=6
Sproul Rd (Phase 4)	SB	35	-0.5	109	3.7	2.6	6.3	use 4+3=7
Sproul Rd (Phase 8)	NB	35	0.5	109	3.6	2.6	6.2	4+3=7
Left-Turn Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 1)	WB	25	4.9	69	2.6	2.5	5.1	3+3=6
SR 0003 (Phase 5)	EB	25	-0.34	91	2.9	3.1	6.0	use 3+4=7
320 (Phase 3)	NB	25	0.5	105	2.9	3.5	6.4	use 3+4=7

PEDESTRIAN INTERVALS

Assumptions and Calibration Inputs

Walk Interval[1]

(T_w, seconds)

$$T_w = \frac{\left(\frac{1}{2}L\right)}{S_w} + 3$$

Pedestrian Change Interval

(T_{pc}, seconds)

$$T_{PC} = \frac{L}{S_w}$$

Minimum Duration

($(T_w+T_{pc})_{min}$, seconds)

$$(T_w + T_{pc})_{\min} = \frac{(L+6)}{3}$$

1) The walk interval should be at least 7 seconds, but where justified, a minimum 4 second interval may be used.

Pedestrian Interval Variables

L = Pedestrian walking distance from the curb or edge of shoulder to the far edge of the traveled way, ft

S_w = Walking Speed, ft/s (3.5 ft/s) ← 3.5

Minimum Green Interval[2]

(T_p, seconds)

$$T_p = \frac{L}{S_w} + 3$$

2) Minimum green interval when no pedestrian signals are present or proposed

Calculations

Description of Pedestrian Crossing	Ped Signal	L	T_w	T_{pc}	$(T_w+T_{pc})_{min}$	T_p	Comments
Crossing of EB SR 0003 (2 Stage)	Yes	52	10.5	14.9	19.4	N/A	use 7 & 15
Crossing of WB SR 0003 (2 Stage)	Yes	46	9.6	13.2	17.4	N/A	7 & 14
Crossing of NB Sproul	No	70	N/A	N/A	N/A	23	need 23 min
Crossing SB Sproul	No	56	N/A	N/A	N/A	19	

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	MARPLE TOWNSHIP	**Analysis Date:**	12/29/2013 update
County:	Delaware County	**Conducted By:**	DJK
PennDOT Engineering District:	6	**Checked By:**	NK
		Agency/Company Name:	Orth-Rodgers & Associates, Inc.

Intersection Description: West Chester Pike (SR 0003) & Church Road/Berkley Road

VEHICLE AND PEDESTRIAN INTERVAL FINDINGS

Vehicle Change and Clearance Interval Findings

Approach Description	Direction	Calculated Yellow Change Interval, Y	User Defined Yellow Change Interval, Y	Calculated All-Red Clearance Interval, AR	User Defined All-Red Clearance Interval, AR	To Be Implemented	
						Y (s)	AR (s)
SR 0003 (Phase 2)	EB	3.7	4	2.3	3	**4**	**3**
SR 0003 (Phase 6)	WB	4.2	5	1.9	2	**5**	**2**
Church Rd (Phase 4)	SB	3.7	4	2.7	3	**4**	**3**
Berkley Rd (Phase 8)	NB	2.9	3	3.9	4	**3**	**4**
SR 0003 (Phase 1)	WB	3	3	2.9	3	**3**	**3**
SR 0003 (Phase 5)	EB	2.7	3	2.9	3	**3**	**3**

Additional Comments/Justifications:

Pedestrian Interval Findings

WITH PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Walk Interval, T_w	User Defined Walk Interval, T_w	Calculated Ped. Change Interval, T_{pc}	User Defined Ped. Change Interval, T_{pc}	Greater than $(T_w+T_{pc})_{min}$?	To Be Implemented	
						T_w (s)	T_{pc} (s)
Crossing of EB SR 0003 (2 Stage)	10.3	7	14.6	15	Yes	**7**	**15**

WITHOUT PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Min. Green Interval, T_p
Crossing of NB Berkley	27.6
Crossing SB Church	18.8

Additional Comments/Justifications:

VEHICLE CHANGE AND CLEARANCE INTERVALS

Assumptions and Calibration Inputs

Change and Clearance Intervals (CCI, seconds)

$$CCI = Y + AR$$

Yellow Change Interval (Y, seconds)

$$Y = t + \frac{1.47V}{2a \pm 64.4(g/100)}$$ (typ. 3-6 seconds)

t = Perception-reaction time, s (1 second) ← 1

V = Approach speed, MPH

a = Deceleration rate (10 ft/s^2) ← 10

g = Grade of approach, %

All-Red Clearance Interval (AR, seconds)

$$AR = \frac{(W + L)}{1.47V}$$

W = Width of the intersection, ft
(from the stop bar to the end of the farthest traveled lane)

L = Length of Vehicle (20 ft) ← 20

V = Approach speed, MPH

Calculations

Through Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 2)	EB	40	3.6	115	3.7	2.3	6.0	4+3=7
SR 0003 (Phase 6)	WB	40	-2.26	90	4.2	1.9	6.1	5+2=7
Church Rd (Phase 4)	SB	35	-0.5	115	3.7	2.7	6.4	4+3=7
Berkley Rd (Phase 8)	NB	25	0.5	120	2.9	3.9	6.8	3+4=7
Left-Turn Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 1)	WB	25	-2.26	85	3.0	2.9	5.9	3+3=6
SR 0003 (Phase 5)	EB	25	3.6	85	2.7	2.9	5.6	use 3+3=6

PEDESTRIAN INTERVALS

Assumptions and Calibration Inputs

Walk Interval[1]

(T_w, seconds)

$$T_w = \frac{\left(\frac{1}{2}L\right)}{S_w} + 3$$

Pedestrian Change Interval

(T_{pc}, seconds)

$$T_{PC} = \frac{L}{S_w}$$

Minimum Duration

($(T_w+T_{pc})_{min}$, seconds)

$$(T_w + T_{pc})_{min} = \frac{(L+6)}{3}$$

1) The walk interval should be at least 7 seconds, but where justified, a minimum 4 second interval may be used.

Pedestrian Interval Variables

L = Pedestrian walking distance from the curb or edge of shoulder to the far edge of the traveled way, ft

S_w = Walking Speed, ft/s (3.5 ft/s) ← 3.5

Minimum Green Interval[2]

(T_p, seconds)

$$T_p = \frac{L}{S_w} + 3$$

2) Minimum green interval when no pedestrian signals are present or proposed

Calculations

Description of Pedestrian Crossing	Ped Signal	L	T_w	T_{pc}	$(T_w+T_{pc})_{min}$	T_p	Comments
Crossing of EB SR 0003 (2 Stage)	Yes	51	10.3	14.6	19.0	N/A	use 7 & 15
Crossing of NB Berkley	No	86	N/A	N/A	N/A	27.6	
Crossing SB Church	No	55	N/A	N/A	N/A	18.8	

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	MARPLE TOWNSHIP	**Analysis Date:**	12/29/2013 update
County:	Delaware County	**Conducted By:**	DJK
PennDOT Engineering District:	6	**Checked By:**	NK
		Agency/Company Name:	Orth-Rodgers & Associates, Inc.

Intersection Description: West Chester Pike (SR 0003) & New Ardmore Ave

VEHICLE AND PEDESTRIAN INTERVAL FINDINGS

Vehicle Change and Clearance Interval Findings

Approach Description	Direction	Calculated Yellow Change Interval, Y	User Defined Yellow Change Interval, Y	Calculated All-Red Clearance Interval, AR	User Defined All-Red Clearance Interval, AR	To Be Implemented	
						Y (s)	AR (s)
SR 0003 (Phase 2)	EB	4.5	5	1.3	2	**5**	**2**
SR 0003 (Phase 6)	WB	4.2	5	1.2	2	**5**	**2**
New Ardmore (Phase 4)	SB	2.9	3	3.5	4	**3**	**4**
New Ardmore (Phase 8)	NB	2.7	3	3.6	4	**3**	**4**
SR 0003 (Phase 1)	WB	2.8	3	2.6	3	**3**	**3**
SR 0003 (Phase 5)	EB	2.9	3	2.9	3	**3**	**3**

Additional Comments/Justifications:

Pedestrian Interval Findings

WITH PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Walk Interval, T_w	User Defined Walk Interval, T_w	Calculated Ped. Change Interval, T_{pc}	User Defined Ped. Change Interval, T_{pc}	Greater than $(T_w+T_{pc})_{min}$?	To Be Implemented	
						T_w (s)	T_{pc} (s)
Crossing of EB SR 0003 (2 Stage)	10.6	7	15.2	16	Yes	**7**	**16**

WITHOUT PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Min. Green Interval, T_p
Crossing of NB New Ardmore	19.6
Crossing SB New Ardmore	15

Additional Comments/Justifications:

VEHICLE CHANGE AND CLEARANCE INTERVALS

Assumptions and Calibration Inputs

Change and Clearance Intervals (CCI, seconds)

$$CCI = Y + AR$$

Yellow Change Interval (Y, seconds)

$$Y = t + \frac{1.47V}{2a \pm 64.4(g/100)}$$ (typ. 3-6 seconds)

t = Perception-reaction time, s (1 second) ← 1

V = Approach speed, MPH

a = Deceleration rate (10 ft/s^2) ← 10

g = Grade of approach, %

All-Red Clearance Interval (AR, seconds)

$$AR = \frac{(W + L)}{1.47V}$$

W = Width of the intersection, ft
(from the stop bar to the end of the farthest traveled lane)

L = Length of Vehicle (20 ft) ← 20

V = Approach speed, MPH

Calculations

Through Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 2)	EB	45	-0.96	65	4.5	1.3	5.8	5+2=7
SR 0003 (Phase 6)	WB	45	1.5	58	4.2	1.2	5.4	use 5+2=7
New Ardmore (Phase 4)	SB	25	-0.5	107	2.9	3.5	6.4	use 3+4=7
New Ardmore (Phase 8)	NB	25	3.5	110	2.7	3.6	6.3	3+4=7
Left-Turn Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 1)	WB	25	1.5	75	2.8	2.6	5.4	3+3=6
SR 0003 (Phase 5)	EB	25	-0.96	85	2.9	2.9	5.8	use 3+3=6

PEDESTRIAN INTERVALS

Assumptions and Calibration Inputs

Walk Interval[1]

(T_w, seconds)

$$T_w = \frac{\left(\frac{1}{2}L\right)}{S_w} + 3$$

Pedestrian Change Interval

(T_{pc}, seconds)

$$T_{PC} = \frac{L}{S_w}$$

Minimum Duration

($(T_w+T_{pc})_{min}$, seconds)

$$(T_w + T_{pc})_{min} = \frac{(L+6)}{3}$$

1) The walk interval should be at least 7 seconds, but where justified, a minimum 4 second interval may be used.

Pedestrian Interval Variables

L = Pedestrian walking distance from the curb or edge of shoulder to the far edge of the traveled way, ft

S_w = Walking Speed, ft/s (3.5 ft/s) ← 3.5

Minimum Green Interval[2]

(T_p, seconds)

$$T_p = \frac{L}{S_w} + 3$$

2) Minimum green interval when no pedestrian signals are present or proposed

Calculations

Description of Pedestrian Crossing	Ped Signal	L	T_w	T_{pc}	$(T_w+T_{pc})_{min}$	T_p	Comments
Crossing of EB SR 0003 (2 Stage)	Yes	53	10.6	15.2	19.7	N/A	use 7 & 16
Crossing of NB New Ardmore	No	58	N/A	N/A	N/A	19.6	
Crossing SB New Ardmore	No	42	N/A	N/A	N/A	15	

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	MARPLE TOWNSHIP	**Analysis Date:**	12/26/2013 update
County:	Delaware County	**Conducted By:**	DJK
PennDOT Engineering District:	6	**Checked By:**	NK
		Agency/Company Name:	Orth-Rodgers & Associates, Inc.

Intersection Description: West Chester Pike (SR 0003) & Langford Run Road

VEHICLE AND PEDESTRIAN INTERVAL FINDINGS

Vehicle Change and Clearance Interval Findings

Approach Description	Direction	Calculated Yellow Change Interval, Y	User Defined Yellow Change Interval, Y	Calculated All-Red Clearance Interval, AR	User Defined All-Red Clearance Interval, AR	To Be Implemented	
						Y (s)	AR (s)
SR 0003 (Phase 2)	EB	4.9	5	2.3	3	**5**	**3**
SR 0003 (Phase 6)	WB	3.9	5	2.2	3	**5**	**3**
Langford Run Rd (Phase 8)	NB	3.7	4	2.7	3	**4**	**3**
SR 0003 (Phase 1)	WB	2.6	3	4.1	5	**3**	**5**

Additional Comments/Justifications:

Pedestrian Interval Findings

WITH PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Walk Interval, T_w	User Defined Walk Interval, T_w	Calculated Ped. Change Interval, T_{pc}	User Defined Ped. Change Interval, T_{pc}	Greater than $(T_w+T_{pc})_{min}$?	To Be Implemented	
						T_w (s)	T_{pc} (s)
Crossing of WB SR 0003	18.6	7	31.2	32	Yes	**7**	**32**
Crossing of NB Langford	18.3	7	30.6	31	Yes	**7**	**31**

WITHOUT PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Min. Green Interval, T_p

Additional Comments/Justifications:

VEHICLE CHANGE AND CLEARANCE INTERVALS

Assumptions and Calibration Inputs

Change and Clearance Intervals (CCI, seconds)

$$CCI = Y + AR$$

Yellow Change Interval (Y, seconds)

$$Y = t + \frac{1.47V}{2a \pm 64.4(g/100)}$$ (typ. 3-6 seconds)

- t = Perception-reaction time, s (1 second) ← 1
- V = Approach speed, MPH
- a = Deceleration rate (10 ft/s^2) ← 10
- g = Grade of approach, %

All-Red Clearance Interval (AR, seconds)

$$AR = \frac{(W + L)}{1.47V}$$

- W = Width of the intersection, ft (from the stop bar to the end of the farthest traveled lane)
- L = Length of Vehicle (20 ft) ← 20
- V = Approach speed, MPH

Calculations

Through Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 2)	EB	45	-4.1	130	4.9	2.3	7.2	5+3=8
SR 0003 (Phase 6)	WB	45	5.5	120	3.9	2.2	6.1	4+3=7
Langford Run Rd (Phase 8)	NB	35	-1.3	115	3.7	2.7	6.4	4+3=7
Left-Turn Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 1)	WB	25	5.5	130	2.6	4.1	6.7	3+5=8

PEDESTRIAN INTERVALS

Assumptions and Calibration Inputs

Walk Interval[1]

(T_w, seconds)

$$T_w = \frac{\left(\frac{1}{2}L\right)}{S_w} + 3$$

Pedestrian Change Interval

(T_{pc}, seconds)

$$T_{PC} = \frac{L}{S_w}$$

Minimum Duration

($(T_w+T_{pc})_{min}$, seconds)

$$(T_w + T_{pc})_{min} = \frac{(L+6)}{3}$$

1) The walk interval should be at least 7 seconds, but where justified, a minimum 4 second interval may be used.

Pedestrian Interval Variables

L = Pedestrian walking distance from the curb or edge of shoulder to the far edge of the traveled way, ft

S_w = Walking Speed, ft/s (3.5 ft/s) ← 3.5

Minimum Green Interval[2]

(T_p, seconds)

$$T_p = \frac{L}{S_w} + 3$$

2) Minimum green interval when no pedestrian signals are present or proposed

Calculations

Description of Pedestrian Crossing	Ped Signal	L	T_w	T_{pc}	$(T_w+T_{pc})_{min}$	T_p	Comments
Crossing of WB SR 0003	Yes	109	18.6	31.2	38.4	N/A	use 7 & 32
Crossing of NB Langford	Yes	107	18.3	30.6	37.7	N/A	use 7 & 31

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	MARPLE TOWNSHIP	**Analysis Date:**	1/5/2014 update
County:	Delaware County	**Conducted By:**	DJK
PennDOT Engineering District:	6	**Checked By:**	NK
		Agency/Company Name:	Orth-Rodgers & Associates, Inc.

Intersection Description: West Chester Pike (SR 0003) & I-476 SB Ramps

VEHICLE AND PEDESTRIAN INTERVAL FINDINGS

Vehicle Change and Clearance Interval Findings

Approach Description	Direction	Calculated Yellow Change Interval, Y	User Defined Yellow Change Interval, Y	Calculated All-Red Clearance Interval, AR	User Defined All-Red Clearance Interval, AR	To Be Implemented	
						Y (s)	AR (s)
SR 0003 (Phase 2)	EB	4.9	5	1.4	2	**5**	**2**
SR 0003 (Phase 6)	WB	4	4	1.6	2	**4**	**2**
Ramp (Phase 4)	NB	3.5	4	3	3	**4**	**3**

Additional Comments/Justifications:

Pedestrian Interval Findings

WITH PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Walk Interval, T_w	User Defined Walk Interval, T_w	Calculated Ped. Change Interval, T_{pc}	User Defined Ped. Change Interval, T_{pc}	Greater than $(T_w+T_{pc})_{min}$?	To Be Implemented	
						T_w (s)	T_{pc} (s)
Crossing of WB SR 0003	18	7	30	30	Yes	**7**	**30**

WITHOUT PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Min. Green Interval, T_p
Crossing NB Ramp	12.5

Additional Comments/Justifications:

VEHICLE CHANGE AND CLEARANCE INTERVALS

Assumptions and Calibration Inputs

Change and Clearance Intervals (CCI, seconds)

$$CCI = Y + AR$$

Yellow Change Interval (Y, seconds)

$$Y = t + \frac{1.47V}{2a \pm 64.4(g/100)}$$ (typ. 3-6 seconds)

- t = Perception-reaction time, s (1 second) ← 1
- V = Approach speed, MPH
- a = Deceleration rate (10 ft/s^2) ← 10
- g = Grade of approach, %

All-Red Clearance Interval (AR, seconds)

$$AR = \frac{(W + L)}{1.47V}$$

- W = Width of the intersection, ft (from the stop bar to the end of the farthest traveled lane)
- L = Length of Vehicle (20 ft) ← 20
- V = Approach speed, MPH

Calculations

Through Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 2)	EB	45	-4.45	70	4.9	1.4	6.3	use 5+2=7
SR 0003 (Phase 6)	WB	45	4.11	82	4.0	1.6	5.6	4+2=6
Ramp (Phase 4)	NB	35	2	130	3.5	3.0	6.5	use 4+3=7

Left-Turn Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**

PEDESTRIAN INTERVALS

Assumptions and Calibration Inputs

Walk Interval[1]

(T_w, seconds)

$$T_w = \frac{\left(\frac{1}{2}L\right)}{S_w} + 3$$

Pedestrian Change Interval

(T_{pc}, seconds)

$$T_{PC} = \frac{L}{S_w}$$

Minimum Duration

($(T_w+T_{pc})_{min}$, seconds)

$$(T_w + T_{pc})_{min} = \frac{(L+6)}{3}$$

1) The walk interval should be at least 7 seconds, but where justified, a minimum 4 second interval may be used.

Pedestrian Interval Variables

L = Pedestrian walking distance from the curb or edge of shoulder to the far edge of the traveled way, ft

S_w = Walking Speed, ft/s (3.5 ft/s) ← 3.5

Minimum Green Interval[2]

(T_p, seconds)

$$T_p = \frac{L}{S_w} + 3$$

2) Minimum green interval when no pedestrian signals are present or proposed

Calculations

Description of Pedestrian Crossing	Ped Signal	L	T_w	T_{pc}	$(T_w+T_{pc})_{min}$	T_p	Comments
Crossing of WB SR 0003	Yes	105	18	30	37.0	N/A	use 7 & 30
Crossing NB Ramp	No	33	N/A	N/A	N/A	12.5	

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	MARPLE TOWNSHIP	**Analysis Date:**	1/5/2014 update
County:	Delaware County	**Conducted By:**	DJK
PennDOT Engineering District:	6	**Checked By:**	NK
		Agency/Company Name:	Orth-Rodgers & Associates, Inc.

Intersection Description: West Chester Pike (SR 0003) & I-476 NB Ramps

VEHICLE AND PEDESTRIAN INTERVAL FINDINGS

Vehicle Change and Clearance Interval Findings

Approach Description	Direction	Calculated Yellow Change Interval, Y	User Defined Yellow Change Interval, Y	Calculated All-Red Clearance Interval, AR	User Defined All-Red Clearance Interval, AR	To Be Implemented	
						Y (s)	AR (s)
SR 0003 (Phase 2)	EB	5	5	1.8	2	**5**	**2**
SR 0003 (Phase 6)	WB	3.9	4	1.1	2	**4**	**2**
Ramp (Phase 8)	NB	3.5	4	3	3	**4**	**3**
SR 0003 (Phase 5)	EB	3.2	3	3.5	5	**3**	**5**

Additional Comments/Justifications:

Pedestrian Interval Findings

WITH PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Walk Interval, T_w	User Defined Walk Interval, T_w	Calculated Ped. Change Interval, T_{pc}	User Defined Ped. Change Interval, T_{pc}	Greater than $(T_w+T_{pc})_{min}$?	To Be Implemented	
						T_w (s)	T_{pc} (s)
Crossing of WB SR 0003 (2 Stage)	13.3	7	20.6	21	Yes	**7**	**21**

WITHOUT PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Min. Green Interval, T_p
Crossing NB Ramp	17.9
Crossing SB Ramp	13

Additional Comments/Justifications:

VEHICLE CHANGE AND CLEARANCE INTERVALS

Assumptions and Calibration Inputs

Change and Clearance Intervals (CCI, seconds)

$$CCI = Y + AR$$

Yellow Change Interval (Y, seconds)

$$Y = t + \frac{1.47V}{2a \pm 64.4(g/100)}$$ (typ. 3-6 seconds)

t = Perception-reaction time, s (1 second) ← 1

V = Approach speed, MPH

a = Deceleration rate (10 ft/s^2) ← 10

g = Grade of approach, %

All-Red Clearance Interval (AR, seconds)

$$AR = \frac{(W + L)}{1.47V}$$

W = Width of the intersection, ft
(from the stop bar to the end of the farthest traveled lane)

L = Length of Vehicle (20 ft) ← 20

V = Approach speed, MPH

Calculations

Through Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 2)	EB	45	-4.99	96	5.0	1.8	6.8	use 5+2=7
SR 0003 (Phase 6)	WB	45	5.1	50	3.9	1.1	5.0	4+2=6
Ramp (Phase 8)	NB	35	2	130	3.5	3.0	6.5	use 4+3=7
Left-Turn Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 5)	EB	25	-4.99	108	3.2	3.5	6.7	4+4=8

PEDESTRIAN INTERVALS

Assumptions and Calibration Inputs

Walk Interval[1]
(T_w, seconds)

$$T_w = \frac{\left(\frac{1}{2}L\right)}{S_w} + 3$$

Pedestrian Change Interval
(T_{pc}, seconds)

$$T_{PC} = \frac{L}{S_w}$$

Minimum Duration
($(T_w+T_{pc})_{min}$, seconds)

$$(T_w + T_{pc})_{min} = \frac{(L+6)}{3}$$

1) The walk interval should be at least 7 seconds, but where justified, a minimum 4 second interval may be used.

Pedestrian Interval Variables

L = Pedestrian walking distance from the curb or edge of shoulder to the far edge of the traveled way, ft

S_w = Walking Speed, ft/s (3.5 ft/s) ← 3.5

Minimum Green Interval[2]
(T_p, seconds)

$$T_p = \frac{L}{S_w} + 3$$

2) Minimum green interval when no pedestrian signals are present or proposed

Calculations

Description of Pedestrian Crossing	Ped Signal	L	T_w	T_{pc}	$(T_w+T_{pc})_{min}$	T_p	Comments
Crossing of WB SR 0003 (2 Stage)	Yes	72	13.3	20.6	26.0	N/A	use 7 & 21
Crossing NB Ramp	No	52	N/A	N/A	N/A	17.9	
Crossing SB Ramp	No	35	N/A	N/A	N/A	13	

STUDY LOCATION AND ANALYSIS INFORMATION

Municipality:	MARPLE TOWNSHIP	**Analysis Date:**	12/29/2013 update
County:	Delaware County	**Conducted By:**	DJK
PennDOT Engineering District:	6	**Checked By:**	NK
		Agency/Company Name:	Orth-Rodgers & Associates, Inc.

Intersection Description: West Chester Pike (SR 0003) & South Lawrence Road

VEHICLE AND PEDESTRIAN INTERVAL FINDINGS

Vehicle Change and Clearance Interval Findings

Approach Description	Direction	Calculated Yellow Change Interval, Y	User Defined Yellow Change Interval, Y	Calculated All-Red Clearance Interval, AR	User Defined All-Red Clearance Interval, AR	To Be Implemented	
						Y (s)	AR (s)
SR 0003 (Phase 2)	EB	5	5	1.7	2	**5**	**2**
SR 0003 (Phase 6)	WB	4.5	5	1.6	2	**5**	**2**
S Lawrence (Phase 8)	NB	4.3	5	2.2	3	**5**	**3**
SR 0003 (Phase 1)	WB	3	3	3.7	4	**3**	**4**

Additional Comments/Justifications:

Pedestrian Interval Findings

WITH PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Walk Interval, T_w	User Defined Walk Interval, T_w	Calculated Ped. Change Interval, T_{pc}	User Defined Ped. Change Interval, T_{pc}	Greater than $(T_w+T_{pc})_{min}$?	To Be Implemented	
						T_w (s)	T_{pc} (s)

WITHOUT PEDESTRIAN SIGNALS Description of Pedestrian Crossing	Calculated Min. Green Interval, T_p
Crossing of NB S Lawrence	32.5

Additional Comments/Justifications:

VEHICLE CHANGE AND CLEARANCE INTERVALS

Assumptions and Calibration Inputs

Change and Clearance Intervals (CCI, seconds)

$$CCI = Y + AR$$

Yellow Change Interval (Y, seconds)

$$Y = t + \frac{1.47V}{2a \pm 64.4(g/100)}$$ (typ. 3-6 seconds)

t = Perception-reaction time, s (1 second) ← 1

V = Approach speed, MPH

a = Deceleration rate (10 ft/s^2) ← 10

g = Grade of approach, %

All-Red Clearance Interval (AR, seconds)

$$AR = \frac{(W + L)}{1.47V}$$

W = Width of the intersection, ft
(from the stop bar to the end of the farthest traveled lane)

L = Length of Vehicle (20 ft) ← 20

V = Approach speed, MPH

Calculations

Through Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 2)	EB	45	-5.06	87	5.0	1.7	6.7	use 5+2=7
SR 0003 (Phase 6)	WB	45	-1.2	85	4.5	1.6	6.1	5+2=7
S Lawrence (Phase 8)	NB	45	0.5	125	4.3	2.2	6.5	use 5+3=8
Left-Turn Movement Phases								
Approach Description	**Direction**	**V**	**g (%)**	**W**	**Y**	**AR**	**CCI**	**Comments**
SR 0003 (Phase 1)	WB	25	-1.2	115	3.0	3.7	6.7	use 3+4=7

PEDESTRIAN INTERVALS

Assumptions and Calibration Inputs

Walk Interval[1]

(T_w, seconds)

$$T_w = \frac{\left(\frac{1}{2}L\right)}{S_w} + 3$$

Pedestrian Change Interval

(T_{pc}, seconds)

$$T_{PC} = \frac{L}{S_w}$$

Minimum Duration

($(T_w+T_{pc})_{min}$, seconds)

$$(T_w + T_{pc})_{min} = \frac{(L+6)}{3}$$

1) The walk interval should be at least 7 seconds, but where justified, a minimum 4 second interval may be used.

Pedestrian Interval Variables

L = Pedestrian walking distance from the curb or edge of shoulder to the far edge of the traveled way, ft

S_w = Walking Speed, ft/s (3.5 ft/s) ← 3.5

Minimum Green Interval[2]

(T_p, seconds)

$$T_p = \frac{L}{S_w} + 3$$

2) Minimum green interval when no pedestrian signals are present or proposed

Calculations

Description of Pedestrian Crossing	Ped Signal	L	T_w	T_{pc}	$(T_w+T_{pc})_{min}$	T_p	Comments
Crossing of NB S Lawrence	No	103	N/A	N/A	N/A	32.5	33 min G

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

A - Applicant's (Municipal) Contact Information

Municipal Contact's Name : Anthony Hamaday **Title :** Manager

Municipal Name : TOWNSHIP OF MARPLE

Municipal Address : 227 South Sproul Road, Broomall, Pennsylvania 19008-2397

Municipal Phone Number : 610-356-4040 **Alternative Phone Number :**

E-mail Address : ahamaday@marpletwp.com

Municipal Hours of Operation : Mon - Fri, 8:30 AM - 5:00 PM

B - Application Description

Location (*intersection*) : WEST CHESTER PIKE (SR 003) & MALIN ROAD

Traffic Control Device is : ☐ **NEW** Traffic Signal ☒ **EXISTING** Traffic Signal **(*Permit Number*) :** 63-0433

Type of Device (*select one*) ☒ Traffic Control Signal (*MUTCD Section 4D, 4E, 4G*) ☐ Flashing Beacon (*MUTCD Section 4L*) ☐ School Warning System (*MUTCD Section 7B*)

☐ Other :

Is Traffic Signal part of a system? : ☒ YES ☐ NO **System Number (*if applicable*) :** I-0097

If YES, provide locations of all signalized intersections in system.

Malin Road, Sproul Road (SR 0320), Church Rd/Berkley Rd, I-476 SB Ramps, I-476 NB Ramps, South Lawrence Road

Explain the proposed improvements :

Signalize existing unsignalized intersection at Langford Run Road, provide median opening, provide traffic adaptive system along corridor

Associated with Highway Occupancy Permit (HOP)?: ☒ YES ☐ NO **If YES, HOP Application # :** 42543

C - Maintenance and Operation Information

Maintenance and Operations are typically performed by? :

☐ Municipal Personnel ☐ Municipal Contractor ☒ Municipal Personnel & Contractor

☐ Other :

Maintenance and Operations Contact Name : Edward T. Cross **Company/Organization :** Twp Public Works

Phone # : 610.356.4040 **Alternative Phone # :** **E-mail :**

D - Attachments Listing

☒ Municipal Resolution (*required*)	☐ Location Map	☐ Traffic Volumes / Pedestrian Volumes
☐ Letter of Financial Commitment	☐ Photographs	☐ Turn Lane Analysis
☒ Traffic Signal Permit	☐ Straight Line Diagram	☐ Turn Restriction Studies
☐ Warrant Analysis	☐ Capacity Analysis	☐ Other :
☐ Crash Analysis	☐ Traffic Impact Study (TIS)	
☐ Traffic Signal Study	☐ Condition Diagram	

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania
DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

E - Applicant (Municipal) Certification

The applicant desires to own, operate, and maintain the traffic control device in the location indicated above; and the Vehicle Code requires the approval of the Department of Transportation ("Department") before any traffic signals may be legally erected or modified. A signed Application for Traffic Signal Approval (TE-160) must be submitted in conformance with the instructions provided by the Department, and a Traffic Signal Permit must be issued, before any work can begin.

If the Department approves a traffic signal after a traffic engineering study and engineering judgment indicates the need, the traffic signal shall be installed, owned, operated, and maintained within the parameters indicated in the Vehicle Code and the Department's regulations relating to traffic signs, signals, and markings. The Department may direct appropriate alterations to the design or operation (including, but not limited to, hours of operation) of the traffic signal, or require removal of the traffic signal, if traffic conditions or other considerations necessitate alteration or removal.

All items associated with the traffic control device (geometric features, signs, signals, pavement markings, pedestrian accommodations, and other traffic control device associated items) are the applicant's responsibility. The Traffic Signal Permit will then document all of the items associated with operation of each traffic control device. The applicant, at its sole expense, shall provide the necessary inspection, maintenance, and operation activities in conformance with the Department's Publication 191 or as otherwise agreed to by the Department. The applicant shall perform the preventative and responsive maintenance requirements and recordkeeping in accordance with the exhibits specified below. If the applicant fails to provide the required inspection, maintenance, or operation services within thirty (30) days of receipt of written notice from the Department, the Department shall have the right to perform the required inspection, maintenance, or operation services in the applicant's stead and the applicant shall reimburse the Department for all costs incurred. Federal- and/or state-aid participation may be withheld on all future projects if the applicant fails to demonstrate to the Department the ability to provide all required maintenance and operation services. The applicant certifies that it has funds available and committed for the operation and maintenance of the traffic control device and that it will make available sufficient funds for all required future inspection, maintenance, and operation activities.

The applicant shall indemnify, save harmless and, defend (if requested) the Commonwealth of Pennsylvania, its agents, representatives, and employees from and against any damages recoverable under the Sovereign Immunity Act, 42 Pa. C.S. §§ 8521-8528, up to the limitations on damages under said law, arising out of any personal injury or damage to property which is finally determined by a court to be caused by or result from acts or omissions of the applicant and for which a court has held applicant, its officials, or employees to be liable. This provision shall not be construed to limit the applicant in asserting any rights or defenses. Additionally, the applicant shall include in any contracts into which it enters for maintenance, operation, or inspection of the traffic control device this same obligation to indemnify the Commonwealth and its officers, agents, and employees; and it shall require its contractor(s) to provide public liability insurance coverage, naming the Commonwealth and the applicant as additional insureds for bodily injury, including death and property damage, in the minimum amounts of $500,000 per person, $1,000,000 per occurrence, it being the intention of parties to have the contractor fully insure and indemnify the Commonwealth and the applicant.

The applicant shall comply with the study and ordinance requirements of 75 Pa. C.S. § 6109. The applicant submits this application with the intention of being legally bound.

Neither this application nor any Traffic Signal Permit creates any rights or obligations with respect to parties other than the applicant and the Department. Third parties may not rely upon any representations made by either the applicant or the Department in connection with the submission or approval of this application or any work permitted or approved that is related to this application, as regards either payment of funds or performance of any particular item of maintenance precisely as specified.

The applicant agrees to comply with the attached Exhibits:

- Exhibit "A": Preventative and Response Maintenance Requirements (Sheet 3 of 5)
- Exhibit "B": Recordkeeping (Sheet 4 of 5)
- Exhibit "C": Signal Maintenance Organization (Sheet 5 of 5)

Printed Municipal Contact Name : _____ **Date :** _____

Signed By : _____ **Witness or Attest :** _____

Title of Signatory : _____ **Title of Witness or Attester:** _____

DEPARTMENT USE ONLY

County :

Engineering District :

Department Tracking # :

Initial Submission Date :

Exhibit "A":

Preventative and Response Maintenance Requirements

pennsylvania
DEPARTMENT OF TRANSPORTATION

Preventive Maintenance

The APPLICANT or its contractor will provide preventive maintenance for each individual component of the traffic signal installation covered by this application at intervals not less than those indicated in the Preventive Maintenance Summary, PA DOT Publication 191, current version. This is the recommended level of maintenance to keep the intersection control equipment and signals in mechanically, structurally and aesthetically good condition.

Response Maintenance

The APPLICANT or its contractor will provide response maintenance in accordance with the provisions of the Response Maintenance Schedule. It encompasses the work necessary to restore a traffic signal system to proper and safe operation. Includes Emergency Repair and Final Repair.

FINAL REPAIR:
Repair or replace failed equipment to restore system to proper and safe operation in accordance with permit within a 24-hour period.

EMERGENCY REPAIR:
Use alternative means or mode to temporarily restore system to safe operation within a 24-hour period. Final repair must then be completed within 30 days unless prohibited by weather conditions or availability of equipment.

Response Maintenance Schedule

KNOCKDOWNS	TYPE OF REPAIR PERMITTED
Support - Mast arm	Emergency or Final
Support - Strain pole	Emergency of Final
Span wire/tether wire	Final Only
Pedestal	Emergency or Final
Cabinet	Emergency of Final
Signal heads	Final Only
EQUIPMENT FAILURE	
Lamp burnout (veh. & ped.)	Final Only
Local controller	Emergency or Final
Master controller	Emergency or Final
Detector sensor	
- Loop	Emergency or Final
- Magnetometer	Emergency or Final
- Sonic	Emergency or Final
- Magnetic	Emergency or Final
- Pushbutton	Emergency or Final
Detector amplifier	Emergency or Final
Conflict monitor	Final Only
Flasher	Final Only
Time clock	Emergency or Final
Load switch/relay	Final Only
Coordination unit	Emergency or Final
Communication interface, mode	Emergency or Final
Signal cable	Final Only
Traffic Signal Communications	Final Only
Traffic Signal Systems	Final Only

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Exhibit "B":

Recordkeeping

pennsylvania
DEPARTMENT OF TRANSPORTATION

Recordkeeping

Accurate and up-to-date recordkeeping is an essential component of a good traffic signal maintenance program. In recognition of this fact, the APPLICANT must prepare, retain, and make available to the COMMONWEALTH, on request, a record of all preventive and response maintenance activities performed on the traffic signal equipment covered by this application.

The APPLICANT shall establish a separate file for each installation and keep its records in the municipal building, signal maintenance shop, or other weather-protected enclosure.

At a minimum, the following records will be kept by the APPLICANT or its contractor for each traffic signal. These forms can be found in Section 10.0, Maintenance Record Forms, PA DOT Publication 191, current version.

FORM 1 - Master Intersection Record

This form, which lists all maintenance functions performed at the intersection, should be updated within one day of the activity but no more than one week later.

FORM 2 - Response Maintenance Record

Each time response maintenance is required at the intersection, this form is to be completed. Once the pertinent information is transferred to the master intersection record, this form is to be placed in the intersection file.

FORM 3 - Preventive Maintenance Record

This form will be used to provide a record of the preventive maintenance activities performed at each intersection. The date, the activities performed, and the signature of the person in charge of the work must be recorded in the form.

This form may be kept at the intersection, if it is adequately protected from the weather. Form 1 must be updated at the central file, however, to reflect the date and activity.

DEPARTMENT USE ONLY

County :DELAWARE

Engineering District :6-0

Department Tracking # :

Initial Submission Date :

Exhibit "C":
Signal Maintenance Organization

pennsylvania
DEPARTMENT OF TRANSPORTATION

Personnel Classifications

In order to properly maintain the traffic signal equipment covered by this applicant, the APPLICANT agrees to provide, as minimum, the following staff throughout the useful life of equipment. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Traffic Engineer - The administrative position which has prime responsibility for the proper operation of traffic signal equipment. The principal function of this position is the supervision and control of subordinate personnel and the planning of their activities to ensure adequate preventive and response maintenance programs.

Minimum Position Requirements

1. A thorough understanding of traffic signal design, installation and maintenance.
2. A working knowledge of the interaction between the following traffic characteristics: Intersection geometry, traffic flow theory, control type (fixed time, actuated, etc.), signal phasing and timing, and interconnection.
3. An ability to supervise subordinate personnel effectively in the assignment of their work.
4. Possession of a college degree in engineering, which includes course work in traffic engineering.
5. Either four years experience in the field of traffic engineering or its equivalent in graduate college work.

Signal Specialist - The individual responsible for the diagnostics and repair of all traffic signal equipment including solid state equipment.

Minimum Position Requirements

1. Extensive training and troubleshooting skills in electronics and software.
2. Ability to repair modules in the shop and to design test equipment needed to diagnose and repair a problem.
3. Ability to make design and modifications to implement or omit special functions.
4. Ability to implement a recordkeeping system to include maintenance activities, inventory control and identification of recurring problems.
5. Ability to perform all tasks required of a signal technician.

Signal Technician - Individual responsible for the operation and maintenance of traffic signals and electromechanical equipment.

Minimum Position Requirements

1. Ability to perform response maintenance on solid state equipment up to the device exchange level.
2. Capability to diagnose a vehicle loop failure and initiate corrective action.
3. Ability to tune detector amplifiers.
4. Ability to follow wiring schematics, check and set timings from plan sheet and check all field connections.
5. Ability to perform preventive maintenance on all equipment and to maintain accurate records of all work perform.

Training

The APPLICANT agrees to secure training in order to upgrade the ability of its present staff to properly perform the required maintenance functions. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Budget Requirements

The APPLICANT agrees to provide, in its annual operating budget, dedicated funds which are sufficient to cover the cost of the personnel, training, contractors (if utilized) and specialized maintenance equipment which are required, by virtue of this application. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191..

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

A - Applicant's (Municipal) Contact Information

Municipal Contact's Name : Anthony Hamaday **Title :** Manager

Municipal Name : TOWNSHIP OF MARPLE

Municipal Address : 227 South Sproul Road, Broomall, Pennsylvania 19008-2397

Municipal Phone Number : 610-356-4040 **Alternative Phone Number :**

E-mail Address : ahamaday@marpletwp.com

Municipal Hours of Operation : Mon - Fri, 8:30 AM - 5:00 PM

B - Application Description

Location (*intersection*) : WEST CHESTER PIKE (SR 003) & SPROUL ROAD (SR 0320)

Traffic Control Device is : ☐ **NEW** Traffic Signal ☒ **EXISTING** Traffic Signal **(*Permit Number*) :** 63-0432

Type of Device (*select one*) ☒ Traffic Control Signal (*MUTCD Section 4D, 4E, 4G*) ☐ Flashing Beacon (*MUTCD Section 4L*) ☐ School Warning System (*MUTCD Section 7B*)

☐ Other :

Is Traffic Signal part of a system? : ☒ YES ☐ NO **System Number (*if applicable*) :** I-0097

If YES, provide locations of all signalized intersections in system.

Malin Road, Sproul Road (SR 0320), Church Rd/Berkley Rd, I-476 SB Ramps, I-476 NB Ramps, South Lawrence Road

Explain the proposed improvements :

Signalize existing unsignalized intersection at Langford Run Road, provide median opening, provide traffic adaptive system along corridor

Associated with Highway Occupancy Permit (HOP)?: ☒ YES ☐ NO **If YES, HOP Application # :** 42543

C - Maintenance and Operation Information

Maintenance and Operations are typically performed by? :

☐ Municipal Personnel ☐ Municipal Contractor ☒ Municipal Personnel & Contractor

☐ Other :

Maintenance and Operations Contact Name : Edward T. Cross **Company/Organization :** Twp Public Works

Phone # : 610.356.4040 **Alternative Phone # :** **E-mail :**

D - Attachments Listing

☒ Municipal Resolution (*required*)	☐ Location Map	☐ Traffic Volumes / Pedestrian Volumes
☐ Letter of Financial Commitment	☐ Photographs	☐ Turn Lane Analysis
☒ Traffic Signal Permit	☐ Straight Line Diagram	☐ Turn Restriction Studies
☐ Warrant Analysis	☐ Capacity Analysis	☐ Other :
☐ Crash Analysis	☐ Traffic Impact Study (TIS)	
☐ Traffic Signal Study	☐ Condition Diagram	

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania
DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

E - Applicant (Municipal) Certification

The applicant desires to own, operate, and maintain the traffic control device in the location indicated above; and the Vehicle Code requires the approval of the Department of Transportation ("Department") before any traffic signals may be legally erected or modified. A signed Application for Traffic Signal Approval (TE-160) must be submitted in conformance with the instructions provided by the Department, and a Traffic Signal Permit must be issued, before any work can begin.

If the Department approves a traffic signal after a traffic engineering study and engineering judgment indicates the need, the traffic signal shall be installed, owned, operated, and maintained within the parameters indicated in the Vehicle Code and the Department's regulations relating to traffic signs, signals, and markings. The Department may direct appropriate alterations to the design or operation (including, but not limited to, hours of operation) of the traffic signal, or require removal of the traffic signal, if traffic conditions or other considerations necessitate alteration or removal.

All items associated with the traffic control device (geometric features, signs, signals, pavement markings, pedestrian accommodations, and other traffic control device associated items) are the applicant's responsibility. The Traffic Signal Permit will then document all of the items associated with operation of each traffic control device. The applicant, at its sole expense, shall provide the necessary inspection, maintenance, and operation activities in conformance with the Department's Publication 191 or as otherwise agreed to by the Department. The applicant shall perform the preventative and responsive maintenance requirements and recordkeeping in accordance with the exhibits specified below. If the applicant fails to provide the required inspection, maintenance, or operation services within thirty (30) days of receipt of written notice from the Department, the Department shall have the right to perform the required inspection, maintenance, or operation services in the applicant's stead and the applicant shall reimburse the Department for all costs incurred. Federal- and/or state-aid participation may be withheld on all future projects if the applicant fails to demonstrate to the Department the ability to provide all required maintenance and operation services. The applicant certifies that it has funds available and committed for the operation and maintenance of the traffic control device and that it will make available sufficient funds for all required future inspection, maintenance, and operation activities.

The applicant shall indemnify, save harmless and, defend (if requested) the Commonwealth of Pennsylvania, its agents, representatives, and employees from and against any damages recoverable under the Sovereign Immunity Act, 42 Pa. C.S. §§ 8521-8528, up to the limitations on damages under said law, arising out of any personal injury or damage to property which is finally determined by a court to be caused by or result from acts or omissions of the applicant and for which a court has held applicant, its officials, or employees to be liable. This provision shall not be construed to limit the applicant in asserting any rights or defenses. Additionally, the applicant shall include in any contracts into which it enters for maintenance, operation, or inspection of the traffic control device this same obligation to indemnify the Commonwealth and its officers, agents, and employees; and it shall require its contractor(s) to provide public liability insurance coverage, naming the Commonwealth and the applicant as additional insureds for bodily injury, including death and property damage, in the minimum amounts of $500,000 per person, $1,000,000 per occurrence, it being the intention of parties to have the contractor fully insure and indemnify the Commonwealth and the applicant.

The applicant shall comply with the study and ordinance requirements of 75 Pa. C.S. § 6109. The applicant submits this application with the intention of being legally bound.

Neither this application nor any Traffic Signal Permit creates any rights or obligations with respect to parties other than the applicant and the Department. Third parties may not rely upon any representations made by either the applicant or the Department in connection with the submission or approval of this application or any work permitted or approved that is related to this application, as regards either payment of funds or performance of any particular item of maintenance precisely as specified.

The applicant agrees to comply with the attached Exhibits:

- Exhibit "A": Preventative and Response Maintenance Requirements (Sheet 3 of 5)
- Exhibit "B": Recordkeeping (Sheet 4 of 5)
- Exhibit "C": Signal Maintenance Organization (Sheet 5 of 5)

Printed Municipal Contact Name : _____ **Date :** _____

Signed By : _____ **Witness or Attest :** _____

Title of Signatory : _____ **Title of Witness or Attester:** _____

DEPARTMENT USE ONLY

County :

Engineering District :

Department Tracking # :

Initial Submission Date :

Exhibit "A":

Preventative and Response Maintenance Requirements

pennsylvania
DEPARTMENT OF TRANSPORTATION

Preventive Maintenance

The APPLICANT or its contractor will provide preventive maintenance for each individual component of the traffic signal installation covered by this application at intervals not less than those indicated in the Preventive Maintenance Summary, PA DOT Publication 191, current version. This is the recommended level of maintenance to keep the intersection control equipment and signals in mechanically, structurally and aesthetically good condition.

Response Maintenance

The APPLICANT or its contractor will provide response maintenance in accordance with the provisions of the Response Maintenance Schedule. It encompasses the work necessary to restore a traffic signal system to proper and safe operation. Includes Emergency Repair and Final Repair.

FINAL REPAIR:
Repair or replace failed equipment to restore system to proper and safe operation in accordance with permit within a 24-hour period.

EMERGENCY REPAIR:
Use alternative means or mode to temporarily restore system to safe operation within a 24-hour period. Final repair must then be completed within 30 days unless prohibited by weather conditions or availability of equipment.

Response Maintenance Schedule

KNOCKDOWNS	TYPE OF REPAIR PERMITTED
Support - Mast arm	Emergency or Final
Support - Strain pole	Emergency of Final
Span wire/tether wire	Final Only
Pedestal	Emergency or Final
Cabinet	Emergency of Final
Signal heads	Final Only
EQUIPMENT FAILURE	
Lamp burnout (veh. & ped.)	Final Only
Local controller	Emergency or Final
Master controller	Emergency or Final
Detector sensor	
- Loop	Emergency or Final
- Magnetometer	Emergency or Final
- Sonic	Emergency or Final
- Magnetic	Emergency or Final
- Pushbutton	Emergency or Final
Detector amplifier	Emergency or Final
Conflict monitor	Final Only
Flasher	Final Only
Time clock	Emergency or Final
Load switch/relay	Final Only
Coordination unit	Emergency or Final
Communication interface, mode	Emergency or Final
Signal cable	Final Only
Traffic Signal Communications	Final Only
Traffic Signal Systems	Final Only

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Exhibit "B":

Recordkeeping

pennsylvania
DEPARTMENT OF TRANSPORTATION

Recordkeeping

Accurate and up-to-date recordkeeping is an essential component of a good traffic signal maintenance program. In recognition of this fact, the APPLICANT must prepare, retain, and make available to the COMMONWEALTH, on request, a record of all preventive and response maintenance activities performed on the traffic signal equipment covered by this application.

The APPLICANT shall establish a separate file for each installation and keep its records in the municipal building, signal maintenance shop, or other weather-protected enclosure.

At a minimum, the following records will be kept by the APPLICANT or its contractor for each traffic signal. These forms can be found in Section 10.0, Maintenance Record Forms, PA DOT Publication 191, current version.

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This form, which lists all maintenance functions performed at the intersection, should be updated within one day of the activity but no more than one week later.

FORM 2 - Response Maintenance Record

Each time response maintenance is required at the intersection, this form is to be completed. Once the pertinent information is transferred to the master intersection record, this form is to be placed in the intersection file.

FORM 3 - Preventive Maintenance Record

This form will be used to provide a record of the preventive maintenance activities performed at each intersection. The date, the activities performed, and the signature of the person in charge of the work must be recorded in the form.

This form may be kept at the intersection, if it is adequately protected from the weather. Form 1 must be updated at the central file, however, to reflect the date and activity.

DEPARTMENT USE ONLY

County :DELAWARE

Engineering District :6-0

Department Tracking # :

Initial Submission Date :

Exhibit "C":
Signal Maintenance Organization

pennsylvania
DEPARTMENT OF TRANSPORTATION

Personnel Classifications

In order to properly maintain the traffic signal equipment covered by this applicant, the APPLICANT agrees to provide, as minimum, the following staff throughout the useful life of equipment. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Traffic Engineer - The administrative position which has prime responsibility for the proper operation of traffic signal equipment. The principal function of this position is the supervision and control of subordinate personnel and the planning of their activities to ensure adequate preventive and response maintenance programs.

Minimum Position Requirements

1. A thorough understanding of traffic signal design, installation and maintenance.
2. A working knowledge of the interaction between the following traffic characteristics: Intersection geometry, traffic flow theory, control type (fixed time, actuated, etc.), signal phasing and timing, and interconnection.
3. An ability to supervise subordinate personnel effectively in the assignment of their work.
4. Possession of a college degree in engineering, which includes course work in traffic engineering.
5. Either four years experience in the field of traffic engineering or its equivalent in graduate college work.

Signal Specialist - The individual responsible for the diagnostics and repair of all traffic signal equipment including solid state equipment.

Minimum Position Requirements

1. Extensive training and troubleshooting skills in electronics and software.
2. Ability to repair modules in the shop and to design test equipment needed to diagnose and repair a problem.
3. Ability to make design and modifications to implement or omit special functions.
4. Ability to implement a recordkeeping system to include maintenance activities, inventory control and identification of recurring problems.
5. Ability to perform all tasks required of a signal technician.

Signal Technician - Individual responsible for the operation and maintenance of traffic signals and electromechanical equipment.

Minimum Position Requirements

1. Ability to perform response maintenance on solid state equipment up to the device exchange level.
2. Capability to diagnose a vehicle loop failure and initiate corrective action.
3. Ability to tune detector amplifiers.
4. Ability to follow wiring schematics, check and set timings from plan sheet and check all field connections.
5. Ability to perform preventive maintenance on all equipment and to maintain accurate records of all work perform.

Training

The APPLICANT agrees to secure training in order to upgrade the ability of its present staff to properly perform the required maintenance functions. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Budget Requirements

The APPLICANT agrees to provide, in its annual operating budget, dedicated funds which are sufficient to cover the cost of the personnel, training, contractors (if utilized) and specialized maintenance equipment which are required, by virtue of this application. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191..

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

A - Applicant's (Municipal) Contact Information

Municipal Contact's Name : Anthony Hamaday **Title :** Manager

Municipal Name : TOWNSHIP OF MARPLE

Municipal Address : 227 South Sproul Road, Broomall, Pennsylvania 19008-2397

Municipal Phone Number : 610-356-4040 **Alternative Phone Number :**

E-mail Address : ahamaday@marpletwp.com

Municipal Hours of Operation : Mon - Fri, 8:30 AM - 5:00 PM

B - Application Description

Location (*intersection*) : WEST CHESTER PIKE (SR 003) & CHURCH ROAD/BERKLEY ROAD

Traffic Control Device is : ☐ **NEW** Traffic Signal ☒ **EXISTING** Traffic Signal **(*Permit Number*) :** 63-0480

Type of Device (*select one*) ☒ Traffic Control Signal (*MUTCD Section 4D, 4E, 4G*) ☐ Flashing Beacon (*MUTCD Section 4L*) ☐ School Warning System (*MUTCD Section 7B*)

☐ Other :

Is Traffic Signal part of a system? : ☒ YES ☐ NO **System Number (*if applicable*) :** I-0097

If YES, provide locations of all signalized intersections in system.

Malin Road, Sproul Road (SR 0320), Church Rd/Berkley Rd, I-476 SB Ramps, I-476 NB Ramps, South Lawrence Road

Explain the proposed improvements :

Signalize existing unsignalized intersection at Langford Run Road, provide median opening, provide traffic adaptive system along corridor

Associated with Highway Occupancy Permit (HOP)?: ☒ YES ☐ NO **If YES, HOP Application # :** 42543

C - Maintenance and Operation Information

Maintenance and Operations are typically performed by? :

☐ Municipal Personnel ☐ Municipal Contractor ☒ Municipal Personnel & Contractor

☐ Other :

Maintenance and Operations Contact Name : Edward T. Cross **Company/Organization :** Twp Public Works

Phone # : 610.356.4040 **Alternative Phone # :** **E-mail :**

D - Attachments Listing

☒ Municipal Resolution (*required*)	☐ Location Map	☐ Traffic Volumes / Pedestrian Volumes
☐ Letter of Financial Commitment	☐ Photographs	☐ Turn Lane Analysis
☒ Traffic Signal Permit	☐ Straight Line Diagram	☐ Turn Restriction Studies
☐ Warrant Analysis	☐ Capacity Analysis	☐ Other :
☐ Crash Analysis	☐ Traffic Impact Study (TIS)	
☐ Traffic Signal Study	☐ Condition Diagram	

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania
DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

E - Applicant (Municipal) Certification

The applicant desires to own, operate, and maintain the traffic control device in the location indicated above; and the Vehicle Code requires the approval of the Department of Transportation ("Department") before any traffic signals may be legally erected or modified. A signed Application for Traffic Signal Approval (TE-160) must be submitted in conformance with the instructions provided by the Department, and a Traffic Signal Permit must be issued, before any work can begin.

If the Department approves a traffic signal after a traffic engineering study and engineering judgment indicates the need, the traffic signal shall be installed, owned, operated, and maintained within the parameters indicated in the Vehicle Code and the Department's regulations relating to traffic signs, signals, and markings. The Department may direct appropriate alterations to the design or operation (including, but not limited to, hours of operation) of the traffic signal, or require removal of the traffic signal, if traffic conditions or other considerations necessitate alteration or removal.

All items associated with the traffic control device (geometric features, signs, signals, pavement markings, pedestrian accommodations, and other traffic control device associated items) are the applicant's responsibility. The Traffic Signal Permit will then document all of the items associated with operation of each traffic control device. The applicant, at its sole expense, shall provide the necessary inspection, maintenance, and operation activities in conformance with the Department's Publication 191 or as otherwise agreed to by the Department. The applicant shall perform the preventative and responsive maintenance requirements and recordkeeping in accordance with the exhibits specified below. If the applicant fails to provide the required inspection, maintenance, or operation services within thirty (30) days of receipt of written notice from the Department, the Department shall have the right to perform the required inspection, maintenance, or operation services in the applicant's stead and the applicant shall reimburse the Department for all costs incurred. Federal- and/or state-aid participation may be withheld on all future projects if the applicant fails to demonstrate to the Department the ability to provide all required maintenance and operation services. The applicant certifies that it has funds available and committed for the operation and maintenance of the traffic control device and that it will make available sufficient funds for all required future inspection, maintenance, and operation activities.

The applicant shall indemnify, save harmless and, defend (if requested) the Commonwealth of Pennsylvania, its agents, representatives, and employees from and against any damages recoverable under the Sovereign Immunity Act, 42 Pa. C.S. §§ 8521-8528, up to the limitations on damages under said law, arising out of any personal injury or damage to property which is finally determined by a court to be caused by or result from acts or omissions of the applicant and for which a court has held applicant, its officials, or employees to be liable. This provision shall not be construed to limit the applicant in asserting any rights or defenses. Additionally, the applicant shall include in any contracts into which it enters for maintenance, operation, or inspection of the traffic control device this same obligation to indemnify the Commonwealth and its officers, agents, and employees; and it shall require its contractor(s) to provide public liability insurance coverage, naming the Commonwealth and the applicant as additional insureds for bodily injury, including death and property damage, in the minimum amounts of $500,000 per person, $1,000,000 per occurrence, it being the intention of parties to have the contractor fully insure and indemnify the Commonwealth and the applicant.

The applicant shall comply with the study and ordinance requirements of 75 Pa. C.S. § 6109. The applicant submits this application with the intention of being legally bound.

Neither this application nor any Traffic Signal Permit creates any rights or obligations with respect to parties other than the applicant and the Department. Third parties may not rely upon any representations made by either the applicant or the Department in connection with the submission or approval of this application or any work permitted or approved that is related to this application, as regards either payment of funds or performance of any particular item of maintenance precisely as specified.

The applicant agrees to comply with the attached Exhibits:

- Exhibit "A": Preventative and Response Maintenance Requirements (Sheet 3 of 5)
- Exhibit "B": Recordkeeping (Sheet 4 of 5)
- Exhibit "C": Signal Maintenance Organization (Sheet 5 of 5)

Printed Municipal Contact Name : _____ **Date :** _____

Signed By : _____ **Witness or Attest :** _____

Title of Signatory : _____ **Title of Witness or Attester:** _____

DEPARTMENT USE ONLY

County :

Engineering District :

Department Tracking # :

Initial Submission Date :

Exhibit "A":

Preventative and Response Maintenance Requirements

pennsylvania
DEPARTMENT OF TRANSPORTATION

Preventive Maintenance

The APPLICANT or its contractor will provide preventive maintenance for each individual component of the traffic signal installation covered by this application at intervals not less than those indicated in the Preventive Maintenance Summary, PA DOT Publication 191, current version. This is the recommended level of maintenance to keep the intersection control equipment and signals in mechanically, structurally and aesthetically good condition.

Response Maintenance

The APPLICANT or its contractor will provide response maintenance in accordance with the provisions of the Response Maintenance Schedule. It encompasses the work necessary to restore a traffic signal system to proper and safe operation. Includes Emergency Repair and Final Repair.

FINAL REPAIR:
Repair or replace failed equipment to restore system to proper and safe operation in accordance with permit within a 24-hour period.

EMERGENCY REPAIR:
Use alternative means or mode to temporarily restore system to safe operation within a 24-hour period. Final repair must then be completed within 30 days unless prohibited by weather conditions or availability of equipment.

Response Maintenance Schedule

KNOCKDOWNS	TYPE OF REPAIR PERMITTED
Support - Mast arm	Emergency or Final
Support - Strain pole	Emergency of Final
Span wire/tether wire	Final Only
Pedestal	Emergency or Final
Cabinet	Emergency of Final
Signal heads	Final Only
EQUIPMENT FAILURE	
Lamp burnout (veh. & ped.)	Final Only
Local controller	Emergency or Final
Master controller	Emergency or Final
Detector sensor	
- Loop	Emergency or Final
- Magnetometer	Emergency or Final
- Sonic	Emergency or Final
- Magnetic	Emergency or Final
- Pushbutton	Emergency or Final
Detector amplifier	Emergency or Final
Conflict monitor	Final Only
Flasher	Final Only
Time clock	Emergency or Final
Load switch/relay	Final Only
Coordination unit	Emergency or Final
Communication interface, mode	Emergency or Final
Signal cable	Final Only
Traffic Signal Communications	Final Only
Traffic Signal Systems	Final Only

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Exhibit "B":

Recordkeeping

pennsylvania
DEPARTMENT OF TRANSPORTATION

Recordkeeping

Accurate and up-to-date recordkeeping is an essential component of a good traffic signal maintenance program. In recognition of this fact, the APPLICANT must prepare, retain, and make available to the COMMONWEALTH, on request, a record of all preventive and response maintenance activities performed on the traffic signal equipment covered by this application.

The APPLICANT shall establish a separate file for each installation and keep its records in the municipal building, signal maintenance shop, or other weather-protected enclosure.

At a minimum, the following records will be kept by the APPLICANT or its contractor for each traffic signal. These forms can be found in Section 10.0, Maintenance Record Forms, PA DOT Publication 191, current version.

FORM 1 - Master Intersection Record

This form, which lists all maintenance functions performed at the intersection, should be updated within one day of the activity but no more than one week later.

FORM 2 - Response Maintenance Record

Each time response maintenance is required at the intersection, this form is to be completed. Once the pertinent information is transferred to the master intersection record, this form is to be placed in the intersection file.

FORM 3 - Preventive Maintenance Record

This form will be used to provide a record of the preventive maintenance activities performed at each intersection. The date, the activities performed, and the signature of the person in charge of the work must be recorded in the form.

This form may be kept at the intersection, if it is adequately protected from the weather. Form 1 must be updated at the central file, however, to reflect the date and activity.

DEPARTMENT USE ONLY

County :DELAWARE

Engineering District :6-0

Department Tracking # :

Initial Submission Date :

Exhibit "C":
Signal Maintenance Organization

pennsylvania
DEPARTMENT OF TRANSPORTATION

Personnel Classifications

In order to properly maintain the traffic signal equipment covered by this applicant, the APPLICANT agrees to provide, as minimum, the following staff throughout the useful life of equipment. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Traffic Engineer - The administrative position which has prime responsibility for the proper operation of traffic signal equipment. The principal function of this position is the supervision and control of subordinate personnel and the planning of their activities to ensure adequate preventive and response maintenance programs.

Minimum Position Requirements

1. A thorough understanding of traffic signal design, installation and maintenance.
2. A working knowledge of the interaction between the following traffic characteristics: Intersection geometry, traffic flow theory, control type (fixed time, actuated, etc.), signal phasing and timing, and interconnection.
3. An ability to supervise subordinate personnel effectively in the assignment of their work.
4. Possession of a college degree in engineering, which includes course work in traffic engineering.
5. Either four years experience in the field of traffic engineering or its equivalent in graduate college work.

Signal Specialist - The individual responsible for the diagnostics and repair of all traffic signal equipment including solid state equipment.

Minimum Position Requirements

1. Extensive training and troubleshooting skills in electronics and software.
2. Ability to repair modules in the shop and to design test equipment needed to diagnose and repair a problem.
3. Ability to make design and modifications to implement or omit special functions.
4. Ability to implement a recordkeeping system to include maintenance activities, inventory control and identification of recurring problems.
5. Ability to perform all tasks required of a signal technician.

Signal Technician - Individual responsible for the operation and maintenance of traffic signals and electromechanical equipment.

Minimum Position Requirements

1. Ability to perform response maintenance on solid state equipment up to the device exchange level.
2. Capability to diagnose a vehicle loop failure and initiate corrective action.
3. Ability to tune detector amplifiers.
4. Ability to follow wiring schematics, check and set timings from plan sheet and check all field connections.
5. Ability to perform preventive maintenance on all equipment and to maintain accurate records of all work perform.

Training

The APPLICANT agrees to secure training in order to upgrade the ability of its present staff to properly perform the required maintenance functions. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Budget Requirements

The APPLICANT agrees to provide, in its annual operating budget, dedicated funds which are sufficient to cover the cost of the personnel, training, contractors (if utilized) and specialized maintenance equipment which are required, by virtue of this application. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191..

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

A - Applicant's (Municipal) Contact Information

Municipal Contact's Name : Anthony Hamaday **Title :** Manager

Municipal Name : TOWNSHIP OF MARPLE

Municipal Address : 227 South Sproul Road, Broomall, Pennsylvania 19008-2397

Municipal Phone Number : 610-356-4040 **Alternative Phone Number :**

E-mail Address : ahamaday@marpletwp.com

Municipal Hours of Operation : Mon - Fri, 8:30 AM - 5:00 PM

B - Application Description

Location (*intersection*) : WEST CHESTER PIKE (SR 003) & NEW ARDMORE AVENUE

Traffic Control Device is : ☐ **NEW** Traffic Signal ☒ **EXISTING** Traffic Signal **(*Permit Number*) :** 63-0002

Type of Device (*select one*) ☒ Traffic Control Signal (*MUTCD Section 4D, 4E, 4G*) ☐ Flashing Beacon (*MUTCD Section 4L*) ☐ School Warning System (*MUTCD Section 7B*)

☐ Other :

Is Traffic Signal part of a system? : ☒ YES ☐ NO **System Number (*if applicable*) :** I-0097

If YES, provide locations of all signalized intersections in system.

Malin Road, Sproul Road (SR 0320), Church Rd/Berkley Rd, I-476 SB Ramps, I-476 NB Ramps, South Lawrence Road

Explain the proposed improvements :

Signalize existing unsignalized intersection at Langford Run Road, provide median opening, provide traffic adaptive system along corridor

Associated with Highway Occupancy Permit (HOP)?: ☒ YES ☐ NO **If YES, HOP Application # :** 42543

C - Maintenance and Operation Information

Maintenance and Operations are typically performed by? :

☐ Municipal Personnel ☐ Municipal Contractor ☒ Municipal Personnel & Contractor

☐ Other :

Maintenance and Operations Contact Name : Edward T. Cross **Company/Organization :** Twp Public Works

Phone # : 610.356.4040 **Alternative Phone # :** **E-mail :**

D - Attachments Listing

☒ Municipal Resolution (*required*)	☐ Location Map	☐ Traffic Volumes / Pedestrian Volumes
☐ Letter of Financial Commitment	☐ Photographs	☐ Turn Lane Analysis
☒ Traffic Signal Permit	☐ Straight Line Diagram	☐ Turn Restriction Studies
☐ Warrant Analysis	☐ Capacity Analysis	☐ Other :
☐ Crash Analysis	☐ Traffic Impact Study (TIS)	
☐ Traffic Signal Study	☐ Condition Diagram	

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania
DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

E - Applicant (Municipal) Certification

The applicant desires to own, operate, and maintain the traffic control device in the location indicated above; and the Vehicle Code requires the approval of the Department of Transportation ("Department") before any traffic signals may be legally erected or modified. A signed Application for Traffic Signal Approval (TE-160) must be submitted in conformance with the instructions provided by the Department, and a Traffic Signal Permit must be issued, before any work can begin.

If the Department approves a traffic signal after a traffic engineering study and engineering judgment indicates the need, the traffic signal shall be installed, owned, operated, and maintained within the parameters indicated in the Vehicle Code and the Department's regulations relating to traffic signs, signals, and markings. The Department may direct appropriate alterations to the design or operation (including, but not limited to, hours of operation) of the traffic signal, or require removal of the traffic signal, if traffic conditions or other considerations necessitate alteration or removal.

All items associated with the traffic control device (geometric features, signs, signals, pavement markings, pedestrian accommodations, and other traffic control device associated items) are the applicant's responsibility. The Traffic Signal Permit will then document all of the items associated with operation of each traffic control device. The applicant, at its sole expense, shall provide the necessary inspection, maintenance, and operation activities in conformance with the Department's Publication 191 or as otherwise agreed to by the Department. The applicant shall perform the preventative and responsive maintenance requirements and recordkeeping in accordance with the exhibits specified below. If the applicant fails to provide the required inspection, maintenance, or operation services within thirty (30) days of receipt of written notice from the Department, the Department shall have the right to perform the required inspection, maintenance, or operation services in the applicant's stead and the applicant shall reimburse the Department for all costs incurred. Federal- and/or state-aid participation may be withheld on all future projects if the applicant fails to demonstrate to the Department the ability to provide all required maintenance and operation services. The applicant certifies that it has funds available and committed for the operation and maintenance of the traffic control device and that it will make available sufficient funds for all required future inspection, maintenance, and operation activities.

The applicant shall indemnify, save harmless and, defend (if requested) the Commonwealth of Pennsylvania, its agents, representatives, and employees from and against any damages recoverable under the Sovereign Immunity Act, 42 Pa. C.S. §§ 8521-8528, up to the limitations on damages under said law, arising out of any personal injury or damage to property which is finally determined by a court to be caused by or result from acts or omissions of the applicant and for which a court has held applicant, its officials, or employees to be liable. This provision shall not be construed to limit the applicant in asserting any rights or defenses. Additionally, the applicant shall include in any contracts into which it enters for maintenance, operation, or inspection of the traffic control device this same obligation to indemnify the Commonwealth and its officers, agents, and employees; and it shall require its contractor(s) to provide public liability insurance coverage, naming the Commonwealth and the applicant as additional insureds for bodily injury, including death and property damage, in the minimum amounts of $500,000 per person, $1,000,000 per occurrence, it being the intention of parties to have the contractor fully insure and indemnify the Commonwealth and the applicant.

The applicant shall comply with the study and ordinance requirements of 75 Pa. C.S. § 6109. The applicant submits this application with the intention of being legally bound.

Neither this application nor any Traffic Signal Permit creates any rights or obligations with respect to parties other than the applicant and the Department. Third parties may not rely upon any representations made by either the applicant or the Department in connection with the submission or approval of this application or any work permitted or approved that is related to this application, as regards either payment of funds or performance of any particular item of maintenance precisely as specified.

The applicant agrees to comply with the attached Exhibits:

- Exhibit "A": Preventative and Response Maintenance Requirements (Sheet 3 of 5)
- Exhibit "B": Recordkeeping (Sheet 4 of 5)
- Exhibit "C": Signal Maintenance Organization (Sheet 5 of 5)

Printed Municipal Contact Name : _____ **Date :** _____

Signed By : _____ **Witness or Attest :** _____

Title of Signatory : _____ **Title of Witness or Attester:** _____

DEPARTMENT USE ONLY

County :

Engineering District :

Department Tracking # :

Initial Submission Date :

Exhibit "A":

Preventative and Response Maintenance Requirements

pennsylvania
DEPARTMENT OF TRANSPORTATION

Preventive Maintenance

The APPLICANT or its contractor will provide preventive maintenance for each individual component of the traffic signal installation covered by this application at intervals not less than those indicated in the Preventive Maintenance Summary, PA DOT Publication 191, current version. This is the recommended level of maintenance to keep the intersection control equipment and signals in mechanically, structurally and aesthetically good condition.

Response Maintenance

The APPLICANT or its contractor will provide response maintenance in accordance with the provisions of the Response Maintenance Schedule. It encompasses the work necessary to restore a traffic signal system to proper and safe operation. Includes Emergency Repair and Final Repair.

FINAL REPAIR:
Repair or replace failed equipment to restore system to proper and safe operation in accordance with permit within a 24-hour period.

EMERGENCY REPAIR:
Use alternative means or mode to temporarily restore system to safe operation within a 24-hour period. Final repair must then be completed within 30 days unless prohibited by weather conditions or availability of equipment.

Response Maintenance Schedule

KNOCKDOWNS	TYPE OF REPAIR PERMITTED
Support - Mast arm	Emergency or Final
Support - Strain pole	Emergency of Final
Span wire/tether wire	Final Only
Pedestal	Emergency or Final
Cabinet	Emergency of Final
Signal heads	Final Only
EQUIPMENT FAILURE	
Lamp burnout (veh. & ped.)	Final Only
Local controller	Emergency or Final
Master controller	Emergency or Final
Detector sensor	
- Loop	Emergency or Final
- Magnetometer	Emergency or Final
- Sonic	Emergency or Final
- Magnetic	Emergency or Final
- Pushbutton	Emergency or Final
Detector amplifier	Emergency or Final
Conflict monitor	Final Only
Flasher	Final Only
Time clock	Emergency or Final
Load switch/relay	Final Only
Coordination unit	Emergency or Final
Communication interface, mode	Emergency or Final
Signal cable	Final Only
Traffic Signal Communications	Final Only
Traffic Signal Systems	Final Only

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Exhibit "B":

Recordkeeping

pennsylvania
DEPARTMENT OF TRANSPORTATION

Recordkeeping

Accurate and up-to-date recordkeeping is an essential component of a good traffic signal maintenance program. In recognition of this fact, the APPLICANT must prepare, retain, and make available to the COMMONWEALTH, on request, a record of all preventive and response maintenance activities performed on the traffic signal equipment covered by this application.

The APPLICANT shall establish a separate file for each installation and keep its records in the municipal building, signal maintenance shop, or other weather-protected enclosure.

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FORM 1 - Master Intersection Record

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This form will be used to provide a record of the preventive maintenance activities performed at each intersection. The date, the activities performed, and the signature of the person in charge of the work must be recorded in the form.

This form may be kept at the intersection, if it is adequately protected from the weather. Form 1 must be updated at the central file, however, to reflect the date and activity.

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Exhibit "C":
Signal Maintenance Organization

pennsylvania
DEPARTMENT OF TRANSPORTATION

Personnel Classifications

In order to properly maintain the traffic signal equipment covered by this applicant, the APPLICANT agrees to provide, as minimum, the following staff throughout the useful life of equipment. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Traffic Engineer - The administrative position which has prime responsibility for the proper operation of traffic signal equipment. The principal function of this position is the supervision and control of subordinate personnel and the planning of their activities to ensure adequate preventive and response maintenance programs.

Minimum Position Requirements

1. A thorough understanding of traffic signal design, installation and maintenance.
2. A working knowledge of the interaction between the following traffic characteristics: Intersection geometry, traffic flow theory, control type (fixed time, actuated, etc.), signal phasing and timing, and interconnection.
3. An ability to supervise subordinate personnel effectively in the assignment of their work.
4. Possession of a college degree in engineering, which includes course work in traffic engineering.
5. Either four years experience in the field of traffic engineering or its equivalent in graduate college work.

Signal Specialist - The individual responsible for the diagnostics and repair of all traffic signal equipment including solid state equipment.

Minimum Position Requirements

1. Extensive training and troubleshooting skills in electronics and software.
2. Ability to repair modules in the shop and to design test equipment needed to diagnose and repair a problem.
3. Ability to make design and modifications to implement or omit special functions.
4. Ability to implement a recordkeeping system to include maintenance activities, inventory control and identification of recurring problems.
5. Ability to perform all tasks required of a signal technician.

Signal Technician - Individual responsible for the operation and maintenance of traffic signals and electromechanical equipment.

Minimum Position Requirements

1. Ability to perform response maintenance on solid state equipment up to the device exchange level.
2. Capability to diagnose a vehicle loop failure and initiate corrective action.
3. Ability to tune detector amplifiers.
4. Ability to follow wiring schematics, check and set timings from plan sheet and check all field connections.
5. Ability to perform preventive maintenance on all equipment and to maintain accurate records of all work perform.

Training

The APPLICANT agrees to secure training in order to upgrade the ability of its present staff to properly perform the required maintenance functions. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Budget Requirements

The APPLICANT agrees to provide, in its annual operating budget, dedicated funds which are sufficient to cover the cost of the personnel, training, contractors (if utilized) and specialized maintenance equipment which are required, by virtue of this application. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191..

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania DEPARTMENT OF TRANSPORTATION

A - Applicant's (Municipal) Contact Information

Municipal Contact's Name : Anthony Hamaday **Title :** Manager

Municipal Name : TOWNSHIP OF MARPLE

Municipal Address : 227 South Sproul Road, Broomall, Pennsylvania 19008-2397

Municipal Phone Number : 610-356-4040 **Alternative Phone Number :**

E-mail Address : ahamaday@marpletwp.com

Municipal Hours of Operation : Mon - Fri, 8:30 AM - 5:00 PM

B - Application Description

Location (*intersection*) : WEST CHESTER PIKE (SR 003) & LANGFORD RUN ROAD

Traffic Control Device is : ☒ **NEW** Traffic Signal ☐ **EXISTING** Traffic Signal **(*Permit Number*) :**

Type of Device (*select one*) ☒ Traffic Control Signal (*MUTCD Section 4D, 4E, 4G*) ☐ Flashing Beacon (*MUTCD Section 4L*) ☐ School Warning System (*MUTCD Section 7B*)

☐ Other :

Is Traffic Signal part of a system? : ☒ YES ☐ NO **System Number (*if applicable*) :** I-0097

If YES, provide locations of all signalized intersections in system.

Malin Road, Sproul Road (SR 0320), Church Rd/Berkley Rd, I-476 SB Ramps, I-476 NB Ramps, South Lawrence Road

Explain the proposed improvements :

Signalize existing unsignalized intersection, provide median opening, provide traffic adaptive system along corridor

Associated with Highway Occupancy Permit (HOP)?: ☒ YES ☐ NO **If YES, HOP Application # :** 42543

C - Maintenance and Operation Information

Maintenance and Operations are typically performed by? :

☐ Municipal Personnel ☐ Municipal Contractor ☒ Municipal Personnel & Contractor

☐ Other :

Maintenance and Operations Contact Name : Edward T. Cross **Company/Organization :** Twp Public Works

Phone # : 610.356.4040 **Alternative Phone # :** **E-mail :**

D - Attachments Listing

☒ Municipal Resolution (*required*)	☐ Location Map	☐ Traffic Volumes / Pedestrian Volumes
☐ Letter of Financial Commitment	☐ Photographs	☒ Turn Lane Analysis
☒ Traffic Signal Permit	☐ Straight Line Diagram	☐ Turn Restriction Studies
☒ Warrant Analysis	☒ Capacity Analysis	☐ Other :
☐ Crash Analysis	☒ Traffic Impact Study (TIS)	
☒ Traffic Signal Study	☐ Condition Diagram	

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania
DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

E - Applicant (Municipal) Certification

The applicant desires to own, operate, and maintain the traffic control device in the location indicated above; and the Vehicle Code requires the approval of the Department of Transportation ("Department") before any traffic signals may be legally erected or modified. A signed Application for Traffic Signal Approval (TE-160) must be submitted in conformance with the instructions provided by the Department, and a Traffic Signal Permit must be issued, before any work can begin.

If the Department approves a traffic signal after a traffic engineering study and engineering judgment indicates the need, the traffic signal shall be installed, owned, operated, and maintained within the parameters indicated in the Vehicle Code and the Department's regulations relating to traffic signs, signals, and markings. The Department may direct appropriate alterations to the design or operation (including, but not limited to, hours of operation) of the traffic signal, or require removal of the traffic signal, if traffic conditions or other considerations necessitate alteration or removal.

All items associated with the traffic control device (geometric features, signs, signals, pavement markings, pedestrian accommodations, and other traffic control device associated items) are the applicant's responsibility. The Traffic Signal Permit will then document all of the items associated with operation of each traffic control device. The applicant, at its sole expense, shall provide the necessary inspection, maintenance, and operation activities in conformance with the Department's Publication 191 or as otherwise agreed to by the Department. The applicant shall perform the preventative and responsive maintenance requirements and recordkeeping in accordance with the exhibits specified below. If the applicant fails to provide the required inspection, maintenance, or operation services within thirty (30) days of receipt of written notice from the Department, the Department shall have the right to perform the required inspection, maintenance, or operation services in the applicant's stead and the applicant shall reimburse the Department for all costs incurred. Federal- and/or state-aid participation may be withheld on all future projects if the applicant fails to demonstrate to the Department the ability to provide all required maintenance and operation services. The applicant certifies that it has funds available and committed for the operation and maintenance of the traffic control device and that it will make available sufficient funds for all required future inspection, maintenance, and operation activities.

The applicant shall indemnify, save harmless and, defend (if requested) the Commonwealth of Pennsylvania, its agents, representatives, and employees from and against any damages recoverable under the Sovereign Immunity Act, 42 Pa. C.S. §§ 8521-8528, up to the limitations on damages under said law, arising out of any personal injury or damage to property which is finally determined by a court to be caused by or result from acts or omissions of the applicant and for which a court has held applicant, its officials, or employees to be liable. This provision shall not be construed to limit the applicant in asserting any rights or defenses. Additionally, the applicant shall include in any contracts into which it enters for maintenance, operation, or inspection of the traffic control device this same obligation to indemnify the Commonwealth and its officers, agents, and employees; and it shall require its contractor(s) to provide public liability insurance coverage, naming the Commonwealth and the applicant as additional insureds for bodily injury, including death and property damage, in the minimum amounts of $500,000 per person, $1,000,000 per occurrence, it being the intention of parties to have the contractor fully insure and indemnify the Commonwealth and the applicant.

The applicant shall comply with the study and ordinance requirements of 75 Pa. C.S. § 6109. The applicant submits this application with the intention of being legally bound.

Neither this application nor any Traffic Signal Permit creates any rights or obligations with respect to parties other than the applicant and the Department. Third parties may not rely upon any representations made by either the applicant or the Department in connection with the submission or approval of this application or any work permitted or approved that is related to this application, as regards either payment of funds or performance of any particular item of maintenance precisely as specified.

The applicant agrees to comply with the attached Exhibits:

- Exhibit "A": Preventative and Response Maintenance Requirements (Sheet 3 of 5)
- Exhibit "B": Recordkeeping (Sheet 4 of 5)
- Exhibit "C": Signal Maintenance Organization (Sheet 5 of 5)

Printed Municipal Contact Name : _____ **Date :** _____

Signed By : _____ **Witness or Attest :** _____

Title of Signatory : _____ **Title of Witness or Attester:** _____

DEPARTMENT USE ONLY

County :

Engineering District :

Department Tracking # :

Initial Submission Date :

Exhibit "A":

Preventative and Response Maintenance Requirements

pennsylvania
DEPARTMENT OF TRANSPORTATION

Preventive Maintenance

The APPLICANT or its contractor will provide preventive maintenance for each individual component of the traffic signal installation covered by this application at intervals not less than those indicated in the Preventive Maintenance Summary, PA DOT Publication 191, current version. This is the recommended level of maintenance to keep the intersection control equipment and signals in mechanically, structurally and aesthetically good condition.

Response Maintenance

The APPLICANT or its contractor will provide response maintenance in accordance with the provisions of the Response Maintenance Schedule. It encompasses the work necessary to restore a traffic signal system to proper and safe operation. Includes Emergency Repair and Final Repair.

FINAL REPAIR:
Repair or replace failed equipment to restore system to proper and safe operation in accordance with permit within a 24-hour period.

EMERGENCY REPAIR:
Use alternative means or mode to temporarily restore system to safe operation within a 24-hour period. Final repair must then be completed within 30 days unless prohibited by weather conditions or availability of equipment.

Response Maintenance Schedule

KNOCKDOWNS	TYPE OF REPAIR PERMITTED
Support - Mast arm	Emergency or Final
Support - Strain pole	Emergency of Final
Span wire/tether wire	Final Only
Pedestal	Emergency or Final
Cabinet	Emergency of Final
Signal heads	Final Only
EQUIPMENT FAILURE	
Lamp burnout (veh. & ped.)	Final Only
Local controller	Emergency or Final
Master controller	Emergency or Final
Detector sensor	
- Loop	Emergency or Final
- Magnetometer	Emergency or Final
- Sonic	Emergency or Final
- Magnetic	Emergency or Final
- Pushbutton	Emergency or Final
Detector amplifier	Emergency or Final
Conflict monitor	Final Only
Flasher	Final Only
Time clock	Emergency or Final
Load switch/relay	Final Only
Coordination unit	Emergency or Final
Communication interface, mode	Emergency or Final
Signal cable	Final Only
Traffic Signal Communications	Final Only
Traffic Signal Systems	Final Only

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Exhibit "B":

Recordkeeping

pennsylvania
DEPARTMENT OF TRANSPORTATION

Recordkeeping

Accurate and up-to-date recordkeeping is an essential component of a good traffic signal maintenance program. In recognition of this fact, the APPLICANT must prepare, retain, and make available to the COMMONWEALTH, on request, a record of all preventive and response maintenance activities performed on the traffic signal equipment covered by this application.

The APPLICANT shall establish a separate file for each installation and keep its records in the municipal building, signal maintenance shop, or other weather-protected enclosure.

At a minimum, the following records will be kept by the APPLICANT or its contractor for each traffic signal. These forms can be found in Section 10.0, Maintenance Record Forms, PA DOT Publication 191, current version.

FORM 1 - Master Intersection Record

This form, which lists all maintenance functions performed at the intersection, should be updated within one day of the activity but no more than one week later.

FORM 2 - Response Maintenance Record

Each time response maintenance is required at the intersection, this form is to be completed. Once the pertinent information is transferred to the master intersection record, this form is to be placed in the intersection file.

FORM 3 - Preventive Maintenance Record

This form will be used to provide a record of the preventive maintenance activities performed at each intersection. The date, the activities performed, and the signature of the person in charge of the work must be recorded in the form.

This form may be kept at the intersection, if it is adequately protected from the weather. Form 1 must be updated at the central file, however, to reflect the date and activity.

DEPARTMENT USE ONLY

County :DELAWARE

Engineering District :6-0

Department Tracking # :

Initial Submission Date :

Exhibit "C":
Signal Maintenance Organization

pennsylvania
DEPARTMENT OF TRANSPORTATION

Personnel Classifications

In order to properly maintain the traffic signal equipment covered by this applicant, the APPLICANT agrees to provide, as minimum, the following staff throughout the useful life of equipment. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Traffic Engineer - The administrative position which has prime responsibility for the proper operation of traffic signal equipment. The principal function of this position is the supervision and control of subordinate personnel and the planning of their activities to ensure adequate preventive and response maintenance programs.

Minimum Position Requirements

1. A thorough understanding of traffic signal design, installation and maintenance.
2. A working knowledge of the interaction between the following traffic characteristics: Intersection geometry, traffic flow theory, control type (fixed time, actuated, etc.), signal phasing and timing, and interconnection.
3. An ability to supervise subordinate personnel effectively in the assignment of their work.
4. Possession of a college degree in engineering, which includes course work in traffic engineering.
5. Either four years experience in the field of traffic engineering or its equivalent in graduate college work.

Signal Specialist - The individual responsible for the diagnostics and repair of all traffic signal equipment including solid state equipment.

Minimum Position Requirements

1. Extensive training and troubleshooting skills in electronics and software.
2. Ability to repair modules in the shop and to design test equipment needed to diagnose and repair a problem.
3. Ability to make design and modifications to implement or omit special functions.
4. Ability to implement a recordkeeping system to include maintenance activities, inventory control and identification of recurring problems.
5. Ability to perform all tasks required of a signal technician.

Signal Technician - Individual responsible for the operation and maintenance of traffic signals and electromechanical equipment.

Minimum Position Requirements

1. Ability to perform response maintenance on solid state equipment up to the device exchange level.
2. Capability to diagnose a vehicle loop failure and initiate corrective action.
3. Ability to tune detector amplifiers.
4. Ability to follow wiring schematics, check and set timings from plan sheet and check all field connections.
5. Ability to perform preventive maintenance on all equipment and to maintain accurate records of all work perform.

Training

The APPLICANT agrees to secure training in order to upgrade the ability of its present staff to properly perform the required maintenance functions. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Budget Requirements

The APPLICANT agrees to provide, in its annual operating budget, dedicated funds which are sufficient to cover the cost of the personnel, training, contractors (if utilized) and specialized maintenance equipment which are required, by virtue of this application. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191..

TE-952 (4-09)

pennsylvania
DEPARTMENT OF TRANSPORTATION
www.dot.state.pa.us

Application for Permit to Install and Operate Traffic Signals

Date _____

WHEREAS, the TOWNSHIP OF MARPLE Delaware County
(City, Township, Bourough)
desires to erect, operate and maintain traffic signals on West Chester Pike (SR 0003) &
Langford Run Road, and

WHEREAS, the Vehicle Code requires the approval of the Secretary of Transportation before any traffic signals may be legally erected or reconstructed, and

WHEREAS, the Department of Transportation requires an engineering drawing of the location, the consultant ORA will prepare such a drawing in conformance with the instructions provided by the Department.

NOW, THEREFORE, BE IT RESOLVED, that traffic signals be erected at the above mentioned location, subject to the approval of the Secretary of Transportation, and that his approval is hereby requested, and

BE IT FURTHER RESOLVED, that, in the event a traffic signal permit is approved after proper investigation, the
TOWNSHIP OF MARPLE
(City, Township, Bourough)
will be bound by the following provisions:

The traffic signals shall be installed and maintained in accordance with the Vehicle Code and the Regulations for traffic signs, signals and markings of the Department of Transportation, and

Should future highway or traffic conditions, or legal requirements, necessitate alteration of the construction or operation, or hours of operation, or removal of the traffic signals at the above mentioned location, they shall be altered or removed when and as directed by the Secretary of Transportation.

I, _____, Secretary of the _____ do certify that the foregoing is a true and correct copy of the resolution legally adopted at the meeting held, _____.
(Date)

(SEAL) Signed_____
(Secretary)

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania DEPARTMENT OF TRANSPORTATION

A - Applicant's (Municipal) Contact Information

Municipal Contact's Name : Anthony Hamaday **Title :** Manager

Municipal Name : TOWNSHIP OF MARPLE

Municipal Address : 227 South Sproul Road, Broomall, Pennsylvania 19008-2397

Municipal Phone Number : 610-356-4040 **Alternative Phone Number :**

E-mail Address : ahamaday@marpletwp.com

Municipal Hours of Operation : Mon - Fri, 8:30 AM - 5:00 PM

B - Application Description

Location (*intersection*) : WEST CHESTER PIKE (SR 003) & I-476 SB RAMPS

Traffic Control Device is : ☐ **NEW** Traffic Signal ☒ **EXISTING** Traffic Signal **(*Permit Number*) :** 63-2418

Type of Device (*select one*) ☒ Traffic Control Signal (*MUTCD Section 4D, 4E, 4G*) ☐ Flashing Beacon (*MUTCD Section 4L*) ☐ School Warning System (*MUTCD Section 7B*)

☐ Other :

Is Traffic Signal part of a system? : ☒ YES ☐ NO **System Number (*if applicable*) :** I-0097

If YES, provide locations of all signalized intersections in system.

Malin Road, Sproul Road (SR 0320), Church Rd/Berkley Rd, I-476 SB Ramps, I-476 NB Ramps, South Lawrence Road

Explain the proposed improvements :

Signalize existing unsignalized intersection at Langford Run Road, provide median opening, provide traffic adaptive system along corridor

Associated with Highway Occupancy Permit (HOP)?: ☒ YES ☐ NO **If YES, HOP Application # :** 42543

C - Maintenance and Operation Information

Maintenance and Operations are typically performed by? :

☐ Municipal Personnel ☐ Municipal Contractor ☒ Municipal Personnel & Contractor

☐ Other :

Maintenance and Operations Contact Name : Edward T. Cross **Company/Organization :** Twp Public Works

Phone # : 610.356.4040 **Alternative Phone # :** **E-mail :**

D - Attachments Listing

☒ Municipal Resolution (*required*)	☐ Location Map	☐ Traffic Volumes / Pedestrian Volumes
☐ Letter of Financial Commitment	☐ Photographs	☐ Turn Lane Analysis
☒ Traffic Signal Permit	☐ Straight Line Diagram	☐ Turn Restriction Studies
☐ Warrant Analysis	☐ Capacity Analysis	☐ Other :
☐ Crash Analysis	☐ Traffic Impact Study (TIS)	
☐ Traffic Signal Study	☐ Condition Diagram	

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania
DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

E - Applicant (Municipal) Certification

The applicant desires to own, operate, and maintain the traffic control device in the location indicated above; and the Vehicle Code requires the approval of the Department of Transportation ("Department") before any traffic signals may be legally erected or modified. A signed Application for Traffic Signal Approval (TE-160) must be submitted in conformance with the instructions provided by the Department, and a Traffic Signal Permit must be issued, before any work can begin.

If the Department approves a traffic signal after a traffic engineering study and engineering judgment indicates the need, the traffic signal shall be installed, owned, operated, and maintained within the parameters indicated in the Vehicle Code and the Department's regulations relating to traffic signs, signals, and markings. The Department may direct appropriate alterations to the design or operation (including, but not limited to, hours of operation) of the traffic signal, or require removal of the traffic signal, if traffic conditions or other considerations necessitate alteration or removal.

All items associated with the traffic control device (geometric features, signs, signals, pavement markings, pedestrian accommodations, and other traffic control device associated items) are the applicant's responsibility. The Traffic Signal Permit will then document all of the items associated with operation of each traffic control device. The applicant, at its sole expense, shall provide the necessary inspection, maintenance, and operation activities in conformance with the Department's Publication 191 or as otherwise agreed to by the Department. The applicant shall perform the preventative and responsive maintenance requirements and recordkeeping in accordance with the exhibits specified below. If the applicant fails to provide the required inspection, maintenance, or operation services within thirty (30) days of receipt of written notice from the Department, the Department shall have the right to perform the required inspection, maintenance, or operation services in the applicant's stead and the applicant shall reimburse the Department for all costs incurred. Federal- and/or state-aid participation may be withheld on all future projects if the applicant fails to demonstrate to the Department the ability to provide all required maintenance and operation services. The applicant certifies that it has funds available and committed for the operation and maintenance of the traffic control device and that it will make available sufficient funds for all required future inspection, maintenance, and operation activities.

The applicant shall indemnify, save harmless and, defend (if requested) the Commonwealth of Pennsylvania, its agents, representatives, and employees from and against any damages recoverable under the Sovereign Immunity Act, 42 Pa. C.S. §§ 8521-8528, up to the limitations on damages under said law, arising out of any personal injury or damage to property which is finally determined by a court to be caused by or result from acts or omissions of the applicant and for which a court has held applicant, its officials, or employees to be liable. This provision shall not be construed to limit the applicant in asserting any rights or defenses. Additionally, the applicant shall include in any contracts into which it enters for maintenance, operation, or inspection of the traffic control device this same obligation to indemnify the Commonwealth and its officers, agents, and employees; and it shall require its contractor(s) to provide public liability insurance coverage, naming the Commonwealth and the applicant as additional insureds for bodily injury, including death and property damage, in the minimum amounts of $500,000 per person, $1,000,000 per occurrence, it being the intention of parties to have the contractor fully insure and indemnify the Commonwealth and the applicant.

The applicant shall comply with the study and ordinance requirements of 75 Pa. C.S. § 6109. The applicant submits this application with the intention of being legally bound.

Neither this application nor any Traffic Signal Permit creates any rights or obligations with respect to parties other than the applicant and the Department. Third parties may not rely upon any representations made by either the applicant or the Department in connection with the submission or approval of this application or any work permitted or approved that is related to this application, as regards either payment of funds or performance of any particular item of maintenance precisely as specified.

The applicant agrees to comply with the attached Exhibits:

- Exhibit "A": Preventative and Response Maintenance Requirements (Sheet 3 of 5)
- Exhibit "B": Recordkeeping (Sheet 4 of 5)
- Exhibit "C": Signal Maintenance Organization (Sheet 5 of 5)

Printed Municipal Contact Name : _____ **Date :** _____

Signed By : _____ **Witness or Attest :** _____

Title of Signatory : _____ **Title of Witness or Attester:** _____

DEPARTMENT USE ONLY

County :

Engineering District :

Department Tracking # :

Initial Submission Date :

Exhibit "A":

Preventative and Response Maintenance Requirements

pennsylvania
DEPARTMENT OF TRANSPORTATION

Preventive Maintenance

The APPLICANT or its contractor will provide preventive maintenance for each individual component of the traffic signal installation covered by this application at intervals not less than those indicated in the Preventive Maintenance Summary, PA DOT Publication 191, current version. This is the recommended level of maintenance to keep the intersection control equipment and signals in mechanically, structurally and aesthetically good condition.

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Span wire/tether wire	Final Only
Pedestal	Emergency or Final
Cabinet	Emergency of Final
Signal heads	Final Only
EQUIPMENT FAILURE	
Lamp burnout (veh. & ped.)	Final Only
Local controller	Emergency or Final
Master controller	Emergency or Final
Detector sensor	
- Loop	Emergency or Final
- Magnetometer	Emergency or Final
- Sonic	Emergency or Final
- Magnetic	Emergency or Final
- Pushbutton	Emergency or Final
Detector amplifier	Emergency or Final
Conflict monitor	Final Only
Flasher	Final Only
Time clock	Emergency or Final
Load switch/relay	Final Only
Coordination unit	Emergency or Final
Communication interface, mode	Emergency or Final
Signal cable	Final Only
Traffic Signal Communications	Final Only
Traffic Signal Systems	Final Only

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Exhibit "B":

Recordkeeping

pennsylvania
DEPARTMENT OF TRANSPORTATION

Recordkeeping

Accurate and up-to-date recordkeeping is an essential component of a good traffic signal maintenance program. In recognition of this fact, the APPLICANT must prepare, retain, and make available to the COMMONWEALTH, on request, a record of all preventive and response maintenance activities performed on the traffic signal equipment covered by this application.

The APPLICANT shall establish a separate file for each installation and keep its records in the municipal building, signal maintenance shop, or other weather-protected enclosure.

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DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Exhibit "C":
Signal Maintenance Organization

pennsylvania
DEPARTMENT OF TRANSPORTATION

Personnel Classifications

In order to properly maintain the traffic signal equipment covered by this applicant, the APPLICANT agrees to provide, as minimum, the following staff throughout the useful life of equipment. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Traffic Engineer - The administrative position which has prime responsibility for the proper operation of traffic signal equipment. The principal function of this position is the supervision and control of subordinate personnel and the planning of their activities to ensure adequate preventive and response maintenance programs.

Minimum Position Requirements

1. A thorough understanding of traffic signal design, installation and maintenance.
2. A working knowledge of the interaction between the following traffic characteristics: Intersection geometry, traffic flow theory, control type (fixed time, actuated, etc.), signal phasing and timing, and interconnection.
3. An ability to supervise subordinate personnel effectively in the assignment of their work.
4. Possession of a college degree in engineering, which includes course work in traffic engineering.
5. Either four years experience in the field of traffic engineering or its equivalent in graduate college work.

Signal Specialist - The individual responsible for the diagnostics and repair of all traffic signal equipment including solid state equipment.

Minimum Position Requirements

1. Extensive training and troubleshooting skills in electronics and software.
2. Ability to repair modules in the shop and to design test equipment needed to diagnose and repair a problem.
3. Ability to make design and modifications to implement or omit special functions.
4. Ability to implement a recordkeeping system to include maintenance activities, inventory control and identification of recurring problems.
5. Ability to perform all tasks required of a signal technician.

Signal Technician - Individual responsible for the operation and maintenance of traffic signals and electromechanical equipment.

Minimum Position Requirements

1. Ability to perform response maintenance on solid state equipment up to the device exchange level.
2. Capability to diagnose a vehicle loop failure and initiate corrective action.
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4. Ability to follow wiring schematics, check and set timings from plan sheet and check all field connections.
5. Ability to perform preventive maintenance on all equipment and to maintain accurate records of all work perform.

Training

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Budget Requirements

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Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

A - Applicant's (Municipal) Contact Information

Municipal Contact's Name : Anthony Hamaday **Title :** Manager

Municipal Name : TOWNSHIP OF MARPLE

Municipal Address : 227 South Sproul Road, Broomall, Pennsylvania 19008-2397

Municipal Phone Number : 610-356-4040 **Alternative Phone Number :**

E-mail Address : ahamaday@marpletwp.com

Municipal Hours of Operation : Mon - Fri, 8:30 AM - 5:00 PM

B - Application Description

Location (*intersection*) : WEST CHESTER PIKE (SR 003) & I-476 NB RAMPS

Traffic Control Device is : ☐ **NEW** Traffic Signal ☒ **EXISTING** Traffic Signal **(*Permit Number*) :** 63-2419

Type of Device (*select one*) ☒ Traffic Control Signal (*MUTCD Section 4D, 4E, 4G*) ☐ Flashing Beacon (*MUTCD Section 4L*) ☐ School Warning System (*MUTCD Section 7B*)

☐ Other :

Is Traffic Signal part of a system? : ☒ YES ☐ NO **System Number (*if applicable*) :** I-0097

If YES, provide locations of all signalized intersections in system.

Malin Road, Sproul Road (SR 0320), Church Rd/Berkley Rd, I-476 SB Ramps, I-476 NB Ramps, South Lawrence Road

Explain the proposed improvements :

Signalize existing unsignalized intersection at Langford Run Road, provide median opening, provide traffic adaptive system along corridor

Associated with Highway Occupancy Permit (HOP)?: ☒ YES ☐ NO **If YES, HOP Application # :** 42543

C - Maintenance and Operation Information

Maintenance and Operations are typically performed by? :

☐ Municipal Personnel ☐ Municipal Contractor ☒ Municipal Personnel & Contractor

☐ Other :

Maintenance and Operations Contact Name : Edward T. Cross **Company/Organization :** Twp Public Works

Phone # : 610.356.4040 **Alternative Phone # :** **E-mail :**

D - Attachments Listing

☒ Municipal Resolution (*required*)	☐ Location Map	☐ Traffic Volumes / Pedestrian Volumes
☐ Letter of Financial Commitment	☐ Photographs	☐ Turn Lane Analysis
☒ Traffic Signal Permit	☐ Straight Line Diagram	☐ Turn Restriction Studies
☐ Warrant Analysis	☐ Capacity Analysis	☐ Other :
☐ Crash Analysis	☐ Traffic Impact Study (TIS)	
☐ Traffic Signal Study	☐ Condition Diagram	

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania
DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

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All items associated with the traffic control device (geometric features, signs, signals, pavement markings, pedestrian accommodations, and other traffic control device associated items) are the applicant's responsibility. The Traffic Signal Permit will then document all of the items associated with operation of each traffic control device. The applicant, at its sole expense, shall provide the necessary inspection, maintenance, and operation activities in conformance with the Department's Publication 191 or as otherwise agreed to by the Department. The applicant shall perform the preventative and responsive maintenance requirements and recordkeeping in accordance with the exhibits specified below. If the applicant fails to provide the required inspection, maintenance, or operation services within thirty (30) days of receipt of written notice from the Department, the Department shall have the right to perform the required inspection, maintenance, or operation services in the applicant's stead and the applicant shall reimburse the Department for all costs incurred. Federal- and/or state-aid participation may be withheld on all future projects if the applicant fails to demonstrate to the Department the ability to provide all required maintenance and operation services. The applicant certifies that it has funds available and committed for the operation and maintenance of the traffic control device and that it will make available sufficient funds for all required future inspection, maintenance, and operation activities.

The applicant shall indemnify, save harmless and, defend (if requested) the Commonwealth of Pennsylvania, its agents, representatives, and employees from and against any damages recoverable under the Sovereign Immunity Act, 42 Pa. C.S. §§ 8521-8528, up to the limitations on damages under said law, arising out of any personal injury or damage to property which is finally determined by a court to be caused by or result from acts or omissions of the applicant and for which a court has held applicant, its officials, or employees to be liable. This provision shall not be construed to limit the applicant in asserting any rights or defenses. Additionally, the applicant shall include in any contracts into which it enters for maintenance, operation, or inspection of the traffic control device this same obligation to indemnify the Commonwealth and its officers, agents, and employees; and it shall require its contractor(s) to provide public liability insurance coverage, naming the Commonwealth and the applicant as additional insureds for bodily injury, including death and property damage, in the minimum amounts of $500,000 per person, $1,000,000 per occurrence, it being the intention of parties to have the contractor fully insure and indemnify the Commonwealth and the applicant.

The applicant shall comply with the study and ordinance requirements of 75 Pa. C.S. § 6109. The applicant submits this application with the intention of being legally bound.

Neither this application nor any Traffic Signal Permit creates any rights or obligations with respect to parties other than the applicant and the Department. Third parties may not rely upon any representations made by either the applicant or the Department in connection with the submission or approval of this application or any work permitted or approved that is related to this application, as regards either payment of funds or performance of any particular item of maintenance precisely as specified.

The applicant agrees to comply with the attached Exhibits:

- Exhibit "A": Preventative and Response Maintenance Requirements (Sheet 3 of 5)
- Exhibit "B": Recordkeeping (Sheet 4 of 5)
- Exhibit "C": Signal Maintenance Organization (Sheet 5 of 5)

Printed Municipal Contact Name : _____ **Date :** _____

Signed By : _____ **Witness or Attest :** _____

Title of Signatory : _____ **Title of Witness or Attester:** _____

DEPARTMENT USE ONLY

County :

Engineering District :

Department Tracking # :

Initial Submission Date :

Exhibit "A":

Preventative and Response Maintenance Requirements

pennsylvania
DEPARTMENT OF TRANSPORTATION

Preventive Maintenance

The APPLICANT or its contractor will provide preventive maintenance for each individual component of the traffic signal installation covered by this application at intervals not less than those indicated in the Preventive Maintenance Summary, PA DOT Publication 191, current version. This is the recommended level of maintenance to keep the intersection control equipment and signals in mechanically, structurally and aesthetically good condition.

Response Maintenance

The APPLICANT or its contractor will provide response maintenance in accordance with the provisions of the Response Maintenance Schedule. It encompasses the work necessary to restore a traffic signal system to proper and safe operation. Includes Emergency Repair and Final Repair.

FINAL REPAIR:
Repair or replace failed equipment to restore system to proper and safe operation in accordance with permit within a 24-hour period.

EMERGENCY REPAIR:
Use alternative means or mode to temporarily restore system to safe operation within a 24-hour period. Final repair must then be completed within 30 days unless prohibited by weather conditions or availability of equipment.

Response Maintenance Schedule

KNOCKDOWNS	TYPE OF REPAIR PERMITTED
Support - Mast arm	Emergency or Final
Support - Strain pole	Emergency of Final
Span wire/tether wire	Final Only
Pedestal	Emergency or Final
Cabinet	Emergency of Final
Signal heads	Final Only
EQUIPMENT FAILURE	
Lamp burnout (veh. & ped.)	Final Only
Local controller	Emergency or Final
Master controller	Emergency or Final
Detector sensor	
- Loop	Emergency or Final
- Magnetometer	Emergency or Final
- Sonic	Emergency or Final
- Magnetic	Emergency or Final
- Pushbutton	Emergency or Final
Detector amplifier	Emergency or Final
Conflict monitor	Final Only
Flasher	Final Only
Time clock	Emergency or Final
Load switch/relay	Final Only
Coordination unit	Emergency or Final
Communication interface, mode	Emergency or Final
Signal cable	Final Only
Traffic Signal Communications	Final Only
Traffic Signal Systems	Final Only

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Exhibit "B":

Recordkeeping

pennsylvania
DEPARTMENT OF TRANSPORTATION

Recordkeeping

Accurate and up-to-date recordkeeping is an essential component of a good traffic signal maintenance program. In recognition of this fact, the APPLICANT must prepare, retain, and make available to the COMMONWEALTH, on request, a record of all preventive and response maintenance activities performed on the traffic signal equipment covered by this application.

The APPLICANT shall establish a separate file for each installation and keep its records in the municipal building, signal maintenance shop, or other weather-protected enclosure.

At a minimum, the following records will be kept by the APPLICANT or its contractor for each traffic signal. These forms can be found in Section 10.0, Maintenance Record Forms, PA DOT Publication 191, current version.

FORM 1 - Master Intersection Record

This form, which lists all maintenance functions performed at the intersection, should be updated within one day of the activity but no more than one week later.

FORM 2 - Response Maintenance Record

Each time response maintenance is required at the intersection, this form is to be completed. Once the pertinent information is transferred to the master intersection record, this form is to be placed in the intersection file.

FORM 3 - Preventive Maintenance Record

This form will be used to provide a record of the preventive maintenance activities performed at each intersection. The date, the activities performed, and the signature of the person in charge of the work must be recorded in the form.

This form may be kept at the intersection, if it is adequately protected from the weather. Form 1 must be updated at the central file, however, to reflect the date and activity.

DEPARTMENT USE ONLY

County :DELAWARE

Engineering District :6-0

Department Tracking # :

Initial Submission Date :

Exhibit "C":
Signal Maintenance Organization

pennsylvania
DEPARTMENT OF TRANSPORTATION

Personnel Classifications

In order to properly maintain the traffic signal equipment covered by this applicant, the APPLICANT agrees to provide, as minimum, the following staff throughout the useful life of equipment. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Traffic Engineer - The administrative position which has prime responsibility for the proper operation of traffic signal equipment. The principal function of this position is the supervision and control of subordinate personnel and the planning of their activities to ensure adequate preventive and response maintenance programs.

Minimum Position Requirements

1. A thorough understanding of traffic signal design, installation and maintenance.
2. A working knowledge of the interaction between the following traffic characteristics: Intersection geometry, traffic flow theory, control type (fixed time, actuated, etc.), signal phasing and timing, and interconnection.
3. An ability to supervise subordinate personnel effectively in the assignment of their work.
4. Possession of a college degree in engineering, which includes course work in traffic engineering.
5. Either four years experience in the field of traffic engineering or its equivalent in graduate college work.

Signal Specialist - The individual responsible for the diagnostics and repair of all traffic signal equipment including solid state equipment.

Minimum Position Requirements

1. Extensive training and troubleshooting skills in electronics and software.
2. Ability to repair modules in the shop and to design test equipment needed to diagnose and repair a problem.
3. Ability to make design and modifications to implement or omit special functions.
4. Ability to implement a recordkeeping system to include maintenance activities, inventory control and identification of recurring problems.
5. Ability to perform all tasks required of a signal technician.

Signal Technician - Individual responsible for the operation and maintenance of traffic signals and electromechanical equipment.

Minimum Position Requirements

1. Ability to perform response maintenance on solid state equipment up to the device exchange level.
2. Capability to diagnose a vehicle loop failure and initiate corrective action.
3. Ability to tune detector amplifiers.
4. Ability to follow wiring schematics, check and set timings from plan sheet and check all field connections.
5. Ability to perform preventive maintenance on all equipment and to maintain accurate records of all work perform.

Training

The APPLICANT agrees to secure training in order to upgrade the ability of its present staff to properly perform the required maintenance functions. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191.

Budget Requirements

The APPLICANT agrees to provide, in its annual operating budget, dedicated funds which are sufficient to cover the cost of the personnel, training, contractors (if utilized) and specialized maintenance equipment which are required, by virtue of this application. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191..

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

A - Applicant's (Municipal) Contact Information

Municipal Contact's Name : Anthony Hamaday **Title :** Manager

Municipal Name : TOWNSHIP OF MARPLE

Municipal Address : 227 South Sproul Road, Broomall, Pennsylvania 19008-2397

Municipal Phone Number : 610-356-4040 **Alternative Phone Number :**

E-mail Address : ahamaday@marpletwp.com

Municipal Hours of Operation : Mon - Fri, 8:30 AM - 5:00 PM

B - Application Description

Location (*intersection*) : WEST CHESTER PIKE (SR 003) & SOUTH LAWRENCE ROAD

Traffic Control Device is : ☐ **NEW** Traffic Signal ☒ **EXISTING** Traffic Signal **(*Permit Number*) :** 63-0827

Type of Device (*select one*) ☒ Traffic Control Signal (*MUTCD Section 4D, 4E, 4G*) ☐ Flashing Beacon (*MUTCD Section 4L*) ☐ School Warning System (*MUTCD Section 7B*)

☐ Other :

Is Traffic Signal part of a system? : ☒ YES ☐ NO **System Number (*if applicable*) :** I-0097

If YES, provide locations of all signalized intersections in system.

Malin Road, Sproul Road (SR 0320), Church Rd/Berkley Rd, I-476 SB Ramps, I-476 NB Ramps, South Lawrence Road

Explain the proposed improvements :

Signalize existing unsignalized intersection at Langford Run Road, provide median opening, provide traffic adaptive system along corridor

Associated with Highway Occupancy Permit (HOP)?: ☒ YES ☐ NO **If YES, HOP Application # :** 42543

C - Maintenance and Operation Information

Maintenance and Operations are typically performed by? :

☐ Municipal Personnel ☐ Municipal Contractor ☒ Municipal Personnel & Contractor

☐ Other :

Maintenance and Operations Contact Name : Edward T. Cross **Company/Organization :** Twp Public Works

Phone # : 610.356.4040 **Alternative Phone # :** **E-mail :**

D - Attachments Listing

☒ Municipal Resolution (*required*)	☐ Location Map	☐ Traffic Volumes / Pedestrian Volumes
☐ Letter of Financial Commitment	☐ Photographs	☐ Turn Lane Analysis
☒ Traffic Signal Permit	☐ Straight Line Diagram	☐ Turn Restriction Studies
☐ Warrant Analysis	☐ Capacity Analysis	☐ Other :
☐ Crash Analysis	☐ Traffic Impact Study (TIS)	
☐ Traffic Signal Study	☐ Condition Diagram	

Application for Traffic Signal Approval

Please Type or Print all information in Blue or Black Ink

pennsylvania
DEPARTMENT OF TRANSPORTATION

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

E - Applicant (Municipal) Certification

The applicant desires to own, operate, and maintain the traffic control device in the location indicated above; and the Vehicle Code requires the approval of the Department of Transportation ("Department") before any traffic signals may be legally erected or modified. A signed Application for Traffic Signal Approval (TE-160) must be submitted in conformance with the instructions provided by the Department, and a Traffic Signal Permit must be issued, before any work can begin.

If the Department approves a traffic signal after a traffic engineering study and engineering judgment indicates the need, the traffic signal shall be installed, owned, operated, and maintained within the parameters indicated in the Vehicle Code and the Department's regulations relating to traffic signs, signals, and markings. The Department may direct appropriate alterations to the design or operation (including, but not limited to, hours of operation) of the traffic signal, or require removal of the traffic signal, if traffic conditions or other considerations necessitate alteration or removal.

All items associated with the traffic control device (geometric features, signs, signals, pavement markings, pedestrian accommodations, and other traffic control device associated items) are the applicant's responsibility. The Traffic Signal Permit will then document all of the items associated with operation of each traffic control device. The applicant, at its sole expense, shall provide the necessary inspection, maintenance, and operation activities in conformance with the Department's Publication 191 or as otherwise agreed to by the Department. The applicant shall perform the preventative and responsive maintenance requirements and recordkeeping in accordance with the exhibits specified below. If the applicant fails to provide the required inspection, maintenance, or operation services within thirty (30) days of receipt of written notice from the Department, the Department shall have the right to perform the required inspection, maintenance, or operation services in the applicant's stead and the applicant shall reimburse the Department for all costs incurred. Federal- and/or state-aid participation may be withheld on all future projects if the applicant fails to demonstrate to the Department the ability to provide all required maintenance and operation services. The applicant certifies that it has funds available and committed for the operation and maintenance of the traffic control device and that it will make available sufficient funds for all required future inspection, maintenance, and operation activities.

The applicant shall indemnify, save harmless and, defend (if requested) the Commonwealth of Pennsylvania, its agents, representatives, and employees from and against any damages recoverable under the Sovereign Immunity Act, 42 Pa. C.S. §§ 8521-8528, up to the limitations on damages under said law, arising out of any personal injury or damage to property which is finally determined by a court to be caused by or result from acts or omissions of the applicant and for which a court has held applicant, its officials, or employees to be liable. This provision shall not be construed to limit the applicant in asserting any rights or defenses. Additionally, the applicant shall include in any contracts into which it enters for maintenance, operation, or inspection of the traffic control device this same obligation to indemnify the Commonwealth and its officers, agents, and employees; and it shall require its contractor(s) to provide public liability insurance coverage, naming the Commonwealth and the applicant as additional insureds for bodily injury, including death and property damage, in the minimum amounts of $500,000 per person, $1,000,000 per occurrence, it being the intention of parties to have the contractor fully insure and indemnify the Commonwealth and the applicant.

The applicant shall comply with the study and ordinance requirements of 75 Pa. C.S. § 6109. The applicant submits this application with the intention of being legally bound.

Neither this application nor any Traffic Signal Permit creates any rights or obligations with respect to parties other than the applicant and the Department. Third parties may not rely upon any representations made by either the applicant or the Department in connection with the submission or approval of this application or any work permitted or approved that is related to this application, as regards either payment of funds or performance of any particular item of maintenance precisely as specified.

The applicant agrees to comply with the attached Exhibits:

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- Exhibit "C": Signal Maintenance Organization (Sheet 5 of 5)

Printed Municipal Contact Name : _____ **Date :** _____

Signed By : _____ **Witness or Attest :** _____

Title of Signatory : _____ **Title of Witness or Attester:** _____

DEPARTMENT USE ONLY

County :

Engineering District :

Department Tracking # :

Initial Submission Date :

Exhibit "A":

Preventative and Response Maintenance Requirements

pennsylvania
DEPARTMENT OF TRANSPORTATION

Preventive Maintenance

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Cabinet	Emergency of Final
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EQUIPMENT FAILURE	
Lamp burnout (veh. & ped.)	Final Only
Local controller	Emergency or Final
Master controller	Emergency or Final
Detector sensor	
- Loop	Emergency or Final
- Magnetometer	Emergency or Final
- Sonic	Emergency or Final
- Magnetic	Emergency or Final
- Pushbutton	Emergency or Final
Detector amplifier	Emergency or Final
Conflict monitor	Final Only
Flasher	Final Only
Time clock	Emergency or Final
Load switch/relay	Final Only
Coordination unit	Emergency or Final
Communication interface, mode	Emergency or Final
Signal cable	Final Only
Traffic Signal Communications	Final Only
Traffic Signal Systems	Final Only

DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Exhibit "B":

Recordkeeping

pennsylvania
DEPARTMENT OF TRANSPORTATION

Recordkeeping

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DEPARTMENT USE ONLY

County : DELAWARE

Engineering District : 6-0

Department Tracking # :

Initial Submission Date :

Exhibit "C":
Signal Maintenance Organization

pennsylvania
DEPARTMENT OF TRANSPORTATION

Personnel Classifications

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Traffic Engineer - The administrative position which has prime responsibility for the proper operation of traffic signal equipment. The principal function of this position is the supervision and control of subordinate personnel and the planning of their activities to ensure adequate preventive and response maintenance programs.

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1. A thorough understanding of traffic signal design, installation and maintenance.
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5. Either four years experience in the field of traffic engineering or its equivalent in graduate college work.

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Minimum Position Requirements

1. Extensive training and troubleshooting skills in electronics and software.
2. Ability to repair modules in the shop and to design test equipment needed to diagnose and repair a problem.
3. Ability to make design and modifications to implement or omit special functions.
4. Ability to implement a recordkeeping system to include maintenance activities, inventory control and identification of recurring problems.
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Budget Requirements

The APPLICANT agrees to provide, in its annual operating budget, dedicated funds which are sufficient to cover the cost of the personnel, training, contractors (if utilized) and specialized maintenance equipment which are required, by virtue of this application. The APPLICANT agrees to abide by all guidance provided in PA DOT Publication 191..