

# **Exhibit A-2A.b**

## **APPENDIX B TRAFFIC IMPACT STUDY**



**F. Tavani and Associates, Inc.**  
*Traffic Engineering and Planning*

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25 August 2020

Charlie Houder  
Haverford Properties  
551 W. Lancaster Avenue, SU 307  
Haverford, PA 19041

*VIA EMAIL ONLY*

**RE: Traffic Engineering Investigations of  
Strafford Ave 41-unit Residential TH Site  
Radnor Township, Delaware County, PA**

**FTA Job #219-011**

Dear Mr. Houder:

F. Tavani and Associates, Inc. (FTA) has conducted traffic engineering investigations for the above-referenced project in Strafford. This report has been prepared in accordance with Radnor code requirements and follows the recommended outline as identified in said ordinance.

#### **GENERAL SITE DESCRIPTION**

This study considers the traffic impact of a proposed townhouse community of 41 units. The housing is proposed to be for sale and will feature a mix of 3 and 4 bedrooms. The housing is proposed to be market-rate and not age-restricted. The process of entitlements, construction, and occupancy is expected to take 3-5 years. The site is immediately surrounded by other residential properties and the Eagle Village Shopping Center. Beyond them, there is a mix of office and retail buildings within a 1 mile radius of the site. Ample mass transit opportunities are also within a short distance of the site.

The site is located on the west side of Strafford Avenue, north of Eagle Road and is known as the Hamilton Estate. The site is presently developed with some existing housing, namely 6 total dwellings.

The site location and surrounding area are presented in figures which are attached to the end of this report, namely **Figure 1** and **Figure 2**. A reduced version of recent site plans for the project is featured in **Figure 3**. There are no other known approved land development projects in the vicinity of the site.

Note that technical appendices are provided following the figures. **Appendix A** is reserved for future project correspondence. Photodocumentation of the study area / surrounding intersections is provided in **Appendix B**.

#### **TRANSPORTATION FACILITIES DESCRIPTION**

The site is surrounded on two sides by existing, two-way, one-lane-per-direction, public roadways, namely Strafford Avenue and Eagle Road. The roadways generally do not feature on-street public parking. Posted speed limit signs are present in the vicinity of the site along both Strafford Avenue and Eagle Road, where the posted speed limit is 25 mph. There are limited sidewalk facilities in the study

area. The major intersections closest to the site are all-way stop-controlled intersections with no painted crosswalks. There are existing SEPTA mass transit opportunities near the site including bus route 106 and a regional rail station (Strafford), each of which are within approximately one half mile of the site. No traffic signals (save for a flashing beacon at the all-way stop-controlled intersection of Strafford Avenue and Eagle Road) exist or are proposed in the immediate vicinity of the site. More site driveway and surrounding intersection details can be seen in photodocumentation log as provided in **Appendix B**.

The site has 41 units and is proposed to feature internal roadways, 2 site driveways (both on Strafford Avenue), garage/driveway parking, and visitor parking (approximately 11 defined spaces). Sidewalks are also proposed.

There are no known planned roadway improvements in the vicinity of the site. None of the streets surrounding the site are “SR”s (state roadways) – instead they are all local roadways. Eagle Road is a “G” roadway, meaning it is not an SR but is eligible for liquid fuels funding and PennDOT does maintain traffic count data along it, as seen in **Appendix C**.

## **EXISTING TRAFFIC CONDITIONS**

FTA conducted traffic counts at the intersections of:

- Strafford Avenue and Eagle Road,
- Strafford Avenue and Grant Lane/Hedgerow Lane, and
- Eagle Road and N Wayne Avenue.

The counts were conducted on Thursday, 16 May 2019 from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. The counts were conducted during the school year, in fair weather, and on a typical weekday. Existing peak hours of 8:00 AM to 9:00 AM and 4:30 PM to 5:30 PM were selected for study based on a system-wide peak hour investigation. The corresponding existing peak hour traffic volumes are plotted and seen in **Figure 4**. Raw traffic volumes are attached in **Appendix D**, as is a spreadsheet which describes the system peak investigation.

With existing peak hour volumes established, present-day “levels of service” can be assessed. Level of service (or LOS) is a descriptive mechanism which is employed by traffic engineers to relate quality of traffic flow to both a letter grade and estimate of delay in seconds per vehicle. LOS results are assessed for traffic which must stop or yield to other traffic. Free-flowing traffic theoretically has no delay, and therefore no LOS rating. Existing levels of service were determined using *Synchro version 10* software, with HCS2010-format outputs selecting for performance reporting purposes. A **LOS Comparison Matrix** was prepared and is attached to the end of this report. The matrix summarizes AM and PM peak hour performance for existing and future (see next section) conditions for all intersections. As shown, existing levels of service are all LOS A and B, with all calculated delays being very low (10 seconds or less in most cases – an acceptable condition). No congestion locations (LOS E/F) are noted.

## **TRANSPORTATION IMPACT OF THE DEVELOPMENT**

Site traffic was estimated using the Institute of Transportation Engineers (ITE) publication, Trip Generation, 10<sup>th</sup> edition. ITE website trip generation outputs are attached and provided in **Appendix E**. Raw trip generation could have been modified to reflect how this site is located in a setting which is within walking distance of several businesses as well as SEPTA bus route 106 plus the Strafford train station, though **no such multimodal credits were taken**. Instead, *all* site traffic was assigned (trip distributed) to the surrounding roadway network in accordance with existing traffic patterns as well as an understanding of

existing road network connectivity, current traffic/congestion patterns, and relative locations of major highway interchanges (Interstates 476, 76, 202, and 422 as well as Business Route 30). The assignments are summarized as follows:

- 30% to/from Routes 202 & 422 via Strafford Ave to Old Eagle School Rd;
- 30% to/from Routes 476 & 76 via Eagle Rd to King of Prussia Rd;
- 15% to/from Business Rt 30 West via Eagle Rd and Strafford Ave;
- 15% to/from Business Rt 30 East via Eagle Rd and Strafford Ave, West Ave., and/or Banbury Way; &
- 10% to/from Conestoga Road via Eagle Road.

The trip distribution model for the community is shown in **Figure 5** and the resultant assignment of new, site-generated, vehicular peak hour traffic is shown in **Figure 6**. A site trip generation summary table follows below. Note that a credit for the previously-mentioned 6 existing dwelling units was applied to the trip generation (net new 35 townhomes)

**TABLE 1  
 PROJECTED VEHICULAR TRIP GENERATION**

| <b>AM PEAK HOUR</b> |                   |                     | <b>PM PEAK HOUR</b> |                   |                     |
|---------------------|-------------------|---------------------|---------------------|-------------------|---------------------|
| <b><u>IN</u></b>    | <b><u>OUT</u></b> | <b><u>TOTAL</u></b> | <b><u>IN</u></b>    | <b><u>OUT</u></b> | <b><u>TOTAL</u></b> |
| 4                   | 14                | 18                  | 14                  | 9                 | 23                  |

Average daily site traffic was also calculated and determined to be approximately 250 trips for the proposed community. See **Appendix E** for more details.

**ANALYSIS OF TRANSPORTATION IMPACT**

Future traffic conditions are a function of three components: (1) existing traffic volumes, (2) additional traffic due to general background growth as well as other known approved developments in the immediate proximity of the site, and (3) site traffic.

As mentioned earlier, there are no other known approved land development projects in the vicinity of the site. Regarding background growth, the currently promulgated background growth rate for Delaware County is 0.00% per year as reported by PennDOT. This means that future ‘no build’ traffic volumes and levels of service are identical to existing traffic volumes and levels of service.

The projected future ‘build’ (no build plus site traffic) peak hour volumes are shown in **Figure 7**. The related projected levels of service are once shown in **LOS Comparison Matrix**. As shown projected ‘build’ levels of service once again remain essentially the same as they are today, and are all LOS B or better. The impact of site traffic is no added delay at all intersections/turning movements (i.e, the impact of site traffic never amounts to *any* added delay at *any* impacted turning movement), and this again is while taking no credits for multi-modalism. Even with this conservative approach, no congestion locations (LOS E/F) are noted.

No road improvements are necessary to offset the impact of added site traffic. No proposed site driveway will feature traffic volumes which warrant the installation of a traffic signal. The acceptable operation of each site driveway (LOS A and B) in unsignalized state underscores this conclusion. Level of service worksheets are provided in **Appendix F**.

## AUXILIARY LANE ANALYSIS

The need for new auxiliary left- and right-turn lanes at the site driveways was investigated. Investigations were based on PennDOT Strike Off Letter 560-08-4 as well as PennDOT *Publication 46* Chapter 11 page 11-46 (“Turn Lane Warrants”) using PennDOT-provided worksheets, and focusing on the highest peak hour. Investigations conclude that new auxiliary left- and right-turn lanes are not warranted at the site driveways. More details are provided in **Appendix G**.

## CONCLUSIONS

As mentioned earlier, a **LOS Comparison Matrix** is provided to afford a simple means to review and assess site traffic impact in the study area. In locations where levels of service are not forecasted to change from one scenario to the next (i.e., from Existing to No Build, or from No Build to Build), hyphens are used. As shown, there are many instances in which the impact of site traffic results in essentially no measurable change in traffic performance and the underlying traffic performance is already acceptable, and with very low delays.

Other key conclusions are as follows:

- The study area is presently well-served by transit opportunities.
- There are no streets or intersections operating below LOS C under existing or future conditions.
- Both site driveways are forecasted to operate at LOS A/B during both peak hours, and for all turning movements.
- No site driveway requires new left-turn or right-turn auxiliary lanes per investigations using standard PennDOT tools.
- The foregoing conclusions were reached taking no credits for walking or transit, even though at least some of either/both are likely.

I hope this has been helpful. Please let me know if I can answer any questions.

Thank you,

F. TAVANI AND ASSOCIATES

  
FRANK TAVANI, P.E., PTOE  
Principal



attachments

cc: George Broseman, Esq.  
Rob Lambert, P.E.

**LEVEL OF SERVICE AND EXPECTED DELAY  
FOR UNSIGNALIZED INTERSECTIONS\***

| <u>LEVEL OF SERVICE</u> | <u>CONTROL DELAY<br/>PER VEHICLE (SECONDS)</u> |
|-------------------------|--|
| a                       | 0 to 10.0                                      |
| b                       | 10.1 to 15.0                                   |
| c                       | 15.1 to 25.0                                   |
| d                       | 25.1 to 35.0                                   |
| e                       | 35.1 to 50.0                                   |
| f                       | Over 50.0                                      |

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\* Transportation Research Board's Highway Capacity Manual

**LEVEL OF SERVICE AND EXPECTED DELAY  
FOR SIGNALIZED INTERSECTIONS\***

| <u>LEVEL OF SERVICE</u> | <u>DESCRIPTION</u>   | <u>CONTROL DELAY PER VEHICLE (IN SECONDS)</u> |
|-------------------------|--|---|
| A                       | Very short delay, good progression; most vehicles do not stop at intersection.   | $\leq 10.0$                                   |
| B                       | Generally good signal progression and/or short cycle length; more vehicles stop at intersection than Level of Service A.   | 10.1 to 20.0                                  |
| C                       | Fair progression and/or longer cycle length; significant number of vehicles stop at intersection.  | 20.1 to 35.0                                  |
| D                       | Congestion becomes noticeable; individual cycle failures; longer delays from unfavorable progression, long cycle length, or high volume/capacity ratios; most vehicles stop at intersection.   | 35.1 to 55.0                                  |
| E                       | Usually considered <u>limit of acceptable delay</u> indication of poor progression, long cycle length, or high volume/capacity ratio; frequent individual cycle failures.  | 55.1 to 80.0                                  |
| F                       | Could be considered excessive delay in some areas, frequently an indication of saturation (i.e., arrival flow exceeds capacity), or very long cycle lengths with minimal side street "green" time. Capacity is not necessarily exceeded under this level of service. | $> 80.0$                                      |

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\* Transportation Research Board's Highway Capacity Manual

## LEVEL OF SERVICE COMPARISON TABLES

| 1. Strafford Ave & Grant Ln / Hedgerow Ln |          |                 |                 |              |                 |                 |              |
|---|----------|-----------------|-----------------|--------------|-----------------|-----------------|--------------|
| Direction                                 | Movement | AM Peak Hour    |                 |              | PM Peak Hour    |                 |              |
| Strafford Ave                             |          | Existing (2019) | No Build (2024) | Build (2024) | Existing (2019) | No Build (2024) | Build (2024) |
| Eastbound                                 | LTR      | A 8             | --              | --           | A 9             | --              | --           |
| Westbound                                 | LTR      | A 9             | --              | --           | A 8             | --              | A 9          |
| Grant Ln / Hedgerow Ln                    |          |                 |                 |              |                 |                 |              |
| Northbound                                | LTR      | A 8             | --              | --           | A 7             | --              | --           |
| Southbound                                | LTR      | A 8             | --              | --           | A 7             | --              | --           |
| <b>OVERALL:</b>                           |          | A 9             | --              | --           | A 9             | --              | --           |

Control Type: AWSC

| 2. Strafford Ave & Eagle Ave |          |                 |                 |              |                 |                 |              |
|------------------------------|----------|-----------------|-----------------|--------------|-----------------|-----------------|--------------|
| Direction                    | Movement | AM Peak Hour    |                 |              | PM Peak Hour    |                 |              |
| Strafford Ave                |          | Existing (2019) | No Build (2024) | Build (2024) | Existing (2019) | No Build (2024) | Build (2024) |
| Eastbound                    | LTR      | A 10            | --              | --           | B 11            | --              | --           |
| Westbound                    | LTR      | A 9             | --              | --           | B 10            | --              | --           |
| Eagle Ave                    |          |                 |                 |              |                 |                 |              |
| Northbound                   | LTR      | A 9             | --              | --           | B 11            | --              | --           |
| Southbound                   | LTR      | A 10            | --              | --           | B 11            | --              | --           |
| <b>OVERALL:</b>              |          | A 9             | --              | A 10         | B 11            | --              | --           |

Control Type: AWSC

| 3. N Wayne Ave & Eagle Ave |          |                 |                 |              |                 |                 |              |
|----------------------------|----------|-----------------|-----------------|--------------|-----------------|-----------------|--------------|
| Direction                  | Movement | AM Peak Hour    |                 |              | PM Peak Hour    |                 |              |
| N Wayne Ave                |          | Existing (2019) | No Build (2024) | Build (2024) | Existing (2019) | No Build (2024) | Build (2024) |
| Eastbound                  | LTR      | A 4             | --              | --           | A 5             | --              | --           |
| Westbound                  | LTR      | A 3             | --              | --           | A 5             | --              | --           |
| Eagle Ave                  |          |                 |                 |              |                 |                 |              |
| Northbound                 | LTR      | B 20            | --              | --           | B 20            | --              | --           |
| Southbound                 | LTR      | B 19            | --              | --           | B 20            | --              | --           |
| <b>OVERALL:</b>            |          | A 8             | --              | --           | B 10            | --              | --           |

Control Type: Signal

| 4. Strafford Ave & TH Site Drive N |          |                 |                 |              |                 |                 |              |
|------------------------------------|----------|-----------------|-----------------|--------------|-----------------|-----------------|--------------|
| Direction                          | Movement | AM Peak Hour    |                 |              | PM Peak Hour    |                 |              |
| TH Site Drive                      |          | Existing (2019) | No Build (2024) | Build (2024) | Existing (2019) | No Build (2024) | Build (2024) |
| Eastbound                          | LR       |                 |                 | A 9          |                 |                 | B 10         |
| Eagle Ave                          |          |                 |                 |              |                 |                 |              |
| Northbound                         | L        |                 |                 | A 9          |                 |                 | A 9          |
| <b>OVERALL:</b>                    |          |                 |                 | A 1          |                 |                 | A 1          |

Control Type: TWSC

| 5. Strafford Ave & SFDU Site Drive S |          |                 |                 |              |                 |                 |              |
|--------------------------------------|----------|-----------------|-----------------|--------------|-----------------|-----------------|--------------|
| Direction                            | Movement | AM Peak Hour    |                 |              | PM Peak Hour    |                 |              |
| SFDU Site Drive                      |          | Existing (2019) | No Build (2024) | Build (2024) | Existing (2019) | No Build (2024) | Build (2024) |
| Eastbound                            | LR       |                 |                 | A 10         |                 |                 | A 10         |
| Eagle Ave                            |          |                 |                 |              |                 |                 |              |
| Northbound                           | L        |                 |                 | A 9          |                 |                 | A 9          |
| <b>OVERALL:</b>                      |          |                 |                 | A 1          |                 |                 | A 1          |

Control Type: TWSC

Future No Build volumes are identical to Existing volumes, so LOS are also identical

-- indicates no change from the previous scenario

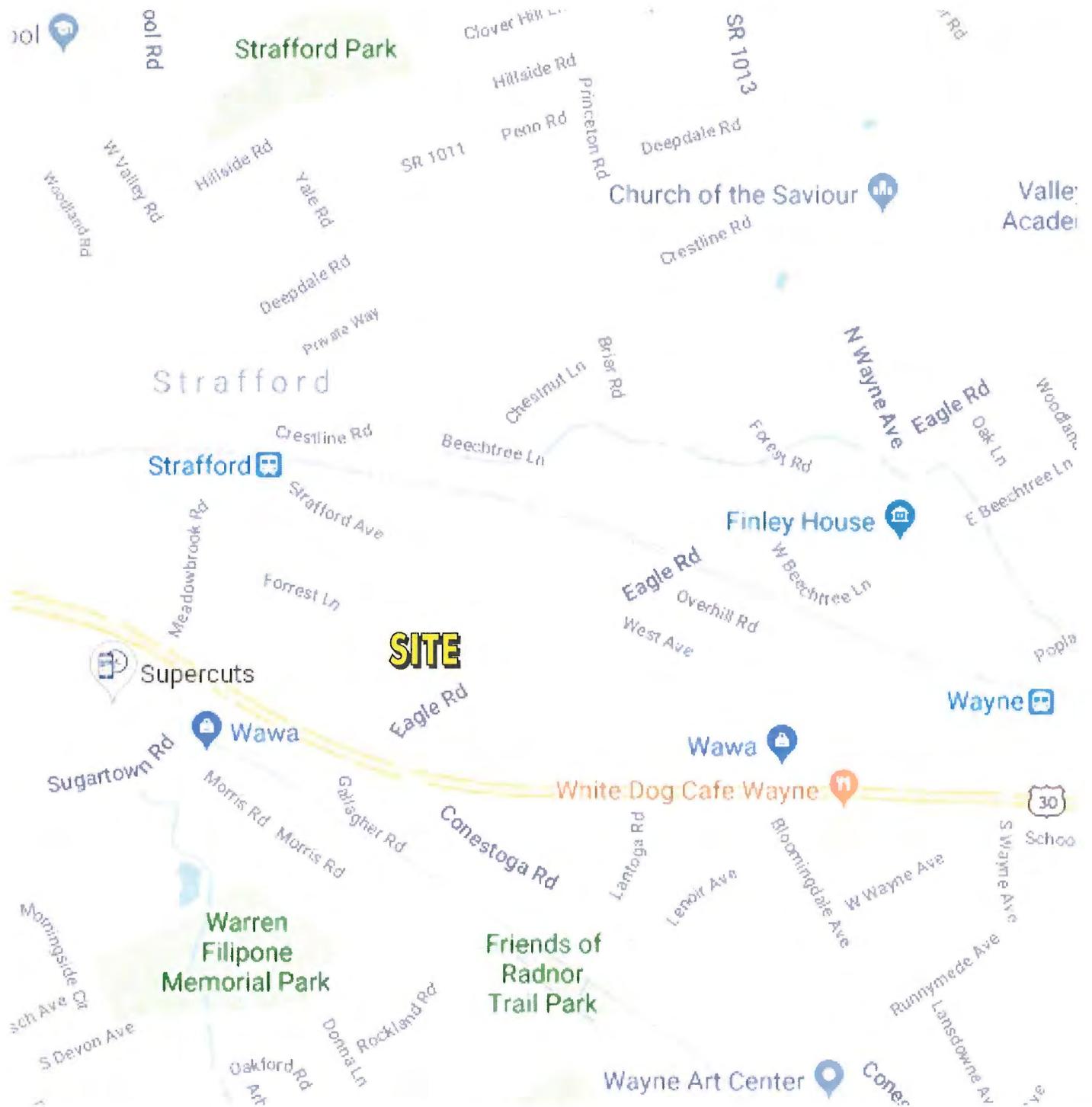


# Site and Surrounding Area – Map View

**Strafford Avenue Residential - Townhouses**  
**Radnor Township,**  
**Delaware County, Pennsylvania**



April 2020\*



\* Figure preparation date. See report for data collection date(s).

## Site and Surrounding Area – Aerial View

**Strafford Avenue Residential - Townhouses**  
**Radnor Township,**  
**Delaware County, Pennsylvania**

April 2020

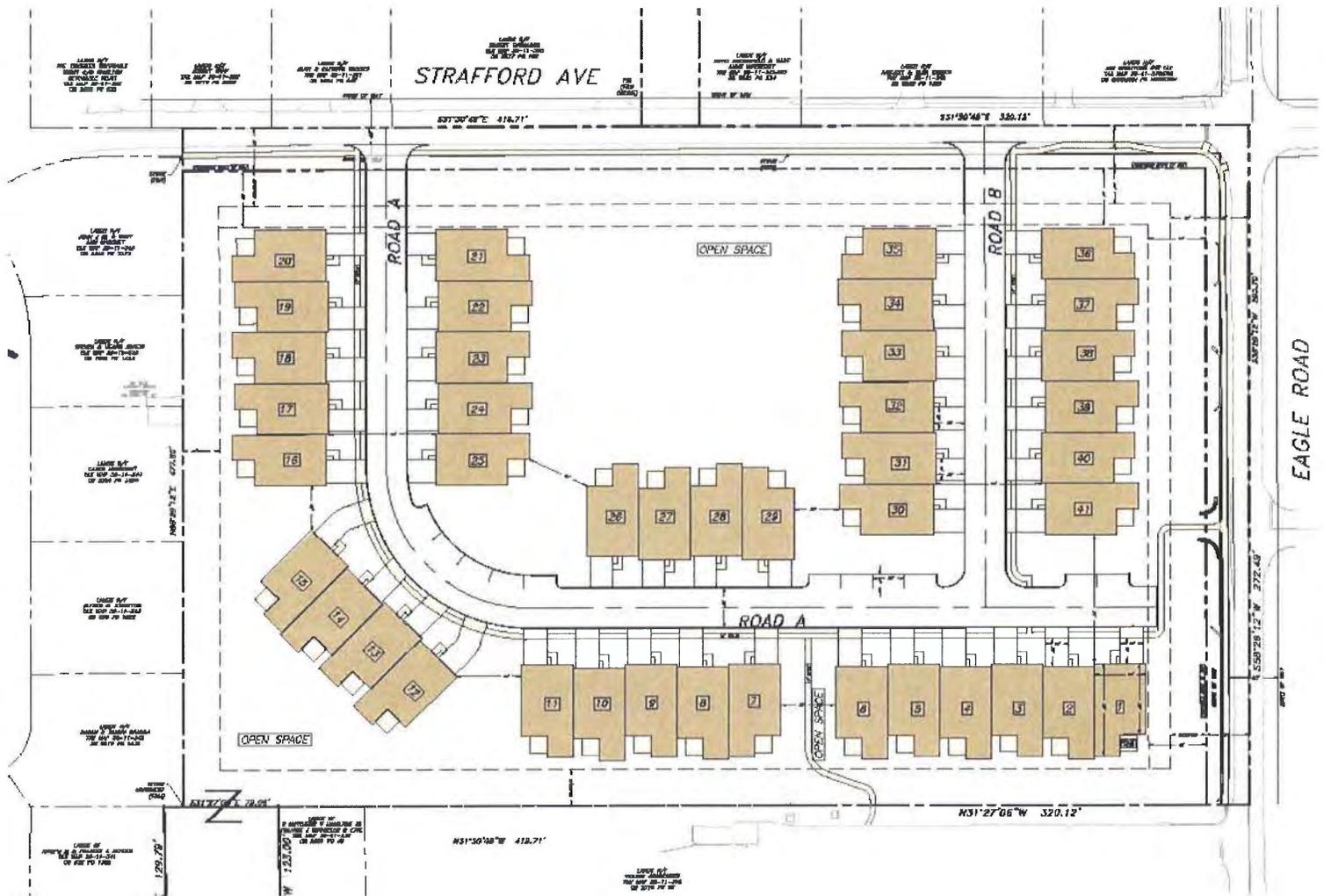




# Site Plan Excerpt

Strafford Avenue Residential - Townhouses  
Radnor Township,  
Delaware County, Pennsylvania

August 2020

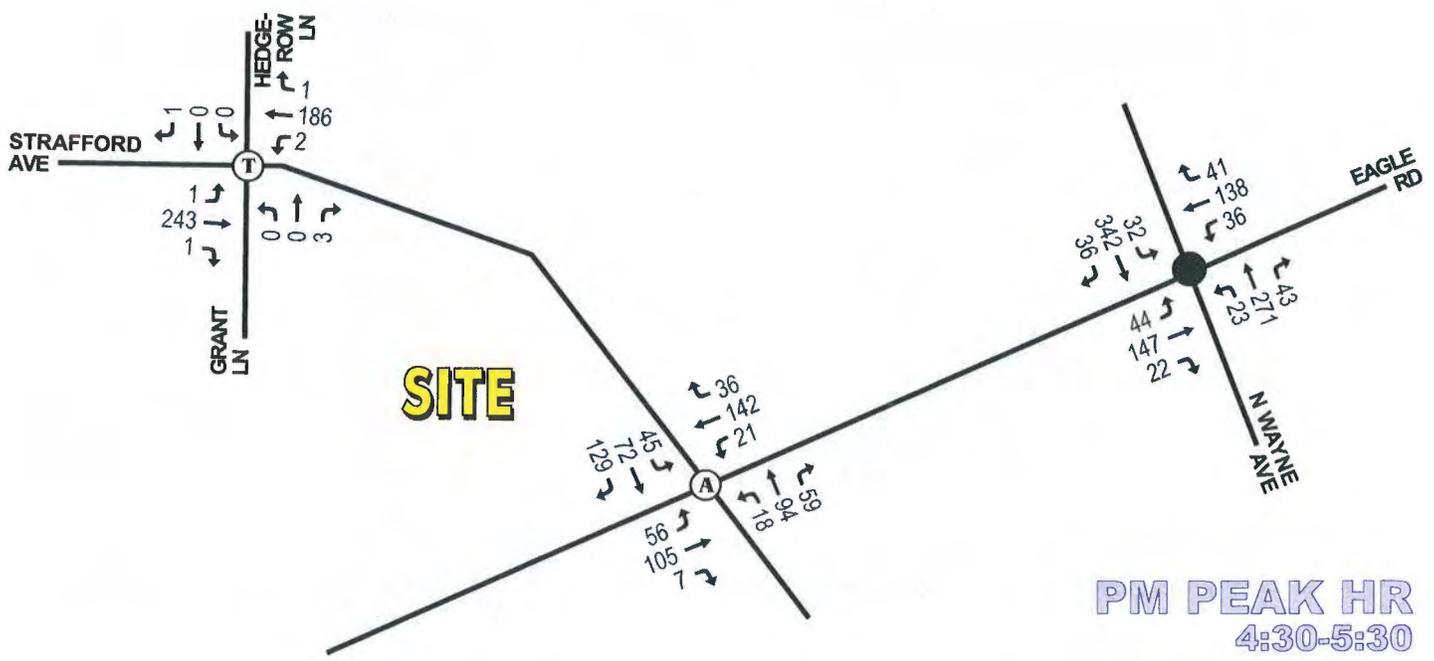
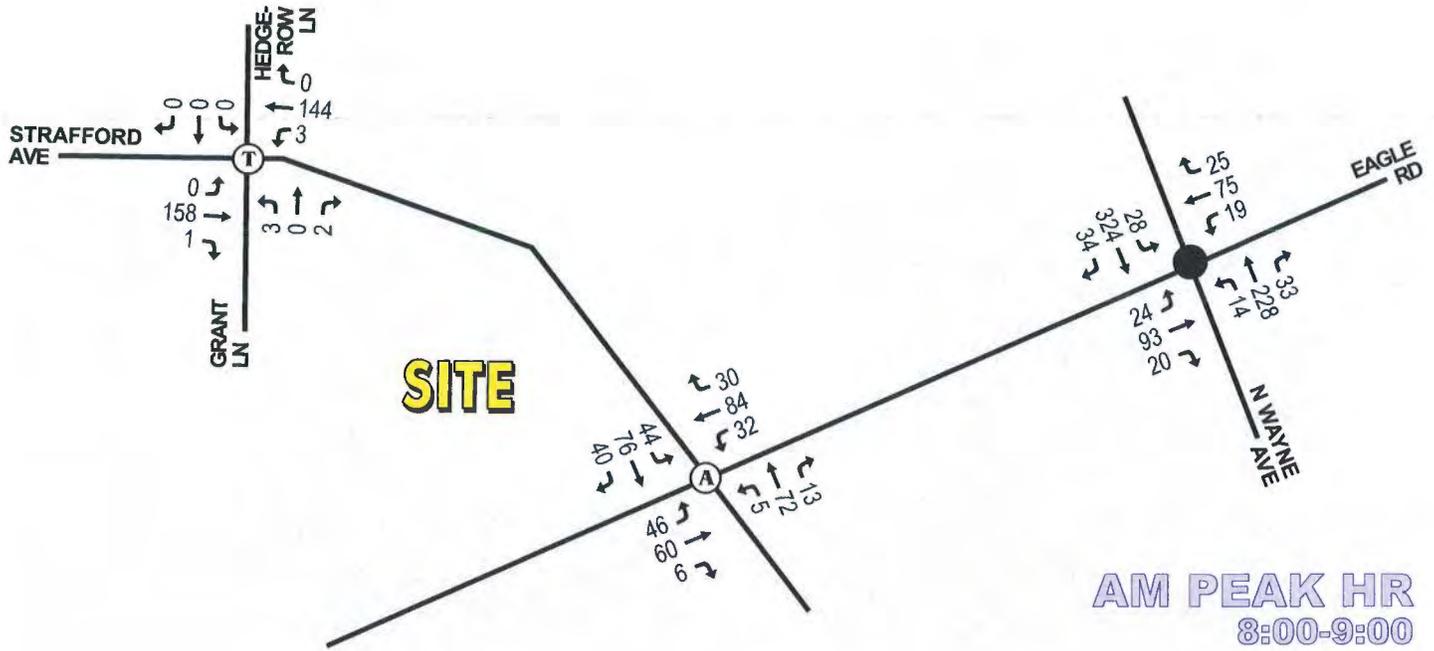


# Existing (2019) Peak Hour Traffic Volumes

Strafford Avenue Residential - Townhouses  
 Radnor Township,  
 Delaware County, Pennsylvania



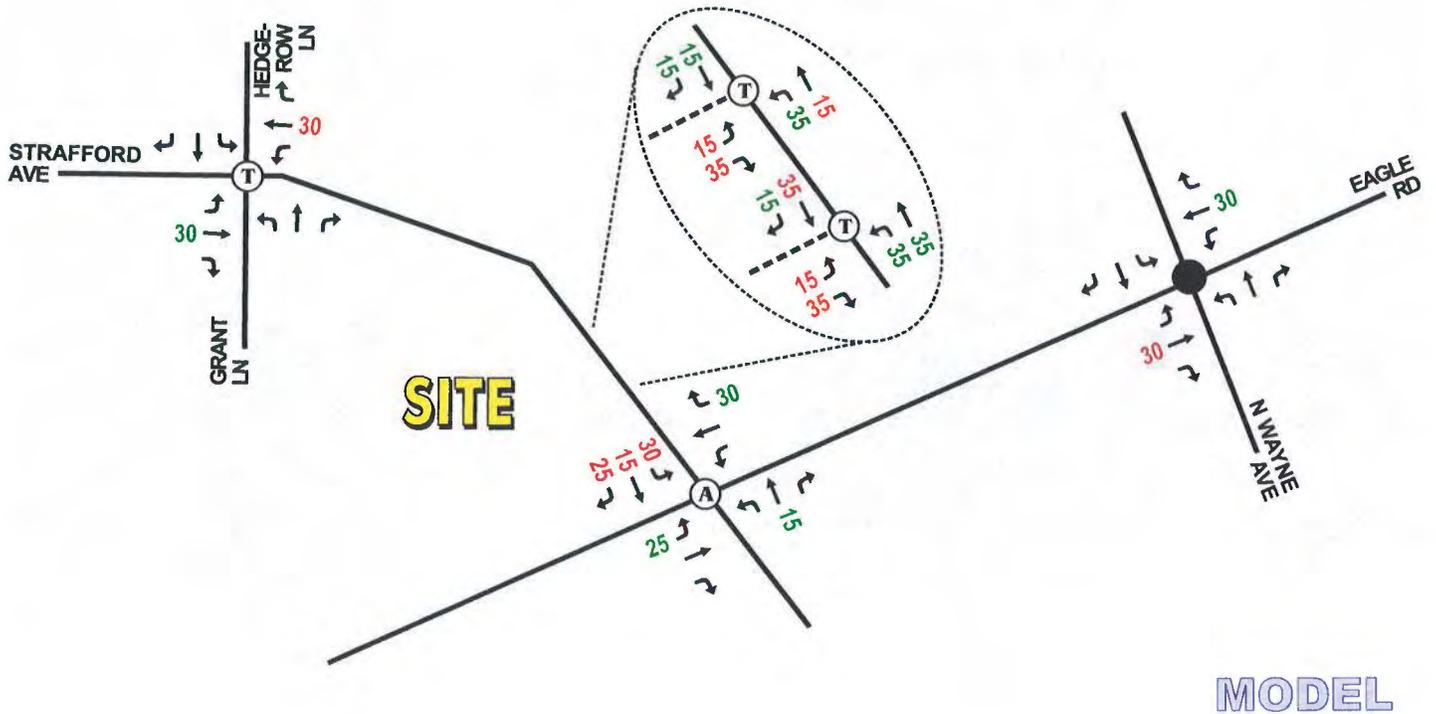
April 2020



# Site Peak Hour Traffic – Model

Strafford Avenue Residential - Townhouses  
Radnor Township,  
Delaware County, Pennsylvania

April 2020

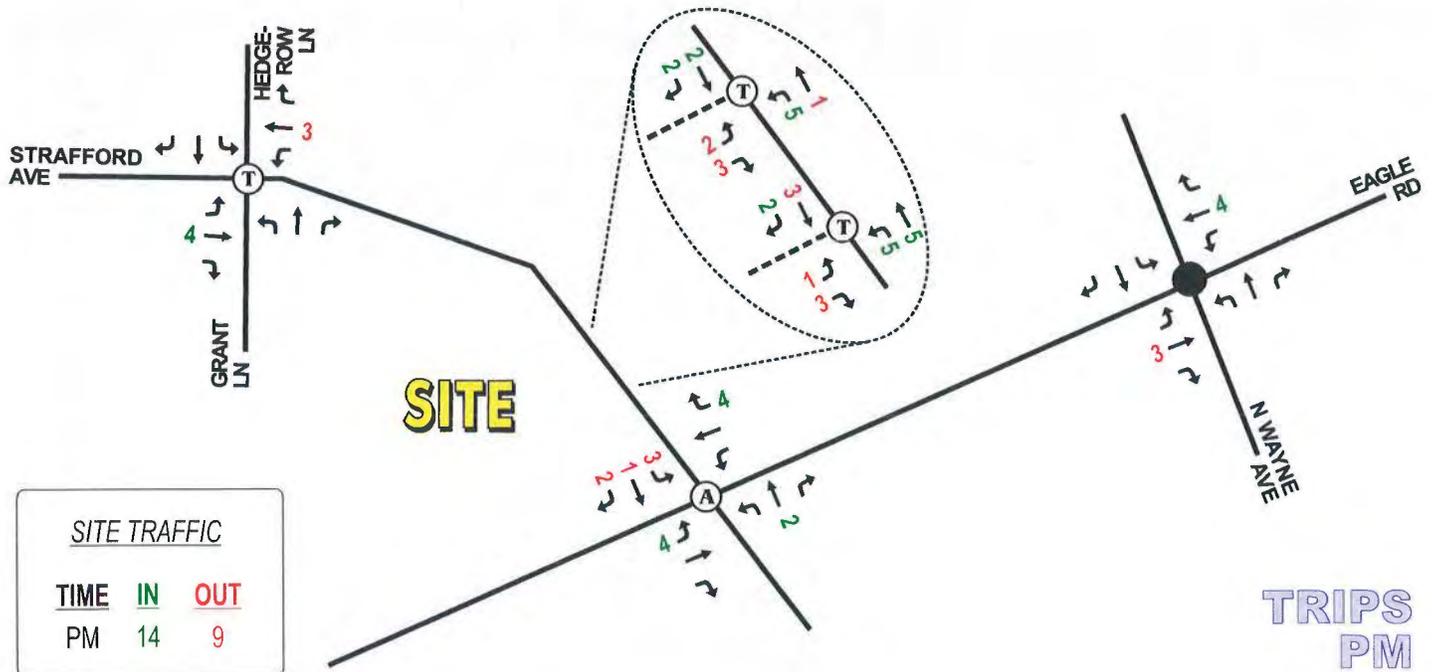
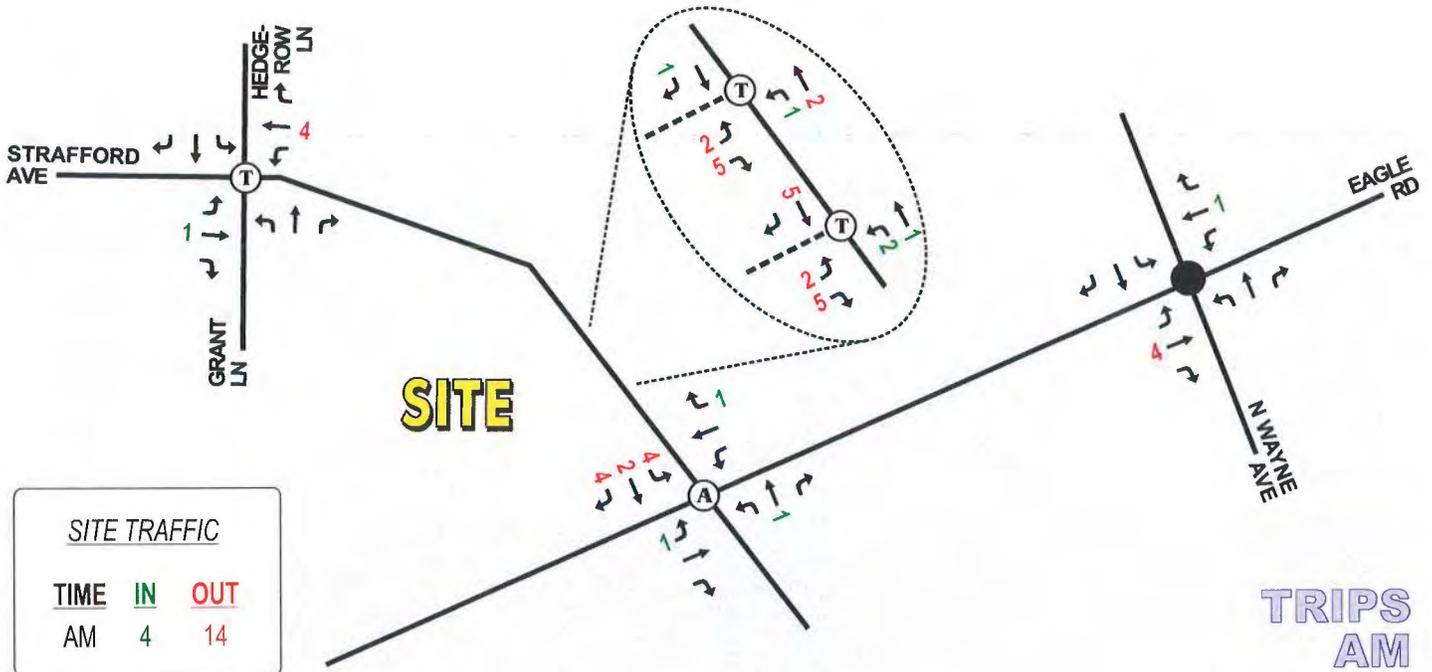


MODEL

# Site Peak Hour Traffic – Volumes

**Strafford Avenue Residential - Townhouses**  
Radnor Township,  
Delaware County, Pennsylvania

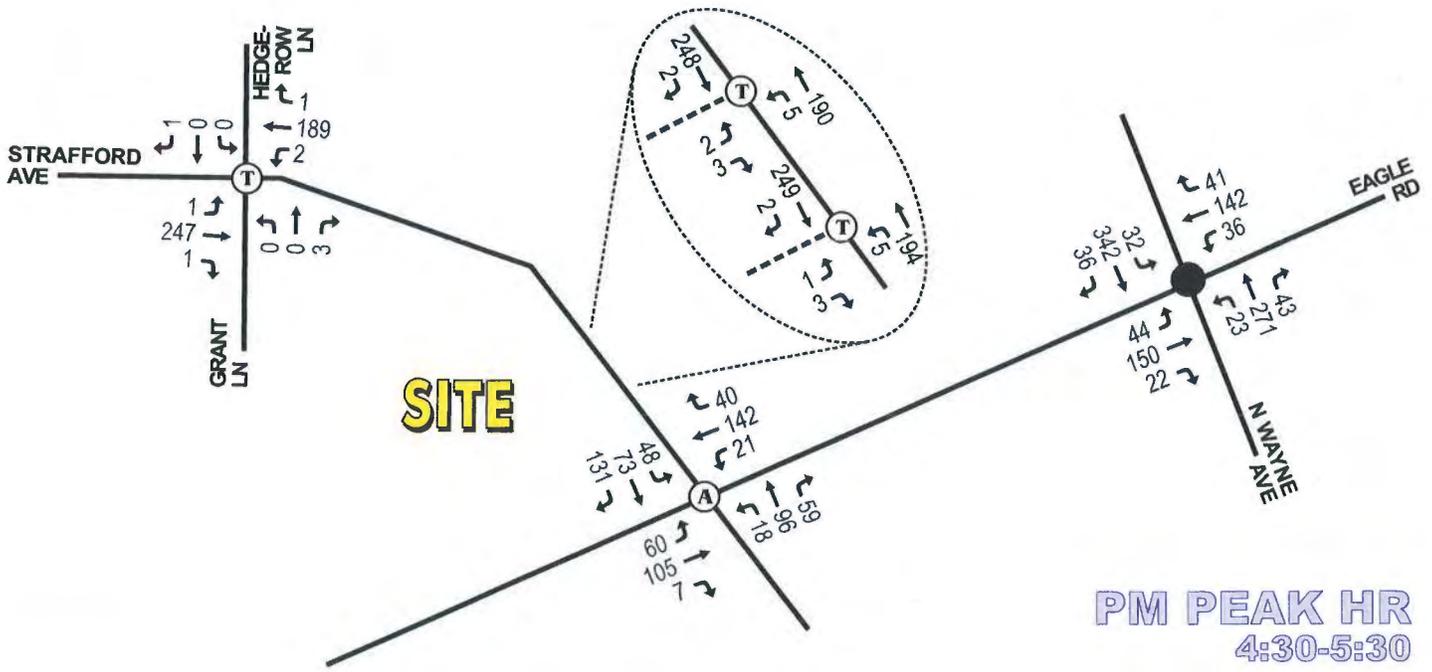
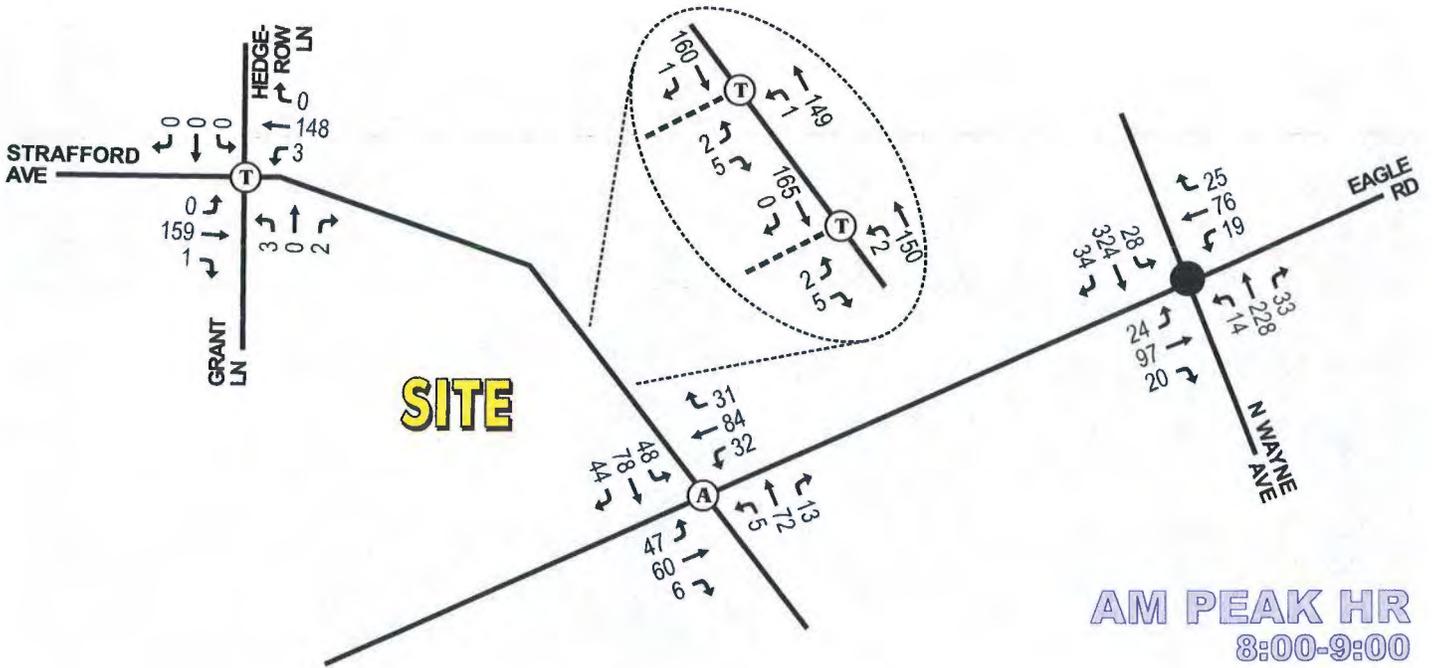
April 2020



# Future (2024) Build Peak Hour Traffic Volumes

Strafford Avenue Residential - Townhouses  
Radnor Township,  
Delaware County, Pennsylvania

April 2020



# **APPENDIX A**

*Correspondence*

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# **APPENDIX B**

*Photodocumentation*

Job #: 219-011

Road name (# of pages)

1. Eagle Road & Strafford Road (3)
2. Strafford Avenue & Grant Lane/Hedgerow Lane (3)
3. Eagle Road & Wayne Avenue (3)



Aerial image of intersection



Photo # 1 - Description: Eastbound Strafford Road



Photo # 2 - Description: Westbound Strafford Road



Photo # 3 - Description: Northbound Eagle Road

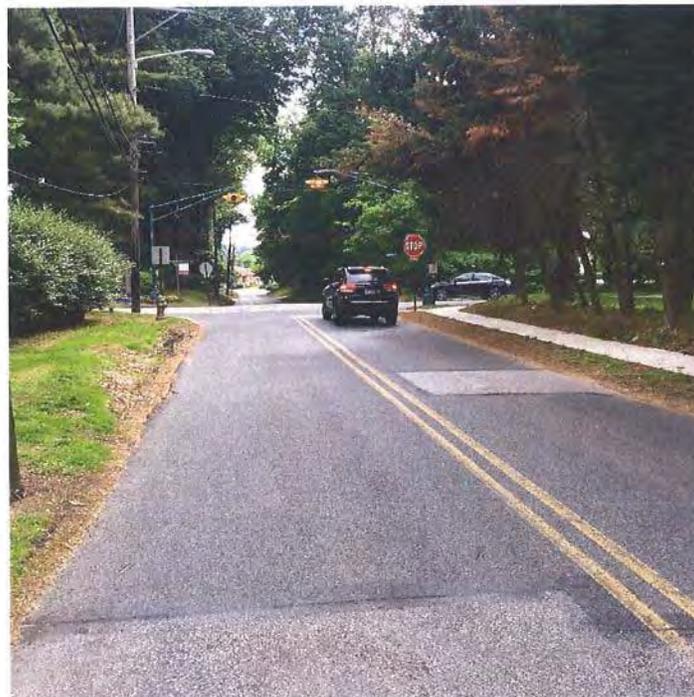
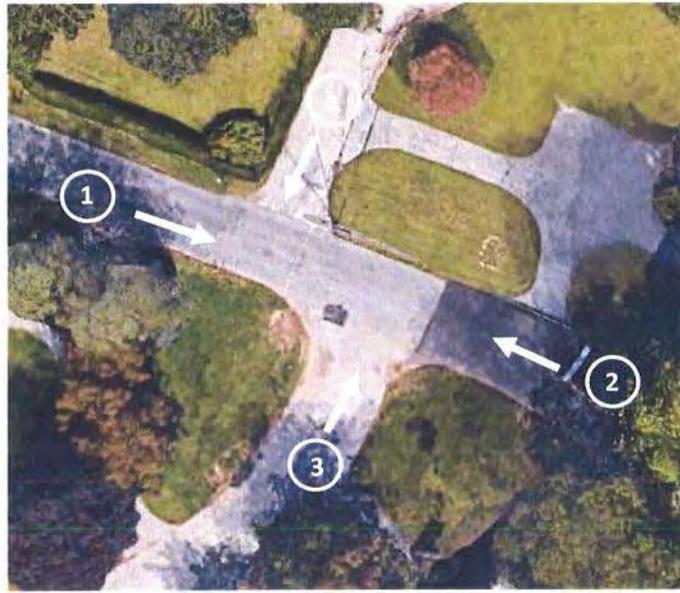


Photo # 4 - Description: Southbound Eagle Road



Aerial image of intersection



Photo # 1 - Description: Eastbound Strafford Road



Photo # 2 - Description: Westbound Strafford Road



Photo # 3 - Description: Northbound Grant Lane



Photo # 4 - Description: Southbound Hedgerow Lane



Aerial image of intersection



Photo # 1 - Description: Eastbound Wayne Avenue

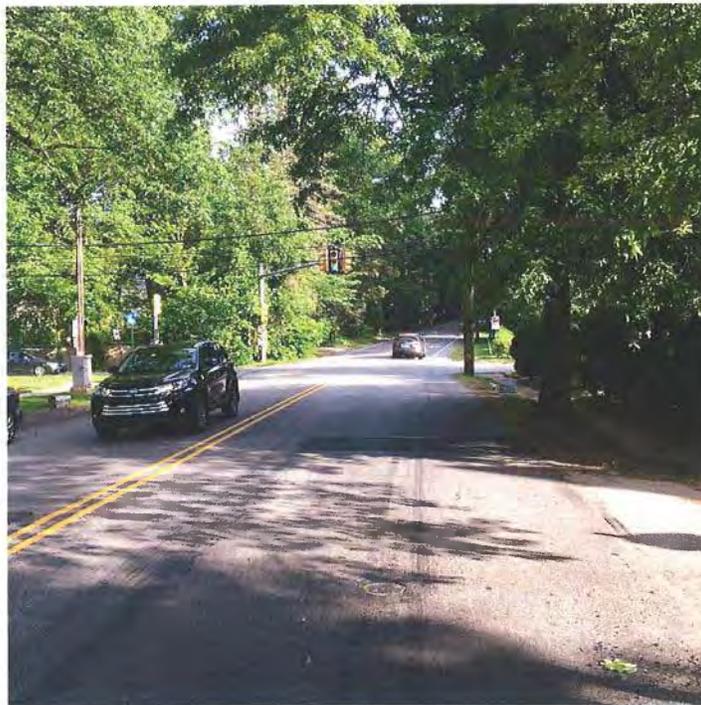


Photo # 2 - Description: Westbound Wayne Avenue



Photo # 3 - Description: Northbound Eagle Road

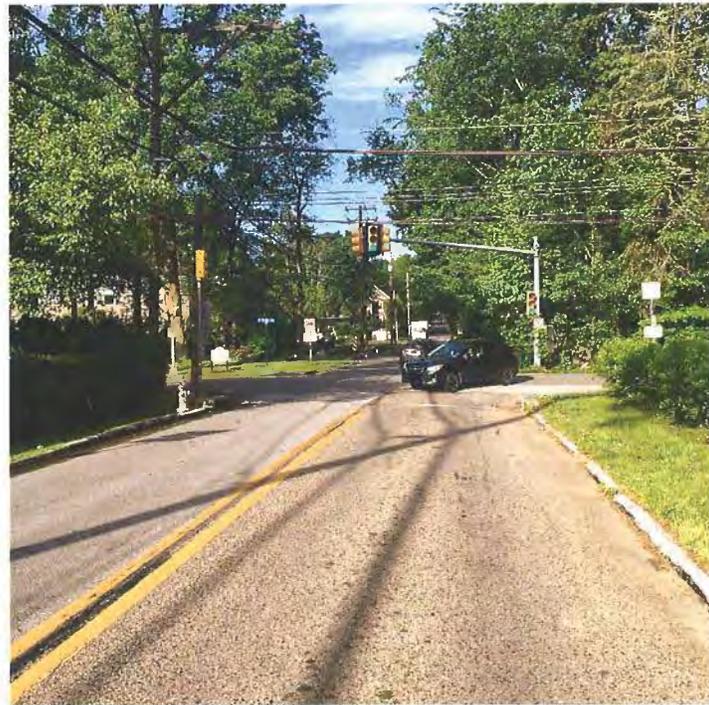
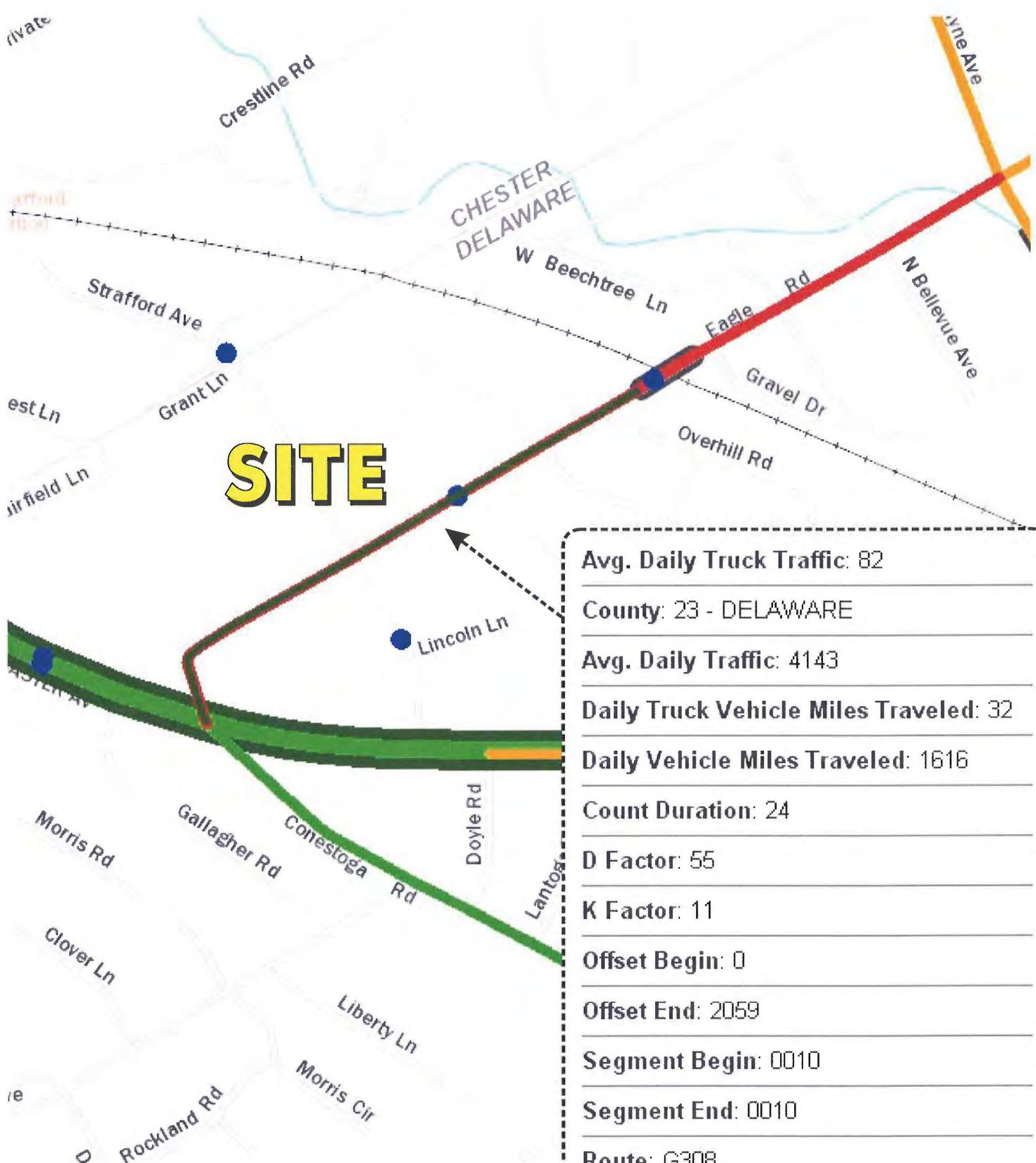


Photo # 4 - Description: Southbound Eagle Road



**SITE**

|   |
|---|
| <b>Avg. Daily Truck Traffic:</b> 82   |
| <b>County:</b> 23 - DELAWARE  |
| <b>Avg. Daily Traffic:</b> 4143   |
| <b>Daily Truck Vehicle Miles Traveled:</b> 32                                       |
| <b>Daily Vehicle Miles Traveled:</b> 1616   |
| <b>Count Duration:</b> 24   |
| <b>D Factor:</b> 55   |
| <b>K Factor:</b> 11   |
| <b>Offset Begin:</b> 0  |
| <b>Offset End:</b> 2059   |
| <b>Segment Begin:</b> 0010  |
| <b>Segment End:</b> 0010  |
| <b>Route:</b> G308  |
| <b>Traffic Pattern Group:</b> 05 - URBAN - MINOR ARTERIALS, COLLECTORS, LOCAL ROADS |
| <b>Truck Percent:</b> 2   |

# SITE



-  INTERSTATE HIGHWAYS (1, 11)
-  OTHER FREEWAYS AND EXPRESSWAYS (12)
-  OTHER PRINCIPAL ARTERIAL HIGHWAYS (2, 14)
-  MINOR ARTERIALS (6, 16)
-  URBAN COLLECTOR OR RURAL MAJOR COLLECTOR (7, 17)
-  RURAL MINOR COLLECTOR (8)

# **APPENDIX E**

*Trip Generation, Background Growth  
& Other Developments*

| Growth Factors for August 2018 to July 2019 |                  |                  |                      |                      |
|---|------------------|------------------|----------------------|----------------------|
| County                                      | Urban Interstate | Rural Interstate | Urban Non-Interstate | Rural Non-Interstate |
| ADAMS                                       | *                | *                | 0.98                 | 0.75                 |
| ALLEGHENY                                   | 0.86             | 2.18             | 0.00                 | 0.38                 |
| ARMSTRONG                                   | 0.85             | *                | 0.00                 | 0.38                 |
| BEAVER                                      | 0.80             | 1.96             | 0.00                 | 0.35                 |
| BEDFORD                                     | *                | 2.13             | 0.00                 | 0.44                 |
| BERKS                                       | 1.16             | 2.43             | 0.26                 | 0.58                 |
| BLAIR                                       | 0.81             | 1.94             | 0.00                 | 0.37                 |
| BRADFORD                                    | 1.14             | *                | 0.07                 | 0.51                 |
| BUCKS                                       | 1.36             | 2.33             | 0.60                 | 0.61                 |
| BUTLER                                      | 1.79             | 2.75             | 0.71                 | 0.76                 |
| CAMBRIA                                     | 0.40             | *                | 0.00                 | 0.19                 |
| CAMERON                                     | *                | *                | *                    | 0.16                 |
| CARBON                                      | 1.35             | 2.60             | 0.38                 | 0.64                 |
| CENTRE                                      | 1.53             | 2.55             | 0.70                 | 0.69                 |
| CHESTER                                     | 1.74             | 3.02             | 0.58                 | 0.82                 |
| CLARION                                     | 0.96             | 2.02             | 0.00                 | 0.41                 |
| CLEARFIELD                                  | 0.99             | 2.09             | 0.01                 | 0.44                 |
| CLINTON                                     | 0.95             | 2.26             | 0.00                 | 0.47                 |
| COLUMBIA                                    | 1.19             | 2.29             | 0.35                 | 0.56                 |
| CRAWFORD                                    | 0.95             | 2.00             | 0.09                 | 0.44                 |
| CUMBERLAND                                  | 1.58             | 2.56             | 0.80                 | 0.70                 |
| DAUPHIN                                     | 1.37             | *                | 0.47                 | 0.64                 |
| DELAWARE                                    | 0.99             | *                | 0.00                 | *                    |
| ELK   | *                | *                | 0.00                 | 0.31                 |
| ERIE  | 1.00             | 2.16             | 0.00                 | 0.45                 |
| FAYETTE                                     | 0.84             | *                | 0.00                 | 0.40                 |
| FOREST                                      | *                | *                | *                    | 0.67                 |
| FRANKLIN                                    | 1.36             | 2.57             | 0.53                 | 0.66                 |
| FULTON                                      | *                | 2.13             | *                    | 0.52                 |
| GREENE                                      | 1.23             | 2.63             | 0.00                 | 0.57                 |
| HUNTINGDON                                  | *                | 1.96             | 0.00                 | 0.39                 |
| INDIANA                                     | 1.22             | *                | 0.17                 | 0.53                 |
| JEFFERSON                                   | *                | 2.13             | 0.00                 | 0.44                 |
| JUNIATA                                     | *                | *                | *                    | 0.57                 |
| LACKAWANNA                                  | 0.85             | 2.30             | 0.00                 | 0.44                 |
| LANCASTER                                   | 1.79             | 2.67             | 1.14                 | 0.80                 |
| LAWRENCE                                    | 0.80             | 2.09             | 0.00                 | 0.37                 |
| LEBANON                                     | *                | 2.48             | 0.45                 | 0.62                 |
| LEHIGH                                      | 1.58             | 2.88             | 0.48                 | 0.74                 |
| LUZERNE                                     | 0.77             | 2.17             | 0.00                 | 0.40                 |
| LYCOMING                                    | 1.02             | 2.18             | 0.04                 | 0.47                 |
| MCKEAN                                      | 0.66             | *                | 0.00                 | 0.34                 |
| MERCER                                      | 0.69             | 1.99             | 0.00                 | 0.35                 |
| MIFFLIN                                     | 0.80             | *                | 0.00                 | 0.39                 |
| MONROE                                      | 1.44             | 2.49             | 0.73                 | 0.68                 |
| MONTGOMERY                                  | 1.21             | *                | 0.34                 | 0.58                 |
| MONTOUR                                     | 1.53             | 2.64             | 0.34                 | 0.67                 |
| NORTHAMPTON                                 | 1.33             | 2.56             | 0.47                 | 0.65                 |
| NORTHUMBERLAND                              | 0.83             | 2.09             | 0.00                 | 0.41                 |
| PERRY                                       | *                | *                | 0.98                 | 0.65                 |
| PHILADELPHIA                                | 0.75             | *                | 0.00                 | *                    |
| PIKE  | 2.20             | 2.84             | 1.64                 | 0.98                 |
| POTTER                                      | *                | *                | *                    | 0.48                 |
| SCHUYLKILL                                  | 0.64             | 1.92             | 0.00                 | 0.35                 |
| SNYDER                                      | 1.21             | *                | 0.40                 | 0.57                 |
| SOMERSET                                    | 0.65             | 1.76             | 0.00                 | 0.34                 |
| SULLIVAN                                    | *                | *                | *                    | 0.43                 |
| SUSQUEHANNA                                 | 1.16             | 2.26             | 0.33                 | 0.54                 |
| TIOGA                                       | *                | *                | *                    | 0.50                 |
| UNION                                       | 1.57             | 2.46             | 0.87                 | 0.70                 |
| VENANGO                                     | *                | 1.71             | 0.00                 | 0.29                 |
| WARREN                                      | *                | *                | 0.00                 | 0.38                 |
| WASHINGTON                                  | 1.32             | 2.63             | 0.15                 | 0.60                 |
| WAYNE                                       | *                | 2.25             | 0.21                 | 0.53                 |
| WESTMORELAND                                | 0.96             | 2.09             | 0.00                 | 0.42                 |
| WYOMING                                     | *                | *                | 0.00                 | 0.44                 |
| YORK  | 1.39             | 2.56             | 0.60                 | 0.67                 |

\* = Functional Class Doesn't Exist in County

Questions? Please contact Andrew O'Neill at the Bureau of Planning and Research, 717-346-3250 or andoneill@pa.gov

**NOTE:** The projected growth factors are derived using historical VMT (Vehicle Miles Traveled) data (1994 to 2017), as well as Woods and Poole demographic and economic data. The factors should be compounded when calculating future values. The factors should not be used to project traffic beyond a 20-year period. Please be aware that these factors are estimates, and unforeseen events (opening of shopping centers, fast food franchises, gas stations, etc) could cause growth to change over time.



| Growth Factors for August 2019 to July 2020 |                  |                  |                      |                      |
|---|------------------|------------------|----------------------|----------------------|
| County                                      | Urban Interstate | Rural Interstate | Urban Non-Interstate | Rural Non-Interstate |
| ADAMS                                       | *                | *                | 0.93                 | 0.73                 |
| ALLEGHENY                                   | 0.81             | *                | 0.00                 | 0.37                 |
| ARMSTRONG                                   | 0.79             | *                | 0.00                 | 0.36                 |
| BEAVER                                      | 0.73             | 1.93             | 0.00                 | 0.33                 |
| BEDFORD                                     | *                | 2.10             | 0.00                 | 0.42                 |
| BERKS                                       | 1.10             | 2.41             | 0.20                 | 0.57                 |
| BLAIR                                       | 0.75             | 1.91             | 0.00                 | 0.36                 |
| BRADFORD                                    | 1.08             | *                | 0.01                 | 0.49                 |
| BUCKS                                       | 1.31             | 2.31             | 0.54                 | 0.59                 |
| BUTLER                                      | 1.75             | 2.74             | 0.65                 | 0.75                 |
| CAMBRIA                                     | 0.34             | *                | 0.00                 | 0.18                 |
| CAMERON                                     | *                | *                | *                    | 0.14                 |
| CARBON                                      | 1.30             | 2.58             | 0.33                 | 0.62                 |
| CENTRE                                      | 1.49             | 2.53             | 0.65                 | 0.68                 |
| CHESTER                                     | 1.70             | 2.99             | 0.52                 | 0.80                 |
| CLARION                                     | 0.90             | 2.00             | 0.00                 | 0.40                 |
| CLEARFIELD                                  | 0.93             | 2.06             | 0.00                 | 0.42                 |
| CLINTON                                     | 0.88             | 2.21             | 0.00                 | 0.45                 |
| COLUMBIA                                    | 1.14             | 2.25             | 0.30                 | 0.54                 |
| CRAWFORD                                    | 0.89             | 1.96             | 0.03                 | 0.42                 |
| CUMBERLAND                                  | 1.53             | 2.55             | 0.74                 | 0.69                 |
| DAUPHIN                                     | 1.31             | *                | 0.41                 | 0.63                 |
| DELAWARE                                    | 0.93             | *                | 0.00                 | *                    |
| ELK   | *                | *                | 0.00                 | 0.29                 |
| ERIE  | 0.95             | 2.14             | 0.00                 | 0.43                 |
| FAYETTE                                     | 0.77             | *                | 0.00                 | 0.38                 |
| FOREST                                      | *                | *                | *                    | 0.65                 |
| FRANKLIN                                    | 1.31             | 2.54             | 0.47                 | 0.65                 |
| FULTON                                      | *                | 2.10             | *                    | 0.50                 |
| GREENE                                      | 1.19             | 2.62             | 0.00                 | 0.56                 |
| HUNTINGDON                                  | *                | 1.91             | 0.00                 | 0.37                 |
| INDIANA                                     | 1.17             | *                | 0.11                 | 0.52                 |
| JEFFERSON                                   | *                | 2.11             | 0.00                 | 0.42                 |
| JUNIATA                                     | *                | *                | *                    | 0.55                 |
| LACKAWANNA                                  | 0.78             | 2.27             | 0.00                 | 0.42                 |
| LANCASTER                                   | 1.74             | 2.64             | 1.08                 | 0.78                 |
| LAWRENCE                                    | 0.74             | 2.05             | 0.00                 | 0.35                 |
| LEBANON                                     | *                | 2.44             | 0.39                 | 0.61                 |
| LEHIGH                                      | 1.54             | 2.86             | 0.43                 | 0.73                 |
| LUZERNE                                     | 0.71             | 2.14             | 0.00                 | 0.39                 |
| LYCOMING                                    | 0.96             | 2.16             | 0.00                 | 0.45                 |
| MCKEAN                                      | 0.60             | *                | 0.00                 | 0.33                 |
| MERCER                                      | 0.63             | 1.96             | 0.00                 | 0.33                 |
| MIFFLIN                                     | 0.73             | *                | 0.00                 | 0.37                 |
| MONROE                                      | 1.40             | 2.46             | 0.68                 | 0.67                 |
| MONTGOMERY                                  | 1.17             | *                | 0.28                 | 0.57                 |
| MONTOUR                                     | 1.48             | 2.61             | 0.28                 | 0.65                 |
| NORTHAMPTON                                 | 1.28             | 2.53             | 0.41                 | 0.63                 |
| NORTHUMBERLAND                              | 0.75             | 2.04             | 0.00                 | 0.39                 |
| PERRY                                       | *                | *                | 0.92                 | 0.63                 |
| PHILADELPHIA                                | 0.69             | *                | 0.00                 | *                    |
| PIKE  | 2.14             | 2.79             | 1.59                 | 0.96                 |
| POTTER                                      | *                | *                | *                    | 0.46                 |
| SCHUYLKILL                                  | 0.58             | 1.89             | 0.00                 | 0.33                 |
| SNYDER                                      | 1.15             | *                | 0.35                 | 0.55                 |
| SOMERSET                                    | 0.59             | 1.72             | 0.00                 | 0.32                 |
| SULLIVAN                                    | *                | *                | *                    | 0.42                 |
| SUSQUEHANNA                                 | 1.11             | 2.23             | 0.27                 | 0.53                 |
| TIOGA                                       | *                | *                | *                    | 0.48                 |
| UNION                                       | 1.52             | 2.42             | 0.82                 | 0.69                 |
| VENANGO                                     | *                | 1.67             | 0.00                 | 0.28                 |
| WARREN                                      | *                | *                | 0.00                 | 0.36                 |
| WASHINGTON                                  | 1.28             | 2.62             | 0.10                 | 0.59                 |
| WAYNE                                       | *                | 2.22             | 0.16                 | 0.51                 |
| WESTMORELAND                                | 0.89             | 2.05             | 0.00                 | 0.40                 |
| WYOMING                                     | *                | *                | 0.00                 | 0.43                 |
| YORK  | 1.34             | 2.53             | 0.54                 | 0.66                 |

\* = Functional Class Doesn't Exist in County

Questions? Please contact Andrew O'Neill at the Bureau of Planning and Research, 717-346-3250 or andoneill@pa.gov

**NOTE:** The projected growth factors are derived using historical VMT (Vehicle Miles Traveled) data (1994 to 2018), as well as Woods and Poole demographic and economic data. The factors should be compounded when calculating future values. The factors should not be used to project traffic beyond a 20-year period. Please be aware that these factors are estimates, and unforeseen events (opening of shopping centers, fast food franchises, gas stations, etc) could cause growth to change over time.



## Land Use: 220

### Multifamily Housing (Low-Rise)

#### Description

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have one or two levels (floors). Multifamily housing (mid-rise) (Land Use 221), multifamily housing (high-rise) (Land Use 222), and off-campus student apartment (Land Use 225) are related land uses.

#### Additional Data

In prior editions of *Trip Generation Manual*, the low-rise multifamily housing sites were further divided into rental and condominium categories. An investigation of vehicle trip data found no clear differences in trip making patterns between the rental and condominium sites within the ITE database. As more data are compiled for future editions, this land use classification can be reinvestigated.

For the three sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.72 residents per occupied dwelling unit.

For the two sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96.2 percent of the total dwelling units were occupied.

This land use included data from a wide variety of units with different sizes, price ranges, locations, and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Time-of-day distribution data for this land use are presented in Appendix A. For the 10 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:45 and 5:45 p.m., respectively. For the one site with Saturday data, the overall highest vehicle volume was counted between 9:45 and 10:45 a.m. For the one site with Sunday data, the overall highest vehicle volume was counted between 11:45 a.m. and 12:45 p.m.

For the one dense multi-use urban site with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:00 and 8:00 a.m. and 6:15 and 7:15 p.m., respectively.

For the three sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.72 residents per occupied dwelling unit.

The average numbers of person trips per vehicle trip at the five general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.13 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.21 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in British Columbia (CAN), California, District of Columbia, Florida, Georgia, Illinois, Indiana, Maine, Maryland, Minnesota, New Jersey, New York, Ontario, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Virginia, and Washington.

***It is expected that the number of bedrooms and number of residents are likely correlated to the number of trips generated by a residential site. Many of the studies included in this land use did not indicate the total number of bedrooms. To assist in the future analysis of this land use, it is important that this information be collected and included in trip generation data submissions.***

### **Source Numbers**

168, 187, 188, 204, 211, 300, 305, 306, 319, 320, 321, 357, 390, 412, 418, 525, 530, 571, 579, 583, 864, 868, 869, 870, 896, 903, 918, 946, 947, 948, 951

# Multifamily Housing (Low-Rise) (220)

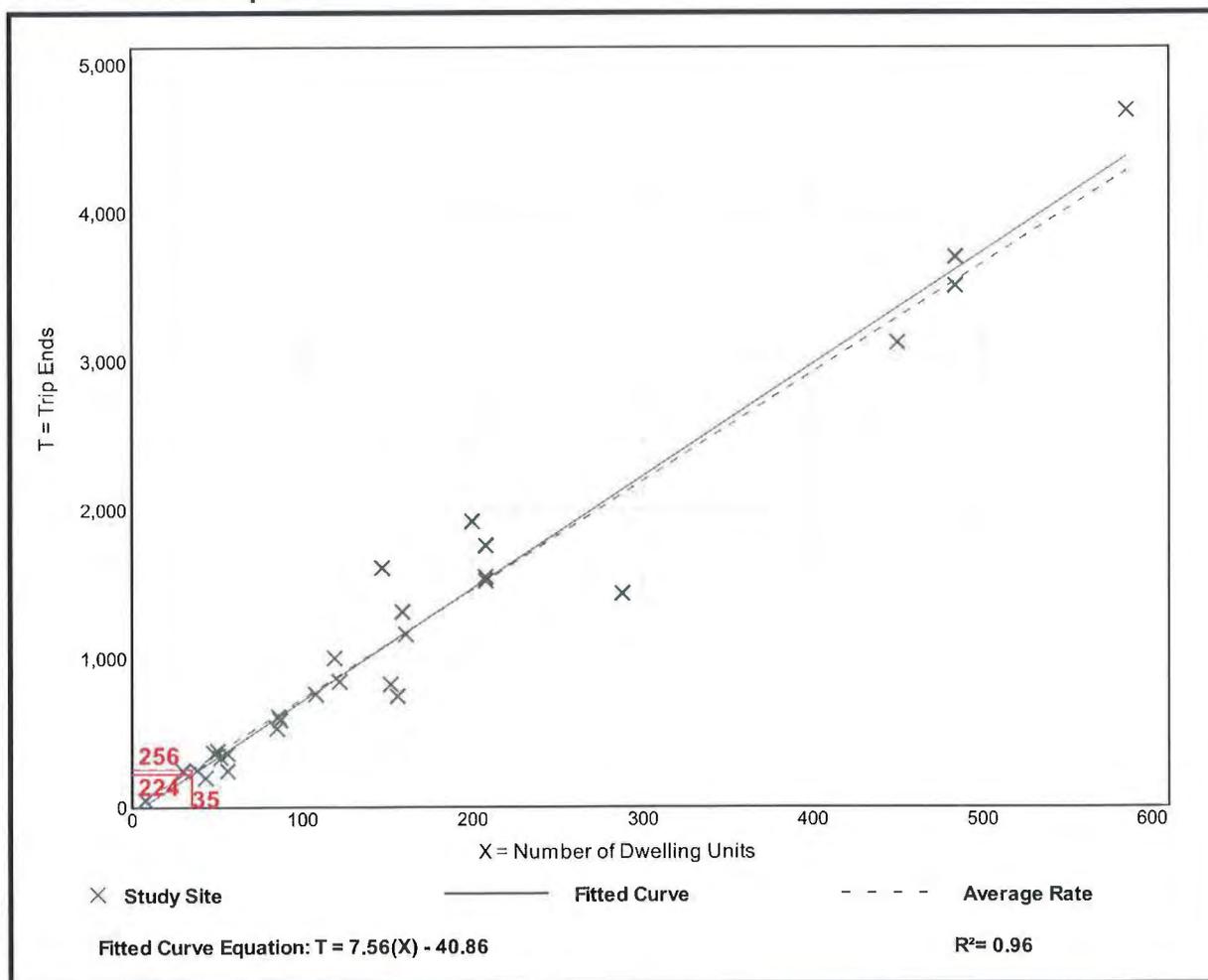
Vehicle Trip Ends vs: Dwelling Units  
On a: Weekday

Setting/Location: General Urban/Suburban  
Number of Studies: 29  
Avg. Num. of Dwelling Units: 168  
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|--------------|----------------|--------------------|
| 7.32         | 4.45 - 10.97   | 1.31               |

## Data Plot and Equation



# Multifamily Housing (Low-Rise) (220)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,  
One Hour Between 7 and 9 a.m.

Setting/Location: General Urban/Suburban

Number of Studies: 42

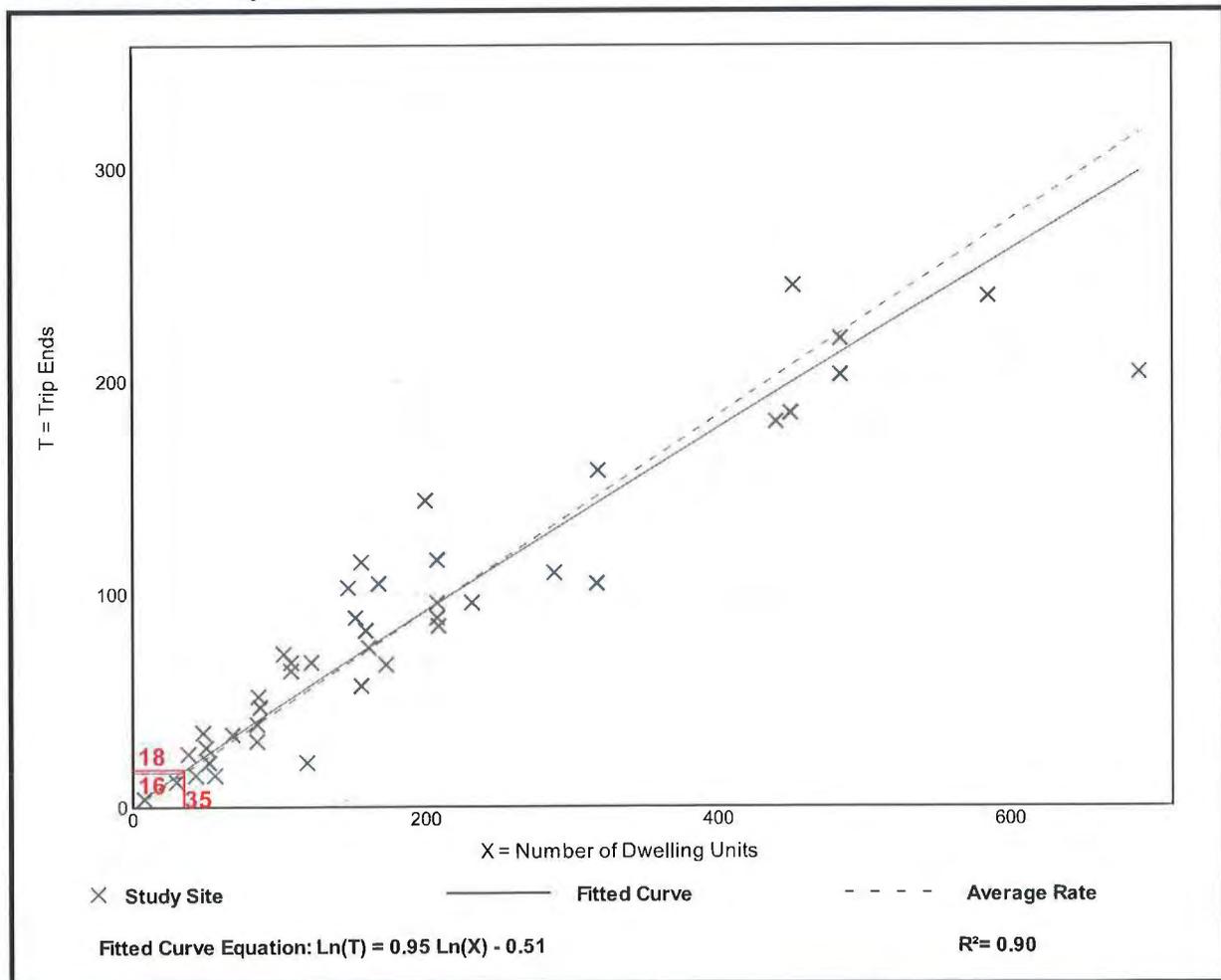
Avg. Num. of Dwelling Units: 199

Directional Distribution: 23% entering, 77% exiting

## Vehicle Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|--------------|----------------|--------------------|
| 0.46         | 0.18 - 0.74    | 0.12               |

## Data Plot and Equation



# Multifamily Housing (Low-Rise) (220)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,  
Peak Hour of Adjacent Street Traffic,  
One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 50

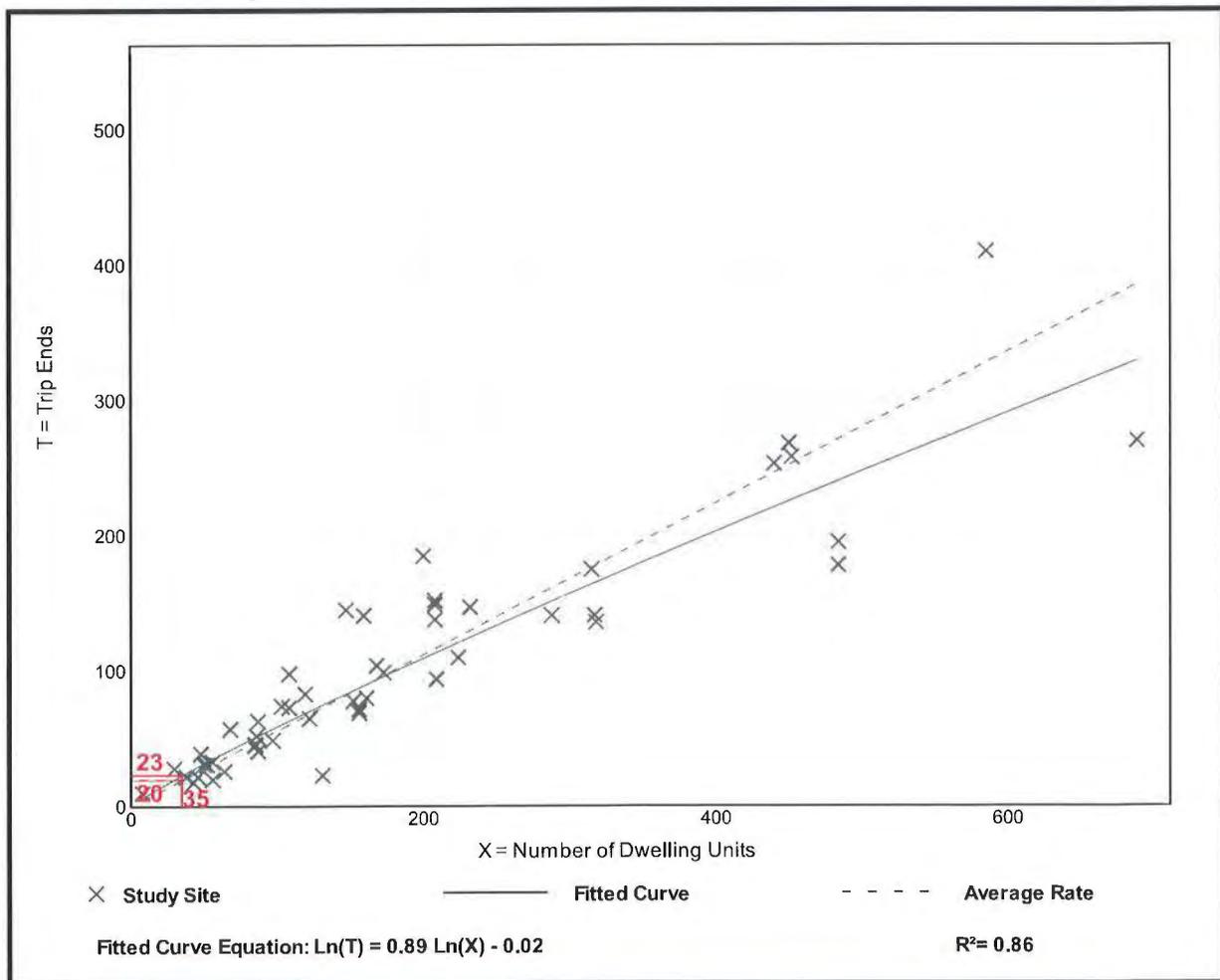
Avg. Num. of Dwelling Units: 187

Directional Distribution: 63% entering, 37% exiting

## Vehicle Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|--------------|----------------|--------------------|
| 0.56         | 0.18 - 1.25    | 0.16               |

## Data Plot and Equation



# APPENDIX F

## *Capacity Analyses*

HCM 2010 Signalized Intersection Summary  
 5: N Wayne & Eagle

06/18/2019

|                              |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                     | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations          |   |  |   |   |  |   |  |  |   |   |  |   |
| Traffic Volume (veh/h)       | 24  | 93  | 20  | 19  | 75  | 25  | 14   | 228   | 33  | 28  | 324   | 34  |
| Future Volume (veh/h)        | 24  | 93  | 20  | 19  | 75  | 25  | 14   | 228   | 33  | 28  | 324   | 34  |
| Number                       | 7   | 4   | 14  | 3   | 8   | 18  | 5  | 2   | 12  | 1   | 6   | 16  |
| Initial Q (Qb), veh          | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0   | 0   | 0   | 0   | 0   |
| Ped-Bike Adj(A_pbT)          | 1.00  |   | 1.00  | 1.00  |   | 1.00  | 1.00   |   | 1.00  | 1.00  |   | 1.00  |
| Parking Bus, Adj             | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00   | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Adj Sat Flow, veh/h/ln       | 1800  | 1761  | 1800  | 1872  | 1827  | 1872  | 1872   | 1806  | 1872  | 1800  | 1756  | 1800  |
| Adj Flow Rate, veh/h         | 26  | 101   | 22  | 21  | 82  | 27  | 15   | 248   | 36  | 30  | 352   | 37  |
| Adj No. of Lanes             | 0   | 1   | 0   | 0   | 1   | 0   | 0  | 1   | 0   | 0   | 1   | 0   |
| Peak Hour Factor             | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Percent Heavy Veh, %         | 0   | 0   | 0   | 0   | 0   | 0   | 4  | 4   | 4   | 2   | 2   | 2   |
| Cap, veh/h                   | 119   | 186   | 38  | 115   | 180   | 55  | 99   | 1026  | 143   | 117   | 1016  | 102   |
| Arrive On Green              | 0.15  | 0.15  | 0.15  | 0.15  | 0.15  | 0.15  | 0.68   | 0.68  | 0.68  | 0.68  | 0.68  | 0.68  |
| Sat Flow, veh/h              | 205   | 1212  | 245   | 188   | 1178  | 358   | 30   | 1505  | 210   | 55  | 1491  | 150   |
| Grp Volume(v), veh/h         | 149   | 0   | 0   | 130   | 0   | 0   | 299  | 0   | 0   | 419   | 0   | 0   |
| Grp Sat Flow(s),veh/h/ln     | 1662  | 0   | 0   | 1725  | 0   | 0   | 1745   | 0   | 0   | 1696  | 0   | 0   |
| Q Serve(g_s), s              | 0.7   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Cycle Q Clear(g_c), s        | 3.9   | 0.0   | 0.0   | 3.2   | 0.0   | 0.0   | 3.1  | 0.0   | 0.0   | 4.9   | 0.0   | 0.0   |
| Prop In Lane                 | 0.17  |   | 0.15  | 0.16  |   | 0.21  | 0.05   |   | 0.12  | 0.07  |   | 0.09  |
| Lane Grp Cap(c), veh/h       | 342   | 0   | 0   | 350   | 0   | 0   | 1268   | 0   | 0   | 1236  | 0   | 0   |
| V/C Ratio(X)                 | 0.44  | 0.00  | 0.00  | 0.37  | 0.00  | 0.00  | 0.24   | 0.00  | 0.00  | 0.34  | 0.00  | 0.00  |
| Avail Cap(c_a), veh/h        | 794   | 0   | 0   | 816   | 0   | 0   | 1268   | 0   | 0   | 1236  | 0   | 0   |
| HCM Platoon Ratio            | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00   | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Upstream Filter(I)           | 1.00  | 0.00  | 0.00  | 1.00  | 0.00  | 0.00  | 1.00   | 0.00  | 0.00  | 1.00  | 0.00  | 0.00  |
| Uniform Delay (d), s/veh     | 19.0  | 0.0   | 0.0   | 18.7  | 0.0   | 0.0   | 3.0  | 0.0   | 0.0   | 3.2   | 0.0   | 0.0   |
| Incr Delay (d2), s/veh       | 0.9   | 0.0   | 0.0   | 0.7   | 0.0   | 0.0   | 0.4  | 0.0   | 0.0   | 0.7   | 0.0   | 0.0   |
| Initial Q Delay(d3),s/veh    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| %ile BackOfQ(95%),veh/ln     | 3.4   | 0.0   | 0.0   | 3.0   | 0.0   | 0.0   | 3.0  | 0.0   | 0.0   | 4.7   | 0.0   | 0.0   |
| LnGrp Delay(d),s/veh         | 19.9  | 0.0   | 0.0   | 19.4  | 0.0   | 0.0   | 3.4  | 0.0   | 0.0   | 4.0   | 0.0   | 0.0   |
| LnGrp LOS                    | B   |   |   | B   |   |   | A  |   |   | A   |   |   |
| Approach Vol, veh/h          |   | 149   |   |   | 130   |   |  | 299   |   |   | 419   |   |
| Approach Delay, s/veh        |   | 19.9  |   |   | 19.4  |   |  | 3.4   |   |   | 4.0   |   |
| Approach LOS                 |   | B   |   |   | B   |   |  | A   |   |   | A   |   |
| <b>Timer</b>                 | <b>1</b>  | <b>2</b>  | <b>3</b>  | <b>4</b>  | <b>5</b>  | <b>6</b>  | <b>7</b>   | <b>8</b>  |   |   |   |   |
| Assigned Phs                 |   | 2   |   | 4   |   | 6   |  | 8   |   |   |   |   |
| Phs Duration (G+Y+Rc), s     |   | 37.0  |   | 11.4  |   | 37.0  |  | 11.4  |   |   |   |   |
| Change Period (Y+Rc), s      |   | 5.0   |   | 5.0   |   | 5.0   |  | 5.0   |   |   |   |   |
| Max Green Setting (Gmax), s  |   | 32.0  |   | 20.0  |   | 32.0  |  | 20.0  |   |   |   |   |
| Max Q Clear Time (g_c+I1), s |   | 5.1   |   | 5.9   |   | 6.9   |  | 5.2   |   |   |   |   |
| Green Ext Time (p_c), s      |   | 2.0   |   | 0.6   |   | 2.9   |  | 0.6   |   |   |   |   |
| <b>Intersection Summary</b>  |   |   |   |   |   |   |  |   |   |   |   |   |
| HCM 2010 Ctrl Delay          |   |   |   | 8.2   |   |   |  |   |   |   |   |   |
| HCM 2010 LOS                 |   |   |   | A   |   |   |  |   |   |   |   |   |

**Intersection**

Intersection Delay, s/veh 9.4

Intersection LOS A

| Movement            | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      | ↕    |      |      | ↕    |      |      | ↕    |      |      | ↕    |      |
| Traffic Vol, veh/h  | 46   | 60   | 6    | 32   | 84   | 30   | 5    | 72   | 13   | 44   | 76   | 40   |
| Future Vol, veh/h   | 46   | 60   | 6    | 32   | 84   | 30   | 5    | 72   | 13   | 44   | 76   | 40   |
| Peak Hour Factor    | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Heavy Vehicles, %   | 2    | 7    | 0    | 6    | 1    | 3    | 0    | 3    | 0    | 5    | 0    | 0    |
| Mvmt Flow           | 58   | 76   | 8    | 41   | 106  | 38   | 6    | 91   | 16   | 56   | 96   | 51   |
| Number of Lanes     | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB  | NB  | SB  |
|----------------------------|-----|-----|-----|-----|
| Opposing Approach          | WB  | EB  | SB  | NB  |
| Opposing Lanes             | 1   | 1   | 1   | 1   |
| Conflicting Approach Left  | SB  | NB  | EB  | WB  |
| Conflicting Lanes Left     | 1   | 1   | 1   | 1   |
| Conflicting Approach Right | NB  | SB  | WB  | EB  |
| Conflicting Lanes Right    | 1   | 1   | 1   | 1   |
| HCM Control Delay          | 9.3 | 9.6 | 8.9 | 9.7 |
| HCM LOS                    | A   | A   | A   | A   |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 6%    | 41%   | 22%   | 28%   |
| Vol Thru, %            | 80%   | 54%   | 58%   | 48%   |
| Vol Right, %           | 14%   | 5%    | 21%   | 25%   |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 90    | 112   | 146   | 160   |
| LT Vol                 | 5     | 46    | 32    | 44    |
| Through Vol            | 72    | 60    | 84    | 76    |
| RT Vol                 | 13    | 6     | 30    | 40    |
| Lane Flow Rate         | 114   | 142   | 185   | 203   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.155 | 0.196 | 0.25  | 0.272 |
| Departure Headway (Hd) | 4.886 | 4.988 | 4.873 | 4.833 |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 728   | 715   | 732   | 737   |
| Service Time           | 2.956 | 3.058 | 2.938 | 2.897 |
| HCM Lane V/C Ratio     | 0.157 | 0.199 | 0.253 | 0.275 |
| HCM Control Delay      | 8.9   | 9.3   | 9.6   | 9.7   |
| HCM Lane LOS           | A     | A     | A     | A     |
| HCM 95th-tile Q        | 0.5   | 0.7   | 1     | 1.1   |

**Intersection**

Intersection Delay, s/veh 8.8

Intersection LOS A

| Movement            | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      | ↕    |      |      | ↕    |      |      | ↕    |      |      | ↕    |      |
| Traffic Vol, veh/h  | 0    | 158  | 1    | 3    | 144  | 0    | 3    | 0    | 2    | 1    | 0    | 0    |
| Future Vol, veh/h   | 0    | 158  | 1    | 3    | 144  | 0    | 3    | 0    | 2    | 1    | 0    | 0    |
| Peak Hour Factor    | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 |
| Heavy Vehicles, %   | 0    | 1    | 0    | 33   | 3    | 0    | 33   | 0    | 0    | 0    | 0    | 0    |
| Mvmt Flow           | 0    | 208  | 1    | 4    | 189  | 0    | 4    | 0    | 3    | 1    | 0    | 0    |
| Number of Lanes     | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB  | NB  | SB |
|----------------------------|-----|-----|-----|----|
| Opposing Approach          | WB  | EB  | SB  | NB |
| Opposing Lanes             | 1   | 1   | 1   | 1  |
| Conflicting Approach Left  | SB  | NB  | EB  | WB |
| Conflicting Lanes Left     | 1   | 1   | 1   | 1  |
| Conflicting Approach Right | NB  | SB  | WB  | EB |
| Conflicting Lanes Right    | 1   | 1   | 1   | 1  |
| HCM Control Delay          | 8.4 | 9.2 | 8.3 | 8  |
| HCM LOS                    | A   | A   | A   | A  |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 60%   | 0%    | 2%    | 100%  |
| Vol Thru, %            | 0%    | 99%   | 98%   | 0%    |
| Vol Right, %           | 40%   | 1%    | 0%    | 0%    |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 5     | 159   | 147   | 1     |
| LT Vol                 | 3     | 0     | 3     | 1     |
| Through Vol            | 0     | 158   | 144   | 0     |
| RT Vol                 | 2     | 1     | 0     | 0     |
| Lane Flow Rate         | 7     | 209   | 193   | 1     |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.01  | 0.237 | 0.249 | 0.002 |
| Departure Headway (Hd) | 5.259 | 4.071 | 4.635 | 5.023 |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 685   | 872   | 772   | 717   |
| Service Time           | 3.259 | 2.145 | 2.688 | 3.024 |
| HCM Lane V/C Ratio     | 0.01  | 0.24  | 0.25  | 0.001 |
| HCM Control Delay      | 8.3   | 8.4   | 9.2   | 8     |
| HCM Lane LOS           | A     | A     | A     | A     |
| HCM 95th-tile Q        | 0     | 0.9   | 1     | 0     |

HCM 2010 Signalized Intersection Summary  
 5: N Wayne & Eagle

06/18/2019

|                              |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                     | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations          |   |  |   |   |  |   |  |  |   |   |  |   |
| Traffic Volume (veh/h)       | 44  | 147   | 22  | 36  | 138   | 41  | 23   | 271   | 43  | 32  | 342   | 36  |
| Future Volume (veh/h)        | 44  | 147   | 22  | 36  | 138   | 41  | 23   | 271   | 43  | 32  | 342   | 36  |
| Number                       | 7   | 4   | 14  | 3   | 8   | 18  | 5  | 2   | 12  | 1   | 6   | 16  |
| Initial Q (Qb), veh          | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0   | 0   | 0   | 0   | 0   |
| Ped-Bike Adj(A_pbT)          | 1.00  |   | 1.00  | 1.00  |   | 1.00  | 1.00   |   | 1.00  | 1.00  |   | 1.00  |
| Parking Bus, Adj             | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00   | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Adj Sat Flow, veh/h/ln       | 1800  | 1779  | 1800  | 1872  | 1872  | 1872  | 1872   | 1838  | 1872  | 1800  | 1770  | 1800  |
| Adj Flow Rate, veh/h         | 46  | 153   | 23  | 38  | 144   | 43  | 24   | 282   | 45  | 33  | 356   | 38  |
| Adj No. of Lanes             | 0   | 1   | 0   | 0   | 1   | 0   | 0  | 1   | 0   | 0   | 1   | 0   |
| Peak Hour Factor             | 0.96  | 0.96  | 0.96  | 0.96  | 0.96  | 0.96  | 0.96   | 0.96  | 0.96  | 0.96  | 0.96  | 0.96  |
| Percent Heavy Veh, %         | 1   | 1   | 1   | 0   | 0   | 0   | 2  | 2   | 2   | 2   | 2   | 2   |
| Cap, veh/h                   | 135   | 246   | 34  | 123   | 240   | 66  | 108  | 960   | 146   | 117   | 963   | 98  |
| Arrive On Green              | 0.20  | 0.20  | 0.20  | 0.20  | 0.20  | 0.20  | 0.65   | 0.65  | 0.65  | 0.65  | 0.65  | 0.65  |
| Sat Flow, veh/h              | 253   | 1257  | 175   | 207   | 1227  | 339   | 51   | 1482  | 225   | 63  | 1487  | 151   |
| Grp Volume(v), veh/h         | 222   | 0   | 0   | 225   | 0   | 0   | 351  | 0   | 0   | 427   | 0   | 0   |
| Grp Sat Flow(s),veh/h/ln     | 1685  | 0   | 0   | 1773  | 0   | 0   | 1758   | 0   | 0   | 1701  | 0   | 0   |
| Q Serve(g_s), s              | 0.2   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Cycle Q Clear(g_c), s        | 6.0   | 0.0   | 0.0   | 5.7   | 0.0   | 0.0   | 4.4  | 0.0   | 0.0   | 5.8   | 0.0   | 0.0   |
| Prop In Lane                 | 0.21  |   | 0.10  | 0.17  |   | 0.19  | 0.07   |   | 0.13  | 0.08  |   | 0.09  |
| Lane Grp Cap(c), veh/h       | 414   | 0   | 0   | 429   | 0   | 0   | 1214   | 0   | 0   | 1178  | 0   | 0   |
| V/C Ratio(X)                 | 0.54  | 0.00  | 0.00  | 0.52  | 0.00  | 0.00  | 0.29   | 0.00  | 0.00  | 0.36  | 0.00  | 0.00  |
| Avail Cap(c_a), veh/h        | 759   | 0   | 0   | 794   | 0   | 0   | 1214   | 0   | 0   | 1178  | 0   | 0   |
| HCM Platoon Ratio            | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00   | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Upstream Filter(I)           | 1.00  | 0.00  | 0.00  | 1.00  | 0.00  | 0.00  | 1.00   | 0.00  | 0.00  | 1.00  | 0.00  | 0.00  |
| Uniform Delay (d), s/veh     | 18.9  | 0.0   | 0.0   | 18.8  | 0.0   | 0.0   | 3.9  | 0.0   | 0.0   | 4.2   | 0.0   | 0.0   |
| Incr Delay (d2), s/veh       | 1.1   | 0.0   | 0.0   | 1.0   | 0.0   | 0.0   | 0.6  | 0.0   | 0.0   | 0.9   | 0.0   | 0.0   |
| Initial Q Delay(d3),s/veh    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| %ile BackOfQ(50%),veh/ln     | 3.0   | 0.0   | 0.0   | 3.0   | 0.0   | 0.0   | 2.3  | 0.0   | 0.0   | 3.0   | 0.0   | 0.0   |
| LnGrp Delay(d),s/veh         | 20.0  | 0.0   | 0.0   | 19.8  | 0.0   | 0.0   | 4.5  | 0.0   | 0.0   | 5.1   | 0.0   | 0.0   |
| LnGrp LOS                    | B   |   |   | B   |   |   | A  |   |   | A   |   |   |
| Approach Vol, veh/h          |   | 222   |   |   | 225   |   |  | 351   |   |   |   | 427   |
| Approach Delay, s/veh        |   | 20.0  |   |   | 19.8  |   |  | 4.5   |   |   |   | 5.1   |
| Approach LOS                 |   | B   |   |   | B   |   |  | A   |   |   |   | A   |
| <b>Timer</b>                 | <b>1</b>  | <b>2</b>  | <b>3</b>  | <b>4</b>  | <b>5</b>  | <b>6</b>  | <b>7</b>   | <b>8</b>  |   |   |   |   |
| Assigned Phs                 |   | 2   |   | 4   |   | 6   |  | 8   |   |   |   |   |
| Phs Duration (G+Y+Rc), s     |   | 37.0  |   | 13.9  |   | 37.0  |  | 13.9  |   |   |   |   |
| Change Period (Y+Rc), s      |   | 5.0   |   | 5.0   |   | 5.0   |  | 5.0   |   |   |   |   |
| Max Green Setting (Gmax), s  |   | 32.0  |   | 20.0  |   | 32.0  |  | 20.0  |   |   |   |   |
| Max Q Clear Time (g_c+I1), s |   | 6.4   |   | 8.0   |   | 7.8   |  | 7.7   |   |   |   |   |
| Green Ext Time (p_c), s      |   | 2.4   |   | 1.0   |   | 3.0   |  | 1.0   |   |   |   |   |
| <b>Intersection Summary</b>  |   |   |   |   |   |   |  |   |   |   |   |   |
| HCM 2010 Ctrl Delay          |   |   |   | 10.3  |   |   |  |   |   |   |   |   |
| HCM 2010 LOS                 |   |   |   | B   |   |   |  |   |   |   |   |   |

**Intersection**

Intersection Delay, s/veh 10.7

Intersection LOS B

| Movement            | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      | ↕    |      |      | ↕    |      |      | ↕    |      |      | ↕    |      |
| Traffic Vol, veh/h  | 56   | 105  | 7    | 21   | 142  | 36   | 18   | 94   | 59   | 45   | 72   | 129  |
| Future Vol, veh/h   | 56   | 105  | 7    | 21   | 142  | 36   | 18   | 94   | 59   | 45   | 72   | 129  |
| Peak Hour Factor    | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, %   | 4    | 0    | 0    | 5    | 1    | 0    | 6    | 1    | 2    | 0    | 1    | 0    |
| Mvmt Flow           | 60   | 112  | 7    | 22   | 151  | 38   | 19   | 100  | 63   | 48   | 77   | 137  |
| Number of Lanes     | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    |

| Approach                   | EB   | WB   | NB   | SB   |
|----------------------------|------|------|------|------|
| Opposing Approach          | WB   | EB   | SB   | NB   |
| Opposing Lanes             | 1    | 1    | 1    | 1    |
| Conflicting Approach Left  | SB   | NB   | EB   | WB   |
| Conflicting Lanes Left     | 1    | 1    | 1    | 1    |
| Conflicting Approach Right | NB   | SB   | WB   | EB   |
| Conflicting Lanes Right    | 1    | 1    | 1    | 1    |
| HCM Control Delay          | 10.6 | 10.9 | 10.3 | 10.9 |
| HCM LOS                    | B    | B    | B    | B    |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 11%   | 33%   | 11%   | 18%   |
| Vol Thru, %            | 55%   | 62%   | 71%   | 29%   |
| Vol Right, %           | 35%   | 4%    | 18%   | 52%   |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 171   | 168   | 199   | 246   |
| LT Vol                 | 18    | 56    | 21    | 45    |
| Through Vol            | 94    | 105   | 142   | 72    |
| RT Vol                 | 59    | 7     | 36    | 129   |
| Lane Flow Rate         | 182   | 179   | 212   | 262   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.268 | 0.274 | 0.315 | 0.363 |
| Departure Headway (Hd) | 5.295 | 5.518 | 5.357 | 4.99  |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 677   | 651   | 671   | 720   |
| Service Time           | 3.335 | 3.559 | 3.396 | 3.027 |
| HCM Lane V/C Ratio     | 0.269 | 0.275 | 0.316 | 0.364 |
| HCM Control Delay      | 10.3  | 10.6  | 10.9  | 10.9  |
| HCM Lane LOS           | B     | B     | B     | B     |
| HCM 95th-tile Q        | 1.1   | 1.1   | 1.3   | 1.7   |

**Intersection**

Intersection Delay, s/veh 8.7  
 Intersection LOS A

| Movement            | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      | ↕    |      |      | ↕    |      |      | ↕    |      |      | ↕    |      |
| Traffic Vol, veh/h  | 1    | 243  | 1    | 2    | 186  | 1    | 0    | 0    | 3    | 0    | 0    | 1    |
| Future Vol, veh/h   | 1    | 243  | 1    | 2    | 186  | 1    | 0    | 0    | 3    | 0    | 0    | 1    |
| Peak Hour Factor    | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, %   | 0    | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Mvmt Flow           | 1    | 264  | 1    | 2    | 202  | 1    | 0    | 0    | 3    | 0    | 0    | 1    |
| Number of Lanes     | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB  | NB  | SB  |
|----------------------------|-----|-----|-----|-----|
| Opposing Approach          | WB  | EB  | SB  | NB  |
| Opposing Lanes             | 1   | 1   | 1   | 1   |
| Conflicting Approach Left  | SB  | NB  | EB  | WB  |
| Conflicting Lanes Left     | 1   | 1   | 1   | 1   |
| Conflicting Approach Right | NB  | SB  | WB  | EB  |
| Conflicting Lanes Right    | 1   | 1   | 1   | 1   |
| HCM Control Delay          | 8.9 | 8.4 | 7.3 | 7.3 |
| HCM LOS                    | A   | A   | A   | A   |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 0%    | 0%    | 1%    | 0%    |
| Vol Thru, %            | 0%    | 99%   | 98%   | 0%    |
| Vol Right, %           | 100%  | 0%    | 1%    | 100%  |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 3     | 245   | 189   | 1     |
| LT Vol                 | 0     | 1     | 2     | 0     |
| Through Vol            | 0     | 243   | 186   | 0     |
| RT Vol                 | 3     | 1     | 1     | 1     |
| Lane Flow Rate         | 3     | 266   | 205   | 1     |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.004 | 0.3   | 0.234 | 0.001 |
| Departure Headway (Hd) | 4.294 | 4.059 | 4.104 | 4.297 |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 838   | 881   | 869   | 838   |
| Service Time           | 2.294 | 2.103 | 2.159 | 2.297 |
| HCM Lane V/C Ratio     | 0.004 | 0.302 | 0.236 | 0.001 |
| HCM Control Delay      | 7.3   | 8.9   | 8.4   | 7.3   |
| HCM Lane LOS           | A     | A     | A     | A     |
| HCM 95th-tile Q        | 0     | 1.3   | 0.9   | 0     |

**Intersection**

|                          |            |            |            |            |            |            |
|--------------------------|------------|------------|------------|------------|------------|------------|
| Int Delay, s/veh         | 0.3        |            |            |            |            |            |
| <b>Movement</b>          | <b>EBL</b> | <b>EBR</b> | <b>NBL</b> | <b>NBT</b> | <b>SBT</b> | <b>SBR</b> |
| Lane Configurations      | ↔          |            |            | ↕          | ↕          |            |
| Traffic Vol, veh/h       | 2          | 5          | 2          | 150        | 165        | 0          |
| Future Vol, veh/h        | 2          | 5          | 2          | 150        | 165        | 0          |
| Conflicting Peds, #/hr   | 0          | 0          | 0          | 0          | 0          | 0          |
| Sign Control             | Stop       | Stop       | Free       | Free       | Free       | Free       |
| RT Channelized           | -          | None       | -          | None       | -          | None       |
| Storage Length           | 0          | -          | -          | -          | -          | -          |
| Veh in Median Storage, # | 0          | -          | -          | 0          | 0          | -          |
| Grade, %                 | 0          | -          | -          | 0          | 0          | -          |
| Peak Hour Factor         | 79         | 79         | 79         | 79         | 79         | 79         |
| Heavy Vehicles, %        | 0          | 0          | 0          | 0          | 0          | 0          |
| Mvmt Flow                | 3          | 6          | 3          | 190        | 209        | 0          |

**Major/Minor**

|                      | Minor2 | Major1 | Major2 |   |   |   |
|----------------------|--------|--------|--------|---|---|---|
| Conflicting Flow All | 405    | 209    | 209    | 0 | - | 0 |
| Stage 1              | 209    | -      | -      | - | - | - |
| Stage 2              | 196    | -      | -      | - | - | - |
| Critical Hdwy        | 6.4    | 6.2    | 4.3    | - | - | - |
| Critical Hdwy Stg 1  | 5.4    | -      | -      | - | - | - |
| Critical Hdwy Stg 2  | 5.4    | -      | -      | - | - | - |
| Follow-up Hdwy       | 3      | 3.1    | 3      | - | - | - |
| Pot Cap-1 Maneuver   | 688    | 885    | 1019   | - | - | - |
| Stage 1              | 956    | -      | -      | - | - | - |
| Stage 2              | 969    | -      | -      | - | - | - |
| Platoon blocked, %   |        |        |        | - | - | - |
| Mov Cap-1 Maneuver   | 686    | 885    | 1019   | - | - | - |
| Mov Cap-2 Maneuver   | 686    | -      | -      | - | - | - |
| Stage 1              | 953    | -      | -      | - | - | - |
| Stage 2              | 969    | -      | -      | - | - | - |

**Approach**

|                      | EB  | NB  | SB |
|----------------------|-----|-----|----|
| HCM Control Delay, s | 9.5 | 0.1 | 0  |
| HCM LOS              | A   |     |    |

**Minor Lane/Major Mvmt**

|                       | NBL   | NBT | EBLn1 | SBT | SBR |
|-----------------------|-------|-----|-------|-----|-----|
| Capacity (veh/h)      | 1019  | -   | 817   | -   | -   |
| HCM Lane V/C Ratio    | 0.002 | -   | 0.011 | -   | -   |
| HCM Control Delay (s) | 8.5   | 0   | 9.5   | -   | -   |
| HCM Lane LOS          | A     | A   | A     | -   | -   |
| HCM 95th %tile Q(veh) | 0     | -   | 0     | -   | -   |

HCM 2010 Signalized Intersection Summary  
 5: N Wayne & Eagle

04/16/2020

|                              |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                     | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations          |   |  |   |   |  |   |  |  |   |   |  |   |
| Traffic Volume (veh/h)       | 24  | 97  | 20  | 19  | 76  | 25  | 14   | 228   | 33  | 28  | 324   | 34  |
| Future Volume (veh/h)        | 24  | 97  | 20  | 19  | 76  | 25  | 14   | 228   | 33  | 28  | 324   | 34  |
| Number                       | 7   | 4   | 14  | 3   | 8   | 18  | 5  | 2   | 12  | 1   | 6   | 16  |
| Initial Q (Qb), veh          | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0   | 0   | 0   | 0   | 0   |
| Ped-Bike Adj(A_pbT)          | 1.00  |   | 1.00  | 1.00  |   | 1.00  | 1.00   |   | 1.00  | 1.00  |   | 1.00  |
| Parking Bus, Adj             | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00   | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Adj Sat Flow, veh/h/ln       | 1800  | 1762  | 1800  | 1872  | 1827  | 1872  | 1872   | 1806  | 1872  | 1800  | 1756  | 1800  |
| Adj Flow Rate, veh/h         | 26  | 105   | 22  | 21  | 83  | 27  | 15   | 248   | 36  | 30  | 352   | 37  |
| Adj No. of Lanes             | 0   | 1   | 0   | 0   | 1   | 0   | 0  | 1   | 0   | 0   | 1   | 0   |
| Peak Hour Factor             | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  | 0.92   | 0.92  | 0.92  | 0.92  | 0.92  | 0.92  |
| Percent Heavy Veh, %         | 0   | 0   | 0   | 0   | 0   | 0   | 4  | 4   | 4   | 2   | 2   | 2   |
| Cap, veh/h                   | 118   | 191   | 37  | 115   | 184   | 55  | 98   | 1023  | 143   | 117   | 1013  | 102   |
| Arrive On Green              | 0.16  | 0.16  | 0.16  | 0.16  | 0.16  | 0.16  | 0.68   | 0.68  | 0.68  | 0.68  | 0.68  | 0.68  |
| Sat Flow, veh/h              | 198   | 1227  | 239   | 185   | 1185  | 356   | 30   | 1505  | 210   | 55  | 1491  | 150   |
| Grp Volume(v), veh/h         | 153   | 0   | 0   | 131   | 0   | 0   | 299  | 0   | 0   | 419   | 0   | 0   |
| Grp Sat Flow(s),veh/h/ln     | 1665  | 0   | 0   | 1725  | 0   | 0   | 1745   | 0   | 0   | 1696  | 0   | 0   |
| Q Serve(g_s), s              | 0.8   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Cycle Q Clear(g_c), s        | 4.0   | 0.0   | 0.0   | 3.3   | 0.0   | 0.0   | 3.2  | 0.0   | 0.0   | 5.0   | 0.0   | 0.0   |
| Prop In Lane                 | 0.17  |   | 0.14  | 0.16  |   | 0.21  | 0.05   |   | 0.12  | 0.07  |   | 0.09  |
| Lane Grp Cap(c), veh/h       | 346   | 0   | 0   | 355   | 0   | 0   | 1264   | 0   | 0   | 1232  | 0   | 0   |
| V/C Ratio(X)                 | 0.44  | 0.00  | 0.00  | 0.37  | 0.00  | 0.00  | 0.24   | 0.00  | 0.00  | 0.34  | 0.00  | 0.00  |
| Avail Cap(c_a), veh/h        | 793   | 0   | 0   | 814   | 0   | 0   | 1264   | 0   | 0   | 1232  | 0   | 0   |
| HCM Platoon Ratio            | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00   | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Upstream Filter(I)           | 1.00  | 0.00  | 0.00  | 1.00  | 0.00  | 0.00  | 1.00   | 0.00  | 0.00  | 1.00  | 0.00  | 0.00  |
| Uniform Delay (d), s/veh     | 19.0  | 0.0   | 0.0   | 18.7  | 0.0   | 0.0   | 3.0  | 0.0   | 0.0   | 3.3   | 0.0   | 0.0   |
| Incr Delay (d2), s/veh       | 0.9   | 0.0   | 0.0   | 0.6   | 0.0   | 0.0   | 0.4  | 0.0   | 0.0   | 0.8   | 0.0   | 0.0   |
| Initial Q Delay(d3),s/veh    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| %ile BackOfQ(95%),veh/ln     | 3.5   | 0.0   | 0.0   | 3.0   | 0.0   | 0.0   | 3.0  | 0.0   | 0.0   | 4.7   | 0.0   | 0.0   |
| LnGrp Delay(d),s/veh         | 19.9  | 0.0   | 0.0   | 19.3  | 0.0   | 0.0   | 3.4  | 0.0   | 0.0   | 4.0   | 0.0   | 0.0   |
| LnGrp LOS                    | B   |   |   | B   |   |   | A  |   |   | A   |   |   |
| Approach Vol, veh/h          |   | 153   |   |   | 131   |   |  | 299   |   |   | 419   |   |
| Approach Delay, s/veh        |   | 19.9  |   |   | 19.3  |   |  | 3.4   |   |   | 4.0   |   |
| Approach LOS                 |   | B   |   |   | B   |   |  | A   |   |   | A   |   |
| <b>Timer</b>                 | <b>1</b>  | <b>2</b>  | <b>3</b>  | <b>4</b>  | <b>5</b>  | <b>6</b>  | <b>7</b>   | <b>8</b>  |   |   |   |   |
| Assigned Phs                 |   | 2   |   | 4   |   | 6   |  | 8   |   |   |   |   |
| Phs Duration (G+Y+Rc), s     |   | 37.0  |   | 11.6  |   | 37.0  |  | 11.6  |   |   |   |   |
| Change Period (Y+Rc), s      |   | 5.0   |   | 5.0   |   | 5.0   |  | 5.0   |   |   |   |   |
| Max Green Setting (Gmax), s  |   | 32.0  |   | 20.0  |   | 32.0  |  | 20.0  |   |   |   |   |
| Max Q Clear Time (g_c+I1), s |   | 5.2   |   | 6.0   |   | 7.0   |  | 5.3   |   |   |   |   |
| Green Ext Time (p_c), s      |   | 2.0   |   | 0.7   |   | 2.9   |  | 0.6   |   |   |   |   |
| <b>Intersection Summary</b>  |   |   |   |   |   |   |  |   |   |   |   |   |
| HCM 2010 Ctrl Delay          |   |   |   | 8.3   |   |   |  |   |   |   |   |   |
| HCM 2010 LOS                 |   |   |   | A   |   |   |  |   |   |   |   |   |

**Intersection**

Intersection Delay, s/veh 9.6

Intersection LOS A

| Movement            | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      | ↕    |      |      | ↕    |      |      | ↕    |      |      | ↕    |      |
| Traffic Vol, veh/h  | 47   | 60   | 6    | 32   | 84   | 31   | 5    | 72   | 13   | 48   | 78   | 44   |
| Future Vol, veh/h   | 47   | 60   | 6    | 32   | 84   | 31   | 5    | 72   | 13   | 48   | 78   | 44   |
| Peak Hour Factor    | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Heavy Vehicles, %   | 2    | 7    | 0    | 6    | 1    | 3    | 0    | 3    | 0    | 5    | 0    | 0    |
| Mvmt Flow           | 59   | 76   | 8    | 41   | 106  | 39   | 6    | 91   | 16   | 61   | 99   | 56   |
| Number of Lanes     | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB  | NB  | SB  |
|----------------------------|-----|-----|-----|-----|
| Opposing Approach          | WB  | EB  | SB  | NB  |
| Opposing Lanes             | 1   | 1   | 1   | 1   |
| Conflicting Approach Left  | SB  | NB  | EB  | WB  |
| Conflicting Lanes Left     | 1   | 1   | 1   | 1   |
| Conflicting Approach Right | NB  | SB  | WB  | EB  |
| Conflicting Lanes Right    | 1   | 1   | 1   | 1   |
| HCM Control Delay          | 9.4 | 9.7 | 8.9 | 9.9 |
| HCM LOS                    | A   | A   | A   | A   |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 6%    | 42%   | 22%   | 28%   |
| Vol Thru, %            | 80%   | 53%   | 57%   | 46%   |
| Vol Right, %           | 14%   | 5%    | 21%   | 26%   |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 90    | 113   | 147   | 170   |
| LT Vol                 | 5     | 47    | 32    | 48    |
| Through Vol            | 72    | 60    | 84    | 78    |
| RT Vol                 | 13    | 6     | 31    | 44    |
| Lane Flow Rate         | 114   | 143   | 186   | 215   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.156 | 0.2   | 0.254 | 0.289 |
| Departure Headway (Hd) | 4.914 | 5.027 | 4.906 | 4.842 |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 723   | 708   | 726   | 736   |
| Service Time           | 2.99  | 3.099 | 2.974 | 2.909 |
| HCM Lane V/C Ratio     | 0.158 | 0.202 | 0.256 | 0.292 |
| HCM Control Delay      | 8.9   | 9.4   | 9.7   | 9.9   |
| HCM Lane LOS           | A     | A     | A     | A     |
| HCM 95th-tile Q        | 0.6   | 0.7   | 1     | 1.2   |

**Intersection**

Intersection Delay, s/veh 8.8

Intersection LOS A

| Movement            | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      | ↕    |      |      | ↕    |      |      | ↕    |      |      | ↕    |      |
| Traffic Vol, veh/h  | 0    | 159  | 1    | 3    | 148  | 0    | 3    | 0    | 2    | 1    | 0    | 0    |
| Future Vol, veh/h   | 0    | 159  | 1    | 3    | 148  | 0    | 3    | 0    | 2    | 1    | 0    | 0    |
| Peak Hour Factor    | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 |
| Heavy Vehicles, %   | 0    | 1    | 0    | 33   | 3    | 0    | 33   | 0    | 0    | 0    | 0    | 0    |
| Mvmt Flow           | 0    | 209  | 1    | 4    | 195  | 0    | 4    | 0    | 3    | 1    | 0    | 0    |
| Number of Lanes     | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    |

| Approach                   | EB  | WB  | NB  | SB |
|----------------------------|-----|-----|-----|----|
| Opposing Approach          | WB  | EB  | SB  | NB |
| Opposing Lanes             | 1   | 1   | 1   | 1  |
| Conflicting Approach Left  | SB  | NB  | EB  | WB |
| Conflicting Lanes Left     | 1   | 1   | 1   | 1  |
| Conflicting Approach Right | NB  | SB  | WB  | EB |
| Conflicting Lanes Right    | 1   | 1   | 1   | 1  |
| HCM Control Delay          | 8.4 | 9.3 | 8.3 | 8  |
| HCM LOS                    | A   | A   | A   | A  |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 60%   | 0%    | 2%    | 100%  |
| Vol Thru, %            | 0%    | 99%   | 98%   | 0%    |
| Vol Right, %           | 40%   | 1%    | 0%    | 0%    |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 5     | 160   | 151   | 1     |
| LT Vol                 | 3     | 0     | 3     | 1     |
| Through Vol            | 0     | 159   | 148   | 0     |
| RT Vol                 | 2     | 1     | 0     | 0     |
| Lane Flow Rate         | 7     | 211   | 199   | 1     |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.01  | 0.238 | 0.256 | 0.002 |
| Departure Headway (Hd) | 5.273 | 4.075 | 4.636 | 5.038 |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 683   | 869   | 771   | 714   |
| Service Time           | 3.273 | 2.151 | 2.689 | 3.039 |
| HCM Lane V/C Ratio     | 0.01  | 0.243 | 0.258 | 0.001 |
| HCM Control Delay      | 8.3   | 8.4   | 9.3   | 8     |
| HCM Lane LOS           | A     | A     | A     | A     |
| HCM 95th-tile Q        | 0     | 0.9   | 1     | 0     |

**Intersection**

Int Delay, s/veh 0.3

**Movement** EBL EBR NBL NBT SBT SBR

|                          |      |      |      |      |      |      |
|--------------------------|------|------|------|------|------|------|
| Lane Configurations      | Y    |      |      | ↑    | ↑    |      |
| Traffic Vol, veh/h       | 2    | 5    | 1    | 149  | 160  | 1    |
| Future Vol, veh/h        | 2    | 5    | 1    | 149  | 160  | 1    |
| Conflicting Peds, #/hr   | 0    | 0    | 0    | 0    | 0    | 0    |
| Sign Control             | Stop | Stop | Free | Free | Free | Free |
| RT Channelized           | -    | None | -    | None | -    | None |
| Storage Length           | 0    | -    | -    | -    | -    | -    |
| Veh in Median Storage, # | 0    | -    | -    | 0    | 0    | -    |
| Grade, %                 | 0    | -    | -    | 0    | 0    | -    |
| Peak Hour Factor         | 79   | 79   | 79   | 79   | 79   | 79   |
| Heavy Vehicles, %        | 0    | 0    | 0    | 3    | 3    | 0    |
| Mvmt Flow                | 3    | 6    | 1    | 189  | 203  | 1    |

**Major/Minor** Minor2 Major1 Major2

|                      |     |     |      |   |   |   |
|----------------------|-----|-----|------|---|---|---|
| Conflicting Flow All | 395 | 204 | 204  | 0 | - | 0 |
| Stage 1              | 204 | -   | -    | - | - | - |
| Stage 2              | 191 | -   | -    | - | - | - |
| Critical Hdwy        | 6.4 | 6.2 | 4.3  | - | - | - |
| Critical Hdwy Stg 1  | 5.4 | -   | -    | - | - | - |
| Critical Hdwy Stg 2  | 5.4 | -   | -    | - | - | - |
| Follow-up Hdwy       | 3   | 3.1 | 3    | - | - | - |
| Pot Cap-1 Maneuver   | 698 | 891 | 1023 | - | - | - |
| Stage 1              | 961 | -   | -    | - | - | - |
| Stage 2              | 975 | -   | -    | - | - | - |
| Platoon blocked, %   |     |     |      | - | - | - |
| Mov Cap-1 Maneuver   | 697 | 891 | 1023 | - | - | - |
| Mov Cap-2 Maneuver   | 697 | -   | -    | - | - | - |
| Stage 1              | 960 | -   | -    | - | - | - |
| Stage 2              | 975 | -   | -    | - | - | - |

**Approach** EB NB SB

|                      |     |     |   |
|----------------------|-----|-----|---|
| HCM Control Delay, s | 9.4 | 0.1 | 0 |
| HCM LOS              | A   |     |   |

**Minor Lane/Major Mvmt** NBL NBT EBLn1 SBT SBR

|                       |       |   |       |   |   |
|-----------------------|-------|---|-------|---|---|
| Capacity (veh/h)      | 1023  | - | 825   | - | - |
| HCM Lane V/C Ratio    | 0.001 | - | 0.011 | - | - |
| HCM Control Delay (s) | 8.5   | 0 | 9.4   | - | - |
| HCM Lane LOS          | A     | A | A     | - | - |
| HCM 95th %tile Q(veh) | 0     | - | 0     | - | - |

**Intersection**

Int Delay, s/veh 0.2

**Movement** EBL EBR NBL NBT SBT SBR

|                          |      |      |      |      |      |      |
|--------------------------|------|------|------|------|------|------|
| Lane Configurations      | Y    |      |      | ↑    | ↑    |      |
| Traffic Vol, veh/h       | 1    | 3    | 5    | 194  | 249  | 2    |
| Future Vol, veh/h        | 1    | 3    | 5    | 194  | 249  | 2    |
| Conflicting Peds, #/hr   | 0    | 0    | 0    | 0    | 0    | 0    |
| Sign Control             | Stop | Stop | Free | Free | Free | Free |
| RT Channelized           | -    | None | -    | None | -    | None |
| Storage Length           | 0    | -    | -    | -    | -    | -    |
| Veh in Median Storage, # | 0    | -    | -    | 0    | 0    | -    |
| Grade, %                 | 0    | -    | -    | 0    | 0    | -    |
| Peak Hour Factor         | 90   | 90   | 90   | 90   | 90   | 90   |
| Heavy Vehicles, %        | 0    | 0    | 0    | 0    | 0    | 0    |
| Mvmt Flow                | 1    | 3    | 6    | 216  | 277  | 2    |

**Major/Minor** Minor2 Major1 Major2

|                      |     |     |     |   |   |   |
|----------------------|-----|-----|-----|---|---|---|
| Conflicting Flow All | 506 | 278 | 279 | 0 | - | 0 |
| Stage 1              | 278 | -   | -   | - | - | - |
| Stage 2              | 228 | -   | -   | - | - | - |
| Critical Hdwy        | 6.4 | 6.2 | 4.3 | - | - | - |
| Critical Hdwy Stg 1  | 5.4 | -   | -   | - | - | - |
| Critical Hdwy Stg 2  | 5.4 | -   | -   | - | - | - |
| Follow-up Hdwy       | 3   | 3.1 | 3   | - | - | - |
| Pot Cap-1 Maneuver   | 598 | 809 | 964 | - | - | - |
| Stage 1              | 886 | -   | -   | - | - | - |
| Stage 2              | 936 | -   | -   | - | - | - |
| Platoon blocked, %   |     |     |     | - | - | - |
| Mov Cap-1 Maneuver   | 594 | 809 | 964 | - | - | - |
| Mov Cap-2 Maneuver   | 594 | -   | -   | - | - | - |
| Stage 1              | 880 | -   | -   | - | - | - |
| Stage 2              | 936 | -   | -   | - | - | - |

**Approach** EB NB SB

|                      |     |     |   |
|----------------------|-----|-----|---|
| HCM Control Delay, s | 9.9 | 0.2 | 0 |
| HCM LOS              | A   |     |   |

**Minor Lane/Major Mvmt** NBL NBT EBLn1 SBT SBR

|                       |       |   |       |   |   |
|-----------------------|-------|---|-------|---|---|
| Capacity (veh/h)      | 964   | - | 742   | - | - |
| HCM Lane V/C Ratio    | 0.006 | - | 0.006 | - | - |
| HCM Control Delay (s) | 8.8   | 0 | 9.9   | - | - |
| HCM Lane LOS          | A     | A | A     | - | - |
| HCM 95th %tile Q(veh) | 0     | - | 0     | - | - |

HCM 2010 Signalized Intersection Summary  
5: N Wayne & Eagle

04/16/2020

|                             |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement                    | EBL   | EBT   | EBR   | WBL   | WBT   | WBR   | NBL  | NBT   | NBR   | SBL   | SBT   | SBR   |
| Lane Configurations         |   | ↕   |   |   | ↕   |   |  | ↕   |   |   | ↕   |   |
| Traffic Volume (veh/h)      | 44  | 150   | 22  | 36  | 142   | 41  | 23   | 271   | 43  | 32  | 342   | 36  |
| Future Volume (veh/h)       | 44  | 150   | 22  | 36  | 142   | 41  | 23   | 271   | 43  | 32  | 342   | 36  |
| Number                      | 7   | 4   | 14  | 3   | 8   | 18  | 5  | 2   | 12  | 1   | 6   | 16  |
| Initial Q (Qb), veh         | 0   | 0   | 0   | 0   | 0   | 0   | 0  | 0   | 0   | 0   | 0   | 0   |
| Ped-Bike Adj(A_pbT)         | 1.00  |   | 1.00  | 1.00  |   | 1.00  | 1.00   |   | 1.00  | 1.00  |   | 1.00  |
| Parking Bus, Adj            | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00   | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Adj Sat Flow, veh/h/ln      | 1800  | 1779  | 1800  | 1872  | 1872  | 1872  | 1872   | 1838  | 1872  | 1800  | 1770  | 1800  |
| Adj Flow Rate, veh/h        | 46  | 156   | 23  | 38  | 148   | 43  | 24   | 282   | 45  | 33  | 356   | 38  |
| Adj No. of Lanes            | 0   | 1   | 0   | 0   | 1   | 0   | 0  | 1   | 0   | 0   | 1   | 0   |
| Peak Hour Factor            | 0.96  | 0.96  | 0.96  | 0.96  | 0.96  | 0.96  | 0.96   | 0.96  | 0.96  | 0.96  | 0.96  | 0.96  |
| Percent Heavy Veh, %        | 1   | 1   | 1   | 0   | 0   | 0   | 2  | 2   | 2   | 2   | 2   | 2   |
| Cap, veh/h                  | 134   | 249   | 34  | 122   | 244   | 66  | 108  | 958   | 146   | 117   | 961   | 98  |
| Arrive On Green             | 0.20  | 0.20  | 0.20  | 0.20  | 0.20  | 0.20  | 0.65   | 0.65  | 0.65  | 0.65  | 0.65  | 0.65  |
| Sat Flow, veh/h             | 249   | 1265  | 172   | 203   | 1238  | 333   | 51   | 1482  | 225   | 63  | 1486  | 151   |
| Grp Volume(v), veh/h        | 225   | 0   | 0   | 229   | 0   | 0   | 351  | 0   | 0   | 427   | 0   | 0   |
| Grp Sat Flow(s),veh/h/ln    | 1686  | 0   | 0   | 1775  | 0   | 0   | 1758   | 0   | 0   | 1701  | 0   | 0   |
| Q Serve(g_s), s             | 0.2   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Cycle Q Clear(g_c), s       | 6.1   | 0.0   | 0.0   | 5.9   | 0.0   | 0.0   | 4.4  | 0.0   | 0.0   | 5.9   | 0.0   | 0.0   |
| Prop In Lane                | 0.20  |   | 0.10  | 0.17  |   | 0.19  | 0.07   |   | 0.13  | 0.08  |   | 0.09  |
| Lane Grp Cap(c), veh/h      | 417   | 0   | 0   | 432   | 0   | 0   | 1212   | 0   | 0   | 1175  | 0   | 0   |
| V/C Ratio(X)                | 0.54  | 0.00  | 0.00  | 0.53  | 0.00  | 0.00  | 0.29   | 0.00  | 0.00  | 0.36  | 0.00  | 0.00  |
| Avail Cap(c_a), veh/h       | 758   | 0   | 0   | 793   | 0   | 0   | 1212   | 0   | 0   | 1175  | 0   | 0   |
| HCM Platoon Ratio           | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  | 1.00   | 1.00  | 1.00  | 1.00  | 1.00  | 1.00  |
| Upstream Filter(I)          | 1.00  | 0.00  | 0.00  | 1.00  | 0.00  | 0.00  | 1.00   | 0.00  | 0.00  | 1.00  | 0.00  | 0.00  |
| Uniform Delay (d), s/veh    | 18.9  | 0.0   | 0.0   | 18.8  | 0.0   | 0.0   | 4.0  | 0.0   | 0.0   | 4.2   | 0.0   | 0.0   |
| Incr Delay (d2), s/veh      | 1.1   | 0.0   | 0.0   | 1.0   | 0.0   | 0.0   | 0.6  | 0.0   | 0.0   | 0.9   | 0.0   | 0.0   |
| Initial Q Delay(d3),s/veh   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| %ile BackOfQ(50%),veh/ln    | 3.0   | 0.0   | 0.0   | 3.0   | 0.0   | 0.0   | 2.3  | 0.0   | 0.0   | 3.0   | 0.0   | 0.0   |
| LnGrp Delay(d),s/veh        | 20.0  | 0.0   | 0.0   | 19.8  | 0.0   | 0.0   | 4.6  | 0.0   | 0.0   | 5.1   | 0.0   | 0.0   |
| LnGrp LOS                   | B   |   |   | B   |   |   | A  |   |   | A   |   |   |
| Approach Vol, veh/h         |   | 225   |   |   | 229   |   |  | 351   |   |   | 427   |   |
| Approach Delay, s/veh       |   | 20.0  |   |   | 19.8  |   |  | 4.6   |   |   | 5.1   |   |
| Approach LOS                |   | B   |   |   | B   |   |  | A   |   |   | A   |   |
| <b>Timer</b>                | <b>1</b>  | <b>2</b>  | <b>3</b>  | <b>4</b>  | <b>5</b>  | <b>6</b>  | <b>7</b>   | <b>8</b>  |   |   |   |   |
| Assigned Phs                |   | 2   |   | 4   |   | 6   |  | 8   |   |   |   |   |
| Phs Duration (G+Y+Rc), s    |   | 37.0  |   | 14.1  |   | 37.0  |  | 14.1  |   |   |   |   |
| Change Period (Y+Rc), s     |   | 5.0   |   | 5.0   |   | 5.0   |  | 5.0   |   |   |   |   |
| Max Green Setting (Gmax), s |   | 32.0  |   | 20.0  |   | 32.0  |  | 20.0  |   |   |   |   |
| Max Q Clear Time (g_c+1), s |   | 6.4   |   | 8.1   |   | 7.9   |  | 7.9   |   |   |   |   |
| Green Ext Time (p_c), s     |   | 2.4   |   | 1.0   |   | 3.0   |  | 1.0   |   |   |   |   |
| <b>Intersection Summary</b> |   |   |   |   |   |   |  |   |   |   |   |   |
| HCM 2010 Ctrl Delay         |   |   |   | 10.4  |   |   |  |   |   |   |   |   |
| HCM 2010 LOS                |   |   |   | B   |   |   |  |   |   |   |   |   |

**Intersection**

Intersection Delay, s/veh 10.9

Intersection LOS B

| Movement            | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      | ↕    |      |      | ↕    |      |      | ↕    |      |      | ↕    |      |
| Traffic Vol, veh/h  | 60   | 105  | 7    | 21   | 142  | 40   | 18   | 96   | 59   | 48   | 73   | 131  |
| Future Vol, veh/h   | 60   | 105  | 7    | 21   | 142  | 40   | 18   | 96   | 59   | 48   | 73   | 131  |
| Peak Hour Factor    | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, %   | 4    | 0    | 0    | 5    | 1    | 0    | 6    | 1    | 2    | 0    | 1    | 0    |
| Mvmt Flow           | 64   | 112  | 7    | 22   | 151  | 43   | 19   | 102  | 63   | 51   | 78   | 139  |
| Number of Lanes     | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    |

| Approach                   | EB   | WB | NB   | SB   |
|----------------------------|------|----|------|------|
| Opposing Approach          | WB   | EB | SB   | NB   |
| Opposing Lanes             | 1    | 1  | 1    | 1    |
| Conflicting Approach Left  | SB   | NB | EB   | WB   |
| Conflicting Lanes Left     | 1    | 1  | 1    | 1    |
| Conflicting Approach Right | NB   | SB | WB   | EB   |
| Conflicting Lanes Right    | 1    | 1  | 1    | 1    |
| HCM Control Delay          | 10.8 | 11 | 10.4 | 11.1 |
| HCM LOS                    | B    | B  | B    | B    |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |
|------------------------|-------|-------|-------|-------|
| Vol Left, %            | 10%   | 35%   | 10%   | 19%   |
| Vol Thru, %            | 55%   | 61%   | 70%   | 29%   |
| Vol Right, %           | 34%   | 4%    | 20%   | 52%   |
| Sign Control           | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    | 173   | 172   | 203   | 252   |
| LT Vol                 | 18    | 60    | 21    | 48    |
| Through Vol            | 96    | 105   | 142   | 73    |
| RT Vol                 | 59    | 7     | 40    | 131   |
| Lane Flow Rate         | 184   | 183   | 216   | 268   |
| Geometry Grp           | 1     | 1     | 1     | 1     |
| Degree of Util (X)     | 0.273 | 0.283 | 0.323 | 0.375 |
| Departure Headway (Hd) | 5.345 | 5.565 | 5.39  | 5.033 |
| Convergence, Y/N       | Yes   | Yes   | Yes   | Yes   |
| Cap                    | 672   | 644   | 665   | 713   |
| Service Time           | 3.386 | 3.606 | 3.43  | 3.071 |
| HCM Lane V/C Ratio     | 0.274 | 0.284 | 0.325 | 0.376 |
| HCM Control Delay      | 10.4  | 10.8  | 11    | 11.1  |
| HCM Lane LOS           | B     | B     | B     | B     |
| HCM 95th-tile Q        | 1.1   | 1.2   | 1.4   | 1.7   |

**Intersection**

Intersection Delay, s/veh 8.7  
 Intersection LOS A

| Movement            | EBL  | EBT  | EBR  | WBL  | WBT  | WBR  | NBL  | NBT  | NBR  | SBL  | SBT  | SBR  |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations |      | ↕    |      |      | ↕    |      |      | ↕    |      |      | ↕    |      |
| Traffic Vol, veh/h  | 1    | 247  | 1    | 2    | 189  | 1    | 0    | 0    | 3    | 0    | 0    | 1    |
| Future Vol, veh/h   | 1    | 247  | 1    | 2    | 189  | 1    | 0    | 0    | 3    | 0    | 0    | 1    |
| Peak Hour Factor    | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, %   | 0    | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Mvmt Flow           | 1    | 268  | 1    | 2    | 205  | 1    | 0    | 0    | 3    | 0    | 0    | 1    |
| Number of Lanes     | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    | 0    | 1    | 0    |

| Approach                      | EB  | WB  | NB  | SB  |
|-------------------------------|-----|-----|-----|-----|
| Opposing Approach             | WB  | EB  | SB  | NB  |
| Opposing Lanes                | 1   | 1   | 1   | 1   |
| Conflicting Approach Left SB  |     | NB  | EB  | WB  |
| Conflicting Lanes Left        | 1   | 1   | 1   | 1   |
| Conflicting Approach Right NB |     | SB  | WB  | EB  |
| Conflicting Lanes Right       | 1   | 1   | 1   | 1   |
| HCM Control Delay             | 8.9 | 8.5 | 7.3 | 7.3 |
| HCM LOS                       | A   | A   | A   | A   |

| Lane                   | NBLn1 | EBLn1 | WBLn1 | SBLn1 |       |
|------------------------|-------|-------|-------|-------|-------|
| Vol Left, %            |       | 0%    | 0%    | 1%    | 0%    |
| Vol Thru, %            |       | 0%    | 99%   | 98%   | 0%    |
| Vol Right, %           |       | 100%  | 0%    | 1%    | 100%  |
| Sign Control           |       | Stop  | Stop  | Stop  | Stop  |
| Traffic Vol by Lane    |       | 3     | 249   | 192   | 1     |
| LT Vol                 |       | 0     | 1     | 2     | 0     |
| Through Vol            |       | 0     | 247   | 189   | 0     |
| RT Vol                 |       | 3     | 1     | 1     | 1     |
| Lane Flow Rate         |       | 3     | 271   | 209   | 1     |
| Geometry Grp           |       | 1     | 1     | 1     | 1     |
| Degree of Util (X)     |       | 0.004 | 0.305 | 0.238 | 0.001 |
| Departure Headway (Hd) |       | 4.31  | 4.061 | 4.108 | 4.313 |
| Convergence, Y/N       |       | Yes   | Yes   | Yes   | Yes   |
| Cap                    |       | 835   | 880   | 868   | 835   |
| Service Time           |       | 2.31  | 2.107 | 2.163 | 2.313 |
| HCM Lane V/C Ratio     |       | 0.004 | 0.308 | 0.241 | 0.001 |
| HCM Control Delay      |       | 7.3   | 8.9   | 8.5   | 7.3   |
| HCM Lane LOS           |       | A     | A     | A     | A     |
| HCM 95th-tile Q        |       | 0     | 1.3   | 0.9   | 0     |

**Intersection**

Int Delay, s/veh 0.2

| Movement                 | EBL  | EBR  | NBL  | NBT  | SBT  | SBR  |
|--------------------------|------|------|------|------|------|------|
| Lane Configurations      | Y    |      |      | ↑    | ↑    |      |
| Traffic Vol, veh/h       | 2    | 3    | 5    | 190  | 248  | 3    |
| Future Vol, veh/h        | 2    | 3    | 5    | 190  | 248  | 3    |
| Conflicting Peds, #/hr   | 0    | 0    | 0    | 0    | 0    | 0    |
| Sign Control             | Stop | Stop | Free | Free | Free | Free |
| RT Channelized           | -    | None | -    | None | -    | None |
| Storage Length           | 0    | -    | -    | -    | -    | -    |
| Veh in Median Storage, # | 0    | -    | -    | 0    | 0    | -    |
| Grade, %                 | 0    | -    | -    | 0    | 0    | -    |
| Peak Hour Factor         | 90   | 90   | 90   | 90   | 90   | 90   |
| Heavy Vehicles, %        | 0    | 0    | 0    | 2    | 3    | 0    |
| Mvmt Flow                | 2    | 3    | 6    | 211  | 276  | 3    |

| Major/Minor          | Minor2 | Major1 | Major2 |   |   |   |
|----------------------|--------|--------|--------|---|---|---|
| Conflicting Flow All | 501    | 278    | 279    | 0 | - | 0 |
| Stage 1              | 278    | -      | -      | - | - | - |
| Stage 2              | 223    | -      | -      | - | - | - |
| Critical Hdwy        | 6.4    | 6.2    | 4.3    | - | - | - |
| Critical Hdwy Stg 1  | 5.4    | -      | -      | - | - | - |
| Critical Hdwy Stg 2  | 5.4    | -      | -      | - | - | - |
| Follow-up Hdwy       | 3      | 3.1    | 3      | - | - | - |
| Pot Cap-1 Maneuver   | 602    | 809    | 964    | - | - | - |
| Stage 1              | 886    | -      | -      | - | - | - |
| Stage 2              | 941    | -      | -      | - | - | - |
| Platoon blocked, %   |        |        |        | - | - | - |
| Mov Cap-1 Maneuver   | 598    | 809    | 964    | - | - | - |
| Mov Cap-2 Maneuver   | 598    | -      | -      | - | - | - |
| Stage 1              | 880    | -      | -      | - | - | - |
| Stage 2              | 941    | -      | -      | - | - | - |

| Approach             | EB   | NB  | SB |
|----------------------|------|-----|----|
| HCM Control Delay, s | 10.1 | 0.2 | 0  |
| HCM LOS              | B    |     |    |

| Minor Lane/Major Mvmt | NBL   | NBT | EBLn1 | SBT | SBR |
|-----------------------|-------|-----|-------|-----|-----|
| Capacity (veh/h)      | 964   | -   | 709   | -   | -   |
| HCM Lane V/C Ratio    | 0.006 | -   | 0.008 | -   | -   |
| HCM Control Delay (s) | 8.8   | 0   | 10.1  | -   | -   |
| HCM Lane LOS          | A     | A   | B     | -   | -   |
| HCM 95th %tile Q(veh) | 0     | -   | 0     | -   | -   |

# **APPENDIX G**

## *Auxiliary Turn Lane Warrants*

## Turn Lane Warrant and Length Analysis Workbook

### STUDY LOCATION AND ANALYSIS INFORMATION

|   |  |
|---|--|
| Municipality: <input type="text" value="Radnor"/><br>County: <input type="text" value="Delaware County"/><br>PennDOT Engineering District: <input type="text" value="6"/>   | Analysis Date: <input type="text" value="4/15/2020"/><br>Conducted By: <input type="text" value="FT"/><br>Checked By: <input type="text" value="NB Approach"/><br>Agency/Company Name: <input type="text" value="FTA"/>  |
| Intersection & Approach Description: <input type="text" value="Strafford Ave &amp; Site Driveway (assumes combined volumes into one hypothetical driveway)"/>   |  |
| Analysis Period: <input type="text" value="2024"/><br>Design Hour: <input type="text" value="PM Peak Hour"/><br>Intersection Control: <input type="text" value="Unsignalized"/><br>Posted Speed Limit (MPH): <input type="text" value="25"/><br>Type of Terrain: <input type="text" value="Level"/> | Number of Approach Lanes: <input type="text" value="1"/><br>Undivided or Divided Highway: <input type="text" value="Undivided"/><br>Type of Analysis: <span style="border: 1px solid red; padding: 2px;">Type of Analysis</span><br>Left or Right-Turn Lane Analysis?: <input type="text" value="Left Turn Lane"/> |

### VOLUME CALCULATIONS

| Left Turn Lane Volume Calculations |         |          |        |          |      |
|------------------------------------|---------|----------|--------|----------|------|
| Movement                           |         | Include? | Volume | % Trucks | PCEV |
| Advancing                          | Left    | Yes      | 10     | 0.0%     | 10   |
|                                    | Through | -        | 194    | 5.0%     | 199  |
|                                    | Right   | No       | 0      | 0.0%     | N/A  |
| Opposing                           | Left    | No       | 0      | 0.0%     | N/A  |
|                                    | Through | -        | 249    | 5.0%     | 256  |
|                                    | Right   | Yes      | 4      | 0.0%     | 4    |

|                                   |                                    |
|-----------------------------------|------------------------------------|
| Advancing Volume:                 | <input type="text" value="209"/>   |
| Opposing Volume:                  | <input type="text" value="260"/>   |
| Left Turn Volume:                 | <input type="text" value="10"/>    |
| % Left Turns in Advancing Volume: | <input type="text" value="4.78%"/> |

| 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:  | <input type="text" value="N/A"/> |
| Right Turn Volume: | <input type="text" value="N/A"/> |

### TURN LANE WARRANT FINDINGS

| Left Turn Lane Warrant Findings   | Right Turn Lane Warrant Findings  |
|---|---|
| Applicable Warrant Figure: <input type="text" value="Figure 1"/><br>Warrant Met?: <input type="text" value="No"/> | Applicable Warrant Figure: <input type="text" value="N/A"/><br>Warrant Met?: <input type="text" value="N/A"/> |

### TURN LANE LENGTH CALCULATIONS

|  |   |
|--|---|
| Intersection Control: <input type="text" value="Unsignalized"/><br>Design Hour Volume of Turning Lane: <input type="text" value="10"/><br>Cycles Per Hour (Assumed): <input type="text" value="60"/><br>Cycles Per Hour (If Known): <input type="text"/> | Average # of Vehicles/Cycle: <input type="text" value="N/A"/> |
|--|---|

| Type of Traffic Control | PennDOT Publication 46, Exhibit 11-6 |     |        |        |        |        |
|-------------------------|--------------------------------------|-----|--------|--------|--------|--------|
|                         | Speed (MPH)                          |     |        |        |        |        |
|                         | 25-35                                |     | 40-45  |        | 50-60  |        |
|                         | 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: | <input type="text" value="N/A"/> | Feet |
| Condition B:                                | <input type="text" value="N/A"/> | Feet |
| Condition C:                                | <input type="text" value="N/A"/> | Feet |
| Required Left Turn Lane Storage Length:     | <input type="text" value="N/A"/> | Feet |

Additional Findings:

Additional Comments / Justifications:

## Turn Lane Warrant and Length Analysis Workbook

### STUDY LOCATION AND ANALYSIS INFORMATION

|   |  |
|---|--|
| Municipality: <input type="text" value="Radnor"/><br>County: <input type="text" value="Delaware County"/><br>PennDOT Engineering District: <input type="text" value="6"/>   | Analysis Date: <input type="text" value="4/15/2020"/><br>Conducted By: <input type="text" value="FT"/><br>Checked By: <input type="text" value="SB Approach"/><br>Agency/Company Name: <input type="text" value="FTA"/>  |
| Intersection & Approach Description: <input type="text" value="Strafford Ave &amp; Site Driveway"/>   |  |
| Analysis Period: <input type="text" value="2024"/><br>Design Hour: <input type="text" value="PM Peak Hour"/><br>Intersection Control: <input type="text" value="Unsignalized"/><br>Posted Speed Limit (MPH): <input type="text" value="25"/><br>Type of Terrain: <input type="text" value="Level"/> | Number of Approach Lanes: <input type="text" value="1"/><br>Undivided or Divided Highway: <input type="text" value="Undivided"/><br><div style="border: 1px solid red; padding: 2px; display: inline-block;">Type of Analysis</div><br>Left or Right-Turn Lane Analysis?: <input type="text" value="Right Turn Lane"/> |

### VOLUME CALCULATIONS

| Left Turn Lane Volume Calculations  |         |          |        |          |      |
|---|---------|----------|--------|----------|------|
| Movement  |         | Include? | Volume | % Trucks | PCEV |
| Advancing   | Left    | Yes      | 0      | 0.0%     | N/A  |
|   | Through | -        | 0      | 0.0%     | N/A  |
|   | Right   | No       | 0      | 0.0%     | N/A  |
| Opposing  | Left    | No       | 0      | 0.0%     | N/A  |
|   | Through | -        | 0      | 0.0%     | N/A  |
|   | Right   | Yes      | 0      | 0.0%     | N/A  |
| Advancing Volume: <input type="text" value="N/A"/><br>Opposing Volume: <input type="text" value="N/A"/><br>Left Turn Volume: <input type="text" value="N/A"/><br>% Left Turns in Advancing Volume: <input type="text" value="N/A"/> |         |          |        |          |      |
| Right Turn Lane Volume Calculations   |         |          |        |          |      |
| Movement  |         | Include? | Volume | % Trucks | PCEV |
| Advancing   | Left    | No       | 0      | 0.0%     | N/A  |
|   | Through | -        | 249    | 5.0%     | 256  |
|   | Right   | -        | 4      | 0.0%     | 4    |
| Advancing Volume: <input type="text" value="260"/><br>Right Turn Volume: <input type="text" value="4"/>   |         |          |        |          |      |

### TURN LANE WARRANT FINDINGS

| Left Turn Lane Warrant Findings   | Right Turn Lane Warrant Findings  |
|---|---|
| Applicable Warrant Figure: <input type="text" value="N/A"/><br>Warrant Met?: <input type="text" value="N/A"/> | Applicable Warrant Figure: <input type="text" value="Figure 9"/><br>Warrant Met?: <input type="text" value="No"/> |

### TURN LANE LENGTH CALCULATIONS

| Intersection Control: <input type="text" value="Unsignalized"/><br>Design Hour Volume of Turning Lane: <input type="text" value="4"/><br>Cycles Per Hour (Assumed): <input type="text" value="60"/><br>Cycles Per Hour (If Known): <input type="text"/>  | Average # of Vehicles/Cycle: <input type="text" value="N/A"/> |                         |             |        |        |        |  |  |       |  |       |  |       |  |                    |  |  |  |  |  |  |      |     |      |     |      |     |            |   |   |        |        |        |        |              |   |   |   |   |        |   |
|--|---|-------------------------|-------------|--------|--------|--------|--|--|-------|--|-------|--|-------|--|--------------------|--|--|--|--|--|--|------|-----|------|-----|------|-----|------------|---|---|--------|--------|--------|--------|--------------|---|---|---|---|--------|---|
| PennDOT Publication 46, Exhibit 11-6   |   |                         |             |        |        |        |  |  |       |  |       |  |       |  |                    |  |  |  |  |  |  |      |     |      |     |      |     |            |   |   |        |        |        |        |              |   |   |   |   |        |   |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="3">Type of Traffic Control</th> <th colspan="6">Speed (MPH)</th> </tr> <tr> <th colspan="2">25-35</th> <th colspan="2">40-45</th> <th colspan="2">50-60</th> </tr> <tr> <th colspan="6" style="text-align: center;">Turn Demand Volume</th> </tr> <tr> <th></th> <th>High</th> <th>Low</th> <th>High</th> <th>Low</th> <th>High</th> <th>Low</th> </tr> </thead> <tbody> <tr> <td>Signalized</td> <td>A</td> <td>A</td> <td>B or C</td> <td>B or C</td> <td>B or C</td> <td>B or C</td> </tr> <tr> <td>Unsignalized</td> <td>A</td> <td>A</td> <td>C</td> <td>B</td> <td>B or C</td> <td>B</td> </tr> </tbody> </table> |   | 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 |
| 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      |  |  |       |  |       |  |       |  |                    |  |  |  |  |  |  |      |     |      |     |      |     |            |   |   |        |        |        |        |              |   |   |   |   |        |   |
| Right Turn Lane Storage Length, Condition A: <input type="text" value="N/A"/> Feet<br>Condition B: <input type="text" value="N/A"/> Feet<br>Condition C: <input type="text" value="N/A"/> Feet<br>Required Right Turn Lane Storage Length: <input type="text" value="N/A"/> Feet   |   |                         |             |        |        |        |  |  |       |  |       |  |       |  |                    |  |  |  |  |  |  |      |     |      |     |      |     |            |   |   |        |        |        |        |              |   |   |   |   |        |   |
| Additional Findings: <input type="text" value="N/A"/>  |   |                         |             |        |        |        |  |  |       |  |       |  |       |  |                    |  |  |  |  |  |  |      |     |      |     |      |     |            |   |   |        |        |        |        |              |   |   |   |   |        |   |
| Additional Comments / Justifications:<br><div style="border: 1px solid black; height: 30px; width: 100%;"></div>   |   |                         |             |        |        |        |  |  |       |  |       |  |       |  |                    |  |  |  |  |  |  |      |     |      |     |      |     |            |   |   |        |        |        |        |              |   |   |   |   |        |   |