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# TRANSPORTATION IMPACT STUDY

**Bull Road Logistics  
Dover Township  
York County, Pennsylvania**

*Prepared For:*

**BULL CANAL DOVER OWNER LLC  
845 Texas Avenue, Suite 3300  
Houston, TX 77002**

*Prepared By:*

**Langan Engineering & Environmental Services, Inc.  
2700 Kelly Road, Suite 200  
Warrington, Pennsylvania 18976**



A handwritten signature in black ink that reads "AnnMarie Vigilante".

**AnnMarie Vigilante, P.E.  
Professional Engineer License No. PE073281**

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# ***LANGAN***

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## **EXECUTIVE SUMMARY**

Langan Engineering and Environmental Services, Inc. (Langan) has prepared this study to assess the traffic impacts associated with the proposed construction of the Bull Road Logistics development located along Bull Road (SR 4001) in Dover Township, York County, Pennsylvania. The proposed development includes the construction of three buildings totaling 1,892,510 square feet of warehousing. Warehouse 1 will be 352,670 square feet, Warehouse 2 will be 1,059,840 square feet and Warehouse 3 will be 450,000 square feet. Construction is anticipated to begin once approvals have been obtained and be completed by the end of 2024.

Access to the site will be provided via one full-access unsignalized driveway located along Bull Road (SR 4001). The potential for an emergency access driveway to Fox Run Road will be discussed with Dover Township as part of the Land Development submissions.

The project is located on an approximate 198.26 acre site bordered on the east by Bull Road (SR 4001), on the west by Fox Run Road, on the north by agricultural properties and on the south by Canal Road (SR 0921). The existing site is undeveloped and the area surrounding the site is a mixture of agricultural uses and residential properties.

Langan has estimated the number of trips the proposed development would generate based on trip generation rates provided by ITE. Based upon the trip generation data, it is estimated that the development will generate approximately 329 trips (254 enter, 75 exit) during the weekday morning peak hour and 346 trips (97 enter, 249 exit) during the weekday evening peak hour. The estimated daily 24 hour two-way trips for the overall site is 3,237 (for a typical weekday), which equates to 1,619 vehicles.

The directional distributions of site generated traffic were determined based on a journey to work census model and an analysis of the existing manual counts and knowledge of the surrounding road network, including access to major arterials. The study area scope of the Transportation Impact Study was discussed and verified with PennDOT and the surrounding municipalities as part of the preliminary scoping application coordination. As part of the Scoping Meeting, We coordinated with Dover Township, Conewago Township, and PennDOT District 8-0.

Based on such discussions, we conducted capacity analyses at the following intersections:

- Canal Road (SR 0921) and Main Street (SR 0074)
- Bull Road (SR 4001) and Canal Road (SR 0921)
- Canal Road (SR 0921) and Greenbriar Road (SR 4011)
- Canal Road (SR 0921) and Susquehanna Trail (SR 0297)

- I-83 SB and SR 0297
- I-83 NB and SR 0297
- Bull Road (SR 4001) and Hilton Avenue
- Bull Road (SR 4001) and Church Road (SR 0238)
- Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001)
- Bull Road (SR 4001) and Site Driveway

With the identified improvements in place, all study area intersections will operate at overall LOS C or better, with the exception of the intersection of Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001), which will operate at LOS E during the weekday morning and evening peak hours. The proposed site driveway intersection along Bull Road (SR 4001) will operate at optimal overall LOS A, with no capacity or queuing issues. The increase in overall delays at the study area intersections, when comparing the 2029 build with improvements conditions to the 2029 no-build conditions fall within an accepted 10 second variance as allowed by PennDOT. These results meet the requirements as described in the PennDOT Policies and Procedures for Transportation Impact Studies.

As part of this project, the applicant proposes the following improvements:

- The applicant will widen Bull Road (SR 4001) along the site frontage, as necessary, to provide an exclusive northbound left-turn lane at the site driveway. The left-turn lane will provide 250 feet of storage in addition to the applicable taper length.
- The applicant will install a traffic signal at the intersection of Bull Road (SR 4001) and Canal Road (SR 0921) and widen the northeast corner radius to accommodate applicable truck turns. There will be No Turn on Red (NTOR) restrictions for all approaches.
- The applicant will construct a 350' foot eastbound left-turn lane at the intersection of Canal Road (SR 0921) and Susquehanna Trail (SR 0297). As part of the signal improvements, the eastbound left-turn will include protected/permitted signal phasing with a Flashing Yellow Arrow (FYA) design.
- The applicant will install a traffic signal at the intersection of Bull Road (SR 4001) and Hilton Avenue and construct a 275' northbound left-turn lane. As part of the signal improvements, the northbound left-turn will include protected/permitted signal phasing with a FYA design. There will be No Turn on Red (NTOR) restrictions for the eastbound, westbound, and southbound approaches.
- Install Do Not Block The Intersection signage and striping at the intersection of Susquehanna Trail (SR 0297) and Cloverleaf Road.

All improvements will be constructed to accommodate non-motorized access/circulation and be ADA compliant unless otherwise approved by the Department. The improvements identified above represent a concerted effort by the developer to provide upgrades that will benefit the surrounding roadway network and mitigate the specific traffic impacts associated with the Bull Road Logistics development.





## **INTRODUCTION**

Langan Engineering and Environmental Services, Inc. (Langan) has prepared this study to assess the traffic impacts associated with the proposed construction of the Bull Road Logistics development located along Bull Road (SR 4001) in Dover Township, York County, Pennsylvania.

### **Project Description**

The proposed development includes the construction of three buildings totaling 1,892,510 square feet of warehousing. Warehouse 1 will be 352,670 square feet, Warehouse 2 will be 1,059,840 square feet and Warehouse 3 will be 450,000 square feet. The existing site is undeveloped and the area surrounding the site is a mixture of agricultural uses and residential properties. The site location is illustrated in Figure 1.

Access to the site will be provided via one full-access unsignalized driveway located along Bull Road (SR 4001). The potential for an emergency access driveway to Fox Run Road will be discussed with Dover Township as part of the Land Development submissions. An overall Site Plan is contained in [Appendix A](#).

### **Study Area**

To assess the impact of the proposed development on the surrounding roadway network, we conducted capacity analyses at the following intersections:

- Canal Road (SR 0921) and Main Street (SR 0074)
- Bull Road (SR 4001) and Canal Road (SR 0921)
- Canal Road (SR 0921) and Greenbriar Road (SR 4011)
- Canal Road (SR 0921) and Susquehanna Trail (SR 0297)
- I-83 SB and SR 0297
- I-83 NB and SR 0297
- Bull Road (SR 4001) and Hilton Avenue
- Bull Road (SR 4001) and Church Road (SR 0238)
- Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001)
- Bull Road (SR 4001) and Site Driveway

An inventory of the physical road conditions is presented in the section “Description of Existing Conditions.” We received PennDOT and the surrounding municipalities’ approval for the study area intersections identified above.



## Scope of Study

Langan undertook the following steps to prepare this study in accordance with standard accepted methodologies:

1. Conducted a field examination of the site and surrounding road network to inventory physical and regulatory conditions including the number of lanes, lane assignments, channelization, traffic-control devices, lateral clearances and other factors that limit traffic capacity. Intersection pictures are located in [Appendix B](#).
2. Reviewed the site plan with respect to the proposed site access.
3. Conducted a series of manual turning movement traffic counts at the intersections identified in the previous section. We conducted counts on a typical weekday from 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM. We then identified the existing weekday morning and weekday evening peak hour traffic volumes based on the manual traffic count data.
4. Established future no-build traffic volumes utilizing a growth rate of 0.47%, which is currently recommended by PennDOT's Bureau of Planning and Research. The growth rate table used for this Transportation Impact Study is located in [Appendix D](#). We also included the approved developments site generated trips within the study area.
5. Prepared trip generation estimates for the proposed development using data compiled by the Institute of Transportation Engineers (ITE) as contained in their publication [Trip Generation](#), 11<sup>th</sup> Edition.
6. Developed trip distribution for the project based on a journey to work census model and an examination of existing travel patterns in the study area.
7. Assigned site-generated trips to the site access roads and surrounding road network based on the likely travel routes motorists will use to travel to and from the site.
8. Established future 2024 and 2029 Build traffic volumes by adding site-generated trips to the 2024 and 2029 No-Build traffic volumes.
9. Performed intersection capacity analyses for the weekday morning and weekday evening peak hours using Synchro software Version 11.1, build 2, revision 9 (11.1.2.9). The Synchro analyses utilized Pennsylvania default values per Publication 46.
10. Prepared this summary report describing our findings.

## **DESCRIPTION OF EXISTING CONDITIONS**

This section describes the roads and traffic volumes near the site. [Appendix G](#) contains copies of the existing traffic signal plans and timings provided by PennDOT. As previously discussed, the site is bordered on the east by Bull Road (SR 4001), on the west by Fox Run Road, on the north by agricultural properties and on the south by Canal Road (SR 0921). The following is a description of the roads and intersections within the study area located in Dover Township, York County, Pennsylvania.

### **Roads**

#### Canal Road (SR 0921)

Canal Road (SR 0921) has a functional classification of collector road and is under PennDOT jurisdiction. The road runs in a general northeast-southwest direction and provides one lane for each travel direction near the site. For purposes of this study, we have assumed that Canal Road (SR 0921) runs in east-west direction. The travel lanes are approximately 12 feet wide. The posted speed limit is 40 mph. Based on PennDOT records, the ADT for Canal Road (SR 0921) is 6,170 vehicles per day (vpd) total for both travel directions. The existing truck percent for Canal Road (SR 0921) is 7% (440 truck trips per day). Sidewalks and shoulders are currently not provided on either side of Canal Road (SR 0921). To the west of Main Street (SR 0074), Canal Road (SR 0921) becomes Canal Street (SR 4002).

#### Main Street (SR 0074)

Main Street (SR 0074) has a functional classification of other principal arterial road and is under PennDOT jurisdiction. The road runs in a general northwest-southeast direction and provides one lane for each travel direction near the site. . For purposes of this study, we have assumed that Main Street (SR 0074) runs in north-south direction. The travel lanes are approximately 12 feet wide. The posted speed limit is 25 mph. Based on PennDOT records, the ADT for Main Street (SR 0074) is 10,225 vpd total for both travel directions. The existing truck percent for Main Street (SR 0074) is 6% (622 truck trips per day). Sidewalks are provided on both side of the road.

#### Bull Road (SR 4001)

Bull Road (SR 4001) has a functional classification of collector road and is under PennDOT jurisdiction. The road runs in a general northwest-southeast direction and provides one lane for each travel direction near the site. For purposes of this study, we have assumed that Bull Road (SR 4001) runs in north-south direction. The travel lanes are approximately 12 feet wide. The posted speed limit is 40 mph. The travel lanes are approximately 10 feet wide. Based on PennDOT records, the ADT for Bull Road (SR 4001) is 1,883 vpd total for both travel directions.

The existing truck percent for Bull Road (SR 4001) is 2% (38 truck trips per day). Sidewalks and shoulders are currently not provided on either side of Bull Road (SR 4001).

#### Roosevelt Avenue (SR 4001)

Roosevelt Ave (SR 4001) has a functional classification of minor arterial road and is under PennDOT jurisdiction. The road runs in a general northwest-southeast direction and provides one lane for each travel direction near the site. For purposes of this study, we have assumed that Roosevelt Ave (SR 4001) runs in north-south direction. The travel lanes are approximately 12 feet wide. The posted speed limit is 35 mph to the north of Loucks Road (SR 0030) and 25 mph to the south of Loucks Road (SR 0030). Based on PennDOT records, the ADT for Roosevelt Ave (SR 4001) is 11,645 vpd for the northbound direction and existing truck percent of 1% (160 truck trips per day). The ADT for the southbound direction is 11,565 vpd and existing truck percent of 1% (138 truck trips per day). Sidewalks and shoulders are currently not provided on either side of Roosevelt Ave (SR 4001).

#### Greenbriar Road (SR 4011)

Greenbriar Road (SR 4011) has a functional classification of collector road and is under PennDOT jurisdiction. The road runs in a general northwest-southeast direction and provides one lane for each travel direction near the site with shoulders of varying widths. For purposes of this study, we have assumed that Greenbriar Road (SR 4011) runs in north-south direction. The travel lanes are approximately 12 feet wide. The posted speed limit is 40 mph. Based on PennDOT records, the ADT for Greenbriar Road (SR 4011) is 5,274 vpd total for both travel directions. The existing truck percent for Greenbriar Road (SR 4011) is 3% (158 truck trips per day). Sidewalks are currently not provided on either side of Greenbriar Road (SR 4011).

#### Susquehanna Trail (T-956/SR 0297)

Susquehanna Trail (T-956) is a township road with functional classification of minor arterial road near Canal Road (SR 0921). The road runs in a general north-south direction and provides one lane for each travel direction. The travel lanes are approximately 10 feet wide. The posted speed limit is 40 mph. Based on PennDOT records, the ADT for Susquehanna Trail (T956) is 8,273 vpd total for both travel directions. The existing truck percent for Susquehanna Trail (T956) is 10% (802 truck trips per day). Sidewalks and shoulders are currently not provided on either side of Susquehanna Trail (T-956).

Near the I-83 Northbound and Southbound Ramps, Susquehanna Trail (SR 0297) has a functional classification of minor arterial and is under PennDOT jurisdiction. The road runs in a general east-west direction and provides one lane for each travel direction with shoulders of varying widths.

The posted speed limit is 40 mph. Based on PennDOT records, the ADT for Susquehanna Trail (SR 0297) is 10,522 vpd total for both travel directions. The existing truck percent for Susquehanna Trail (T956) is 16% (4,819 truck trips per day). Sidewalks are currently not provided on either side of Susquehanna Trail (SR 0297).

#### Hilton Avenue

Hilton Avenue is a township road with functional classification of collector road. The road runs in a general northeast-southwest direction and provides one lane for each travel direction. The travel lanes are approximately 10 feet wide. For purposes of this study, we have assumed that Hilton Avenue runs in east-west direction. The posted speed limit is 35 mph to the west of Bull Road (SR 4001) and there is no posted speed limit to the east of Bull Road (SR 4001). The assumed speed limit is 25 mph. Based on PennDOT records, the ADT for Hilton Avenue is 3,869 vpd total for both travel directions. The existing truck percent for Hilton Avenue is 3% (110 truck trips per day). Sidewalks and shoulders are currently not provided on either side of Hilton Avenue.

#### Church Road (SR 0238)

Church Road (SR 0238) has a functional classification of collector road and is under PennDOT jurisdiction. The road runs in a general northeast-southwest direction and provides one lane for each travel direction with shoulders of varying widths. The travel lanes are approximately 14 feet wide. For purposes of this study, we have assumed that Church Road (SR 0238) runs in east-west direction. The posted speed limit is 35 mph to the west of Bull Road (SR 4001) and 40 mph to the east of Bull Road (SR 4001). Based on PennDOT records, the ADT for Church Road is 10,110 vpd total for both travel directions. The existing truck percent for Church Road is 4% (392 truck trips per day). Sidewalks are currently not provided on either side of Hilton Avenue.

#### Loucks Road (SR 0030)

Loucks Road (SR 0030) has a functional classification of collector road and is under PennDOT jurisdiction. The road runs in a general east-west direction and provides one lane for each travel direction near the site. The travel lanes are approximately 12 feet wide. The posted speed limit is 40 mph. Based on PennDOT records, the ADT for Loucks Road (SR 0030) is 37,998 vehicles per day (vpd) total for the westbound direction with 10% truck traffic (3,784 truck trips per day). For the eastbound direction, the ADT is 24,129 vehicles per day (vpd) with 11% truck traffic (2,624 truck trips per day). Sidewalks are currently not provided on either side of Loucks Road (SR 0030).

A summary of the roadway characteristics is provided in the table below:

Road Name	Designation	Functional Class	# of Lanes	Lane Widths	Speed Limit (mph)	ADT (based on TIRe)	Land Use Context
Canal Road (SR 0921)	State Road	Collector	2	12'	40	6,170	Suburban Neighborhood
Main Street (SR 0074)	State Road	Principal Arterial	2	12'	25	10,225	Suburban Center
Bull Road (SR 4001)	State Road	Collector	2	12'	40	1,883	Suburban Neighborhood
Roosevelt Ave (SR 4001)	State Road	Minor Arterial	2	12'	25-35	11,565 (SB)/ 11,645 (NB)	Suburban Center
Greenbriar Road (SR 4011)	State Road	Collector	2	12'	40	5,274	Suburban Neighborhood
Susquehanna Trail (T956/SR 297)	Township Road/ State Road	Minor Arterial	2	10'	40	8,273 - 10,522	Suburban Corridor
Hilton Avenue	Township Road	Collector	2	10'	25-35	3,869	Township Neighborhood
Church Road (SR 0238)	State Road	Collector	2	14'	35	10,110	Township Neighborhood
Loucks Road (SR 0030)	State Road	Collector	6	12	40	24,129 (EB)/ 37,998 (WB)	Suburban Center

## Intersections

### Canal Road (SR 0921) and Main Street (SR 0074)

The intersection of Canal Road (SR 0921) and Main Street (SR 0074) is a four-legged signalized intersection. The eastbound and westbound approaches along Canal Road (SR 0921) consist of one shared left-turn, through and right-turn lane. The northbound and southbound approaches along Main Street (SR 0074) consist of one exclusive left-turn lane and one shared through and right-turn lane. A copy of the traffic signal permit plan has been included in Appendix G.

### Bull Road (SR 4001) and Canal Road (SR 0921)

The intersection of Bull Road (SR 4001) and Canal Road (SR 0921) is a four-legged unsignalized intersection with stop sign control along all approaches. All approaches consist of one shared left-turn, through and right-turn lane. A copy of the intersection field sketch has been included in Appendix G.

#### Canal Road (SR 0921) and Greenbriar Road (SR 4011)

The intersection of Canal Road (SR 0921) and Greenbriar Road (SR 4011) is a three-legged unsignalized intersection with stop sign control along the Greenbriar Road (SR 4011) approach. The eastbound approach along Canal Road (SR 0921) consists of one shared through and right-turn lane. The westbound approach along Canal Road (SR 0921) consists of one shared left-turn and through lane. The northbound approach along Greenbriar Road (SR 4011) consists of one shared left-turn and right-turn lane. A copy of the intersection field sketch has been included in Appendix G.

#### Canal Road (SR 0921) and Susquehanna Trail (SR 0297)

The intersection of Canal Road (SR 0921) and Susquehanna Trail (SR 0297) is a four-legged signalized intersection. The eastbound and westbound approaches along Canal Road (SR 0921) consist of one shared left-turn, through and right-turn lane. The northbound approach along Susquehanna Trail consists of one shared left-turn, through and right-turn lane. The southbound approach along Susquehanna Trail (SR 0297) consists of one shared left-turn and through lane and one exclusive right-turn lane. A copy of the intersection field sketch has been included in Appendix G.

#### I-83 SB and SR 0297

The intersection of I-83 SB and SR 0297 is a four-legged signalized intersection. The eastbound approach along SR 0297 consists of one shared through and right-turn lane. The westbound approach along SR 0297 consists of one exclusive left-turn lane and one exclusive through lane. The southbound approach along the I-83 SB ramp consists of one shared left-turn, through and right-turn lane. A copy of the intersection field sketch has been included in Appendix G.

#### I-83 NB and SR 0297

The intersection of I-83 NB and SR 0297 is a four-legged signalized intersection. The eastbound approach along SR 0297 consists of exclusive left-turn lane and one exclusive through lane. The westbound approach along SR 0297 consists of one shared through and right-turn lane. The northbound approach along the I-83 SNB ramp consists of one shared left-turn, through and right-turn lane. A copy of the intersection field sketch has been included in Appendix G.

#### Bull Road (SR 4001) and Hilton Avenue

The intersection of Bull Road (SR 4001) and Hilton Avenue is a four-legged unsignalized intersection with stop sign control along the Hilton Avenue approaches. All approaches consist of one shared left-turn, through and right-turn lane. A copy of the intersection field sketch has been included in Appendix G.

#### Bull Road (SR 4001) and Church Road (SR 0238)

The intersection of Bull Road (SR 4001) and Church Road (SR 0238) is a four-legged signalized intersection. The eastbound and westbound approaches along Church Road (SR 0238) consist of one shared left-turn, through and right-turn lane. The northbound and southbound approaches along Bull Road (SR 4001) consist of one exclusive left-turn lane and one shared through and right-turn lane. A copy of the traffic signal permit plan has been included in Appendix G.

#### Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001)

The intersection of Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001) is a four-legged signalized intersection. The eastbound and westbound approaches along Loucks Road (SR 0030) consist of one exclusive left-turn lane, three exclusive through lanes, and one exclusive right-turn lane. The northbound and southbound approaches along Roosevelt Avenue (SR 4001) consist of one exclusive left-turn lane, one shared left-turn and through lane, one exclusive through lane, and one exclusive right-turn lane. A copy of the traffic signal permit plan has been included in Appendix G.

#### Bull Road (SR 4001) and Site Driveway

The proposed intersection of Bull Road (SR 4001) and Site Driveway will be a three-legged unsignalized intersection with stop sign control along the driveway approach. The eastbound approach along the Site Driveway will consist of one shared left-turn and right-turn lane. The northbound approach along Bull Road (SR 4001) will consist of one exclusive left-turn lane and one exclusive through lane. The southbound approach along Bull Road (SR 4001) will consist of one shared through and right-turn lane.

### **Existing Traffic Volumes**

To examine traffic conditions near the site, manual turning movement traffic counts were conducted during the typical weekday morning and weekday evening peak hours at the study intersections. Specifically, we conducted manual turning movement counts at the study area intersections on Wednesday, May 18, 2022 from 6:00 AM to 9:00 AM and from 3:00 PM to 6:00 PM.

The manual traffic counts identify distinct times during the weekday morning and weekday evening periods when traffic experienced its highest levels. To be conservative, we used the peak hour of each individual intersection to determine the peak hour traffic volumes rather than use a common peak hour for all of the intersections.

Figure 2 illustrates the existing weekday morning and weekday evening peak hour traffic volumes. The manual traffic counts used for this Transportation Impact Study are located in [Appendix C](#) and are summarized in 15-minute and peak hour intervals. The manual traffic counts include passenger cars, heavy vehicles, buses, bicycles and pedestrians.

In order to prepare the traffic signal warrant analysis included in this revised study, we conducted additional turning movement counts at the intersections of Bull Road (SR 4001) and Canal Road (SR 0921) and Bull Road (SR 4001) and Hilton Avenue. The additional 12 hour (6AM – 6PM) traffic counts were conducted on Thursday May 18, 2023. These additional traffic counts are located in [Appendix C](#).

### **Existing Transit Facilities**

There are currently no existing transit or pedestrian facilities along the site frontage on Bull Road (SR 4001). There are pedestrian accommodations located at the majority of the signalized intersections within the study area. Based on a review of the manual traffic counts, there is negligible pedestrian activity along Bull Road (SR 4001) in the vicinity of the site. Currently there are no sidewalks located along Bull Road (SR 4001), Canal Road (SR 0921) or Fox Run Road near the site frontage. We do not anticipate increasing pedestrian traffic on the surrounding road network as part of this project.

### **Crash Data Summary**

A separate Crash Data Report will be prepared and submitted under separate cover.



## **ESTIMATE OF FUTURE CONDITIONS**

This section of the report covers background traffic growth, adjacent developments, site-generated trips, trip distribution, and future traffic volumes. We anticipate the project will be completed by the end of 2024. Accordingly, we projected traffic volumes to include existing traffic and new traffic created by background growth to derive the 2024 and 2029 No-Build traffic volumes. The site generated trips were added to the 2024 and 2029 No-Build traffic volumes to derive the 2024 and 2029 Build traffic volumes.

### **No-Build Traffic Volumes**

The proposed project is expected to be complete by the end of 2024. The weekday morning and evening peak hour volumes were expanded to the year 2024 and 2029 at a growth rate of 0.47% per annum, based on the currently recommended rates by PennDOT's Bureau of Planning and Research. The growth rate table used for this Transportation Impact Study is located in [Appendix D](#).

Based on discussions with PennDOT and the surrounding municipalities, as part of the scoping meeting coordination, we determined that the following approved developments should be included as part of the background conditions:

- Freedom Square Development
- Manchester Commerce Center (Northpoint)

Based on direction from PennDOT, for purposes of our analysis, only Phase 1 of the Freedom Square Development was included as part of the background conditions because future development of the site beyond Phase 1 is unknown at this time. Phase 1 of the Freedom Square Development is included as part of the 2024 and 2029 no-build conditions. The build years from the approved TIS for the Freedom Square Development were Phase 1= 2025, Phase 2=2028 and Phase 3=2031. The Manchester Commerce Center build year was 2025, so we included those additional volumes within both our 2024 and 2029 no-build conditions.

The proposed traffic volumes associated with the approved developments are illustrated in Figures D1-D3 in Appendix D. The site generated figures from the submitted Transportation Impact Studies are included in Appendix D. Because the study area for this study extends beyond what was studied for those projects, we used engineering judgment to extrapolate the site generated trips to the surrounding road network, where necessary.

In addition, we reviewed the previously prepared Canal Road Betterment Project Transportation Impact Assessment prepared by Transportation Resource Group, Inc.. That study was completed for the purpose of bringing portions of Canal Road (SR 0921), Zions View Road (SR 0921) and Locust Point Road (SR 1021) to STAA Truck Route Standards for the various industrial/distribution projects within the surrounding study area.

### **Planned Improvements By Others**

Specific intersection improvements were identified within the TIS for the Freedom Square Development. It was determined that the following intersection improvements within the study area are proposed to be installed by others:

#### Freedom Square Development Phase 1 Improvements:

##### I-83 SB and SR 0297

- Widen the southbound I-83 off-ramp to provide a 285' dedicated right-turn lane with a 100' bay taper
- Optimize traffic signal timings

Additional improvements associated with Phase 2 of the Freedom Square Development are not contemplated as part of this traffic study due to unknown timelines associated with the future phases.

The Phase 1 associated improvements identified above are assumed to be in place for the 2024 and 2029 no-build conditions in this study.

### **Bull Road (SR 4001) and Canal Road (SR 0921) Congestion Reduction Project**

We understand that the intersection of Bull Road (SR 4001) and Canal Road (SR 0921) is in the process of being evaluated as part of a PennDOT/MPO congestion reduction project. Two options are being considered, a traffic signal and a roundabout. We coordinated with Kyle Kreiser and learned that the project is currently within the consultant selection process, followed by the scoping phase which identifies stakeholders and engages with the MPO/municipalities etc. The project is anticipating to have more direction on the choice of traffic control by Spring 2023.

Currently there are no potential schematics for the intersection improvements. For purposes of this study, we are anticipating the need for intersection improvements at Bull Road (SR 4001) and Canal Road (SR 0921) in order to accommodate the projected site traffic. For the Build with improvements scenario, we are assuming that the intersection will be signalized, with left-turn lanes along Canal Road (SR 0921).

There will be coordination between this project and the PennDOT/MPO congestion reduction project in order to make sure that the ultimate design and construction can accommodate the trips associated with the warehouse project, and also the design vehicle turns at the intersection (tractor-trailers).

Based on discussions with PennDOT, as part of this project, we assume that the congestion reduction project will be its own project. We were directed to mitigate our project traffic impacts at the intersections of Bull Road (SR 4001) and Canal Road (SR 0921) assuming the PennDOT/MPO project will come later. Therefore, we did not assume any separate PennDOT/MPO improvements are in place at the intersection of Bull Road (SR 4001) and Canal Road (SR 0921), even though we expect that the larger congestion project will install additional improvements (turn lanes, widening etc.).

### **Proposed Site Access**

Access to the site will be provided via one full-access unsignalized driveway located along Bull Road (SR 4001). The potential for an emergency access driveway to Fox Run Road will be discussed with Dover Township as part of the Land Development submissions.

As discussed with PennDOT during the scoping meeting, although the daily trips for the driveway just barely falls within the high-volume driveway threshold, the driveway design will likely not be a typical high-volume driveway. The majority of trips for the site are coming to/from the south along Bull Road, and there is no need to provide channelized movements as would be the case with a standard high-volume driveway layout. Based on discussions with PennDOT, we are showing a 150' median along the driveway approach, with no internal site driveways located within the median. We will continue to work with PennDOT to determine the applicable design requirements while moving through the HOP design process.

Detailed plans showing the truck turning templates will be provided for review with the future HOP submissions. In addition, the proposed driveways will be designed to provide acceptable sight distance according to PennDOT and Dover Township standards. Detailed sight distance profiles will be included as part of the HOP plans. A preliminary breakdown of the required and available sight distances (based on PennDOT Form M-950S) at the proposed driveway is shown in the table below. A copy of the PennDOT M-950S form has been included in [Appendix J](#).

In addition, based on the most recent PennDOT comment letter, we have provided a sight distance analysis in [Appendix J](#) for the proposed signalized intersections of Bull Road (SR 4001) and Canal Road (SR 0921) and Bull Road (SR 4001) and Hilton Avenue.

PROPOSED SIGHT ACCESS SIGHT DISTANCE TABLE									
Intersection	TURNING MANEUVER	DIRECTION	MINIMUM M-950S (FT)	Minimum M950s Case:	DESIRABLE PASSENGER PA CODE 67 (FT)	PA code 67 Table:	DESIRABLE COMBINATION PA CODE 67 (FT)	PA code 67 Table:	AVAILABLE (FT)
Bull Road (SR 4001) and Site Driveway	EB LEFT	LOOKING LEFT	325'	A	538'	1	N/A	2	1000'
		LOOKING RIGHT	309'	A	460'	1	N/A	2	950'
	EB RIGHT	LOOKING LEFT	325'	A	538'	1	950'	2	1000'
		LOOKING AHEAD	325'	C	373'	5	588'	6	1000'
	NB LEFT	LOOKING AHEAD	325'	C	373'	5	588'	6	1000'
		FROM REAR	309'	B	319'	SSSD Formula	N/A	-	950'

\* Based on a speed limit 40 MPH

## Turn Lane Warrant Analysis

Turn lane warrant analyses for the proposed site driveway along Bull Road (SR 4001) have been included in [Appendix H](#). All turn lane warrants were prepared in accordance with PennDOT Publication 46.

Based on the calculations, the warrants for a northbound left-turn lane are satisfied for the 2029 build conditions. In order to provide efficient access to the site, the applicant is proposing to install a 250 foot northbound left-turn lane.

The warrants for a southbound right-turn lane are not satisfied for the build conditions at the site driveway. No right-turn lane is proposed as part of the project.

In addition, we prepared turn lane warrant analyses for the proposed eastbound left-turn lane at the intersection of Canal Road (SR 0921) and Susquehanna Trail (SR 0297) and the proposed northbound left-turn lane at the intersection of Bull Road (SR 4001) and Hilton Avenue.

Based on the calculations, the required storage for the eastbound left-turn lane at the intersection of Canal Road (SR 0921) and Susquehanna Trail (SR 0297) is 325 feet. The applicant is proposing to install a 350 foot eastbound left-turn lane. The required storage for the northbound left-turn lane at the intersection of Bull Road (SR 4001) and Hilton Avenue is 275 feet. The applicant is proposing to install a 275 foot northbound left-turn lane.

## Traffic Signal Warrant Analysis

To determine the need for a new traffic signal at the intersections of Bull Road (SR 4001) and Canal Road (SR 0921) and Bull Road (SR 4001) and Hilton Avenue, a traffic signal warrant analysis was conducted in accordance with provisions identified in Publication 46 Section 4.3. There are a total of eleven warrants for traffic signals. Warrants 1 through 9 are as defined in Sections 4C.02 through 4C.10 in Part 4 of the MUTCD, and the tenth and eleventh warrants as defined in 67 PA. Code Chapter 212. The eleven warrants are as follows:

- MUTCD Warrant 1, Eight-Hour Vehicular Volume

- MUTCD Warrant 2, Four-Hour Vehicular Volume
- MUTCD Warrant 3, Peak Hour
- MUTCD Warrant 4, Pedestrian Volume
- MUTCD Warrant 5, School Crossing
- MUTCD Warrant 6, Coordinated Signal System
- MUTCD Warrant 7, Crash Experience
- MUTCD Warrant 8, Roadway Network
- MUTCD Warrant 9, Intersection Near a Grade Crossing
- Warrant PA-1, ADT Volume Warrant
- Warrant PA-2, Optional Traffic Signal Warrant for Midblock and Trail Crossings

For purposes of this study supplement, the applicable warrants are considered to be MUTCD Warrant 1 and MUTCD Warrant 2. The traffic signal warrant analyses was completed utilizing 2022/2023 12 hour (6 AM to 6 PM) existing year traffic count data.

Considering that the speed limit on Bull Road (SR 4001) and Canal Road (SR 0921) is 40 mph, the 100% warrant criteria volume levels as specified in the MUTCD were used. The available PennDOT Traffic Signal Warrant Analysis Workbook, accessed from the Traffic Signal Portal, was utilized for this analysis. The applicable signal warrants are discussed in detail below and the warrant analysis workbooks have been included in [Appendix H](#).

#### Bull Road (SR 4001) and Canal Road (SR 0921)

- MUTCD Warrant 1, Eight-Hour Vehicular Volume – This warrant is satisfied based on the existing traffic volumes. Condition A has 11 unique hours met and Condition B has 4 unique hours met, which meets the eight total hours required.
- MUTCD Warrant 2, Four-Hour Vehicular Volume - This warrant is satisfied based on the existing traffic volumes. There are 8 unique hours met which is more than the four total hours required.
- MUTCD Warrant 3, Peak Hour Volume – This warrant is satisfied based on the existing traffic volumes. There are 3 unique hours met which is more than the one total hour required.

#### Bull Road (SR 4001) and Hilton Avenue

- MUTCD Warrant 1, Eight-Hour Vehicular Volume – This warrant is satisfied based on the 2024 build traffic volumes. Condition A has 12 unique hours met and Condition B has 4 unique hours met, which meets the eight total hours required.

- MUTCD Warrant 2, Four-Hour Vehicular Volume - This warrant is satisfied based on the 2024 build traffic volumes. There are 7 unique hours met which is more than the four total hours required.
- MUTCD Warrant 3, Peak Hour Volume – This warrant is satisfied based on the 2024 build traffic volumes. There is 1 unique hour met which meets the one total hour required.

### **Advance Phase Calculations and Clearance Interval Calculations**

Advance phase calculations have been included in [Appendix H](#). Based on the conflict factors, protected/permitted left-turn phasing is recommended for the proposed eastbound left-turn lane at the intersection of Canal Road (SR 0921) and Susquehanna Trail (SR 0297) and the proposed northbound left-turn lane at the intersection of Bull Road (SR 4001) and Hilton Avenue.

Clearance interval calculations have been included in [Appendix H](#) for the proposed signalized intersections of Bull Road (SR 4001) and Canal Road (SR 0921) and Bull Road (SR 4001) and Hilton Avenue

### **Trip Generation**

We prepared trip generation estimates for the proposed development based on data compiled by the Institute of Transportation Engineers (ITE) as contained in their publication [Trip Generation](#), 11<sup>th</sup> Edition. The following table presents the total vehicle trips which will be generated during the weekday morning and evening peak travel hours by the proposed development. The more conservative between the Average Rate and Equation was used for trip generation calculations. The estimated daily 24 hour two-way trips for the site are estimated to be 3,237 (for a typical weekday), which equates to 1,619 daily vehicles. The PennDOT driveway classification for the site (assuming one access) is [High Volume](#). Printouts of the ITE trip generation relevant sections are included in [Appendix E](#).

### Total Trips for Site

Building	ITE	SIZE	VEHICLE	ADT (TRIPS)	AM PEAK HOUR			PM PEAK HOUR		
					ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
1	LUC 150 Warehousing	352,670 SF	Cars	391	47	12	59	13	45	58
			Trucks	212	4	3	7	6	5	11
			Total	603	51	15	66	19	50	69
2	LUC 150 Warehousing	1,089,840 SF	Cars	1,210	131	32	163	38	125	163
			Trucks	654	11	11	22	17	16	33
			Total	1,864	142	43	185	55	141	196
3	LUC 150 Warehousing	450,000 SF	Cars	500	55	14	69	16	51	67
			Trucks	270	5	4	9	7	7	14
			Total	770	60	18	78	23	58	81
	Total Combined	1,892,510 SF	Cars	2,101	234	57	291	67	221	288
			Trucks	1,136	20	18	38	30	28	58
			Total	3,237	254	75	329	97	249	346

### Trip Distribution

We prepared two separate general distribution patterns, one for the passenger cars and one for the trucks. A description of each distribution pattern is below:

Passenger Cars - Site generated directional distribution for the passenger cars was developed based on a gravity model utilizing the most current journey to work data assuming Dover Township as the place of employment. The gravity model data is included in [Appendix E](#). Detailed passenger car trip distribution percentages at the study area intersections for the passenger cars are included in Figure 8.

Trucks – Site generated directional distribution for the trucks was developed based on the assumption that trucks will utilize available approved STAA truck routes within the region. For purposes of this Transportation Impact Study, we have assumed that all trucks will be accessing I-83/SR 0030 located to the east and south of the site. The trucks coming to/from the north on I-83 will utilize the I-83 and SR 0297 interchange. For the trucks coming to/from the south along I-83, we assumed that those trucks will take the Exit 21B interchange to SR 0030 to the intersection with Roosevelt Avenue which turns into Bull Road (SR 4001). We assume a 50/50 split for the tractor trailer truck trips. Based on discussions with the applicant, no large trucks are anticipated to travel through downtown Dover to the west of the site. In addition, trucks will be discouraged from turning left from the site driveway onto Bull Road (SR 4001) with the

implementation of signage and geometry, as necessary. Detailed truck trip distribution percentages at the study area intersections are included in Figure 10.

### **Build Traffic Volumes**

The site generated traffic was then applied to the adjacent roadway system as per the above distributions. Figure 12 shows the total combined site generated trips assigned to the roadway network for the development. The 2024 and 2029 build traffic volumes were derived by adding the total site-generated trips to the 2024 and 2029 no-build traffic volumes. The 2024 and 2029 build traffic volumes are illustrated in Figures 13 and 15, titled *2024 Build Traffic Volumes* and *2029 Build Traffic Volumes*.



## ANALYSIS OF TRAFFIC OPERATIONS

This section describes the capacity analyses that were conducted to assess traffic operations for the Existing, No-Build and Build conditions. Capacity analysis provides an indication of the adequacy of road facilities to serve traffic demand.

### Level of Service Criteria

Level of Service (LOS) is the term used to denote the different operating conditions that occur on a given road segment under various traffic volume demands. LOS is a qualitative measure that considers a number of factors including road geometry, speed and travel delay. LOS provides an index to the operational qualities of a road segment or an intersection. LOS designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. Level of service (LOS) capacity analyses were conducted for the intersections within the study area using the Synchro software. This software is based on methodologies contained within the Highway Capacity Manual 6<sup>th</sup> Edition (HCM), published by the Transportation Research Board (TRB).

For signalized intersections, LOS is based upon the average delay experienced by stopped vehicles and the operation is graded between A (least delay) and F (most delay). The following table describes the LOS gradation criteria for signalized intersections:

**Level of Service Criteria for Signalized Intersections**

<b>Level of Service (LOS)</b>	<b>Expected Traffic Delay</b>	<b>Average Total Delay (seconds/vehicle)</b>
A	Very low or no delays, very good progression, most vehicles do not stop at all.	$\leq 10$
B	Short delay, good progression and/or short cycle lengths, more vehicles stop than with LOS A.	$> 10$ And $\leq 20$
C	Average delay, fair progression and/or longer cycle lengths, a significant number of vehicles stop at the intersection.	$> 20$ And $\leq 35$
D	Longer delays, unfavorable progression, long cycle lengths or high v/c ratios, most vehicles stop at intersection.	$> 35$ And $\leq 55$
E	Longer delays (Maximum Capacity), considered to be the limit of acceptable delay, poor progression, long cycle lengths and high v/c ratios	$> 55$ And $\leq 80$
F	Worst delays (Over saturated), poor progression, long cycle lengths and high v/c ratios.	$> 80$

The traffic operation for unsignalized intersections is classified based upon the LOS and delay experienced by critical movements which correspond to any minor street movements or left-turns from a major street. The following table describes the LOS gradation criteria for unsignalized intersections:

**Level of Service Criteria for Unsignalized Intersections**

<b>Level of Service (LOS)</b>	<b>Expected Traffic Delay</b>	<b>Average Total Delay (seconds/vehicle)</b>
A	Very low or no delays	$\leq 10$
B	Short delays	$> 10$ And $\leq 15$
C	Average delays	$> 15$ And $\leq 25$
D	Long delays	$> 25$ And $\leq 35$
E	Long delays (Maximum Capacity)	$> 35$ And $\leq 50$
F	Worst delays (Over saturated)	$> 50$

### **Analysis Assumptions**

Below is a list of the assumptions used in our technical analysis:

- PennDOT default values were used as described in Publication 46. A copy of the headway calculations have been included in [Appendix D](#).
- Traffic signal timings were determined based on the latest approved plans on TSAMs.
- Traffic signal timings were optimized, where applicable, for the 2024 and 2029 no-build conditions. We adjusted the optimized timings as necessary to meet standard requirements and to provide realistic splits, as the Synchro optimization tool sometimes does not provide optimization that makes real world sense.
- For the intersections that have configurations where analysis is not compatible with HCM 6<sup>th</sup> Edition, the Synchro Percentile Delay methodology was utilized.
- Utilized Synchro software Version 11.1, build 2, revision 9 (11.1.2.9).
- For the intersection of Loucks Road (SR 003) and Roosevelt Avenue (SR 4001) we utilized the backup time-of-day timing programs for analysis purposes. This intersection runs on the traffic adaptive system, but the Synchro software can not sufficiently analyze adaptive signals. The capacity analysis results for this intersection are likely conservative, as the adaptive operations will typically provide variable splits based on real-time conditions, as opposed to the time based splits and cycle length used in this study. In addition, at this intersection, the delay shows an improvement from the no-build to build conditions for the northbound through movement and the eastbound through movement during the weekday morning peak hour. We determined that the HCM 6<sup>th</sup> Edition algorithm automatically adjusts the “adjusted number of lanes” for the northbound approach based on an increase in volume threshold which is triggered.

## Capacity Analysis

We conducted capacity analyses for the intersections in the study area and found that with the applicable improvements in place, the proposed development will not significantly impact operations in the study area during peak hours. As part of the 2024 and 2029 No-Build conditions, improvements are assumed to be in place associated with Phase 1 of the Freedom Square Development, including traffic signal timing optimization, where applicable. The following are discussions pertaining to each of the intersections analyzed for the project. The discussions are specifically for the most conservative 2029 design year. Note that all capacity analyses worksheets are contained in [Appendix F](#). The corresponding levels of service and delays for each condition are summarized in [Table A](#), and also contained in Figures 3, 5, 7, 14 and 16.

All study area intersections will operate at acceptable overall LOS D or better in the build conditions, with the exception of the following:

- Bull Road (SR 4001) and Canal Road (SR 0921) will operate at overall LOS F during the weekday morning and evening peak hours.
- Bull Road (SR 4001) and Hilton Avenue will operate at overall LOS E during the weekday evening peak hour with an LOS F for the specific eastbound approach.
- Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001) will operate at LOS E during the weekday morning and evening peak hours.

The only deficient LOS identified above that degrades from the no-build to build conditions is at the intersection of Bull Road (SR 4001) and Hilton Avenue which goes from a no-build overall LOS C to a build overall LOS E.

All other overall intersection delay increases within the study area fall within an accepted 10 second variance as allowed by PennDOT. There is a specific movement degradation at the intersection Canal Road (SR 0921) and Susquehanna Trail (SR 0297) for the northbound approach which goes from no-build LOS E to build LOS F during the weekday evening peak hour.

In order to mitigate the deficient LOS, the applicant will coordinate with various stakeholders and projects within the surrounding area to determine applicable improvements. As part of this study, we assumed that the following improvements are necessary to mitigate the LOS deficiencies associated with the Bull Road Logistics development:

### Bull Road (SR 4001) and Canal Road (SR 0921)

- Install a traffic signal
- Widen the radius on the northeast corner to accommodate truck turns.

The improvements at this intersection will be coordinated with the PennDOT/MPO congestion reduction project. As stated previously, based on discussions with PennDOT, we assume that the congestion reduction project will be its own project. We were directed to mitigate our project traffic impacts at the intersections of Bull Road (SR 4001) and Canal Road (SR 0921) assuming the PennDOT/MPO project will come later. With the traffic signal in place, the intersection will operate at an overall LOS B during the weekday morning peak hour and LOS C during the weekday evening peak hour with a significant reduction in delays and queuing when compared to the no-build conditions.

#### Canal Road (SR 0921) and Susquehanna Trail (SR 0297)

- Widen the eastbound Canal Road (SR 0921) approach to provide a 350' dedicated left-turn lane.

The improvements at this intersection will ultimately need to be coordinated with the Freedom Square Development project. As part of this project, the installation of the eastbound left-turn lane will mitigate the deficient levels of service. With the improvements in place, the intersection will operate at an overall LOS B during the weekday morning peak hour and LOS C during the weekday evening peak hour, with all movements operating at LOS D or better.

#### Bull Road (SR 4001) and Hilton Avenue

- Install a traffic signal
- Widen the northbound Bull Road (SR 4001) approach to provide a 275' dedicated left-turn lane with applicable bay taper.

We understand that there were previous discussions about a potential project occurring near this intersection that may lead to the realignment of Hilton Avenue. However, no final determination was made as far as potential projects within the vicinity so as part of this revised TIS we are assuming that no adjacent project exists and that the deficient levels of service need to be mitigated as part of this project.

With the identified improvements in place, all study area intersections will operate at overall LOS C or better, with the exception of the intersection of Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001), which will operate at LOS E during the weekday morning and evening peak hour. There are no LOS degradations at the intersection of Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001) and all overall intersection and specific movements experience an increase of 10 seconds or less.

The proposed site driveway intersection along Bull Road (SR 4001) will operate at optimal overall LOS A, with no capacity or queuing issues. These results meet the requirements as described in the PennDOT Policies and Procedures for Transportation Impact Studies.

### **Queue Analysis**

We conducted a queue analysis for the intersections in the study area and found that the proposed development will not significantly impact storage lane queues during the peak hours. Based on discussions with PennDOT during the scoping meeting, we have provided the applicable HCM 6<sup>th</sup> Edition 95<sup>th</sup> percentile queues, in addition to the Synchro Percentile Delay 95<sup>th</sup> and 50<sup>th</sup> percentile queues. The corresponding queues for each condition are summarized in [Table B](#).

There are instances within the analysis where existing/no-build queues extend beyond specific available storages, however; this project is not significantly impacting those movements and it is not feasible to mitigate every instance where a queue is extending beyond available storages. The applicant is already agreeing to install significant improvements as part of this project and some of the intersections that are being evaluated as part of this study do not currently meet generally accepted study area requirements (100 or more directional peak hour trips), and should typically not be considered for analysis as they are located multiple miles away from the site. The PennDOT TIS guidelines mention that study area guidance is provided in ITE, Transportation Impact Analyses for Site Development, Chapter 2. Based on those guidelines, a project this size with the number of peak hour trips should only be required to analyze “all signalized intersections and access drives within 0.5 miles from a property line of the site and all major unsignalized intersections and access driveway within 0.25 miles”. Based on those recommendations (the unwritten rule of 100 directional trips and the specific ITE guidelines), the applicant is currently analyzing multiple intersections beyond these thresholds. It is not a reasonable request to ask for mitigating measures for all instances where queues extend beyond existing storage lengths, as this is occurring in the existing and no-build conditions, and this project will typically add less than one additional vehicle length of queue to the majority of these movements. We have optimized the traffic signal timings as part of the no-build conditions to show the best-case scenarios and have provided improvement recommendation measures at three intersections to mitigate project impacts (while also mitigating the significant capacity issues that are occurring in the existing conditions at these locations).

Based on a follow-up meeting with PennDOT on August 11, 2023, we discussed the specific comment regarding queuing at the three intersections identified in the latest July 12, 2023 comment letter. We understand that the locations identified by PennDOT are existing

deficiencies and the developer is making a reasonable effort to analyze and mitigate impacts to the greatest extent possible given the existing constraints at each location. At the I-83 interchange with Susquehanna Trail (SR 0297) it is not reasonable to widen the bridge as part of this project, which is what would be required to provide additional left-turn storage across the bridge. In addition, further additional traffic signal timing modifications will not mitigate the specific queuing issues, as we are currently showing optimized timings as part of the no-build/build conditions. For the queuing experienced along the eastbound through/right movement at the intersection of Susquehanna Trail (SR 0297) and I-83 SB Ramps, the developer is willing to install Do Not Block The Intersection signage and striping at the adjacent intersection of Cloverleaf Road in order to allow vehicles at that intersection to turn during those time periods when traffic is queued along Susquehanna Trail (SR 0297).

For the southbound left-turn movement at the intersection of Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001), the HCM 6<sup>th</sup> Edition 95<sup>th</sup> percentile queues do not extend beyond the existing storage during any of the analysis periods. The Synchro 95<sup>th</sup> percentile queues show a maximum queue of 452 feet for the 2029 Build AM peak hour (which is only a 6 foot increase from the No-Build condition) and 441 for the 2029 Build PM peak hour (which is only a 51 foot increase from the No-Build condition). Based on a review of the intersection layout, it appears that the southbound left-turn lane can theoretically accommodate approximately 465 feet of queuing within the available storage (the storage shown on the queue table is 400 feet, however; the stop bar striping for the southbound approach is missing in the field and it actually looks like additional vehicles can queue beyond 400 feet). Based on the information provided, no improvements are proposed at this location.

## CONCLUSIONS

Langan has concluded that the estimate of site generated traffic from the future build-out of the proposed Bull Road Logistics development will not have a significant impact on traffic operations of the study intersections during peak traffic hours.

With the identified improvements in place, all study area intersections will operate at overall LOS C or better, with the exception of the intersection of Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001), which will operate at LOS E during the weekday morning and evening peak hours. The proposed site driveway intersection along Bull Road (SR 4001) will operate at optimal overall LOS A, with no capacity or queuing issues. The increase in overall delays at the study area intersections, when comparing the 2029 build with improvements conditions to the 2029 no-build conditions fall within an accepted 10 second variance as allowed by PennDOT. These results meet the requirements as described in the PennDOT Policies and Procedures for Transportation Impact Studies.

As part of this project, the applicant proposes the following improvements:

- The applicant will widen Bull Road (SR 4001) along the site frontage, as necessary, to provide an exclusive northbound left-turn lane at the site driveway. The left-turn lane will provide 250 feet of storage in addition to the applicable taper length.
- The applicant will install a traffic signal at the intersection of Bull Road (SR 4001) and Canal Road (SR 0921) and widen the northeast corner radius to accommodate applicable truck turns. There will be No Turn on Red (NTOR) restrictions for all approaches.
- The applicant will construct a 350' foot eastbound left-turn lane at the intersection of Canal Road (SR 0921) and Susquehanna Trail (SR 0297). As part of the signal improvements, the eastbound left-turn will include protected/permitted signal phasing with a Flashing Yellow Arrow (FYA) design.
- The applicant will install a traffic signal at the intersection of Bull Road (SR 4001) and Hilton Avenue and construct a 275' northbound left-turn lane. As part of the signal improvements, the northbound left-turn will include protected/permitted signal phasing with a FYA design. There will be No Turn on Red (NTOR) restrictions for the eastbound, westbound, and southbound approaches.
- Install Do Not Block The Intersection signage and striping at the intersection of Susquehanna Trail (SR 0297) and Cloverleaf Road.

All improvements will be constructed to accommodate non-motorized access/circulation and be ADA compliant unless otherwise approved by the Department. The improvements identified above represent a concerted effort by the developer to provide upgrades that will benefit the surrounding roadway network and mitigate the specific traffic impacts associated with the Bull Road Logistics development.

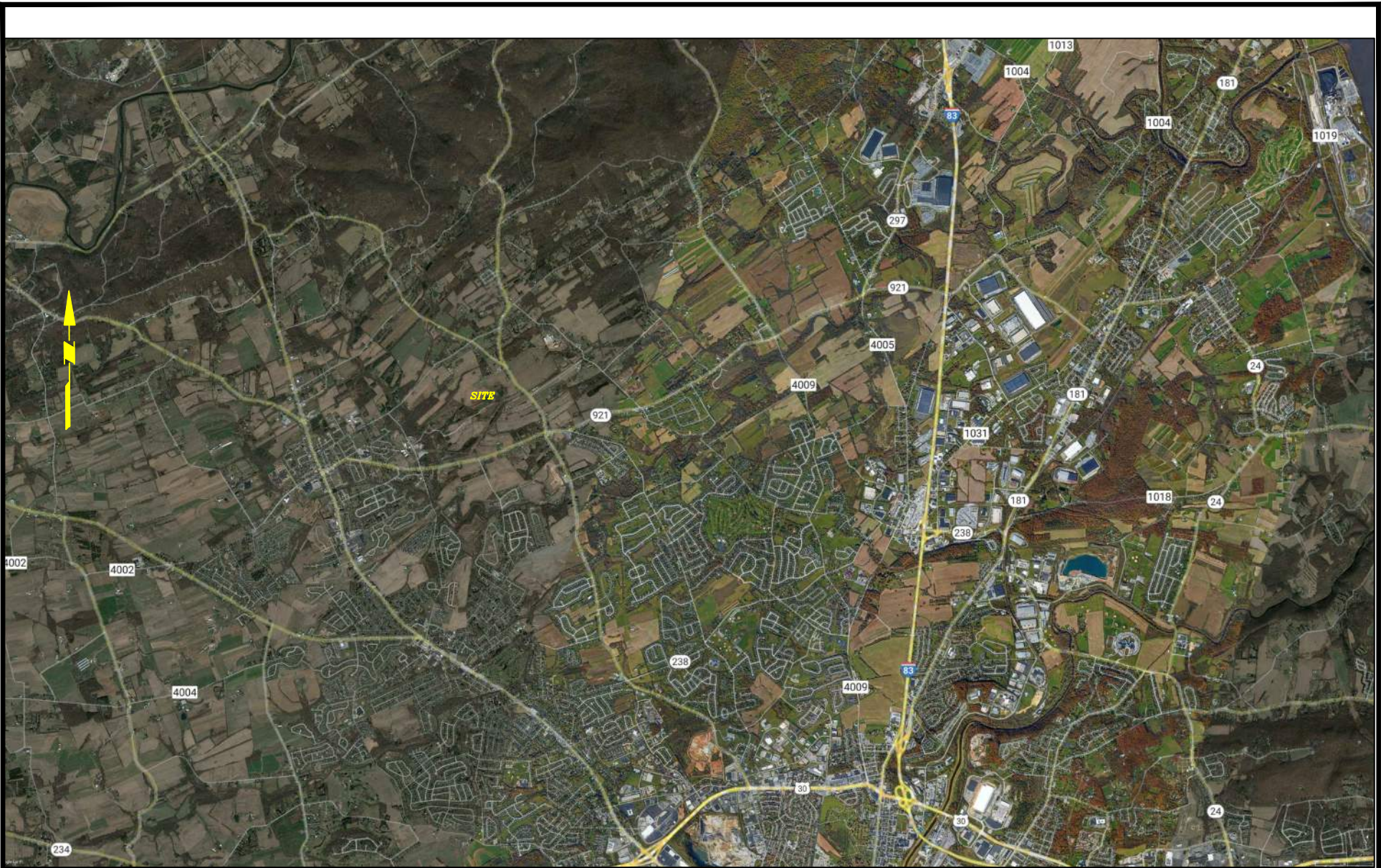
## **TABLES**



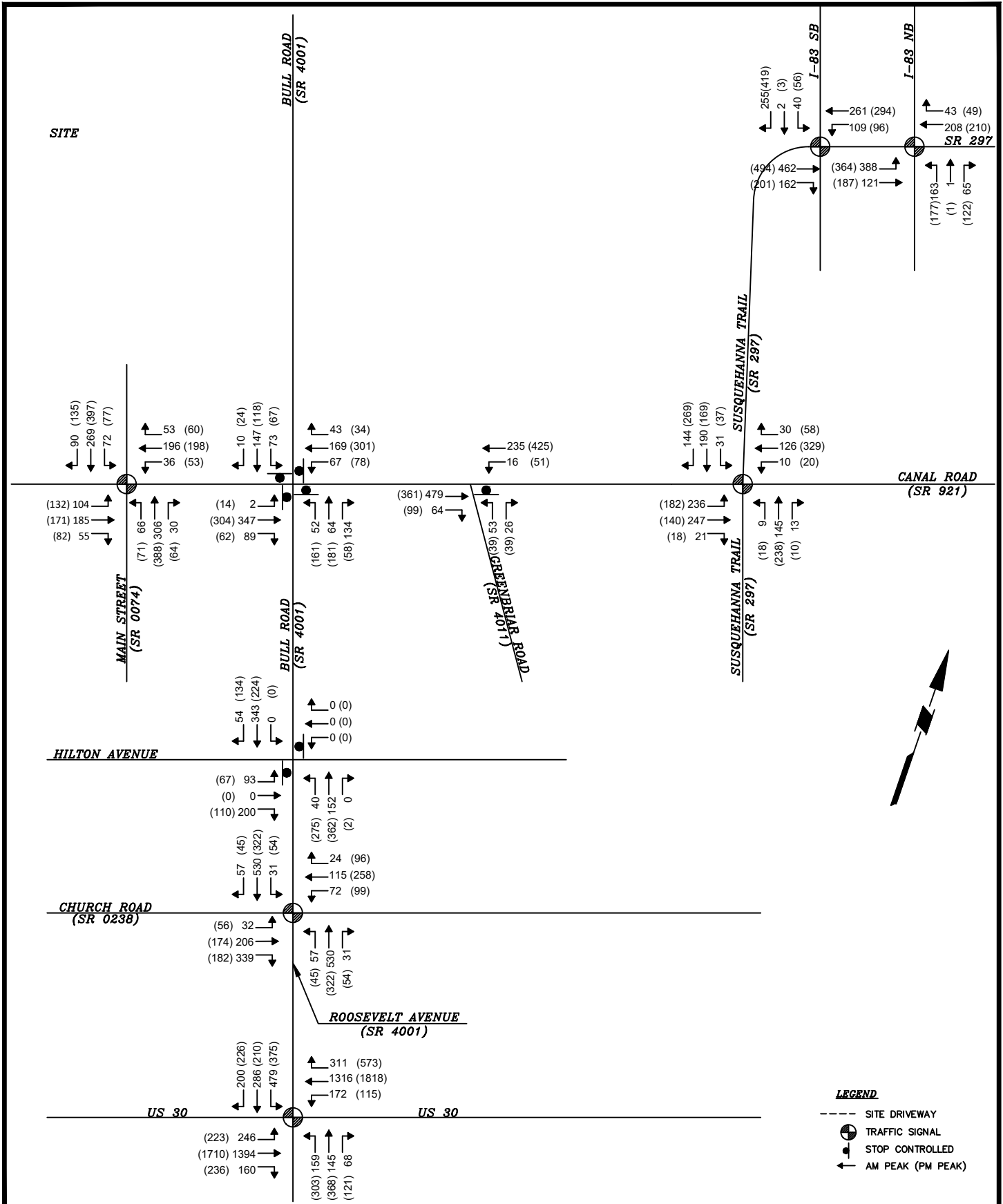




## **FIGURES**



<p><b>LANGAN</b> Langan Engineering and Environmental Services, Inc. Stone Manor Corporate Center, 2700 Kelly Road, Suite 200 Warrington, PA 18976 T: 215.491.6500 F: 215.491.6501 www.langan.com</p>	Project	Drawing Title	Project No.	Drawing No.
	<b>BULL ROAD LOGISTICS</b>	<b>SITE LOCATION MAP</b>	200164401	
	DOVER TOWNSHIP YORK COUNTY PENNSYLVANIA		Date rev 6/6/2023	
			Drawn By KLP	
			Checked By R.J.L.	<b>FIGURE 1</b>



**LANGAN**

Langan Engineering and Environmental Services, Inc.  
 Stone Manor Corporate Center, 2700 Kelly Road, Suite 200  
 Warrington, PA 18976

T: 215.491.6500 F: 215.491.6501 www.langan.com

Project

**BULL ROAD LOGISTICS**

DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title

**2022 EXISTING TRAFFIC VOLUMES**

Project No.

200164401

Date

rev 6/6/2023

Drawn By

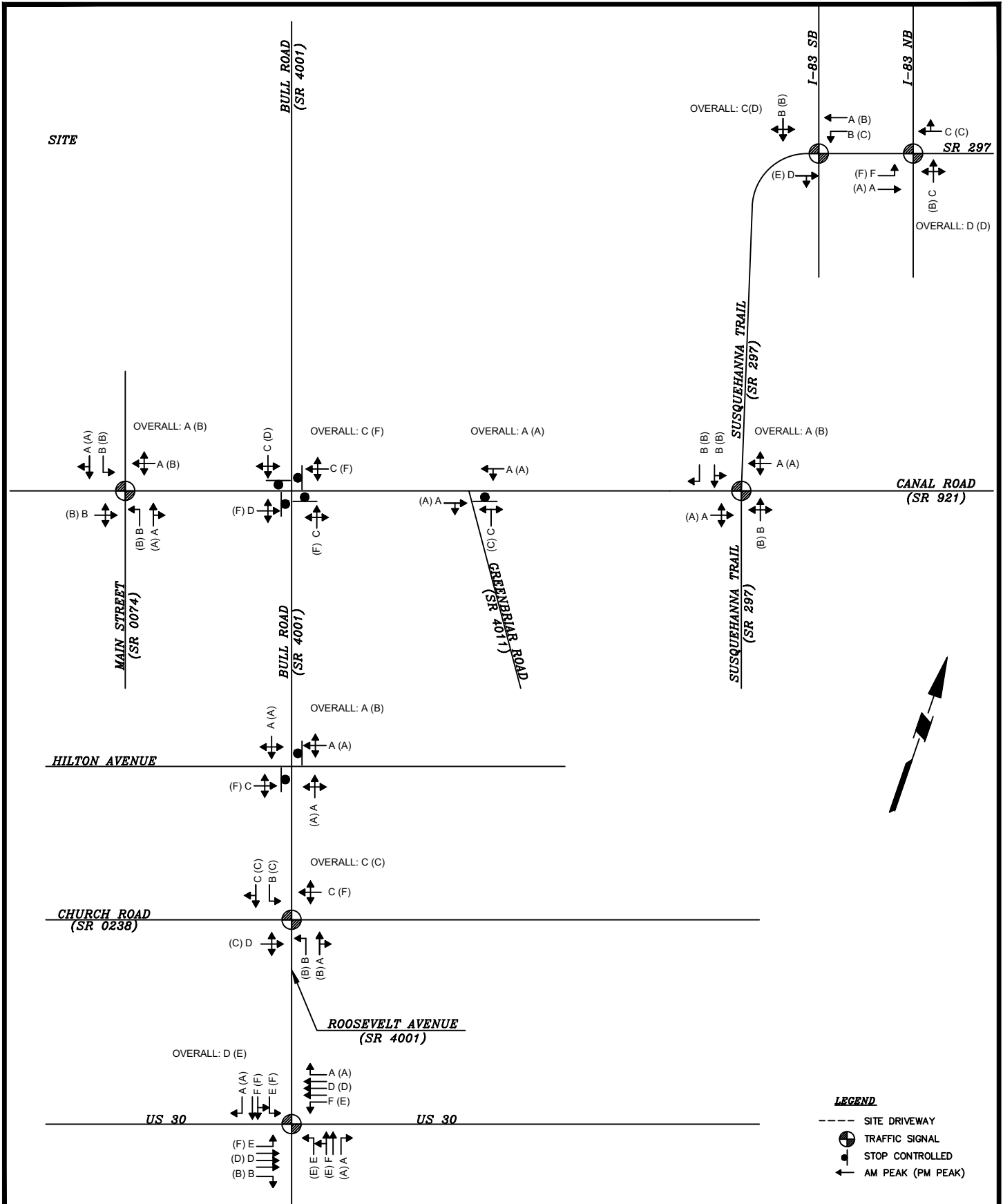
KLP

Checked By

RJL

Drawing No.

**FIGURE 2**



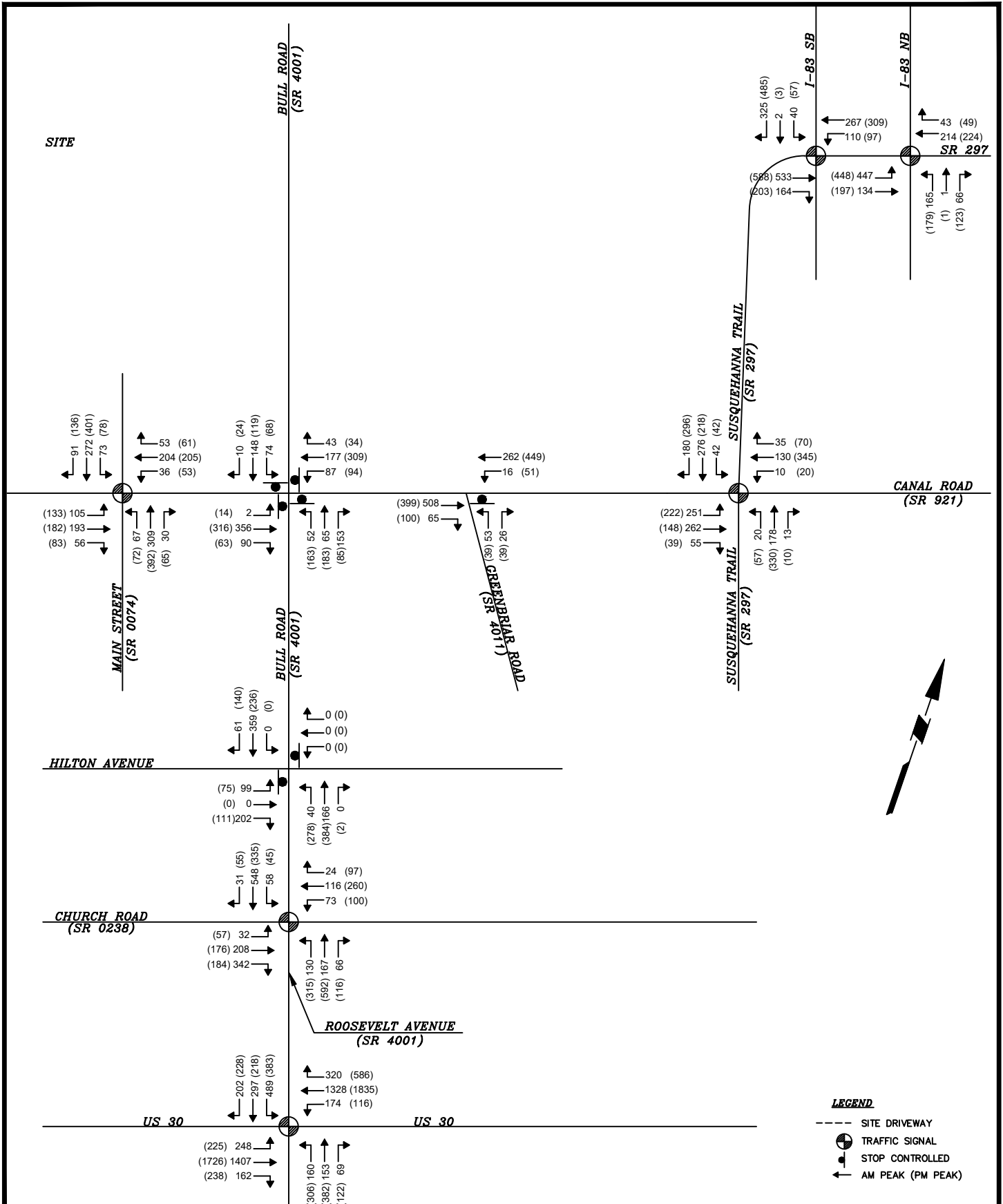
**LANGAN**  
 Langan Engineering and Environmental Services, Inc.  
 Stone Manor Corporate Center, 2700 Kelly Road, Suite 200  
 Warrington, PA 18976  
 T: 215.491.6500 F: 215.491.6501 www.langan.com

Project  
**BULL ROAD LOGISTICS**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

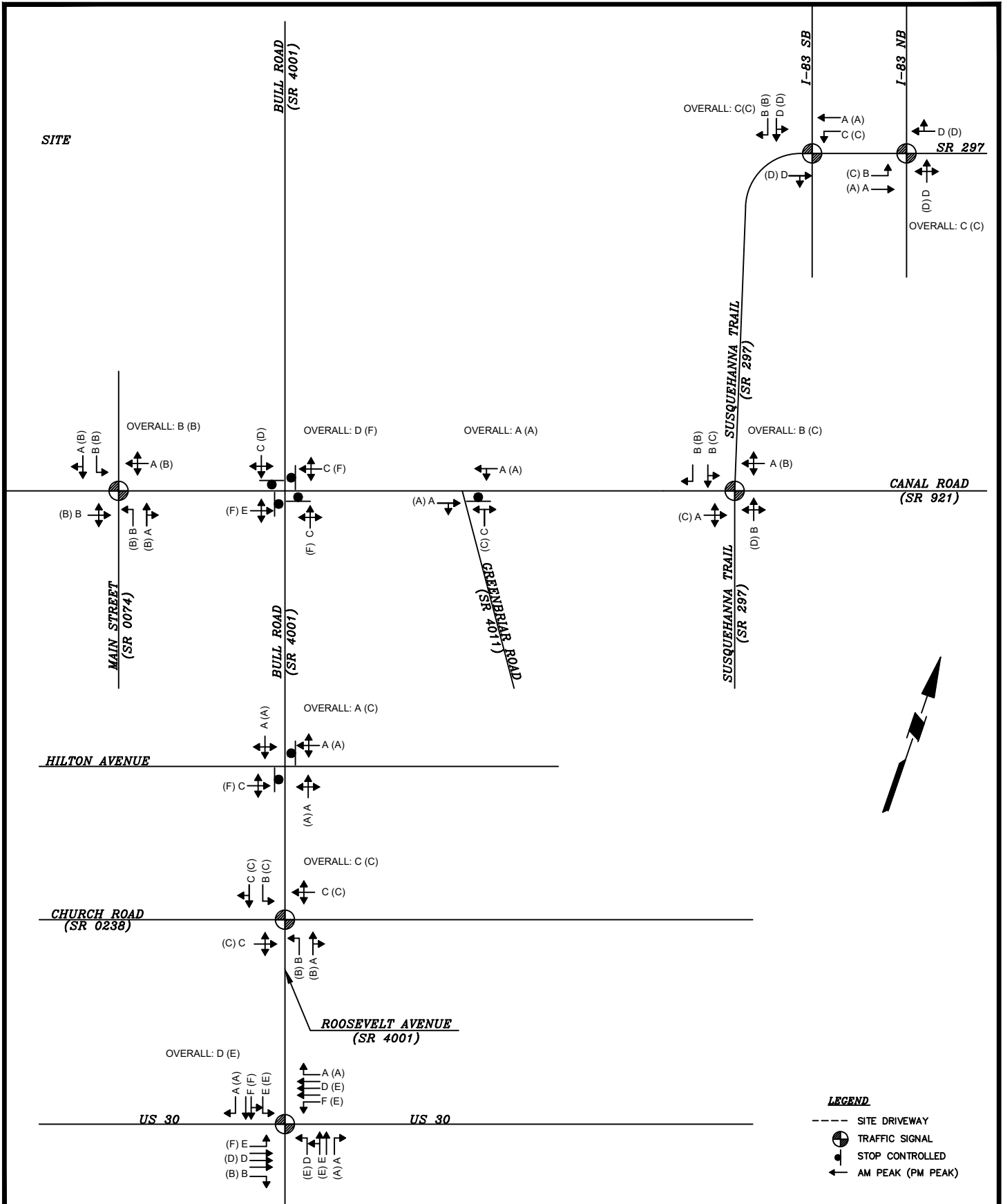
Drawing Title  
**2022 EXISTING LEVELS OF SERVICE**

Project No.  
 200164401  
 Date  
 rev 6/6/2023  
 Drawn By  
 KLP  
 Checked By  
 RJL

Drawing No.  
**FIGURE 3**



<p><b>LANGAN</b></p> <p>Langan Engineering and Environmental Services, Inc.</p> <p>Stone Manor Corporate Center, 2700 Kelly Road, Suite 200 Warrington, PA 18976</p> <p>T: 215.491.6500 F: 215.491.6501 www.langan.com</p>	Project	Drawing Title	Project No.	Drawing No.
	<b>BULL ROAD LOGISTICS</b>	<b>2024 NO-BUILD TRAFFIC VOLUMES</b>	200164401	
	DOVER TOWNSHIP YORK COUNTY PENNSYLVANIA		Date rev 6/6/2023	
			Drawn By KLP	
			Checked By RJL	<b>FIGURE 4</b>



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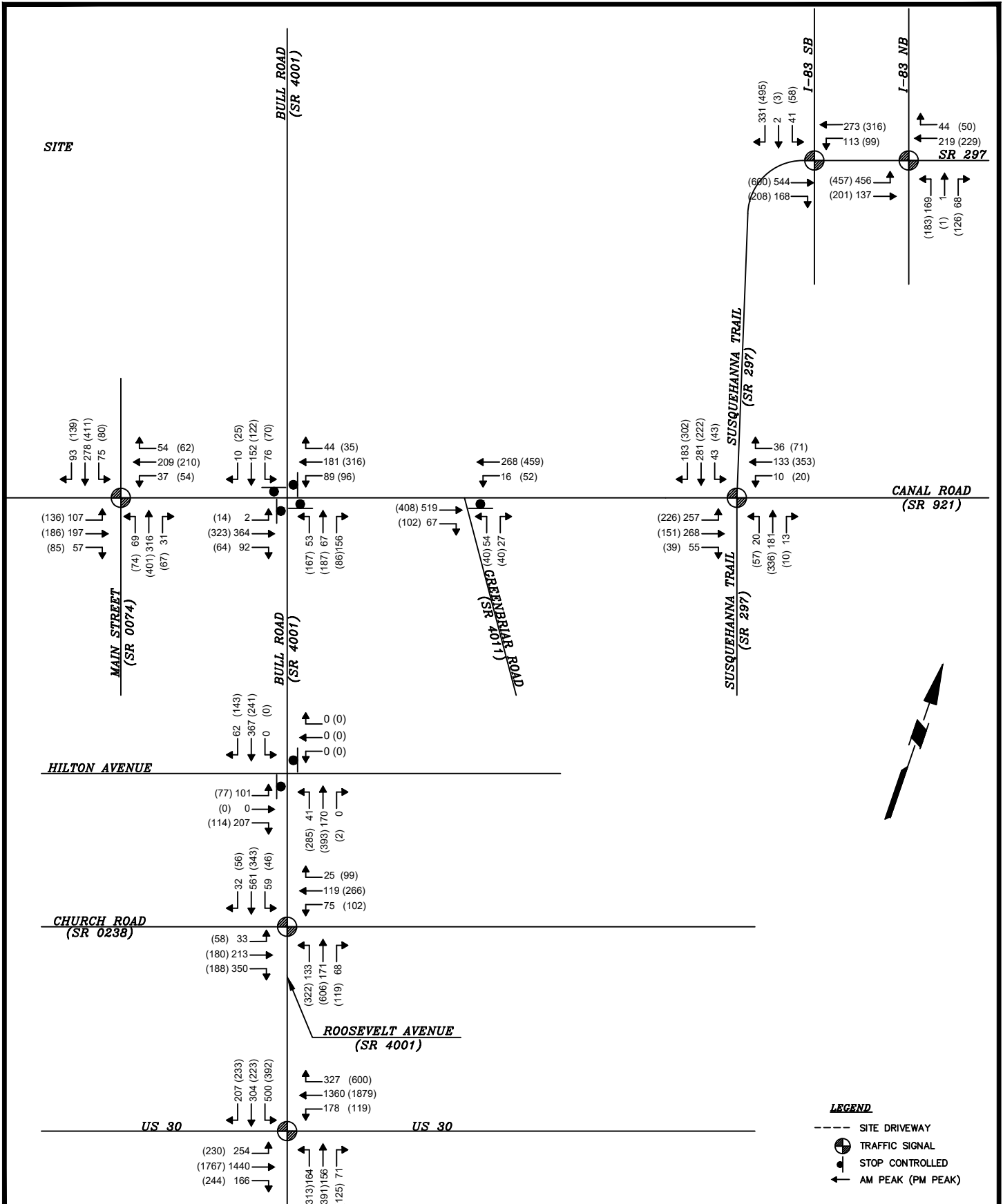
Project  
**BULL ROAD LOGISTICS**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title  
**2024 NO-BUILD LEVELS OF SERVICE**

Project No.  
200164401  
 Date  
rev 6/6/2023  
 Drawn By  
KLP  
 Checked By  
RJL

Drawing No.  
**FIGURE 5**





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Project

**BULL ROAD LOGISTICS**

DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title

**2029 NO-BUILD TRAFFIC VOLUMES**

Project No.

200164401

Date

rev 6/6/2023

Drawn By

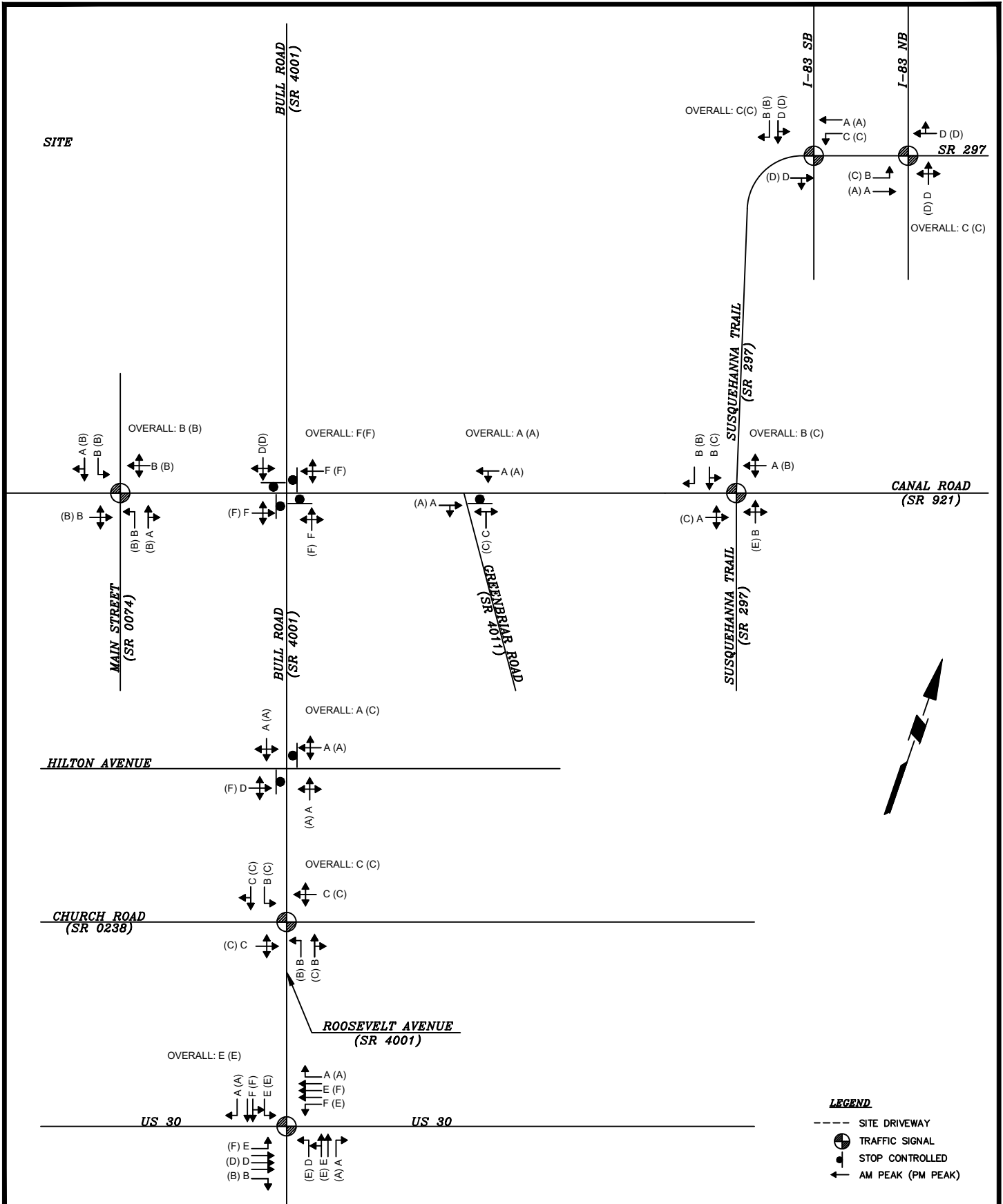
KLP

Checked By

RJL

Drawing No.

**FIGURE 6**



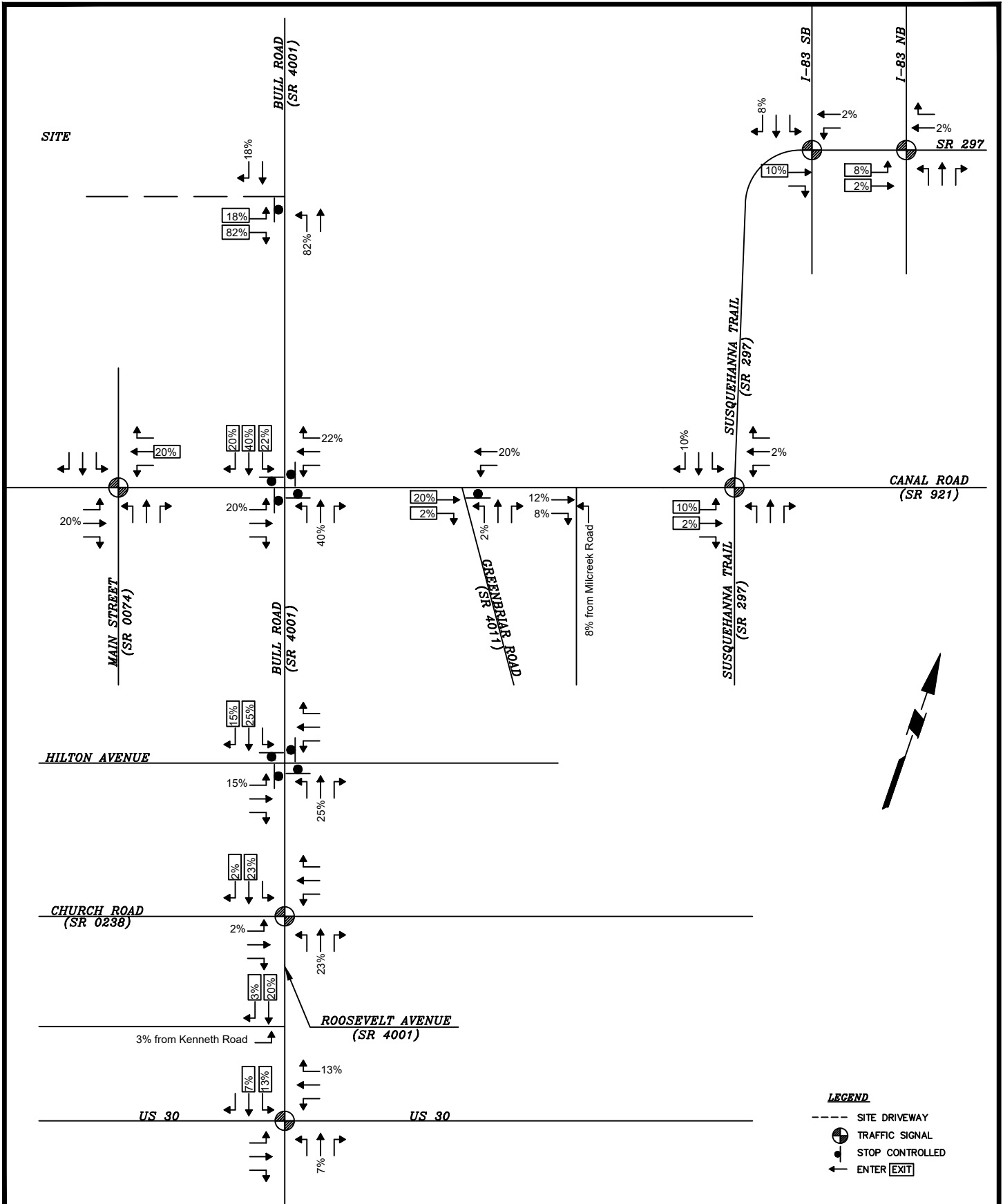
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 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

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**2029 NO-BUILD LEVELS OF SERVICE**

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**FIGURE 7**



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**BULL ROAD LOGISTICS**

DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title

**TRIP DISTRIBUTION PERCENTAGES - CARS**

Project No.

200164401

Date

rev 6/6/2023

Drawn By

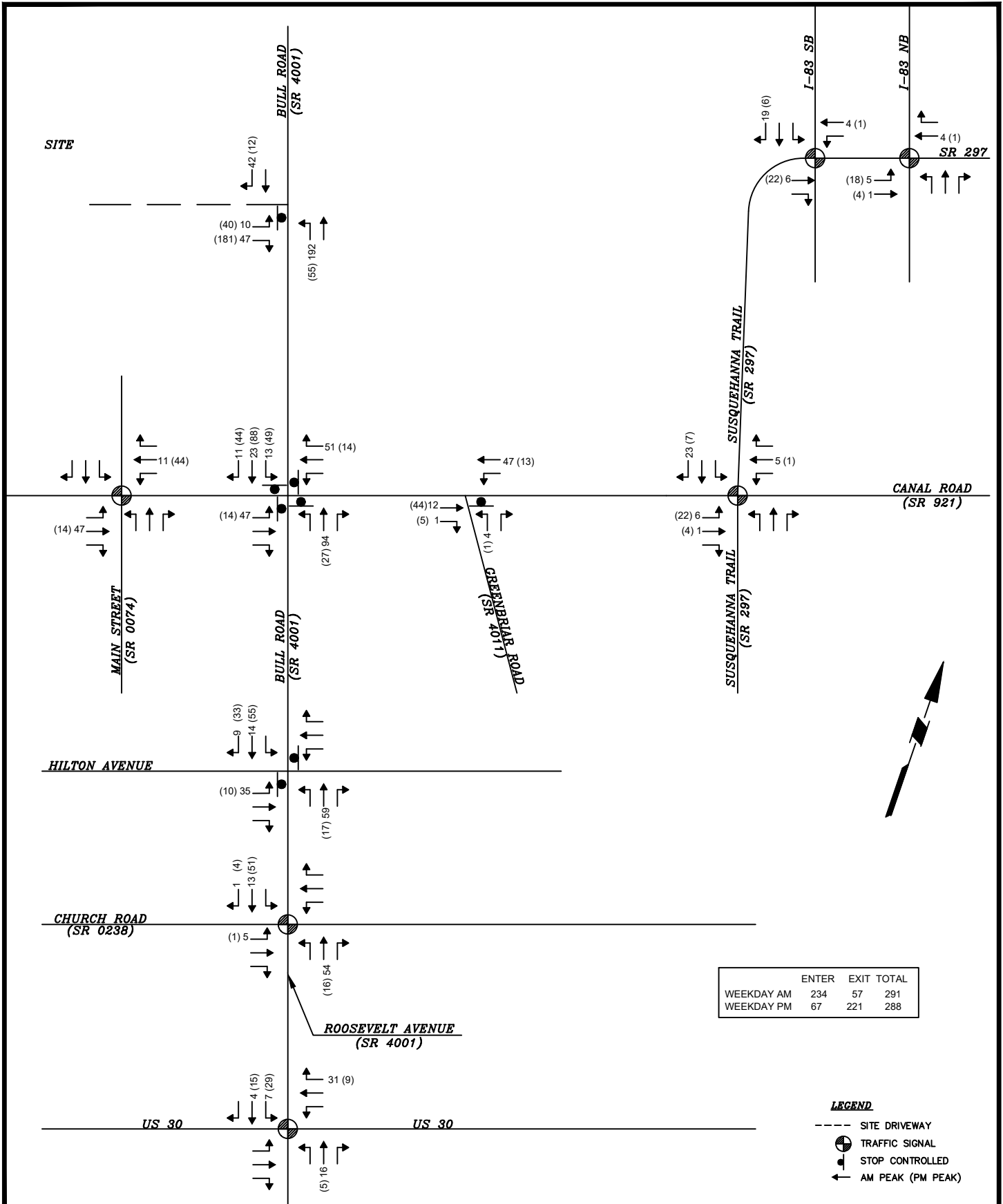
KLP

Checked By

RJL

Drawing No.

**FIGURE 8**



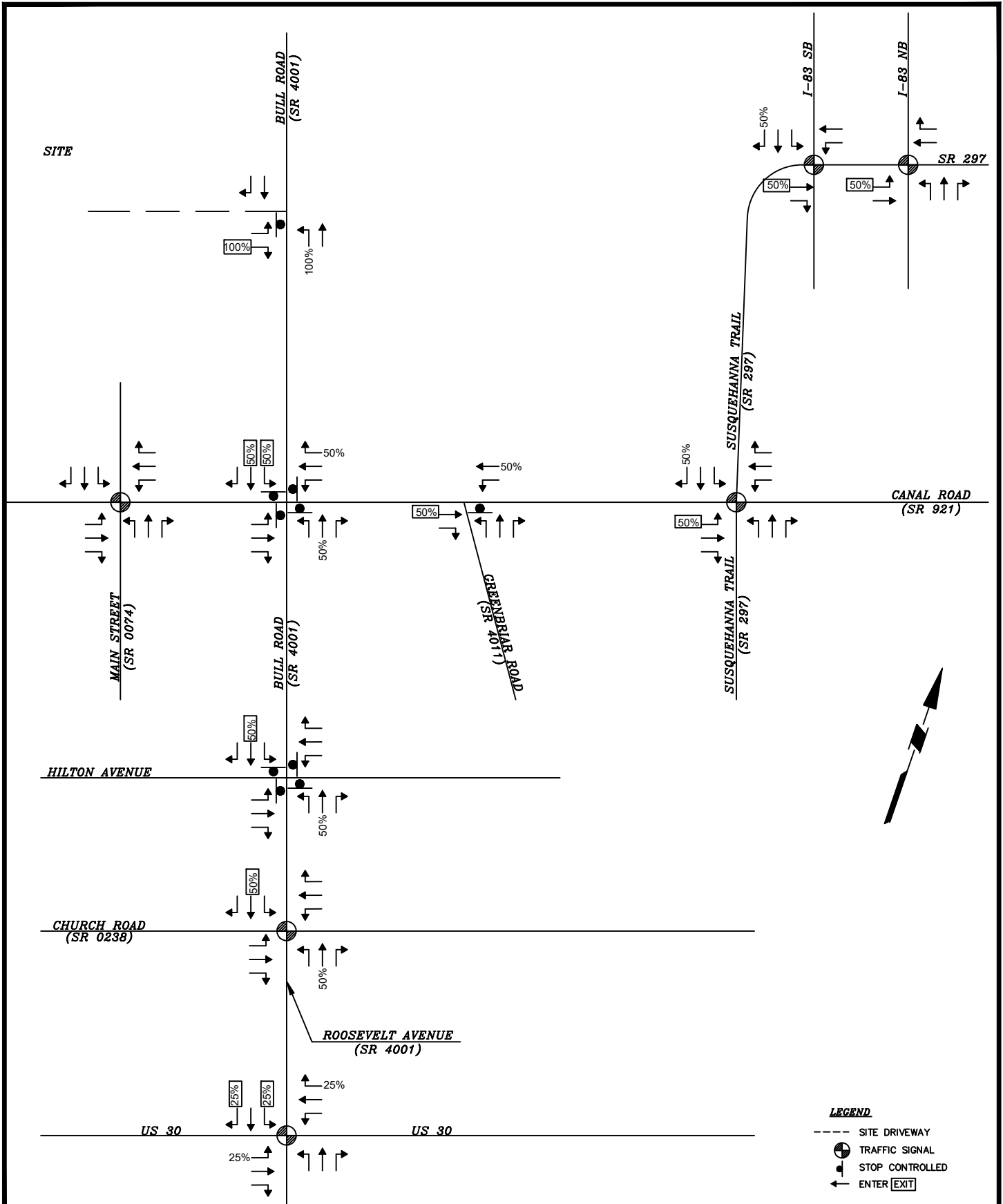
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Project  
**BULL ROAD LOGISTICS**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title  
**SITE GENERATED TRIPS - CARS**

Project No.  
 200164401  
 Date  
 rev 6/6/2023  
 Drawn By  
 KLP  
 Checked By  
 RJL

Drawing No.  
**FIGURE 9**



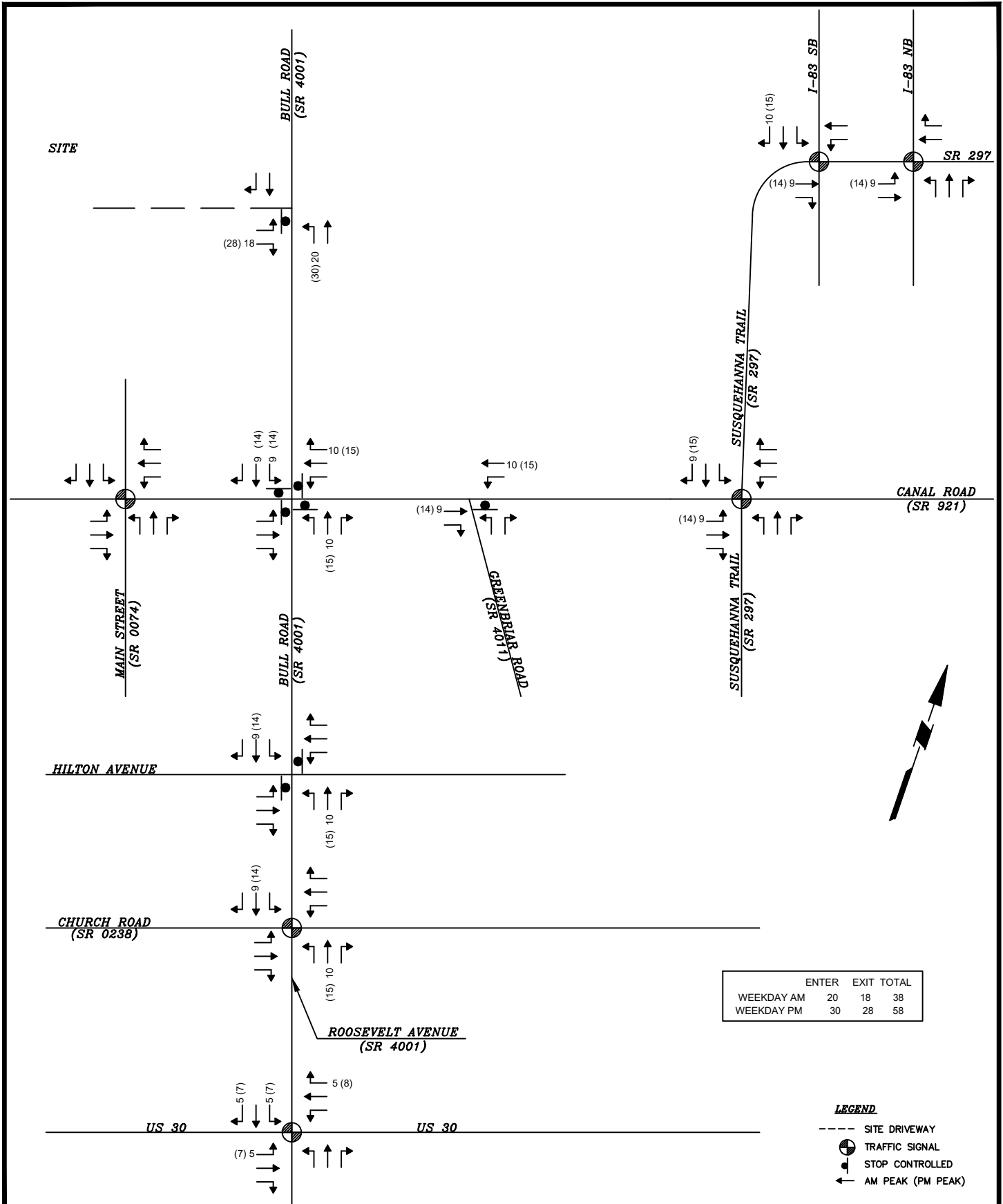
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Project  
**BULL ROAD  
 LOGISTICS**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title  
**TRIP DISTRIBUTION  
 PERCENTAGES -  
 TRUCKS**

Project No.  
 200164401  
 Date  
 rev 6/6/2023  
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 RJL

Drawing No.  
**FIGURE 10**



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Project

## BULL ROAD LOGISTICS

DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title

## SITE GENERATED TRIPS - TRUCKS

Project No.

200164401

Date

rev 6/6/2023

Drawn By

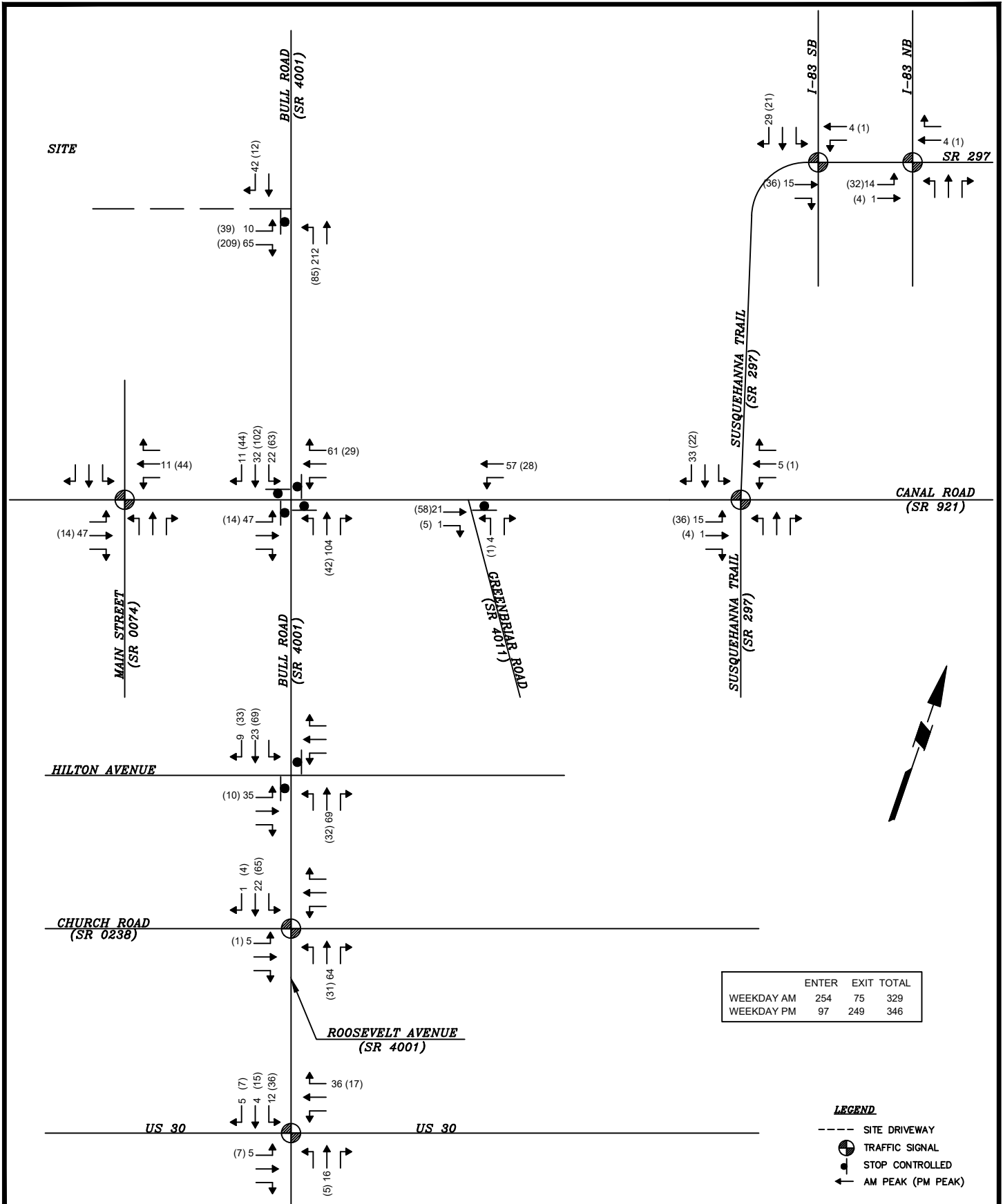
KLP

Checked By

RJL

Drawing No.

# FIGURE 11

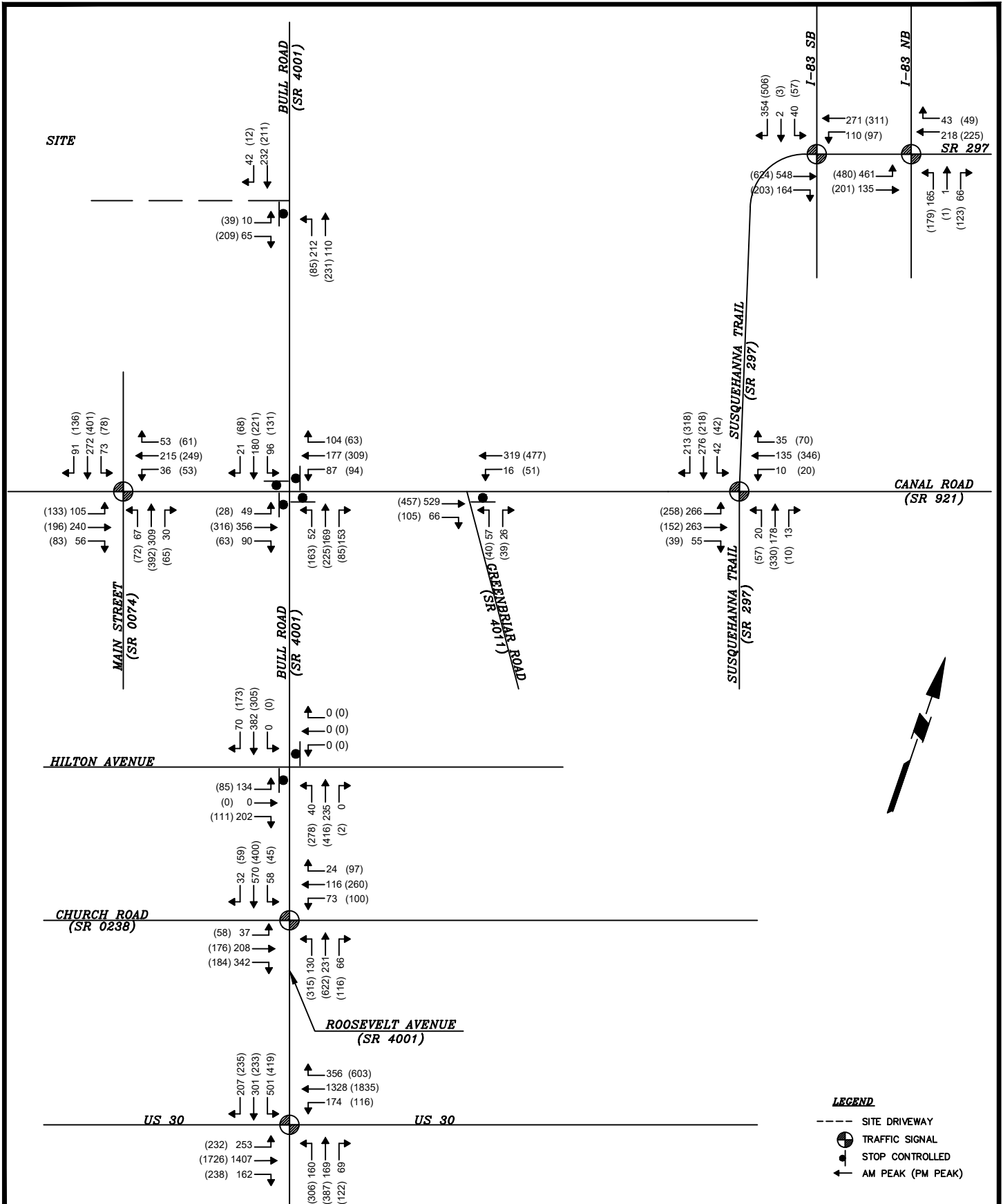


	ENTER	EXIT	TOTAL
WEEKDAY AM	254	75	329
WEEKDAY PM	97	249	346

**LEGEND**

- SITE DRIVEWAY
- ⊙ TRAFFIC SIGNAL
- STOP CONTROLLED
- ← AM PEAK (PM PEAK)

<p><b>LANGAN</b> Langan Engineering and Environmental Services, Inc. Stone Manor Corporate Center, 2700 Kelly Road, Suite 200 Warrington, PA 18976 T: 215.491.6500 F: 215.491.6501 www.langan.com</p>	<p>Project <b>BULL ROAD LOGISTICS</b> DOVER TOWNSHIP YORK COUNTY PENNSYLVANIA</p>	<p>Drawing Title <b>COMBINED SITE GENERATED TRIPS</b></p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Project No. 200164401</td> <td style="width: 50%;">Drawing No.</td> </tr> <tr> <td>Date rev 6/6/2023</td> <td rowspan="3" style="text-align: center; vertical-align: middle;"><b>FIGURE 12</b></td> </tr> <tr> <td>Drawn By KLP</td> </tr> <tr> <td>Checked By RJL</td> </tr> </table>	Project No. 200164401	Drawing No.	Date rev 6/6/2023	<b>FIGURE 12</b>	Drawn By KLP	Checked By RJL
	Project No. 200164401	Drawing No.							
	Date rev 6/6/2023	<b>FIGURE 12</b>							
	Drawn By KLP								
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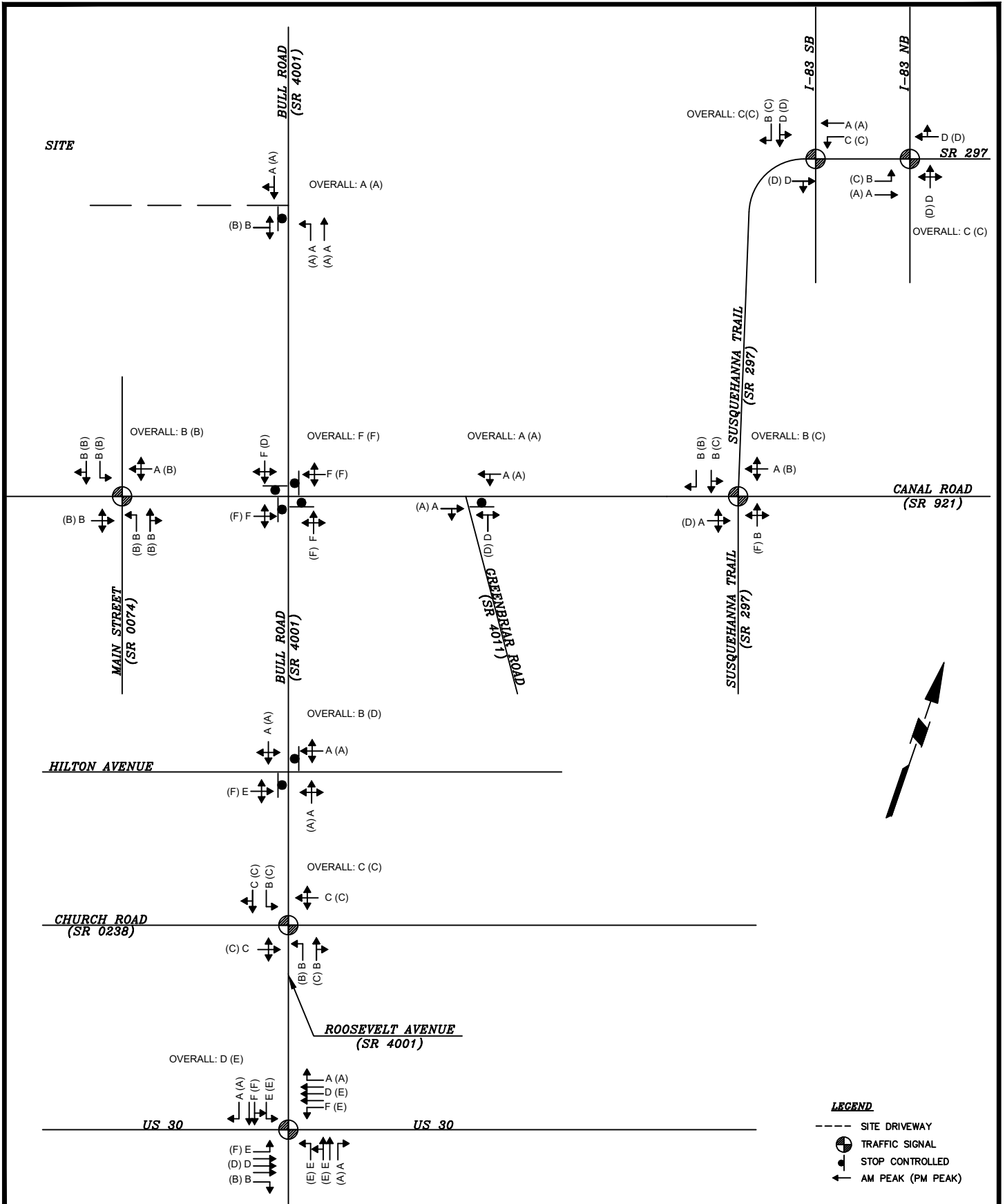
Project  
**BULL ROAD LOGISTICS**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title  
**2024 BUILD TRAFFIC VOLUMES**

Project No.  
 200164401  
 Date  
 rev 6/6/2023  
 Drawn By  
 KLP  
 Checked By  
 RJL

Drawing No.  
**FIGURE 13**





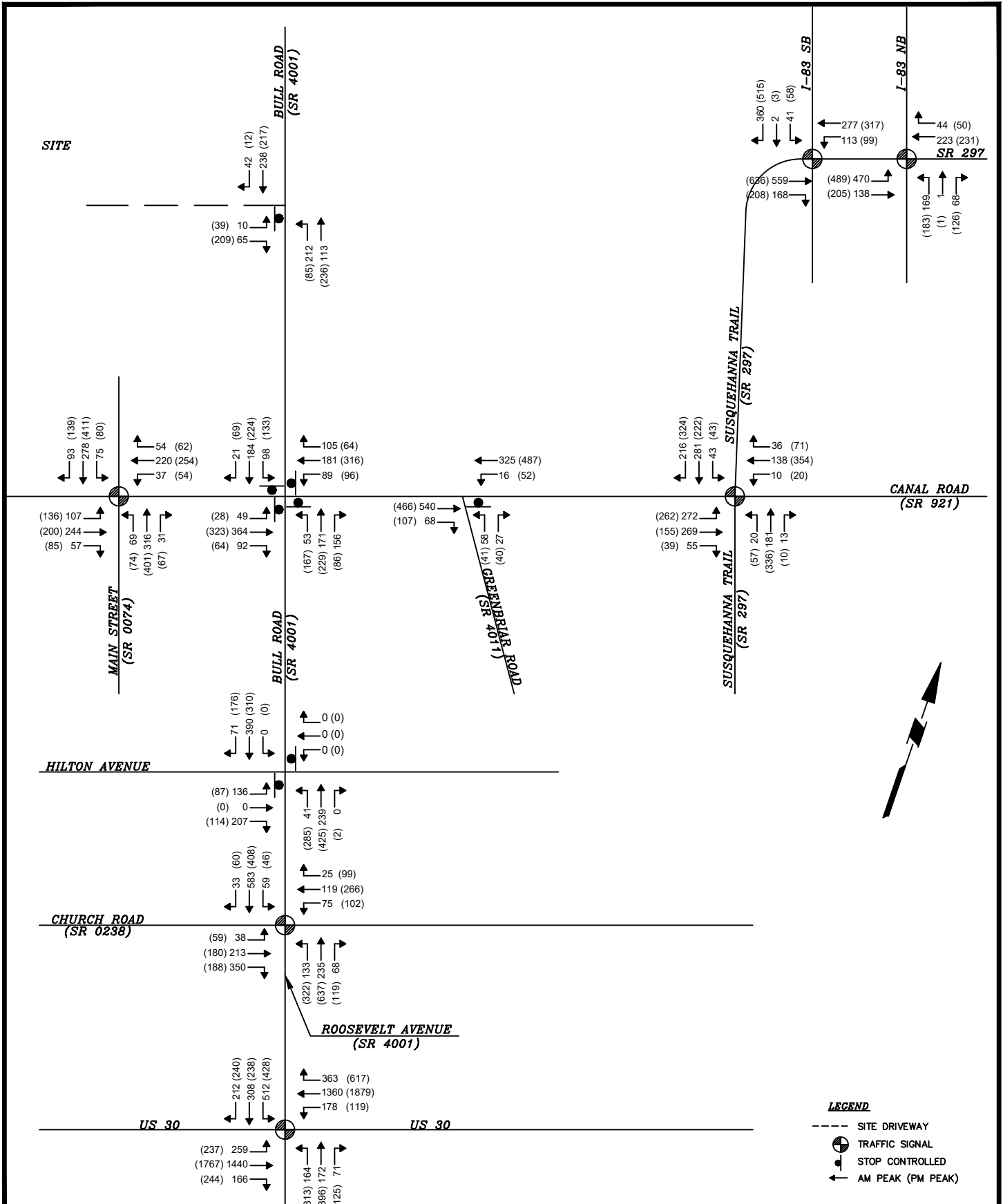
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 DOVER TOWNSHIP  
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Drawing Title  
**2024 BUILD LEVELS OF SERVICE**

Project No.  
200164401  
 Date  
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Drawing No.  
**FIGURE 14**



- LEGEND**
- SITE DRIVEWAY
  - TRAFFIC SIGNAL
  - ◐ STOP CONTROLLED
  - ← AM PEAK (PM PEAK)

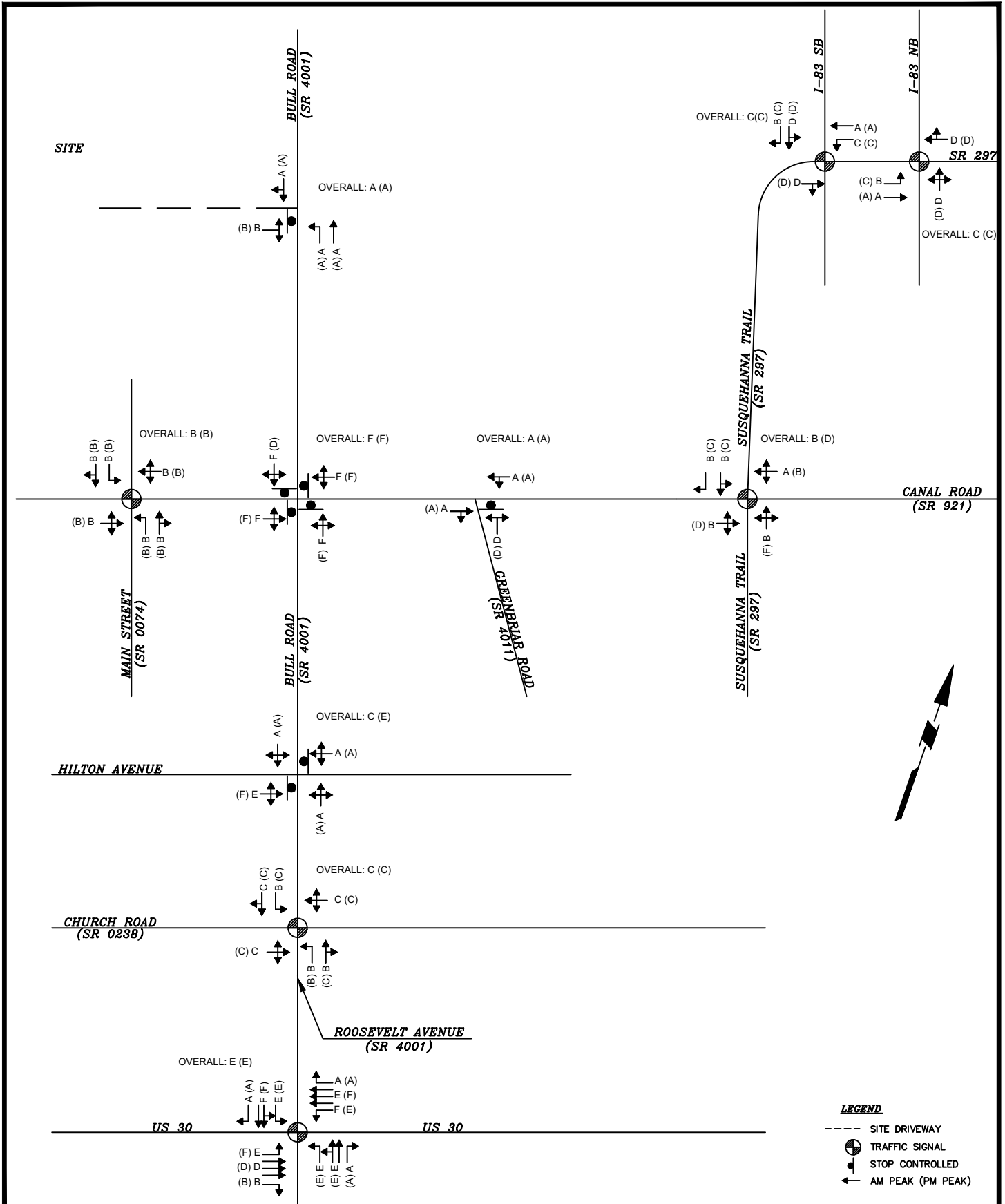
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Project  
**BULL ROAD LOGISTICS**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title  
**2029 BUILD TRAFFIC VOLUMES**

Project No.  
 200164401  
 Date  
 rev 6/6/2023  
 Drawn By  
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 Checked By  
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Drawing No.  
**FIGURE 15**



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	<b>BULL ROAD LOGISTICS</b>	<b>2029 BUILD LEVELS OF SERVICE</b>	200164401	
	DOVER TOWNSHIP YORK COUNTY PENNSYLVANIA		Date rev 6/6/2023	
			Drawn By KLP	
			Checked By RJL	<b>FIGURE 16</b>

# **APPENDIX A**

## **SITE PLAN**



## **APPENDIX B**

### **INTERSECTION PICTURES**



Canal Road (SR 921) and Main Street (SR 0074) – Eastbound Approach



Canal Road (SR 921) and Main Street (SR 0074) – Westbound Approach



Canal Road (SR 921) and Main Street (SR 0074) – Northbound Approach



Canal Road (SR 921) and Main Street (SR 0074) – Southbound Approach





Bull Road (SR 4001) and Canal Road (SR 921) – Eastbound Approach



Bull Road (SR 4001) and Canal Road (SR 921) – Westbound Approach



Bull Road (SR 4001) and Canal Road (SR 921) – Northbound Approach



Bull Road (SR 4001) and Canal Road (SR 921) –Southbound Approach



Canal Road (SR 921) and Greenbriar Road – Eastbound Approach



Canal Road (SR 921) and Greenbriar Road – Westbound Approach



Canal Road (SR 921) and Greenbriar Road – Northbound Approach



Canal Road (SR 921) and Susquehanna Trail (SR 297) – Eastbound Approach



Canal Road (SR 921) and Susquehanna Trail (SR 297) – Westbound Approach



Canal Road (SR 921) and Susquehanna Trail (SR 297) – Northbound Approach



Canal Road (SR 921) and Susquehanna Trail (SR 297) – Southbound Approach



I-83 NB and Susquehanna Trail (SR 297) – Northbound Approach



I-83 SB and Susquehanna Trail (SR 297)



Bull Road (SR 4001) and Hilton Avenue – Eastbound Approach



Bull Road (SR 4001) and Hilton Avenue – Westbound Approach





Bull Road (SR 4001) and Hilton Avenue – Northbound Approach



Bull Road (SR 4001) and Hilton Avenue – Southbound Approach



Bull Road (SR 4001) and Church Road – Eastbound Approach



Bull Road (SR 4001) and Church Road – Westbound Approach



Bull Road (SR 4001) and Church Road – Northbound Approach



Bull Road (SR 4001) and Church Road – Southbound Approach



Loucks Road (SR 0030) and Roosevelt Avenue – Eastbound Approach



Loucks Road (SR 0030) and Roosevelt Avenue – Westbound Approach



Loucks Road (SR 0030) and Roosevelt Avenue – Northbound Approach



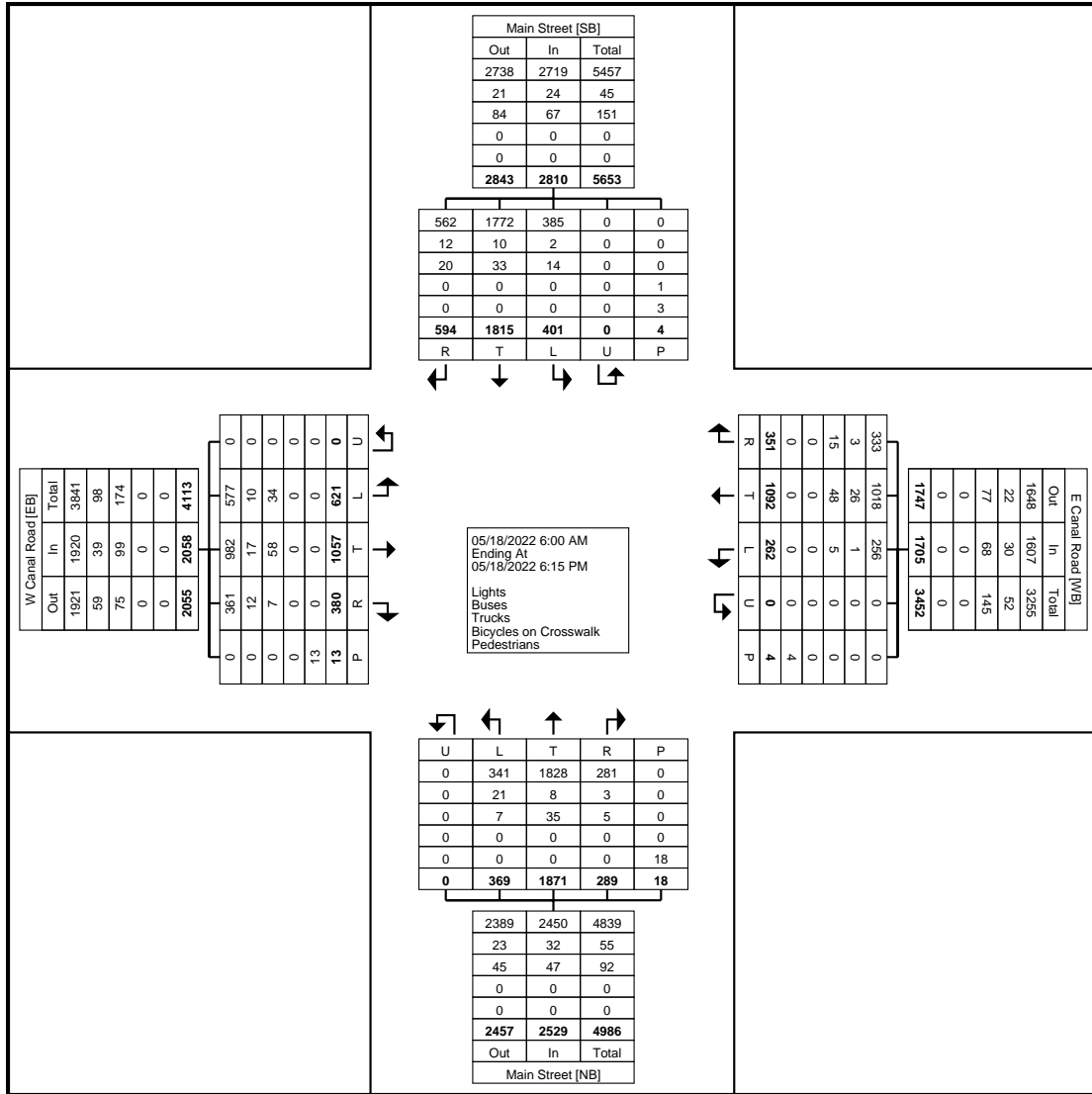
Loucks Road (SR 0030) and Roosevelt Avenue – Southbound Approach

## **APPENDIX C**

### **MANUAL TRAFFIC COUNT DATA**

## Turning Movement Data

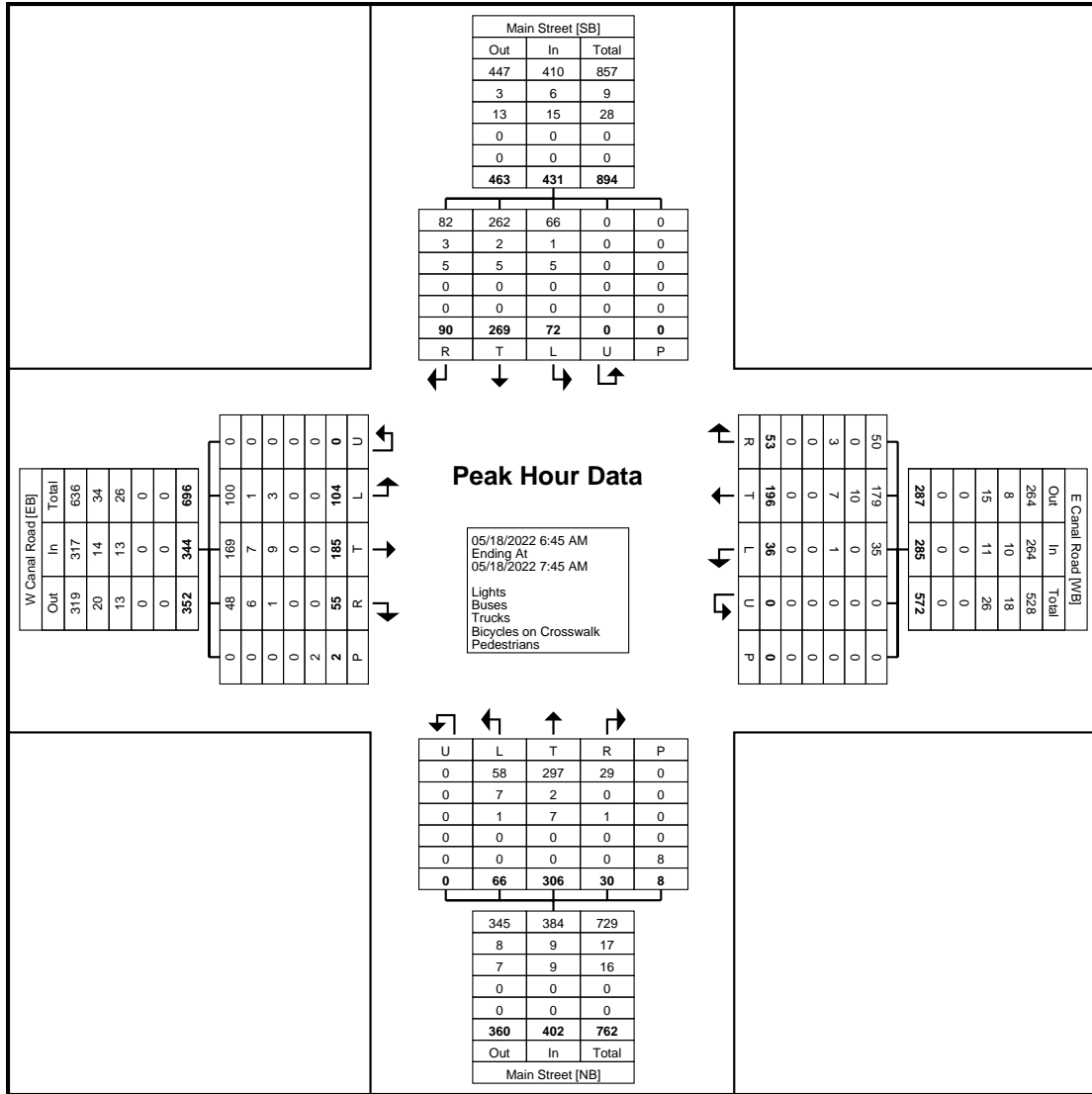
Start Time	W Canal Road Eastbound							E Canal Road Westbound							Main Street Northbound							Main Street Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
6:00 AM	29	35	7	0	0	0	71	3	31	3	0	0	1	37	9	32	2	0	0	0	43	19	28	16	0	0	0	63	214
6:15 AM	25	64	3	0	0	0	92	2	20	15	0	0	0	37	7	66	1	1	0	0	75	18	51	23	0	0	0	92	296
6:30 AM	30	52	2	0	0	0	84	5	46	18	0	0	0	69	9	73	5	0	0	0	87	14	63	19	1	0	0	97	337
6:45 AM	24	60	9	0	0	1	93	3	48	8	0	0	0	59	16	81	7	0	0	0	104	9	45	22	0	0	0	76	332
Hourly Total	108	211	21	0	0	1	340	13	145	44	0	0	1	202	41	252	15	1	0	0	309	60	187	80	1	0	0	328	1179
7:00 AM	25	25	9	0	0	0	59	13	40	14	0	0	0	67	13	53	5	0	0	5	71	18	54	21	0	0	0	93	290
7:15 AM	28	43	12	0	0	1	83	13	61	19	0	0	0	93	25	83	6	0	0	2	114	25	80	23	0	0	0	128	418
7:30 AM	27	57	25	0	0	0	109	7	47	12	0	0	0	66	12	89	12	0	0	1	113	20	90	24	0	0	0	134	422
7:45 AM	26	41	16	0	0	0	83	8	34	9	0	0	0	51	12	75	5	1	0	1	93	18	59	27	0	0	0	104	331
Hourly Total	106	166	62	0	0	1	334	41	182	54	0	0	0	277	62	300	28	1	0	9	391	81	283	95	0	0	0	459	1461
8:00 AM	19	31	14	0	0	0	64	5	28	7	2	0	0	42	4	55	12	0	0	0	71	11	61	20	0	0	0	92	269
8:15 AM	22	39	14	0	0	0	75	14	29	19	0	0	0	62	6	59	7	0	0	2	72	15	54	16	0	0	0	85	294
8:30 AM	20	35	13	0	0	3	68	11	34	12	0	0	0	57	16	47	13	0	0	0	76	11	60	10	0	0	0	81	282
8:45 AM	14	40	27	0	0	0	81	18	29	15	0	0	3	62	24	43	9	1	0	0	77	19	67	17	0	0	0	103	323
Hourly Total	75	145	68	0	0	3	288	48	120	53	2	0	3	223	50	204	41	1	0	2	296	56	242	63	0	0	0	361	1168
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	2
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	2
3:00 PM	25	58	21	0	0	0	104	8	49	18	0	0	0	75	15	87	11	1	0	2	114	21	54	19	0	0	0	94	387
3:15 PM	31	34	18	0	0	2	83	9	59	23	0	0	0	91	20	80	29	0	0	2	129	15	79	17	0	0	0	111	414
3:30 PM	25	44	25	0	0	0	94	18	56	16	0	0	0	90	11	94	7	2	0	0	114	10	87	27	0	0	1	124	422
3:45 PM	27	40	15	0	0	0	82	16	63	21	0	0	0	100	21	103	12	2	0	0	138	7	101	39	0	0	2	147	467
Hourly Total	108	176	79	0	0	2	363	51	227	78	0	0	0	356	67	364	59	5	0	4	495	53	321	102	0	0	3	476	1690
4:00 PM	21	43	14	0	0	2	78	18	61	11	0	0	0	90	16	97	20	0	0	0	133	12	97	30	0	0	1	139	440
4:15 PM	30	63	16	0	0	3	109	13	49	18	0	0	0	80	18	84	14	0	0	0	116	15	96	30	0	0	0	141	446
4:30 PM	38	30	20	1	0	1	89	12	48	20	0	0	0	80	13	86	19	0	0	1	118	21	114	33	1	0	0	169	456
4:45 PM	30	53	17	0	0	0	100	16	54	11	0	0	0	81	14	121	15	1	0	2	151	11	106	30	2	0	0	149	481
Hourly Total	119	189	67	1	0	6	376	59	212	60	0	0	0	331	61	388	68	1	0	3	518	59	413	123	3	0	1	598	1823
5:00 PM	38	40	15	0	0	0	93	12	42	14	0	0	0	68	27	96	10	0	0	0	133	19	79	38	1	0	0	137	431
5:15 PM	26	48	29	0	0	0	103	13	54	15	0	0	0	82	17	85	19	0	0	0	121	26	98	29	1	0	0	154	460
5:30 PM	25	36	17	0	0	0	78	10	58	15	0	0	0	83	17	78	17	0	0	0	112	27	98	29	0	0	0	154	427
5:45 PM	16	46	21	0	0	0	83	15	52	16	0	0	0	83	27	104	23	0	0	0	154	20	93	28	0	0	0	141	461
Hourly Total	105	170	82	0	0	0	357	50	206	60	0	0	0	316	88	363	69	0	0	0	520	92	368	124	2	0	0	586	1779
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	621	1057	379	1	0	13	2058	262	1092	349	2	0	4	1705	369	1871	280	9	0	18	2529	401	1815	588	6	0	4	2810	9102
Approach %	30.2	51.4	18.4	0.0	0.0	-	-	15.4	64.0	20.5	0.1	0.0	-	-	14.6	74.0	11.1	0.4	0.0	-	-	14.3	64.6	20.9	0.2	0.0	-	-	-
Total %	6.8	11.6	4.2	0.0	0.0	-	22.6	2.9	12.0	3.8	0.0	0.0	-	18.7	4.1	20.6	3.1	0.1	0.0	-	27.8	4.4	19.9	6.5	0.1	0.0	-	30.9	-
Lights	577	982	360	1	0	-	1920	256	1018	331	2	0	-	1607	341	1828	272	9	0	-	2450	385	1772	556	6	0	-	2719	8696
% Lights	92.9	92.9	95.0	100.0	-	-	93.3	97.7	93.2	94.8	100.0	-	-	94.3	92.4	97.7	97.1	100.0	-	-	96.9	96.0	97.6	94.6	100.0	-	-	96.8	95.5
Buses	10	17	12	0	0	-	39	1	26	3	0	0	-	30	21	8	3	0	0	-	32	2	10	12	0	0	-	24	125
% Buses	1.6	1.6	3.2	0.0	-	-	1.9	0.4	2.4	0.9	0.0	-	-	1.8	5.7	0.4	1.1	0.0	-	-	1.3	0.5	0.6	2.0	0.0	-	-	0.9	1.4
Trucks	34	58	7	0	0	-	99	5	48	15	0	0	-	68	7	35	5	0	0	-	47	14	33	20	0	0	-	67	281
% Trucks	5.5	5.5	1.8	0.0	-	-	4.8	1.9	4.4	4.3	0.0	-	-	4.0	1.9	1.9	1.8	0.0	-	-	1.9	3.5	1.8	3.4	0.0	-	-	2.4	3.1
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	25.0	-	-
Pedestrians	-	-	-	-	-	13	-	-	-	-	-	4	-	-	-	-	-	-	-	18	-	-	-	-	-	3	-	-	
% Pedestrians	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	100.0	-	-	-	-	-	75.0	-	-	-



Turning Movement Data Plot

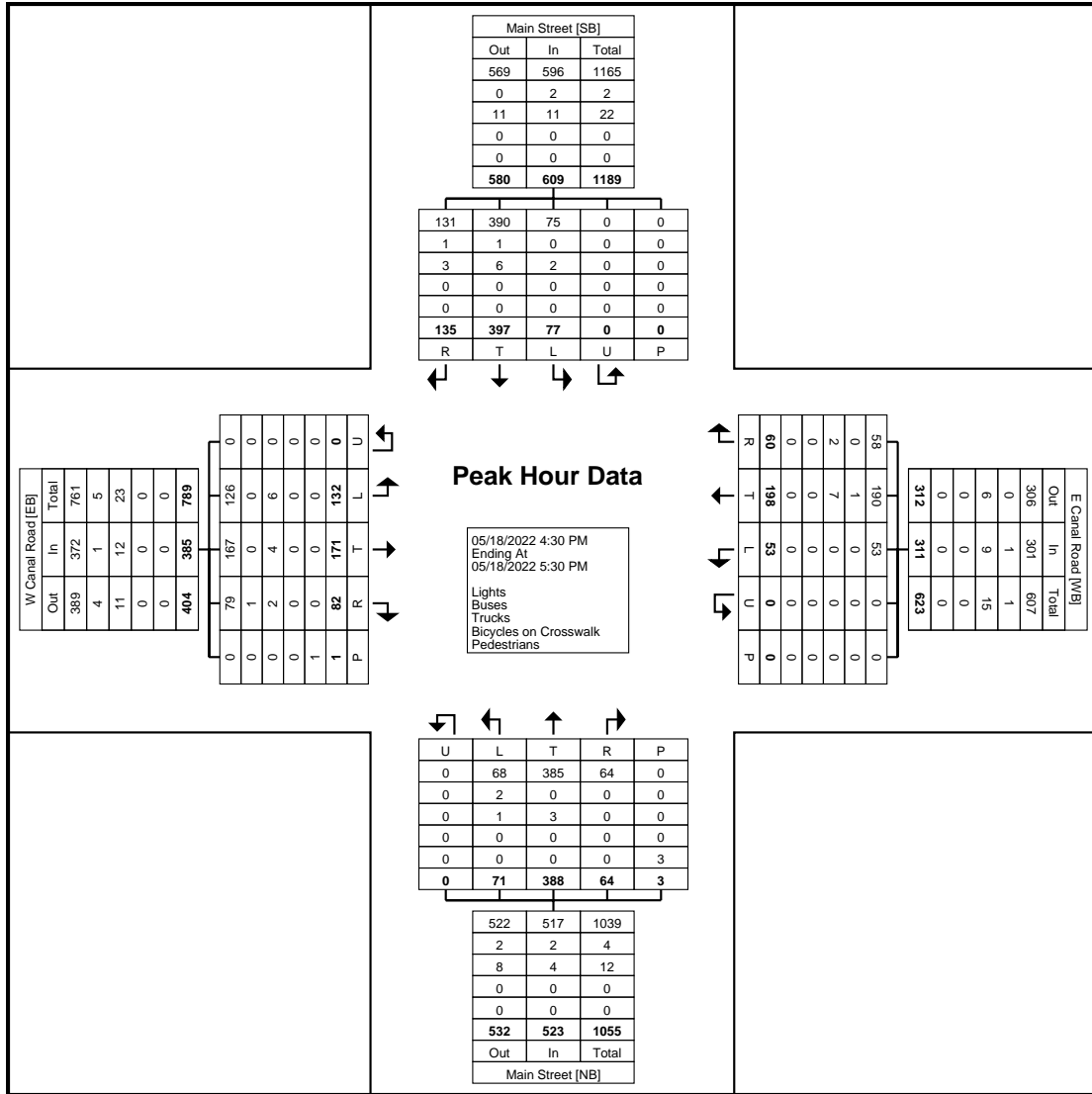






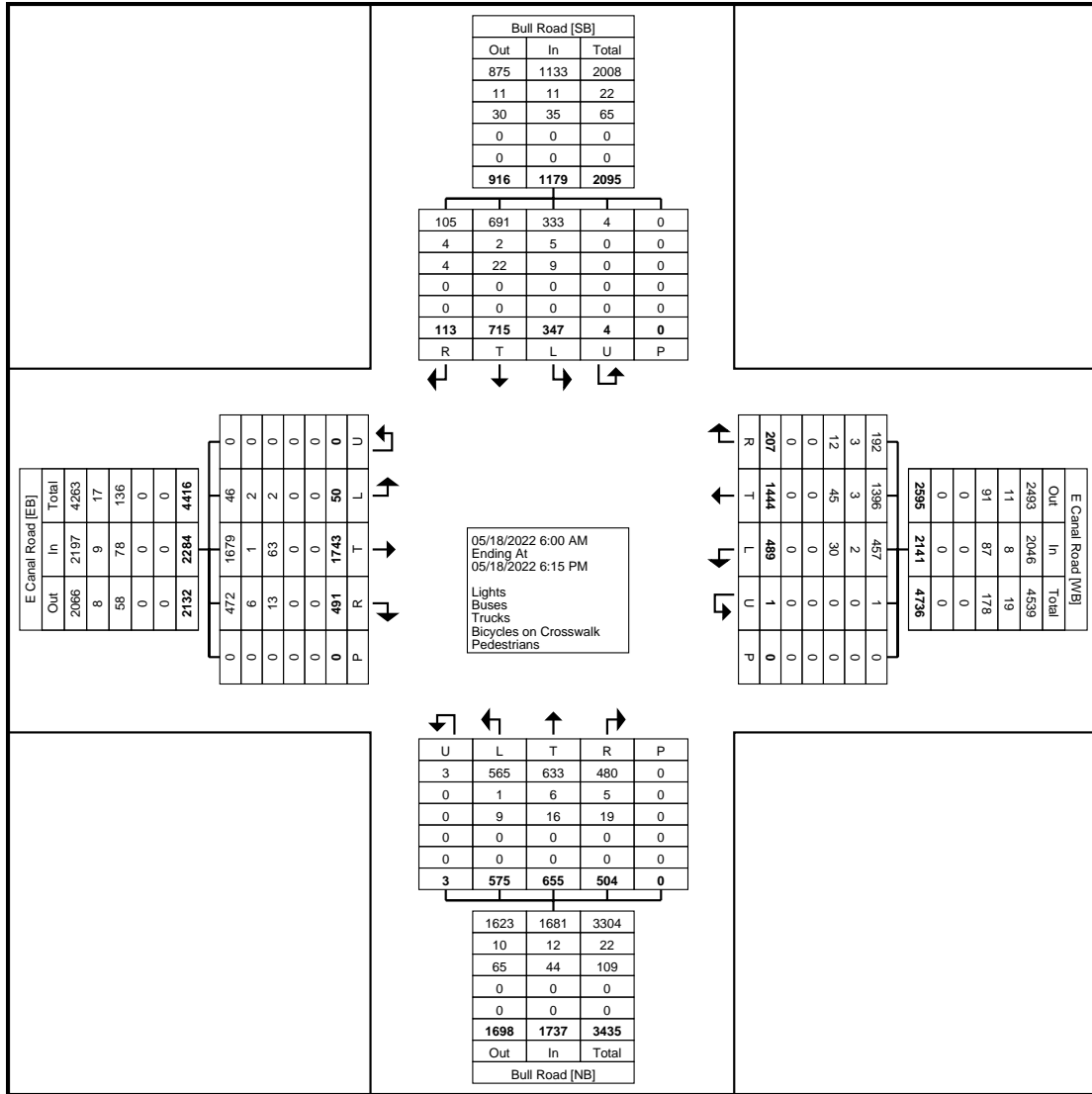
Turning Movement Peak Hour Data Plot (6:45 AM)





Turning Movement Peak Hour Data Plot (4:30 PM)





Turning Movement Data Plot



www.TSTData.com  
184 Baker Rd

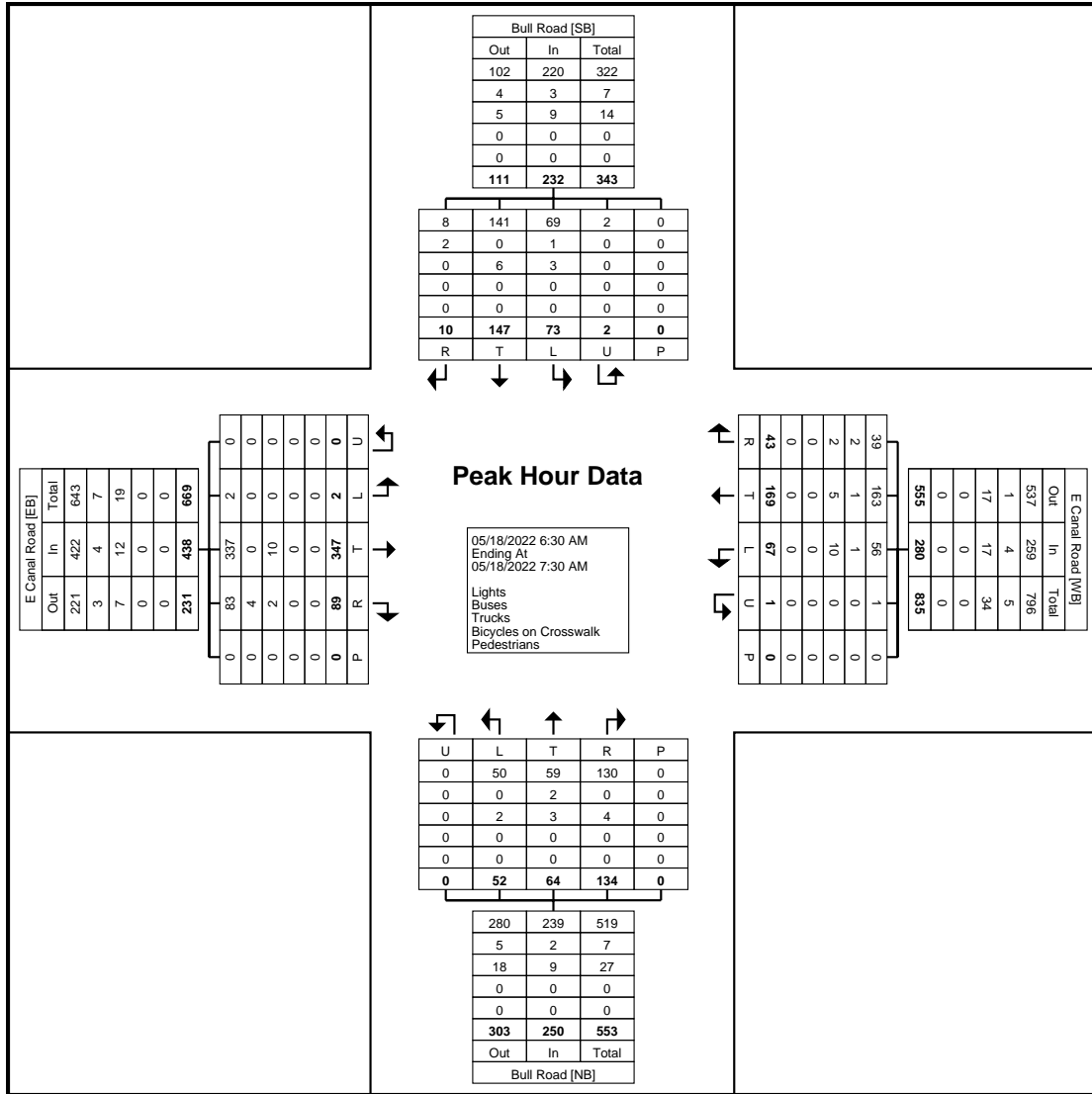
Coatesville, Pennsylvania, United States 19320  
610-466-1469  
Serving Transportation Professionals Since 1995

Count Name: E Canal Rd & Bull Rd  
Site Code:  
Start Date: 05/18/2022  
Page No: 3

York County, PA  
E Canal Rd & Bull Rd  
Wednesday, May 18, 2022  
Location: 40.016808, -76.81402

### Turning Movement Peak Hour Data (6:30 AM)

Start Time	E Canal Road Eastbound						E Canal Road Westbound						Bull Road Northbound						Bull Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
6:30 AM	0	105	13	0	0	118	15	41	14	0	0	70	18	16	38	0	0	72	26	35	0	0	0	61	321
6:45 AM	1	86	20	0	0	107	17	46	12	0	0	75	12	18	37	0	0	67	14	43	3	0	0	60	309
7:00 AM	1	72	22	0	0	95	17	38	10	0	0	65	12	18	29	0	0	59	14	30	1	1	0	46	265
7:15 AM	0	84	34	0	0	118	18	44	7	1	0	70	10	12	30	0	0	52	19	39	6	1	0	65	305
Total	2	347	89	0	0	438	67	169	43	1	0	280	52	64	134	0	0	250	73	147	10	2	0	232	1200
Approach %	0.5	79.2	20.3	0.0	-	-	23.9	60.4	15.4	0.4	-	-	20.8	25.6	53.6	0.0	-	-	31.5	63.4	4.3	0.9	-	-	-
Total %	0.2	28.9	7.4	0.0	-	36.5	5.6	14.1	3.6	0.1	-	23.3	4.3	5.3	11.2	0.0	-	20.8	6.1	12.3	0.8	0.2	-	19.3	-
PHF	0.500	0.826	0.654	0.000	-	0.928	0.931	0.918	0.768	0.250	-	0.933	0.722	0.889	0.882	0.000	-	0.868	0.702	0.855	0.417	0.500	-	0.892	0.935
Lights	2	337	83	0	-	422	56	163	39	1	-	259	50	59	130	0	-	239	69	141	8	2	-	220	1140
% Lights	100.0	97.1	93.3	-	-	96.3	83.6	96.4	90.7	100.0	-	92.5	96.2	92.2	97.0	-	-	95.6	94.5	95.9	80.0	100.0	-	94.8	95.0
Buses	0	0	4	0	-	4	1	1	2	0	-	4	0	2	0	0	-	2	1	0	2	0	-	3	13
% Buses	0.0	0.0	4.5	-	-	0.9	1.5	0.6	4.7	0.0	-	1.4	0.0	3.1	0.0	-	-	0.8	1.4	0.0	20.0	0.0	-	1.3	1.1
Trucks	0	10	2	0	-	12	10	5	2	0	-	17	2	3	4	0	-	9	3	6	0	0	-	9	47
% Trucks	0.0	2.9	2.2	-	-	2.7	14.9	3.0	4.7	0.0	-	6.1	3.8	4.7	3.0	-	-	3.6	4.1	4.1	0.0	0.0	-	3.9	3.9
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (6:30 AM)





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184 Baker Rd

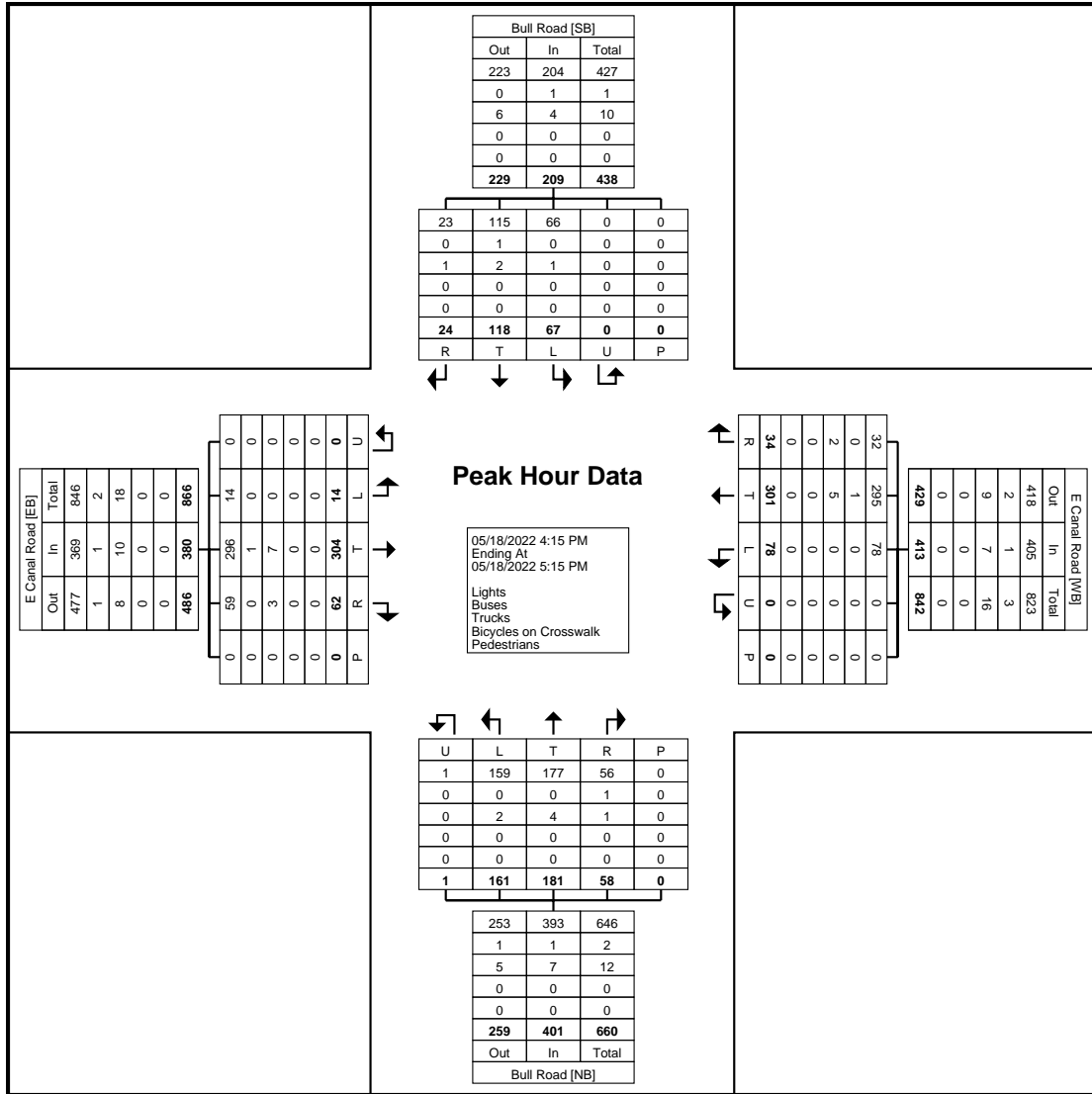
Coatesville, Pennsylvania, United States 19320  
610-466-1469  
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Count Name: E Canal Rd & Bull Rd  
Site Code:  
Start Date: 05/18/2022  
Page No: 5

York County, PA  
E Canal Rd & Bull Rd  
Wednesday, May 18, 2022  
Location: 40.016808, -76.81402

### Turning Movement Peak Hour Data (4:15 PM)

Start Time	E Canal Road Eastbound						E Canal Road Westbound						Bull Road Northbound						Bull Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:15 PM	1	74	16	0	0	91	23	63	9	0	0	95	41	48	10	0	0	99	14	33	5	0	0	52	337
4:30 PM	4	76	18	0	0	98	16	74	13	0	0	103	39	46	13	1	0	99	15	22	8	0	0	45	345
4:45 PM	4	69	13	0	0	86	23	80	3	0	0	106	35	45	21	0	0	101	16	31	7	0	0	54	347
5:00 PM	5	85	15	0	0	105	16	84	9	0	0	109	46	42	14	0	0	102	22	32	4	0	0	58	374
<b>Total</b>	14	304	62	0	0	380	78	301	34	0	0	413	161	181	58	1	0	401	67	118	24	0	0	209	1403
Approach %	3.7	80.0	16.3	0.0	-	-	18.9	72.9	8.2	0.0	-	-	40.1	45.1	14.5	0.2	-	-	32.1	56.5	11.5	0.0	-	-	-
Total %	1.0	21.7	4.4	0.0	-	27.1	5.6	21.5	2.4	0.0	-	29.4	11.5	12.9	4.1	0.1	-	28.6	4.8	8.4	1.7	0.0	-	14.9	-
PHF	0.700	0.894	0.861	0.000	-	0.905	0.848	0.896	0.654	0.000	-	0.947	0.875	0.943	0.690	0.250	-	0.983	0.761	0.894	0.750	0.000	-	0.901	0.938
Lights	14	296	59	0	-	369	78	295	32	0	-	405	159	177	56	1	-	393	66	115	23	0	-	204	1371
% Lights	100.0	97.4	95.2	-	-	97.1	100.0	98.0	94.1	-	-	98.1	98.8	97.8	96.6	100.0	-	98.0	98.5	97.5	95.8	-	-	97.6	97.7
Buses	0	1	0	0	-	1	0	1	0	0	-	1	0	0	1	0	-	1	0	1	0	0	-	1	4
% Buses	0.0	0.3	0.0	-	-	0.3	0.0	0.3	0.0	-	-	0.2	0.0	0.0	1.7	0.0	-	0.2	0.0	0.8	0.0	-	-	0.5	0.3
Trucks	0	7	3	0	-	10	0	5	2	0	-	7	2	4	1	0	-	7	1	2	1	0	-	4	28
% Trucks	0.0	2.3	4.8	-	-	2.6	0.0	1.7	5.9	-	-	1.7	1.2	2.2	1.7	0.0	-	1.7	1.5	1.7	4.2	-	-	1.9	2.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (4:15 PM)



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Count Name: Canal Rd &  
Greenbriar Rd  
Site Code:  
Start Date: 05/18/2022  
Page No: 1

York County, PA  
Canal Rd & Greenbriar Rd  
Wednesday, May 18, 2022  
Location: 40.01801, -76.810005

### Turning Movement Data

Start Time	Canal Rd Eastbound					Canal Rd Westbound					Greenbriar Rd Northbound					Int. Total
	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	U-Turn	Peds	App. Total	Left	Right	U-Turn	Peds	App. Total	
6:00 AM	95	6	0	0	101	2	56	0	0	58	3	4	0	0	7	166
6:15 AM	115	6	0	0	121	1	52	0	0	53	7	3	0	0	10	184
6:30 AM	152	19	0	0	171	2	64	0	0	66	11	5	0	0	16	253
6:45 AM	124	13	0	0	137	3	54	0	0	57	20	12	0	0	32	226
Hourly Total	486	44	0	0	530	8	226	0	0	234	41	24	0	0	65	829
7:00 AM	97	11	0	0	108	3	57	0	0	60	11	5	0	0	16	184
7:15 AM	106	21	0	0	127	8	60	0	0	68	11	4	0	0	15	210
7:30 AM	110	24	0	0	134	10	80	0	0	90	8	11	0	0	19	243
7:45 AM	117	17	0	0	134	1	53	0	0	54	13	9	0	0	22	210
Hourly Total	430	73	0	0	503	22	250	0	0	272	43	29	0	0	72	847
8:00 AM	77	8	0	0	85	6	76	0	0	82	9	12	0	0	21	188
8:15 AM	73	17	0	0	90	3	66	0	0	69	8	10	0	0	18	177
8:30 AM	73	14	0	0	87	4	66	0	0	70	7	9	0	0	16	173
8:45 AM	71	21	0	0	92	6	72	0	0	78	17	3	0	0	20	190
Hourly Total	294	60	0	0	354	19	280	0	0	299	41	34	0	0	75	728
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	89	20	0	0	109	10	103	0	0	113	10	6	0	0	16	238
3:15 PM	79	14	0	0	93	15	130	0	0	145	11	11	0	0	22	260
3:30 PM	97	16	0	0	113	10	107	0	1	117	13	9	0	0	22	252
3:45 PM	71	14	0	0	85	20	114	0	0	134	7	4	0	0	11	230
Hourly Total	336	64	0	0	400	55	454	0	1	509	41	30	0	0	71	980
4:00 PM	73	22	0	0	95	11	112	0	0	123	7	11	0	0	18	236
4:15 PM	86	24	0	0	110	15	114	0	0	129	6	13	0	0	19	258
4:30 PM	92	24	0	0	116	7	95	0	0	102	19	10	0	0	29	247
4:45 PM	97	19	0	0	116	11	112	0	0	123	5	6	0	0	11	250
Hourly Total	348	89	0	0	437	44	433	0	0	477	37	40	0	0	77	991
5:00 PM	86	32	0	0	118	18	104	0	0	122	9	10	0	0	19	259
5:15 PM	95	12	0	0	107	19	105	0	0	124	11	12	0	0	23	254
5:30 PM	76	22	0	0	98	16	98	0	0	114	20	9	0	0	29	241
5:45 PM	79	23	0	0	102	10	85	0	0	95	18	8	0	0	26	223
Hourly Total	336	89	0	0	425	63	392	0	0	455	58	39	0	0	97	977
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	2230	419	0	0	2649	211	2035	0	1	2246	261	196	0	0	457	5352
Approach %	84.2	15.8	0.0	-	-	9.4	90.6	0.0	-	-	57.1	42.9	0.0	-	-	-
Total %	41.7	7.8	0.0	-	49.5	3.9	38.0	0.0	-	42.0	4.9	3.7	0.0	-	8.5	-
Lights	2132	409	0	-	2541	198	1936	0	-	2134	255	189	0	-	444	5119
% Lights	95.6	97.6	-	-	95.9	93.8	95.1	-	-	95.0	97.7	96.4	-	-	97.2	95.6
Buses	10	3	0	-	13	9	4	0	-	13	3	2	0	-	5	31
% Buses	0.4	0.7	-	-	0.5	4.3	0.2	-	-	0.6	1.1	1.0	-	-	1.1	0.6
Trucks	88	7	0	-	95	4	95	0	-	99	3	5	0	-	8	202
% Trucks	3.9	1.7	-	-	3.6	1.9	4.7	-	-	4.4	1.1	2.6	-	-	1.8	3.8
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-

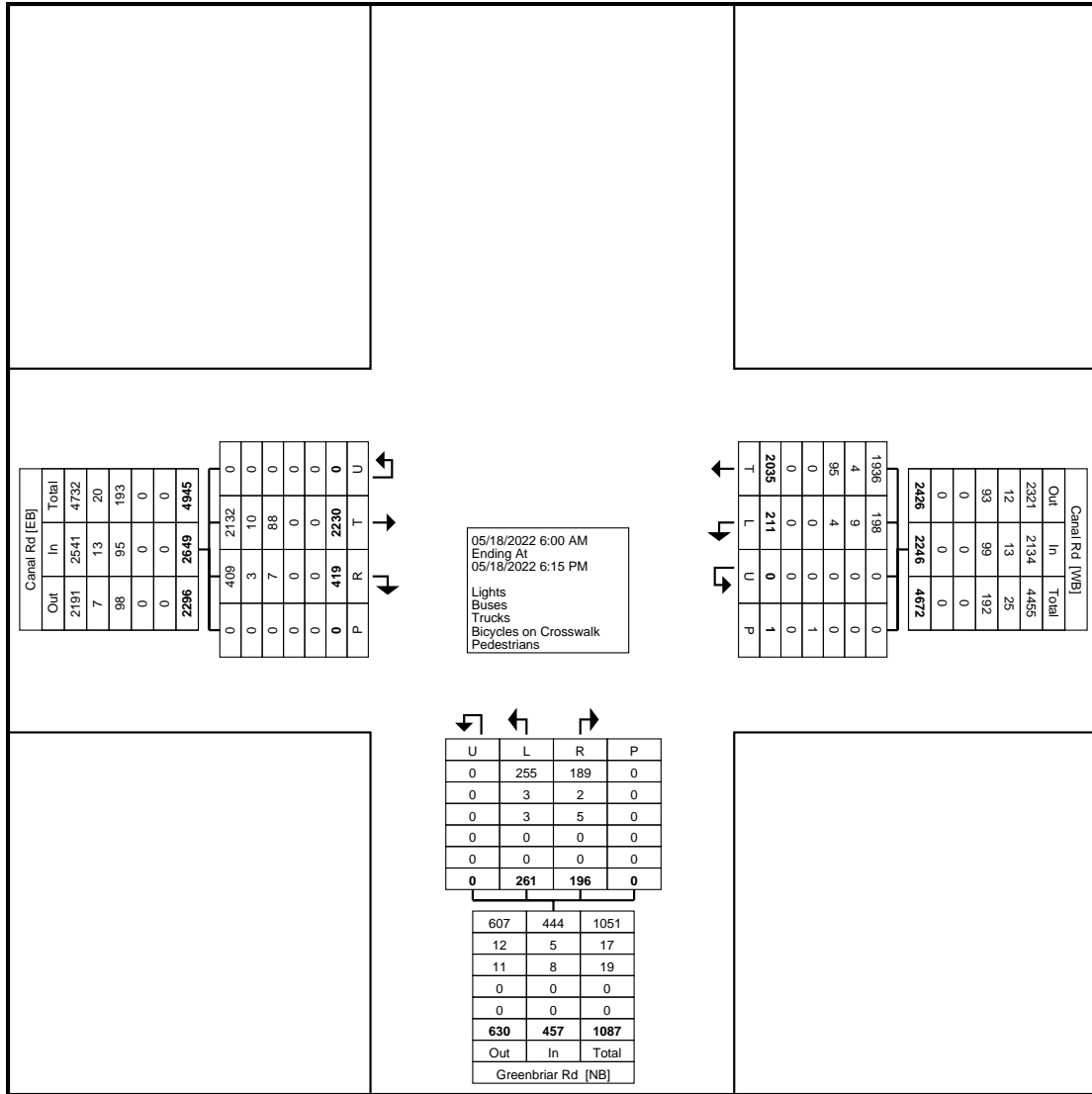


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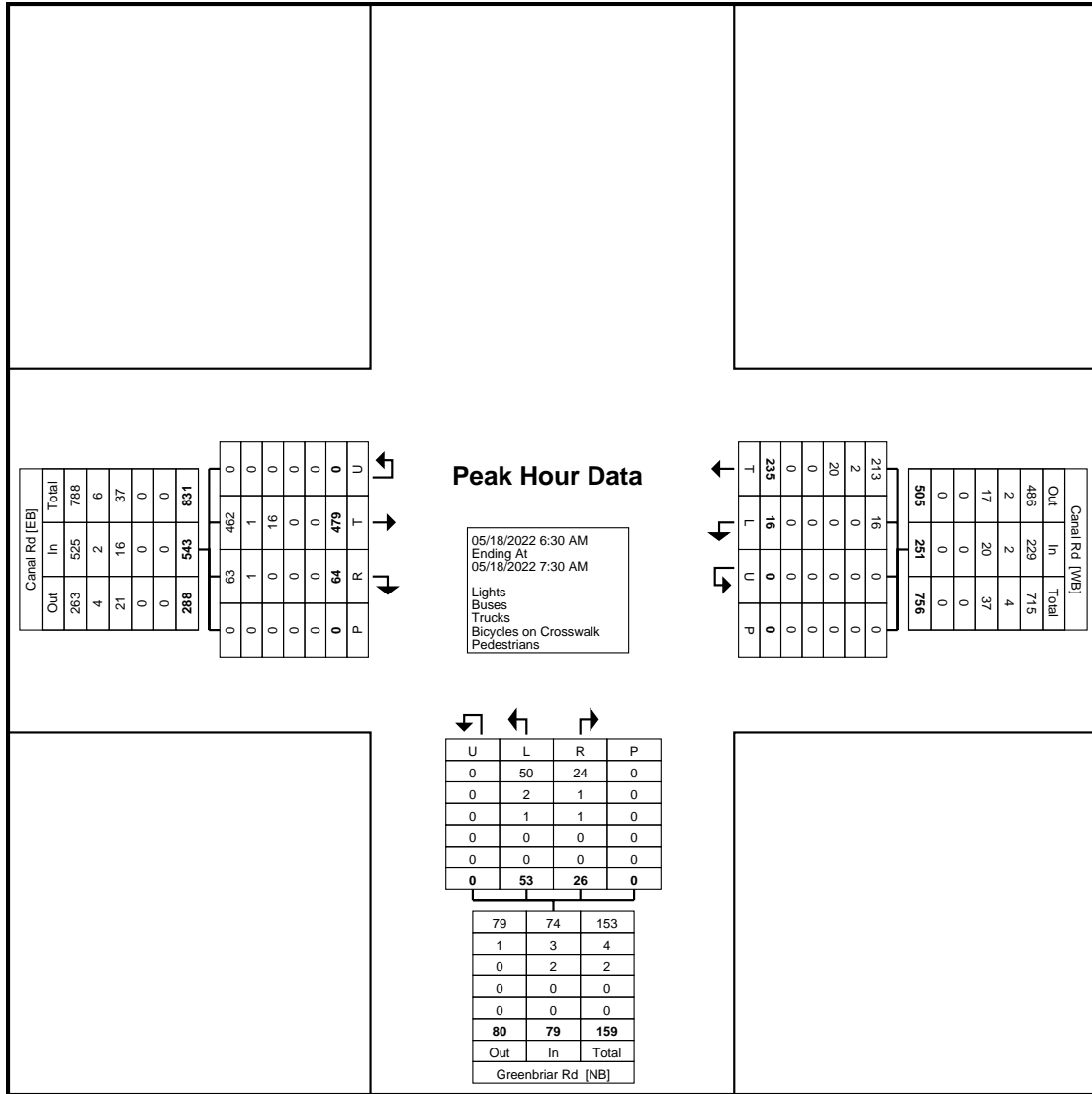
Count Name: Canal Rd &  
Greenbriar Rd  
Site Code:  
Start Date: 05/18/2022  
Page No: 2

York County, PA  
Canal Rd & Greenbriar Rd  
Wednesday, May 18, 2022  
Location: 40.01801, -76.810005



Turning Movement Data Plot

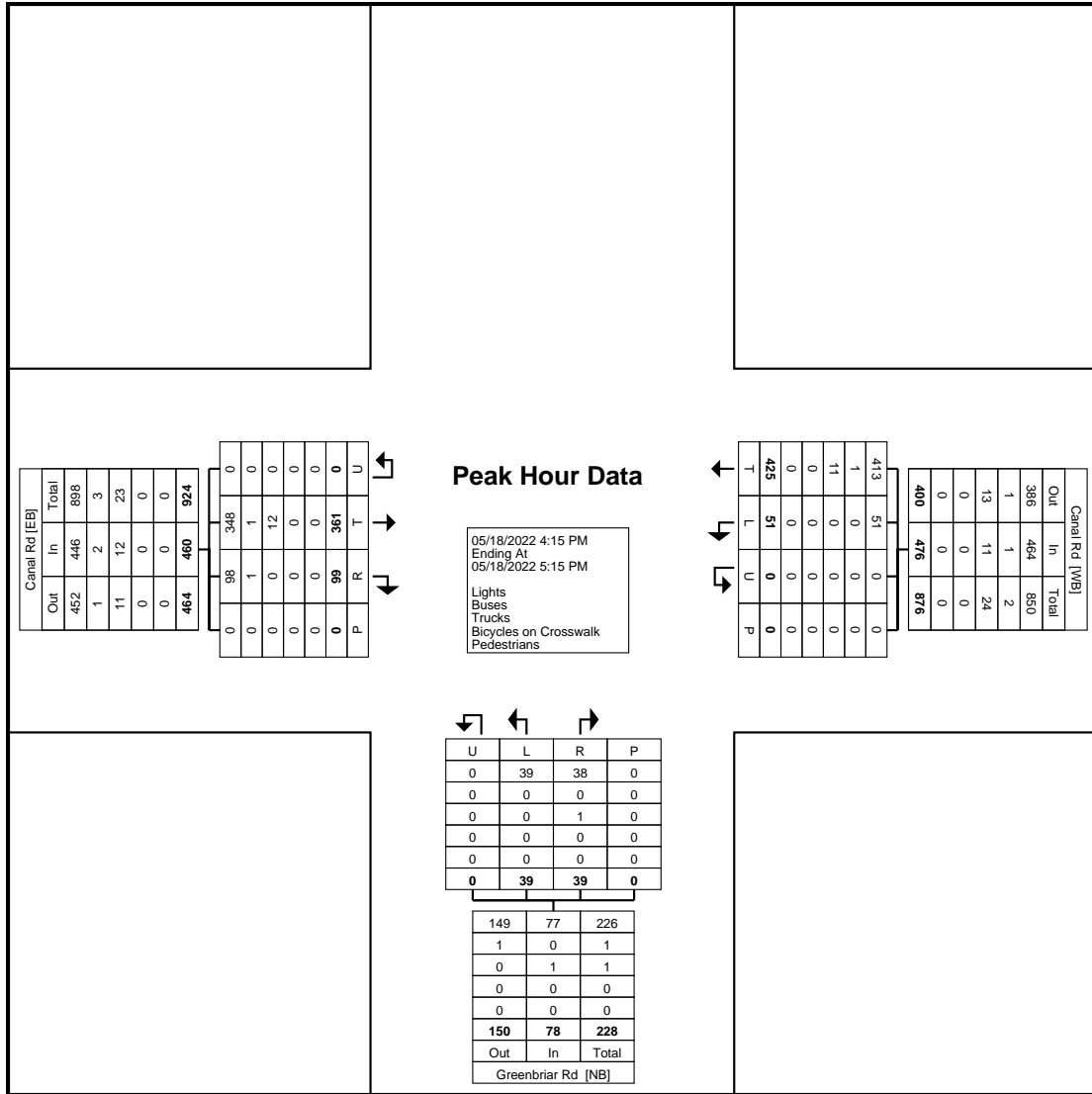




Turning Movement Peak Hour Data Plot (6:30 AM)



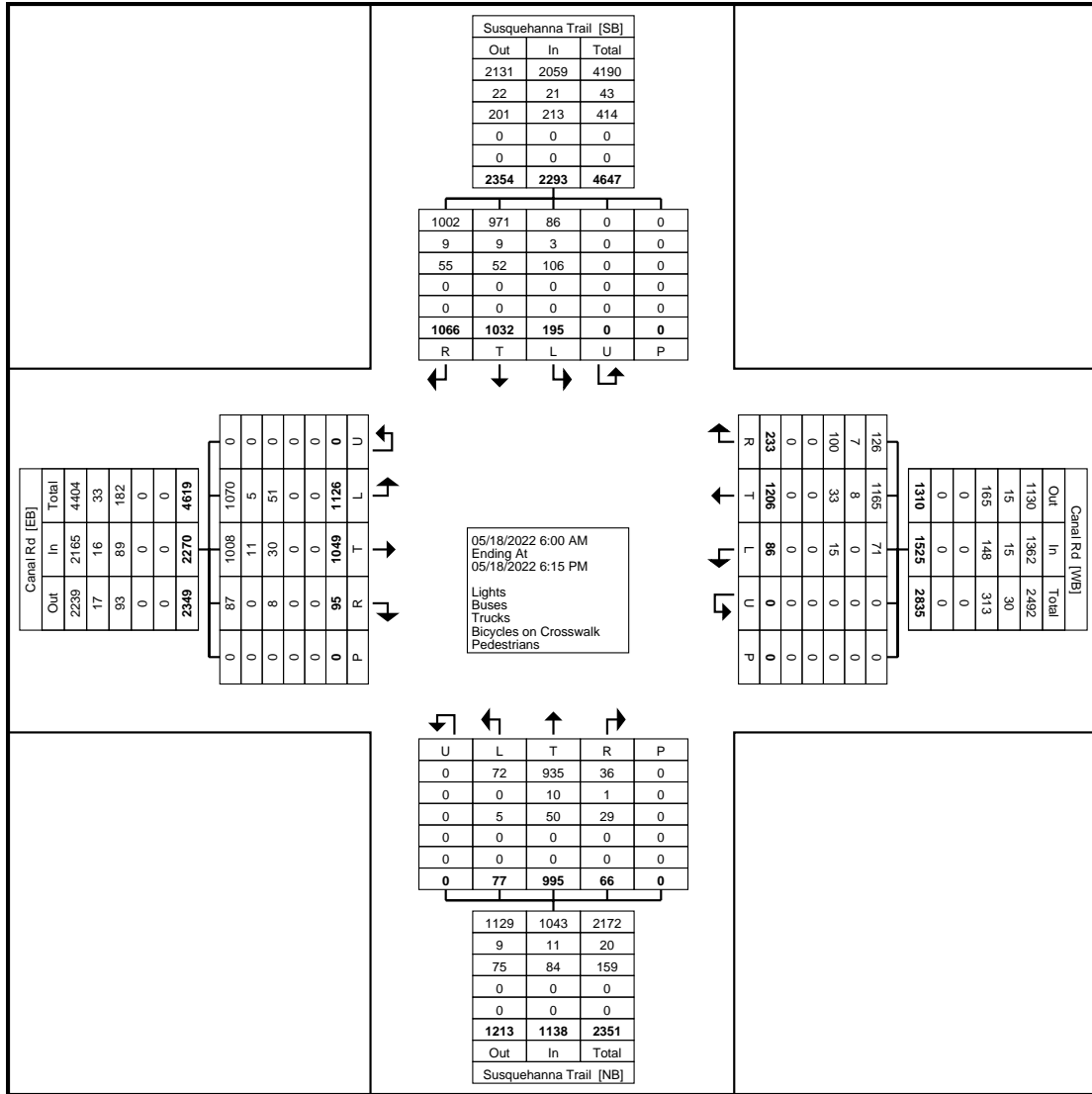
York County, PA  
Canal Rd & Greenbriar Rd  
Wednesday, May 18, 2022  
Location: 40.01801, -76.810005



Turning Movement Peak Hour Data Plot (4:15 PM)







Turning Movement Data Plot



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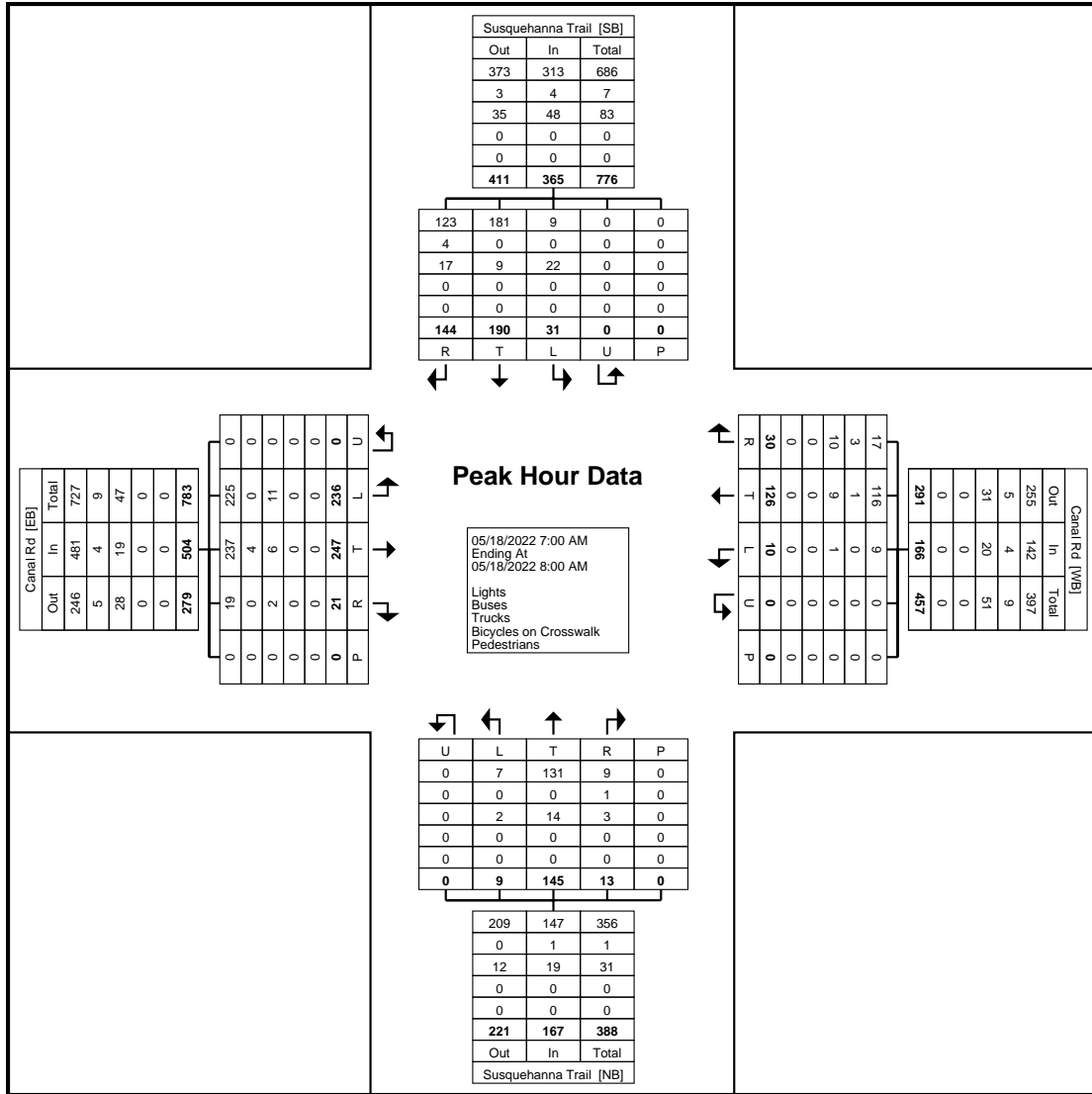
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York County, PA  
Canal Rd & Susquehanna Trail  
Wednesday, May 18, 2022  
Location: 40.049099, -  
76.766932

Count Name: Canal Rd &  
Susquehanna Trail  
Site Code:  
Start Date: 05/18/2022  
Page No: 3

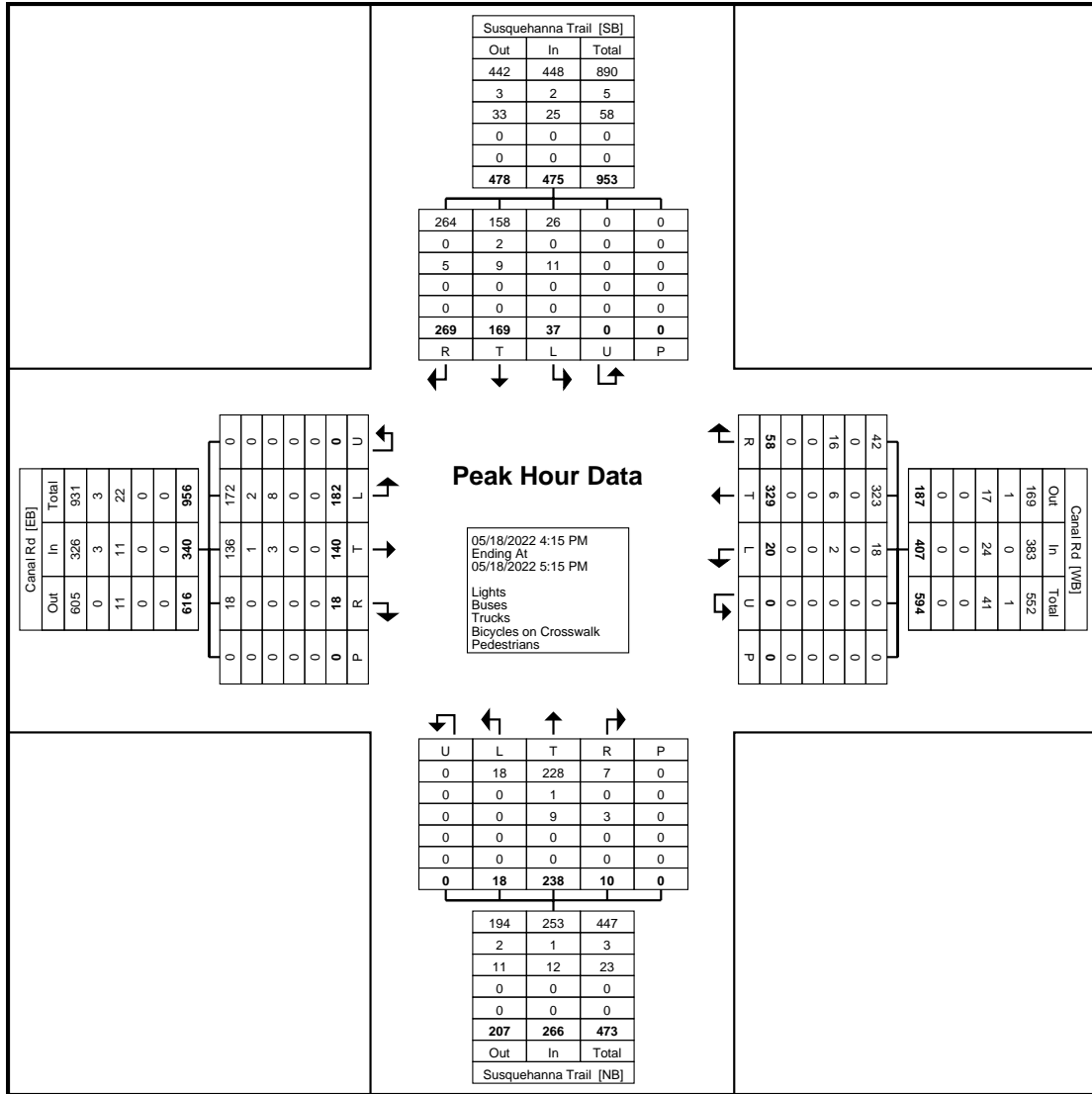
### Turning Movement Peak Hour Data (7:00 AM)

Start Time	Canal Rd Eastbound							Canal Rd Westbound							Susquehanna Trail Northbound							Susquehanna Trail Southbound							Int. Total
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	
7:00 AM	69	63	5	0	0	0	137	2	26	5	1	0	0	34	1	33	5	1	0	0	40	7	57	9	24	0	0	97	308
7:15 AM	58	60	5	0	0	0	123	5	44	7	1	0	0	57	3	31	1	0	0	35	7	46	15	19	0	0	87	302	
7:30 AM	60	56	3	0	0	0	119	1	29	10	0	0	0	40	2	46	4	0	0	52	7	46	19	18	0	0	90	301	
7:45 AM	49	68	8	0	0	0	125	2	27	6	0	0	0	35	3	35	2	0	0	40	10	41	20	20	0	0	91	291	
Total	236	247	21	0	0	0	504	10	126	28	2	0	0	166	9	145	12	1	0	167	31	190	63	81	0	0	365	1202	
Approach %	46.8	49.0	4.2	0.0	0.0	-	-	6.0	75.9	16.9	1.2	0.0	-	-	5.4	86.8	7.2	0.6	0.0	-	-	8.5	52.1	17.3	22.2	0.0	-	-	-
Total %	19.6	20.5	1.7	0.0	0.0	-	41.9	0.8	10.5	2.3	0.2	0.0	-	13.8	0.7	12.1	1.0	0.1	0.0	-	13.9	2.6	15.8	5.2	6.7	0.0	-	30.4	-
PHF	0.855	0.908	0.656	0.000	0.000	-	0.920	0.500	0.716	0.700	0.500	0.000	-	0.728	0.750	0.788	0.600	0.250	0.000	-	0.803	0.775	0.833	0.788	0.844	0.000	-	0.941	0.976
Lights	225	237	19	0	0	-	481	9	116	15	2	0	-	142	7	131	8	1	0	-	147	9	181	49	74	0	-	313	1083
% Lights	95.3	96.0	90.5	-	-	-	95.4	90.0	92.1	53.6	100.0	-	85.5	77.8	90.3	66.7	100.0	-	88.0	29.0	95.3	77.8	91.4	-	-	85.8	90.1		
Buses	0	4	0	0	0	-	4	0	1	3	0	0	-	4	0	0	1	0	0	-	1	0	0	3	1	0	-	4	13
% Buses	0.0	1.6	0.0	-	-	-	0.8	0.0	0.8	10.7	0.0	-	2.4	0.0	0.0	8.3	0.0	-	0.6	0.0	0.0	4.8	1.2	-	-	1.1	1.1		
Trucks	11	6	2	0	0	-	19	1	9	10	0	0	-	20	2	14	3	0	0	-	19	22	9	11	6	0	-	48	106
% Trucks	4.7	2.4	9.5	-	-	-	3.8	10.0	7.1	35.7	0.0	-	12.0	22.2	9.7	25.0	0.0	-	11.4	71.0	4.7	17.5	7.4	-	-	13.2	8.8		
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-			
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-			
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			



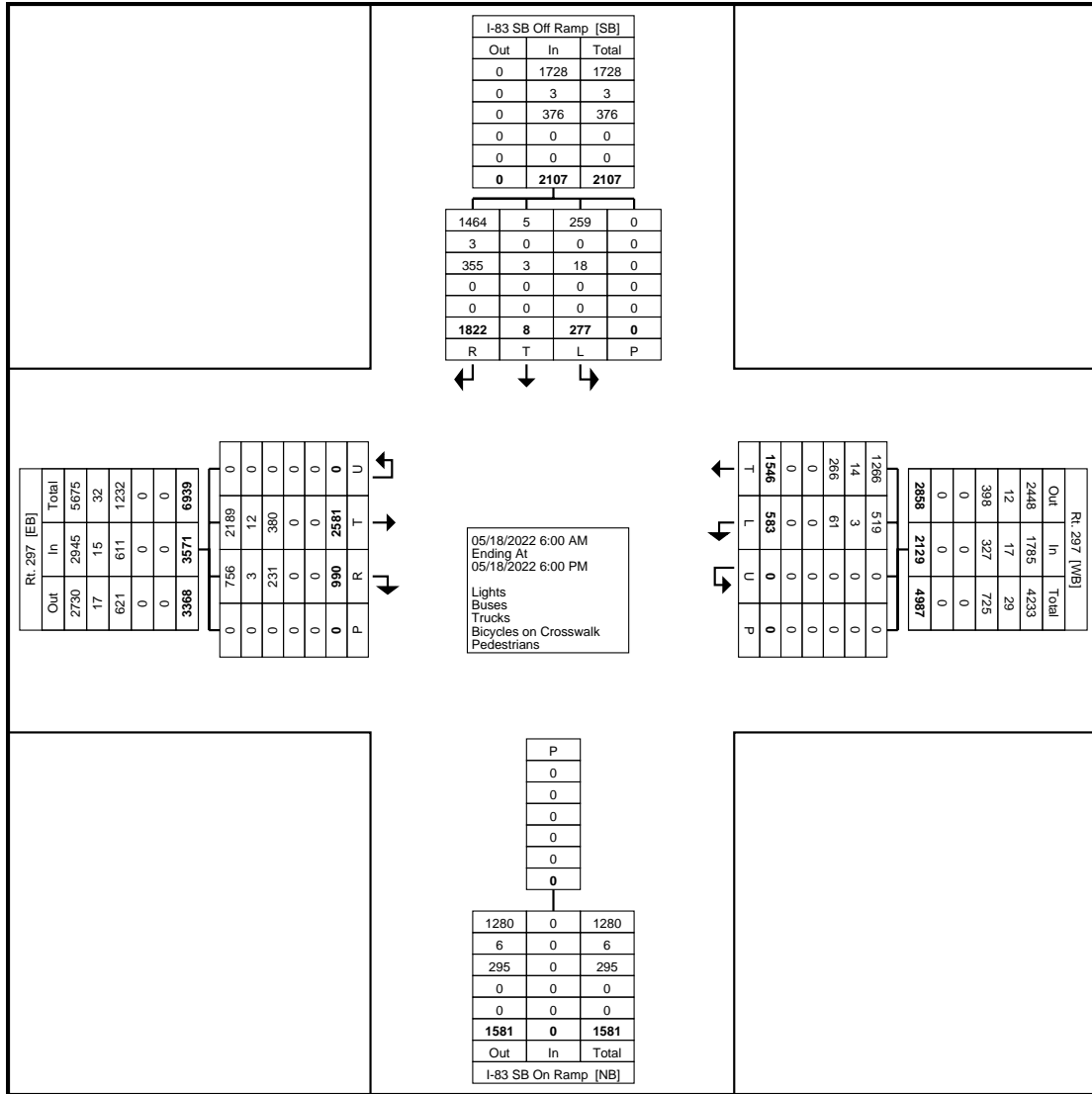
Turning Movement Peak Hour Data Plot (7:00 AM)





Turning Movement Peak Hour Data Plot (4:15 PM)

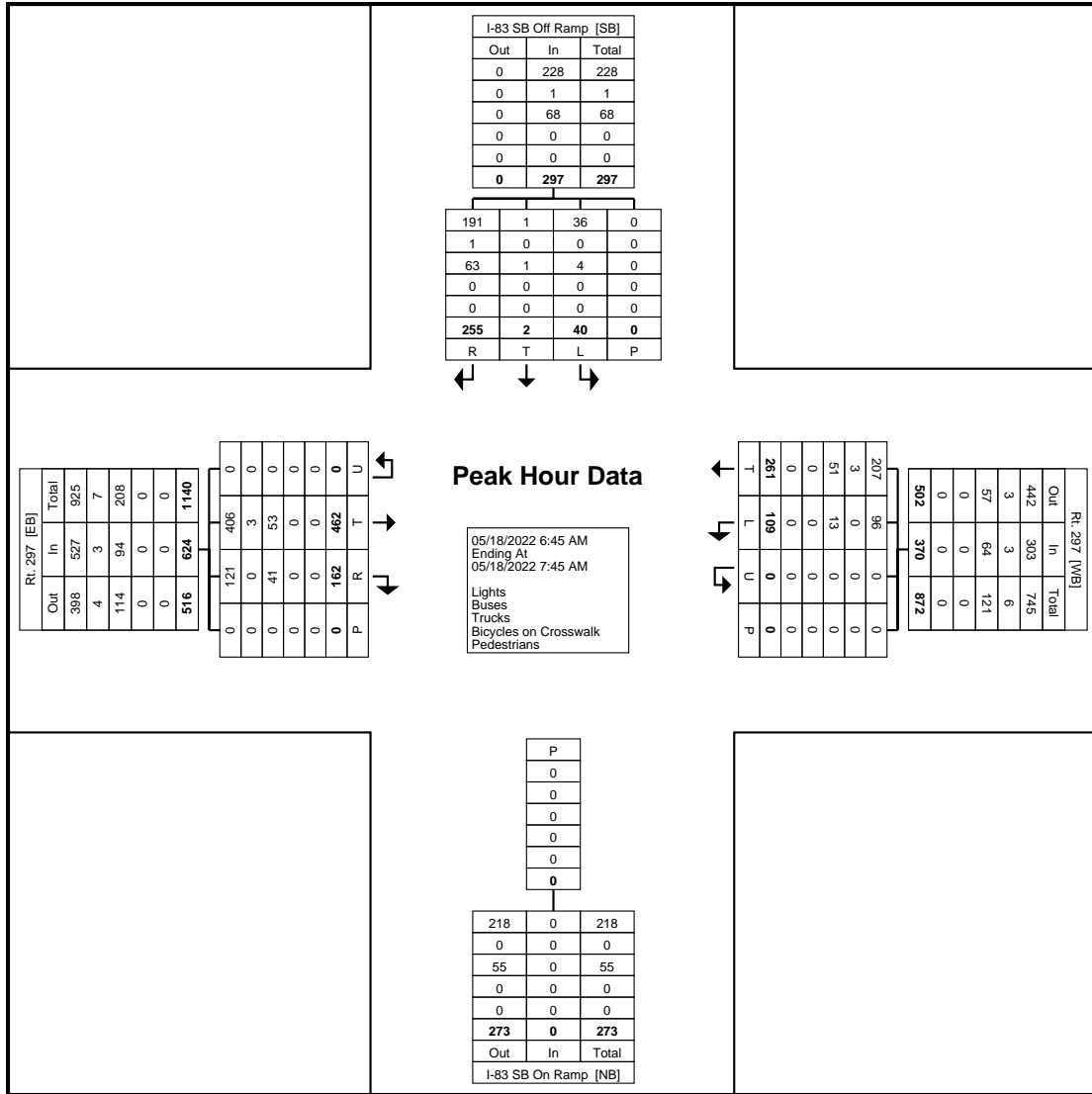




Turning Movement Data Plot

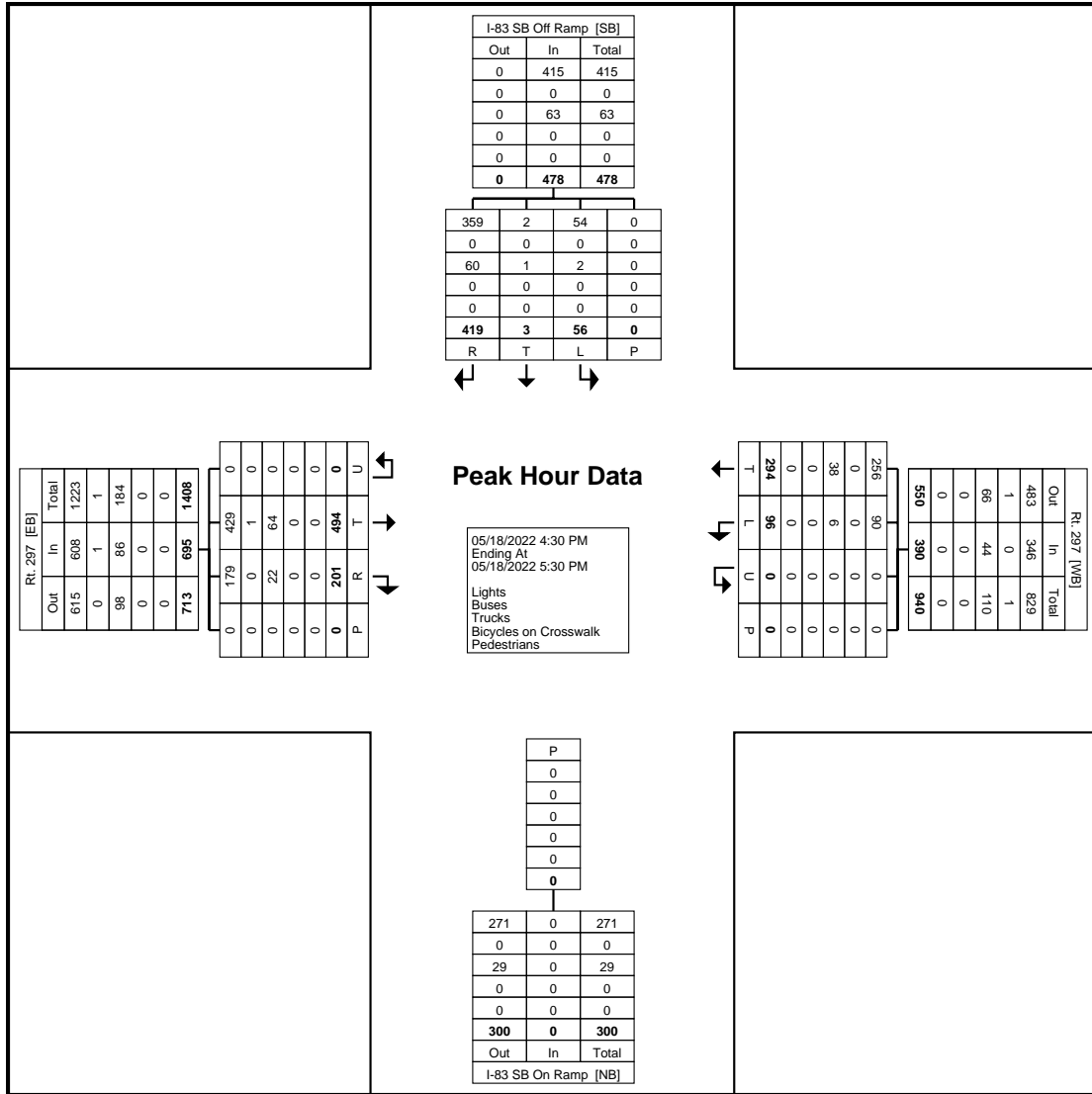






Turning Movement Peak Hour Data Plot (6:45 AM)





Turning Movement Peak Hour Data Plot (4:30 PM)



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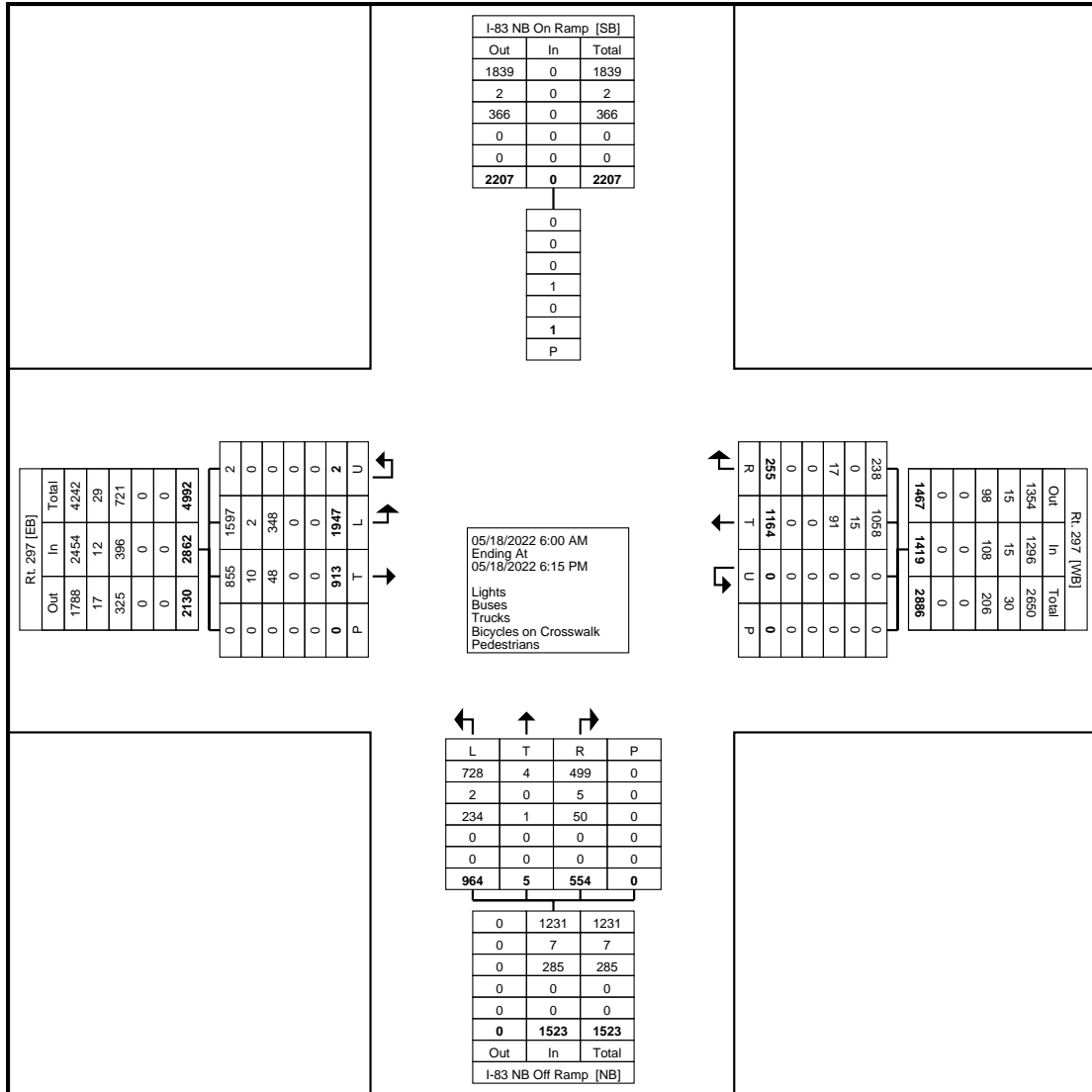
York County, PA  
Route 297 & I83 NB Ramps  
Wednesday, May 18, 2022  
Location: 40.082722, -  
76.764771

Coatesville, Pennsylvania, United States 19320  
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Count Name: Rt. 297 & I-83 NB  
Ramps  
Site Code:  
Start Date: 05/18/2022  
Page No: 1

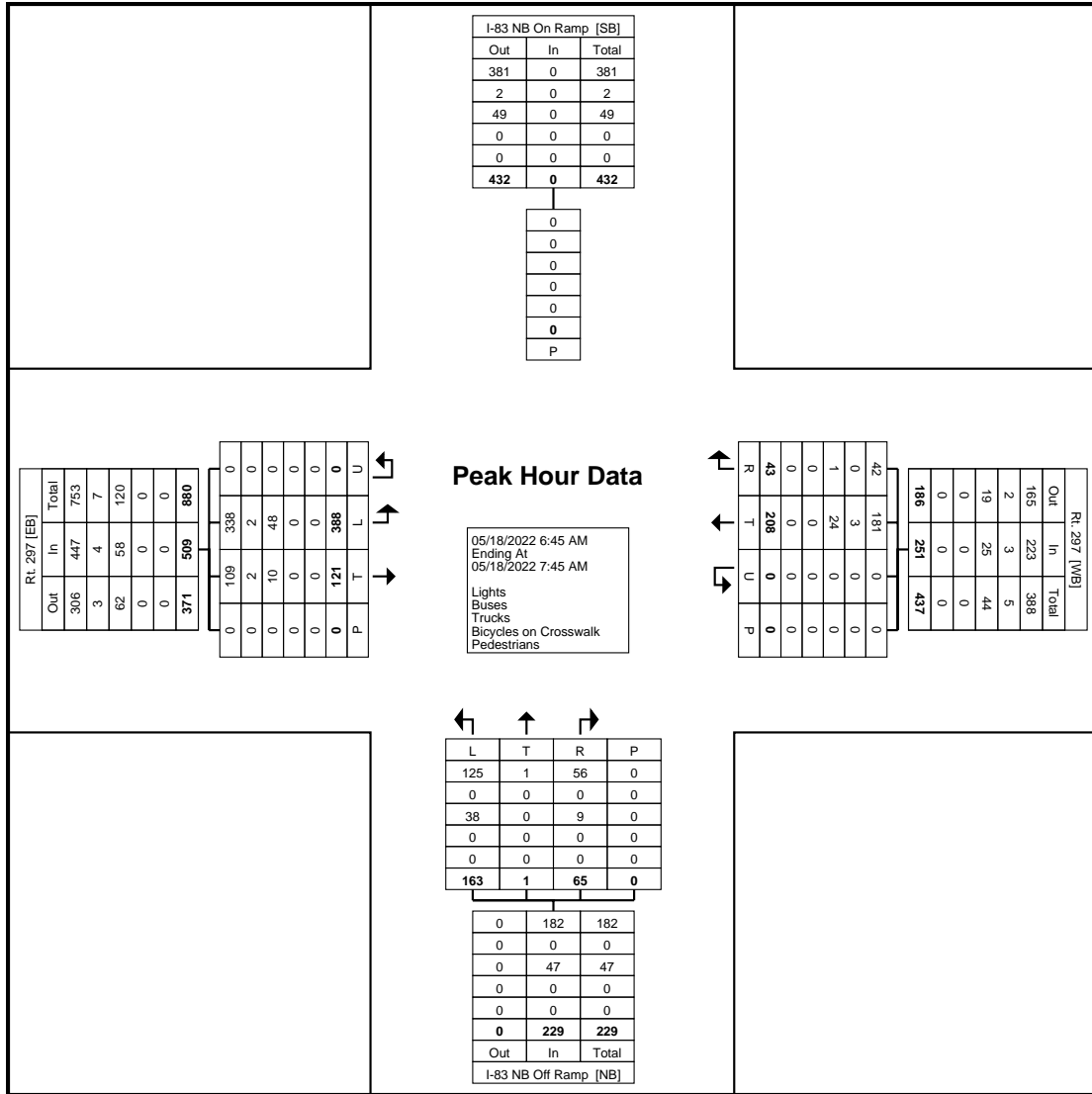
### Turning Movement Data

Start Time	Rt. 297 Eastbound					Rt. 297 Westbound					I-83 NB Off Ramp Northbound					I-83 NB On Ramp Southbound		Int. Total		
	Left	Thru	U-Turn	Peds	App. Total	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	Peds	App. Total		Peds	App. Total
	6:00 AM	76	20	0	0	96	38	7	4	0	0	49	25	0	4	2	0		31	0
6:15 AM	86	23	0	0	109	50	12	5	0	0	67	32	0	11	3	0	46	0	0	222
6:30 AM	77	34	1	0	112	54	10	7	0	0	71	33	0	6	7	0	46	0	0	229
6:45 AM	108	38	0	0	146	44	4	6	0	0	54	61	0	13	8	0	82	0	0	282
Hourly Total	347	115	1	0	463	186	33	22	0	0	241	151	0	34	20	0	205	0	0	909
7:00 AM	98	28	0	0	126	46	3	8	0	0	57	36	1	13	6	0	56	0	0	239
7:15 AM	93	25	0	0	118	52	4	5	0	0	61	30	0	8	8	0	46	0	0	225
7:30 AM	89	30	0	0	119	66	8	5	0	0	79	36	0	8	1	0	45	0	0	243
7:45 AM	80	36	0	0	116	49	3	3	0	0	55	53	0	11	3	0	67	0	0	238
Hourly Total	360	119	0	0	479	213	18	21	0	0	252	155	1	40	18	0	214	0	0	945
8:00 AM	72	35	0	0	107	34	7	0	0	0	41	35	0	15	7	0	57	1	0	205
8:15 AM	72	37	0	0	109	31	4	5	0	0	40	36	0	18	4	0	58	0	0	207
8:30 AM	87	34	0	0	121	56	6	5	0	0	67	24	0	12	8	0	44	0	0	232
8:45 AM	47	21	0	0	68	30	5	0	0	0	35	53	0	16	3	0	72	0	0	175
Hourly Total	278	127	0	0	405	151	22	10	0	0	183	148	0	61	22	0	231	1	0	819
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	62	37	1	0	100	40	11	0	0	0	51	41	0	12	4	0	57	0	0	208
3:15 PM	74	48	0	0	122	47	15	0	0	0	62	37	1	21	11	0	70	0	0	254
3:30 PM	70	43	0	0	113	66	10	0	0	0	76	37	0	18	16	0	71	0	0	260
3:45 PM	78	59	0	0	137	49	12	0	0	0	61	43	1	28	11	0	83	0	0	281
Hourly Total	284	187	1	0	472	202	48	0	0	0	250	158	2	79	42	0	281	0	0	1003
4:00 PM	70	44	0	0	114	72	15	0	0	0	87	42	0	9	18	0	69	0	0	270
4:15 PM	86	35	0	0	121	40	9	0	0	0	49	50	1	19	21	0	91	0	0	261
4:30 PM	92	41	0	0	133	61	10	1	0	0	72	43	0	19	5	0	67	0	0	272
4:45 PM	89	52	0	0	141	45	6	0	0	0	51	55	1	28	16	0	100	0	0	292
Hourly Total	337	172	0	0	509	218	40	1	0	0	259	190	2	75	60	0	327	0	0	1095
5:00 PM	79	42	0	0	121	52	18	1	0	0	71	34	0	11	16	0	61	0	0	253
5:15 PM	104	52	0	0	156	52	9	4	0	0	65	45	0	21	6	0	72	0	0	293
5:30 PM	80	44	0	0	124	60	2	1	0	0	63	47	0	21	7	0	75	0	0	262
5:45 PM	78	55	0	0	133	30	4	1	0	0	35	36	0	12	9	0	57	0	0	225
Hourly Total	341	193	0	0	534	194	33	7	0	0	234	162	0	65	38	0	265	0	0	1033
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	1947	913	2	0	2862	1164	194	61	0	0	1419	964	5	354	200	0	1523	1	0	5804
Approach %	68.0	31.9	0.1	-	-	82.0	13.7	4.3	0.0	-	-	63.3	0.3	23.2	13.1	-	-	-	-	-
Total %	33.5	15.7	0.0	-	49.3	20.1	3.3	1.1	0.0	-	24.4	16.6	0.1	6.1	3.4	-	26.2	-	0.0	-
Lights	1597	855	2	-	2454	1058	182	56	0	-	1296	728	4	310	189	-	1231	-	0	4981
% Lights	82.0	93.6	100.0	-	85.7	90.9	93.8	91.8	-	-	91.3	75.5	80.0	87.6	94.5	-	80.8	-	-	85.8
Buses	2	10	0	-	12	15	0	0	0	-	15	2	0	5	0	-	7	-	0	34
% Buses	0.1	1.1	0.0	-	0.4	1.3	0.0	0.0	-	-	1.1	0.2	0.0	1.4	0.0	-	0.5	-	-	0.6
Trucks	348	48	0	-	396	91	12	5	0	-	108	234	1	39	11	-	285	-	0	789
% Trucks	17.9	5.3	0.0	-	13.8	7.8	6.2	8.2	-	-	7.6	24.3	20.0	11.0	5.5	-	18.7	-	-	13.6
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	-	-	0	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-



Turning Movement Data Plot

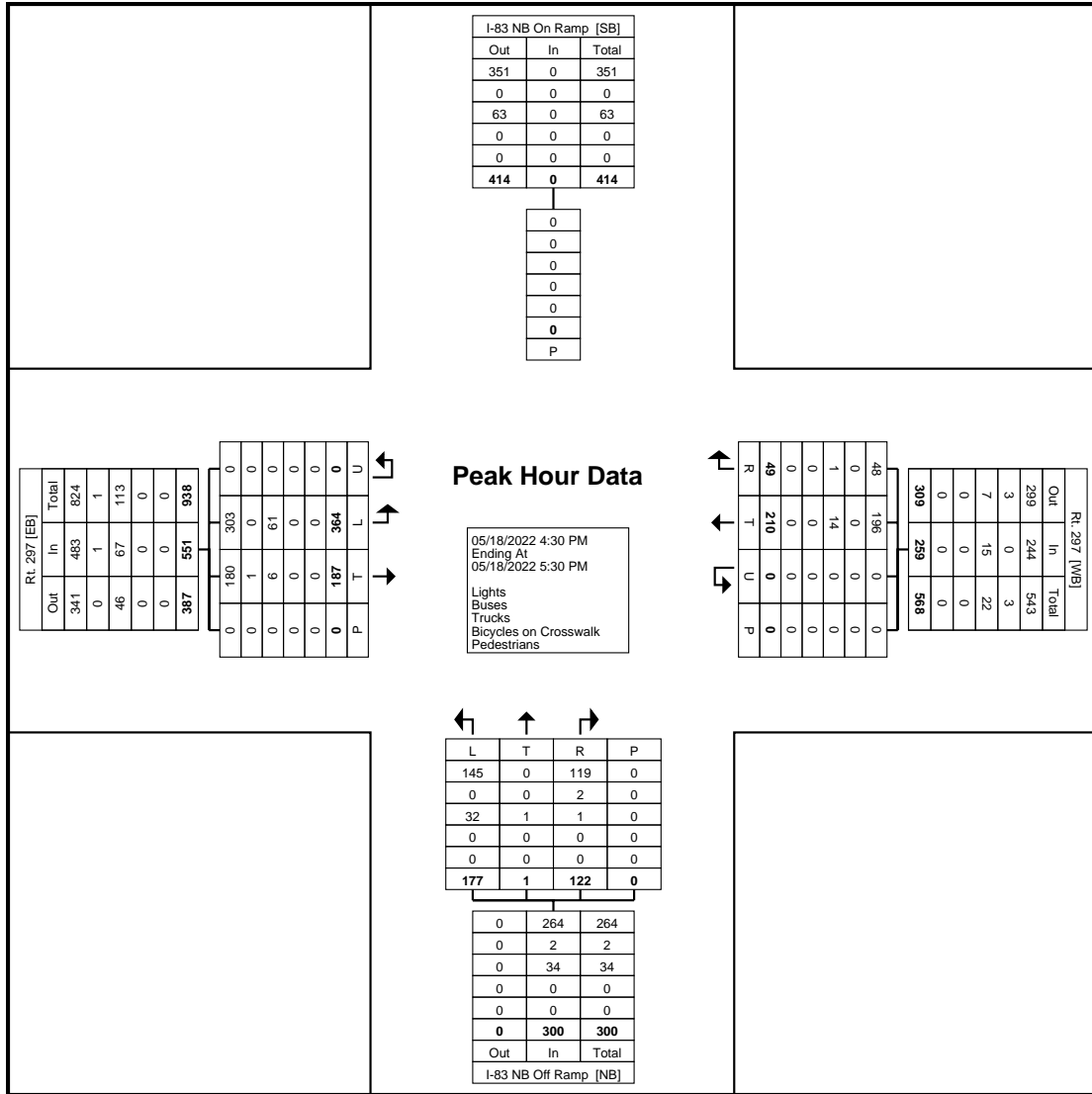




Turning Movement Peak Hour Data Plot (6:45 AM)

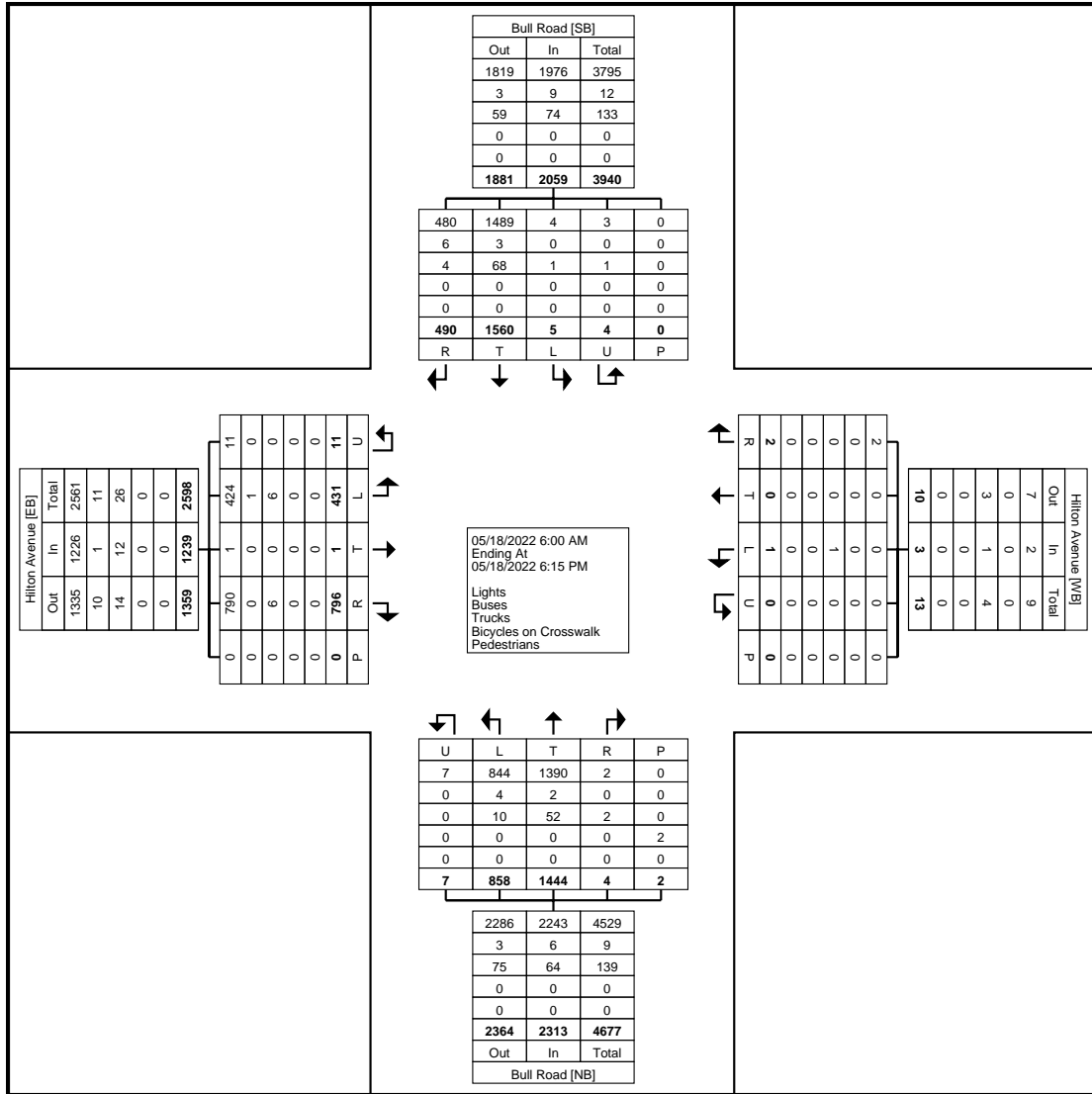






Turning Movement Peak Hour Data Plot (4:30 PM)





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York County, PA  
Bull Rd & Hilton Ave  
Wednesday, May 18, 2022  
Location: 40.005005, -  
76.803039

Count Name: Bull Rd & Hilton Ave  
Site Code:  
Start Date: 05/18/2022  
Page No: 3

### Turning Movement Peak Hour Data (7:00 AM)

Start Time	Hilton Avenue Eastbound						Hilton Avenue Westbound						Bull Road Northbound						Bull Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	28	0	40	0	0	68	0	0	0	0	0	0	11	41	0	0	0	52	0	63	6	0	0	69	189
7:15 AM	21	0	39	0	0	60	0	0	0	0	0	0	11	32	0	0	0	43	0	88	14	0	0	102	205
7:30 AM	20	0	60	0	0	80	0	0	0	0	0	0	8	44	0	1	0	53	0	99	17	0	0	116	249
7:45 AM	24	0	61	1	0	86	0	0	0	0	0	0	10	35	0	0	0	45	0	93	17	0	0	110	241
Total	93	0	200	1	0	294	0	0	0	0	0	0	40	152	0	1	0	193	0	343	54	0	0	397	884
Approach %	31.6	0.0	68.0	0.3	-	-	0.0	0.0	0.0	0.0	-	-	20.7	78.8	0.0	0.5	-	-	0.0	86.4	13.6	0.0	-	-	-
Total %	10.5	0.0	22.6	0.1	-	33.3	0.0	0.0	0.0	0.0	-	0.0	4.5	17.2	0.0	0.1	-	21.8	0.0	38.8	6.1	0.0	-	44.9	-
PHF	0.830	0.000	0.820	0.250	-	0.855	0.000	0.000	0.000	0.000	-	0.000	0.909	0.864	0.000	0.250	-	0.910	0.000	0.866	0.794	0.000	-	0.856	0.888
Lights	92	0	200	1	-	293	0	0	0	0	-	0	40	141	0	1	-	182	0	320	52	0	-	372	847
% Lights	98.9	-	100.0	100.0	-	99.7	-	-	-	-	-	-	100.0	92.8	-	100.0	-	94.3	-	93.3	96.3	-	-	93.7	95.8
Buses	1	0	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	0	1	1	0	-	2	3
% Buses	1.1	-	0.0	0.0	-	0.3	-	-	-	-	-	-	0.0	0.0	-	0.0	-	0.0	-	0.3	1.9	-	-	0.5	0.3
Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	11	0	0	-	11	0	22	1	0	-	23	34
% Trucks	0.0	-	0.0	0.0	-	0.0	-	-	-	-	-	-	0.0	7.2	-	0.0	-	5.7	-	6.4	1.9	-	-	5.8	3.8
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-





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184 Baker Rd

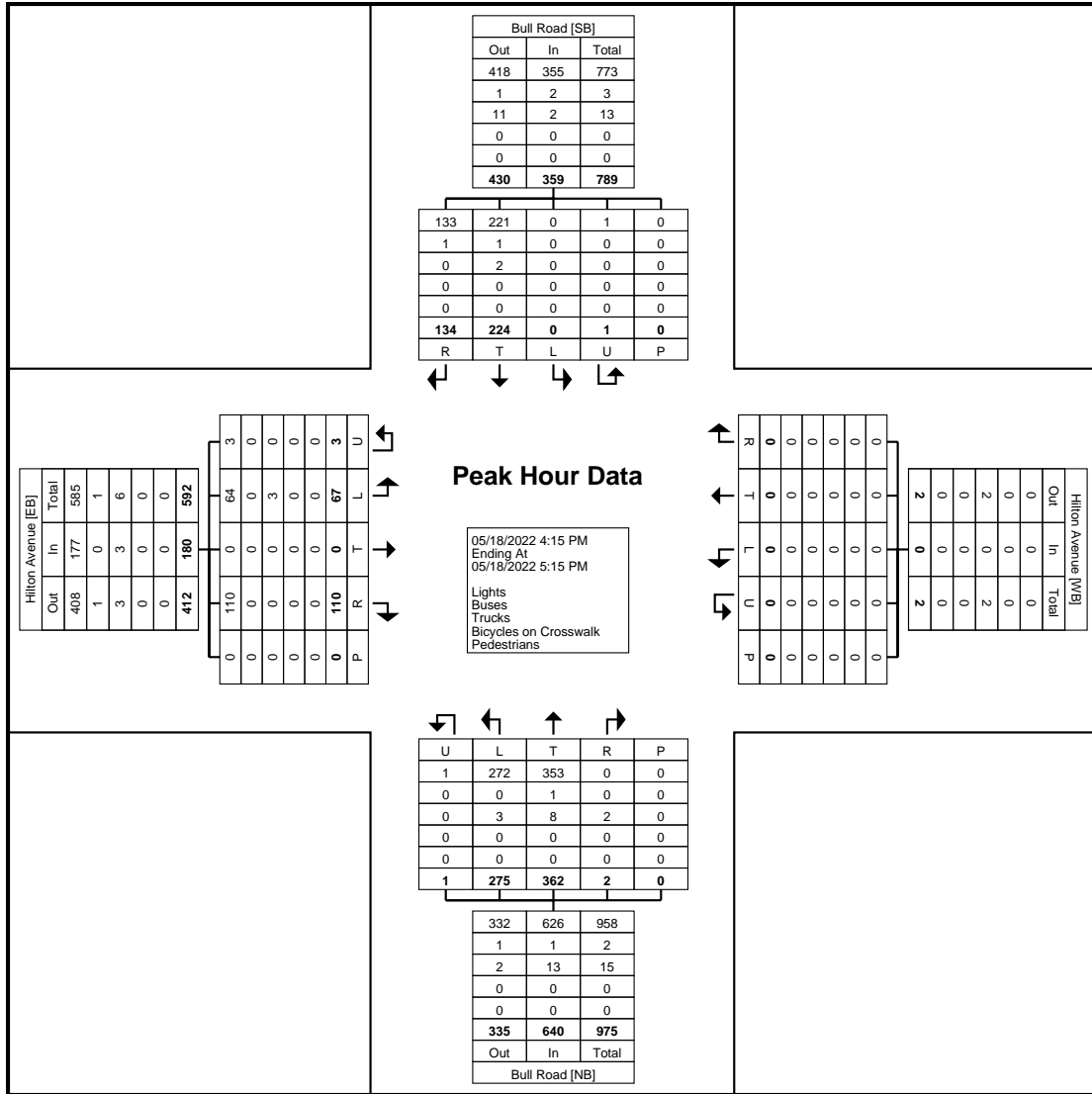
Coatesville, Pennsylvania, United States 19320  
610-466-1469  
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York County, PA  
Bull Rd & Hilton Ave  
Wednesday, May 18, 2022  
Location: 40.005005, -  
76.803039

Count Name: Bull Rd & Hilton Ave  
Site Code:  
Start Date: 05/18/2022  
Page No: 5

### Turning Movement Peak Hour Data (4:15 PM)

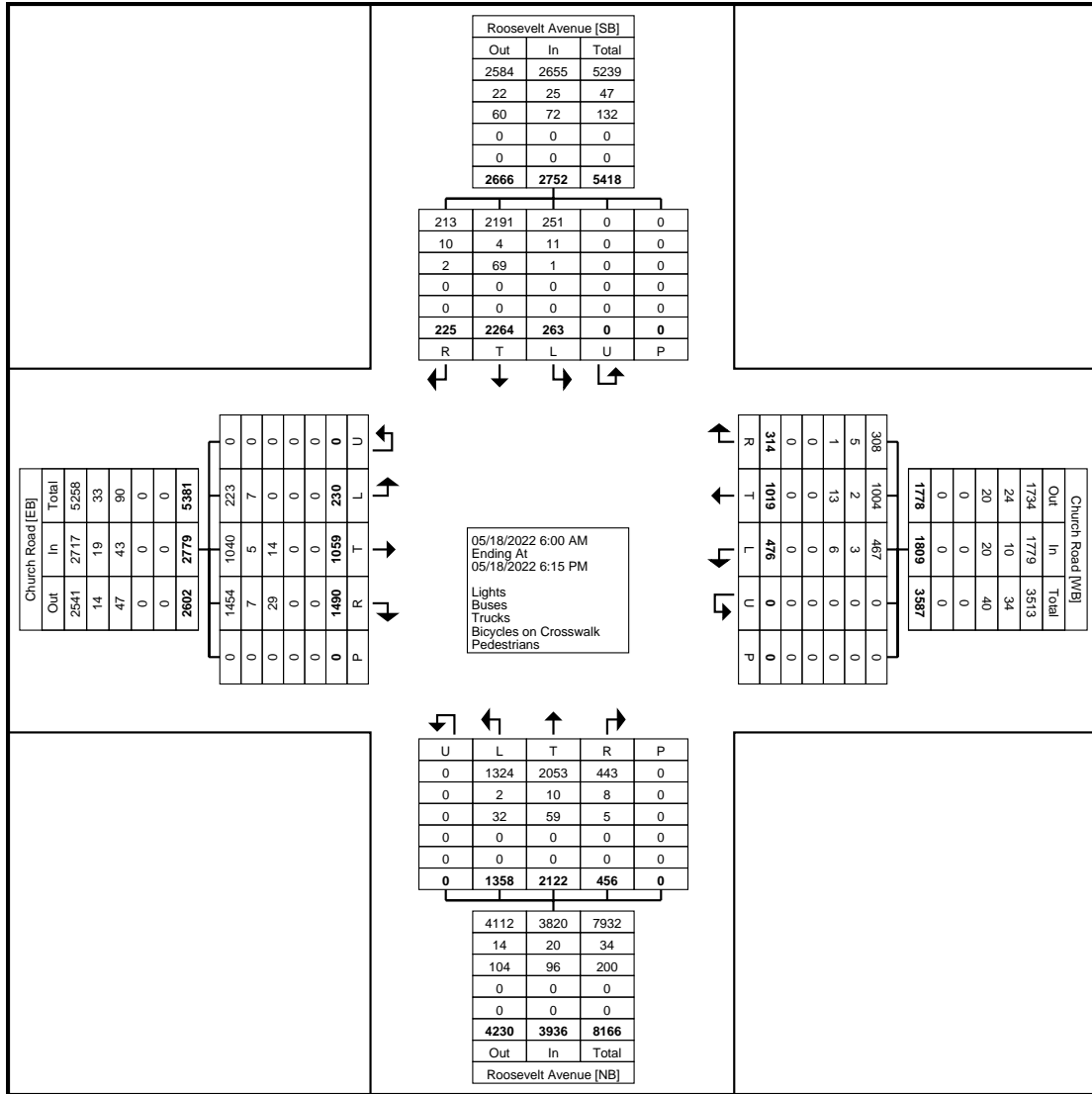
Start Time	Hilton Avenue Eastbound						Hilton Avenue Westbound						Bull Road Northbound						Bull Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:15 PM	12	0	32	1	0	45	0	0	0	0	0	0	63	106	0	0	0	169	0	57	33	0	0	90	304
4:30 PM	19	0	23	0	0	42	0	0	0	0	0	0	76	91	0	1	0	168	0	55	28	1	0	84	294
4:45 PM	17	0	32	1	0	50	0	0	0	0	0	0	73	73	2	0	0	148	0	53	33	0	0	86	284
5:00 PM	19	0	23	1	0	43	0	0	0	0	0	0	63	92	0	0	0	155	0	59	40	0	0	99	297
Total	67	0	110	3	0	180	0	0	0	0	0	0	275	362	2	1	0	640	0	224	134	1	0	359	1179
Approach %	37.2	0.0	61.1	1.7	-	-	0.0	0.0	0.0	0.0	-	-	43.0	56.6	0.3	0.2	-	-	0.0	62.4	37.3	0.3	-	-	-
Total %	5.7	0.0	9.3	0.3	-	15.3	0.0	0.0	0.0	0.0	-	0.0	23.3	30.7	0.2	0.1	-	54.3	0.0	19.0	11.4	0.1	-	30.4	-
PHF	0.882	0.000	0.859	0.750	-	0.900	0.000	0.000	0.000	0.000	-	0.000	0.905	0.854	0.250	0.250	-	0.947	0.000	0.949	0.838	0.250	-	0.907	0.970
Lights	64	0	110	3	-	177	0	0	0	0	-	0	272	353	0	1	-	626	0	221	133	1	-	355	1158
% Lights	95.5	-	100.0	100.0	-	98.3	-	-	-	-	-	-	98.9	97.5	0.0	100.0	-	97.8	-	98.7	99.3	100.0	-	98.9	98.2
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	0	1	1	0	-	2	3
% Buses	0.0	-	0.0	0.0	-	0.0	-	-	-	-	-	-	0.0	0.3	0.0	0.0	-	0.2	-	0.4	0.7	0.0	-	0.6	0.3
Trucks	3	0	0	0	-	3	0	0	0	0	-	0	3	8	2	0	-	13	0	2	0	0	-	2	18
% Trucks	4.5	-	0.0	0.0	-	1.7	-	-	-	-	-	-	1.1	2.2	100.0	0.0	-	2.0	-	0.9	0.0	0.0	-	0.6	1.5
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (4:15 PM)

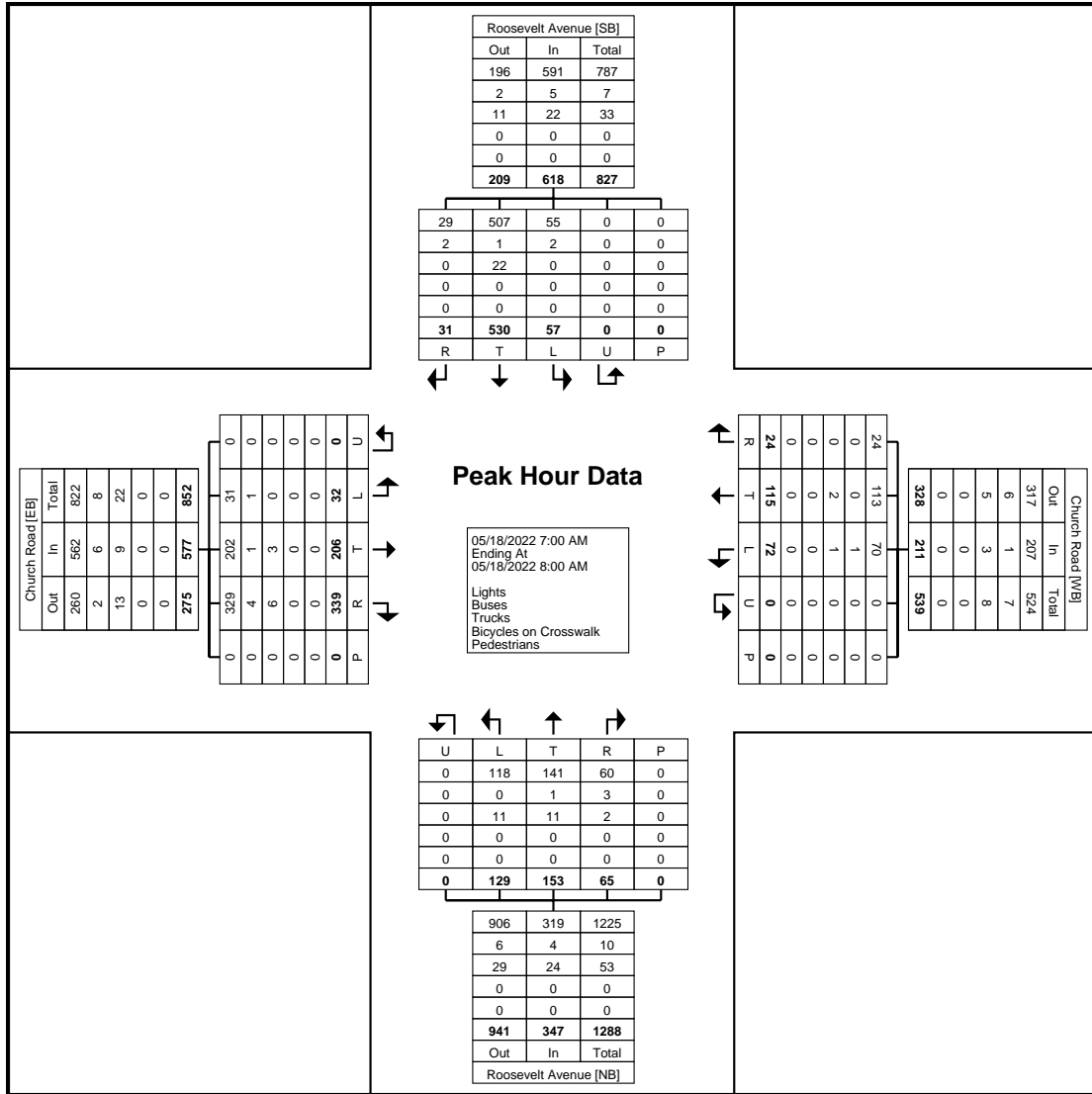






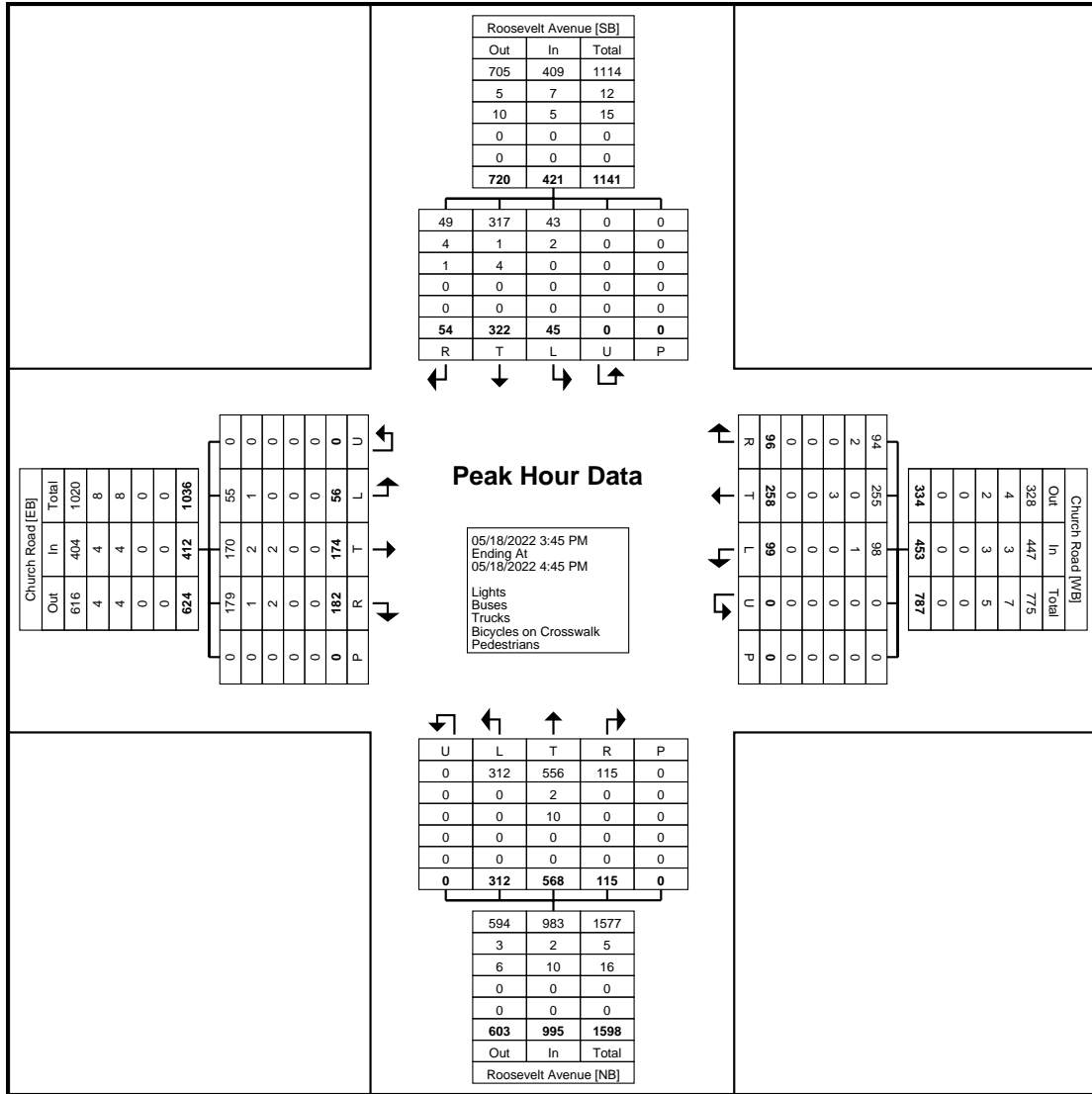
Turning Movement Data Plot





Turning Movement Peak Hour Data Plot (7:00 AM)





Turning Movement Peak Hour Data Plot (3:45 PM)



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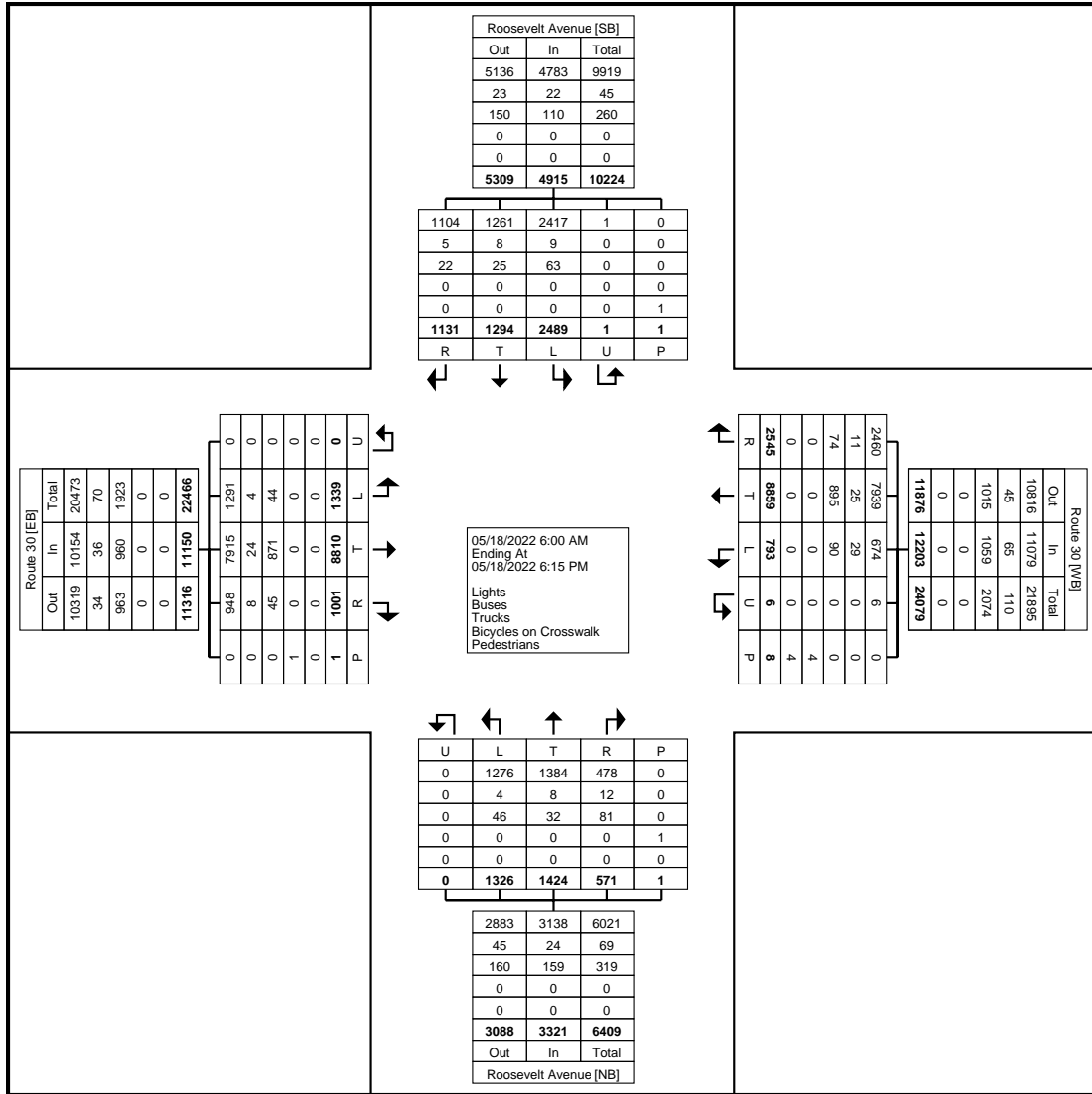
York County, PA  
Roosevelt Ave & Route 30  
Wednesday, May 18, 2022  
Location: 39.978602, -76.75799

Coatesville, Pennsylvania, United States 19320  
610-466-1469  
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Count Name: Roosevelt Ave &  
Rt 30  
Site Code:  
Start Date: 05/18/2022  
Page No: 1

### Turning Movement Data

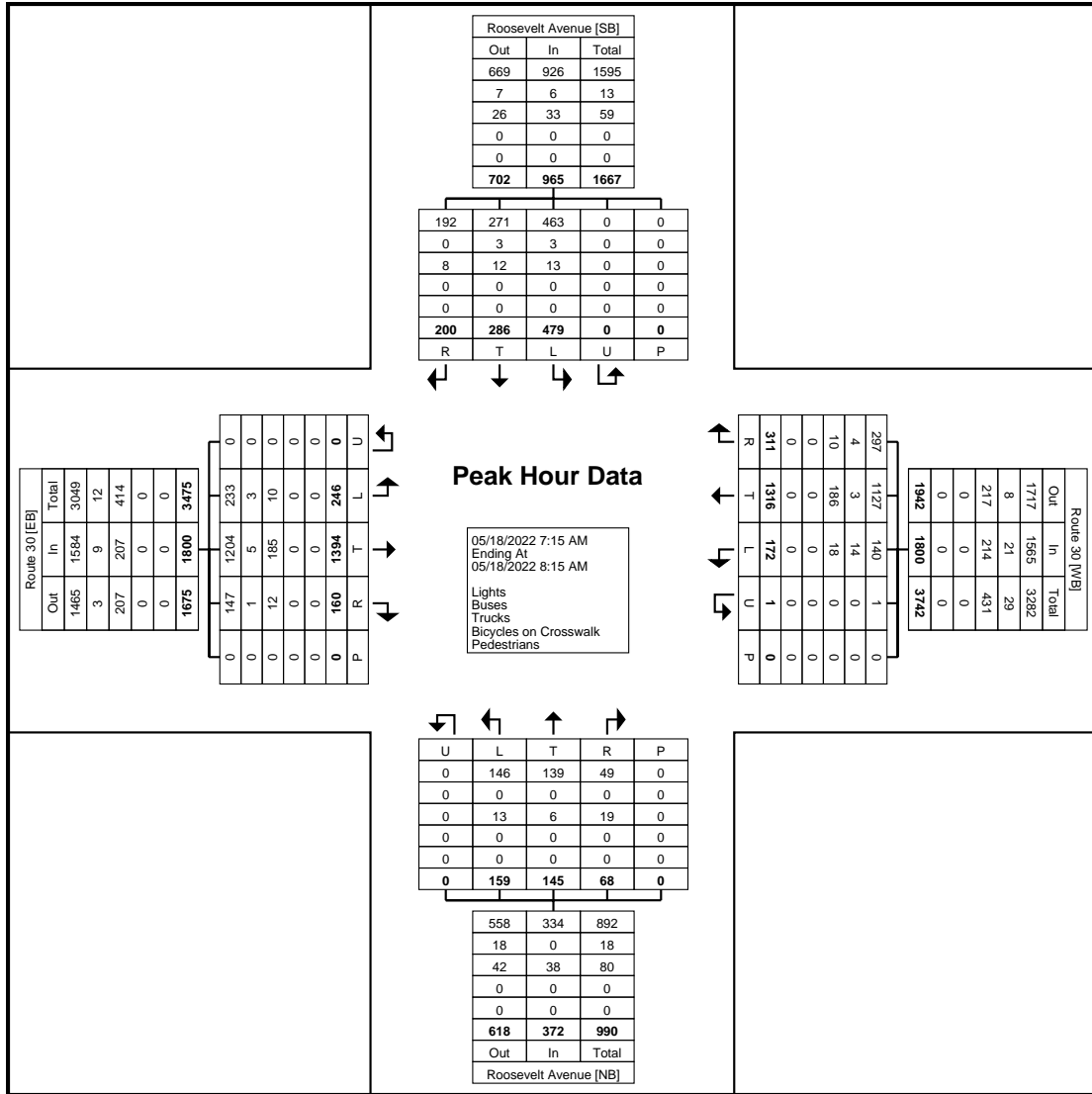
Start Time	Route 30 Eastbound							Route 30 Westbound							Roosevelt Avenue Northbound							Roosevelt Avenue Southbound							Int. Total	
	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total	Left	Thru	Right	Right on Red	U-Turn	Peds	App. Total		
6:00 AM	36	357	9	1	0	0	403	21	208	38	5	0	0	272	20	17	7	12	0	0	56	90	31	1	17	0	0	139	870	
6:15 AM	45	350	17	5	0	0	417	11	254	47	13	0	0	325	21	34	13	12	0	0	80	100	37	5	27	0	0	169	991	
6:30 AM	56	401	20	4	0	0	481	32	358	85	11	0	0	486	28	18	9	4	0	0	59	111	37	11	35	0	0	194	1220	
6:45 AM	62	312	30	9	0	0	413	32	296	73	16	0	0	417	42	43	7	11	0	0	103	106	58	13	21	0	0	198	1131	
Hourly Total	199	1420	76	19	0	0	1714	96	1116	243	45	0	0	1500	111	112	36	39	0	0	298	407	163	30	100	0	0	700	4212	
7:00 AM	33	312	23	20	0	0	388	41	360	78	7	0	1	486	31	25	9	12	0	0	77	104	56	6	24	0	0	190	1141	
7:15 AM	63	299	29	12	0	0	403	31	291	54	9	1	0	386	38	37	13	13	0	0	101	148	79	15	34	0	0	276	1166	
7:30 AM	57	394	32	9	0	0	492	49	363	79	4	0	0	495	43	35	6	2	0	0	86	115	59	10	46	0	0	230	1303	
7:45 AM	71	371	40	13	0	0	495	38	303	81	10	0	0	432	44	44	8	10	0	0	106	115	86	8	51	0	0	260	1293	
Hourly Total	224	1376	124	54	0	0	1778	159	1317	292	30	1	1	1799	156	141	36	37	0	0	370	482	280	39	155	0	0	956	4903	
8:00 AM	55	330	19	6	0	0	410	54	359	62	12	0	0	487	34	29	5	11	0	0	79	101	62	13	23	0	0	199	1175	
8:15 AM	47	330	33	4	0	0	414	35	305	64	10	0	1	414	32	36	10	11	0	0	89	125	58	16	26	0	0	225	1142	
8:30 AM	34	290	33	6	0	0	363	30	339	71	12	0	1	452	59	40	9	16	0	0	124	88	46	9	21	0	0	164	1103	
8:45 AM	57	319	24	1	0	0	401	36	332	65	13	1	0	447	48	34	9	18	0	0	109	113	67	14	30	0	0	224	1181	
Hourly Total	193	1269	109	17	0	0	1588	155	1335	262	47	1	2	1800	173	139	33	56	0	0	401	427	233	52	100	0	0	812	4601	
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3:00 PM	65	351	27	13	0	0	456	36	367	77	45	2	0	527	59	72	19	20	0	0	170	98	41	20	34	0	1	193	1346	
3:15 PM	50	368	33	13	0	0	464	36	430	106	31	0	0	603	56	71	7	21	0	0	155	101	48	19	33	1	0	202	1424	
3:30 PM	66	352	26	26	0	0	470	41	394	76	30	1	1	542	89	101	11	18	0	0	219	97	64	12	43	0	0	216	1447	
3:45 PM	64	385	39	16	0	0	504	34	476	109	41	0	0	660	86	82	3	16	0	0	187	82	48	20	31	0	0	181	1532	
Hourly Total	245	1456	125	68	0	0	1894	147	1667	368	147	3	1	2332	290	326	40	75	0	0	731	378	201	71	141	1	1	792	5749	
4:00 PM	56	364	26	12	0	0	458	26	403	54	65	0	1	548	79	106	15	11	0	0	211	129	54	18	50	0	0	251	1468	
4:15 PM	62	397	43	10	0	1	512	42	493	80	46	0	1	661	87	85	11	16	0	0	199	94	48	13	40	0	0	195	1567	
4:30 PM	62	395	49	6	0	0	512	19	417	57	44	0	0	537	75	100	18	15	0	0	208	109	65	14	39	0	0	227	1484	
4:45 PM	54	431	54	10	0	0	549	33	513	94	58	0	1	698	91	81	15	14	0	0	201	86	45	10	38	0	0	179	1627	
Hourly Total	234	1587	172	38	0	1	2031	120	1826	285	213	0	3	2444	332	372	59	56	0	0	819	418	212	55	167	0	0	852	6146	
5:00 PM	60	405	37	16	0	0	518	29	418	115	51	0	0	613	65	100	32	10	0	1	207	100	66	20	46	0	0	232	1570	
5:15 PM	47	479	39	25	0	0	590	34	470	122	32	0	0	658	72	87	6	11	0	0	176	80	34	16	43	0	0	173	1597	
5:30 PM	73	391	35	6	0	0	505	27	314	110	31	0	1	482	68	88	14	8	0	0	178	100	55	15	35	0	0	205	1370	
5:45 PM	64	427	31	10	0	0	532	26	395	108	44	1	0	574	59	59	17	6	0	0	141	97	50	18	28	0	0	193	1440	
Hourly Total	244	1702	142	57	0	0	2145	116	1597	455	158	1	1	2327	264	334	69	35	0	1	702	377	205	69	152	0	0	803	5977	
6:00 PM	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Grand Total	1339	8810	748	253	0	1	11150	793	8859	1905	640	6	8	12203	1326	1424	273	298	0	1	3321	2489	1294	316	815	1	1	4915	31589	
Approach %	12.0	79.0	6.7	2.3	0.0	-	-	6.5	72.6	15.6	5.2	0.0	-	-	39.9	42.9	8.2	9.0	0.0	-	-	50.6	26.3	6.4	16.6	0.0	-	-	-	-
Total %	4.2	27.9	2.4	0.8	0.0	-	35.3	2.5	28.0	6.0	2.0	0.0	-	38.6	4.2	4.5	0.9	0.9	0.0	-	10.5	7.9	4.1	1.0	2.6	0.0	-	15.6	-	
Lights	1291	7915	707	241	0	-	10154	674	7939	1832	628	6	-	11079	1276	1384	223	255	0	-	3138	2417	1261	310	794	1	-	4783	29154	
% Lights	96.4	89.8	94.5	95.3	-	-	91.1	85.0	89.6	96.2	98.1	100.0	-	90.8	96.2	97.2	81.7	85.6	-	-	94.5	97.1	97.4	98.1	97.4	100.0	-	97.3	92.3	
Buses	4	24	8	0	0	-	36	29	25	8	3	0	-	65	4	8	7	5	0	-	24	9	8	0	5	0	-	22	147	
% Buses	0.3	0.3	1.1	0.0	-	-	0.3	3.7	0.3	0.4	0.5	0.0	-	0.5	0.3	0.6	2.6	1.7	-	-	0.7	0.4	0.6	0.0	0.6	0.0	-	0.4	0.5	
Trucks	44	871	33	12	0	-	960	90	895	65	9	0	-	1059	46	32	43	38	0	-	159	63	25	6	16	0	-	110	2288	
% Trucks	3.3	9.9	4.4	4.7	-	-	8.6	11.3	10.1	3.4	1.4	0.0	-	8.7	3.5	2.2	15.8	12.8	-	-	4.8	2.5	1.9	1.9	2.0	0.0	-	2.2	7.2	
Bicycles on Crosswalk	-	-	-	-	-	1	-	-	-	-	-	-	4	-	-	-	-	-	-	1	-	-	-	-	-	-	0	-	-	
% Bicycles on Crosswalk	-	-	-	-	-	100.0	-	-	-	-	-	-	50.0	-	-	-	-	-	-	100.0	-	-	-	-	-	-	0.0	-	-	
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	4	-	-	-	-	-	-	0	-	-	-	-	-	-	1	-	-	
% Pedestrians	-	-	-	-	-	0.0	-	-	-	-	-	-	50.0	-	-	-	-	-	-	0.0	-	-	-	-	-	-	100.0	-	-	



Turning Movement Data Plot



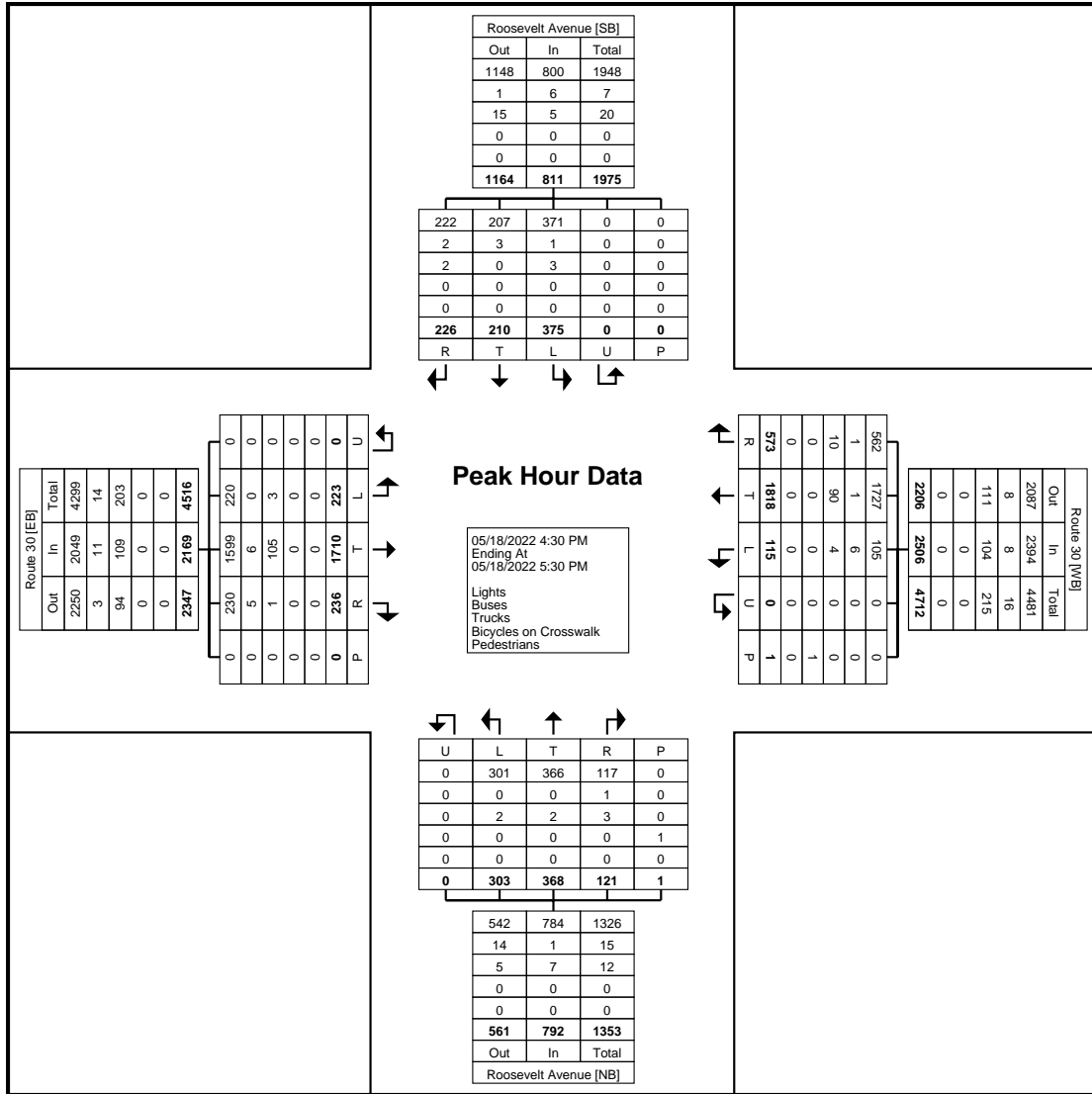




Turning Movement Peak Hour Data Plot (7:15 AM)



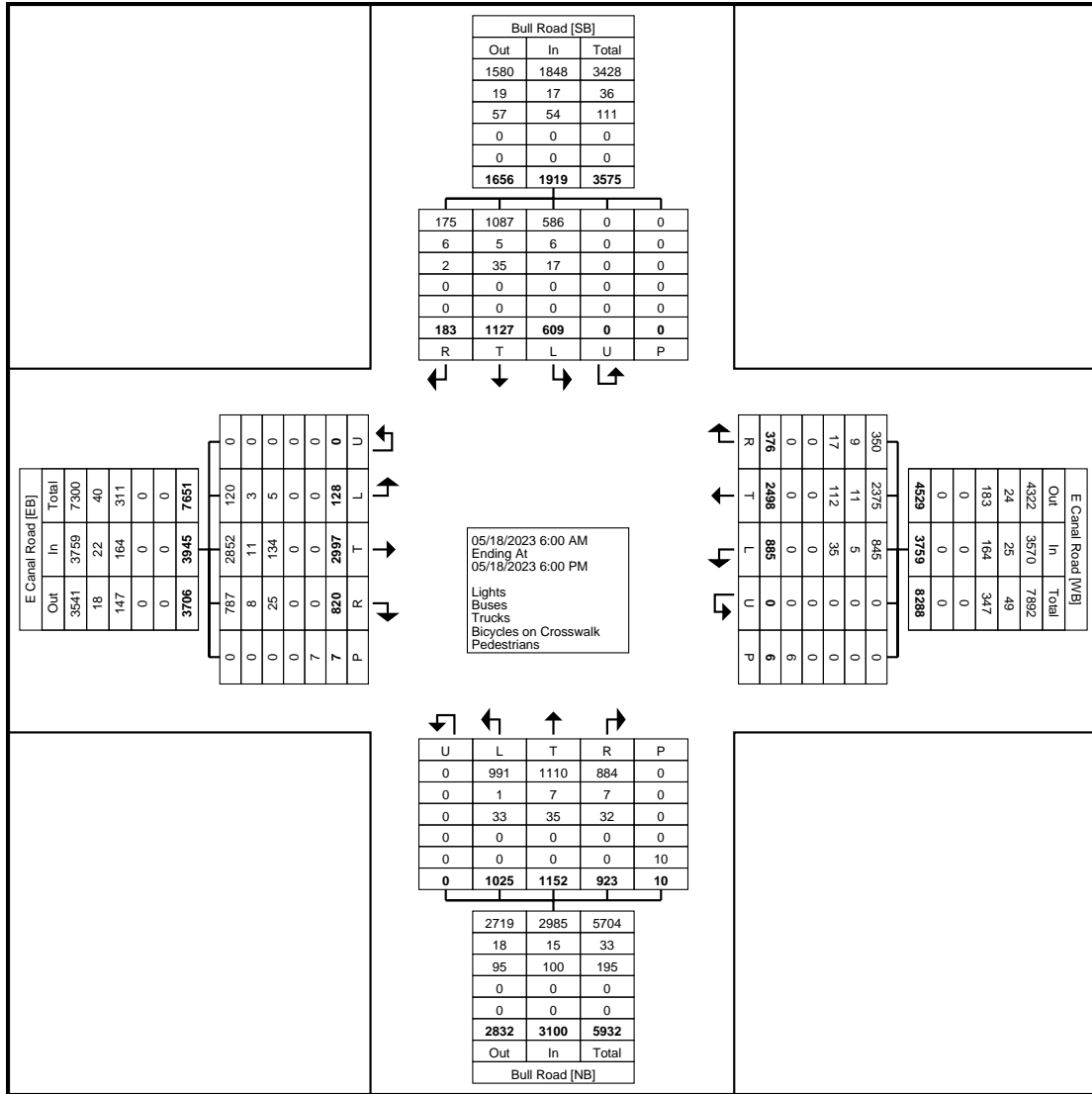
York County, PA  
Roosevelt Ave & Route 30  
Wednesday, May 18, 2022  
Location: 39.978602, -76.75799



Turning Movement Peak Hour Data Plot (4:30 PM)



Hourly Total	24	263	68	0	0	355	95	275	29	0	0	399	150	145	81	0	0	376	63	100	18	0	0	181	1311
Grand Total	128	2997	820	0	7	3945	885	2498	376	0	6	3759	1025	1152	923	0	10	3100	609	1127	183	0	0	1919	12723
Approach %	3.2	76.0	20.8	0.0	-	-	23.5	66.5	10.0	0.0	-	-	33.1	37.2	29.8	0.0	-	-	31.7	58.7	9.5	0.0	-	-	-
Total %	1.0	23.6	6.4	0.0	-	31.0	7.0	19.6	3.0	0.0	-	29.5	8.1	9.1	7.3	0.0	-	24.4	4.8	8.9	1.4	0.0	-	15.1	-
Lights	120	2852	787	0	-	3759	845	2375	350	0	-	3570	991	1110	884	0	-	2985	586	1087	175	0	-	1848	12162
% Lights	93.8	95.2	96.0	-	-	95.3	95.5	95.1	93.1	-	-	95.0	96.7	96.4	95.8	-	-	96.3	96.2	96.5	95.6	-	-	96.3	95.6
Buses	3	11	8	0	-	22	5	11	9	0	-	25	1	7	7	0	-	15	6	5	6	0	-	17	79
% Buses	2.3	0.4	1.0	-	-	0.6	0.6	0.4	2.4	-	-	0.7	0.1	0.6	0.8	-	-	0.5	1.0	0.4	3.3	-	-	0.9	0.6
Trucks	5	134	25	0	-	164	35	112	17	0	-	164	33	35	32	0	-	100	17	35	2	0	-	54	482
% Trucks	3.9	4.5	3.0	-	-	4.2	4.0	4.5	4.5	-	-	4.4	3.2	3.0	3.5	-	-	3.2	2.8	3.1	1.1	-	-	2.8	3.8
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	7	-	-	-	-	-	6	-	-	-	-	-	10	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-



Turning Movement Data Plot



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Count Name: Bull Rd & Canal Rd  
Site Code:  
Start Date: 05/18/2023  
Page No: 4

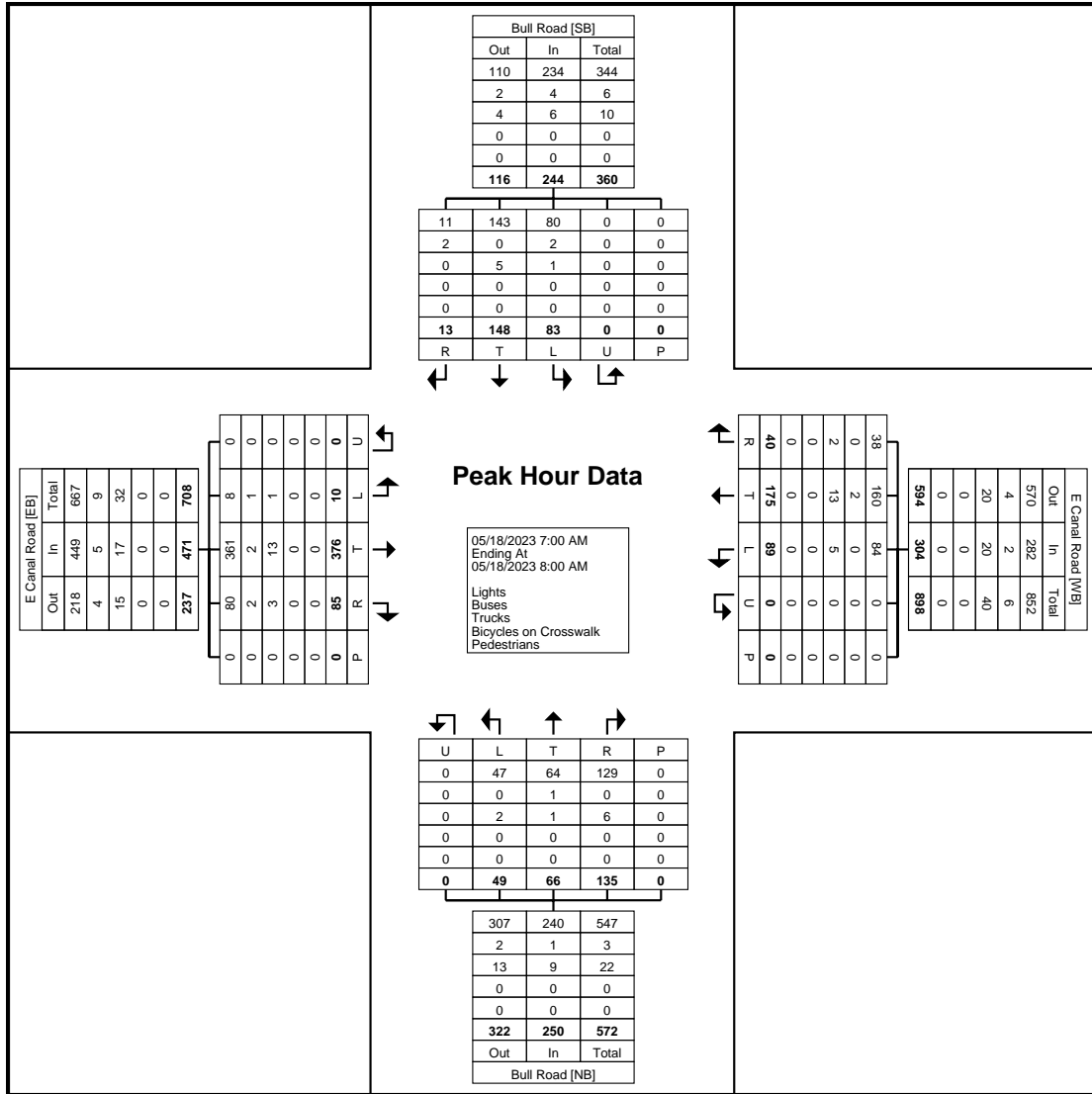
York County, PA  
Bull Rd & Canal Rd  
Thursday, May 18, 2023  
Location: 40.016808, -76.81402

### Turning Movement Peak Hour Data (7:00 AM)

Start Time	E Canal Road Eastbound						E Canal Road Westbound						Bull Road Northbound						Bull Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	0	85	27	0	0	112	20	33	11	0	0	64	15	17	34	0	0	66	14	40	5	0	0	59	301
7:15 AM	0	98	26	0	0	124	19	41	10	0	0	70	12	15	33	0	0	60	18	46	4	0	0	68	322
7:30 AM	4	103	18	0	0	125	24	47	10	0	0	81	7	18	39	0	0	64	28	31	2	0	0	61	331
7:45 AM	6	90	14	0	0	110	26	54	9	0	0	89	15	16	29	0	0	60	23	31	2	0	0	56	315
Total	10	376	85	0	0	471	89	175	40	0	0	304	49	66	135	0	0	250	83	148	13	0	0	244	1269
Approach %	2.1	79.8	18.0	0.0	-	-	29.3	57.6	13.2	0.0	-	-	19.6	26.4	54.0	0.0	-	-	34.0	60.7	5.3	0.0	-	-	-
Total %	0.8	29.6	6.7	0.0	-	37.1	7.0	13.8	3.2	0.0	-	24.0	3.9	5.2	10.6	0.0	-	19.7	6.5	11.7	1.0	0.0	-	19.2	-
PHF	0.417	0.913	0.787	0.000	-	0.942	0.856	0.810	0.909	0.000	-	0.854	0.817	0.917	0.865	0.000	-	0.947	0.741	0.804	0.650	0.000	-	0.897	0.958
Lights	8	361	80	0	-	449	84	160	38	0	-	282	47	64	129	0	-	240	80	143	11	0	-	234	1205
% Lights	80.0	96.0	94.1	-	-	95.3	94.4	91.4	95.0	-	-	92.8	95.9	97.0	95.6	-	-	96.0	96.4	96.6	84.6	-	-	95.9	95.0
Buses	1	2	2	0	-	5	0	2	0	0	-	2	0	1	0	0	-	1	2	0	2	0	-	4	12
% Buses	10.0	0.5	2.4	-	-	1.1	0.0	1.1	0.0	-	-	0.7	0.0	1.5	0.0	-	-	0.4	2.4	0.0	15.4	-	-	1.6	0.9
Trucks	1	13	3	0	-	17	5	13	2	0	-	20	2	1	6	0	-	9	1	5	0	0	-	6	52
% Trucks	10.0	3.5	3.5	-	-	3.6	5.6	7.4	5.0	-	-	6.6	4.1	1.5	4.4	-	-	3.6	1.2	3.4	0.0	-	-	2.5	4.1
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



York County, PA  
Bull Rd & Canal Rd  
Thursday, May 18, 2023  
Location: 40.016808, -76.81402



Turning Movement Peak Hour Data Plot (7:00 AM)



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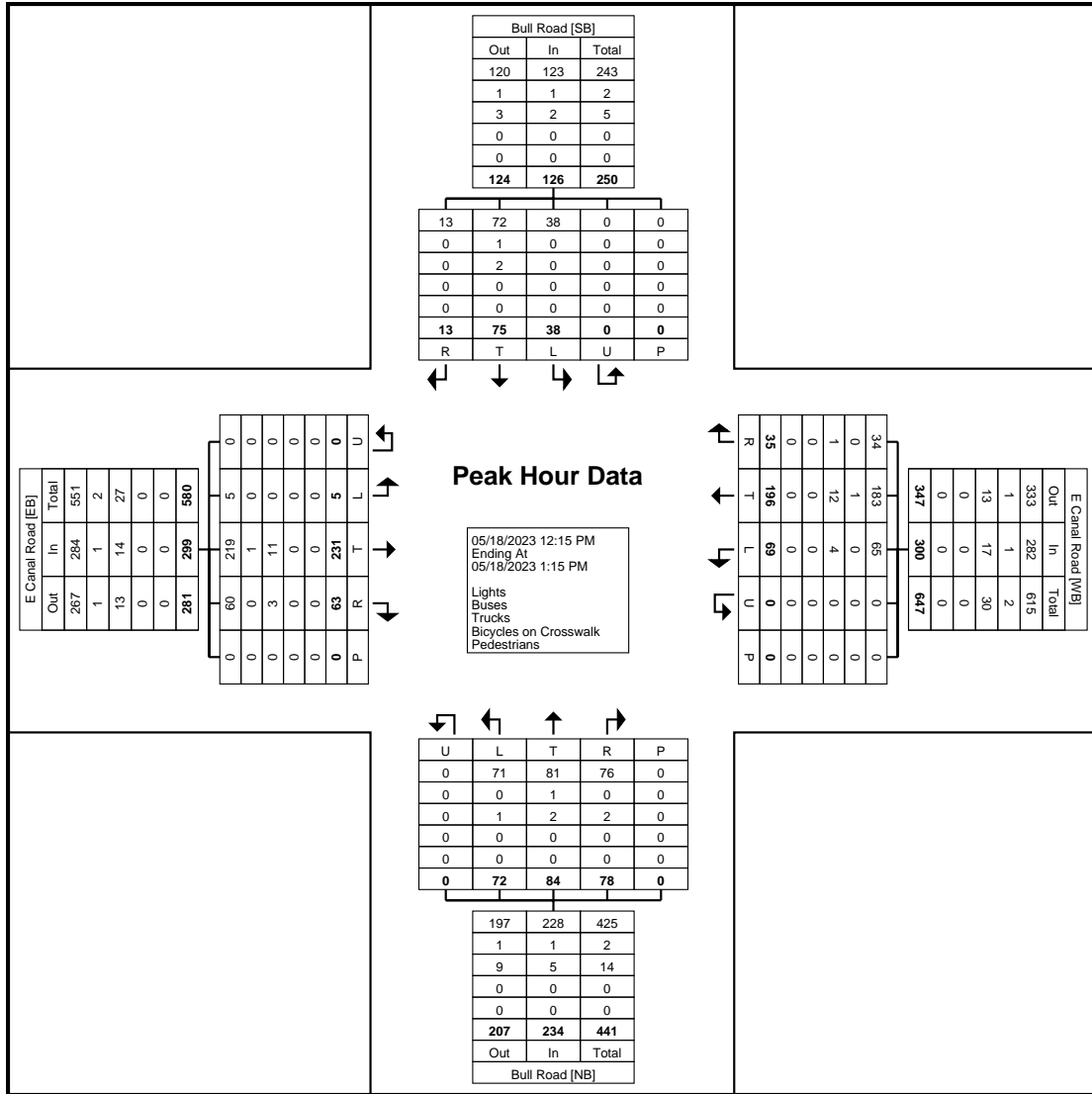
Count Name: Bull Rd & Canal Rd  
Site Code:  
Start Date: 05/18/2023  
Page No: 6

York County, PA  
Bull Rd & Canal Rd  
Thursday, May 18, 2023  
Location: 40.016808, -76.81402

### Turning Movement Peak Hour Data (12:15 PM)

Start Time	E Canal Road Eastbound						E Canal Road Westbound						Bull Road Northbound						Bull Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
12:15 PM	1	62	14	0	0	77	25	57	7	0	0	89	16	22	21	0	0	59	10	22	3	0	0	35	260
12:30 PM	3	53	20	0	0	76	10	42	13	0	0	65	25	22	22	0	0	69	14	19	4	0	0	37	247
12:45 PM	1	58	13	0	0	72	18	52	10	0	0	80	17	17	21	0	0	55	6	20	3	0	0	29	236
1:00 PM	0	58	16	0	0	74	16	45	5	0	0	66	14	23	14	0	0	51	8	14	3	0	0	25	216
Total	5	231	63	0	0	299	69	196	35	0	0	300	72	84	78	0	0	234	38	75	13	0	0	126	959
Approach %	1.7	77.3	21.1	0.0	-	-	23.0	65.3	11.7	0.0	-	-	30.8	35.9	33.3	0.0	-	-	30.2	59.5	10.3	0.0	-	-	-
Total %	0.5	24.1	6.6	0.0	-	31.2	7.2	20.4	3.6	0.0	-	31.3	7.5	8.8	8.1	0.0	-	24.4	4.0	7.8	1.4	0.0	-	13.1	-
PHF	0.417	0.931	0.788	0.000	-	0.971	0.690	0.860	0.673	0.000	-	0.843	0.720	0.913	0.886	0.000	-	0.848	0.679	0.852	0.813	0.000	-	0.851	0.922
Lights	5	219	60	0	-	284	65	183	34	0	-	282	71	81	76	0	-	228	38	72	13	0	-	123	917
% Lights	100.0	94.8	95.2	-	-	95.0	94.2	93.4	97.1	-	-	94.0	98.6	96.4	97.4	-	-	97.4	100.0	96.0	100.0	-	-	97.6	95.6
Buses	0	1	0	0	-	1	0	1	0	0	-	1	0	1	0	0	-	1	0	1	0	0	-	1	4
% Buses	0.0	0.4	0.0	-	-	0.3	0.0	0.5	0.0	-	-	0.3	0.0	1.2	0.0	-	-	0.4	0.0	1.3	0.0	-	-	0.8	0.4
Trucks	0	11	3	0	-	14	4	12	1	0	-	17	1	2	2	0	-	5	0	2	0	0	-	2	38
% Trucks	0.0	4.8	4.8	-	-	4.7	5.8	6.1	2.9	-	-	5.7	1.4	2.4	2.6	-	-	2.1	0.0	2.7	0.0	-	-	1.6	4.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

York County, PA  
Bull Rd & Canal Rd  
Thursday, May 18, 2023  
Location: 40.016808, -76.81402



Turning Movement Peak Hour Data Plot (12:15 PM)



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Count Name: Bull Rd & Canal Rd  
Site Code:  
Start Date: 05/18/2023  
Page No: 8

York County, PA  
Bull Rd & Canal Rd  
Thursday, May 18, 2023  
Location: 40.016808, -76.81402

### Turning Movement Peak Hour Data (4:30 PM)

Start Time	E Canal Road Eastbound						E Canal Road Westbound						Bull Road Northbound						Bull Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:30 PM	4	65	21	0	0	90	20	80	6	0	0	106	31	46	20	0	0	97	17	24	8	0	0	49	342
4:45 PM	3	62	10	0	0	75	23	73	7	0	0	103	44	38	17	0	0	99	18	23	6	0	0	47	324
5:00 PM	6	60	16	0	0	82	25	68	7	0	0	100	39	37	19	0	0	95	21	26	7	0	0	54	331
5:15 PM	9	60	16	0	0	85	23	78	7	0	0	108	45	39	22	0	0	106	10	33	4	0	0	47	346
Total	22	247	63	0	0	332	91	299	27	0	0	417	159	160	78	0	0	397	66	106	25	0	0	197	1343
Approach %	6.6	74.4	19.0	0.0	-	-	21.8	71.7	6.5	0.0	-	-	40.1	40.3	19.6	0.0	-	-	33.5	53.8	12.7	0.0	-	-	-
Total %	1.6	18.4	4.7	0.0	-	24.7	6.8	22.3	2.0	0.0	-	31.0	11.8	11.9	5.8	0.0	-	29.6	4.9	7.9	1.9	0.0	-	14.7	-
PHF	0.611	0.950	0.750	0.000	-	0.922	0.910	0.934	0.964	0.000	-	0.965	0.883	0.870	0.886	0.000	-	0.936	0.786	0.803	0.781	0.000	-	0.912	0.970
Lights	22	239	62	0	-	323	90	298	24	0	-	412	157	158	76	0	-	391	66	106	25	0	-	197	1323
% Lights	100.0	96.8	98.4	-	-	97.3	98.9	99.7	88.9	-	-	98.8	98.7	98.8	97.4	-	-	98.5	100.0	100.0	100.0	-	-	100.0	98.5
Buses	0	1	0	0	-	1	1	1	1	0	-	3	0	0	0	0	-	0	0	0	0	0	-	0	4
% Buses	0.0	0.4	0.0	-	-	0.3	1.1	0.3	3.7	-	-	0.7	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.3
Trucks	0	7	1	0	-	8	0	0	2	0	-	2	2	2	2	0	-	6	0	0	0	0	-	0	16
% Trucks	0.0	2.8	1.6	-	-	2.4	0.0	0.0	7.4	-	-	0.5	1.3	1.3	2.6	-	-	1.5	0.0	0.0	0.0	-	-	0.0	1.2
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-





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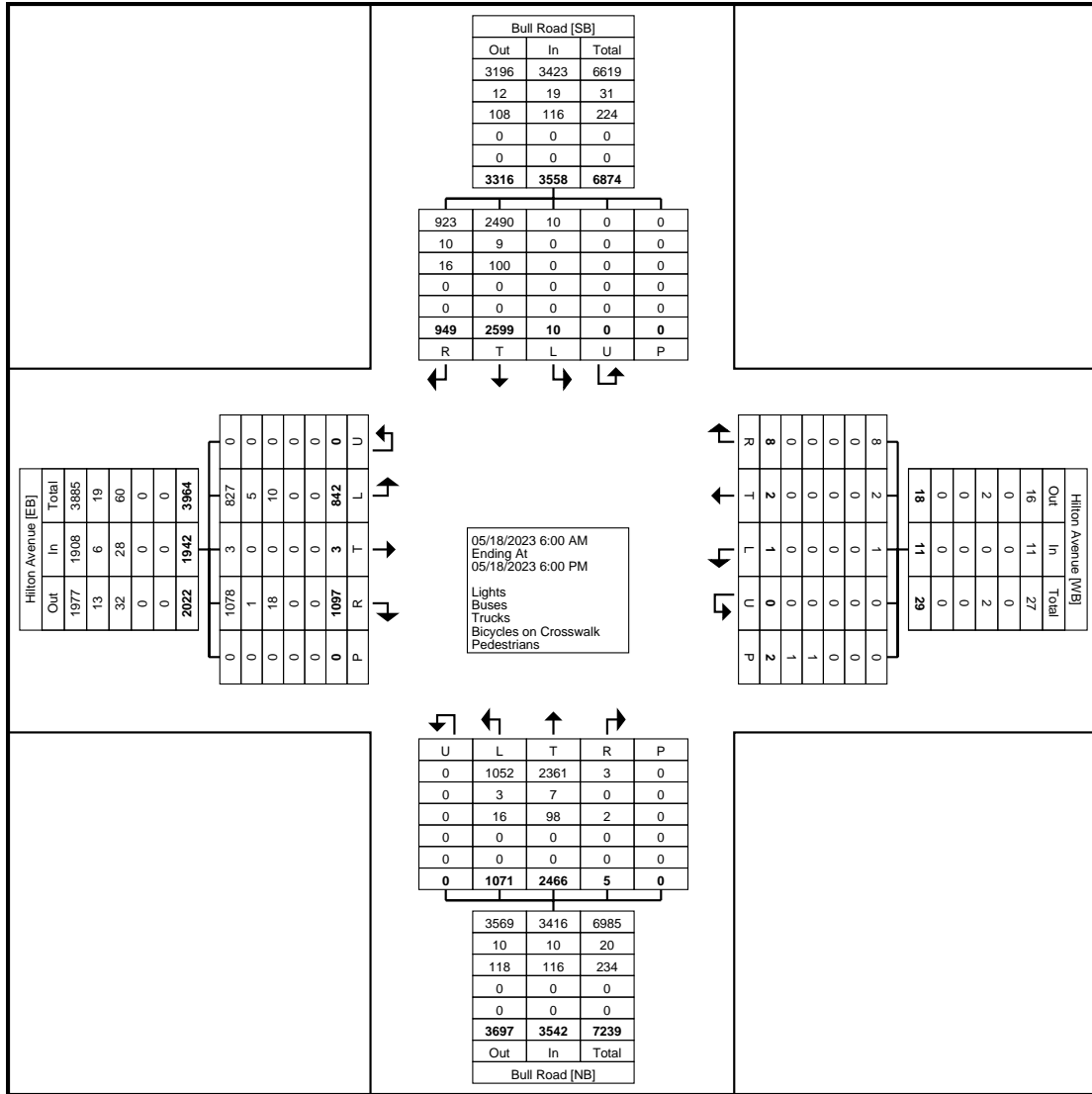
York County, PA  
Bull Rd & Hilton Ave  
Thursday, May 18, 2023  
Location: 40.005005, -  
76.803039

Count Name: Bull Rd & Hilton Ave  
Site Code:  
Start Date: 05/18/2023  
Page No: 1

### Turning Movement Data

Start Time	Hilton Avenue Eastbound						Hilton Avenue Westbound						Bull Road Northbound						Bull Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
6:00 AM	15	0	24	0	0	39	0	0	1	0	0	1	3	21	0	0	0	24	0	48	5	0	0	53	117
6:15 AM	17	0	29	0	0	46	0	0	0	0	0	0	11	37	0	0	0	48	0	59	15	0	0	74	168
6:30 AM	38	0	30	0	0	68	0	0	0	0	0	0	11	43	0	0	0	54	0	66	13	0	0	79	201
6:45 AM	27	0	31	0	0	58	0	0	0	0	0	0	15	32	0	0	0	47	0	61	13	0	0	74	179
Hourly Total	97	0	114	0	0	211	0	0	1	0	0	1	40	133	0	0	0	173	0	234	46	0	0	280	665
7:00 AM	19	0	30	0	0	49	0	0	0	0	0	0	10	44	0	0	0	54	0	72	18	0	0	90	193
7:15 AM	19	0	38	0	0	57	0	0	0	0	1	0	14	46	0	0	0	60	0	90	17	0	0	107	224
7:30 AM	29	0	40	0	0	69	0	0	0	0	0	0	10	41	0	0	0	51	0	74	18	0	0	92	212
7:45 AM	33	0	32	0	0	65	0	0	0	0	0	0	15	36	0	0	0	51	0	72	20	0	0	92	208
Hourly Total	100	0	140	0	0	240	0	0	0	0	1	0	49	167	0	0	0	216	0	308	73	0	0	381	837
8:00 AM	17	0	24	0	0	41	0	0	0	0	0	0	11	32	0	0	0	43	0	53	19	0	0	72	156
8:15 AM	20	0	14	0	0	34	0	0	0	0	0	0	13	34	0	0	0	47	0	50	10	0	0	60	141
8:30 AM	28	0	34	0	0	62	0	0	0	0	0	0	11	28	0	0	0	39	0	52	22	0	0	74	175
8:45 AM	18	0	33	0	0	51	0	0	0	0	0	0	13	42	0	0	0	55	0	66	11	0	0	77	183
Hourly Total	83	0	105	0	0	188	0	0	0	0	0	0	48	136	0	0	0	184	0	221	62	0	0	283	655
9:00 AM	15	0	15	0	0	30	0	0	0	0	0	0	8	34	0	0	0	42	0	57	13	0	0	70	142
9:15 AM	11	0	20	0	0	31	0	0	0	0	0	0	16	35	0	0	0	51	0	45	9	0	0	54	136
9:30 AM	11	0	15	0	0	26	0	0	0	0	0	0	11	30	0	0	0	41	0	58	13	0	0	71	138
9:45 AM	10	0	26	0	0	36	0	0	1	0	0	1	17	53	0	0	0	70	2	42	11	0	0	55	162
Hourly Total	47	0	76	0	0	123	0	0	1	0	0	1	52	152	0	0	0	204	2	202	46	0	0	250	578
10:00 AM	10	0	23	0	0	33	0	0	0	0	0	0	20	43	1	0	0	64	0	40	15	0	0	55	152
10:15 AM	12	0	9	0	0	21	0	0	1	0	0	1	12	43	1	0	0	56	0	46	12	0	0	58	136
10:30 AM	11	0	20	0	0	31	0	0	0	0	0	0	18	36	0	0	0	54	0	49	6	0	0	55	140
10:45 AM	12	0	21	0	0	33	0	0	0	0	0	0	20	43	0	0	0	63	0	46	8	0	0	54	150
Hourly Total	45	0	73	0	0	118	0	0	1	0	0	1	70	165	2	0	0	237	0	181	41	0	0	222	578
11:00 AM	13	0	17	0	0	30	0	0	0	0	0	0	23	42	0	0	0	65	0	52	8	0	0	60	155
11:15 AM	11	0	18	0	0	29	0	0	0	0	0	0	11	42	0	0	0	53	0	47	16	0	0	63	145
11:30 AM	10	1	20	0	0	31	0	0	0	0	0	0	20	45	0	0	0	65	0	49	18	0	0	67	163
11:45 AM	11	0	14	0	0	25	0	0	0	0	1	0	22	43	0	0	0	65	0	39	13	0	0	52	142
Hourly Total	45	1	69	0	0	115	0	0	0	0	1	0	76	172	0	0	0	248	0	187	55	0	0	242	605
12:00 PM	12	0	14	0	0	26	0	0	0	0	0	0	20	50	1	0	0	71	0	48	14	0	0	62	159
12:15 PM	8	0	29	0	0	37	0	0	1	0	0	1	22	51	1	0	0	74	0	54	15	0	0	69	181
12:30 PM	15	0	22	0	0	37	0	0	1	0	0	1	18	54	0	0	0	72	0	49	4	0	0	53	163
12:45 PM	21	0	23	0	0	44	0	0	0	0	0	0	22	37	0	0	0	59	1	44	24	0	0	69	172
Hourly Total	56	0	88	0	0	144	0	0	2	0	0	2	82	192	2	0	0	276	1	195	57	0	0	253	675
1:00 PM	16	0	17	0	0	33	0	0	0	0	0	0	10	48	0	0	0	58	0	45	13	0	0	58	149
1:15 PM	11	1	18	0	0	30	0	1	0	0	0	1	34	42	0	0	0	76	1	51	16	0	0	68	175
1:30 PM	15	0	24	0	0	39	0	0	0	0	0	0	20	58	0	0	0	78	0	48	18	0	0	66	183
1:45 PM	20	0	14	0	0	34	0	0	0	0	0	0	24	64	0	0	0	88	0	36	23	0	0	59	181
Hourly Total	62	1	73	0	0	136	0	1	0	0	0	1	88	212	0	0	0	300	1	180	70	0	0	251	688
2:00 PM	15	0	31	0	0	46	0	0	0	0	0	0	14	59	0	0	0	73	0	41	23	0	0	64	183
2:15 PM	15	0	17	0	0	32	0	0	0	0	0	0	26	49	0	0	0	75	0	45	11	0	0	56	163
2:30 PM	14	0	24	0	0	38	1	0	0	0	0	1	34	60	0	0	0	94	0	51	17	0	0	68	201
2:45 PM	14	0	29	0	0	43	0	0	0	0	0	0	33	75	0	0	0	108	1	65	30	0	0	96	247
Hourly Total	58	0	101	0	0	159	1	0	0	0	0	1	107	243	0	0	0	350	1	202	81	0	0	284	794
3:00 PM	19	1	21	0	0	41	0	0	0	0	0	0	28	64	0	0	0	92	1	61	29	0	0	91	224
3:15 PM	18	0	18	0	0	36	0	0	0	0	0	0	34	77	0	0	0	111	0	60	26	0	0	86	233
3:30 PM	15	0	15	0	0	30	0	0	0	0	0	0	46	72	1	0	0	119	0	52	37	0	0	89	238
3:45 PM	24	0	15	0	0	39	0	0	1	0	0	1	34	71	0	0	0	105	0	49	38	0	0	87	232
Hourly Total	76	1	69	0	0	146	0	0	1	0	0	1	142	284	1	0	0	427	1	222	130	0	0	353	927
4:00 PM	12	0	22	0	0	34	0	0	0	0	0	0	44	81	0	0	0	125	1	63	44	0	0	108	267
4:15 PM	30	0	18	0	0	48	0	0	1	0	0	1	47	83	0	0	0	130	2	63	37	0	0	102	281
4:30 PM	18	0	23	0	0	41	0	1	0	0	0	1	40	72	0	0	0	112	0	58	34	0	0	92	246
4:45 PM	21	0	25	0	0	46	0	0	0	0	0	0	35	73	0	0	0	108	0	52	37	0	0	89	243
Hourly Total	81	0	88	0	0	169	0	1	1	0	0	2	166	309	0	0	0	475	3	236	152	0	0	391	1037
5:00 PM	25	0	30	0	0	55	0	0	0	0	0	0	45	77	0	0	0	122	0	56	41	0	0	97	274
5:15 PM	23	0	24	0	0	47	0	0	0	0	0	0	45	91	0	0	0	136	0	56	37	0	0	93	276
5:30 PM	16	0	26	0	0	42	0	0	0	0	0	0	36	74	0	0	0	110	0	55	27	0	0	82	234
5:45 PM	28	0	21	0	0	49	0	0	1	0	0	1	25	59	0	0	0	84	1	64	31	0	0	96	230





Turning Movement Data Plot





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184 Baker Rd

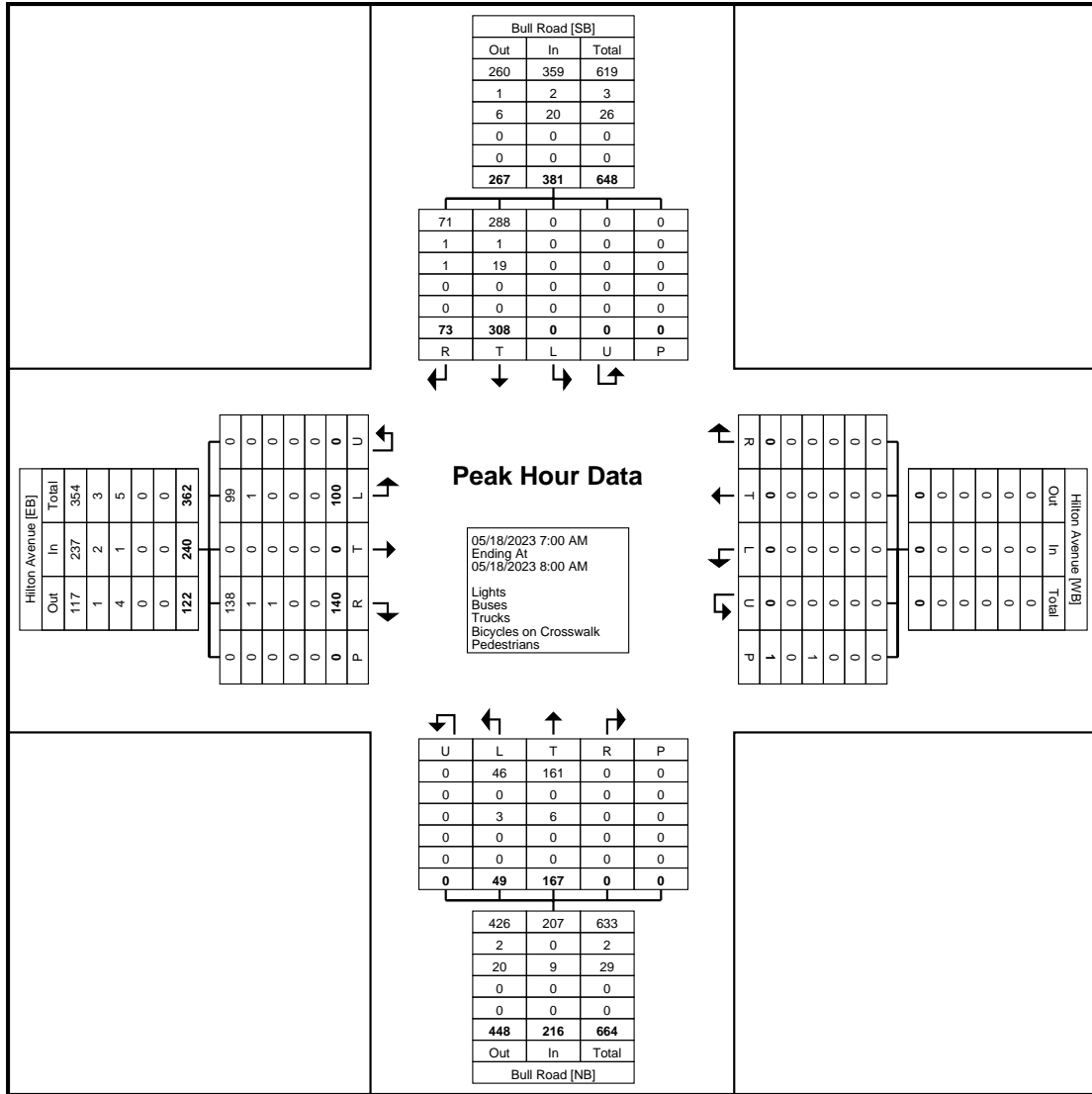
Coatesville, Pennsylvania, United States 19320  
610-466-1469  
Serving Transportation Professionals Since 1995

York County, PA  
Bull Rd & Hilton Ave  
Thursday, May 18, 2023  
Location: 40.005005, -  
76.803039

Count Name: Bull Rd & Hilton Ave  
Site Code:  
Start Date: 05/18/2023  
Page No: 4

### Turning Movement Peak Hour Data (7:00 AM)

Start Time	Hilton Avenue Eastbound						Hilton Avenue Westbound						Bull Road Northbound						Bull Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	19	0	30	0	0	49	0	0	0	0	0	0	10	44	0	0	0	54	0	72	18	0	0	90	193
7:15 AM	19	0	38	0	0	57	0	0	0	0	1	0	14	46	0	0	0	60	0	90	17	0	0	107	224
7:30 AM	29	0	40	0	0	69	0	0	0	0	0	0	10	41	0	0	0	51	0	74	18	0	0	92	212
7:45 AM	33	0	32	0	0	65	0	0	0	0	0	0	15	36	0	0	0	51	0	72	20	0	0	92	208
Total	100	0	140	0	0	240	0	0	0	0	1	0	49	167	0	0	0	216	0	308	73	0	0	381	837
Approach %	41.7	0.0	58.3	0.0	-	-	0.0	0.0	0.0	0.0	-	-	22.7	77.3	0.0	0.0	-	-	0.0	80.8	19.2	0.0	-	-	-
Total %	11.9	0.0	16.7	0.0	-	28.7	0.0	0.0	0.0	0.0	-	0.0	5.9	20.0	0.0	0.0	-	25.8	0.0	36.8	8.7	0.0	-	45.5	-
PHF	0.758	0.000	0.875	0.000	-	0.870	0.000	0.000	0.000	0.000	-	0.000	0.817	0.908	0.000	0.000	-	0.900	0.000	0.856	0.913	0.000	-	0.890	0.934
Lights	99	0	138	0	-	237	0	0	0	0	-	0	46	161	0	0	-	207	0	288	71	0	-	359	803
% Lights	99.0	-	98.6	-	-	98.8	-	-	-	-	-	-	93.9	96.4	-	-	-	95.8	-	93.5	97.3	-	-	94.2	95.9
Buses	1	0	1	0	-	2	0	0	0	0	-	0	0	0	0	0	-	0	0	1	1	0	-	2	4
% Buses	1.0	-	0.7	-	-	0.8	-	-	-	-	-	-	0.0	0.0	-	-	-	0.0	-	0.3	1.4	-	-	0.5	0.5
Trucks	0	0	1	0	-	1	0	0	0	0	-	0	3	6	0	0	-	9	0	19	1	0	-	20	30
% Trucks	0.0	-	0.7	-	-	0.4	-	-	-	-	-	-	6.1	3.6	-	-	-	4.2	-	6.2	1.4	-	-	5.2	3.6
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (7:00 AM)



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184 Baker Rd

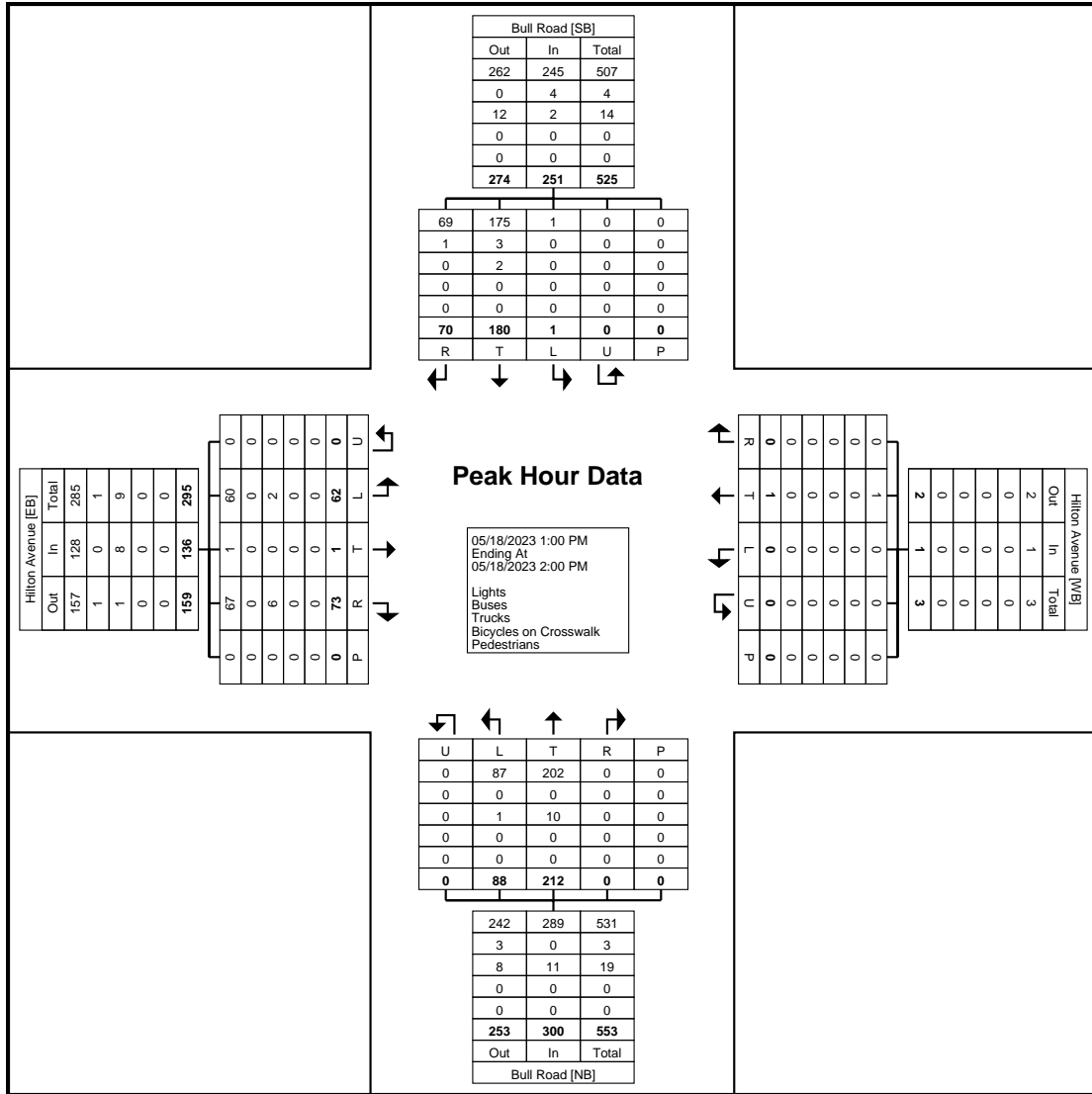
Coatesville, Pennsylvania, United States 19320  
610-466-1469  
Serving Transportation Professionals Since 1995

York County, PA  
Bull Rd & Hilton Ave  
Thursday, May 18, 2023  
Location: 40.005005, -  
76.803039

Count Name: Bull Rd & Hilton Ave  
Site Code:  
Start Date: 05/18/2023  
Page No: 6

### Turning Movement Peak Hour Data (1:00 PM)

Start Time	Hilton Avenue Eastbound						Hilton Avenue Westbound						Bull Road Northbound						Bull Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
1:00 PM	16	0	17	0	0	33	0	0	0	0	0	0	10	48	0	0	0	58	0	45	13	0	0	58	149
1:15 PM	11	1	18	0	0	30	0	1	0	0	0	1	34	42	0	0	0	76	1	51	16	0	0	68	175
1:30 PM	15	0	24	0	0	39	0	0	0	0	0	0	20	58	0	0	0	78	0	48	18	0	0	66	183
1:45 PM	20	0	14	0	0	34	0	0	0	0	0	0	24	64	0	0	0	88	0	36	23	0	0	59	181
Total	62	1	73	0	0	136	0	1	0	0	0	1	88	212	0	0	0	300	1	180	70	0	0	251	688
Approach %	45.6	0.7	53.7	0.0	-	-	0.0	100.0	0.0	0.0	-	-	29.3	70.7	0.0	0.0	-	-	0.4	71.7	27.9	0.0	-	-	-
Total %	9.0	0.1	10.6	0.0	-	19.8	0.0	0.1	0.0	0.0	-	0.1	12.8	30.8	0.0	0.0	-	43.6	0.1	26.2	10.2	0.0	-	36.5	-
PHF	0.775	0.250	0.760	0.000	-	0.872	0.000	0.250	0.000	0.000	-	0.250	0.647	0.828	0.000	0.000	-	0.852	0.250	0.882	0.761	0.000	-	0.923	0.940
Lights	60	1	67	0	-	128	0	1	0	0	-	1	87	202	0	0	-	289	1	175	69	0	-	245	663
% Lights	96.8	100.0	91.8	-	-	94.1	-	100.0	-	-	-	100.0	98.9	95.3	-	-	-	96.3	100.0	97.2	98.6	-	-	97.6	96.4
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	3	1	0	-	4	4
% Buses	0.0	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	1.7	1.4	-	-	1.6	0.6
Trucks	2	0	6	0	-	8	0	0	0	0	-	0	1	10	0	0	-	11	0	2	0	0	-	2	21
% Trucks	3.2	0.0	8.2	-	-	5.9	-	0.0	-	-	-	0.0	1.1	4.7	-	-	-	3.7	0.0	1.1	0.0	-	-	0.8	3.1
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (1:00 PM)



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184 Baker Rd

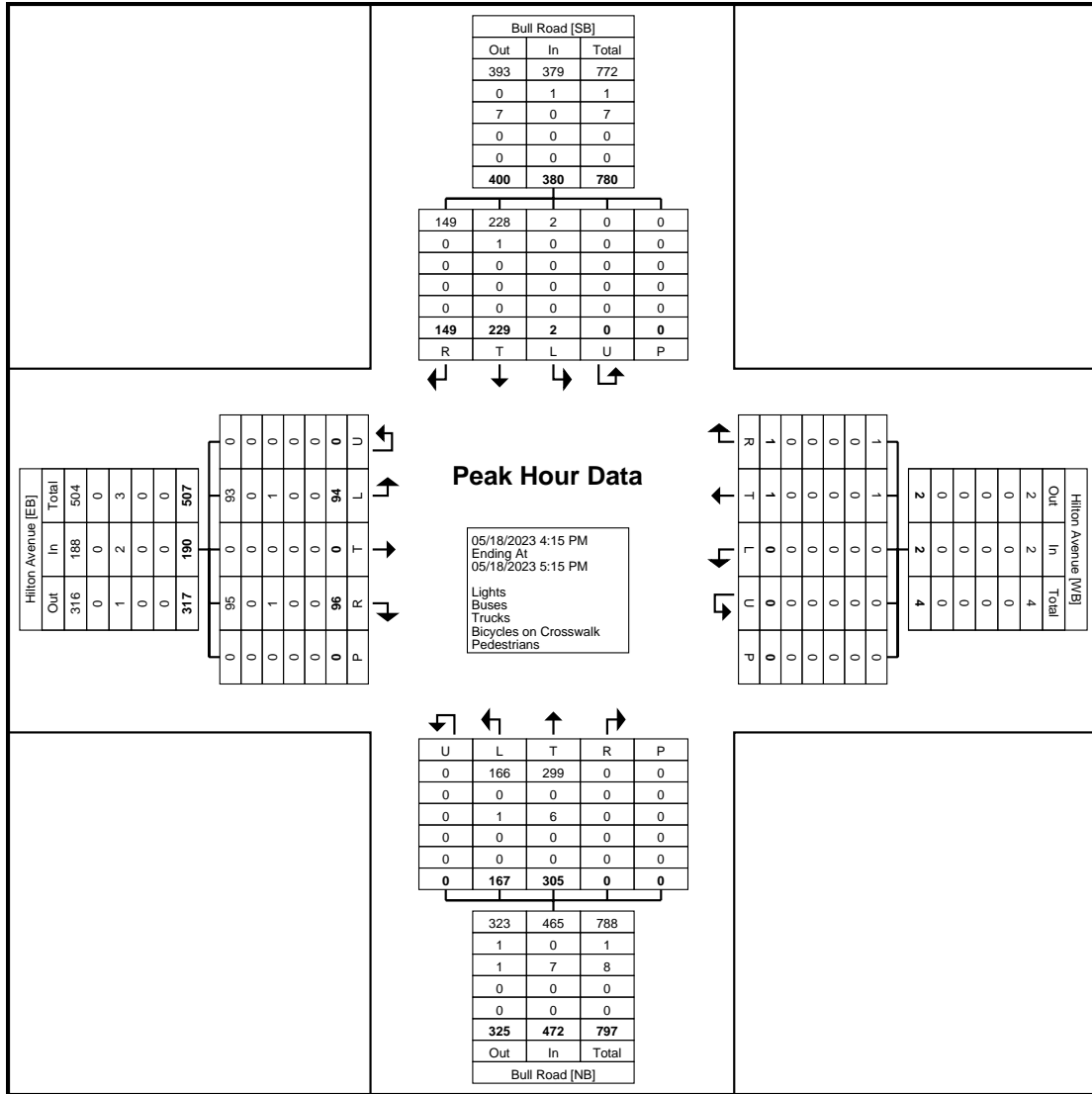
Coatesville, Pennsylvania, United States 19320  
610-466-1469  
Serving Transportation Professionals Since 1995

York County, PA  
Bull Rd & Hilton Ave  
Thursday, May 18, 2023  
Location: 40.005005, -  
76.803039

Count Name: Bull Rd & Hilton Ave  
Site Code:  
Start Date: 05/18/2023  
Page No: 8

### Turning Movement Peak Hour Data (4:15 PM)

Start Time	Hilton Avenue Eastbound						Hilton Avenue Westbound						Bull Road Northbound						Bull Road Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:15 PM	30	0	18	0	0	48	0	0	1	0	0	1	47	83	0	0	0	130	2	63	37	0	0	102	281
4:30 PM	18	0	23	0	0	41	0	1	0	0	0	1	40	72	0	0	0	112	0	58	34	0	0	92	246
4:45 PM	21	0	25	0	0	46	0	0	0	0	0	0	35	73	0	0	0	108	0	52	37	0	0	89	243
5:00 PM	25	0	30	0	0	55	0	0	0	0	0	0	45	77	0	0	0	122	0	56	41	0	0	97	274
Total	94	0	96	0	0	190	0	1	1	0	0	2	167	305	0	0	0	472	2	229	149	0	0	380	1044
Approach %	49.5	0.0	50.5	0.0	-	-	0.0	50.0	50.0	0.0	-	-	35.4	64.6	0.0	0.0	-	-	0.5	60.3	39.2	0.0	-	-	-
Total %	9.0	0.0	9.2	0.0	-	18.2	0.0	0.1	0.1	0.0	-	0.2	16.0	29.2	0.0	0.0	-	45.2	0.2	21.9	14.3	0.0	-	36.4	-
PHF	0.783	0.000	0.800	0.000	-	0.864	0.000	0.250	0.250	0.000	-	0.500	0.888	0.919	0.000	0.000	-	0.908	0.250	0.909	0.909	0.000	-	0.931	0.929
Lights	93	0	95	0	-	188	0	1	1	0	-	2	166	299	0	0	-	465	2	228	149	0	-	379	1034
% Lights	98.9	-	99.0	-	-	98.9	-	100.0	100.0	-	-	100.0	99.4	98.0	-	-	-	98.5	100.0	99.6	100.0	-	-	99.7	99.0
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	1	0	0	-	1	1
% Buses	0.0	-	0.0	-	-	0.0	-	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.4	0.0	-	-	0.3	0.1
Trucks	1	0	1	0	-	2	0	0	0	0	-	0	1	6	0	0	-	7	0	0	0	0	-	0	9
% Trucks	1.1	-	1.0	-	-	1.1	-	0.0	0.0	-	-	0.0	0.6	2.0	-	-	-	1.5	0.0	0.0	0.0	-	-	0.0	0.9
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Turning Movement Peak Hour Data Plot (4:15 PM)

## **APPENDIX D**

**GROWTH RATE TABLE, HEADWAY CALCULATIONS,  
APPROVED DEVELOPMENT FIGURES AND  
VOLUME DEVELOPMENT SPREADSHEET**

Growth Factors for August 2022 to July 2023				
County	Urban Interstate	Rural Interstate	Urban Non-Interstate	Rural Non-Interstate
ADAMS	*	*	0.50	0.60
ALLEGHENY	0.98	*	0.00	0.43
ARMSTRONG	0.80	*	0.00	0.37
BEAVER	0.64	2.05	0.00	0.30
BEDFORD	*	2.20	0.00	0.39
BERKS	1.34	2.53	0.32	0.58
BLAIR	0.86	2.34	0.00	0.40
BRADFORD	1.06	*	0.00	0.48
BUCKS	1.35	2.63	0.22	0.58
BUTLER	1.66	2.88	0.29	0.71
CAMBRIA	0.35	*	0.00	0.19
CAMERON	*	*	*	0.12
CARBON	1.42	2.68	0.28	0.60
CENTRE	1.79	2.75	0.72	0.74
CHESTER	1.77	2.92	0.54	0.77
CLARION	0.79	2.23	0.00	0.37
CLEARFIELD	0.61	1.94	0.00	0.31
CLINTON	1.10	2.36	0.02	0.48
COLUMBIA	1.10	2.32	0.06	0.48
CRAWFORD	0.74	2.12	0.00	0.36
CUMBERLAND	1.63	2.79	0.59	0.69
DAUPHIN	1.54	*	0.35	0.66
DELAWARE	1.27	*	0.00	*
ELK	*	*	0.00	0.30
ERIE	0.96	2.31	0.00	0.43
FAYETTE	0.86	*	0.00	0.39
FOREST	*	*	*	0.96
FRANKLIN	1.71	2.81	0.73	0.72
FULTON	*	2.33	*	0.50
GREENE	0.73	2.28	0.00	0.36
HUNTINGDON	*	2.49	0.00	0.49
INDIANA	0.94	*	0.00	0.44
JEFFERSON	*	2.32	0.00	0.46
JUNIATA	*	*	*	0.53
LACKAWANNA	0.99	2.36	0.00	0.44
LANCASTER	1.66	2.84	0.60	0.70
LAWRENCE	0.69	2.18	0.00	0.33
LEBANON	*	2.55	0.48	0.62
LEHIGH	1.75	3.09	0.53	0.75
LUZERNE	1.04	2.41	0.00	0.47
LYCOMING	0.99	2.37	0.00	0.44
MCKEAN	0.60	*	0.00	0.30
MERCER	0.92	2.52	0.00	0.43
MIFFLIN	1.17	*	0.00	0.51
MONROE	1.77	2.88	0.79	0.75
MONTGOMERY	1.29	*	0.27	0.55
MONTOUR	1.30	2.68	0.00	0.57
NORTHAMPTON	1.80	3.16	0.47	0.78
NORTHUMBERLAND	1.00	2.28	0.00	0.43
PERRY	*	*	0.24	0.54
PHILADELPHIA	1.18	*	0.05	*
PIKE	1.72	2.72	0.86	0.73
POTTER	*	*	*	0.35
SCHUYLKILL	1.00	2.45	0.00	0.45
SNYDER	1.23	*	0.21	0.54
SOMERSET	0.60	2.06	0.00	0.34
SULLIVAN	*	*	*	0.37
SUSQUEHANNA	1.09	2.43	0.00	0.47
TIOGA	*	*	*	0.42
UNION	1.54	2.68	0.44	0.63
VENANGO	*	1.91	0.00	0.27
WARREN	*	*	0.00	0.35
WASHINGTON	1.22	2.74	0.00	0.55
WAYNE	*	2.53	0.31	0.58
WESTMORELAND	0.89	2.18	0.00	0.40
WYOMING	*	*	0.00	0.44
YORK	1.57	2.89	0.47	0.69

\* = 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](mailto:andoneill@pa.gov)

**NOTE:** The projected growth factors are derived using historical VMT (Vehicle Miles Traveled) data (1994 to 2021), 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.



APPENDIX D  
HEADWAY FACTOR CALCULATIONS

EXISTING AM PEAK HOUR

Location	Number of Lanes	Intersection Geometry Minor Street Left-Turn movement at Three-leg intersections?	Movement	Vehicle Movement	BASE CRITICAL HEADWAY							BASE FOLLOW-UP HEADWAY			
					Suburban Two Lane Defaults	Adjustment Factor For Heavy Vehicle	Heavy Vehicle Percentage	Adjustment Factor for Grades	Approach Grade	Adj. Factor for intersection geometry	Calculated Base Critical Headway	Suburban Two Lane Defaults	Heavy Vehicle Percentage	Adjustment Factor For Heavy Vehicle	Calculated Base Critical Headway
					E Canal Road (SR 921) and Greenbriar Road	Two Lanes	Other	WB L	Left Turn from Major Roadway	4.3	1	0	0	0	0
	Two Lanes	Minor Left Turn at Three Leg Intersection	NB L	Left Turn from Minor (1 Stage only)	7.1	1	0.06	0.2	4	0.7	7.26	3	0.06	0.9	3.1
	Two Lanes	Other	NB R	Right Turn from Minor Roadway	6.2	1	0.08	0.1	4	0	6.68	3.1	0.08	0.9	3.2
Bull Road (SR 4001) and Hilton Avenue	Two Lanes	Other	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0.01	0.2	0	0	7.11	3	0.01	0.9	3.0
	Two Lanes	Other	EB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0.00	0.9	4.0
	Two Lanes	Other	EB R	Right Turn from Minor Roadway	6.2	1	0	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	WB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	0	0	7.1	3	0	0.9	3.0
	Two Lanes	Other	WB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0	0.9	4.0
	Two Lanes	Other	WB R	Right Turn from Minor Roadway	6.2	1	0.00	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.00	0	2	0	4.3	3	0	0.9	3.0
	Two Lanes	Other	SB L	Left Turn from Major Roadway	4.3	1	0.00	0	-2	0	4.3	3	0	0.9	3.0

EXISTING PM PEAK HOUR

Location	Number of Lanes	Intersection Geometry Minor Street Left-Turn movement at Three-leg intersections?	Movement	Vehicle Movement	BASE CRITICAL HEADWAY							BASE FOLLOW-UP HEADWAY			
					Suburban Two Lane Defaults	Adjustment Factor For Heavy Vehicle	Heavy Vehicle Percentage	Adjustment Factor for Grades	Approach Grade	Adj. Factor for intersection geometry	Calculated Base Critical Headway	Suburban Two Lane Defaults	Heavy Vehicle Percentage	Adjustment Factor For Heavy Vehicle	Calculated Base Critical Headway
					Bull Road (SR 4001) and E Canal Road (SR 921)	Two Lanes	Other	EB L	Left Turn from Major Roadway	4.3	1	0	0	-1	0
	Two Lanes	Other	WB L	Left Turn from Major Roadway	4.3	1	0.00	0	2	0	4.3	3	0.00	0.9	3.0
	Two Lanes	Other	NB L	Left Turn from Minor (1 Stage only)	7.1	1	0.01	0.2	2	0	7.51	3	0.01	0.9	3.0
	Two Lanes	Other	NB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.02	0.2	2	0	6.92	4	0.02	0.9	4.0
	Two Lanes	Other	NB R	Right Turn from Minor Roadway	6.2	1	0.03	0.1	2	0	6.43	3.1	0.03	0.9	3.1
	Two Lanes	Other	SB L	Left Turn from Minor (1 Stage only)	7.1	1	0.01	0.2	-2	0	6.71	3	0.01	0.9	3.0
	Two Lanes	Other	SB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.03	0.2	-2	0	6.13	4	0.03	0.9	4.0
	Two Lanes	Other	SB R	Right Turn from Minor Roadway	6.2	1	0.04	0.1	-2	0	6.04	3.1	0.04	0.9	3.1
E Canal Road (SR 921) and Greenbriar Road	Two Lanes	Other	WB L	Left Turn from Major Roadway	4.3	1	0	0	0	0	4.3	3	0	0.9	3.0
	Two Lanes	Minor Left Turn at Three Leg Intersection	NB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	4	0.7	7.2	3	0	0.9	3.0
	Two Lanes	Other	NB R	Right Turn from Minor Roadway	6.2	1	0.03	0.1	4	0	6.63	3.1	0.03	0.9	3.1
Bull Road (SR 4001) and Hilton Avenue	Two Lanes	Other	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0.04	0.2	0	0	7.14	3	0.04	0.9	3.0
	Two Lanes	Other	EB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0.00	0.9	4.0
	Two Lanes	Other	EB R	Right Turn from Minor Roadway	6.2	1	0	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	WB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	0	0	7.1	3	0	0.9	3.0
	Two Lanes	Other	WB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0	0.9	4.0
	Two Lanes	Other	WB R	Right Turn from Minor Roadway	6.2	1	0.00	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.01	0	2	0	4.31	3	0.01	0.9	3.0
	Two Lanes	Other	SB L	Left Turn from Major Roadway	4.3	1	0.00	0	-2	0	4.3	3	0	0.9	3.0

NO-BUILD AM PEAK HOUR

Location	Number of Lanes	Intersection Geometry Minor Street Left-Turn movement at Three-leg intersections?	Movement	Vehicle Movement	BASE CRITICAL HEADWAY							BASE FOLLOW-UP HEADWAY			
					Suburban Two Lane Defaults	Adjustment Factor For Heavy Vehicle	Heavy Vehicle Percentage	Adjustment Factor for Grades	Approach Grade	Adj. Factor for intersection geometry	Calculated Base Critical Headway	Suburban Two Lane Defaults	Heavy Vehicle Percentage	Adjustment Factor For Heavy Vehicle	Calculated Base Critical Headway
					E Canal Road (SR 921) and Greenbriar Road	Two Lanes	Other	WB L	Left Turn from Major Roadway	4.3	1	0	0	0	0
	Two Lanes	Minor Left Turn at Three Leg Intersection	NB L	Left Turn from Minor (1 Stage only)	7.1	1	0.06	0.2	4	0.7	7.26	3	0.06	0.9	3.1
	Two Lanes	Other	NB R	Right Turn from Minor Roadway	6.2	1	0.08	0.1	4	0	6.68	3.1	0.08	0.9	3.2
Bull Road (SR 4001) and Hilton Avenue	Two Lanes	Other	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0.01	0.2	0	0	7.11	3	0.01	0.9	3.0
	Two Lanes	Other	EB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0.00	0.9	4.0
	Two Lanes	Other	EB R	Right Turn from Minor Roadway	6.2	1	0	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	WB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	0	0	7.1	3	0	0.9	3.0
	Two Lanes	Other	WB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0	0.9	4.0
	Two Lanes	Other	WB R	Right Turn from Minor Roadway	6.2	1	0.00	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.00	0	2	0	4.3	3	0	0.9	3.0
	Two Lanes	Other	SB L	Left Turn from Major Roadway	4.3	1	0.00	0	-2	0	4.3	3	0	0.9	3.0

NO-BUILD PM PEAK HOUR

Location	Number of Lanes	Intersection Geometry Minor Street Left-Turn movement at Three-leg intersections?	Movement	Vehicle Movement	BASE CRITICAL HEADWAY							BASE FOLLOW-UP HEADWAY			
					Suburban Two Lane Defaults	Adjustment Factor For Heavy Vehicle	Heavy Vehicle Percentage	Adjustment Factor for Grades	Approach Grade	Adj. Factor for intersection geometry	Calculated Base Critical Headway	Suburban Two Lane Defaults	Heavy Vehicle Percentage	Adjustment Factor For Heavy Vehicle	Calculated Base Critical Headway
					E Canal Road (SR 921) and Greenbriar Road	Two Lanes	Other	WB L	Left Turn from Major Roadway	4.3	1	0	0	0	0
	Two Lanes	Minor Left Turn at Three Leg Intersection	NB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	4	0.7	7.2	3	0	0.9	3.0
	Two Lanes	Other	NB R	Right Turn from Minor Roadway	6.2	1	0.03	0.1	4	0	6.63	3.1	0.03	0.9	3.1
Bull Road (SR 4001) and Hilton Avenue	Two Lanes	Other	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0.04	0.2	0	0	7.14	3	0.04	0.9	3.0
	Two Lanes	Other	EB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0.00	0.9	4.0
	Two Lanes	Other	EB R	Right Turn from Minor Roadway	6.2	1	0	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	WB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	0	0	7.1	3	0	0.9	3.0
	Two Lanes	Other	WB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0	0.9	4.0
	Two Lanes	Other	WB R	Right Turn from Minor Roadway	6.2	1	0.00	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.01	0	2	0	4.31	3	0.01	0.9	3.0
	Two Lanes	Other	SB L	Left Turn from Major Roadway	4.3	1	0.00	0	-2	0	4.3	3	0	0.9	3.0

2024 BUILD AM PEAK HOUR

Location	Number of Lanes	Intersection Geometry Minor Street Left-Turn movement at Three-leg intersections?	Movement	Vehicle Movement	BASE CRITICAL HEADWAY							BASE FOLLOW-UP HEADWAY			
					Suburban Two Lane Defaults	Adjustment Factor For Heavy Vehicle	Heavy Vehicle Percentage	Adjustment Factor for Grades	Approach Grade	Adj. Factor for intersection geometry	Calculated Base Critical Headway	Suburban Two Lane Defaults	Heavy Vehicle Percentage	Adjustment Factor For Heavy Vehicle	Calculated Base Critical Headway
					E Canal Road (SR 921) and Greenbriar Road	Two Lanes	Other	WB L	Left Turn from Major Roadway	4.3	1	0	0	0	0
	Two Lanes	Minor Left Turn at Three Leg Intersection	NB L	Left Turn from Minor (1 Stage only)	7.1	1	0.05	0.2	4	0.7	7.25	3	0.05	0.9	3.0
	Two Lanes	Other	NB R	Right Turn from Minor Roadway	6.2	1	0.08	0.1	4	0	6.68	3.1	0.08	0.9	3.2
Bull Road (SR 4001) and Hilton Avenue	Two Lanes	Other	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0.01	0.2	0	0	7.11	3	0.01	0.9	3.0
	Two Lanes	Other	EB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0.00	0.9	4.0
	Two Lanes	Other	EB R	Right Turn from Minor Roadway	6.2	1	0	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	WB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	0	0	7.1	3	0	0.9	3.0
	Two Lanes	Other	WB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0	0.9	4.0
	Two Lanes	Other	WB R	Right Turn from Minor Roadway	6.2	1	0.00	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.00	0	2	0	4.3	3	0	0.9	3.0
	Two Lanes	Other	SB L	Left Turn from Major Roadway	4.3	1	0.00	0	-2	0	4.3	3	0	0.9	3.0
Bull Road (SR 4001) and Site Drive	Two Lanes	Minor Left Turn at Three Leg Intersection	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0	0.2	0	0.7	6.4	3	0	0.9	3.0
	Two Lanes	Other	EB R	Left Turn from Minor (1 Stage only)	7.1	1	0.30	0.2	0	0	7.39	3	0.29	0.9	3.3
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.09	0	0	0	4.38	3	0.08	0.9	3.1

2024 BUILD PM PEAK HOUR

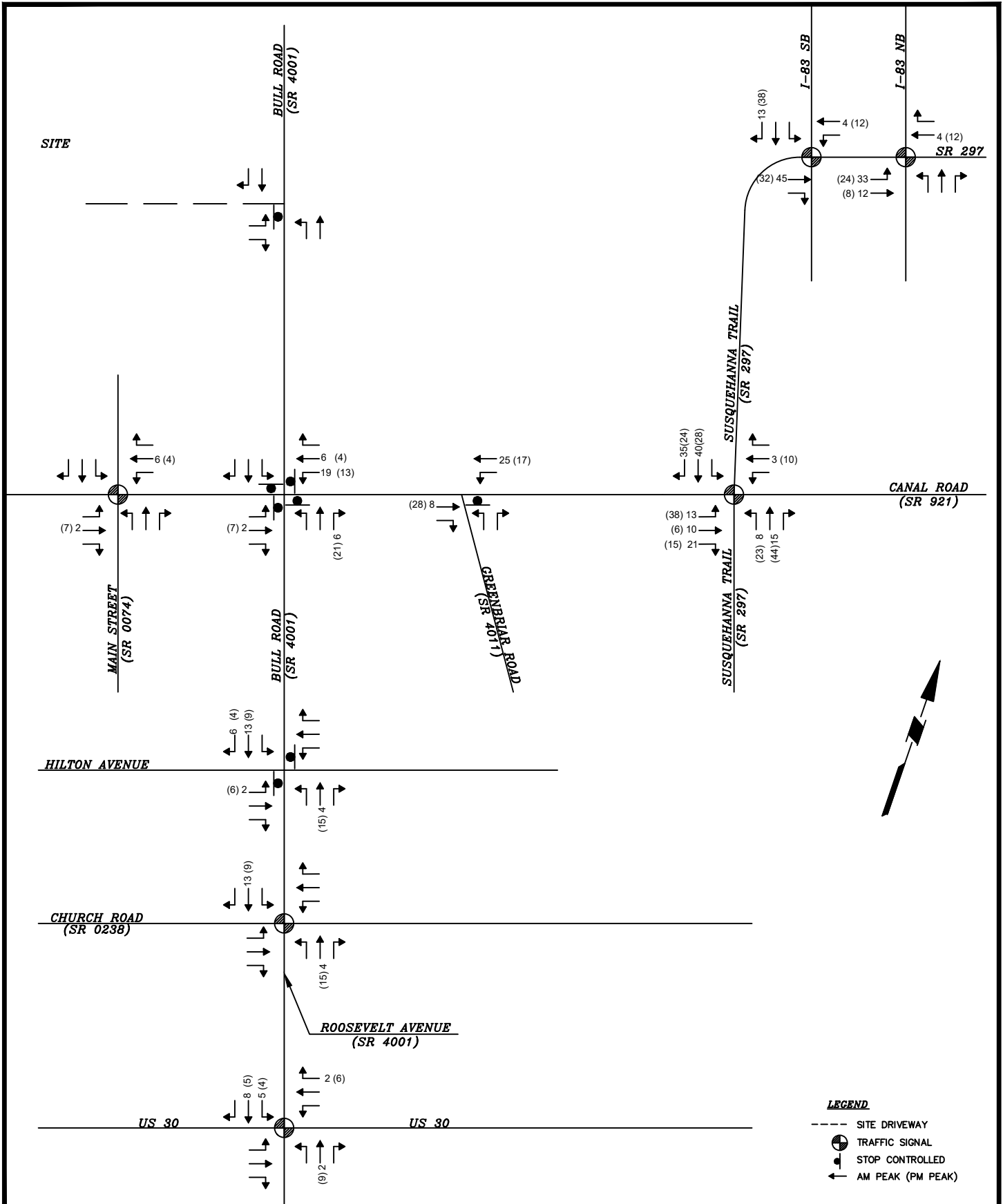
Location	Number of Lanes	Intersection Geometry Minor Street Left-Turn movement at Three-leg intersections?	Movement	Vehicle Movement	BASE CRITICAL HEADWAY							BASE FOLLOW-UP HEADWAY			
					Suburban Two Lane Defaults	Adjustment Factor For Heavy Vehicle	Heavy Vehicle Percentage	Adjustment Factor for Grades	Approach Grade	Adj. Factor for intersection geometry	Calculated Base Critical Headway	Suburban Two Lane Defaults	Heavy Vehicle Percentage	Adjustment Factor For Heavy Vehicle	Calculated Base Critical Headway
					E Canal Road (SR 921) and Greenbriar Road	Two Lanes	Other	WB L	Left Turn from Major Roadway	4.3	1	0	0	0	0
	Two Lanes	Minor Left Turn at Three Leg Intersection	NB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	4	0.7	7.2	3	0	0.9	3.0
	Two Lanes	Other	NB R	Right Turn from Minor Roadway	6.2	1	0.03	0.1	4	0	6.63	3.1	0.03	0.9	3.1
Bull Road (SR 4001) and Hilton Avenue	Two Lanes	Other	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0.04	0.2	0	0	7.14	3	0.04	0.9	3.0
	Two Lanes	Other	EB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0.00	0.9	4.0
	Two Lanes	Other	EB R	Right Turn from Minor Roadway	6.2	1	0	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	WB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	0	0	7.1	3	0	0.9	3.0
	Two Lanes	Other	WB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0	0.9	4.0
	Two Lanes	Other	WB R	Right Turn from Minor Roadway	6.2	1	0.00	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.01	0	2	0	4.31	3	0.01	0.9	3.0
	Two Lanes	Other	SB L	Left Turn from Major Roadway	4.3	1	0.00	0	-2	0	4.3	3	0	0.9	3.0
Bull Road (SR 4001) and Site Drive	Two Lanes	Minor Left Turn at Three Leg Intersection	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0	0.2	0	0.7	6.4	3	0	0.9	3.0
	Two Lanes	Other	EB R	Left Turn from Minor (1 Stage only)	7.1	1	0.13	0.2	0	0	7.22	3	0.12	0.9	3.1
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.34	0	0	0	4.63	3	0.33	0.9	3.3

2029 BUILD AM PEAK HOUR

Location	Number of Lanes	Intersection Geometry Minor Street Left-Turn movement at Three-leg intersections?	Movement	Vehicle Movement	BASE CRITICAL HEADWAY							BASE FOLLOW-UP HEADWAY			
					Suburban Two Lane Defaults	Adjustment Factor For Heavy Vehicle	Heavy Vehicle Percentage	Adjustment Factor for Grades	Approach Grade	Adj. Factor for Intersection geometry	Calculated Base Critical Headway	Suburban Two Lane Defaults	Heavy Vehicle Percentage	Adjustment Factor For Heavy Vehicle	Calculated Base Critical Headway
E Canal Road (SR 921) and Greenbriar Road	Two Lanes	Other	WB L	Left Turn from Major Roadway	4.3	1	0	0	0	0	4.3	3	0	0.9	3.0
	Two Lanes	Minor Left Turn at Three Leg Intersection	NB L	Left Turn from Minor (1 Stage only)	7.1	1	0.05	0.2	4	0.7	7.25	3	0.05	0.9	3.0
	Two Lanes	Other	NB R	Right Turn from Minor Roadway	6.2	1	0.07	0.1	4	0	6.67	3.1	0.07	0.9	3.2
Bull Road (SR 4001) and Hilton Avenue	Two Lanes	Other	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0.01	0.2	0	0	7.11	3	0.01	0.9	3.0
	Two Lanes	Other	EB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0.00	0.9	4.0
	Two Lanes	Other	EB R	Right Turn from Minor Roadway	6.2	1	0	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	WB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	0	0	7.1	3	0	0.9	3.0
	Two Lanes	Other	WB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0	0.9	4.0
	Two Lanes	Other	WB R	Right Turn from Minor Roadway	6.2	1	0.00	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.00	0	2	0	4.3	3	0	0.9	3.0
	Two Lanes	Other	SB L	Left Turn from Major Roadway	4.3	1	0.00	0	-2	0	4.3	3	0	0.9	3.0
Bull Road (SR 4001) and Site Drive	Two Lanes	Minor Left Turn at Three Leg Intersection	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0	0.2	0	0.7	6.4	3	0	0.9	3.0
	Two Lanes	Other	EB R	Left Turn from Minor (1 Stage only)	7.1	1	0.30	0.2	0	0	7.39	3	0.29	0.9	3.3
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.09	0	0	0	4.38	3	0.08	0.9	3.1

2029 BUILD PM PEAK HOUR

Location	Number of Lanes	Intersection Geometry Minor Street Left-Turn movement at Three-leg intersections?	Movement	Vehicle Movement	BASE CRITICAL HEADWAY							BASE FOLLOW-UP HEADWAY			
					Suburban Two Lane Defaults	Adjustment Factor For Heavy Vehicle	Heavy Vehicle Percentage	Adjustment Factor for Grades	Approach Grade	Adj. Factor for Intersection geometry	Calculated Base Critical Headway	Suburban Two Lane Defaults	Heavy Vehicle Percentage	Adjustment Factor For Heavy Vehicle	Calculated Base Critical Headway
E Canal Road (SR 921) and Greenbriar Road	Two Lanes	Other	WB L	Left Turn from Major Roadway	4.3	1	0	0	0	0	4.3	3	0	0.9	3.0
	Two Lanes	Minor Left Turn at Three Leg Intersection	NB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	4	0.7	7.2	3	0	0.9	3.0
	Two Lanes	Other	NB R	Right Turn from Minor Roadway	6.2	1	0.03	0.1	4	0	6.63	3.1	0.03	0.9	3.1
Bull Road (SR 4001) and Hilton Avenue	Two Lanes	Other	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0.03	0.2	0	0	7.13	3	0.03	0.9	3.0
	Two Lanes	Other	EB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0.00	0.9	4.0
	Two Lanes	Other	EB R	Right Turn from Minor Roadway	6.2	1	0	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	WB L	Left Turn from Minor (1 Stage only)	7.1	1	0.00	0.2	0	0	7.1	3	0	0.9	3.0
	Two Lanes	Other	WB T	Through Traffic on Minor (1 Stage only)	6.5	1	0.00	0.2	0	0	6.5	4	0	0.9	4.0
	Two Lanes	Other	WB R	Right Turn from Minor Roadway	6.2	1	0.00	0.1	0	0	6.2	3.1	0	0.9	3.1
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.01	0	2	0	4.31	3	0.01	0.9	3.0
	Two Lanes	Other	SB L	Left Turn from Major Roadway	4.3	1	0.00	0	-2	0	4.3	3	0	0.9	3.0
Bull Road (SR 4001) and Site Drive	Two Lanes	Minor Left Turn at Three Leg Intersection	EB L	Left Turn from Minor (1 Stage only)	7.1	1	0	0.2	0	0.7	6.4	3	0	0.9	3.0
	Two Lanes	Other	EB R	Left Turn from Minor (1 Stage only)	7.1	1	0.13	0.2	0	0	7.22	3	0.12	0.9	3.1
	Two Lanes	Other	NB L	Left Turn from Major Roadway	4.3	1	0.34	0	0	0	4.63	3	0.33	0.9	3.3



- LEGEND**
- SITE DRIVEWAY
  - ⊙ TRAFFIC SIGNAL
  - ⊙ STOP CONTROLLED
  - AM PEAK (PM PEAK)

# LANGAN

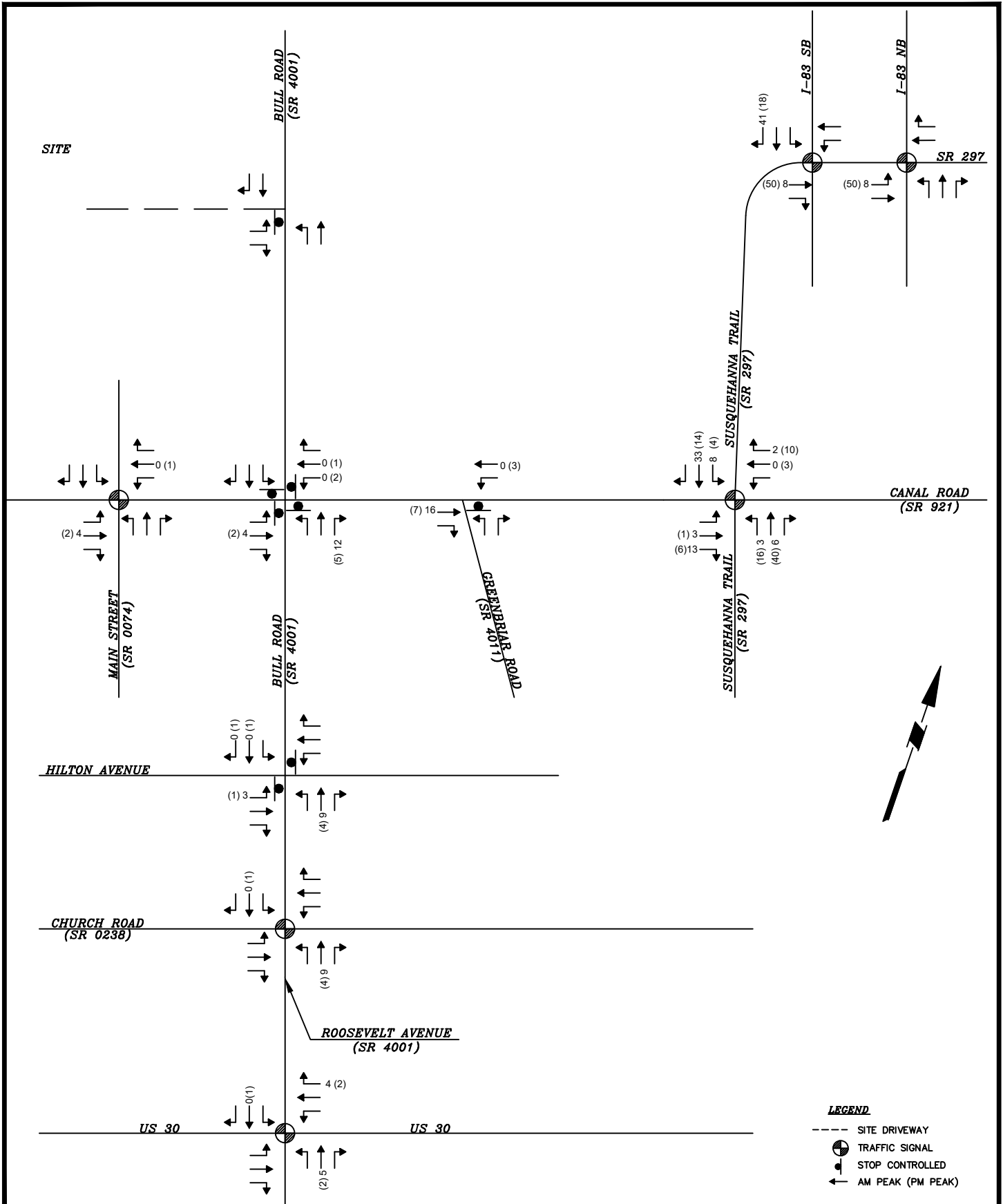
Langan Engineering and Environmental Services, Inc.  
 Stone Manor Corporate Center, 2700 Kelly Road, Suite 200  
 Warrington, PA 18976  
 T: 215.491.6500 F: 215.491.6501 www.langan.com

Project  
**BULL ROAD LOGISTICS**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title  
**FREEDOM SQUARE (PHASE 1)**

Project No.  
 200164401  
 Date  
 rev 6/6/2023  
 Drawn By  
 KLP  
 Checked By  
 RJL

Drawing No.  
**D1**



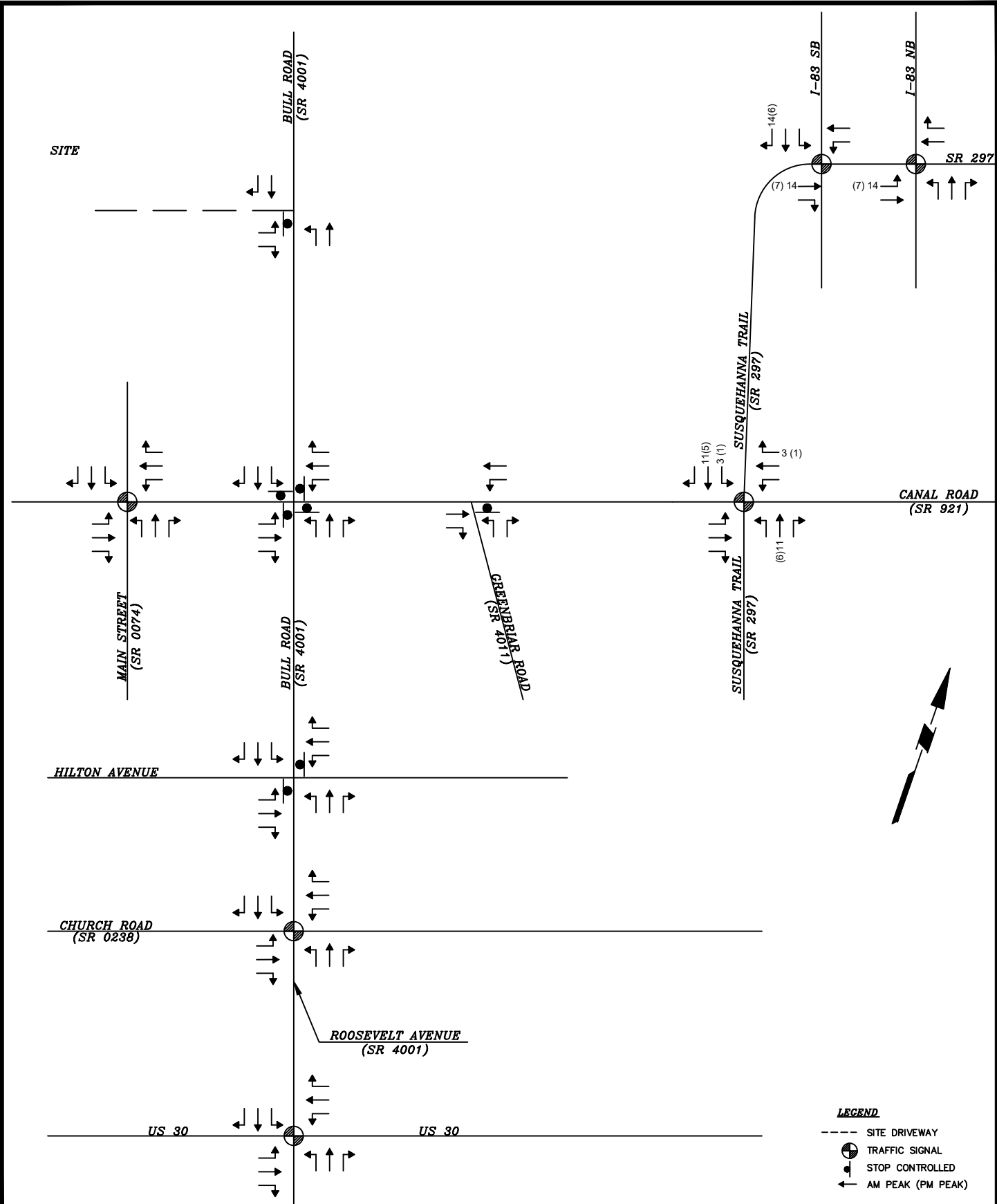
**LANGAN**  
 Langan Engineering and Environmental Services, Inc.  
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 T: 215.491.6500 F: 215.491.6501 www.langan.com

Project  
**BULL ROAD LOGISTICS**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title  
**MANCHESTER COMMERCE CENTER - CARS**

Project No.  
200164401  
 Date  
rev 6/6/2023  
 Drawn By  
KLP  
 Checked By  
RJL

Drawing No.  
**D2**



- LEGEND**
- SITE DRIVEWAY
  - ⊕ TRAFFIC SIGNAL
  - ⊙ STOP CONTROLLED
  - ← AM PEAK (PM PEAK)

<p><b>LANGAN</b></p> <p>Langan Engineering and Environmental Services, Inc.</p> <p>Stone Manor Corporate Center, 2700 Kelly Road, Suite 200 Warrington, PA 18976</p> <p>T: 215.491.6500 F: 215.491.6501 www.langan.com</p>	Project	Drawing Title	Project No.	Drawing No.
	<b>BULL ROAD LOGISTICS</b>	<b>MANCHESTER COMMERCE CENTER - TRUCKS</b>	200164401	
	DOVER TOWNSHIP YORK COUNTY PENNSYLVANIA		Date rev 6/6/2023	
			Drawn By KLP	
			Checked By RJL	<b>D3</b>

February 25, 2022

TPD# PSCO.0007



TRAFFIC PLANNING AND DESIGN, INC.



**Freedom Square – Master Plan**

Transportation Impact Study – Part 1  
(Report/Figures)

**For Submission To:**

*PennDOT District 8-0; Conewago Township, York  
County; & York County Planning Commission*

## EXECUTIVE SUMMARY

The purpose of this study is to examine the potential traffic impact associated with the proposed Freedom Square Development on the roadway network in Conewago Township, York County, PA. Based on this evaluation, the following conclusions were reached:

1. This report has been prepared in accordance with Appendix A - Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits of PennDOT *Publication 282*, dated July 2017.
2. The project scope and the extent of the study area were based on the contents of the approved TIS Scoping Application dated October 14, 2021. The study area intersections included in this TIS are as follows:
  - » Lewisberry Road (SR 4009) and Butter Road;
  - » Lewisberry Road (SR 4009) and Canal Road (SR 0921);
  - » Susquehanna Trail (T-956) and Canal Road (SR 0921);
  - » Copenhaffer Road and Canal Road (SR 0921);
  - » Copenhaffer Road and Susquehanna Trail (T-956);
  - » Copenhaffer Road and Stone Gate Drive/Proposed Street Q;
  - » Copenhaffer Road and Fisher Drive;
  - » Copenhaffer Road and Green Springs Road/Twp Admin. Building Driveway;
  - » Copenhaffer Road and Butter Road;
  - » Green Springs Road and Cross Farm Lane;
  - » Susquehanna Trail (T-956) and Cross Farm Lane;
  - » Susquehanna Trail (SR 0297) and I-83 South Ramps;
  - » Susquehanna Trail (SR 0297) and I-83 North Ramps;
  - » Susquehanna Trail (SR 4005) and Farm Trail Road/Church Road (SR 0238);
  - » Church Road (SR 0238) and I-83 South Ramps;
  - » Church Road (SR 0238) and I-83 North Ramps/Board Road (SR 1031);
  - » Lewisberry Road (SR 4009) and Proposed Site Driveways;
  - » Canal Road (SR 0921) and Proposed Site Driveways.
3. The ±458-acre project site is located on both sides of Canal Road (SR 0921), between Copenhaffer Road and Lewisberry Road (SR 4009) within the Township's (V) Village Zoning District. The proposed mixed-use development will consist of residential, commercial, office and light industrial uses which will be built-out over three (3) traffic phases as follows:

### Traffic Phase 1

- » Single-Family Detached Housing – 226 dwelling units;
- » Multifamily Low-Rise Housing (Townhomes) – 80 dwelling units;
- » Senior Adult Housing – Attached (Active Adult) – 293 dwelling units.

### Traffic Phase 2 (including Phase 1 build-out)

- » Single-Family Detached Housing – 334 dwelling units;
- » Multifamily Low-Rise Housing (Townhomes) – 309 dwelling units;



- » Multifamily Mid-Rise Housing (Apartments) – 320 dwelling units;
- » Senior Adult Housing – Attached (Active Adult) – 523 dwelling units;
- » Assisted Living (Memory Care) – 180 beds;
- » Shopping Center (Commercial Space) – 24,700 s.f.

**Traffic Phase 3 (including Phase 1&2 build-out)**

- » Light Industrial (Flex Space) – 77,800 s.f.
- » Mini-Warehouse (Self Storage) – 100,000 s.f.
- » Single-Family Detached Housing – 707 dwelling units;
- » Multifamily Low-Rise Housing (Townhomes) – 309 dwelling units;
- » Multifamily Mid-Rise Housing (Apartments) – 536 dwelling units;
- » Senior Adult Housing – Attached (Active Adult) – 643 dwelling units;
- » Assisted Living (Memory Care) – 180 beds;
- » Shopping Center (Commercial Space) – 169,600 s.f.
- » Hotel – 280 rooms;
- » General Office Building – 136,800 s.f.
- » Public Park – 5.7 acres

For purposes of this TIS the proposed development has been assumed to consist of **three (3) traffic phases** as follows:

- » **Traffic Phase 1** will consist of land development phases 1-2 and is anticipated to have an opening year of 2025.
- » **Traffic Phase 2** will consist of land development phase 3 and is anticipated to have an opening year of 2028. For analysis purposes, Traffic Phase 2 includes impacts of land development phases 1-3.
- » **Traffic Phase 3** (full build-out) will consist of land development phases 4-7 and is anticipated to have an opening year of 2031. For analysis purposes, Traffic Phase 3 evaluates full build-out of the development (land development phases 1-7).

4. Access for the development is proposed to be built out as follows:

**Traffic Phase 1:**

- » Construct one (1) full-movement local road (Street AA) to Lewisberry Road (SR 4009).
- » Construct two (2) full-movement local roads (Street T and Street GG) to Canal Road (SR 0921) creating a 4-way intersection.
- » Construct one (1) full-movement local road (Street Q) to Copenhaffer Road, directly opposite Stone Gate Drive.
- » A connection to Taylor Drive (Street R), which ultimately provides access to Copenhaffer Road.

**Traffic Phase 2:**

- » Construct one (1) right-in, right-out, left-in local road (Street D – north leg) to Canal Road (SR 0921).
- » Construct one (1) full-movement local road connection to Canal Road (SR 0921), which will be designed as a 3-leg roundabout (Street A – north leg).

### Traffic Phase 3:

- » Construct one (1) right-in, right-out, left-in driveway (Street D – south leg) to Canal Road (SR 0921).
  - » Construct one (1) full-movement local road connection to Canal Road (SR 0921), which will be designed as a 4-leg roundabout (Street A – south leg).
  - » Construct one (1) full-movement local road connection (Street C) to Canal Road (SR 0921).
  - » Construct one (1) full-movement driveway (Driveway V) to Canal Road (SR 0921).
5. Based on trip generation data obtained from the tenth edition of the manual *Trip Generation* and the methodologies within the approved scope application, the proposed development is anticipated to generate the following:
- » **Traffic Phase 1:** 262 new vehicle-trips during the weekday A.M. peak hour, 343 new vehicle-trips during the weekday P.M. peak hour and 362 new vehicle-trips during the Saturday midday peak hour.
  - » **Traffic Phase 2:** 737 new vehicle-trips during the weekday A.M. peak hour, 863 new vehicle-trips during the weekday P.M. peak hour and 1,063 new vehicle-trips during the Saturday midday peak hour.
  - » **Traffic Phase 3:** (Full Build-Out): 1,436 new vehicle-trips during the weekday A.M. peak hour, 1,793 new vehicle-trips during the weekday P.M. peak hour and 2,098 new vehicle-trips during the Saturday midday peak hour.
6. PennDOT's *Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits* typically requires analyses of the following future years:
- » Opening Year which is assumed to be the last phase of construction;
  - » Design Horizon Year which is assumed to be 5 years after the Opening Year.
- However, as outlined in the approved scope application, TPD analyzed Traffic Phase 1 2025 opening year; Traffic Phase 2 2028 opening year and Traffic Phase 3 (Full Build-Out) 2031 opening year with a 2036 design year.
7. Capacity analyses were conducted to determine the quality of operation (LOS) at the study area intersections for the 2021 existing conditions, 2025/2028/2031/2036 base (no-build) conditions, projected (build) conditions, and projected (build) conditions with improvements. The capacity analyses were conducted in accordance with the standards contained in Appendix A - Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits of PennDOT *Publication 282*, dated July 2017.
8. Levels of Service (LOS) for the study area intersections have been summarized in matrix form. **Tables I-III** detail the overall intersection LOS for each study area intersection for the analyzed conditions and time periods. **Tables 14-22** of the report details the LOS for all approaches and movements at the study area intersections for the analyzed conditions and time periods.

**TABLE I**  
**OVERALL INTERSECTION LEVEL OF SERVICE SUMMARY – TRAFFIC PHASE 1**

Intersection	Time Period	2021 Existing Conditions	2025 Base Conditions	Phase 1 Opening Year 2025		Meets LOS Requirements?
				Projected Conditions	Projected Conditions <sup>1</sup>	
Lewisberry Road (SR 4009) & Butter Road	AM	A (4.4)	A (4.3)	A (4.2)	--	YES
	PM	A (4.6)	A (4.4)	A (4.4)	--	YES
	SAT	A (5.0)	A (4.7)	A (4.6)	--	YES
Lewisberry Road (SR 4009) & Canal Road (SR 0921)	AM	A (3.3)	A (3.7)	A (5.1)	--	YES
	PM	A (4.6)	A (5.5)	A (8.3)	--	YES
	SAT	A (3.1)	A (3.3)	A (4.1)	--	YES
Susquehanna Trail (T-956) & Canal Road (SR 0921)	AM	A (9.5)	B (14.0)	B (17.0)	--	YES
	PM	A (8.6)	B (12.6)	B (18.3)	--	YES
	SAT	A (8.0)	A (9.0)	B (10.2)	--	YES
Copenhaffer Road & Canal Road (SR 0921)	AM	A (3.2)	A (4.1)	A (4.6)	--	YES
	PM	A (1.9)	A (3.0)	A (3.4)	--	YES
	SAT	A (1.2)	A (0.9)	A (1.0)	--	YES
Copenhaffer Road & Susquehanna Trail (T-956)	AM	A (6.2)	A (8.5)	D (39.6)	C (16.3)	NO <sup>2</sup>
	PM	B (10.1)	F (83.7)	F (58.9)	F (71.0)	YES
	SAT	A (6.0)	A (6.2)	D (31.5)	B (11.1)	NO <sup>2</sup>
Copenhaffer Road & Stone Gate Drive/Street Q	AM	A (0.5)	A (0.5)	A (4.1)	A (4.3)	YES
	PM	A (0.6)	A (0.6)	A (4.2)	A (4.6)	YES
	SAT	A (0.3)	A (0.3)	A (4.8)	A (5.1)	YES
Copenhaffer Road & Fisher Drive	AM	A (2.7)	A (2.6)	A (2.7)	A (2.5)	YES
	PM	A (3.1)	A (3.1)	A (3.1)	A (3.1)	YES
	SAT	A (3.7)	A (3.7)	A (3.5)	A (3.4)	YES
Copenhaffer Road & Green Springs Road/Twp Admin.	AM	A (1.4)	A (1.3)	A (1.4)	A (1.5)	YES
	PM	A (2.2)	A (2.2)	A (2.4)	A (2.7)	YES
	SAT	A (2.0)	A (1.9)	A (2.2)	A (2.3)	YES
Copenhaffer Road & Butter Road	AM	A (6.0)	A (5.9)	A (5.7)	--	YES
	PM	A (5.8)	A (5.7)	A (5.6)	--	YES
	SAT	A (5.3)	A (5.3)	A (5.2)	--	YES
Green Springs Road & Cross Farm Lane	AM	A (2.5)	A (2.4)	A (2.4)	A (1.8)	YES
	PM	A (5.2)	A (5.3)	A (5.3)	A (4.0)	YES
	SAT	A (4.7)	A (4.8)	A (4.8)	A (3.6)	YES
Susquehanna Trail (T-956) & Cross Farm Lane	AM	A (5.5)	A (6.1)	A (6.6)	A (7.7)	YES
	PM	A (5.5)	A (6.1)	A (6.5)	A (7.4)	YES
	SAT	A (4.1)	A (4.4)	A (4.7)	A (5.6)	YES

Base = No-Build scenario; Projected = Build scenario for Traffic Phase 1 of Freedom Square

<sup>1</sup> Projected conditions with implementation of improvements recommended in this TIS

<sup>2</sup> Condition 1: Marginal ILOS degradation per PennDOT standards; Township approval to be obtained

**TABLE I (CONTINUED)**  
**OVERALL INTERSECTION LEVEL OF SERVICE SUMMARY – TRAFFIC PHASE 1**

Intersection	Time Period	2021 Existing Conditions	2025 Base Conditions	Phase 1 Opening Year 2025		Meets LOS Requirements?
				Projected Conditions	Projected Conditions <sup>1</sup>	
I-83 South Ramps & Susquehanna Trail (SR 0297)	AM	D (36.2)	E (67.2)	F (81.2)	C (33.3)	YES
	PM	D (41.9)	F (115.7)	F (131.3)	E (57.7)	YES
	SAT	B (15.6)	C (20.1)	C (21.2)	B (19.8)	YES
I-83 North Ramps & Susquehanna Trail (SR 0297)	AM	C (20.8)	C (22.5)	C (23.1)	C (25.1)	YES
	PM	C (22.7)	D (38.9)	D (50.4)	D (37.0)	YES
	SAT	B (10.9)	B (12.5)	B (13.2)	B (13.3)	YES
Susquehanna Trail (SR 4005) & Farm Trail Road/Church Road (SR 0238)	AM	C (27.3)	C (30.1)	C (31.9)	--	YES
	PM	C (28.5)	C (29.8)	C (31.3)	--	YES
	SAT	B (16.6)	B (17.6)	B (18.4)	--	YES
I-83 South Ramps & Church Road (SR 0238)	AM	C (29.6)	C (25.3)	C (25.8)	--	YES
	PM	D (51.6)	C (27.5)	C (29.0)	--	YES
	SAT	A (9.9)	B (10.0)	B (10.2)	--	YES
I-83 North Ramps/Board Road (SR 1031) & Church Road (SR 0238)	AM	D (39.1)	D (50.4)	D (51.9)	--	YES
	PM	D (35.2)	D (43.8)	D (44.5)	--	YES
	SAT	B (18.2)	C (21.0)	C (21.5)	--	YES
Lewisberry Road (SR 4009) & Street AA	AM	--	--	A (0.8)	--	YES
	PM	--	--	A (0.7)	--	YES
	SAT	--	--	A (0.9)	--	YES
Canal Road (SR 0921) & Street GG/Street T	AM	--	--	A (1.0)	--	YES
	PM	--	--	A (0.8)	--	YES
	SAT	--	--	A (0.9)	--	YES

*Base = No-Build scenario; Projected = Build scenario for Traffic Phase 1 of Freedom Square*

<sup>1</sup> *Projected conditions with implementation of improvements recommended in this TIS*

<sup>2</sup> *Condition 1: Marginal ILOS degradation per PennDOT standards; Township approval to be obtained*

**TABLE II**  
**OVERALL INTERSECTION LEVEL OF SERVICE SUMMARY – TRAFFIC PHASE 2**

Intersection	Time Period	2028 Base Conditions	Phase 2 Opening Year 2028		Meets LOS Requirements?
			Projected Conditions	Projected Conditions <sup>1</sup>	
Lewisberry Road (SR 4009) & Butter Road	AM	A (4.3)	A (4.1)	--	YES
	PM	A (4.5)	A (4.3)	--	YES
	SAT	A (4.8)	A (4.5)	--	YES
Lewisberry Road (SR 4009) & Canal Road (SR 0921)	AM	A (3.9)	B (14.2)	A (8.1)	YES
	PM	A (5.8)	E (42.6)	A (8.5)	YES
	SAT	A (3.3)	A (9.3)	A (7.3)	YES
Susquehanna Trail (T-956) & Canal Road (SR 0921)	AM	B (14.4)	C (29.8)	C (24.8)	NO <sup>2</sup>
	PM	B (12.8)	E (69.6)	C (27.0)	NO <sup>2</sup>
	SAT	A (9.0)	C (25.9)	B (18.7)	NO <sup>2</sup>
Copenhaffer Road & Canal Road (SR 0921)	AM	A (4.3)	A (5.7)	A (2.3)	YES
	PM	A (3.1)	A (4.5)	A (2.2)	YES
	SAT	A (0.9)	A (1.3)	A (0.2)	YES
Copenhaffer Road & Susquehanna Trail (T-956)	AM	A (9.1)	F (80.8)	A (4.2)	YES
	PM	C (19.8)	F (52.1)	A (4.4)	YES
	SAT	A (6.3)	F (83.4)	A (4.5)	YES
Copenhaffer Road & Stone Gate Drive/Street Q	AM	A (0.5)	A (4.9)	A (5.6)	YES
	PM	A (0.6)	A (4.8)	A (5.6)	YES
	SAT	A (0.3)	A (6.1)	A (7.4)	YES
Copenhaffer Road & Fisher Drive	AM	A (2.7)	A (2.6)	A (2.3)	YES
	PM	A (3.2)	A (3.0)	A (2.9)	YES
	SAT	A (3.7)	A (3.2)	A (2.8)	YES
Copenhaffer Road & Green Springs Road/Twp Admin.	AM	A (1.3)	A (1.5)	A (1.5)	YES
	PM	A (2.2)	A (2.7)	A (2.9)	YES
	SAT	A (2.0)	A (2.5)	A (2.3)	YES
Copenhaffer Road & Butter Road	AM	A (5.9)	A (5.6)	--	YES
	PM	A (5.7)	A (5.6)	--	YES
	SAT	A (5.3)	A (5.0)	--	YES
Green Springs Road & Cross Farm Lane	AM	A (2.5)	A (2.4)	A (1.6)	YES
	PM	A (5.2)	A (5.2)	A (3.6)	YES
	SAT	A (4.7)	A (4.7)	A (3.1)	YES
Susquehanna Trail (T-956) & Cross Farm Lane	AM	A (6.2)	A (7.5)	A (9.9)	YES
	PM	A (6.2)	A (7.2)	A (9.0)	YES
	SAT	A (4.4)	A (5.3)	A (7.2)	YES

Base = No-Build scenario; Projected = Build scenario for Traffic Phases 1& 2 of Freedom Square

<sup>1</sup> Projected conditions with implementation of improvements recommended in this TIS

<sup>2</sup> Condition 1: Marginal ILOS degradation per PennDOT standards; Township approval to be obtained

**TABLE II (CONTINUED)**  
**OVERALL INTERSECTION LEVEL OF SERVICE SUMMARY – TRAFFIC PHASE 2**

Intersection	Time Period	2028 Base Conditions	Phase 2 Opening Year 2028		Meets LOS Requirements?
			Projected Conditions	Projected Conditions <sup>1</sup>	
I-83 South Ramps & Susquehanna Trail (SR 0297)	AM	E (71.0)	F (109.0)	B (19.5)	YES
	PM	F (121.1)	F (158.7)	D (41.6)	YES
	SAT	C (20.4)	C (26.5)	B (16.5)	YES
I-83 North Ramps & Susquehanna Trail (SR 0297)	AM	C (23.0)	C (27.5)	B (17.7)	YES
	PM	D (42.1)	E (74.7)	C (24.7)	YES
	SAT	B (12.8)	B (15.0)	B (13.6)	YES
Susquehanna Trail (SR 4005) & Farm Trail Road/Church Road (SR 0238)	AM	C (30.9)	D (40.6)	D (37.4)	YES
	PM	C (30.3)	D (36.2)	D (36.0)	YES
	SAT	B (17.7)	C (20.3)	B (19.9)	YES
I-83 South Ramps & Church Road (SR 0238)	AM	C (25.8)	C (27.6)	C (23.7)	YES
	PM	C (28.4)	C (27.5)	C (28.2)	YES
	SAT	B (10.1)	B (10.6)	B (10.6)	YES
I-83 North Ramps/Board Road (SR 1031) & Church Road (SR 0238)	AM	D (52.5)	D (56.9)	D (53.2)	YES
	PM	D (44.8)	D (46.6)	D (46.6)	YES
	SAT	C (21.3)	C (22.9)	C (22.9)	YES
Lewisberry Road (SR 4009) & Street AA	AM	--	A (2.7)	--	YES
	PM	--	A (1.9)	--	YES
	SAT	--	A (2.6)	--	YES
Canal Road (SR 0921) & Street GG/Street T	AM	--	A (1.9)	A (1.2)	YES
	PM	--	A (1.7)	A (1.1)	YES
	SAT	--	A (2.1)	A (1.5)	YES
Canal Road (SR 0921) & Street A	AM	--	A (8.8)	C (17.5)	YES
	PM	--	A (8.6)	C (15.3)	YES
	SAT	--	A (7.6)	B (10.0)	YES
Canal Road (SR 0921) & Street D	AM	--	A (0.4)	A (0.4)	YES
	PM	--	A (0.5)	A (0.5)	YES
	SAT	--	A (0.7)	A (0.7)	YES

Base = No-Build scenario; Projected = Build scenario for Traffic Phases 1 & 2 of Freedom Square

<sup>1</sup> Projected conditions with implementation of improvements recommended in this TIS

<sup>2</sup> Condition 1: Marginal ILOS degradation per PennDOT standards; Township approval to be obtained

**TABLE III  
OVERALL INTERSECTION LEVEL OF SERVICE SUMMARY – TRAFFIC PHASE 3**

Intersection	Time Period	Phase 3 Opening Year 2031			Phase 3 Full Build-Out/Design Year 2036			Meets LOS Requirements?
		Base Conditions	Projected Conditions	Projected Conditions <sup>1</sup>	Base Conditions	Projected Conditions	Projected Conditions <sup>1</sup>	
Lewisberry Road (SR 4009) & Butter Road	AM	A (4.3)	A (4.0)	--	A (4.3)	A (4.0)	--	YES
	PM	A (4.5)	A (4.2)	--	A (4.5)	A (4.3)	--	YES
	SAT	A (4.7)	A (4.2)	--	A (4.9)	A (4.3)	--	YES
Lewisberry Road (SR 4009) & Canal Road (SR 0921)	AM	A (4.0)	F (87.7)	A (9.4)	A (4.3)	F (101.8)	A (9.6)	YES
	PM	A (6.1)	F (352.5)	B (12.5)	A (6.7)	F (*)	B (12.9)	YES
	SAT	A (3.3)	F (111.0)	B (10.6)	A (3.4)	F (122.6)	B (10.7)	YES
Susquehanna Trail (T-956) & Canal Road (SR 0921)	AM	B (14.9)	F (130.0)	C (27.9)	B (16.0)	F (137.7)	C (28.5)	NO <sup>2</sup>
	PM	B (13.0)	F (238.0)	C (29.9)	B (13.4)	D (250.7)	C (30.6)	NO <sup>2</sup>
	SAT	A (9.1)	F (243.8)	C (24.7)	A (9.2)	F (253.1)	C (25.0)	NO <sup>2</sup>
Copenhaffer Road & Canal Road (SR 0921)	AM	A (4.4)	A (7.5)	A (3.8)	A (4.7)	A (8.2)	A (4.3)	YES
	PM	A (3.3)	A (5.9)	A (5.0)	A (3.5)	A (6.7)	A (5.7)	YES
	SAT	A (0.9)	A (1.5)	A (0.2)	A (0.9)	A (1.5)	A (0.3)	YES
Copenhaffer Road & Susquehanna Trail (T-956)	AM	A (9.8)	F (118.7)	A (4.6)	B (10.5)	F (129.6)	A (4.7)	YES
	PM	C (23.8)	F (*)	A (4.9)	D (26.5)	F (*)	A (4.9)	YES
	SAT	A (6.6)	C (17.8)	A (5.1)	A (6.7)	C (19.5)	A (5.1)	YES
Copenhaffer Road & Stone Gate Drive/Street Q	AM	A (0.5)	A (5.1)	A (5.4)	A (0.6)	A (5.1)	A (5.5)	YES
	PM	A (0.6)	A (4.4)	A (4.7)	A (0.6)	A (4.3)	A (4.6)	YES
	SAT	A (0.3)	A (5.2)	A (5.7)	A (0.4)	A (5.2)	A (5.7)	YES
Copenhaffer Road & Fisher Drive	AM	A (2.7)	A (2.6)	A (2.4)	A (2.7)	A (2.7)	A (2.5)	YES
	PM	A (3.2)	A (3.0)	A (3.0)	A (3.2)	A (3.0)	A (3.0)	YES
	SAT	A (3.7)	A (3.1)	A (3.0)	A (3.7)	A (3.2)	A (3.0)	YES
Copenhaffer Road & Green Springs Road/Twp Admin.	AM	A (1.4)	A (1.7)	A (1.7)	A (1.4)	A (1.7)	A (1.7)	YES
	PM	A (2.2)	A (2.9)	A (3.3)	A (2.2)	A (3.0)	A (3.3)	YES
	SAT	A (2.0)	A (2.6)	A (2.7)	A (2.0)	A (2.6)	A (2.7)	YES
Copenhaffer Road & Butter Road	AM	A (5.9)	A (5.4)	--	A (5.9)	A (5.3)	--	YES
	PM	A (5.7)	A (5.5)	--	A (5.8)	A (5.5)	--	YES
	SAT	A (5.3)	A (5.0)	--	A (5.3)	A (5.0)	--	YES
Green Springs Road & Cross Farm Lane	AM	A (2.5)	A (2.4)	A (1.9)	A (2.5)	A (2.5)	A (1.9)	YES
	PM	A (5.2)	A (5.3)	A (4.3)	A (5.3)	A (5.3)	A (4.3)	YES
	SAT	A (4.8)	A (4.8)	A (3.9)	A (4.8)	A (4.8)	A (3.9)	YES
Susquehanna Trail (T-956) & Cross Farm Lane	AM	A (6.3)	A (8.6)	A (9.3)	A (6.4)	A (8.8)	A (9.4)	YES
	PM	A (6.3)	A (8.1)	A (8.2)	A (6.4)	A (8.3)	A (8.4)	YES
	SAT	A (4.5)	A (5.8)	A (6.4)	A (4.5)	A (5.8)	A (6.5)	YES

Base = No-Build scenario; Projected = Build scenario for full build-out of Freedom Square

<sup>1</sup> Projected conditions with implementation of improvements recommended in this TIS

<sup>2</sup> Condition 1: Marginal ILOS degradation per PennDOT standards; Township approval to be obtained

TABLE III (CONT.) - OVERALL INTERSECTION LEVEL OF SERVICE SUMMARY – TRAFFIC PHASE 3

Intersection	Time Period	Phase 3 Opening Year 2031			Phase 3 Full Build-Out/Design Year 2036			Meets LOS Requirements?
		Base Conditions	Projected Conditions	Projected Conditions <sup>1</sup>	Base Conditions	Projected Conditions	Projected Conditions <sup>1</sup>	
I-83 South Ramps & Susquehanna Trail (SR 0297)	AM	E (75.8)	F (142.0)	B (17.4)	F (82.0)	F (149.5)	B (17.6)	YES
	PM	F (125.9)	F (196.4)	D (38.7)	F (134.7)	F (205.4)	D (42.0)	YES
	SAT	C (21.2)	D (44.1)	B (15.5)	C (21.7)	D (48.0)	B (15.9)	YES
I-83 North Ramps & Susquehanna Trail (SR 0297)	AM	C (23.4)	D (52.5)	B (17.2)	C (24.3)	E (59.0)	B (17.8)	YES
	PM	D (45.4)	F (112.4)	C (23.0)	D (52.6)	F (121.3)	C (24.4)	YES
	SAT	B (12.9)	B (16.8)	B (13.6)	B (13.3)	B (17.1)	B (13.6)	YES
Susquehanna Trail (SR 4005) & Farm Trail Road/Church Road (SR 0238)	AM	C (31.8)	E (60.2)	C (29.2)	C (33.6)	E (64.9)	C (29.8)	YES
	PM	C (31.0)	E (56.8)	D (40.2)	C (32.1)	E (60.9)	D (41.8)	NO <sup>2</sup>
	SAT	B (17.8)	C (23.8)	C (23.1)	B (18.1)	C (24.1)	C (23.4)	NO <sup>2</sup>
I-83 South Ramps & Church Road (SR 0238)	AM	C (26.5)	C (32.0)	C (20.2)	C (27.6)	C (34.5)	C (21.6)	YES
	PM	C (29.6)	D (35.8)	C (26.9)	C (31.5)	D (39.3)	C (29.0)	YES
	SAT	B (10.2)	B (11.4)	B (10.5)	B (10.4)	B (11.6)	B (10.7)	YES
I-83 North Ramps/Board Road (SR 1031) & Church Road (SR 0238)	AM	D (54.9)	E (63.5)	D (42.7)	E (58.5)	E (68.2)	D (44.1)	YES
	PM	D (46.1)	D (51.5)	D (46.7)	D (48.1)	E (55.2)	D (50.0)	YES
	SAT	C (21.5)	C (25.0)	C (22.3)	C (21.9)	C (25.6)	C (22.8)	YES
Lewisberry Road (SR 4009) & Street AA	AM	--	A (2.4)	--	--	A (2.4)	--	YES
	PM	--	A (1.7)	--	--	A (1.7)	--	YES
	SAT	--	A (2.2)	--	--	A (2.1)	--	YES
Canal Road (SR 0921) & Street GG/Street T	AM	--	A (7.4)	A (2.0)	--	A (7.9)	A (2.0)	YES
	PM	--	A (6.4)	A (1.4)	--	A (7.0)	A (1.4)	YES
	SAT	--	A (6.5)	A (1.7)	--	A (6.7)	A (1.7)	YES
Canal Road (SR 0921) & Street C	AM	--	A (1.7)	A (1.6)	--	A (1.8)	A (1.6)	YES
	PM	--	A (4.0)	A (3.5)	--	A (4.2)	A (3.6)	YES
	SAT	--	A (3.3)	A (1.3)	--	A (3.5)	A (1.3)	YES
Canal Road (SR 0921) & Street A	AM	--	F (492.7)	B (10.3)	--	F (515.2)	B (10.5)	YES
	PM	--	F (1731.6)	B (13.1)	--	F (1790.5)	B (13.3)	YES
	SAT	--	F (1773.5)	B (11.6)	--	F (1809.5)	B (11.6)	YES
Canal Road (SR 0921) & Street D	AM	--	A (0.8)	A (0.7)	--	A (0.8)	A (0.7)	YES
	PM	--	A (1.3)	A (1.0)	--	A (1.3)	A (0.9)	YES
	SAT	--	A (1.3)	A (1.1)	--	A (1.3)	A (1.1)	YES
Canal Road (SR 0921) & Driveway V	AM	--	A (0.0)	A (0.0)	--	A (0.0)	A (0.0)	YES
	PM	--	A (0.1)	A (0.1)	--	A (0.1)	A (0.1)	YES
	SAT	--	A (0.1)	A (0.0)	--	A (0.1)	A (0.0)	YES

Base = No-Build scenario; Projected = Build scenario for full build-out of Freedom Square

<sup>1</sup> Projected conditions with implementation of improvements recommended in this TIS

<sup>2</sup> Condition 1: Marginal ILOS degradation per PennDOT standards; Township approval to be obtained



9. Under the 2025/2028/2031/2036 projected (build) conditions, with implementation of the recommended improvements, the study area intersections will operate in accordance with the standards contained in *Appendix A - Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits* of PennDOT Publication 282, dated July 2017, unless otherwise noted.
10. Given the size/complexity of the Freedom Square development, and the likelihood that potential future improvements may alter existing traffic patterns (i.e. a new interchange to Interstate 83 at Canal Road/SR 0921), the applicant is proposing to study only the impacts of Traffic Phase 1 in this TIS. The applicant will then be required to conduct a new TIS at the point of final land development approvals for Traffic Phases 2 and 3, as doing so would allow counts to be done to assess actual traffic generation of Traffic Phase 1, and to more accurately traffic conditions and improvements at that time. Therefore, the following approach to traffic improvement implementation is proposed:
  - a. This TIS will evaluate traffic impacts for Traffic Phases 1-3, although only the improvements associated with Traffic Phase 1 will be implemented up front.
  - b. The applicant reserves the right to conduct a new TIS for Traffic Phase 2 or Traffic Phase 3 after the improvements and land development associated with Traffic Phase 1 are built and operational. This will give the applicant the opportunity to conduct new counts and assess the actual traffic generation of the initial phases of the development, along with more accurate forecasting of impacts based on other regional developments or improvements (i.e., possible Canal Road interchange with Interstate 83).
  - c. The Township will place conditions on the LD/Conditional Use approval indicating that either: (1) a new TIS is required in order to proceed with approvals/development of phases beyond land development phase 2 as shown on the Freedom Square Master Plan; or (2) the recommended improvements noted in the initial TIS for Traffic Phases 2 and 3 are implemented. PennDOT may add a similar condition to the HOP associated with the Traffic Phase 1 improvements.
  - d. The applicant will not submit HOP plans for the site driveways/local roads associated with Traffic Phase 2 and 3 up front since this access is related to land development phases beyond Phase 3. Rather, an HOP will be submitted for these access points at the time approvals are pursued for land development phases 4 and beyond (Traffic Phases 2 and 3). Separating out the HOPs for the latter phases gives PennDOT leverage with the phasing, in that an HOP (and subsequent TIS) can be required before access is provided for the later development phases associated with Traffic Phases 2 and 3.
11. Traffic Planning and Design Inc. (TPD) recommends the following roadway improvements as outlined at the study area intersections with [Traffic Phase 1 of Freedom Square](#):

#### **Lewisberry Road (SR 4009) & Proposed Street AA**

- » Design Street AA as a low-volume local roadway, per PennDOT standards.
- » Provide one entering and one exiting lane.
- » Provide a stop sign (PennDOT designation R1-1) to control exiting traffic.
- » Provide and perpetually maintain required sight distances.

#### **Canal Road (SR 0921) & Proposed Street T/Street GG**

- » Design Street T as a medium-volume local roadway, per PennDOT standards.
- » Design Street GG as a low-volume driveway, per PennDOT standards.
- » Provide one entering and one exiting lane for Street T and Street GG.

- » Provide a stop sign (PennDOT designation R1-1) to control exiting traffic.
- » Provide and perpetually maintain required sight distances.

### **Copenhaffer Road & Stone Gate Drive/Proposed Street Q**

- » Design Street Q as a local roadway and align it directly opposite Stone Gate Drive.
- » Provide one entering and one exiting lane for Street Q.
- » Widen the northbound Copenhaffer Road approach to provide a 100' northbound left-turn lane with a 75' bay taper. This improvement is subject to the availability of ROW, as this improvement is not necessary in future phases once additional access points to Canal Road are constructed.
- » Provide a stop sign (PennDOT designation R1-1) to control exiting traffic.
- » Provide and perpetually maintain required sight distances.

### **Susquehanna Trail (SR 0297) & I-83 South Ramps**

- » Widen the southbound I-83 off-ramp approach to provide a 275' dedicated right-turn lane with a 100' bay taper.
- » Optimize traffic signal timings.

### **Susquehanna Trail & Copenhaffer Road**

- » Prohibit egress peak hour left turn movements (via a signing) on the northbound and southbound Copenhaffer Road approaches during the weekday AM (6-9 AM) and weekday PM (3-6 PM) peak periods.

As part of PennDOT's HOP and Township land development processes, the applicant will coordinate and fund the implementation of the recommended roadway improvements. Additionally, all improvements will be constructed to accommodate non-motorized access/circulation and be ADA-compliant unless otherwise approved by the Department.

12. Traffic Planning and Design Inc. (TPD) recommends the following roadway improvements as outlined at the study area intersections with [Traffic Phase 2 of Freedom Square](#):

### **Canal Road along Site Frontage**

- » Widen Canal Road along the site frontage to provide a continuous left turn lane outside the area of the proposed roundabout at Street A.

### **Canal Road (SR 0921) & Proposed Street T/Street GG**

- » Widen the westbound Canal Road (SR 0921) approach to provide a 75' westbound right-turn lane with a 100' bay taper.
- » Maintain the two-way center left turn lane pattern from Street A through Street T to provide a minimum of 75' of storage for the eastbound left turn movement into Street T.

### **Canal Road (SR 0921) & Proposed Street A**

- » Configure the intersection as a single-lane roundabout with yield-control on all approaches.
- » Design the roundabout diameter/geometry to accommodate a possible future expansion that includes a two-lane approach on eastbound/westbound Canal Road (SR 0921), if necessary; provide sufficient right of way to encompass this potential future northbound approach along with possible right turn bypass lane on the southbound approach.
- » Provide one entering and one exiting lane for Street A.

- » Provide and perpetually maintain required sight distances.

### **Canal Road (SR 0921) & Proposed Street D**

- » Design Street D (north-leg) as a medium-volume local roadway, per PennDOT standards.
- » Widen the westbound Canal Road (SR 0921) approach to provide a 150' westbound right-turn lane with a 100' bay taper.
- » Maintain the two-way center left turn lane pattern from Street A through Susquehanna Trail to provide a minimum of 75' of storage for the eastbound left turn movements.
- » Provide one entering and one exiting lane for Street D.
- » Provide a stop sign (PennDOT designation R1-1) to control exiting traffic.
- » Restrict exiting left-turn and through movements on the southbound Street D approach to Canal Road (SR 0921) via concrete median and appropriate signage.
- » Provide and perpetually maintain required sight distances.

### **Susquehanna Trail (SR 0297) & I-83 South Ramps**

- » Widen eastbound Susquehanna Trail (SR 0297) approaching the I-83 South On-Ramp. The length of the right-turn lane should be maximized relative to the location of the adjacent existing Rutter's driveway.
- » Optimize traffic signal timings.

### **Susquehanna Trail (SR 0297) & I-83 North Ramps**

- » Widen the northbound I-83 off-ramp approach to provide a 250' dedicated left-turn lane with a 75' bay taper.
- » Widen westbound Susquehanna Trail (SR 0297) approaching the I-83 North On-Ramp to provide a 75' westbound right-turn lane with a 100' bay taper.
- » Optimize traffic signal timings.

### **Susquehanna Trail & Copenhaffer Road**

- » Prohibit egress through and left turn movements (via a signing/median) on the northbound and southbound Copenhaffer Road approaches.

### **Canal Road (SR 0921) & Susquehanna Trail**

- » Widen the eastbound Canal Road (SR 0921) approach to provide a 200' dedicated left-turn lane that transitions to a two-way center left-turn lane pattern to proposed Street A.
- » Widen the eastbound Canal Road (SR 0921) approach to provide a 200' dedicated right-turn lane with a 100' bay taper.
- » Widen the westbound Canal Road (SR 0921) approach to provide a 75' dedicated left-turn lane with a 75' bay taper.
- » Widen the westbound Canal Road (SR 0921) approach to provide a 200' dedicated right-turn lane with a 100' bay taper.
- » Widen the northbound Susquehanna Trail approach to provide a 125' dedicated left-turn lane with a 75' bay taper. This lane length is constrained by the existing bridge to the south and may require an altered design/taper.

- » Optimize traffic signal timings, implement protected-permitted left-turn phasing on all approaches and permitted-overlap phasing on the westbound approach.

### **Canal Road (SR 0921) & Lewisberry Road (SR 4009)**

- » Install traffic signal.
- » Widen Canal Road (SR 0921) to provide a 75' left-turn lane with a 75' bay taper on the eastbound Canal Road (SR 0921) approach.
- » Widen Canal Road (SR 0921) to provide a minimum 75' left-turn lane that transitions to the two-way center left-turn lane pattern along Canal Road (SR 0921).

### **Church Road (SR 0238)/Farm Trail Road & Susquehanna Trail (SR 4005)**

- » Optimize traffic signal timings.
- » Implement right-turn overlap phasing on the northbound Susquehanna Trail (SR 4005) approach.

### **Church Road (SR 0238) & I-83 South Ramps**

- » Optimize traffic signal timings.

### **Church Road (SR 0238) & I-83 North Ramps/Board Road (SR 1031)**

- » Optimize traffic signal timings.

13. Traffic Planning and Design Inc. (TPD) recommends the following roadway improvements as outlined at the study area intersections with [Traffic Phase 3 \(full build-out\) of Freedom Square \(Note the following improvements assume construction of a new I-83 interchange with Canal Road \(SR 0921\)\)](#):

### **Canal Road (SR 0921) and Interstate 83 Interchange**

- » Given the capacity constraints in the area with or without the development, PennDOT, York County MPO, and nearby municipalities should continue to advocate for funding and design/construction advancement for a new interchange on Interstate 83 with SR 0921. Given the capacity analysis results in this study, it appears clear that a new interchange is required to support existing and future traffic volumes, or one of the existing interchanges to the north or south will need to be substantially rebuilt.
- » Based on recent feedback from PennDOT, it is TPD's understanding that PennDOT has submitted a Point of Access (POA) Study to FHWA for the new interchange. FHWA has provided comments on the POA study, and PennDOT is in the process of reviewing and responding to the FHWA comments.

### **Canal Road (SR 0921) & Proposed Driveway V**

- » Design Driveway V as a low-volume driveway, per PennDOT standards.
- » Provide one entering and one exiting lane for Driveway V.
- » Provide a stop sign (PennDOT designation R1-1) to control exiting traffic.
- » Provide and perpetually maintain required sight distances.

### **Canal Road along Site Frontage**

- » Widen Canal Road along the site frontage to provide two (2) travel lanes in each direction from Proposed Street C to Susquehanna Trail.

### **Canal Road (SR 0921) & Proposed Street A**

- » Configure the intersection as a multi-lane roundabout with yield-control on all approaches.
- » Design the northbound approach as a single-lane approach.
- » Design the southbound approach as a single-lane approach with a yield-controlled right-turn bypass lane.

### **Canal Road (SR 0921) & Proposed Street D**

- » Design Street D (north-leg) as a medium-volume local roadway, per PennDOT standards.
- » Design Street D (south-leg) as a low-volume driveway, per PennDOT standards.
- » Widen the westbound Canal Road (SR 0921) approach to provide a 150' westbound right-turn lane with a 100' bay taper.
- » Maintain the two-way center left turn lane pattern from Street A through Susquehanna Trail to provide a minimum of 75' of storage for the eastbound left turn movements.
- » Provide one entering and one exiting lane for Street D.
- » Provide a stop sign (PennDOT designation R1-1) to control exiting traffic.
- » Restrict exiting left-turn and through movements on the northbound/southbound Street D approaches to Canal Road (SR 0921) via concrete median and appropriate signage.

### **Canal Road (SR 0921) & Susquehanna Trail**

- » Optimize traffic signal timings.
- » Implement protected/prohibited phasing on the eastbound/westbound Canal Road (SR 0921) approaches and protected/overlap phasing on the southbound Susquehanna Trail approach.
- » Widen eastbound Canal Road (SR 0921) approach to provide a 325' dedicated left-turn lane, dual through lanes and a 250' dedicated right-turn lane.
- » Widen the westbound Canal Road (SR 0921) approach to provide a 150' dedicated left-turn lane, dual through lanes and a 300' dedicated right-turn lane.
- » Widen the northbound Susquehanna Trail approach to provide a 200' dedicated left-turn lane with a 75' bay taper. This lane length is constrained by the existing bridge to the south and may require an altered design/taper.

### **Canal Road (SR 0921) & Lewisberry Road (SR 4009)**

- » Restripe Canal Road (SR 0921) to provide a minimum 125' left-turn lane that transitions to the two-way center left-turn lane pattern along Canal Road (SR 0921).

### **Susquehanna Trail (SR 0297) & I-83 South Ramps**

- » Optimize traffic signal timings.

### **Susquehanna Trail (SR 0297) & I-83 North Ramps**

- » Optimize traffic signal timings.

### **Church Road (SR 0238)/Farm Trail Road & Susquehanna Trail (SR 4005)**

- » Optimize traffic signal timings.
- » Implement Protected/Prohibited advance left-turn phasing on the northbound/southbound Susquehanna Trail approaches.

- » Convert the existing eastbound dedicated right turn lane to a shared/through right.
- » Restripe the existing dedicated westbound left-turn lane to provide 250' of storage.
- » Restripe the existing dedicated northbound left-turn lane to provide 175' of storage. The existing southbound left-turn lane into the Sunoco/SPCA property will be reduced by 50'.
- » Widen southbound Susquehanna Trail to provide dual left-turn lanes with 250' of storage. Widening for dual receiving lanes will be required on eastbound Church Road.

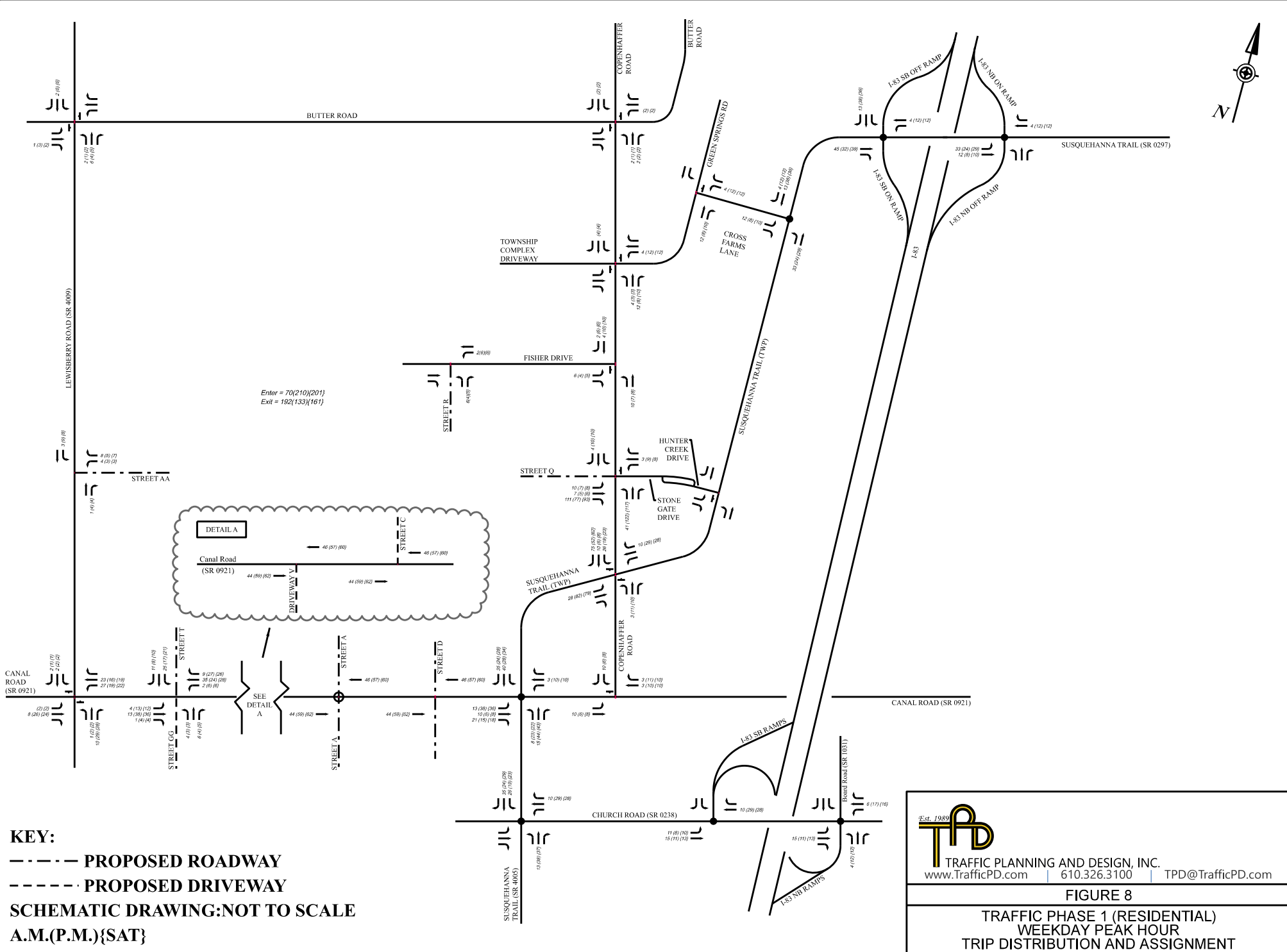
### **Church Road (SR 0238) & I-83 South Ramps**

- » Optimize traffic signal timings.


### **Church Road (SR 0238) & I-83 North Ramps/Board Road (SR 1031)**

- » Optimize traffic signal timings.
- » Widen the eastbound Church Road (SR 0238) approach to provide a dedicated channelized right-turn lane to provide 275' of storage and a 100' bay taper.
- » Widen the eastbound Church Road (SR 0238) approach to extend the existing eastbound left-turn lane to provide 250' of storage and a 75' bay taper.

As part of PennDOT's HOP and Township land development processes, the applicant will coordinate and fund the implementation of the recommended roadway improvements. Additionally, all improvements will be constructed to accommodate non-motorized access/circulation and be ADA-compliant unless otherwise approved by the Department.

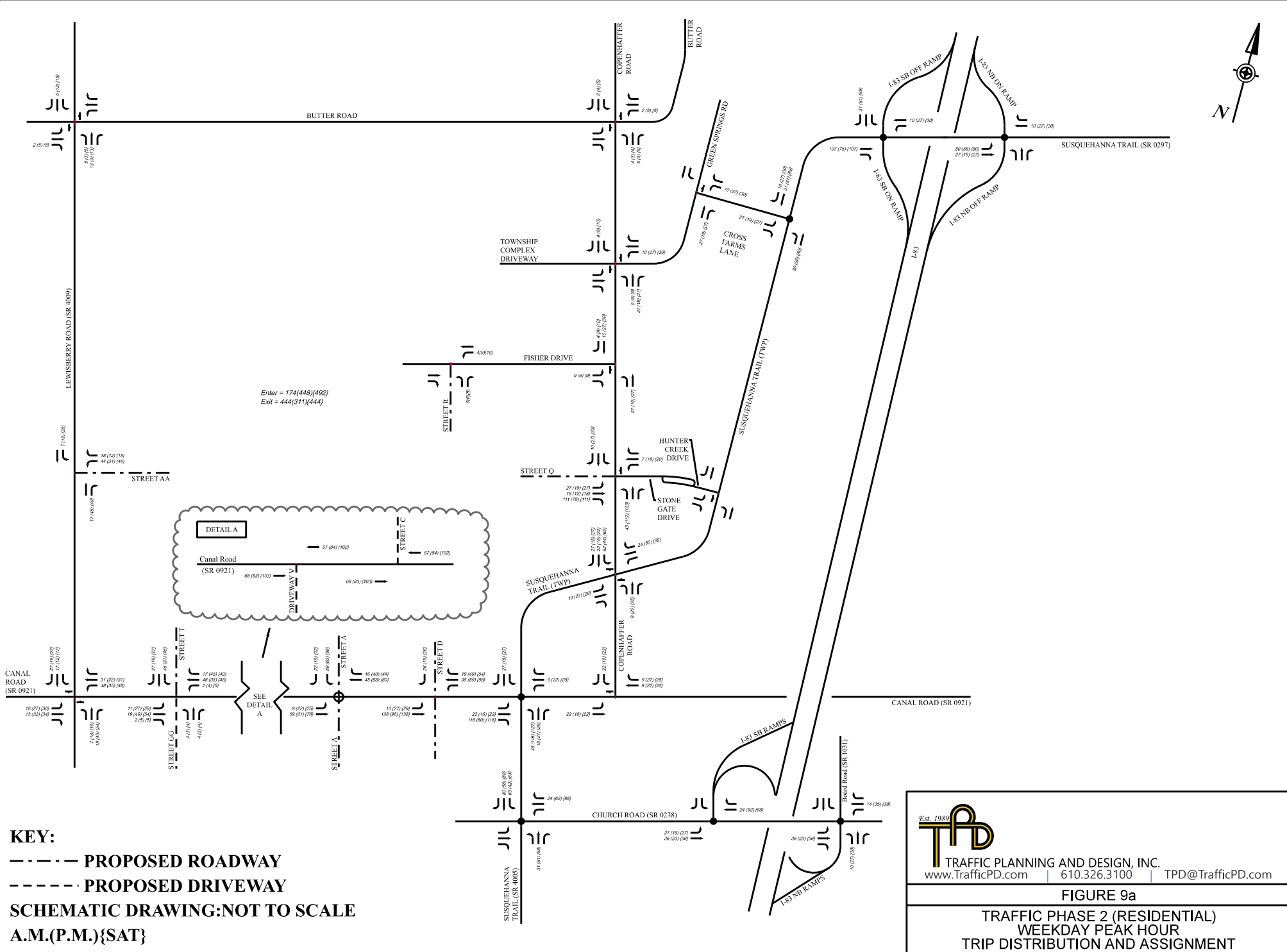


**KEY:**  
 - - - - - PROPOSED ROADWAY  
 - - - - - PROPOSED DRIVEWAY  
**SCHEMATIC DRAWING: NOT TO SCALE**  
**A.M.(P.M.){SAT}**

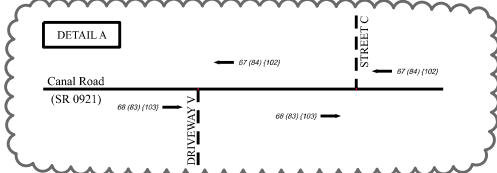

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**FIGURE 8**

**TRAFFIC PHASE 1 (RESIDENTIAL)**  
**WEEKDAY PEAK HOUR**  
**TRIP DISTRIBUTION AND ASSIGNMENT**



Enter = 174(448)(492)  
Exit = 444(311)(444)



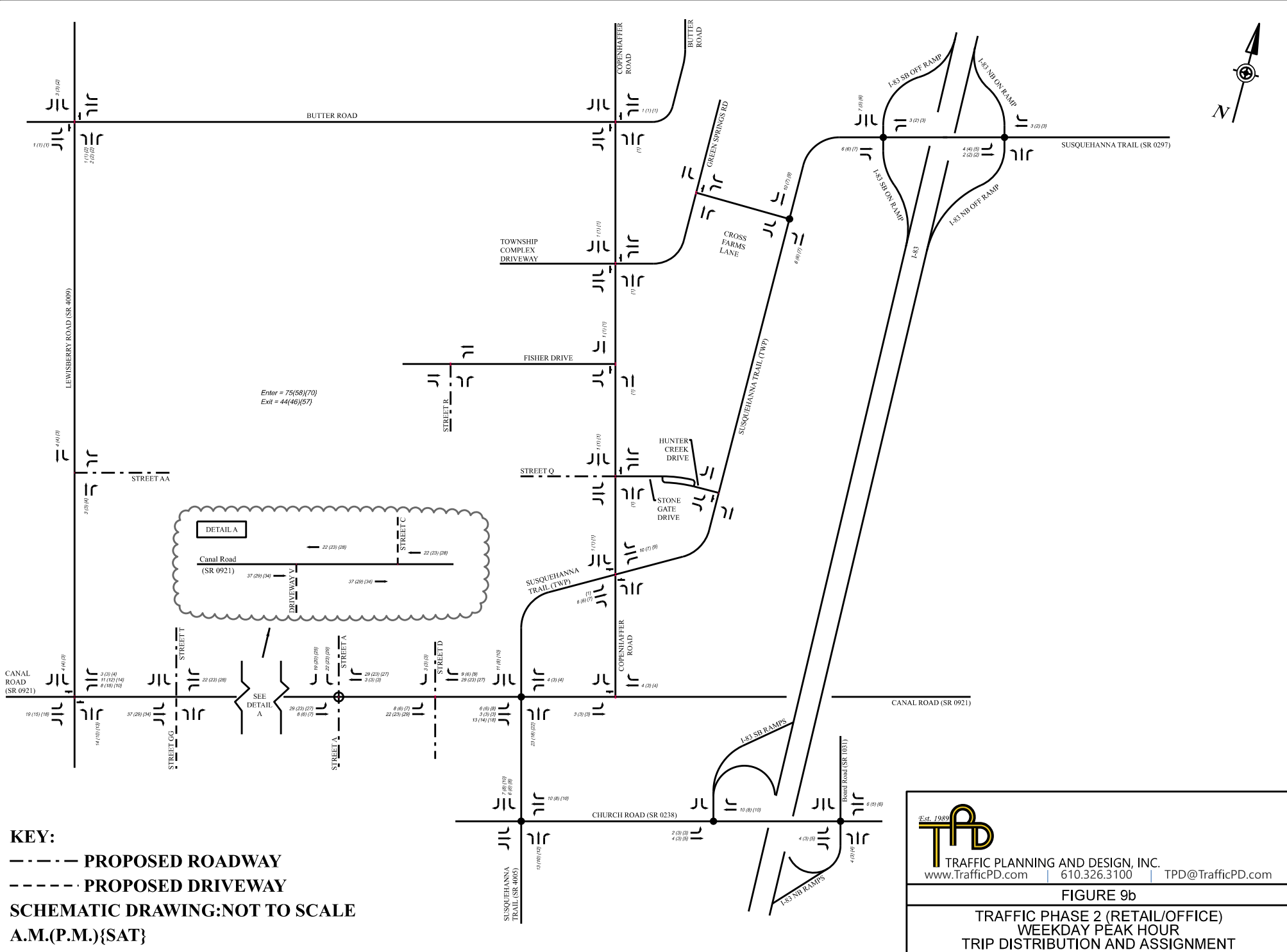
**KEY:**  
 - - - - - PROPOSED ROADWAY  
 - - - - - PROPOSED DRIVEWAY  
**SCHEMATIC DRAWING: NOT TO SCALE**  
**A.M.(P.M.){SAT}**

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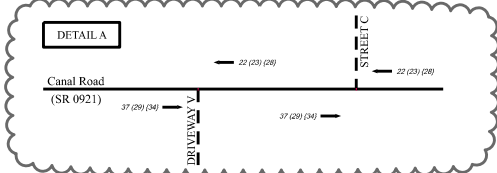
**FIGURE 9a**

**TRAFFIC PHASE 2 (RESIDENTIAL)**  
**WEEKDAY PEAK HOUR**  
**TRIP DISTRIBUTION AND ASSIGNMENT**





Enter = 75(58)(70)  
 Exit = 44(46)(57)

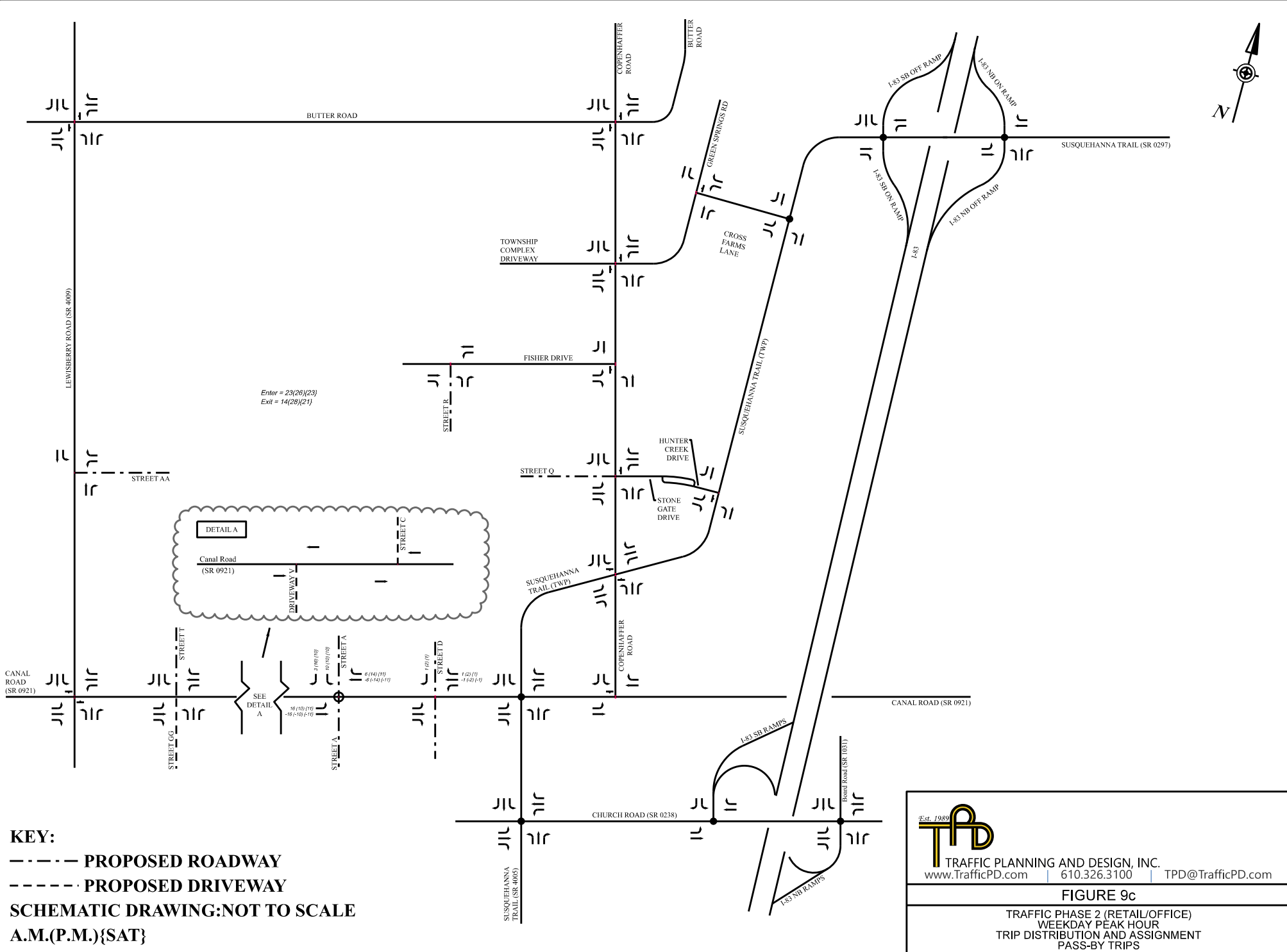


SEE  
 DETAIL  
 A

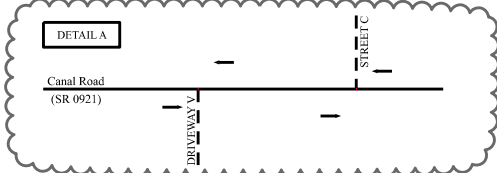
Est. 1989  
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**FIGURE 9b**

**TRAFFIC PHASE 2 (RETAIL/OFFICE)**  
**WEEKDAY PEAK HOUR**  
**TRIP DISTRIBUTION AND ASSIGNMENT**



Enter = 23(26){23}  
Exit = 14(28){21}

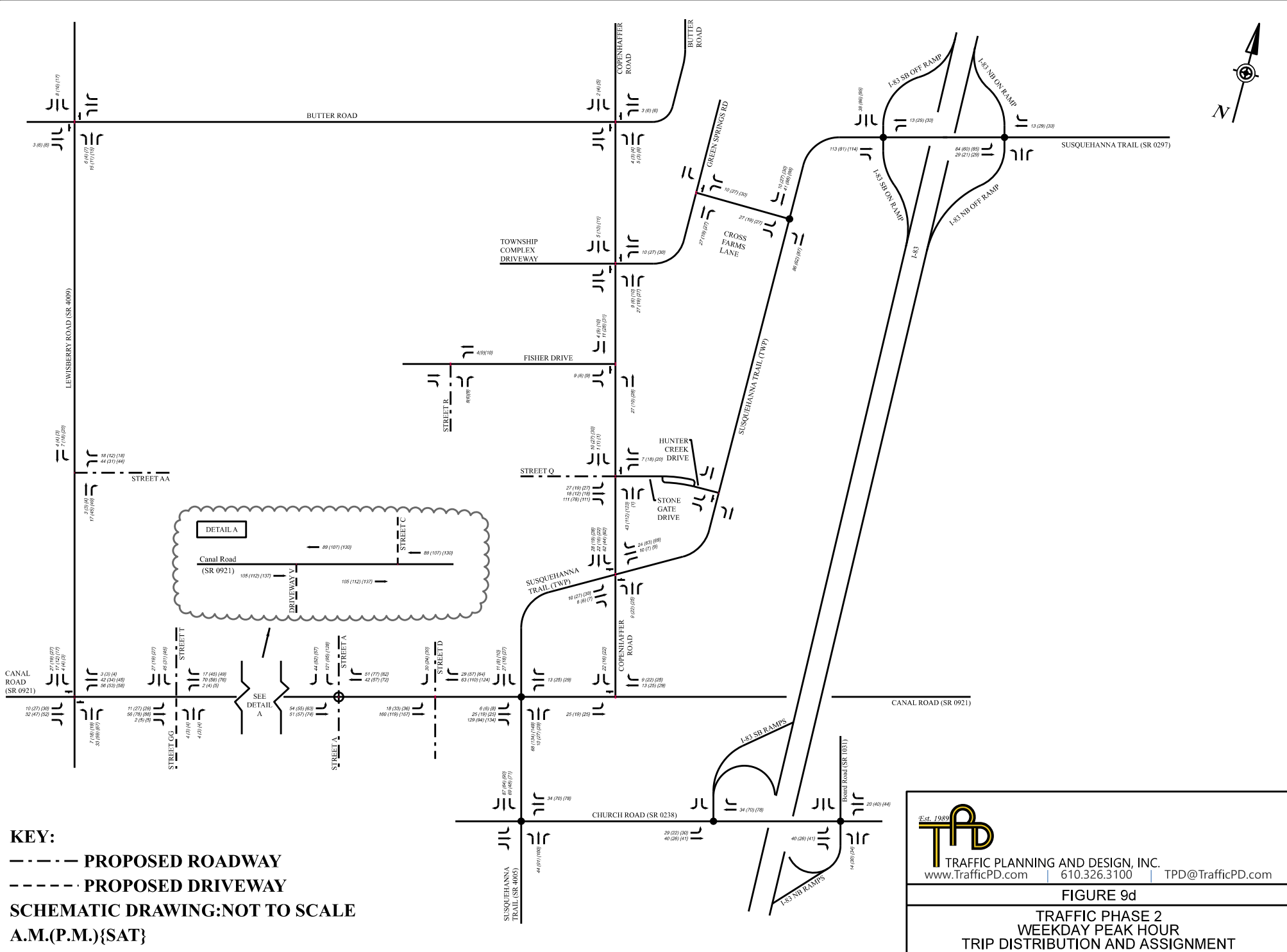



**KEY:**  
- - - - - PROPOSED ROADWAY  
- - - - - PROPOSED DRIVEWAY  
**SCHEMATIC DRAWING: NOT TO SCALE**  
**A.M.(P.M.) {SAT}**

**TPD**  
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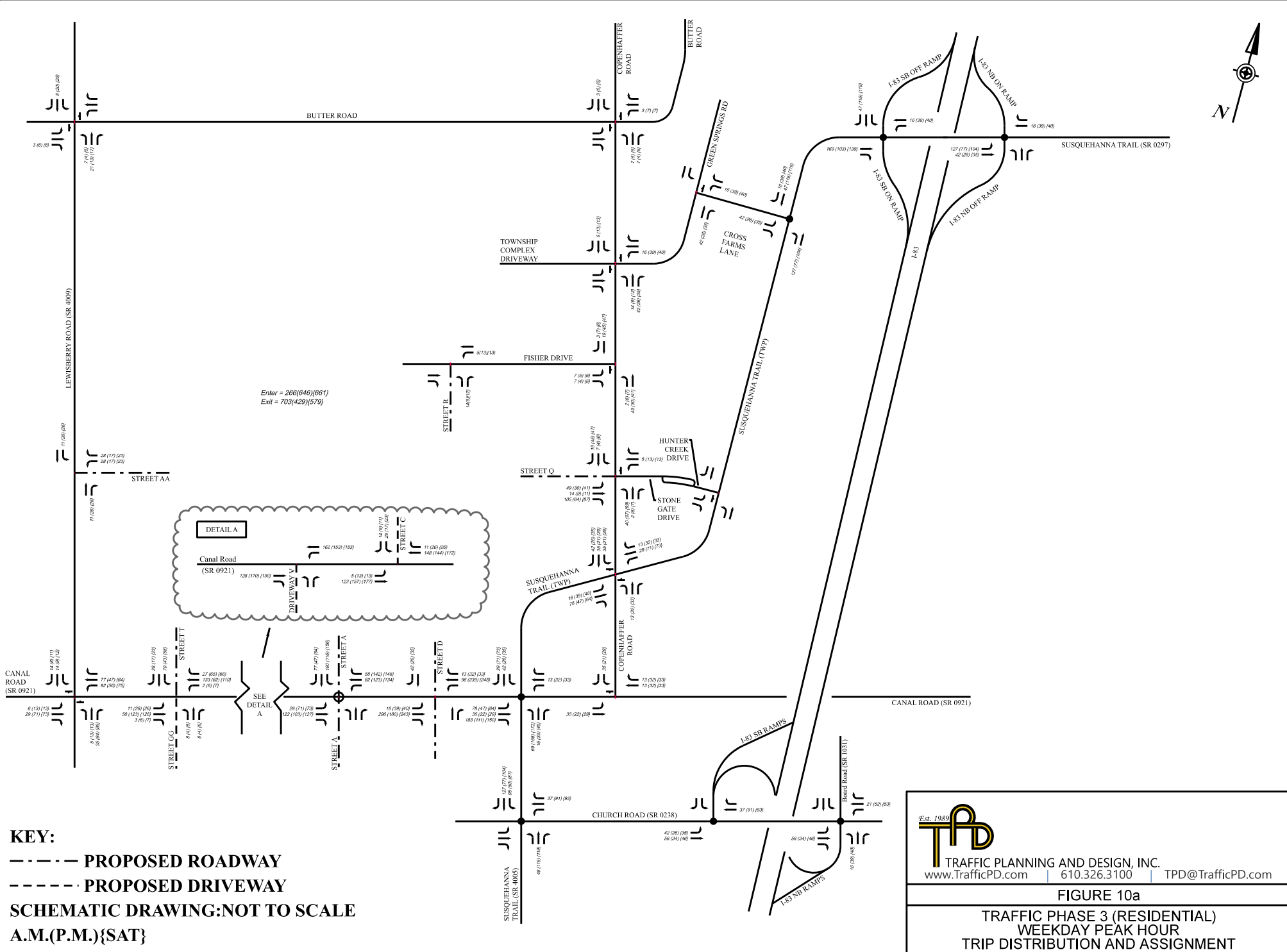
**FIGURE 9c**

TRAFFIC PHASE 2 (RETAIL/OFFICE)  
WEEKDAY PEAK HOUR  
TRIP DISTRIBUTION AND ASSIGNMENT  
PASS-BY TRIPS

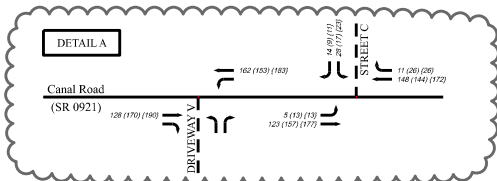



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**FIGURE 9d**  
**TRAFFIC PHASE 2**  
**WEEKDAY PEAK HOUR**  
**TRIP DISTRIBUTION AND ASSIGNMENT**

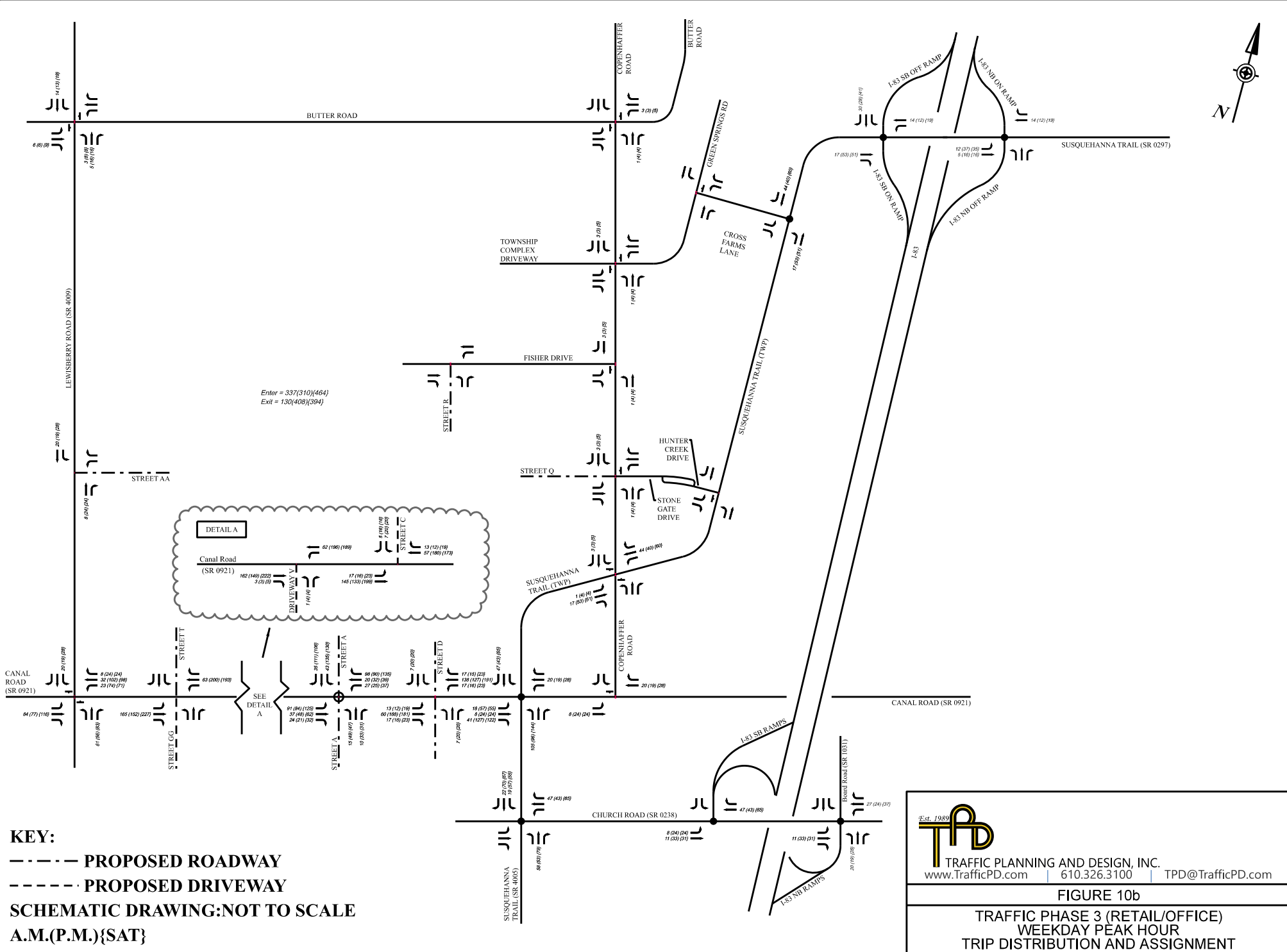


Enter = 266(646)(661)  
Exit = 703(429)(579)



**KEY:**  
 - - - - - PROPOSED ROADWAY  
 - - - - - PROPOSED DRIVEWAY  
**SCHEMATIC DRAWING: NOT TO SCALE**  
**A.M.(P.M.){SAT}**

  
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**FIGURE 10a**  
**TRAFFIC PHASE 3 (RESIDENTIAL)**  
**WEEKDAY PEAK HOUR**  
**TRIP DISTRIBUTION AND ASSIGNMENT**




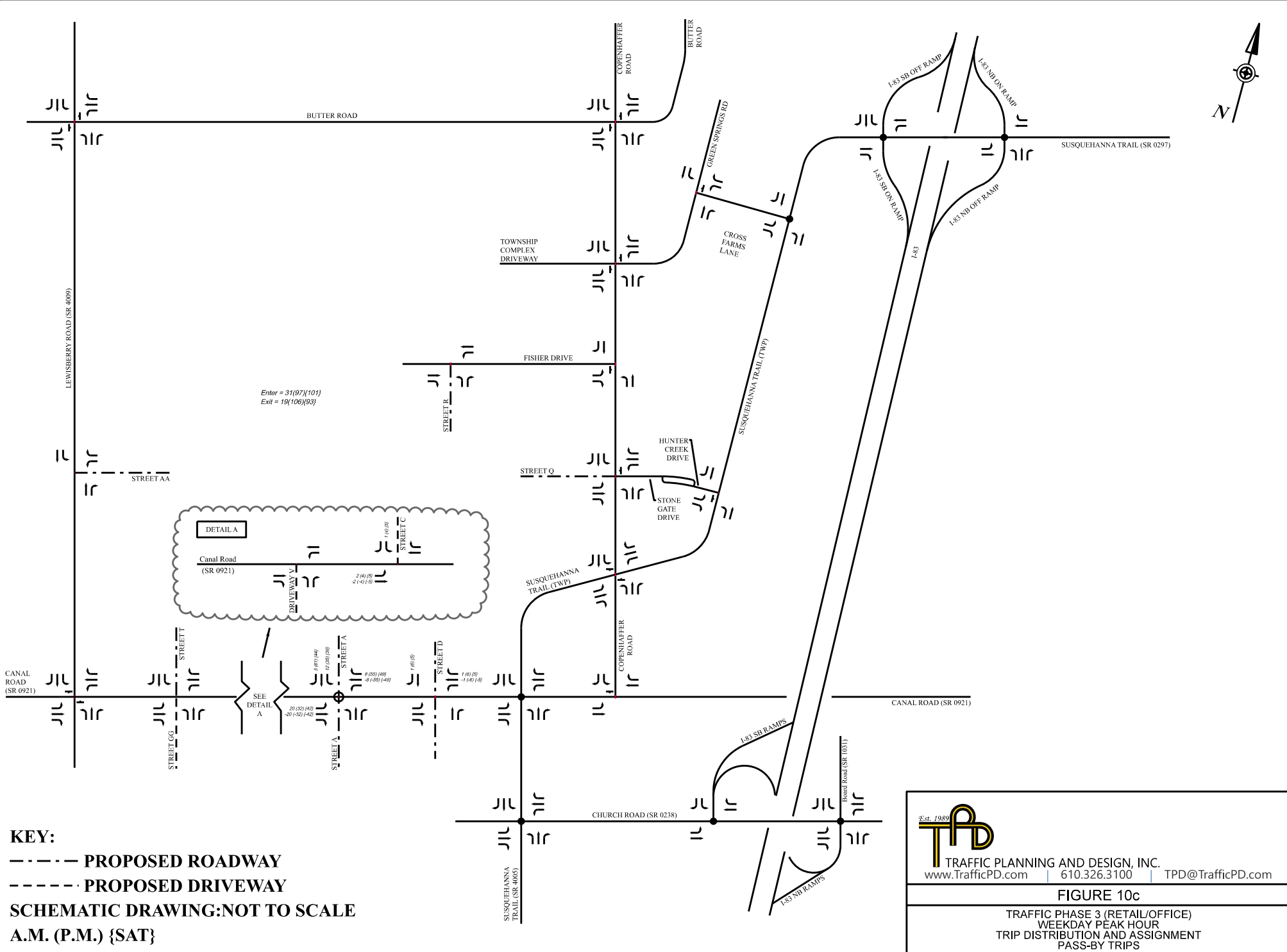
Enter = 337(310)(464)  
Exit = 130(408)(304)

DETAIL A

SEE  
DETAIL  
A

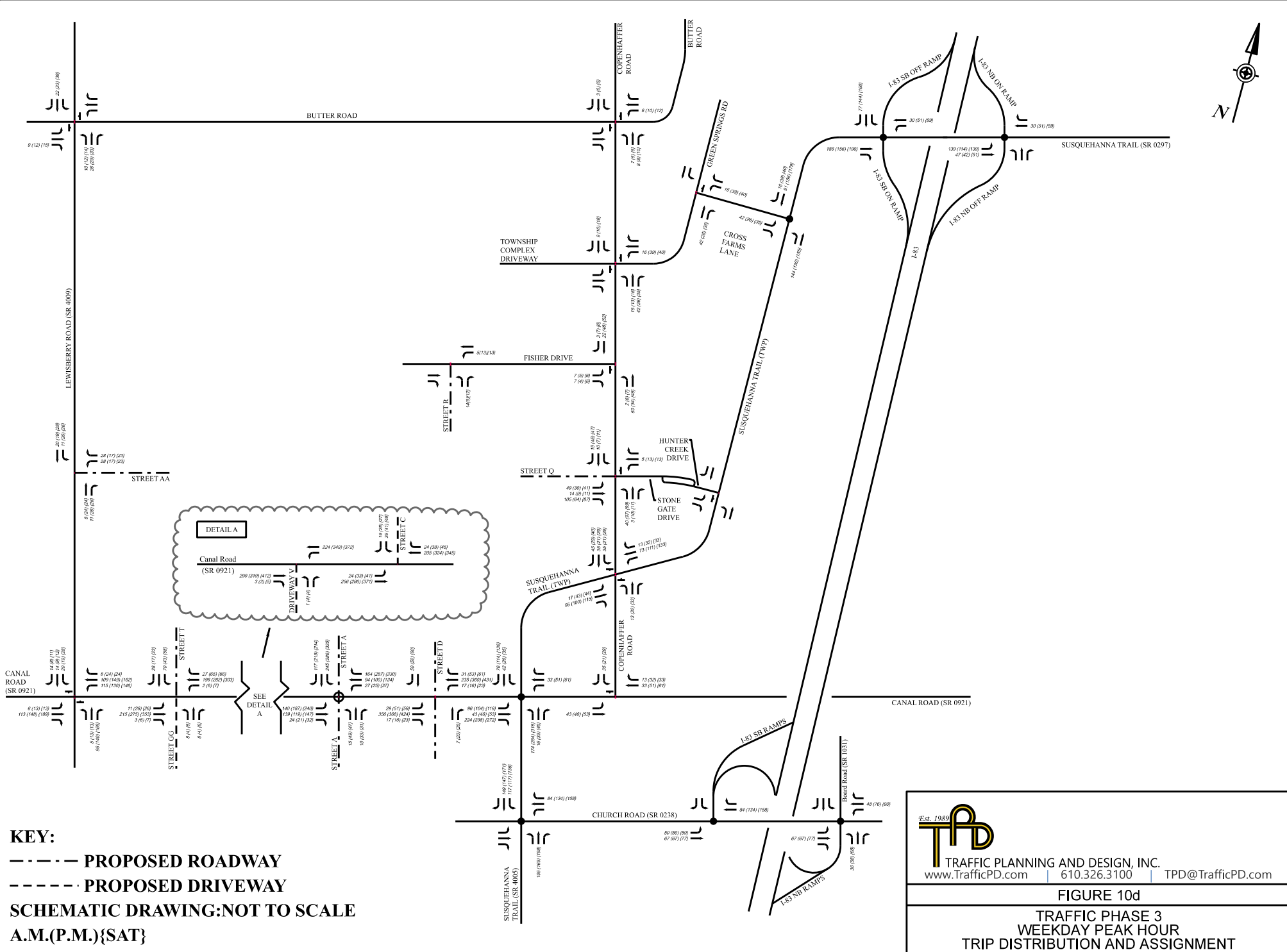
**KEY:**  
 - - - - - PROPOSED ROADWAY  
 - - - - - PROPOSED DRIVEWAY  
**SCHEMATIC DRAWING: NOT TO SCALE**  
**A.M.(P.M.) {SAT}**

  
 TRAFFIC PLANNING AND DESIGN, INC.  
 www.TrafficPD.com | 610.326.3100 | TPD@TrafficPD.com  
**FIGURE 10b**  
**TRAFFIC PHASE 3 (RETAIL/OFFICE)**  
**WEEKDAY PEAK HOUR**  
**TRIP DISTRIBUTION AND ASSIGNMENT**




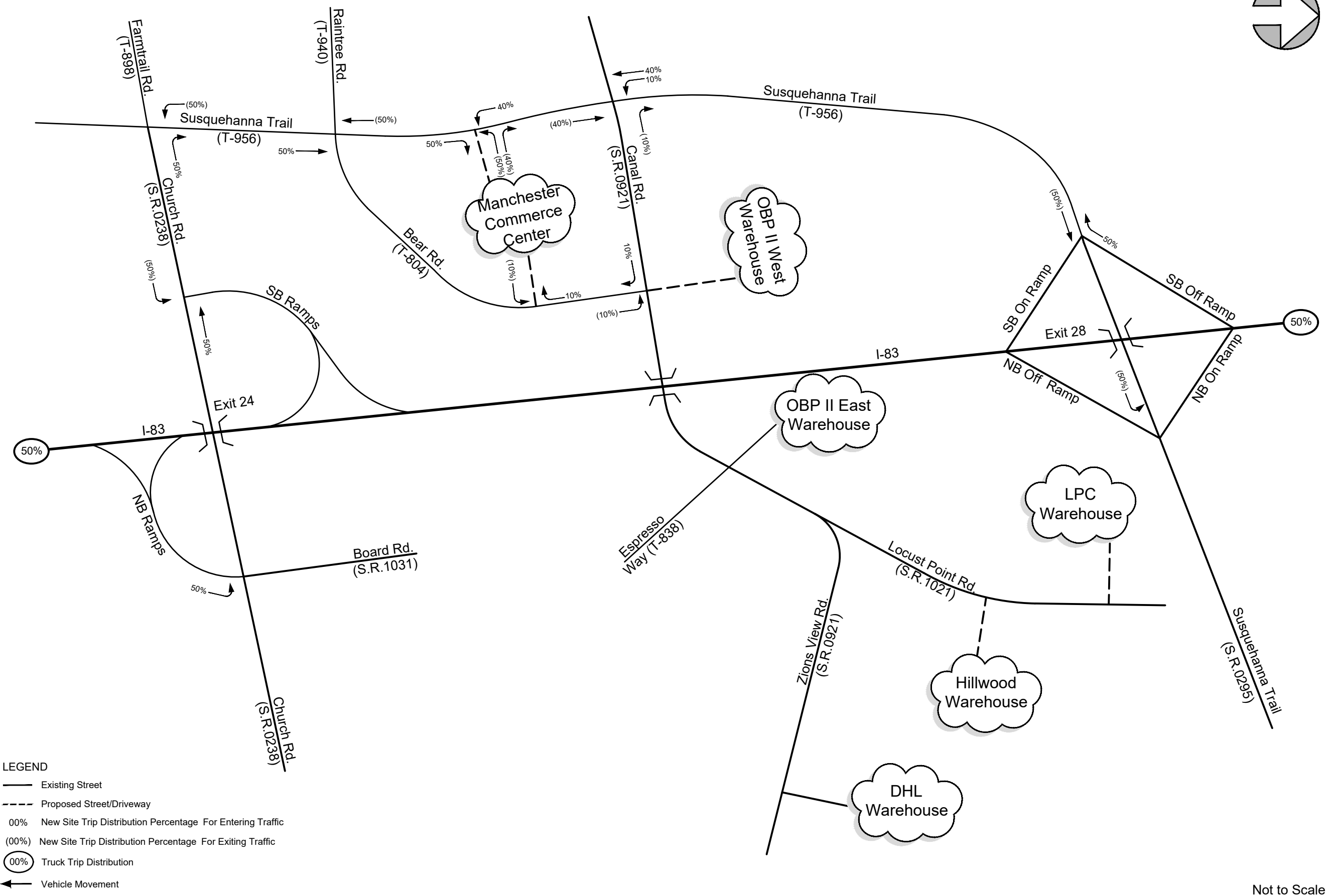
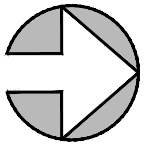
**KEY:**  
 - - - - - PROPOSED ROADWAY  
 - - - - - PROPOSED DRIVEWAY  
**SCHEMATIC DRAWING: NOT TO SCALE**  
**A.M. (P.M.) {SAT}**

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	<b>FIGURE 10c</b> TRAFFIC PHASE 3 (RETAIL/OFFICE) WEEKDAY PEAK HOUR TRIP DISTRIBUTION AND ASSIGNMENT PASS-BY TRIPS	



**KEY:**  
 - - - - - PROPOSED ROADWAY  
 - - - - - PROPOSED DRIVEWAY  
**SCHEMATIC DRAWING: NOT TO SCALE**  
**A.M.(P.M.) {SAT}**

  
 TRAFFIC PLANNING AND DESIGN, INC.  
 www.TrafficPD.com | 610.326.3100 | TPD@TrafficPD.com  
**FIGURE 10d**  
**TRAFFIC PHASE 3**  
**WEEKDAY PEAK HOUR**  
**TRIP DISTRIBUTION AND ASSIGNMENT**



Not to Scale

TRANSPORTATION IMPACT STUDY

MANCHESTER COMMERCE CENTER

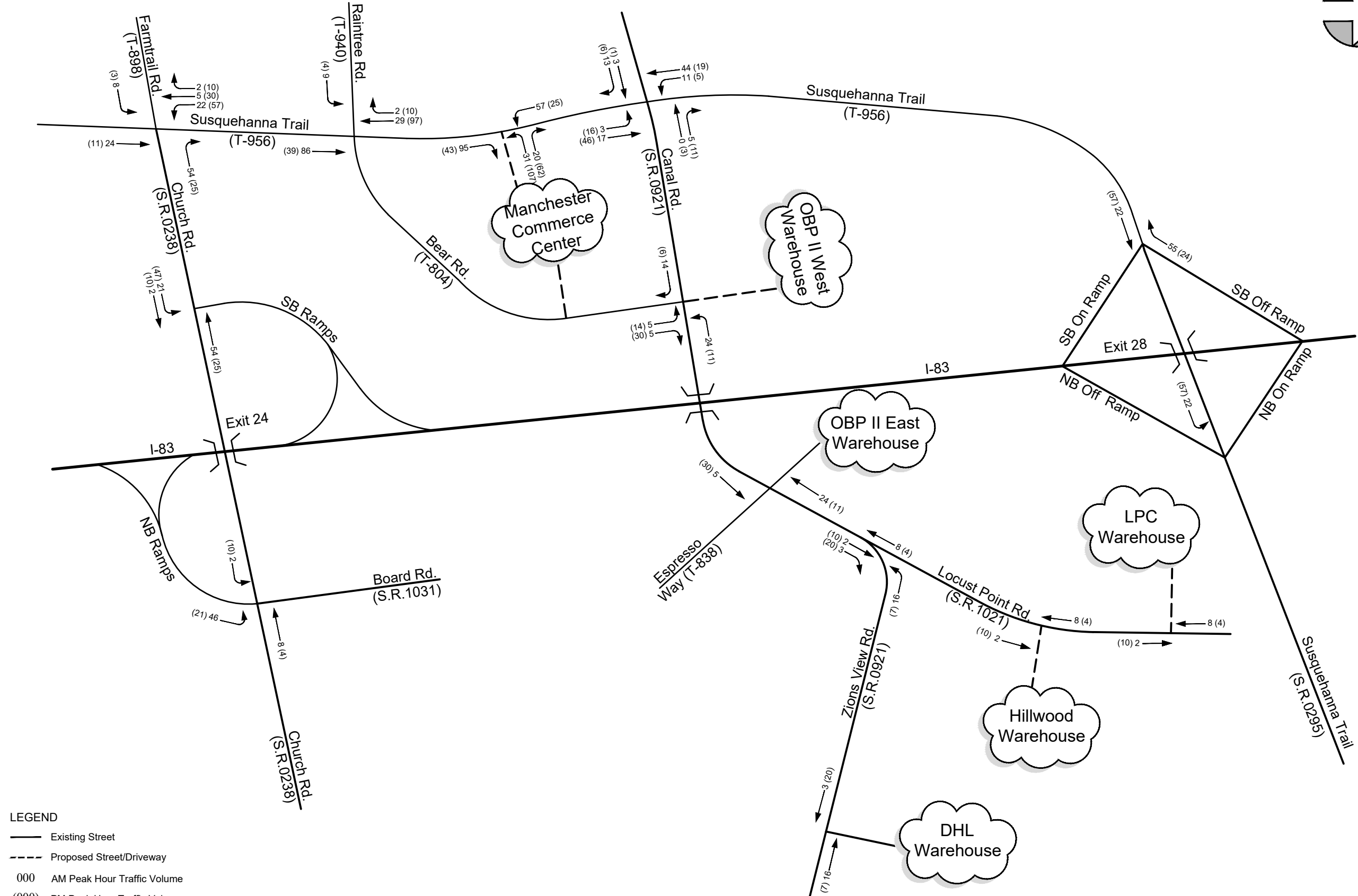
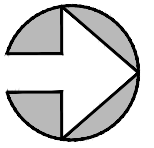
MANCHESTER AND EAST  
MANCHESTER TOWNSHIPS  
YORK COUNTY, PA

FIGURE 11

NEW SITE TRIP DISTRIBUTION  
PERCENTAGES - TRUCKS







- LEGEND**
- Existing Street
  - - - Proposed Street/Driveway
  - 000 AM Peak Hour Traffic Volume
  - (000) PM Peak Hour Traffic Volume
  - ← Vehicle Movement

Not to Scale

**TRANSPORTATION IMPACT STUDY**

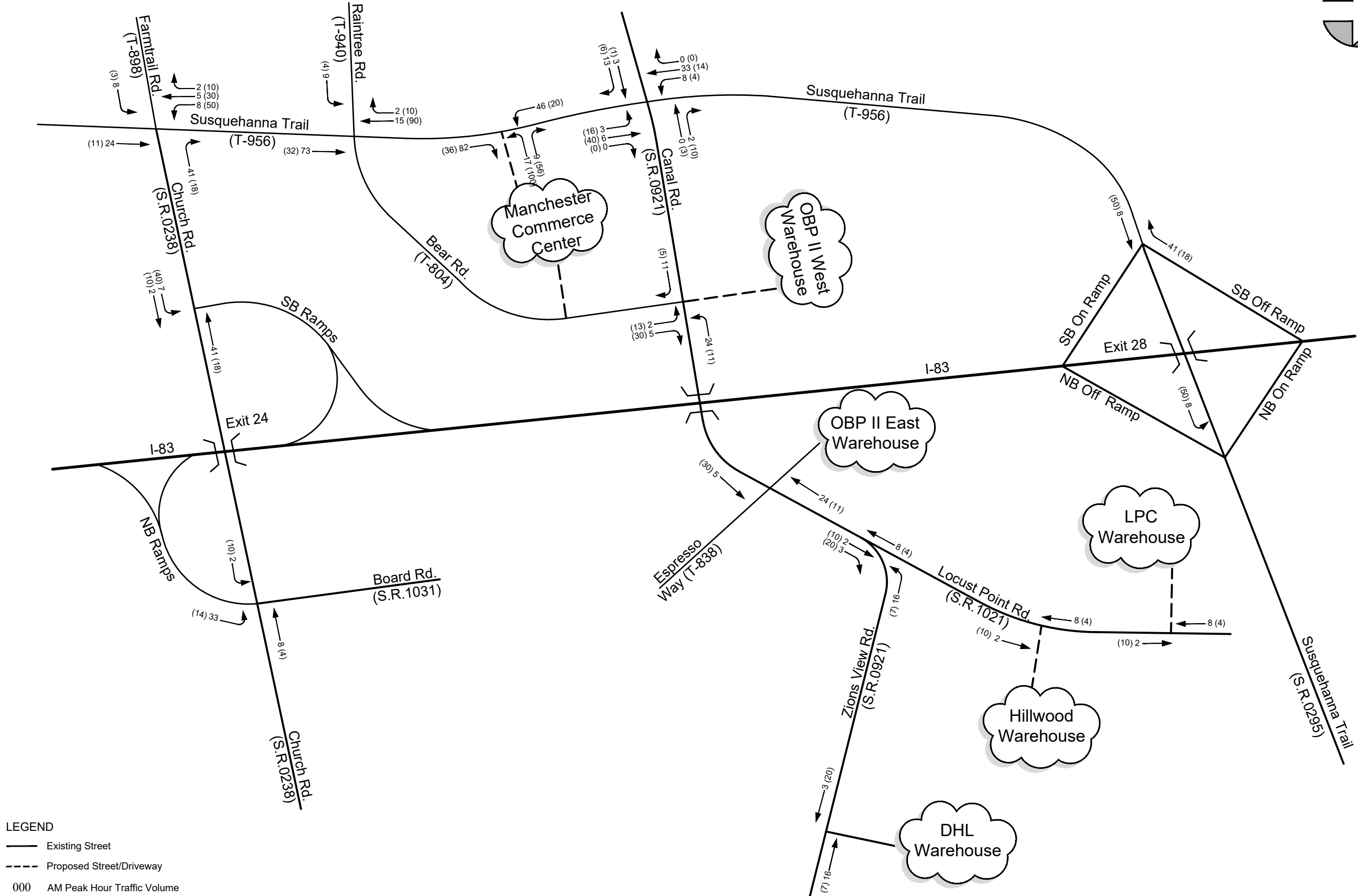
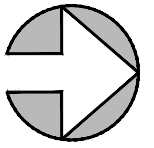
MANCHESTER COMMERCE CENTER

MANCHESTER AND EAST  
MANCHESTER TOWNSHIPS  
YORK COUNTY, PA

**FIGURE 12**

TOTAL SITE TRIPS  
AM & PM PEAK HOURS





- LEGEND**
- Existing Street
  - - - Proposed Street/Driveway
  - 000 AM Peak Hour Traffic Volume
  - (000) PM Peak Hour Traffic Volume
  - ← Vehicle Movement

Not to Scale

**TRANSPORTATION IMPACT STUDY**

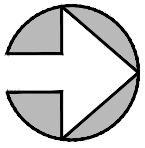
MANCHESTER COMMERCE CENTER

MANCHESTER AND EAST  
MANCHESTER TOWNSHIPS  
YORK COUNTY, PA

**FIGURE 13**

SITE TRIPS - PASSENGER VEHICLES  
AM & PM PEAK HOURS





TRANSPORTATION IMPACT STUDY

MANCHESTER COMMERCE CENTER

MANCHESTER AND EAST  
MANCHESTER TOWNSHIPS  
YORK COUNTY, PA

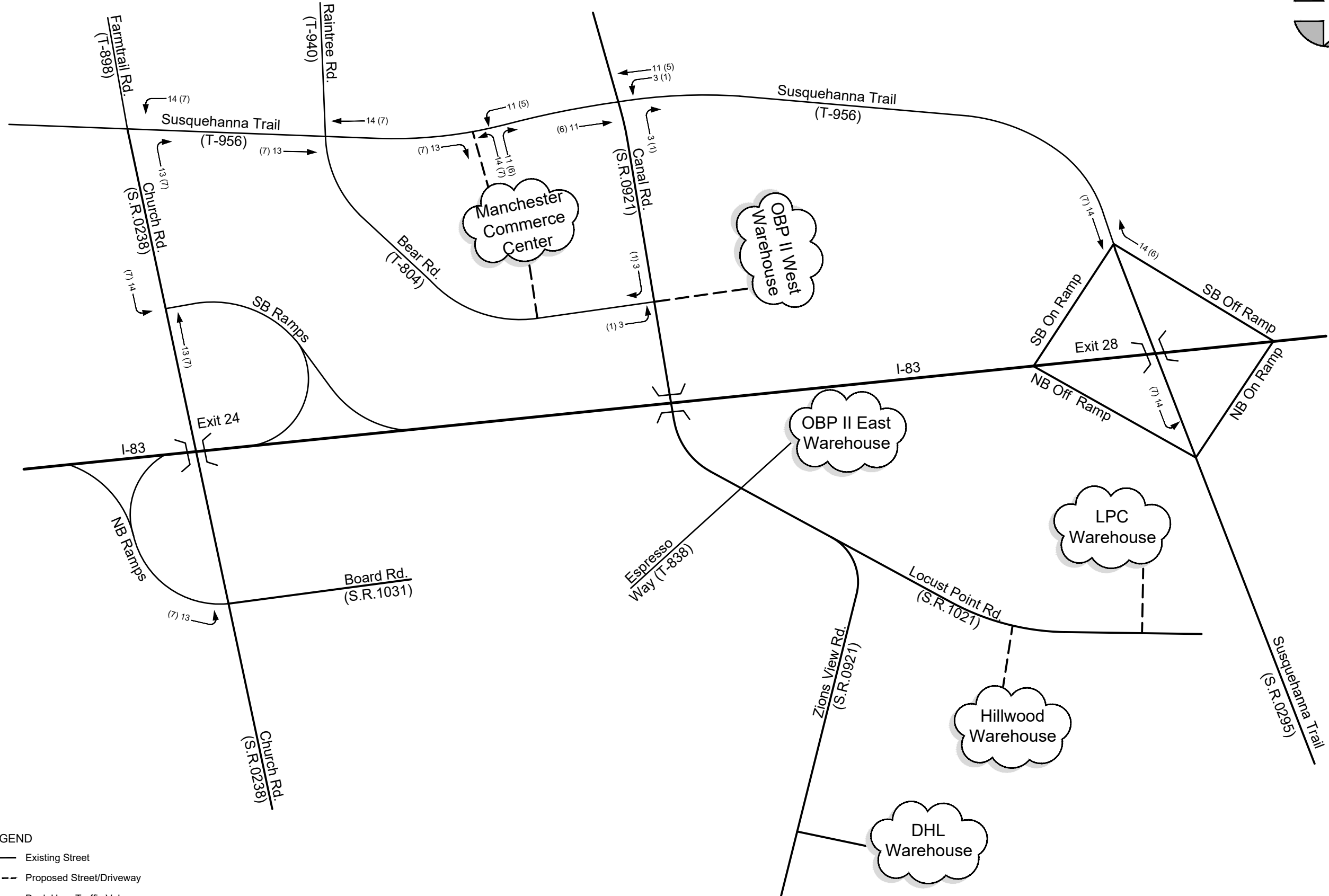
FIGURE 14

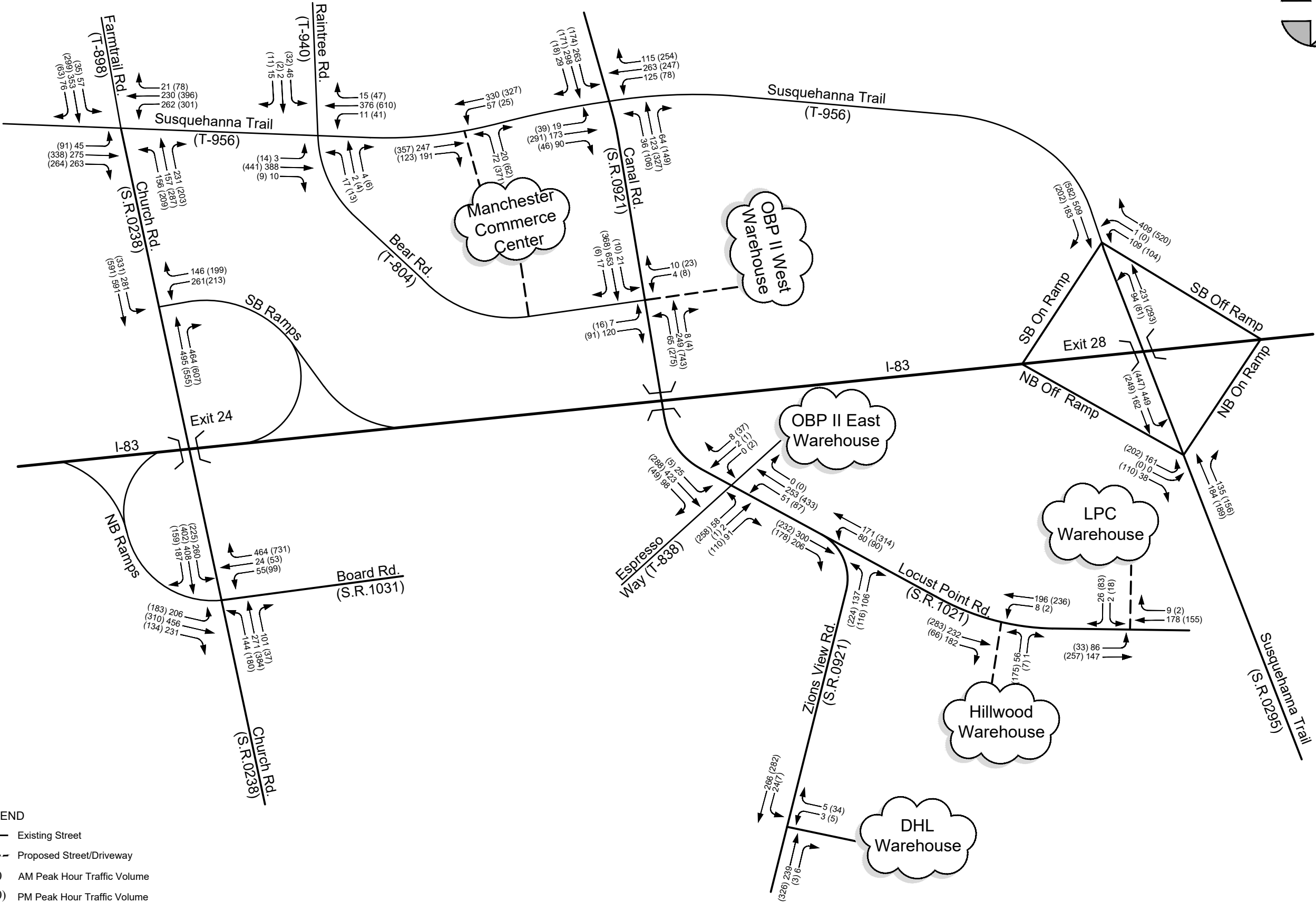
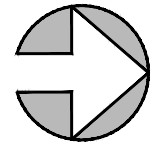
SITE TRIPS - TRUCKS  
AM & PM PEAK HOURS



Not to Scale

- LEGEND
- Existing Street
  - - - Proposed Street/Driveway
  - ← Peak Hour Traffic Volume
  - Site Trip Distribution Percentage





- LEGEND**
- Existing Street
  - - - Proposed Street/Driveway
  - 000 AM Peak Hour Traffic Volume
  - (000) PM Peak Hour Traffic Volume
  - ← Vehicle Movement

Not to Scale

**TRANSPORTATION IMPACT STUDY**

MANCHESTER COMMERCE CENTER

MANCHESTER AND EAST  
MANCHESTER TOWNSHIPS  
YORK COUNTY, PA

**FIGURE 15**

OPENING YEAR (2025) TRAFFIC VOLUMES  
WITH DEVELOPMENT  
AM & PM PEAK HOURS



development is ITE Land Use Code (LUC) 154 – High Cube Transload and Short-Term Storage. Use of LUC 154 is compatible with the recent developments planned for the Canal Road Betterment Project and confirmed by post-construction counts at the DHL Warehouse (84 Zions View Road). ITE Land Use Code 154 is also consistent with the findings in the NorthPoint Development Trip Generation Analysis Report, dated December 30, 2019. The building square footage was used as the independent variable. Information related to truck trip generation was obtained from Appendix I of ITE’s Trip Generation Handbook (3<sup>rd</sup> Ed. 2017). In order to determine the magnitude of trip generation for the new police department headquarters, a local trip generation study was made at the existing Northern York County Regional Police Department facility. Details of the trip generation analysis can be found in the Appendices. Table 3 summarizes the estimated site trip generation for the proposed development during the typical weekday AM and PM peak hours and during the typical weekday.

**Table 3: Estimated Site Trip Generation**

Land Use (Code)	Trip Type	AM Peak Hour			PM Peak Hour			ADWT
		Enter	Exit	Total	Enter	Exit	Total	
2,734,000 sf High-Cube Transload And Short-Term Storage Warehouse (154)	Passenger Vehicles	142	22	164	63	183	246	3,227
	Trucks	27	28	55	13	14	27	601
Warehouse Subtotal		169	50	219	76	197	273	3,828
Police Station (Local Data)	Passenger Vehicles	21	11	32	9	16	25	150
TOTAL		190	61	251	85	213	298	3,978

### Modal Split

Because there is not sufficient pedestrian or transit facilities provided within the study area, a trip reduction due to modal split is not applicable and was not assumed for this study.

### Site Trip Distribution and Assignment

Figure 7 in the Appendices shows the trip distribution percentages for the new site traffic on the roadway system. The site trip distribution was based on the trip distribution approved for the Canal Road Betterment Project, along with existing traffic patterns found from the TMC counts, knowledge of the study area, and engineering judgment.

The proposed distribution used for the new site traffic is as follows:

#### Passenger Vehicles

- 25% oriented to/from the north on Interstate 83
- 5% oriented to/from the north on Locust Point Road (S.R.1021)
- 10% oriented to/from the east on Zions View Road (S.R.0921)
- 5% oriented to/from the east on Church Road (S.R.0238)
- 20% oriented to/from the south on I-83
- 15% oriented to/from the south on Susquehanna Trail
- 10% oriented to/from the west on Farmtrail Road
- 10% oriented to/from the west on Canal Road (S.R.0921)

#### Trucks

- 50% oriented to/from the north on I-83

Details of the site trip distribution and assignment are included in the Appendices.

Figures 10 & 11 graphically show the site trip distribution percentages used for the passenger vehicle and truck site trips. Total site trips generated by the proposed development and assigned to the roadway network are included in Figure 12, while Figures 13 and 14 show the passenger vehicle and truck site traffic.

### **Bear Road Traffic Reassignment**

As part of the Manchester Commerce development, Bear Road will be terminated in a cul-de-sac just west of the proposed Bear Road driveway. Currently, Bear Road serves as a short-cut for vehicles travelling between the Susquehanna Trail and Canal Road. With the termination of Bear Road west of the driveway, traffic will still be able to access the residences and businesses along Bear Road, but will not be able to use Bear Road as a cut through path. However, it is assumed that motorists will utilize the new Manchester Commerce Center driveway as a cut through path. The reassignment of the existing traffic is included in the Appendices.



## **APPENDIX E**

### **TRIP GENERATION DATA AND JOURNEY TO WORK JUSTIFICATION**



# Warehousing (150)

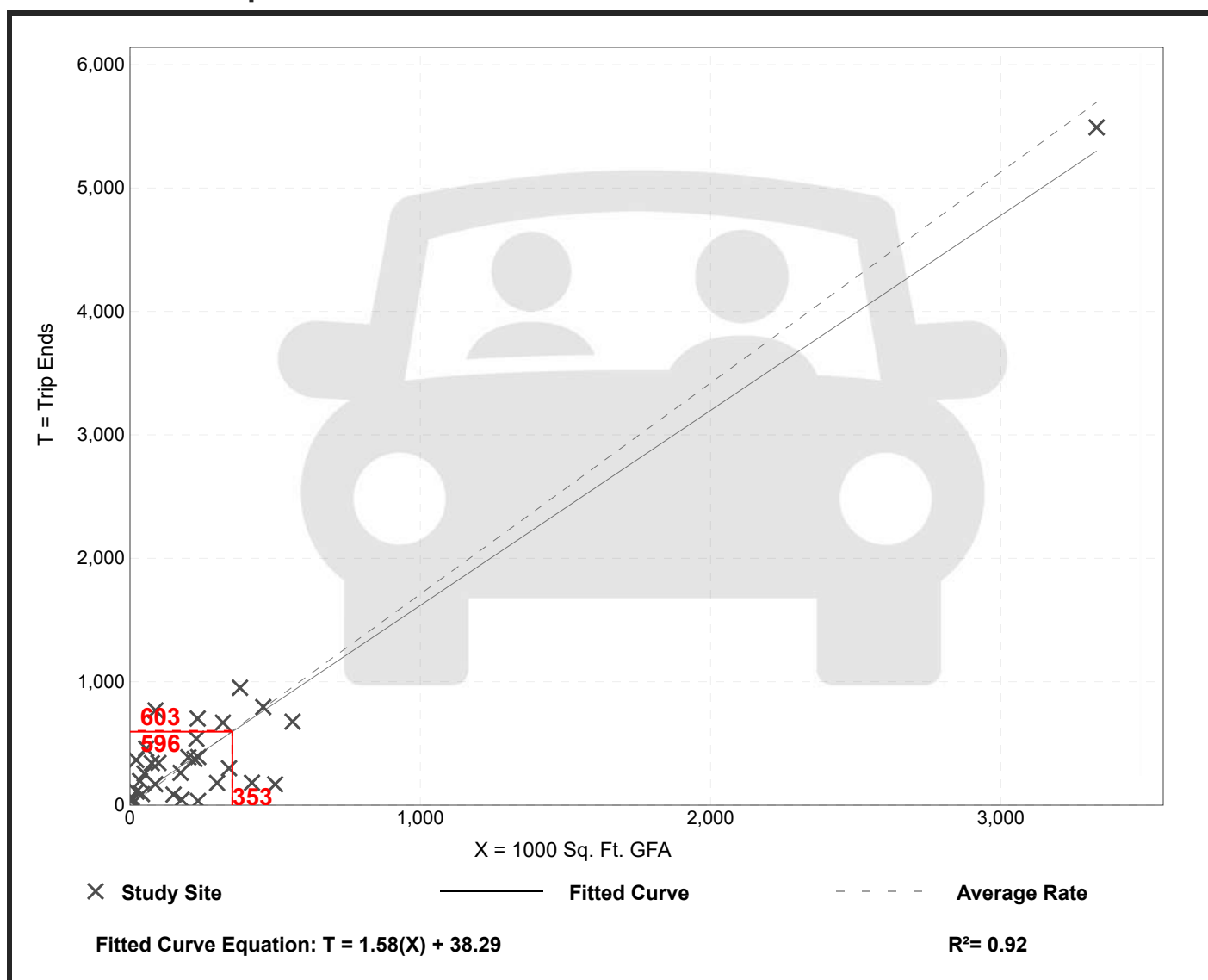
**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday**

**Setting/Location: General Urban/Suburban**  
 Number of Studies: 31  
 Avg. 1000 Sq. Ft. GFA: 292  
 Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.71	0.15 - 16.93	1.48

## Data Plot and Equation



# Warehousing (150)

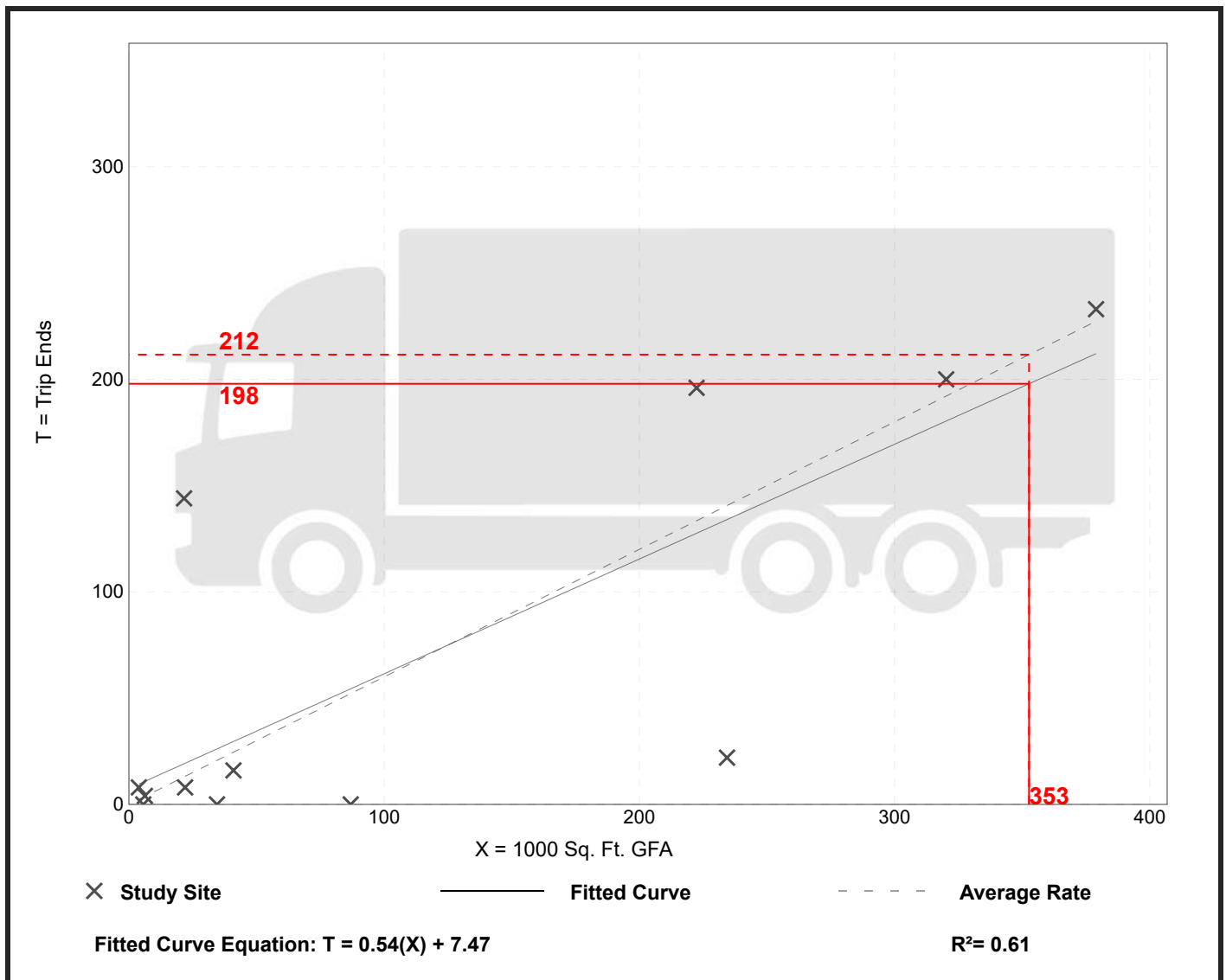
Truck Trip Ends vs: 1000 Sq. Ft. GFA  
On a: Weekday

Setting/Location: General Urban/Suburban  
Number of Studies: 12  
Avg. 1000 Sq. Ft. GFA: 115  
Directional Distribution: 50% entering, 50% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.60	0.00 - 6.66	0.86

## Data Plot and Equation



# Warehousing (150)

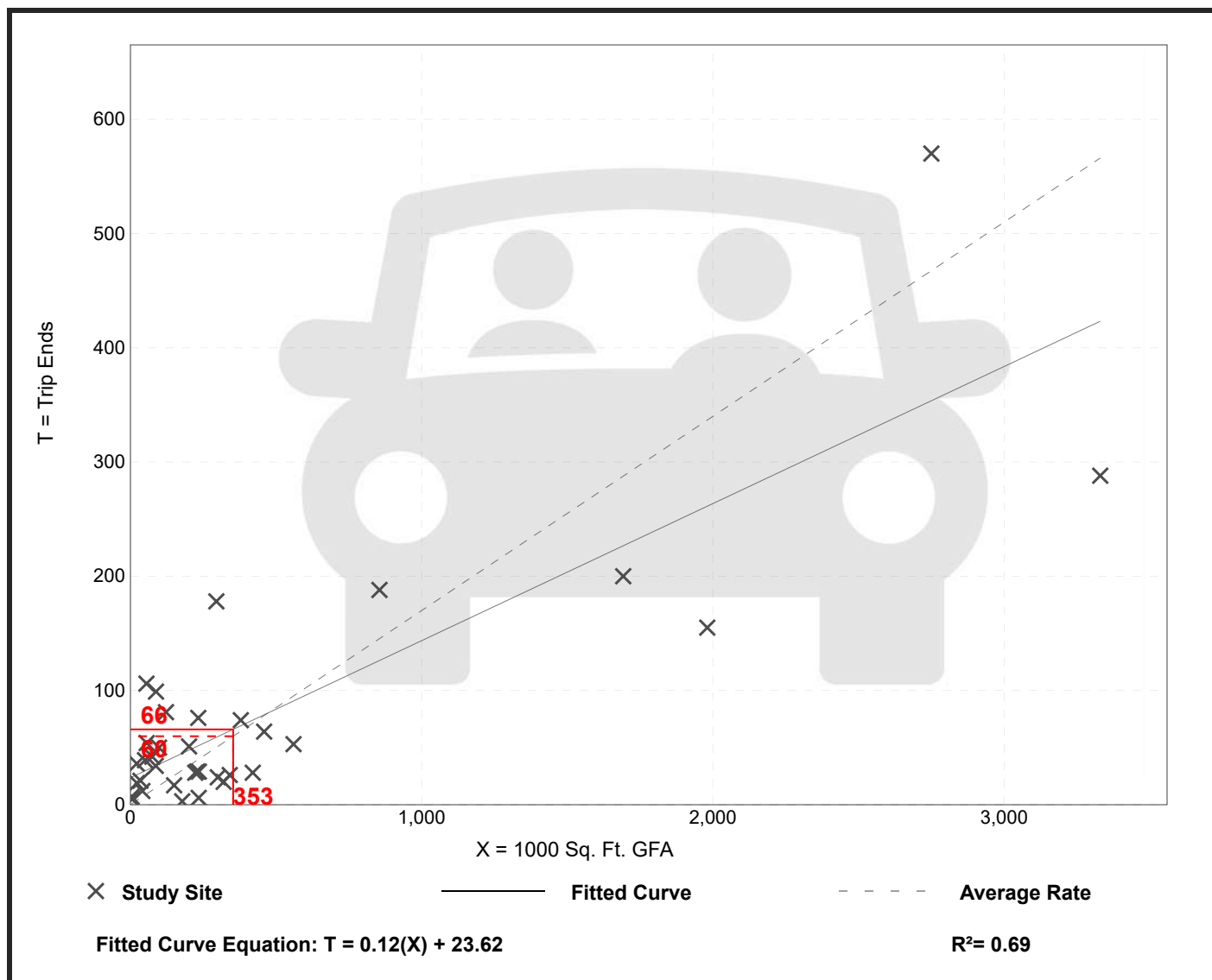
**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**

**Setting/Location: General Urban/Suburban**  
 Number of Studies: 36  
 Avg. 1000 Sq. Ft. GFA: 448  
 Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.17	0.02 - 1.93	0.19

## Data Plot and Equation



# Warehousing (150)

**Truck Trip Ends vs: 1000 Sq. Ft. GFA**

**On a: Weekday,  
Peak Hour of Adjacent Street Traffic,  
One Hour Between 7 and 9 a.m.**

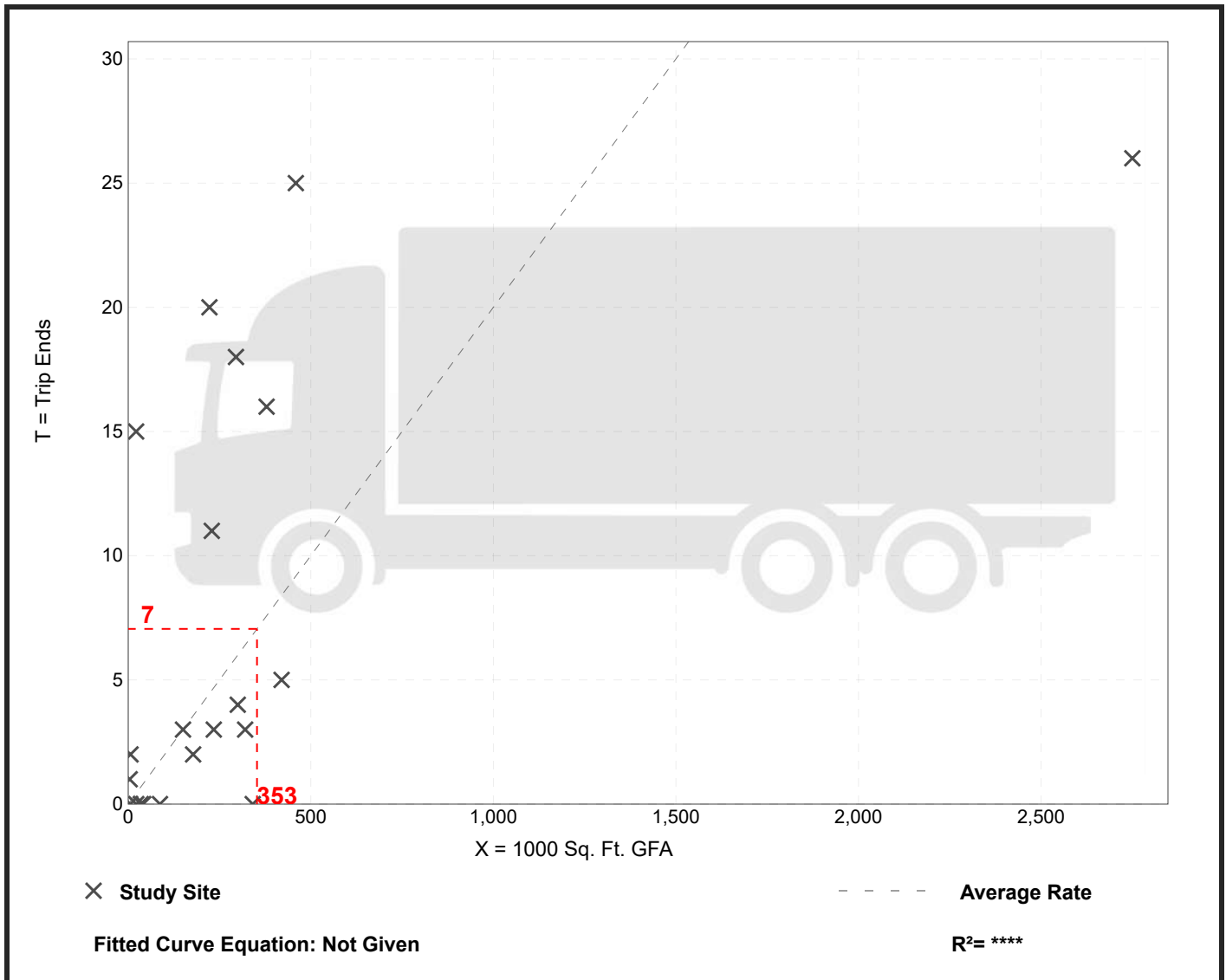
**Setting/Location: General Urban/Suburban**

Number of Studies: 21  
Avg. 1000 Sq. Ft. GFA: 309  
Directional Distribution: 52% entering, 48% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.02	0.00 - 0.69	0.05

## Data Plot and Equation



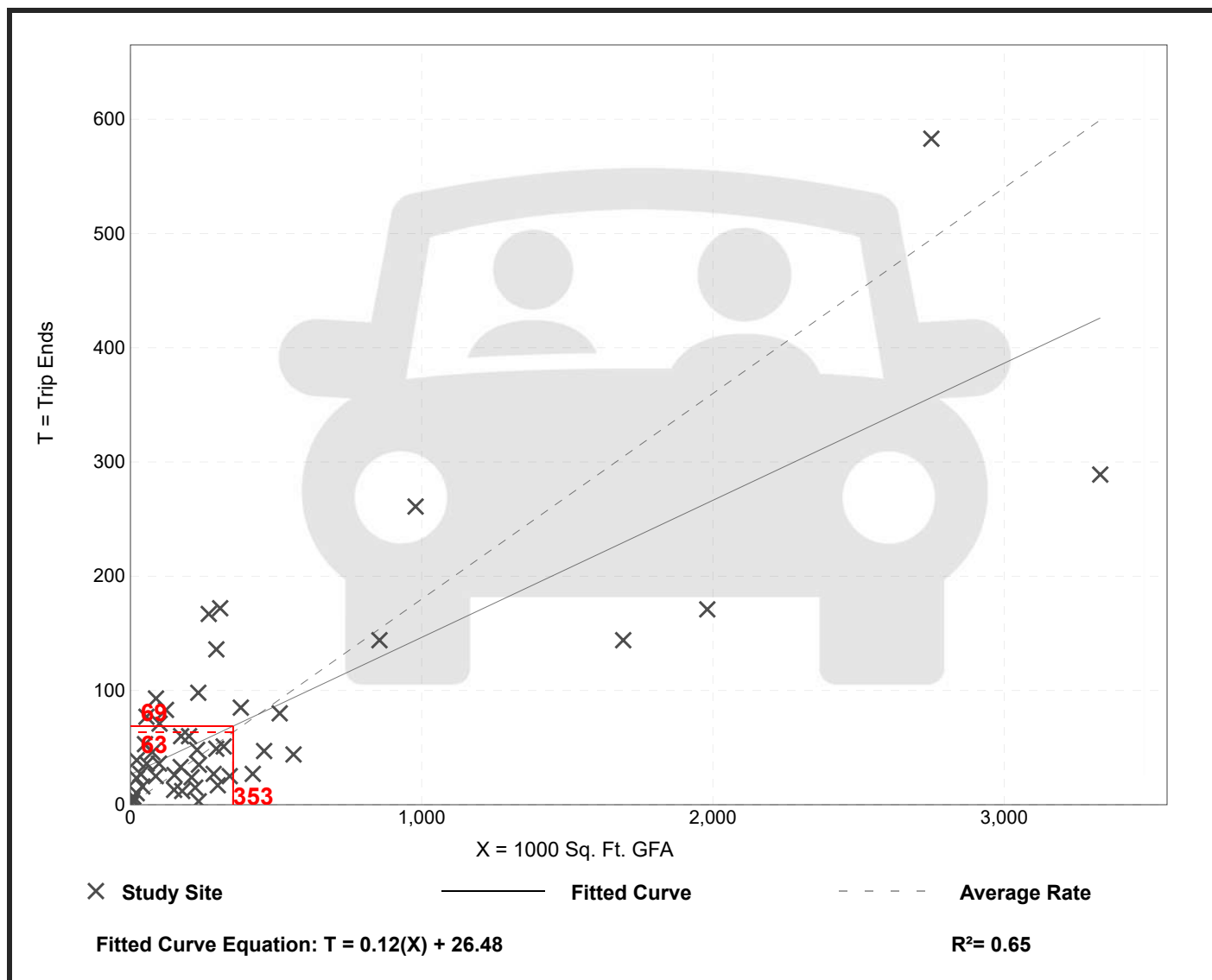
# Warehousing (150)

**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**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: 49  
 Avg. 1000 Sq. Ft. GFA: 400  
 Directional Distribution: 28% entering, 72% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.18	0.01 - 1.80	0.18

## Data Plot and Equation



# Warehousing (150)

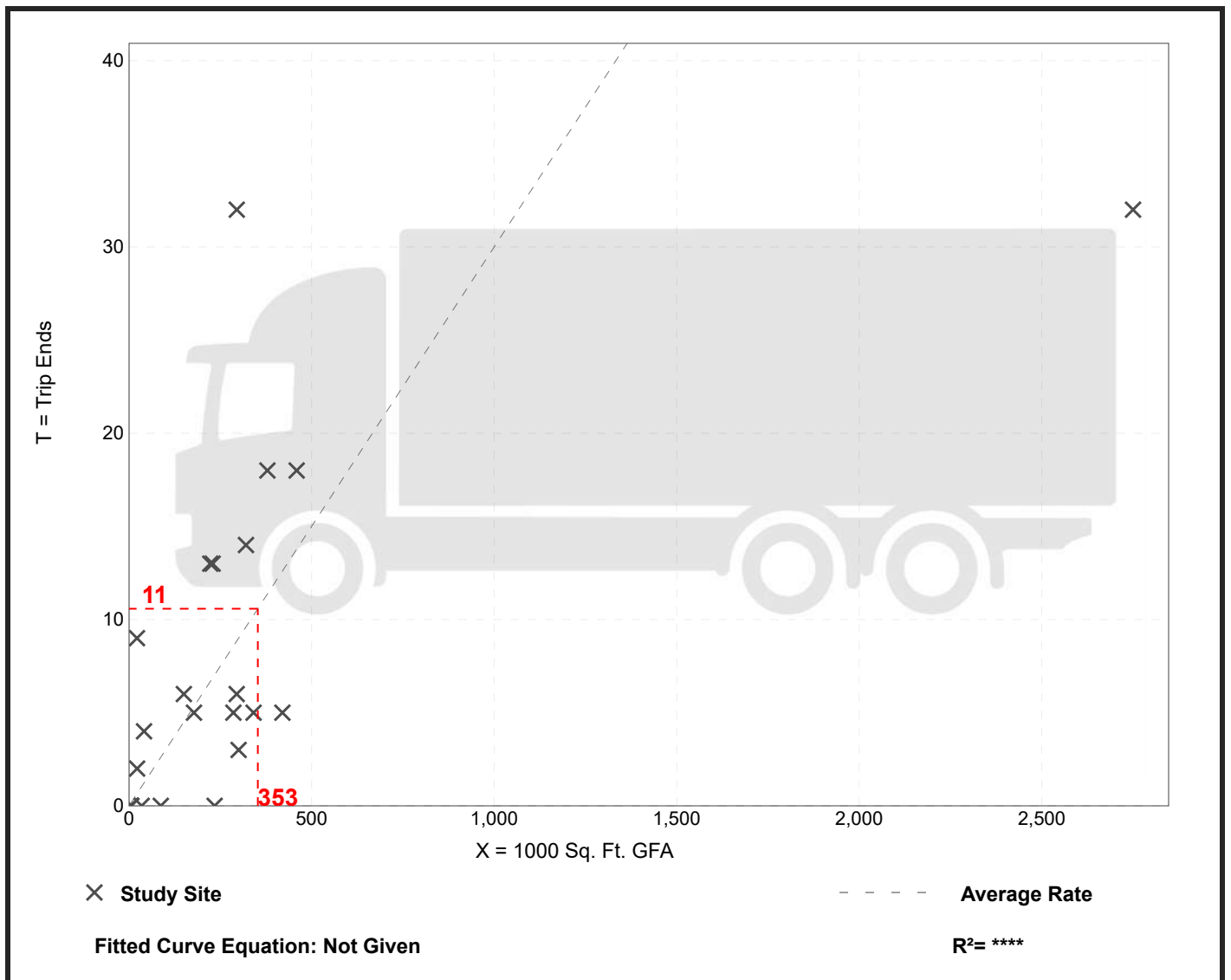
**Truck Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 4 and 6 p.m.**

**Setting/Location: General Urban/Suburban**  
 Number of Studies: 23  
 Avg. 1000 Sq. Ft. GFA: 308  
 Directional Distribution: 52% entering, 48% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.03	0.00 - 0.42	0.03

## Data Plot and Equation



# Warehousing (150)

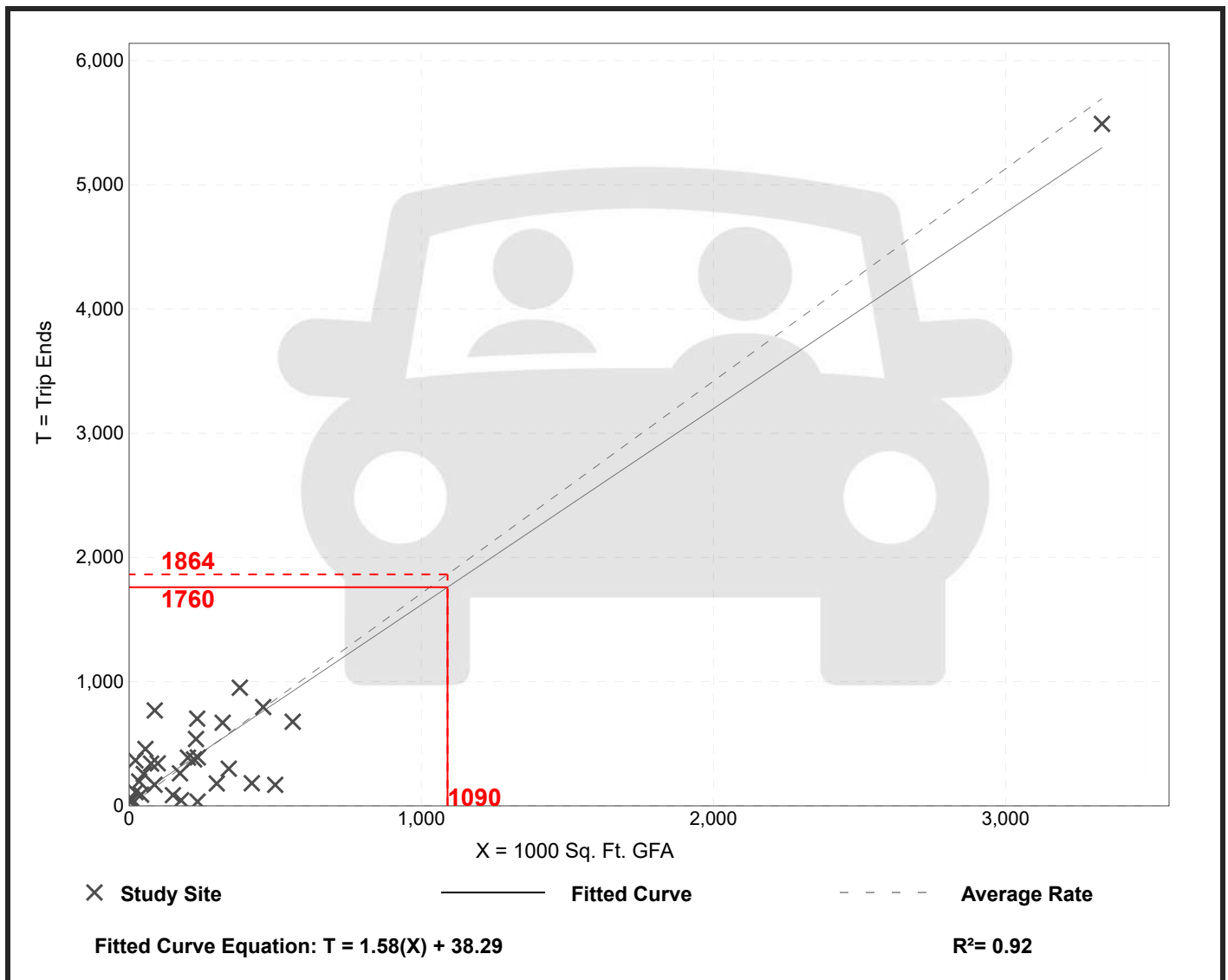
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA  
On a: Weekday

Setting/Location: General Urban/Suburban  
Number of Studies: 31  
Avg. 1000 Sq. Ft. GFA: 292  
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.71	0.15 - 16.93	1.48

## Data Plot and Equation



# Warehousing (150)

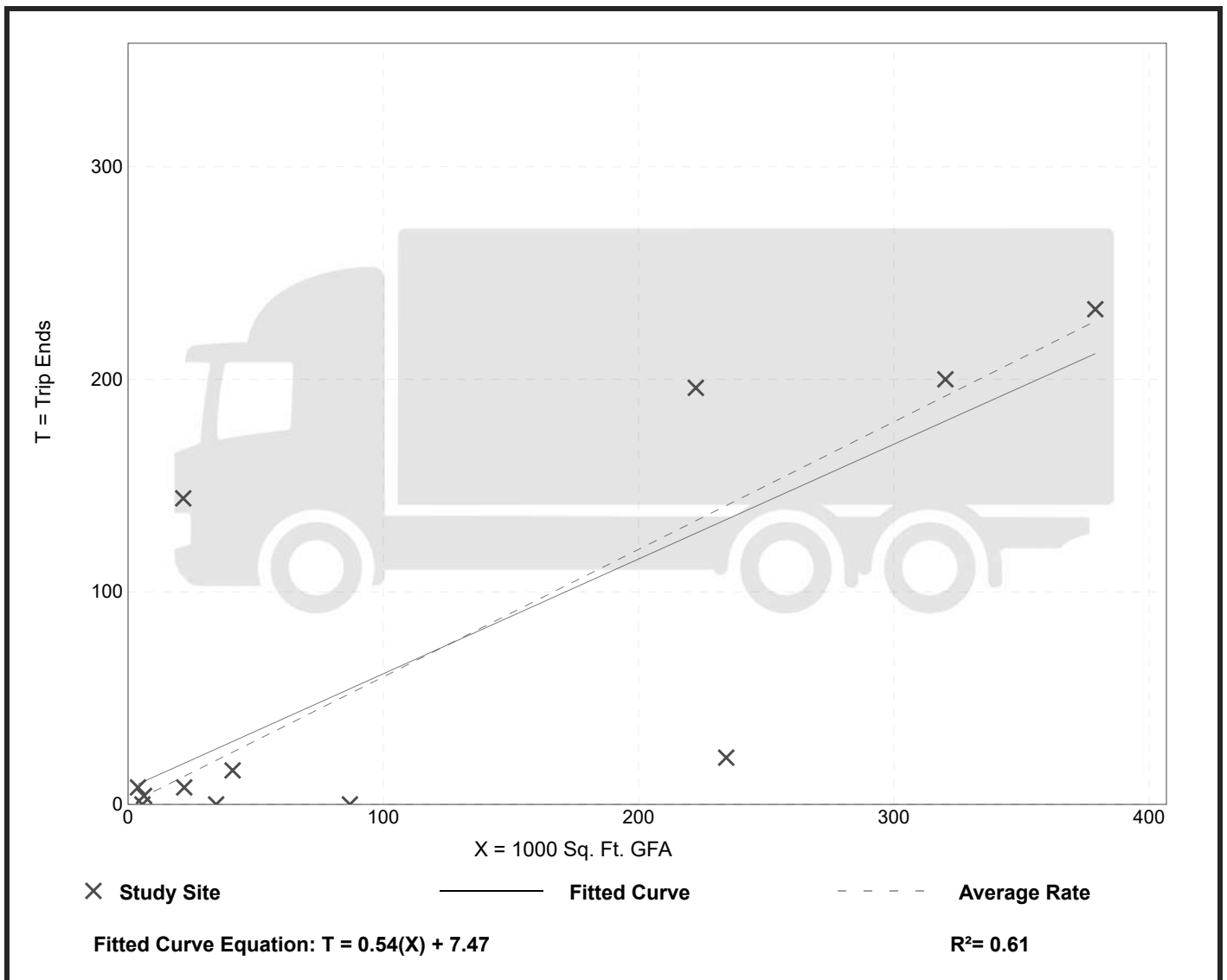
**Truck Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday**

**Setting/Location: General Urban/Suburban**  
 Number of Studies: 12  
 Avg. 1000 Sq. Ft. GFA: 115  
 Directional Distribution: 50% entering, 50% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.60	0.00 - 6.66	0.86

## Data Plot and Equation





# Warehousing (150)

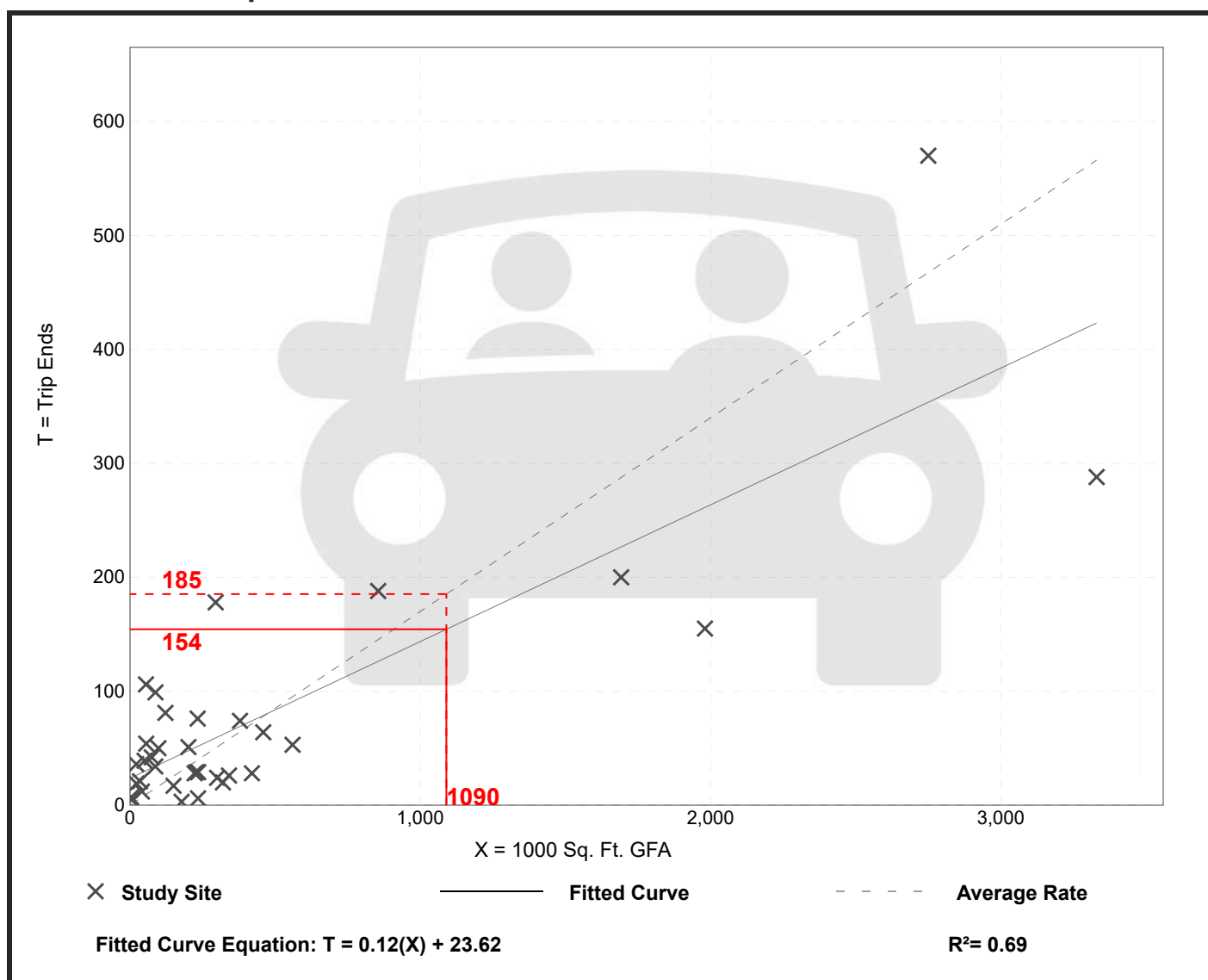
**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**

**Setting/Location: General Urban/Suburban**  
 Number of Studies: 36  
 Avg. 1000 Sq. Ft. GFA: 448  
 Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.17	0.02 - 1.93	0.19

## Data Plot and Equation



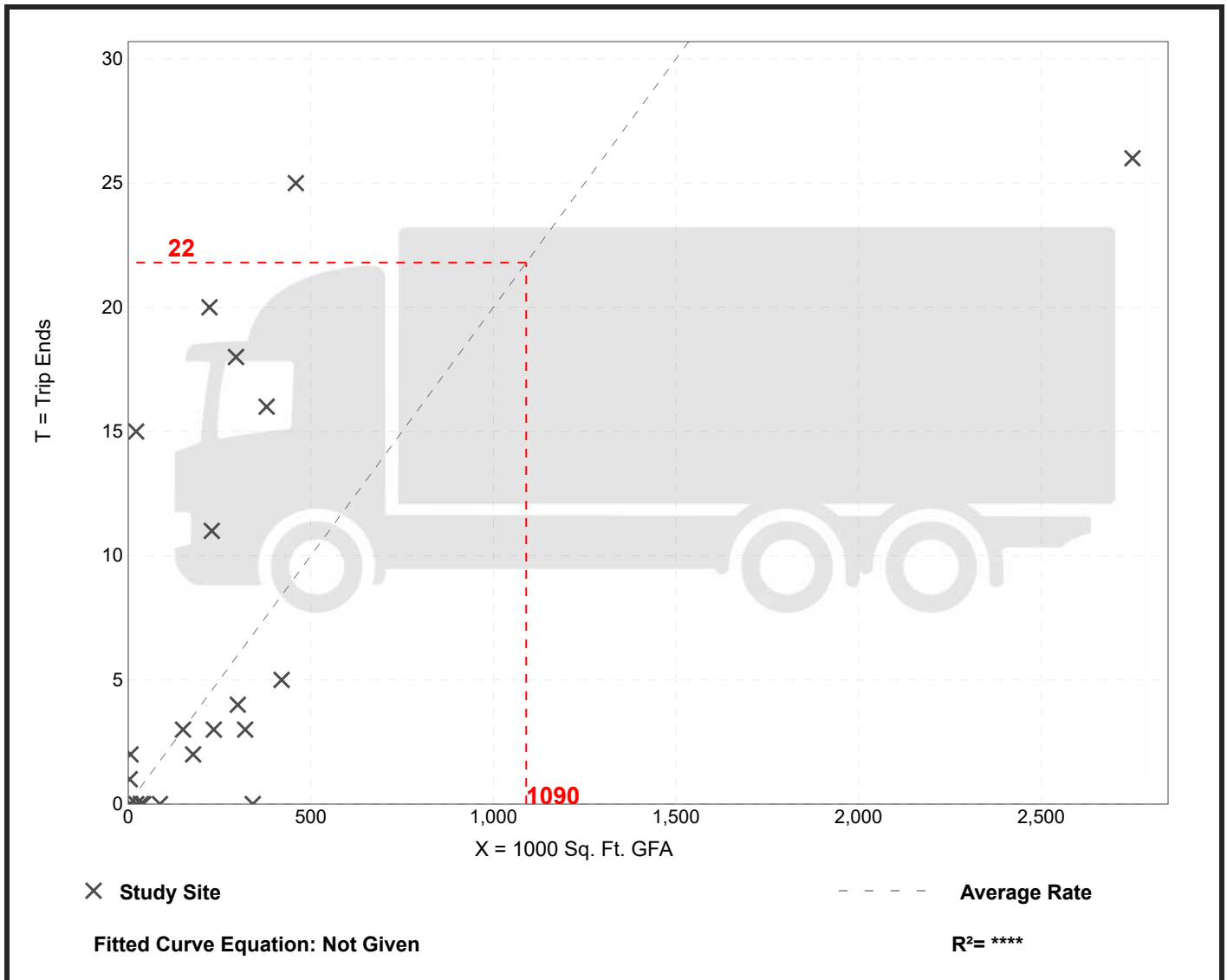
# Warehousing (150)

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**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**  
**Setting/Location: General Urban/Suburban**  
 Number of Studies: 21  
 Avg. 1000 Sq. Ft. GFA: 309  
 Directional Distribution: 52% entering, 48% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
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## Data Plot and Equation



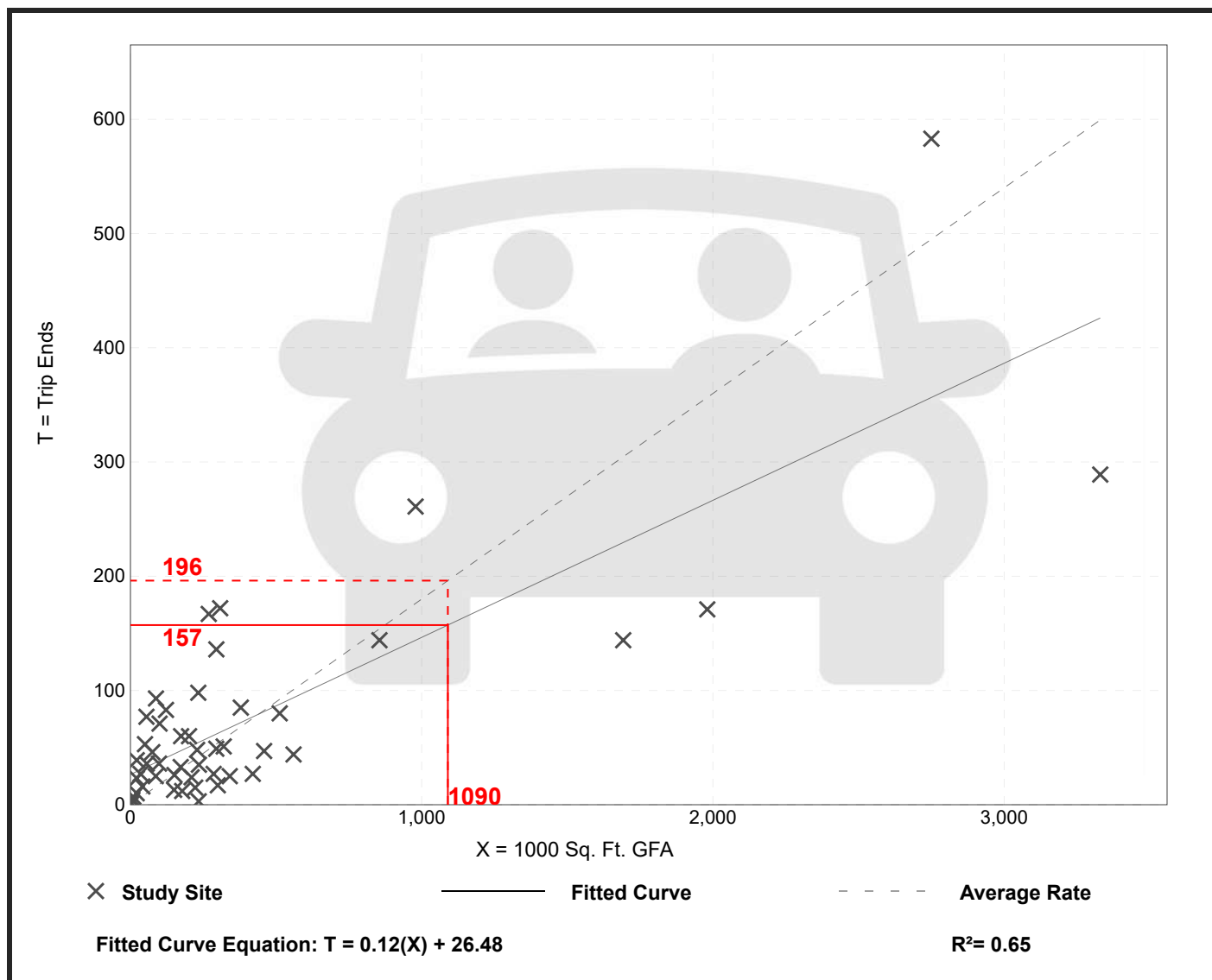
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**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 4 and 6 p.m.**  
**Setting/Location: General Urban/Suburban**  
 Number of Studies: 49  
 Avg. 1000 Sq. Ft. GFA: 400  
 Directional Distribution: 28% entering, 72% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
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## Data Plot and Equation



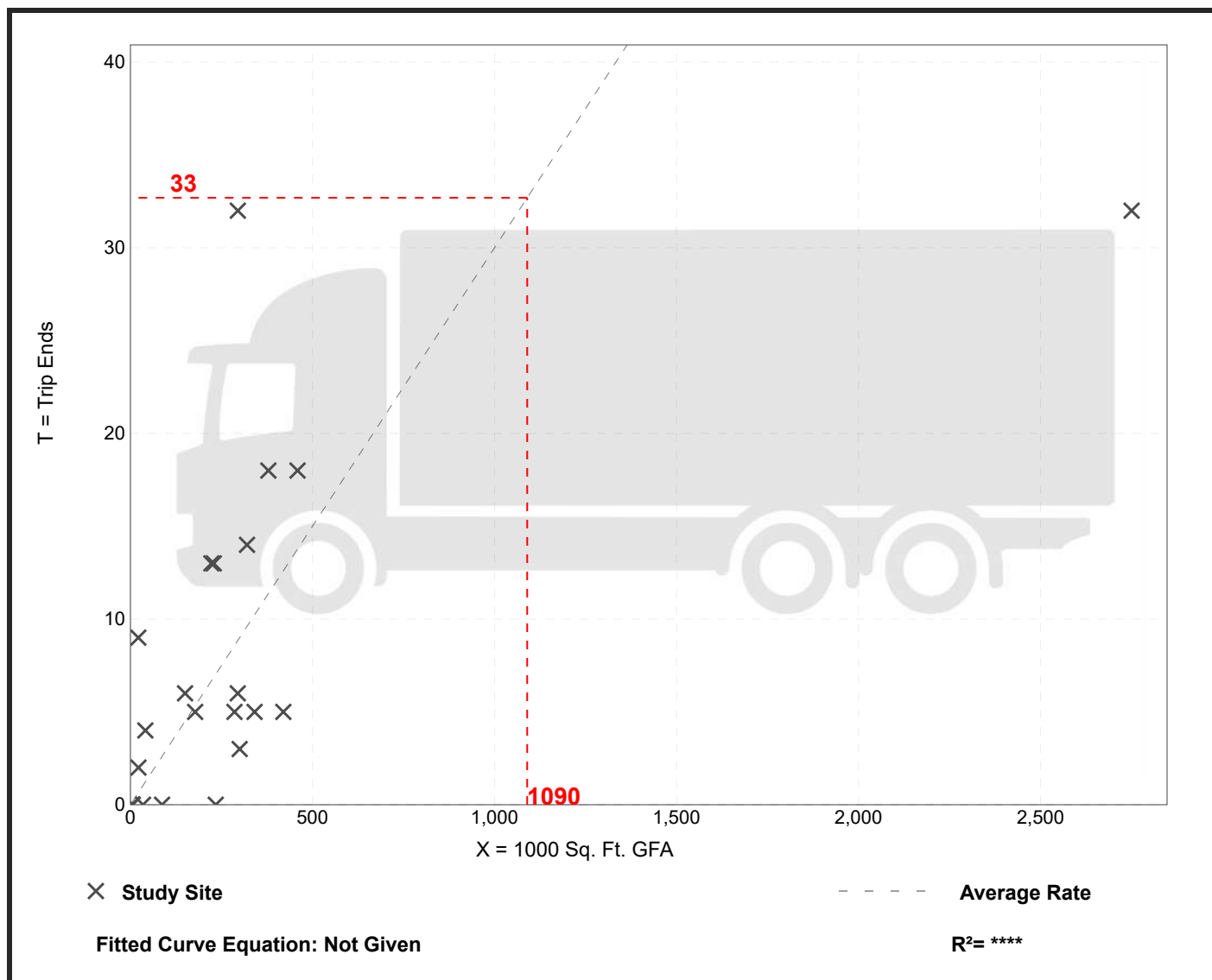
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## Data Plot and Equation



# Warehousing (150)

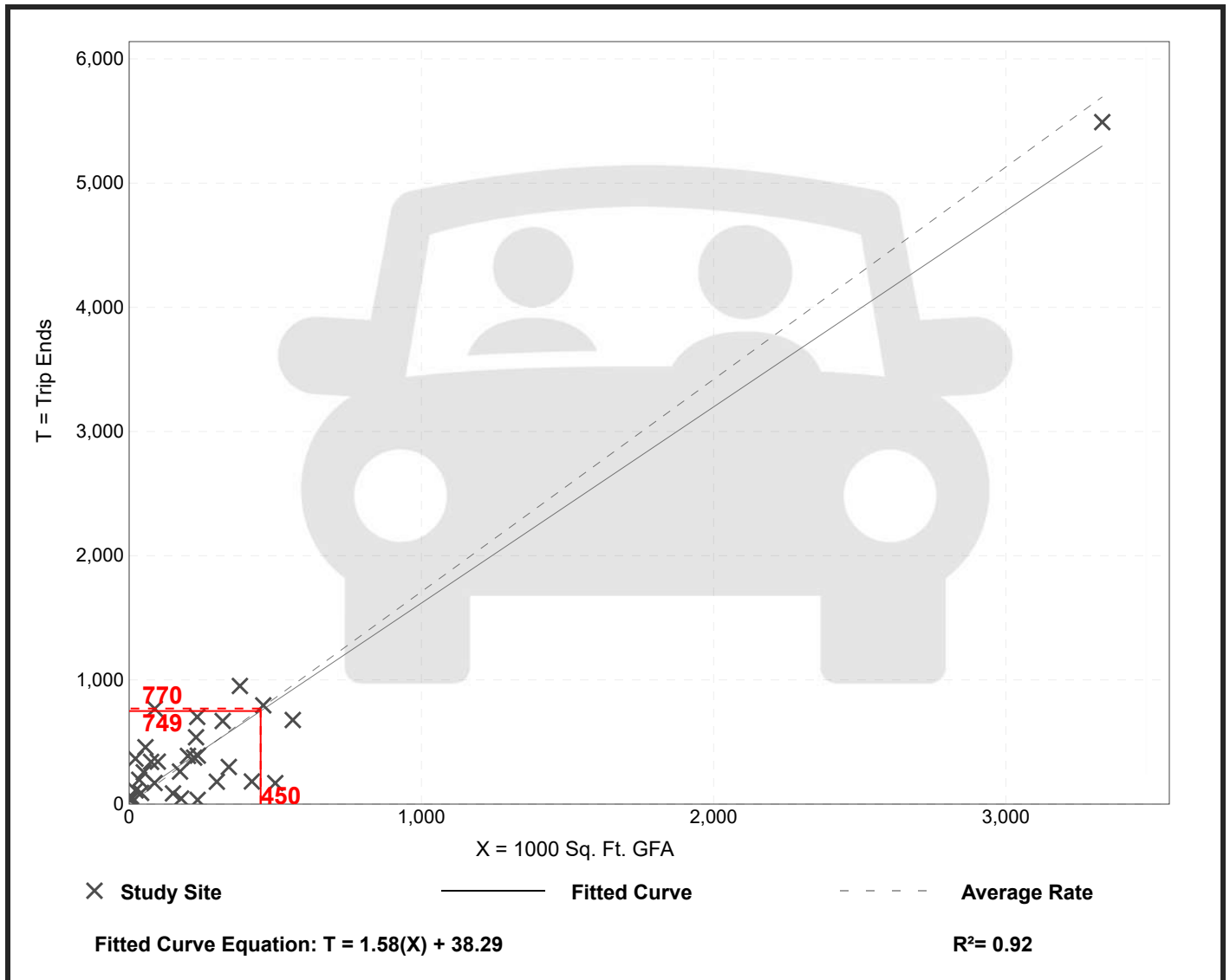
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**On a: Weekday**

**Setting/Location: General Urban/Suburban**  
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Avg. 1000 Sq. Ft. GFA: 292  
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.71	0.15 - 16.93	1.48

## Data Plot and Equation



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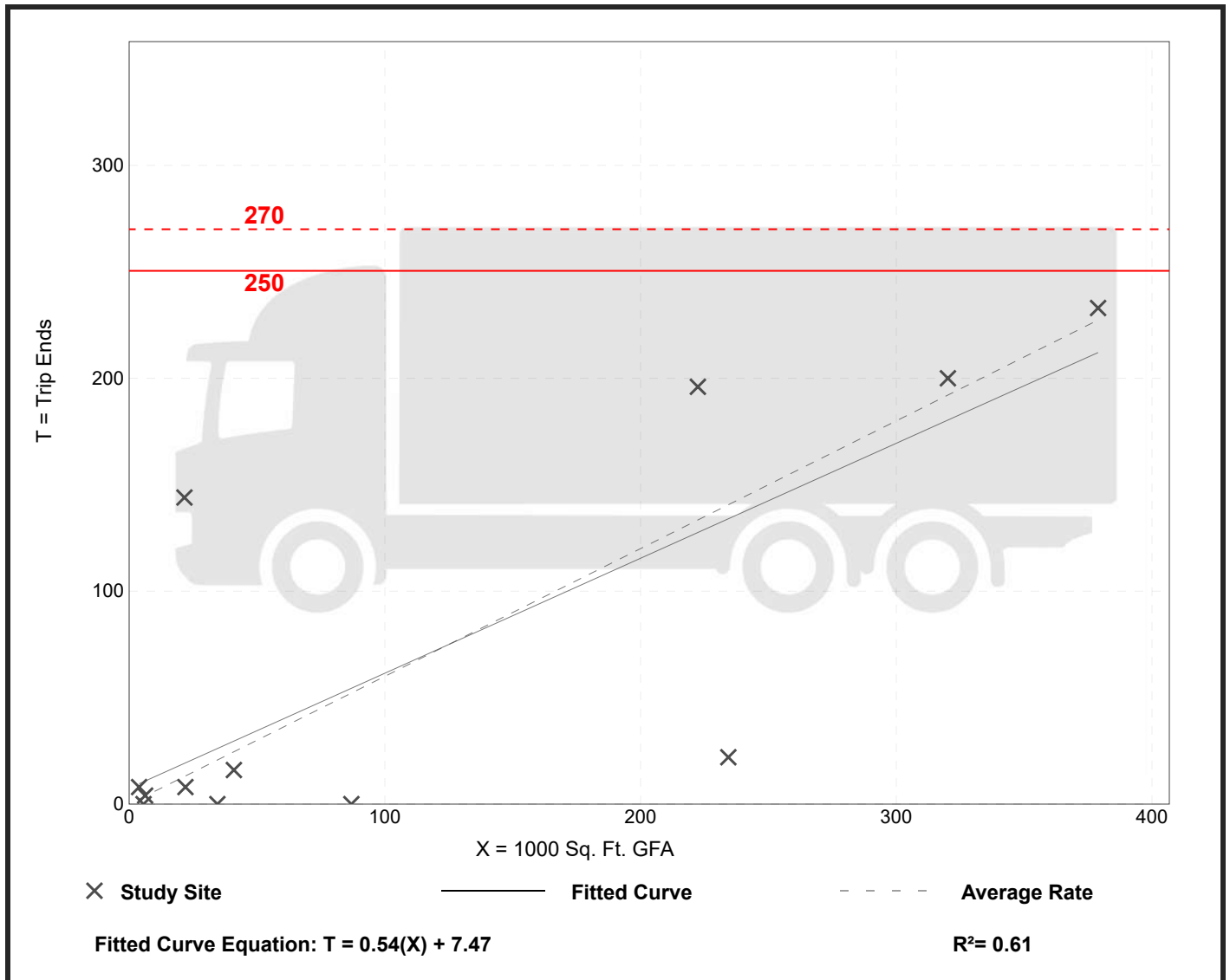
**Truck Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday**

**Setting/Location: General Urban/Suburban**  
 Number of Studies: 12  
 Avg. 1000 Sq. Ft. GFA: 115  
 Directional Distribution: 50% entering, 50% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
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## Data Plot and Equation



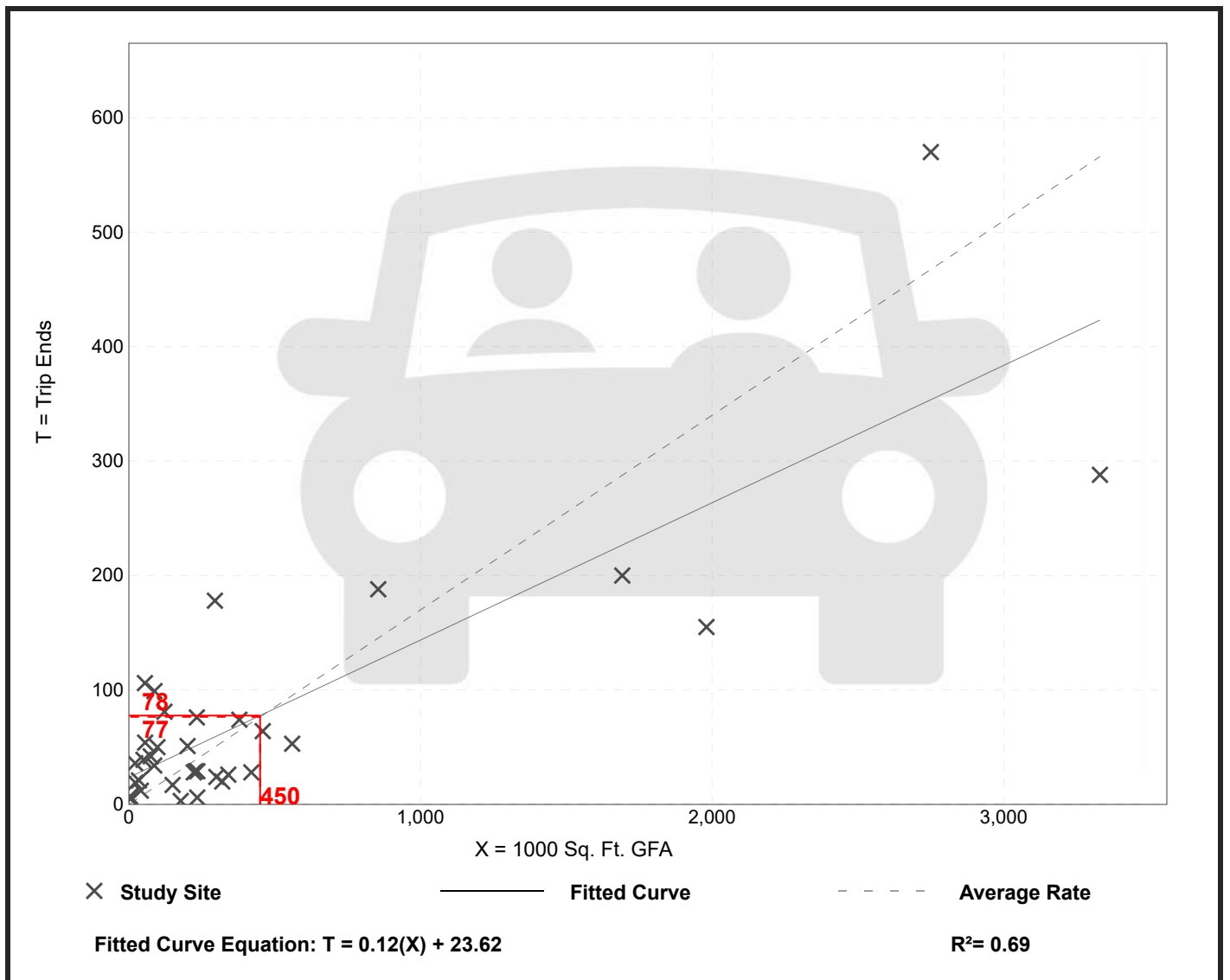
# Warehousing (150)

**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**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: 36  
 Avg. 1000 Sq. Ft. GFA: 448  
 Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.17	0.02 - 1.93	0.19

## Data Plot and Equation



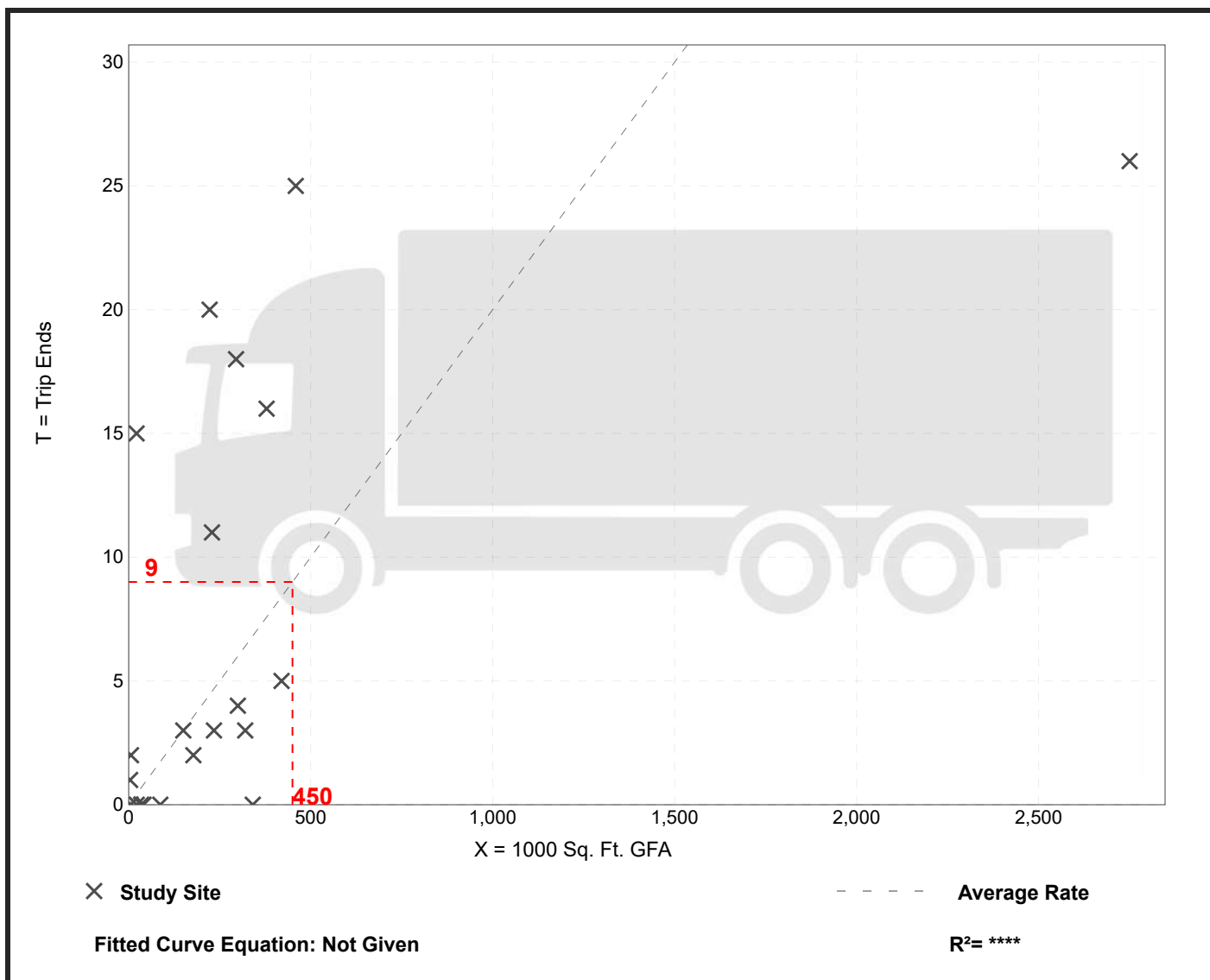
# Warehousing (150)

**Truck Trip Ends vs: 1000 Sq. Ft. GFA**  
**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: 21  
 Avg. 1000 Sq. Ft. GFA: 309  
 Directional Distribution: 52% entering, 48% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.02	0.00 - 0.69	0.05

## Data Plot and Equation





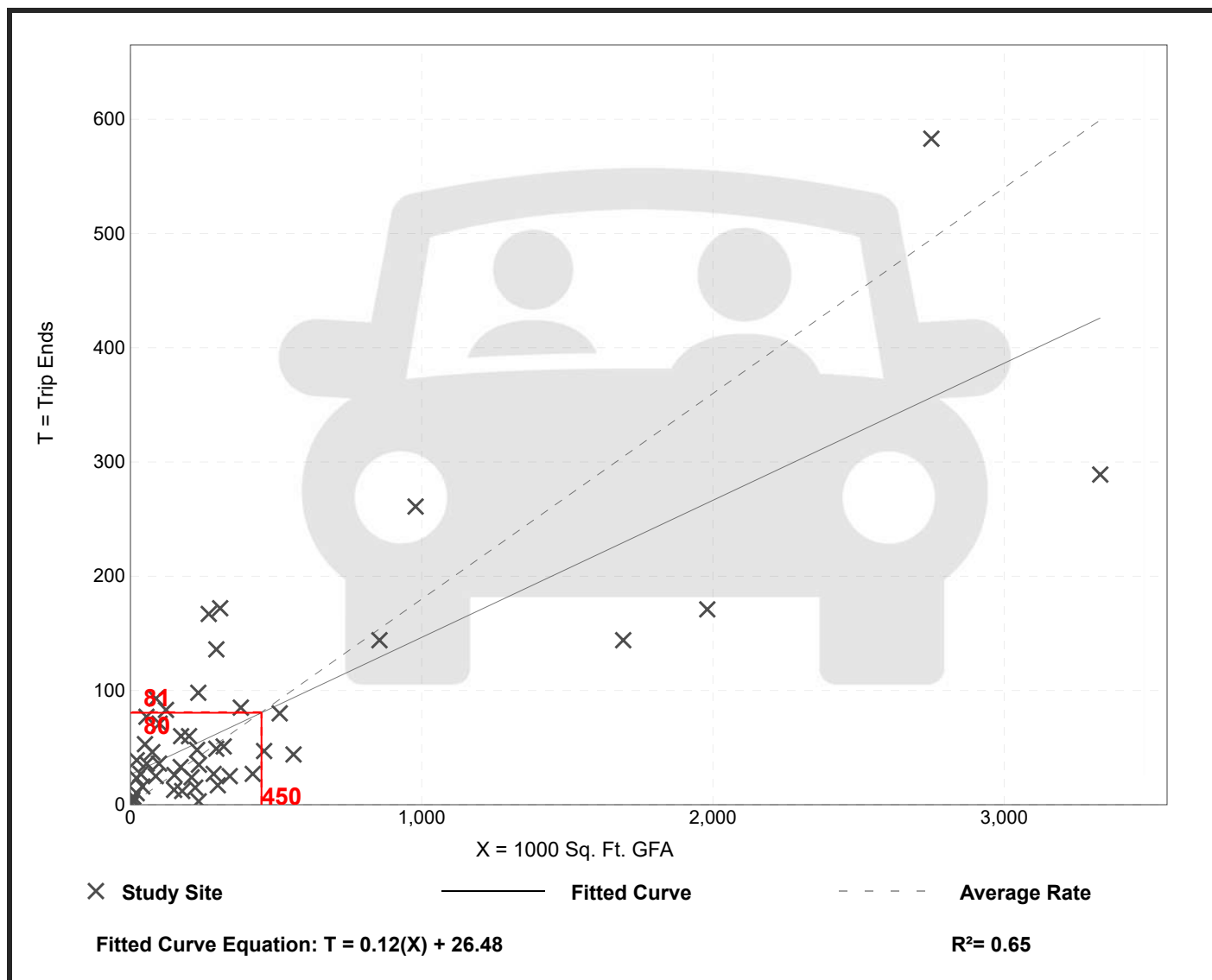
# Warehousing (150)

**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**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: 49  
 Avg. 1000 Sq. Ft. GFA: 400  
 Directional Distribution: 28% entering, 72% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.18	0.01 - 1.80	0.18

## Data Plot and Equation



# Warehousing (150)

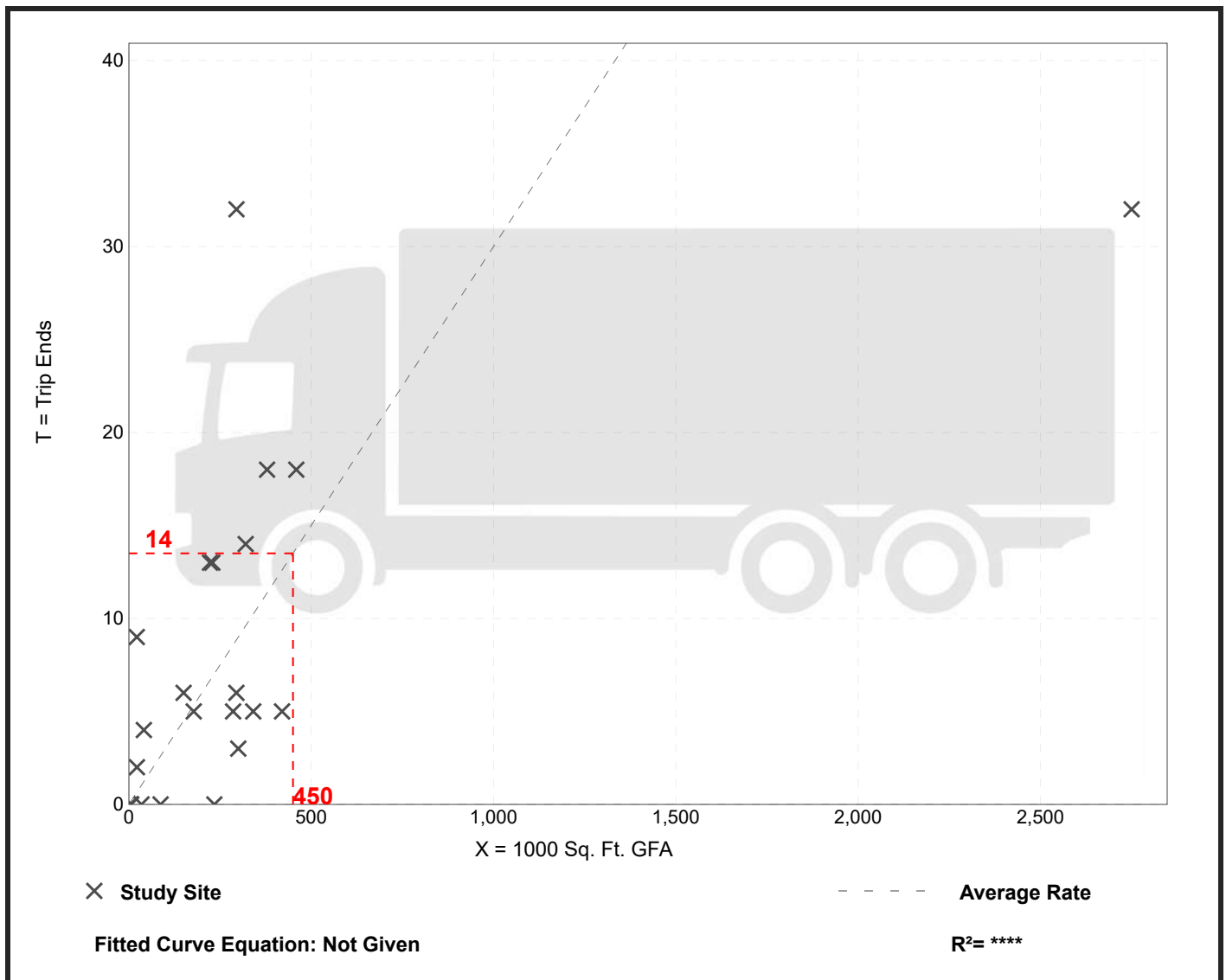
Truck Trip Ends vs: 1000 Sq. Ft. GFA  
 On a: Weekday,  
 Peak Hour of Adjacent Street Traffic,  
 One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban  
 Number of Studies: 23  
 Avg. 1000 Sq. Ft. GFA: 308  
 Directional Distribution: 52% entering, 48% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.03	0.00 - 0.42	0.03

## Data Plot and Equation



Home Destination Report - Where Workers Live Who are Employed in the Selection Area - by Count

Total All Jobs

Count	Share
3,770	100.0%

Jobs Counts by Counties Where Workers Live

Count	Share
2,738	77.5%
196	5.3% East
182	5.1% West
172	4.9% NW
106	3.0% NE
28	0.8% NE
24	0.7% West
18	0.5% East
16	0.5% East
16	0.5% North
12	0.3% North
9	0.3% North
8	0.2%
8	0.2% NE
6	0.2% South
6	0.2% North

	E Canal Road - EB	E Canal Rd WB	Hilton Ave	Roosevelt /Church Rd	Greenbriar	Milcreek Rd	Bull Run Rd	Route 30 W	SB Exit	297 WB	US 30 to Ke	Susquehan E	Canal Ro	E Canal Rd	Hilton Ave	Roosevelt /Church Rd	Greenbriar	Milcreek Rd	Bull Run Rd	Route 30 W	E Column1	US 30 to	US 30 to	Susque		
York County, PA	100.00%	18.83%																								
Lancaster County, PA	100.00%	2.86%	19.20%	9.72%	2.62%	2.56%	10.01%	19.03%	8.66%	0.79%	0.18%	3.40%	2.15%	14.55%	2.21%	14.87%	7.53%	2.03%	1.98%	7.75%	14.74%	6.70%	0.61%	0.14%	2.63%	
Adams County, PA	100.00%													5.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Cumberland County, PA	100.00%						60.00%		40.00%					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.92%	0.00%	1.95%	0.00%	0.00%	0.00%	
Dauphin County, PA	100.00%							100.00%						0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.00%	0.00%	0.00%	0.00%	
Lebanon County, PA	100.00%							100.00%						0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.79%	0.00%	0.00%	
Franklin County, PA	100.00%						50.00%		50.00%					0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.34%	0.00%	0.34%	0.00%	
Montgomery County, PA	0.00%													0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Chester County, PA	100.00%	100.00%												0.51%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Berks County, PA	100.00%							100.00%						0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.45%	0.00%	0.00%	0.00%	
Perry County, PA	100.00%							100.00%						0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.45%	0.00%	0.00%	0.00%	
Delaware County, PA	0.00%													0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Northumberland County, PA	100.00%							100.00%						0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.34%	0.00%	0.00%	0.00%	
Philadelphia County, PA	0.00%													0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Bucks County, PA	0.00%													0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Junata County, PA	100.00%							100.00%						0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.25%	0.00%	0.00%	
Baltimore County, MD	100.00%							100.00%						0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%	0.00%	0.00%	0.00%	
Schuykill County, PA	100.00%							100.00%						0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.23%	0.00%	0.00%	0.00%	
Clinton County, PA	0.00%													0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Lackawanna County, PA	0.00%													0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Lycoming County, PA	0.00%													0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Anne Arundel County, MD	100.00%							100.00%						0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.17%	0.00%	0.00%	0.00%	
Centre County, PA	0.00%													0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Mifflin County, PA	100.00%							100.00%						0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.17%	0.00%	0.00%	0.00%	
Northampton County, PA	0.00%													0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
	3,535													100.00%	29.24%	2.21%	14.87%	7.53%	2.03%	1.98%	7.75%	16.00%	12.81%	6.13%	0.14%	2.63%

E Canal Road - EB	20.2%	20.0%
E Canal Rd WB	2.2%	2.0%
Hilton Ave - EB	14.9%	15.0%
Roosevelt Ave NB	7.5%	7.0%
Church Road EB	2.0%	2.0%
Greenbriar Farm NB	2.0%	2.0%
Milcreek Rd NB	7.8%	8.0%
Bull Run Rd SB	18.0%	18.0%
Route 30 WB	12.8%	13.0%
SB Exit	5.1%	5.0%
297 WB	0.1%	0.0%
US 30 to Kenneth Road	2.6%	3.0%
Susquehanna Trail WBT	1.7%	2.0%
	100.0%	100.0%



## **APPENDIX F**

### **CAPACITY ANALYSIS**

## **2022 EXISTING CONDITIONS**

Bull Road Logistics  
1: Main St & Canal Rd

2022 Existing AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕		↗	↘		↗	↘	
Traffic Volume (vph)	104	185	55	36	196	53	66	306	30	72	269	90
Future Volume (vph)	104	185	55	36	196	53	66	306	30	72	269	90
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	15	12	10	12	12	10	12	12
Grade (%)		1%			-1%			6%			-1%	
Storage Length (ft)	0		0	0		0	70		0	60		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			70			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		25			25			25				25
Link Distance (ft)		933			1422			721				620
Travel Time (s)		25.4			38.8			19.7				16.9
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	4%	9%	13%	3%	9%	6%	12%	3%	3%	8%	3%	9%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	396	0	0	327	0	76	386	0	83	412	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		15.0	15.0	
Total Split (s)	34.0	34.0		34.0	34.0		46.0	46.0		46.0	46.0	
Total Split (%)	42.5%	42.5%		42.5%	42.5%		57.5%	57.5%		57.5%	57.5%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
v/c Ratio		0.66			0.42		0.37	0.61		0.35	0.65	
Control Delay		19.2			12.9		19.2	18.9		17.8	20.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		19.2			12.9		19.2	18.9		17.8	20.1	
Queue Length 50th (ft)		89			63		19	105		20	115	
Queue Length 95th (ft)		221			152		49	177		50	192	
Internal Link Dist (ft)		853			1342			641			540	
Turn Bay Length (ft)							70			60		
Base Capacity (vph)		738			951		418	1302		485	1296	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.54			0.34		0.18	0.30		0.17	0.32	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 54.8

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Main St & Canal Rd





Bull Road Logistics  
1: Main St & Canal Rd

2022 Existing AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Volume (veh/h)	104	185	55	36	196	53	66	306	30	72	269	90
Future Volume (veh/h)	104	185	55	36	196	53	66	306	30	72	269	90
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1668	1612	1795	1778	1752	1431	1557	1557	1724	1795	1709
Adj Flow Rate, veh/h	120	213	63	41	225	61	76	352	34	83	309	103
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	4	9	13	3	9	6	12	3	3	8	3	9
Cap, veh/h	252	324	85	153	454	114	383	588	57	417	542	181
Arrive On Green	0.33	0.36	0.33	0.33	0.36	0.33	0.42	0.42	0.39	0.42	0.42	0.39
Sat Flow, veh/h	342	899	235	116	1259	315	745	1398	135	919	1288	429
Grp Volume(v), veh/h	396	0	0	327	0	0	76	0	386	83	0	412
Grp Sat Flow(s),veh/h/ln	1476	0	0	1690	0	0	745	0	1533	919	0	1717
Q Serve(g_s), s	2.8	0.0	0.0	0.0	0.0	0.0	3.1	0.0	7.1	2.8	0.0	6.7
Cycle Q Clear(g_c), s	8.4	0.0	0.0	5.6	0.0	0.0	9.3	0.0	7.1	9.4	0.0	6.7
Prop In Lane	0.30		0.16	0.13		0.19	1.00		0.09	1.00		0.25
Lane Grp Cap(c), veh/h	620	0	0	674	0	0	383	0	645	417	0	722
V/C Ratio(X)	0.64	0.00	0.00	0.49	0.00	0.00	0.20	0.00	0.60	0.20	0.00	0.57
Avail Cap(c_a), veh/h	1237	0	0	1404	0	0	926	0	1761	1086	0	1974
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.2	0.0	0.0	9.4	0.0	0.0	11.4	0.0	8.2	11.6	0.0	8.2
Incr Delay (d2), s/veh	1.1	0.0	0.0	0.5	0.0	0.0	0.3	0.0	0.9	0.2	0.0	0.7
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	4.3	0.0	0.0	3.2	0.0	0.0	0.8	0.0	3.3	0.9	0.0	3.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.3	0.0	0.0	9.9	0.0	0.0	11.7	0.0	9.1	11.9	0.0	8.9
LnGrp LOS	B	A	A	A	A	A	B	A	A	B	A	A
Approach Vol, veh/h		396			327			462				495
Approach Delay, s/veh		11.3			9.9			9.6				9.4
Approach LOS		B			A			A				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		19.4		17.2		19.4		17.2				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		41.0		29.0		41.0		29.0				
Max Q Clear Time (g_c+I1), s		11.8		10.4		11.9		7.6				
Green Ext Time (p_c), s		2.4		1.8		2.5		1.4				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				10.0								
HCM 6th LOS				A								

Bull Road Logistics  
2: Bull Rd & Canal Rd

2022 Existing AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	2	347	89	67	169	43	52	64	134	73	147	10
Future Volume (vph)	2	347	89	67	169	43	52	64	134	73	147	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	7%	16%	4%	9%	4%	8%	3%	5%	4%	20%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	466	0	0	297	0	0	266	0	0	245	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection	
Intersection Delay, s/veh	24.4
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	347	89	67	169	43	52	64	134	73	147	10
Future Vol, veh/h	2	347	89	67	169	43	52	64	134	73	147	10
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, %	0	3	7	16	4	9	4	8	3	5	4	20
Mvmt Flow	2	369	95	71	180	46	55	68	143	78	156	11
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	34.3	20.2	17.6	17.9
HCM LOS	D	C	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	21%	0%	24%	32%
Vol Thru, %	26%	79%	61%	64%
Vol Right, %	54%	20%	15%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	250	438	279	230
LT Vol	52	2	67	73
Through Vol	64	347	169	147
RT Vol	134	89	43	10
Lane Flow Rate	266	466	297	245
Geometry Grp	1	1	1	1
Degree of Util (X)	0.521	0.836	0.592	0.505
Departure Headway (Hd)	7.049	6.459	7.182	7.424
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	511	559	502	484
Service Time	5.113	4.512	5.245	5.489
HCM Lane V/C Ratio	0.521	0.834	0.592	0.506
HCM Control Delay	17.6	34.3	20.2	17.9
HCM Lane LOS	C	D	C	C
HCM 95th-tile Q	3	8.7	3.8	2.8



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↔	↔	
Traffic Volume (vph)	479	64	16	235	53	26
Future Volume (vph)	479	64	16	235	53	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	12
Grade (%)	4%			0%	4%	
Link Speed (mph)	40			40	40	
Link Distance (ft)	1159			3081	2342	
Travel Time (s)	19.8			52.5	39.9	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	4%	2%	0%	9%	6%	8%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	631	0	0	292	92	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	479	64	16	235	53	26
Future Vol, veh/h	479	64	16	235	53	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	4	-	-	0	4	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	4	2	0	9	6	8
Mvmt Flow	557	74	19	273	62	30

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	631	0	905
Stage 1	-	-	-	-	594
Stage 2	-	-	-	-	311
Critical Hdwy	-	-	4.3	-	7.3
Critical Hdwy Stg 1	-	-	-	-	6.26
Critical Hdwy Stg 2	-	-	-	-	6.26
Follow-up Hdwy	-	-	3	-	3.1
Pot Cap-1 Maneuver	-	-	726	-	267
Stage 1	-	-	-	-	528
Stage 2	-	-	-	-	771
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	726	-	259
Mov Cap-2 Maneuver	-	-	-	-	259
Stage 1	-	-	-	-	528
Stage 2	-	-	-	-	747

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	21.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	305	-	-	726	-
HCM Lane V/C Ratio	0.301	-	-	0.026	-
HCM Control Delay (s)	21.8	-	-	10.1	0
HCM Lane LOS	C	-	-	B	A
HCM 95th %tile Q(veh)	1.2	-	-	0.1	-

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2022 Existing AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (vph)	236	247	21	10	126	30	9	145	13	31	190	144
Future Volume (vph)	236	247	21	10	126	30	9	145	13	31	190	144
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	0		0	0		0	0		0	0		160
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	5%	4%	10%	10%	8%	43%	22%	10%	31%	71%	5%	15%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	514	0	0	170	0	0	170	0	0	226	147
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	16.3	16.3		16.3	16.3		9.6	9.6		9.6	9.6	9.6
Total Split (s)	51.3	51.3		51.3	51.3		26.6	26.6		26.6	26.6	26.6
Total Split (%)	65.9%	65.9%		65.9%	65.9%		34.1%	34.1%		34.1%	34.1%	34.1%
Yellow Time (s)	4.3	4.3		4.3	4.3		4.3	4.3		4.3	4.3	4.3
All-Red Time (s)	2.0	2.0		2.0	2.0		2.3	2.3		2.3	2.3	2.3
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)		5.3			5.3			5.6			5.6	5.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
v/c Ratio		0.81			0.23			0.43			0.57	0.31
Control Delay		22.4			8.3			23.1			26.0	6.4
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		22.4			8.3			23.1			26.0	6.4
Queue Length 50th (ft)		116			26			42			58	0
Queue Length 95th (ft)		270			63			125			167	42
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)												160
Base Capacity (vph)		1072			1224			621			627	672
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		0.48			0.14			0.27			0.36	0.22

Intersection Summary

Area Type: Other

Cycle Length: 77.9  
Actuated Cycle Length: 53.3  
Natural Cycle: 60  
Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2022 Existing AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (veh/h)	236	247	21	10	126	30	9	145	13	31	190	144
Future Volume (veh/h)	236	247	21	10	126	30	9	145	13	31	190	144
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1803	1818	1732	1807	1835	1338	1441	1609	1315	902	1841	1698
Adj Flow Rate, veh/h	241	252	21	10	129	31	9	148	13	32	194	64
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	5	4	10	10	8	43	22	10	31	71	5	15
Cap, veh/h	446	411	31	115	707	161	106	276	23	140	346	304
Arrive On Green	0.48	0.50	0.48	0.48	0.50	0.48	0.18	0.21	0.18	0.18	0.21	0.21
Sat Flow, veh/h	612	817	61	30	1406	320	32	1307	111	154	1636	1439
Grp Volume(v), veh/h	514	0	0	170	0	0	170	0	0	226	0	64
Grp Sat Flow(s),veh/h/ln	1489	0	0	1757	0	0	1450	0	0	1789	0	1439
Q Serve(g_s), s	8.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	1.4
Cycle Q Clear(g_c), s	10.1	0.0	0.0	2.0	0.0	0.0	4.4	0.0	0.0	4.3	0.0	1.4
Prop In Lane	0.47		0.04	0.06		0.18	0.05		0.08	0.14		1.00
Lane Grp Cap(c), veh/h	848	0	0	937	0	0	368	0	0	439	0	304
V/C Ratio(X)	0.61	0.00	0.00	0.18	0.00	0.00	0.46	0.00	0.00	0.51	0.00	0.21
Avail Cap(c_a), veh/h	1870	0	0	2142	0	0	889	0	0	1021	0	793
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	1.00
Uniform Delay (d), s/veh	7.3	0.0	0.0	5.3	0.0	0.0	13.4	0.0	0.0	13.6	0.0	12.4
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.9	0.0	0.3
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	3.2	0.0	0.0	0.8	0.0	0.0	2.0	0.0	0.0	2.7	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.5	0.0	0.0	5.3	0.0	0.0	14.3	0.0	0.0	14.6	0.0	12.7
LnGrp LOS	A	A	A	A	A	A	B	A	A	B	A	B
Approach Vol, veh/h		514			170			170				290
Approach Delay, s/veh		7.5			5.3			14.3				14.2
Approach LOS		A			A			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.5		13.6		24.5		13.6				
Change Period (Y+Rc), s		6.3		* 6.6		6.3		* 6.6				
Max Green Setting (Gmax), s		45.0		* 20		45.0		* 20				
Max Q Clear Time (g_c+I1), s		12.1		6.4		4.0		6.3				
Green Ext Time (p_c), s		6.1		0.4		1.6		0.8				

Intersection Summary

HCM 6th Ctrl Delay	9.9
HCM 6th LOS	A

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Bull Road Logistics  
5: I-83 SB Ramps & Susquehanna Trail

2022 Existing AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔						↔	
Traffic Volume (vph)	0	462	162	109	261	0	0	0	0	40	2	255
Future Volume (vph)	0	462	162	109	261	0	0	0	0	40	2	255
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	11	12	12	12	12	12	12	15	12
Grade (%)		2%			0%			0%				1%
Storage Length (ft)	0		0	50		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			35			25			25		
Satd. Flow (prot)	0	1490	0	1476	1488	0	0	0	0	0	1404	0
Flt Permitted				0.198							0.993	
Satd. Flow (perm)	0	1490	0	308	1488	0	0	0	0	0	1404	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26										290
Link Speed (mph)		40			40			30				30
Link Distance (ft)		3254			450			1020				690
Travel Time (s)		55.5			7.7			23.2				15.7
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	12%	25%	12%	21%	0%	0%	0%	0%	10%	50%	25%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	709	0	124	297	0	0	0	0	0	337	0
Turn Type		NA		pm+pt	NA					Perm		NA
Protected Phases		2		1	2 1							4
Permitted Phases				2 1						4		
Detector Phase		2		1	2 1					4		4
Switch Phase												
Minimum Initial (s)		15.0		3.0						3.0		3.0
Minimum Split (s)		21.3		9.3						9.1		9.1
Total Split (s)		53.3		15.3						27.1		27.1
Total Split (%)		55.7%		16.0%						28.3%		28.3%
Yellow Time (s)		4.0		4.0						3.2		3.2
All-Red Time (s)		2.3		2.3						2.9		2.9
Lost Time Adjust (s)		-1.0		-1.0								-1.0
Total Lost Time (s)		5.3		5.3								5.1
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		Min						None		None
Act Effct Green (s)		42.1		52.3	57.8							14.6
Actuated g/C Ratio		0.51		0.63	0.70							0.18
v/c Ratio		0.92		0.37	0.29							0.69
Control Delay		38.5		17.8	6.8							14.9
Queue Delay		0.0		0.0	0.0							0.0
Total Delay		38.5		17.8	6.8							14.9
LOS		D		B	A							B
Approach Delay		38.5			10.1							14.9
Approach LOS		D			B							B
Queue Length 50th (ft)		305		8	20							23
Queue Length 95th (ft)		#607		63	120							100
Internal Link Dist (ft)		3174			370			940				610

Lane Group	Ø5	Ø6	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	5	6	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	15.3	53.3	27.1
Total Split (%)	16%	56%	28%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	None	Min	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)				50								
Base Capacity (vph)		892		338	1054							591
Starvation Cap Reductn		0		0	0							0
Spillback Cap Reductn		0		0	0							0
Storage Cap Reductn		0		0	0							0
Reduced v/c Ratio		0.79		0.37	0.28							0.57

Intersection Summary

Area Type: Other  
 Cycle Length: 95.7  
 Actuated Cycle Length: 83  
 Natural Cycle: 70  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 1.12  
 Intersection Signal Delay: 24.9 Intersection LOS: C  
 Intersection Capacity Utilization 74.6% ICU Level of Service D  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 5: I-83 SB Ramps & Susquehanna Trail

#5 Ø2	#5 Ø1	#5 Ø4
53.3 s	15.3 s	27.1 s
#6 Ø6	#6 Ø5	#6 Ø8
53.3 s	15.3 s	27.1 s

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Lane Group	Ø5	Ø6	Ø8
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
6: I-83 NB Ramps & Susquehanna Trail

2022 Existing AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	388	121	0	0	208	43	163	1	65	0	0	0
Future Volume (vph)	388	121	0	0	208	43	163	1	65	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	11	12	12	12	12	12	12	16	12	12	12	12
Grade (%)		0%			2%			2%			0%	
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	35			25			25			25		
Satd. Flow (prot)	1463	1636	0	0	1567	0	0	1559	0	0	0	0
Flt Permitted	0.457							0.966				
Satd. Flow (perm)	704	1636	0	0	1567	0	0	1559	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					16			19				
Link Speed (mph)		40			40			30				30
Link Distance (ft)		450			839			925				282
Travel Time (s)		7.7			14.3			21.0				6.4
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	13%	10%	0%	0%	13%	2%	23%	0%	14%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	441	138	0	0	285	0	0	260	0	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA				
Protected Phases	5	6 5			6			8				
Permitted Phases	6 5						8					
Detector Phase	5	6 5			6		8	8				
Switch Phase												
Minimum Initial (s)	3.0				15.0		3.0	3.0				
Minimum Split (s)	9.3				21.3		9.1	9.1				
Total Split (s)	15.3				53.3		27.1	27.1				
Total Split (%)	16.0%				55.7%		28.3%	28.3%				
Yellow Time (s)	4.0				4.0		3.2	3.2				
All-Red Time (s)	2.3				2.3		2.9	2.9				
Lost Time Adjust (s)	-1.0				-1.0			-1.0				
Total Lost Time (s)	5.3				5.3			5.1				
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Recall Mode	None				Min		None	None				
Act Effct Green (s)	35.5	40.9			25.3			31.5				
Actuated g/C Ratio	0.43	0.49			0.30			0.38				
v/c Ratio	1.12	0.17			0.58			0.43				
Control Delay	89.3	6.8			28.3			21.7				
Queue Delay	0.0	0.0			0.0			0.0				
Total Delay	89.3	6.8			28.3			21.7				
LOS	F	A			C			C				
Approach Delay		69.7			28.3			21.7				
Approach LOS		E			C			C				
Queue Length 50th (ft)	~112	21			130			88				
Queue Length 95th (ft)	m#200	m12			184			185				
Internal Link Dist (ft)		370			759			845			202	

Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	15.3	53.3	27.1
Total Split (%)	16%	56%	28%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	Min	None	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			









Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	50											
Base Capacity (vph)	394	986			933			602				
Starvation Cap Reductn	0	0			0			0				
Spillback Cap Reductn	0	0			0			0				
Storage Cap Reductn	0	0			0			0				
Reduced v/c Ratio	1.12	0.14			0.31			0.43				

**Intersection Summary**

Area Type: Other  
 Cycle Length: 95.7  
 Actuated Cycle Length: 83  
 Natural Cycle: 70  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 1.12  
 Intersection Signal Delay: 48.1  
 Intersection LOS: D  
 Intersection Capacity Utilization 74.6%  
 ICU Level of Service D  
 Analysis Period (min) 15  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

**Splits and Phases: 6: I-83 NB Ramps & Susquehanna Trail**

#5  Ø2	#5  Ø1	#5  Ø4
53.3 s	15.3 s	27.1 s
#6  Ø6	#6  Ø5	#6  Ø8
53.3 s	15.3 s	27.1 s

---

Lane Group	Ø1	Ø2	Ø4
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
7: Bull Road & Hilton Ave

2022 Existing AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	93	0	200	0	0	0	40	152	0	0	343	54
Future Volume (vph)	93	0	200	0	0	0	40	152	0	0	343	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			2%			-2%	
Link Speed (mph)		35			25			40			40	
Link Distance (ft)		1242			1074			3105			1664	
Travel Time (s)		24.2			29.3			52.9			28.4	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	0%	7%	0%	0%	7%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	329	0	0	0	0	0	216	0	0	446	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection												
Int Delay, s/veh	7.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	93	0	200	0	0	0	40	152	0	0	343	54
Future Vol, veh/h	93	0	200	0	0	0	40	152	0	0	343	54
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	2	-	-	-2	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	1	0	0	0	0	0	0	7	0	0	7	4
Mvmt Flow	104	0	225	0	0	0	45	171	0	0	385	61

Major/Minor	Minor2		Minor1			Major1		Major2				
Conflicting Flow All	677	677	416	789	707	171	446	0	0	171	0	0
Stage 1	416	416	-	261	261	-	-	-	-	-	-	-
Stage 2	261	261	-	528	446	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.11	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3	4	3.1	3	4	3.1	3	-	-	3	-	-
Pot Cap-1 Maneuver	413	377	675	345	363	930	843	-	-	1050	-	-
Stage 1	701	595	-	858	696	-	-	-	-	-	-	-
Stage 2	857	696	-	606	577	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	394	355	675	220	342	930	843	-	-	1050	-	-
Mov Cap-2 Maneuver	394	355	-	220	342	-	-	-	-	-	-	-
Stage 1	660	595	-	807	655	-	-	-	-	-	-	-
Stage 2	806	655	-	404	577	-	-	-	-	-	-	-

Approach	EB		WB			NB		SB		
HCM Control Delay, s	20.8		0			2		0		
HCM LOS	C		A							

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	843	-	-	550	-	1050	-	-
HCM Lane V/C Ratio	0.053	-	-	0.599	-	-	-	-
HCM Control Delay (s)	9.5	0	-	20.8	0	0	-	-
HCM Lane LOS	A	A	-	C	A	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	3.9	-	0	-	-

Bull Road Logistics  
8: Bull Road & Church Road

2022 Existing AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	32	206	339	72	115	24	129	153	65	57	530	31
Future Volume (vph)	32	206	339	72	115	24	129	153	65	57	530	31
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	14	10	12	12	12	11	12	12	12	12	12
Grade (%)		-7%			2%			1%			0%	
Storage Length (ft)	0		5	0		5	175		0	90		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			90			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			40			35			40	
Link Distance (ft)		1991			2295			1045			638	
Travel Time (s)		38.8			39.1			20.4			10.9	
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 (%)	3%	2%	3%	3%	2%	0%	9%	8%	8%	4%	4%	6%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	614	0	0	225	0	137	232	0	61	597	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		3.0	10.0		10.0	10.0	
Minimum Split (s)	9.2	9.2		9.2	9.2		6.0	16.6		16.6	16.6	
Total Split (s)	26.2	26.2		26.2	26.2		15.0	59.2		44.2	44.2	
Total Split (%)	30.7%	30.7%		30.7%	30.7%		17.6%	69.3%		51.8%	51.8%	
Yellow Time (s)	4.8	4.8		4.8	4.8		3.0	4.0		4.0	4.0	
All-Red Time (s)	1.4	1.4		1.4	1.4		0.0	2.2		2.2	2.2	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		5.2			5.2		2.0	5.2		5.2	5.2	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Min		Min	Min	
v/c Ratio		1.09			1.05		0.37	0.25		0.14	0.83	
Control Delay		91.9			110.2		8.4	6.3		14.7	30.8	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		91.9			110.2		8.4	6.3		14.7	30.8	
Queue Length 50th (ft)		~343			~132		23	37		18	254	
Queue Length 95th (ft)		#592			#292		43	67		42	392	
Internal Link Dist (ft)		1911			2215			965			558	
Turn Bay Length (ft)							175			90		
Base Capacity (vph)		564			214		405	1187		579	936	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		1.09			1.05		0.34	0.20		0.11	0.64	

Intersection Summary

Area Type: Other

Cycle Length: 85.4

Actuated Cycle Length: 74.3

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

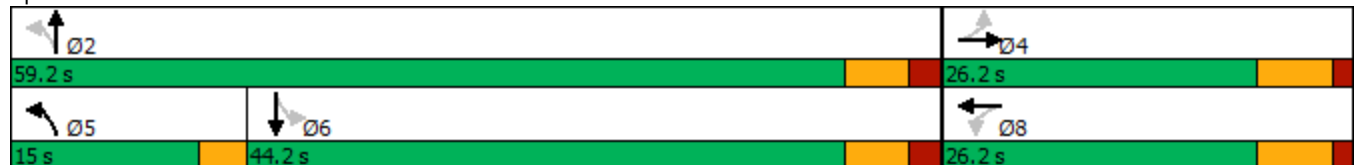
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Bull Road & Church Road



Bull Road Logistics  
8: Bull Road & Church Road

2022 Existing AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	32	206	339	72	115	24	129	153	65	57	530	31
Future Volume (veh/h)	32	206	339	72	115	24	129	153	65	57	530	31
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2018	2114	2018	1736	1750	1778	1668	1682	1682	1744	1744	1716
Adj Flow Rate, veh/h	34	219	255	77	122	16	137	163	64	61	564	28
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
Percent Heavy Veh, %	3	2	3	3	2	0	9	8	8	4	4	6
Cap, veh/h	74	255	279	142	201	22	371	660	259	594	760	38
Arrive On Green	0.27	0.29	0.29	0.27	0.29	0.29	0.09	0.57	0.56	0.46	0.46	0.45
Sat Flow, veh/h	78	894	980	266	704	78	1589	1150	451	1076	1647	82
Grp Volume(v), veh/h	508	0	0	215	0	0	137	0	227	61	0	592
Grp Sat Flow(s),veh/h/ln	1952	0	0	1048	0	0	1589	0	1601	1076	0	1729
Q Serve(g_s), s	5.9	0.0	0.0	0.0	0.0	0.0	2.9	0.0	5.2	2.4	0.0	20.7
Cycle Q Clear(g_c), s	18.8	0.0	0.0	12.9	0.0	0.0	2.9	0.0	5.2	2.4	0.0	20.7
Prop In Lane	0.07		0.50	0.36		0.07	1.00		0.28	1.00		0.05
Lane Grp Cap(c), veh/h	582	0	0	351	0	0	371	0	919	594	0	798
V/C Ratio(X)	0.87	0.00	0.00	0.61	0.00	0.00	0.37	0.00	0.25	0.10	0.00	0.74
Avail Cap(c_a), veh/h	582	0	0	351	0	0	516	0	1173	667	0	915
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.5	0.0	0.0	22.7	0.0	0.0	11.4	0.0	7.9	11.3	0.0	16.3
Incr Delay (d2), s/veh	13.7	0.0	0.0	3.1	0.0	0.0	0.6	0.0	0.6	0.3	0.0	6.2
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	15.6	0.0	0.0	6.0	0.0	0.0	1.6	0.0	3.0	1.0	0.0	13.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	39.2	0.0	0.0	25.8	0.0	0.0	12.0	0.0	8.5	11.7	0.0	22.4
LnGrp LOS	D	A	A	C	A	A	B	A	A	B	A	C
Approach Vol, veh/h		508			215			364			653	
Approach Delay, s/veh		39.2			25.8			9.8			21.4	
Approach LOS		D			C			A			C	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		47.5		26.2	8.3	39.2		26.2				
Change Period (Y+Rc), s		* 6.2		* 6.2	3.0	* 6.2		* 6.2				
Max Green Setting (Gmax), s		* 53		* 20	12.0	* 38		* 20				
Max Q Clear Time (g_c+I1), s		7.2		20.8	5.4	22.7		14.9				
Green Ext Time (p_c), s		7.8		0.0	0.2	10.3		0.4				

Intersection Summary

HCM 6th Ctrl Delay	24.7
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2022 Existing AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	246	1394	160	172	1316	311	159	145	68	479	286	200
Future Volume (vph)	246	1394	160	172	1316	311	159	145	68	479	286	200
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Grade (%)		-2%			-1%			-1%			1%	
Storage Length (ft)	270		370	410		410	530		150	400		320
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	80			75			50			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			25				35
Link Distance (ft)		1907			1983			690				1750
Travel Time (s)		32.5			33.8			18.8				34.1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	5%	14%	8%	19%	14%	5%	8%	4%	28%	3%	5%	4%
Shared Lane Traffic (%)							38%			48%		
Lane Group Flow (vph)	259	1467	168	181	1385	327	104	216	72	262	543	211
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6	4	5	2		4	4		8	8	
Permitted Phases			6			2			4			8
Detector Phase	1	6	4	5	2	2	4	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	5.0	4.5	10.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	17.0	12.5	11.5	17.0	17.0	12.5	12.5	12.5	12.5	12.5	12.5
Total Split (s)	31.0	57.0	18.0	20.0	46.0	46.0	18.0	18.0	18.0	30.0	30.0	30.0
Total Split (%)	24.8%	45.6%	14.4%	16.0%	36.8%	36.8%	14.4%	14.4%	14.4%	24.0%	24.0%	24.0%
Yellow Time (s)	3.0	4.5	3.0	4.5	4.5	4.5	3.0	3.0	3.0	3.5	3.5	3.5
All-Red Time (s)	3.5	2.5	4.5	2.5	2.5	2.5	4.5	4.5	4.5	4.0	4.0	4.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.5	6.0	6.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Min	None	None	C-Min	C-Min	None	None	None	None	None	None
v/c Ratio	0.84	0.83	0.20	1.12	0.95	0.46	0.78	0.76	0.23	0.93	0.94	0.47
Control Delay	71.5	38.0	4.5	158.0	56.1	5.6	91.9	73.2	1.8	88.3	76.1	8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.5	38.0	4.5	158.0	56.1	5.6	91.9	73.2	1.8	88.3	76.1	8.7
Queue Length 50th (ft)	200	383	14	~168	409	0	92	95	0	231	240	0
Queue Length 95th (ft)	#325	448	48	#318	#523	68	#200	#156	0	#413	#356	61
Internal Link Dist (ft)		1827			1903			610			1670	
Turn Bay Length (ft)	270		370	410		410	530		150	400		320
Base Capacity (vph)	335	1776	842	161	1452	707	133	284	308	282	576	452
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.77	0.83	0.20	1.12	0.95	0.46	0.78	0.76	0.23	0.93	0.94	0.47

**Intersection Summary**  
 Area Type: Other  
 Cycle Length: 125

Actuated Cycle Length: 125

Offset: 76 (61%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 9: Roosevelt Ave & Loucks Road



Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2022 Existing AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↕	↗	↘	↕	↗
Traffic Volume (veh/h)	246	1394	160	172	1316	311	159	145	68	479	286	200
Future Volume (veh/h)	246	1394	160	172	1316	311	159	145	68	479	286	200
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1803	1675	1761	1567	1638	1766	1724	1780	1439	1752	1724	1738
Adj Flow Rate, veh/h	259	1467	126	181	1385	0	179	137	0	504	301	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	5	14	8	19	14	5	8	4	28	3	5	4
Cap, veh/h	303	1866	746	167	1553		302	164		627	324	
Arrive On Green	0.18	0.41	0.41	0.11	0.35	0.00	0.09	0.09	0.00	0.19	0.19	0.00
Sat Flow, veh/h	1718	4574	1492	1492	4472	1497	3283	1780	1220	3338	1724	1473
Grp Volume(v), veh/h	259	1467	126	181	1385	0	179	137	0	504	301	0
Grp Sat Flow(s),veh/h/ln	1718	1525	1492	1492	1491	1497	1641	1780	1220	1669	1724	1473
Q Serve(g_s), s	18.3	34.9	5.8	14.0	36.6	0.0	6.5	9.5	0.0	18.1	21.5	0.0
Cycle Q Clear(g_c), s	18.3	34.9	5.8	14.0	36.6	0.0	6.5	9.5	0.0	18.1	21.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	303	1866	746	167	1553		302	164		627	324	
V/C Ratio(X)	0.85	0.79	0.17	1.08	0.89		0.59	0.84		0.80	0.93	
Avail Cap(c_a), veh/h	350	1866	746	167	1553		302	164		627	324	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	49.9	32.2	17.1	55.5	38.6	0.0	54.5	55.8	0.0	48.5	49.9	0.0
Incr Delay (d2), s/veh	16.4	3.4	0.5	93.4	8.2	0.0	3.1	29.8	0.0	7.5	32.1	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	14.0	18.9	4.4	15.0	20.2	0.0	5.1	9.5	0.0	12.8	17.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.3	35.7	17.6	148.9	46.7	0.0	57.6	85.6	0.0	56.0	82.0	0.0
LnGrp LOS	E	D	B	F	D		E	F		E	F	
Approach Vol, veh/h		1852			1566			316			805	
Approach Delay, s/veh		38.7			58.5			69.7			65.7	
Approach LOS		D			E			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	27.6	49.4		18.0	20.0	57.0		30.0				
Change Period (Y+Rc), s	6.5	7.0		7.5	7.0	7.0		7.5				
Max Green Setting (Gmax), s	24.5	39.0		10.5	13.0	50.0		22.5				
Max Q Clear Time (g_c+I1), s	20.8	39.1		12.0	16.5	37.4		24.0				
Green Ext Time (p_c), s	0.3	0.0		0.0	0.0	10.9		0.0				

Intersection Summary

HCM 6th Ctrl Delay	52.5
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.  
Unsignalized Delay for [NBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Bull Road Logistics  
1: Main St & Canal Rd

2022 Existing PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	132	171	82	53	198	60	71	388	64	77	397	135
Future Volume (vph)	132	171	82	53	198	60	71	388	64	77	397	135
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	15	12	10	12	12	10	12	12
Grade (%)		1%			-1%			6%				-1%
Storage Length (ft)	0		0	0		0	70		0	60		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			70			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		25			25			25				25
Link Distance (ft)		933			1422			721				620
Travel Time (s)		25.4			38.8			19.7				16.9
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	5%	2%	4%	0%	4%	3%	4%	1%	0%	3%	2%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	405	0	0	327	0	75	475	0	81	560	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		10.0	10.0		5.0	5.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		15.0	15.0	
Total Split (s)	29.0	29.0		29.0	29.0		41.0	41.0		41.0	41.0	
Total Split (%)	41.4%	41.4%		41.4%	41.4%		58.6%	58.6%		58.6%	58.6%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
v/c Ratio		0.75			0.46		0.43	0.65		0.33	0.76	
Control Delay		28.6			16.7		19.3	17.2		14.6	21.0	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		28.6			16.7		19.3	17.2		14.6	21.0	
Queue Length 50th (ft)		114			78		17	124		18	157	
Queue Length 95th (ft)		#323			186		49	202		45	255	
Internal Link Dist (ft)		853			1342			641			540	
Turn Bay Length (ft)							70			60		
Base Capacity (vph)		543			722		258	1079		354	1083	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.75			0.45		0.29	0.44		0.23	0.52	

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 59.1

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Main St & Canal Rd



Bull Road Logistics  
1: Main St & Canal Rd

2022 Existing PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Volume (veh/h)	132	171	82	53	198	60	71	388	64	77	397	135
Future Volume (veh/h)	132	171	82	53	198	60	71	388	64	77	397	135
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1724	1766	1738	1837	1852	1795	1543	1585	1599	1795	1809	1795
Adj Flow Rate, veh/h	139	180	86	56	208	63	75	408	67	81	418	142
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	5	2	4	0	4	3	4	1	0	3	2	3
Cap, veh/h	258	262	110	160	413	113	330	631	104	389	613	208
Arrive On Green	0.32	0.34	0.32	0.32	0.34	0.32	0.47	0.47	0.45	0.47	0.47	0.45
Sat Flow, veh/h	429	769	323	184	1212	333	701	1328	218	882	1291	439
Grp Volume(v), veh/h	405	0	0	327	0	0	75	0	475	81	0	560
Grp Sat Flow(s),veh/h/ln	1522	0	0	1729	0	0	701	0	1546	882	0	1730
Q Serve(g_s), s	3.7	0.0	0.0	0.0	0.0	0.0	4.0	0.0	10.1	3.3	0.0	11.0
Cycle Q Clear(g_c), s	10.3	0.0	0.0	6.6	0.0	0.0	14.4	0.0	10.1	12.9	0.0	11.0
Prop In Lane	0.34		0.21	0.17		0.19	1.00		0.14	1.00		0.25
Lane Grp Cap(c), veh/h	595	0	0	646	0	0	330	0	734	389	0	822
V/C Ratio(X)	0.68	0.00	0.00	0.51	0.00	0.00	0.23	0.00	0.65	0.21	0.00	0.68
Avail Cap(c_a), veh/h	922	0	0	1026	0	0	595	0	1319	722	0	1476
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.9	0.0	0.0	11.7	0.0	0.0	14.3	0.0	8.7	13.3	0.0	9.0
Incr Delay (d2), s/veh	1.4	0.0	0.0	0.6	0.0	0.0	0.3	0.0	1.0	0.3	0.0	1.0
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	5.9	0.0	0.0	4.3	0.0	0.0	1.1	0.0	4.9	1.1	0.0	6.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.2	0.0	0.0	12.4	0.0	0.0	14.6	0.0	9.7	13.6	0.0	10.0
LnGrp LOS	B	A	A	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h		405			327			550				641
Approach Delay, s/veh		14.2			12.4			10.3				10.4
Approach LOS		B			B			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.6		18.8		24.6		18.8				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		36.0		24.0		36.0		24.0				
Max Q Clear Time (g_c+I1), s		16.9		12.3		15.4		8.6				
Green Ext Time (p_c), s		2.7		1.5		3.2		1.2				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				11.5								
HCM 6th LOS				B								

Bull Road Logistics  
2: Bull Rd & Canal Rd

2022 Existing PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	14	304	62	78	301	34	161	181	58	67	118	24
Future Volume (vph)	14	304	62	78	301	34	161	181	58	67	118	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	5%	0%	2%	6%	1%	2%	3%	1%	3%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	404	0	0	439	0	0	426	0	0	223	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other  
Control Type: Unsignalized

Intersection	
Intersection Delay, s/veh	66.6
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	14	304	62	78	301	34	161	181	58	67	118	24
Future Vol, veh/h	14	304	62	78	301	34	161	181	58	67	118	24
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, %	0	3	5	0	2	6	1	2	3	1	3	4
Mvmt Flow	15	323	66	83	320	36	171	193	62	71	126	26
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	63.2	81.6	75.5	25.9
HCM LOS	F	F	F	D

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	40%	4%	19%	32%
Vol Thru, %	45%	80%	73%	56%
Vol Right, %	14%	16%	8%	11%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	400	380	413	209
LT Vol	161	14	78	67
Through Vol	181	304	301	118
RT Vol	58	62	34	24
Lane Flow Rate	426	404	439	222
Geometry Grp	1	1	1	1
Degree of Util (X)	1.005	0.954	1.029	0.59
Departure Headway (Hd)	8.676	8.679	8.605	9.772
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	421	420	426	371
Service Time	6.676	6.679	6.605	7.772
HCM Lane V/C Ratio	1.012	0.962	1.031	0.598
HCM Control Delay	75.5	63.2	81.6	25.9
HCM Lane LOS	F	F	F	D
HCM 95th-tile Q	12.6	11	13.5	3.6



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Traffic Volume (vph)	361	99	51	425	39	39
Future Volume (vph)	361	99	51	425	39	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	12
Grade (%)	4%			0%	4%	
Link Speed (mph)	40			40	40	
Link Distance (ft)	1159			3081	2342	
Travel Time (s)	19.8			52.5	39.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	4%	1%	0%	3%	0%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	469	0	0	486	80	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	361	99	51	425	39	39
Future Vol, veh/h	361	99	51	425	39	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	4	-	-	0	4	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	4	1	0	3	0	3
Mvmt Flow	368	101	52	434	40	40

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	469	0	957
Stage 1	-	-	-	-	419
Stage 2	-	-	-	-	538
Critical Hdwy	-	-	4.3	-	7.3
Critical Hdwy Stg 1	-	-	-	-	6.2
Critical Hdwy Stg 2	-	-	-	-	6.2
Follow-up Hdwy	-	-	3	-	3.1
Pot Cap-1 Maneuver	-	-	828	-	245
Stage 1	-	-	-	-	672
Stage 2	-	-	-	-	574
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	828	-	225
Mov Cap-2 Maneuver	-	-	-	-	225
Stage 1	-	-	-	-	672
Stage 2	-	-	-	-	526

Approach	EB	WB	NB
HCM Control Delay, s	0	1	19.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	330	-	-	828	-
HCM Lane V/C Ratio	0.241	-	-	0.063	-
HCM Control Delay (s)	19.3	-	-	9.6	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.9	-	-	0.2	-

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2022 Existing PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (vph)	182	140	18	20	329	58	18	238	10	37	169	269
Future Volume (vph)	182	140	18	20	329	58	18	238	10	37	169	269
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	0		0	0		0	0		0	0		160
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	5%	3%	0%	10%	2%	28%	0%	4%	30%	30%	7%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	396	0	0	473	0	0	310	0	0	240	313
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	16.3	16.3		16.3	16.3		9.6	9.6		9.6	9.6	9.6
Total Split (s)	46.3	46.3		46.3	46.3		31.6	31.6		31.6	31.6	31.6
Total Split (%)	59.4%	59.4%		59.4%	59.4%		40.6%	40.6%		40.6%	40.6%	40.6%
Yellow Time (s)	4.3	4.3		4.3	4.3		4.3	4.3		4.3	4.3	4.3
All-Red Time (s)	2.0	2.0		2.0	2.0		2.3	2.3		2.3	2.3	2.3
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)		5.3			5.3			5.6			5.6	5.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
v/c Ratio		0.83			0.61			0.65			0.54	0.45
Control Delay		31.2			15.3			27.1			24.2	5.0
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		31.2			15.3			27.1			24.2	5.0
Queue Length 50th (ft)		112			113			98			73	0
Queue Length 95th (ft)		#283			215			195			151	44
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)												160
Base Capacity (vph)		700			1144			723			680	888
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		0.57			0.41			0.43			0.35	0.35

Intersection Summary

Area Type: Other



Cycle Length: 77.9

Actuated Cycle Length: 59.7

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2022 Existing PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (veh/h)	182	140	18	20	329	58	18	238	10	37	169	269
Future Volume (veh/h)	182	140	18	20	329	58	18	238	10	37	169	269
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1803	1832	1875	1807	1921	1551	1750	1694	1329	1485	1812	1883
Adj Flow Rate, veh/h	212	163	21	23	383	67	21	277	12	43	197	204
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	5	3	0	10	2	28	0	4	30	30	7	2
Cap, veh/h	412	284	31	118	668	113	118	420	17	165	431	441
Arrive On Green	0.40	0.43	0.40	0.40	0.43	0.40	0.25	0.28	0.25	0.25	0.28	0.28
Sat Flow, veh/h	611	661	71	38	1552	262	53	1518	63	184	1559	1596
Grp Volume(v), veh/h	396	0	0	473	0	0	310	0	0	240	0	204
Grp Sat Flow(s),veh/h/ln	1343	0	0	1852	0	0	1634	0	0	1743	0	1596
Q Serve(g_s), s	0.7	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	3.9
Cycle Q Clear(g_c), s	8.1	0.0	0.0	7.4	0.0	0.0	6.4	0.0	0.0	4.2	0.0	3.9
Prop In Lane	0.54		0.05	0.05		0.14	0.07		0.04	0.18		1.00
Lane Grp Cap(c), veh/h	691	0	0	849	0	0	511	0	0	549	0	441
V/C Ratio(X)	0.57	0.00	0.00	0.56	0.00	0.00	0.61	0.00	0.00	0.44	0.00	0.46
Avail Cap(c_a), veh/h	1491	0	0	2076	0	0	1182	0	0	1228	0	1116
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	1.00
Uniform Delay (d), s/veh	8.4	0.0	0.0	8.2	0.0	0.0	12.0	0.0	0.0	11.3	0.0	11.2
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.2	0.0	0.0	1.2	0.0	0.0	0.5	0.0	0.8
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	2.9	0.0	0.0	3.3	0.0	0.0	3.3	0.0	0.0	2.4	0.0	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	8.7	0.0	0.0	8.4	0.0	0.0	13.2	0.0	0.0	11.9	0.0	11.9
LnGrp LOS	A	A	A	A	A	A	B	A	A	B	A	B
Approach Vol, veh/h		396			473			310				444
Approach Delay, s/veh		8.7			8.4			13.2				11.9
Approach LOS		A			A			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		21.3		15.9		21.3		15.9				
Change Period (Y+Rc), s		6.3		* 6.6		6.3		* 6.6				
Max Green Setting (Gmax), s		40.0		* 25		40.0		* 25				
Max Q Clear Time (g_c+I1), s		10.1		8.4		9.4		6.4				
Green Ext Time (p_c), s		4.9		0.9		5.1		1.5				

Intersection Summary

HCM 6th Ctrl Delay	10.3
HCM 6th LOS	B

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
5: I-83 SB Ramps & Susquehanna Trail

2022 Existing PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗		↖	↗						↕	
Traffic Volume (vph)	0	494	201	96	294	0	0	0	0	56	3	419
Future Volume (vph)	0	494	201	96	294	0	0	0	0	56	3	419
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	11	12	12	12	12	12	12	15	12
Grade (%)		2%			0%			0%				1%
Storage Length (ft)	0		0	50		0	0		0	0		0
Storage Lanes	0		0	1		0	0		0	0		0
Taper Length (ft)	25			35			25			25		
Satd. Flow (prot)	0	1523	0	1559	1593	0	0	0	0	0	1529	0
Flt Permitted				0.108							0.994	
Satd. Flow (perm)	0	1523	0	177	1593	0	0	0	0	0	1529	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		25										376
Link Speed (mph)		40			40			30				30
Link Distance (ft)		3254			450			1020				690
Travel Time (s)		55.5			7.7			23.2				15.7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	13%	11%	6%	13%	0%	0%	0%	0%	4%	33%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	772	0	107	327	0	0	0	0	0	531	0
Turn Type		NA		pm+pt	NA					Perm		NA
Protected Phases		2		1	2 1							4
Permitted Phases				2 1						4		
Detector Phase		2		1	2 1					4		4
Switch Phase												
Minimum Initial (s)		15.0		3.0						3.0		3.0
Minimum Split (s)		21.3		9.3						9.1		9.1
Total Split (s)		48.3		15.3						37.1		37.1
Total Split (%)		48.0%		15.2%						36.8%		36.8%
Yellow Time (s)		4.0		4.0						3.2		3.2
All-Red Time (s)		2.3		2.3						2.9		2.9
Lost Time Adjust (s)		-1.0		-1.0								-1.0
Total Lost Time (s)		5.3		5.3								5.1
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		Min						None		None
Act Effect Green (s)		43.3		53.4	58.7							22.2
Actuated g/C Ratio		0.47		0.58	0.64							0.24
v/c Ratio		1.05		0.42	0.32							0.81
Control Delay		73.6		31.6	10.0							19.8
Queue Delay		0.0		0.0	0.6							0.0
Total Delay		73.6		31.6	10.6							19.8
LOS		E		C	B							B
Approach Delay		73.6			15.8							19.8
Approach LOS		E			B							B
Queue Length 50th (ft)		~490		18	59							79
Queue Length 95th (ft)		#816		84	144							213
Internal Link Dist (ft)		3174			370			940				610

Lane Group	Ø5	Ø6	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	5	6	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	15.3	48.3	37.1
Total Split (%)	15%	48%	37%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	None	Min	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)				50								
Base Capacity (vph)		735		255	1023						782	
Starvation Cap Reductn		0		0	371						0	
Spillback Cap Reductn		0		0	0						0	
Storage Cap Reductn		0		0	0						0	
Reduced v/c Ratio		1.05		0.42	0.50						0.68	

**Intersection Summary**

Area Type: Other  
 Cycle Length: 100.7  
 Actuated Cycle Length: 91.4  
 Natural Cycle: 70  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 1.14  
 Intersection Signal Delay: 42.7      Intersection LOS: D  
 Intersection Capacity Utilization 89.8%      ICU Level of Service E  
 Analysis Period (min) 15  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

**Splits and Phases: 5: I-83 SB Ramps & Susquehanna Trail**

#5 Ø2	#5 Ø1	#5 Ø4
48.3 s	15.3 s	37.1 s
#6 Ø6	#6 Ø5	#6 Ø8
48.3 s	15.3 s	37.1 s

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Lane Group	Ø5	Ø6	Ø8
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
6: I-83 NB Ramps & Susquehanna Trail

2022 Existing PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	364	187	0	0	210	49	177	1	122	0	0	0
Future Volume (vph)	364	187	0	0	210	49	177	1	122	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	11	12	12	12	12	12	12	16	12	12	12	12
Grade (%)		0%			2%			2%			0%	
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	35			25			25			25		
Satd. Flow (prot)	1413	1731	0	0	1637	0	0	1658	0	0	0	0
Flt Permitted	0.438							0.971				
Satd. Flow (perm)	651	1731	0	0	1637	0	0	1658	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					15			36				
Link Speed (mph)		40			40			30				30
Link Distance (ft)		450			839			925				282
Travel Time (s)		7.7			14.3			21.0				6.4
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	17%	4%	0%	0%	7%	2%	18%	100%	2%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	383	197	0	0	273	0	0	315	0	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA				
Protected Phases	5	6 5			6			8				
Permitted Phases	6 5						8					
Detector Phase	5	6 5			6		8	8				
Switch Phase												
Minimum Initial (s)	3.0				15.0		3.0	3.0				
Minimum Split (s)	9.3				21.3		9.1	9.1				
Total Split (s)	15.3				48.3		37.1	37.1				
Total Split (%)	15.2%				48.0%		36.8%	36.8%				
Yellow Time (s)	4.0				4.0		3.2	3.2				
All-Red Time (s)	2.3				2.3		2.9	2.9				
Lost Time Adjust (s)	-1.0				-1.0			-1.0				
Total Lost Time (s)	5.3				5.3			5.1				
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Recall Mode	None				Min		None	None				
Act Effct Green (s)	35.3	40.7			25.2			40.3				
Actuated g/C Ratio	0.39	0.45			0.28			0.44				
v/c Ratio	1.14	0.26			0.59			0.42				
Control Delay	86.3	7.7			32.0			19.1				
Queue Delay	0.0	0.0			0.0			0.0				
Total Delay	86.3	7.7			32.0			19.1				
LOS	F	A			C			B				
Approach Delay		59.6			32.0			19.1				
Approach LOS		E			C			B				
Queue Length 50th (ft)	~93	38			131			104				
Queue Length 95th (ft)	m62	m11			197			217				
Internal Link Dist (ft)		370			759			845			202	

Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	15.3	48.3	37.1
Total Split (%)	15%	48%	37%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	Min	None	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	50											
Base Capacity (vph)	335	863			783			750				
Starvation Cap Reductn	0	0			0			0				
Spillback Cap Reductn	0	0			0			0				
Storage Cap Reductn	0	0			0			0				
Reduced v/c Ratio	1.14	0.23			0.35			0.42				

Intersection Summary

Area Type:	Other
Cycle Length:	100.7
Actuated Cycle Length:	91.4
Natural Cycle:	70
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	1.14
Intersection Signal Delay:	42.2
Intersection LOS:	D
Intersection Capacity Utilization	89.8%
ICU Level of Service	E
Analysis Period (min)	15
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 6: I-83 NB Ramps & Susquehanna Trail

#5 ← Ø2	#5 ↙ Ø1	#5 ↓ Ø4
48.3 s	15.3 s	37.1 s
#6 ← Ø6	#6 ↘ Ø5	#6 ↑ Ø8
48.3 s	15.3 s	37.1 s

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Lane Group	Ø1	Ø2	Ø4
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	67	0	110	0	0	0	275	362	2	0	224	134
Future Volume (vph)	67	0	110	0	0	0	275	362	2	0	224	134
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			2%			-2%	
Link Speed (mph)		35			25			40			40	
Link Distance (ft)		1242			1074			3105			1664	
Travel Time (s)		24.2			29.3			52.9			28.4	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%	1%	2%	0%	0%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	182	0	0	0	0	0	659	0	0	369	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection												
Int Delay, s/veh	10.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	67	0	110	0	0	0	275	362	2	0	224	134
Future Vol, veh/h	67	0	110	0	0	0	275	362	2	0	224	134
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	2	-	-	-2	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	4	0	0	0	0	0	1	2	0	0	1	1
Mvmt Flow	69	0	113	0	0	0	284	373	2	0	231	138

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1242	1243	300	1299	1311	374	369	0	0	375	0	0
Stage 1	300	300	-	942	942	-	-	-	-	-	-	-
Stage 2	942	943	-	357	369	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.5	6.2	7.1	6.5	6.2	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.14	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3	4	3.1	3	4	3.1	3	-	-	3	-	-
Pot Cap-1 Maneuver	164	176	786	152	160	713	897	-	-	893	-	-
Stage 1	813	669	-	351	344	-	-	-	-	-	-	-
Stage 2	347	344	-	758	624	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	113	106	786	90	96	713	897	-	-	893	-	-
Mov Cap-2 Maneuver	113	106	-	90	96	-	-	-	-	-	-	-
Stage 1	488	669	-	211	206	-	-	-	-	-	-	-
Stage 2	208	206	-	649	624	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	54.6		0		4.7		0	
HCM LOS	F		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	897	-	-	242	-	893	-
HCM Lane V/C Ratio	0.316	-	-	0.754	-	-	-
HCM Control Delay (s)	10.9	0	-	54.6	0	0	-
HCM Lane LOS	B	A	-	F	A	A	-
HCM 95th %tile Q(veh)	1.4	-	-	5.3	-	0	-

Bull Road Logistics  
8: Bull Road & Church Road

2022 Existing PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↖		↗	↖	
Traffic Volume (vph)	56	174	182	99	258	96	312	568	115	45	322	54
Future Volume (vph)	56	174	182	99	258	96	312	568	115	45	322	54
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	14	10	12	12	12	11	12	12	12	12	12
Grade (%)		-7%			2%			1%			0%	
Storage Length (ft)	0		5	0		5	175		0	90		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			90			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			40			35			40	
Link Distance (ft)		1991			2295			1045			638	
Travel Time (s)		38.8			39.1			20.4			10.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	1%	1%	2%	0%	2%	0%	4%	2%	9%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	421	0	0	462	0	318	697	0	46	384	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		3.0	10.0		10.0	10.0	
Minimum Split (s)	9.2	9.2		9.2	9.2		6.0	16.6		16.6	16.6	
Total Split (s)	26.2	26.2		26.2	26.2		18.0	69.2		51.2	51.2	
Total Split (%)	27.5%	27.5%		27.5%	27.5%		18.9%	72.5%		53.7%	53.7%	
Yellow Time (s)	4.8	4.8		4.8	4.8		3.0	4.0		4.0	4.0	
All-Red Time (s)	1.4	1.4		1.4	1.4		0.0	2.2		2.2	2.2	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		5.2			5.2		2.0	5.2		5.2	5.2	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Min		Min	Min	
v/c Ratio		0.83			1.20		0.59	0.75		0.22	0.74	
Control Delay		39.3			139.3		11.9	17.3		20.4	29.7	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		39.3			139.3		11.9	17.3		20.4	29.7	
Queue Length 50th (ft)		149			~241		61	199		14	140	
Queue Length 95th (ft)		#384			#504		99	314		39	231	
Internal Link Dist (ft)		1911			2215			965			558	
Turn Bay Length (ft)							175			90		
Base Capacity (vph)		507			385		572	1576		472	1170	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.83			1.20		0.56	0.44		0.10	0.33	

Intersection Summary

Area Type: Other

Cycle Length: 95.4

Actuated Cycle Length: 68.6

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

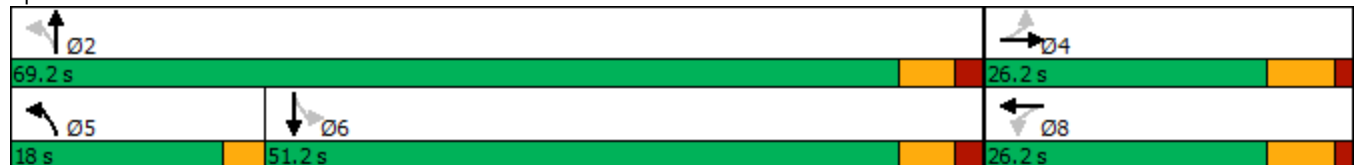
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Bull Road & Church Road



Bull Road Logistics  
8: Bull Road & Church Road

2022 Existing PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Volume (veh/h)	56	174	182	99	258	96	312	568	115	45	322	54
Future Volume (veh/h)	56	174	182	99	258	96	312	568	115	45	322	54
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2032	2114	2032	1764	1764	1750	1794	1766	1794	1744	1772	1674
Adj Flow Rate, veh/h	57	178	85	101	263	52	318	580	102	46	329	50
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	1	1	2	0	2	0	4	2	9
Cap, veh/h	107	271	118	129	247	46	615	896	158	346	677	103
Arrive On Green	0.25	0.26	0.26	0.25	0.26	0.26	0.14	0.61	0.60	0.45	0.45	0.44
Sat Flow, veh/h	210	1048	455	287	953	177	1709	1463	257	707	1502	228
Grp Volume(v), veh/h	320	0	0	416	0	0	318	0	682	46	0	379
Grp Sat Flow(s),veh/h/ln	1712	0	0	1417	0	0	1709	0	1720	707	0	1731
Q Serve(g_s), s	0.0	0.0	0.0	6.5	0.0	0.0	7.1	0.0	20.7	3.6	0.0	12.5
Cycle Q Clear(g_c), s	13.5	0.0	0.0	20.0	0.0	0.0	7.1	0.0	20.7	10.6	0.0	12.5
Prop In Lane	0.18		0.27	0.24		0.12	1.00		0.15	1.00		0.13
Lane Grp Cap(c), veh/h	475	0	0	405	0	0	615	0	1054	346	0	780
V/C Ratio(X)	0.67	0.00	0.00	1.03	0.00	0.00	0.52	0.00	0.65	0.13	0.00	0.49
Avail Cap(c_a), veh/h	475	0	0	405	0	0	717	0	1358	429	0	982
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.0	0.0	0.0	31.1	0.0	0.0	9.2	0.0	10.1	17.6	0.0	15.7
Incr Delay (d2), s/veh	3.7	0.0	0.0	52.0	0.0	0.0	0.7	0.0	3.1	0.8	0.0	2.2
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	9.9	0.0	0.0	20.0	0.0	0.0	4.0	0.0	11.7	1.1	0.0	8.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.7	0.0	0.0	83.1	0.0	0.0	9.8	0.0	13.2	18.4	0.0	17.9
LnGrp LOS	C	A	A	F	A	A	A	A	B	B	A	B
Approach Vol, veh/h		320			416			1000				425
Approach Delay, s/veh		30.7			83.1			12.1				17.9
Approach LOS		C			F			B				B
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		54.9		26.2	13.1	41.7		26.2				
Change Period (Y+Rc), s		* 6.2		* 6.2	3.0	* 6.2		* 6.2				
Max Green Setting (Gmax), s		* 63		* 20	15.0	* 45		* 20				
Max Q Clear Time (g_c+I1), s		22.7		15.5	9.6	14.5		22.0				
Green Ext Time (p_c), s		26.0		0.5	0.6	10.5		0.0				

Intersection Summary

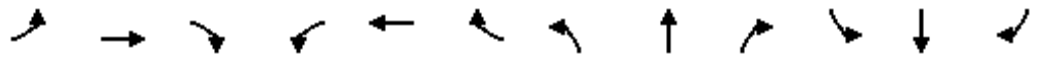
HCM 6th Ctrl Delay	29.7
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2022 Existing PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↑↑	↗	↘	↑↑	↗
Traffic Volume (vph)	223	1710	236	115	1818	573	303	368	121	375	210	226
Future Volume (vph)	223	1710	236	115	1818	573	303	368	121	375	210	226
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		-2%			-1%			-1%			1%	
Storage Length (ft)	270		370	410		410	530		150	400		320
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	80			75			50			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			25			35	
Link Distance (ft)		1907			1983			668			1750	
Travel Time (s)		32.5			33.8			18.2			34.1	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	6%	3%	9%	5%	2%	1%	1%	3%	1%	1%	2%
Shared Lane Traffic (%)							28%			49%		
Lane Group Flow (vph)	230	1763	243	119	1874	591	225	466	125	197	406	233
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6	4	5	2		4	4		8	8	
Permitted Phases			6			2			4			8
Detector Phase	1	6	4	5	2	2	4	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	4.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	17.0	12.5	11.5	17.0	17.0	12.5	12.5	12.5	12.5	12.5	12.5
Total Split (s)	26.0	67.0	32.0	26.0	67.0	67.0	32.0	32.0	32.0	25.0	25.0	25.0
Total Split (%)	17.3%	44.7%	21.3%	17.3%	44.7%	44.7%	21.3%	21.3%	21.3%	16.7%	16.7%	16.7%
Yellow Time (s)	3.0	4.5	3.0	4.5	4.5	4.5	3.0	3.0	3.0	3.5	3.5	3.5
All-Red Time (s)	3.5	2.5	4.5	2.5	2.5	2.5	4.5	4.5	4.5	4.0	4.0	4.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.5	6.0	6.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Min	None	Min	C-Min	C-Min	None	None	None	None	None	None
v/c Ratio	0.99	0.88	0.23	0.67	0.98	0.71	0.87	0.86	0.35	1.02	1.02	0.61
Control Delay	119.1	46.0	2.2	82.2	60.1	18.0	91.7	77.6	9.4	131.9	113.2	15.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	119.1	46.0	2.2	82.2	60.1	18.0	91.7	77.6	9.4	131.9	113.2	15.5
Queue Length 50th (ft)	228	581	5	113	657	182	238	246	0	~228	~235	8
Queue Length 95th (ft)	#406	669	39	182	#776	337	#400	#335	51	#410	#352	95
Internal Link Dist (ft)		1827			1903			588			1670	
Turn Bay Length (ft)	270		370	410		410	530		150	400		320
Base Capacity (vph)	233	2002	1039	210	1912	833	263	549	365	194	398	384
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.88	0.23	0.57	0.98	0.71	0.86	0.85	0.34	1.02	1.02	0.61

Intersection Summary

Area Type: Other



Cycle Length: 150  
 Actuated Cycle Length: 150  
 Offset: 80 (53%), Referenced to phase 2:WBT and 6:EBT, Start of Green  
 Natural Cycle: 140  
 Control Type: Actuated-Coordinated  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Roosevelt Ave & Loucks Road



Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2022 Existing PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↑↑	↗	↘	↑↑	↗
Traffic Volume (veh/h)	223	1710	236	115	1818	573	303	368	121	375	210	226
Future Volume (veh/h)	223	1710	236	115	1818	573	303	368	121	375	210	226
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1860	1789	1832	1709	1766	1809	1823	1823	1795	1780	1780	1766
Adj Flow Rate, veh/h	230	1763	184	119	1874	0	230	493	0	387	216	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	6	3	9	5	2	1	1	3	1	1	2
Cap, veh/h	242	2220	954	156	2010		278	583		418	220	
Arrive On Green	0.14	0.45	0.45	0.10	0.42	0.00	0.16	0.16	0.00	0.12	0.12	0.00
Sat Flow, veh/h	1772	4885	1552	1628	4822	1533	1736	3646	1521	3391	1780	1497
Grp Volume(v), veh/h	230	1763	184	119	1874	0	230	493	0	387	216	0
Grp Sat Flow(s),veh/h/ln	1772	1628	1552	1628	1607	1533	1736	1823	1521	1696	1780	1497
Q Serve(g_s), s	19.3	46.2	7.8	10.7	55.6	0.0	19.2	19.7	0.0	16.9	18.2	0.0
Cycle Q Clear(g_c), s	19.3	46.2	7.8	10.7	55.6	0.0	19.2	19.7	0.0	16.9	18.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	242	2220	954	156	2010		278	583		418	220	
V/C Ratio(X)	0.95	0.79	0.19	0.76	0.93		0.83	0.85		0.93	0.98	
Avail Cap(c_a), veh/h	242	2220	954	217	2010		295	620		418	220	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	64.2	34.9	12.7	66.2	41.7	0.0	61.0	61.2	0.0	65.1	65.6	0.0
Incr Delay (d2), s/veh	44.0	3.0	0.5	10.0	9.4	0.0	16.8	10.0	0.0	26.4	55.9	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	17.2	25.5	7.5	8.5	31.1	0.0	15.0	15.2	0.0	13.7	17.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	108.2	38.0	13.1	76.2	51.2	0.0	77.8	71.3	0.0	91.4	121.5	0.0
LnGrp LOS	F	D	B	E	D		E	E		F	F	
Approach Vol, veh/h		2177			1993			723			603	
Approach Delay, s/veh		43.3			52.7			73.4			102.2	
Approach LOS		D			D			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	26.0	68.5		30.5	20.3	74.2		25.0				
Change Period (Y+Rc), s	6.5	7.0		7.5	7.0	7.0		7.5				
Max Green Setting (Gmax), s	19.5	60.0		24.5	19.0	60.0		17.5				
Max Q Clear Time (g_c+I1), s	21.8	58.1		22.2	13.2	48.7		20.7				
Green Ext Time (p_c), s	0.0	1.8		0.8	0.1	10.6		0.0				

Intersection Summary

HCM 6th Ctrl Delay	57.1
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.  
Unsignalized Delay for [NBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

**2024 NO-BUILD CONDITION**

Bull Road Logistics  
1: Main St & Canal Rd

2024 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕		↗	↘		↗	↘	
Traffic Volume (vph)	105	193	56	36	204	53	67	309	30	73	272	91
Future Volume (vph)	105	193	56	36	204	53	67	309	30	73	272	91
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	15	12	10	12	12	10	12	12
Grade (%)		1%			-1%			6%			-1%	
Storage Length (ft)	0		0	0		0	70		0	60		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			70			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		25			25			25				25
Link Distance (ft)		933			1422			721				620
Travel Time (s)		25.4			38.8			19.7				16.9
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	4%	8%	13%	3%	8%	6%	12%	3%	3%	8%	3%	9%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	407	0	0	336	0	77	389	0	84	418	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		15.0	15.0	
Total Split (s)	44.0	44.0		44.0	44.0		36.0	36.0		36.0	36.0	
Total Split (%)	55.0%	55.0%		55.0%	55.0%		45.0%	45.0%		45.0%	45.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
v/c Ratio		0.70			0.45		0.37	0.61		0.35	0.66	
Control Delay		19.9			12.9		20.6	19.5		19.0	20.9	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		19.9			12.9		20.6	19.5		19.0	20.9	
Queue Length 50th (ft)		89			63		16	89		17	98	
Queue Length 95th (ft)		224			154		61	225		63	246	
Internal Link Dist (ft)		853			1342			641			540	
Turn Bay Length (ft)							70			60		
Base Capacity (vph)		1002			1294		357	1102		417	1097	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.41			0.26		0.22	0.35		0.20	0.38	

Intersection Summary

Area Type: Other

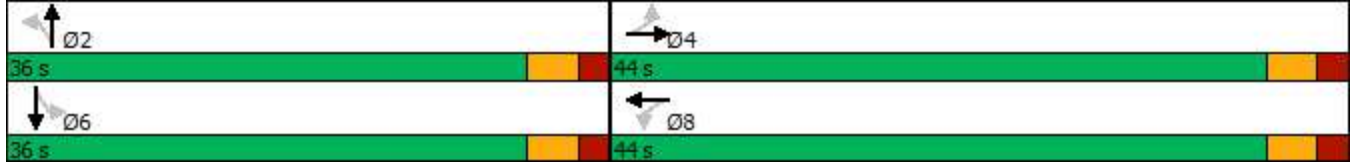
Cycle Length: 80

Actuated Cycle Length: 53.9

Natural Cycle: 40

Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Main St & Canal Rd

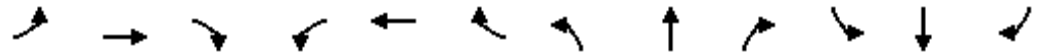


Bull Road Logistics  
1: Main St & Canal Rd

2024 No-Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	105	193	56	36	204	53	67	309	30	73	272	91
Future Volume (veh/h)	105	193	56	36	204	53	67	309	30	73	272	91
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1682	1612	1795	1792	1752	1431	1557	1557	1724	1795	1709
Adj Flow Rate, veh/h	121	222	64	41	234	61	77	355	34	84	313	105
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	4	8	13	3	8	6	12	3	3	8	3	9
Cap, veh/h	250	336	86	150	471	114	373	584	56	406	537	180
Arrive On Green	0.34	0.37	0.34	0.34	0.37	0.34	0.42	0.42	0.39	0.42	0.42	0.39
Sat Flow, veh/h	338	915	234	113	1282	309	741	1399	134	917	1286	431
Grp Volume(v), veh/h	407	0	0	336	0	0	77	0	389	84	0	418
Grp Sat Flow(s),veh/h/ln	1487	0	0	1704	0	0	741	0	1533	917	0	1717
Q Serve(g_s), s	2.9	0.0	0.0	0.0	0.0	0.0	3.3	0.0	7.4	2.9	0.0	7.0
Cycle Q Clear(g_c), s	8.7	0.0	0.0	5.8	0.0	0.0	9.8	0.0	7.4	9.8	0.0	7.0
Prop In Lane	0.30		0.16	0.12		0.18	1.00		0.09	1.00		0.25
Lane Grp Cap(c), veh/h	632	0	0	689	0	0	373	0	640	406	0	717
V/C Ratio(X)	0.64	0.00	0.00	0.49	0.00	0.00	0.21	0.00	0.61	0.21	0.00	0.58
Avail Cap(c_a), veh/h	1586	0	0	1818	0	0	699	0	1315	810	0	1473
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.2	0.0	0.0	9.4	0.0	0.0	11.9	0.0	8.5	12.1	0.0	8.5
Incr Delay (d2), s/veh	1.1	0.0	0.0	0.5	0.0	0.0	0.3	0.0	0.9	0.2	0.0	0.8
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	4.5	0.0	0.0	3.3	0.0	0.0	0.9	0.0	3.5	0.9	0.0	3.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.3	0.0	0.0	9.9	0.0	0.0	12.2	0.0	9.4	12.3	0.0	9.2
LnGrp LOS	B	A	A	A	A	A	B	A	A	B	A	A
Approach Vol, veh/h		407			336			466			502	
Approach Delay, s/veh		11.3			9.9			9.9			9.7	
Approach LOS		B			A			A			A	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		19.6		17.7		19.6		17.7				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		31.0		39.0		31.0		39.0				
Max Q Clear Time (g_c+I1), s		12.3		10.7		12.3		7.8				
Green Ext Time (p_c), s		2.2		2.0		2.3		1.5				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				10.2								
HCM 6th LOS				B								



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	2	356	90	87	177	43	52	65	153	74	148	10
Future Volume (vph)	2	356	90	87	177	43	52	65	153	74	148	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	7%	13%	3%	9%	4%	8%	3%	5%	4%	20%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	477	0	0	327	0	0	287	0	0	247	0
Sign Control		Stop			Stop			Stop			Stop	

**Intersection Summary**

Area Type: Other  
Control Type: Unsignalized

Intersection

Intersection Delay, s/veh	29.9
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	356	90	87	177	43	52	65	153	74	148	10
Future Vol, veh/h	2	356	90	87	177	43	52	65	153	74	148	10
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, %	0	3	7	13	3	9	4	8	3	5	4	20
Mvmt Flow	2	379	96	93	188	46	55	69	163	79	157	11
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	44.3	24.9	20.5	19.7
HCM LOS	E	C	C	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	19%	0%	28%	32%
Vol Thru, %	24%	79%	58%	64%
Vol Right, %	57%	20%	14%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	270	448	307	232
LT Vol	52	2	87	74
Through Vol	65	356	177	148
RT Vol	153	90	43	10
Lane Flow Rate	287	477	327	247
Geometry Grp	1	1	1	1
Degree of Util (X)	0.587	0.898	0.676	0.537
Departure Headway (Hd)	7.358	6.781	7.453	7.827
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	488	534	483	459
Service Time	5.453	4.861	5.544	5.926
HCM Lane V/C Ratio	0.588	0.893	0.677	0.538
HCM Control Delay	20.5	44.3	24.9	19.7
HCM Lane LOS	C	E	C	C
HCM 95th-tile Q	3.7	10.4	5	3.1





Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	508	65	16	262	53	26
Future Volume (vph)	508	65	16	262	53	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	12
Grade (%)	4%			0%	4%	
Link Speed (mph)	40			40	40	
Link Distance (ft)	1159			3081	2342	
Travel Time (s)	19.8			52.5	39.9	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	3%	2%	0%	8%	6%	8%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	667	0	0	324	92	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	2.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	508	65	16	262	53	26
Future Vol, veh/h	508	65	16	262	53	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	4	-	-	0	4	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	3	2	0	8	6	8
Mvmt Flow	591	76	19	305	62	30

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	667	0	972 629
Stage 1	-	-	-	-	629 -
Stage 2	-	-	-	-	343 -
Critical Hdwy	-	-	4.3	-	7.3 6.68
Critical Hdwy Stg 1	-	-	-	-	6.26 -
Critical Hdwy Stg 2	-	-	-	-	6.26 -
Follow-up Hdwy	-	-	3	-	3.1 3.2
Pot Cap-1 Maneuver	-	-	705	-	239 457
Stage 1	-	-	-	-	504 -
Stage 2	-	-	-	-	739 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	705	-	231 457
Mov Cap-2 Maneuver	-	-	-	-	231 -
Stage 1	-	-	-	-	504 -
Stage 2	-	-	-	-	715 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	24.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	276	-	-	705	-
HCM Lane V/C Ratio	0.333	-	-	0.026	-
HCM Control Delay (s)	24.4	-	-	10.2	0
HCM Lane LOS	C	-	-	B	A
HCM 95th %tile Q(veh)	1.4	-	-	0.1	-

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (vph)	251	262	55	10	130	35	20	178	13	42	276	180
Future Volume (vph)	251	262	55	10	130	35	20	178	13	42	276	180
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	0		0	0		0	0		0	0		160
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	4%	4%	4%	10%	8%	46%	10%	14%	31%	60%	7%	12%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	579	0	0	179	0	0	215	0	0	325	184
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	16.3	16.3		16.3	16.3		9.6	9.6		9.6	9.6	9.6
Total Split (s)	48.9	48.9		48.9	48.9		29.0	29.0		29.0	29.0	29.0
Total Split (%)	62.8%	62.8%		62.8%	62.8%		37.2%	37.2%		37.2%	37.2%	37.2%
Yellow Time (s)	4.3	4.3		4.3	4.3		4.3	4.3		4.3	4.3	4.3
All-Red Time (s)	2.0	2.0		2.0	2.0		2.3	2.3		2.3	2.3	2.3
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)		5.3			5.3			5.6			5.6	5.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
v/c Ratio		0.87			0.24			0.52			0.74	0.33
Control Delay		30.1			9.7			26.1			34.3	5.6
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		30.1			9.7			26.1			34.3	5.6
Queue Length 50th (ft)		196			38			73			120	0
Queue Length 95th (ft)		#411			73			154			#265	43
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)												160
Base Capacity (vph)		918			1022			531			565	655
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		0.63			0.18			0.40			0.58	0.28

Intersection Summary

Area Type: Other

Cycle Length: 77.9

Actuated Cycle Length: 63.9

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 No-Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (veh/h)	251	262	55	10	130	35	20	178	13	42	276	180
Future Volume (veh/h)	251	262	55	10	130	35	20	178	13	42	276	180
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1818	1818	1818	1807	1835	1295	1609	1553	1315	1059	1812	1741
Adj Flow Rate, veh/h	256	267	56	10	133	36	20	182	13	43	282	101
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	4	4	4	10	8	46	10	14	31	60	7	12
Cap, veh/h	418	382	74	94	705	181	92	278	18	122	416	379
Arrive On Green	0.49	0.51	0.49	0.49	0.51	0.49	0.24	0.26	0.24	0.24	0.26	0.26
Sat Flow, veh/h	600	742	144	28	1370	352	38	1081	72	143	1621	1476
Grp Volume(v), veh/h	579	0	0	179	0	0	215	0	0	325	0	101
Grp Sat Flow(s),veh/h/ln	1486	0	0	1750	0	0	1191	0	0	1764	0	1476
Q Serve(g_s), s	12.3	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	2.6
Cycle Q Clear(g_c), s	15.0	0.0	0.0	2.6	0.0	0.0	8.6	0.0	0.0	8.0	0.0	2.6
Prop In Lane	0.44		0.10	0.06		0.20	0.09		0.06	0.13		1.00
Lane Grp Cap(c), veh/h	843	0	0	944	0	0	363	0	0	501	0	379
V/C Ratio(X)	0.69	0.00	0.00	0.19	0.00	0.00	0.59	0.00	0.00	0.65	0.00	0.27
Avail Cap(c_a), veh/h	1420	0	0	1622	0	0	696	0	0	895	0	723
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	1.00
Uniform Delay (d), s/veh	9.3	0.0	0.0	6.3	0.0	0.0	15.5	0.0	0.0	16.2	0.0	14.2
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	1.4	0.0	0.4
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	5.9	0.0	0.0	1.2	0.0	0.0	3.4	0.0	0.0	5.2	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.6	0.0	0.0	6.4	0.0	0.0	17.1	0.0	0.0	17.6	0.0	14.5
LnGrp LOS	A	A	A	A	A	A	B	A	A	B	A	B
Approach Vol, veh/h		579			179			215				426
Approach Delay, s/veh		9.6			6.4			17.1				16.9
Approach LOS		A			A			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		29.9		17.9		29.9		17.9				
Change Period (Y+Rc), s		6.3		* 6.6		6.3		* 6.6				
Max Green Setting (Gmax), s		42.6		* 22		42.6		* 22				
Max Q Clear Time (g_c+I1), s		17.0		10.6		4.6		10.0				
Green Ext Time (p_c), s		6.6		0.5		1.7		1.2				

Intersection Summary

HCM 6th Ctrl Delay	12.6
HCM 6th LOS	B

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
5: I-83 SB Ramps & Susquehanna Trail

2024 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗		↖	↖						↖	↖
Traffic Volume (vph)	0	533	164	110	267	0	0	0	0	40	2	325
Future Volume (vph)	0	533	164	110	267	0	0	0	0	40	2	325
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	11	12	12	12	12	12	12	15	12
Grade (%)		2%			0%			0%			1%	
Storage Length (ft)	0		0	50		0	0		0	0		275
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			35			25			25		
Satd. Flow (prot)	0	1489	0	1476	1500	0	0	0	0	0	1683	1228
Flt Permitted				0.170							0.954	
Satd. Flow (perm)	0	1489	0	264	1500	0	0	0	0	0	1683	1228
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		25										369
Link Speed (mph)		40			40			30				30
Link Distance (ft)		3254			450			1020				690
Travel Time (s)		55.5			7.7			23.2				15.7
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	13%	25%	12%	20%	0%	0%	0%	0%	10%	50%	24%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	792	0	125	303	0	0	0	0	0	47	369
Turn Type		NA		pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	2 1						4	
Permitted Phases				2 1						4		4
Detector Phase		2		1	2 1					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		3.0						3.0	3.0	3.0
Minimum Split (s)		21.3		9.3						9.1	9.1	9.1
Total Split (s)		61.0		15.7						24.0	24.0	24.0
Total Split (%)		60.6%		15.6%						23.8%	23.8%	23.8%
Yellow Time (s)		4.0		4.0						3.2	3.2	3.2
All-Red Time (s)		2.3		2.3						2.9	2.9	2.9
Lost Time Adjust (s)		-1.0		-1.0							-1.0	0.0
Total Lost Time (s)		5.3		5.3							5.1	6.1
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		Min						None	None	None
Act Effct Green (s)		50.9		61.5	66.8						15.1	14.1
Actuated g/C Ratio		0.55		0.66	0.72						0.16	0.15
v/c Ratio		0.95		0.40	0.28						0.17	0.74
Control Delay		42.7		26.2	7.8						36.2	14.0
Queue Delay		0.6		0.0	0.0						0.0	0.0
Total Delay		43.3		26.2	7.8						36.2	14.0
LOS		D		C	A						D	B
Approach Delay		43.3			13.2						16.5	
Approach LOS		D			B						B	
Queue Length 50th (ft)		434		34	89						26	0
Queue Length 95th (ft)		#699		m73	125						56	83
Internal Link Dist (ft)		3174			370			940			610	

Lane Group	Ø5	Ø6	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	5	6	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	40.6	29.6	30.5
Total Split (%)	40%	29%	30%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	None	Min	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)				50								275
Base Capacity (vph)		920		313	1093						349	537
Starvation Cap Reductn		0		0	0						0	0
Spillback Cap Reductn		20		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.88		0.40	0.28						0.13	0.69

**Intersection Summary**

Area Type: Other  
 Cycle Length: 100.7  
 Actuated Cycle Length: 92.5  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.95  
 Intersection Signal Delay: 28.6 Intersection LOS: C  
 Intersection Capacity Utilization 67.8% ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: I-83 SB Ramps & Susquehanna Trail





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Lane Group	Ø5	Ø6	Ø8
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
6: I-83 NB Ramps & Susquehanna Trail

2024 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	447	134	0	0	214	43	165	1	66	0	0	0
Future Volume (vph)	447	134	0	0	214	43	165	1	66	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	11	12	12	12	12	12	12	16	12	12	12	12
Grade (%)		0%			2%			2%			0%	
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	35			25			25			25		
Satd. Flow (prot)	1450	1651	0	0	1566	0	0	1559	0	0	0	0
Flt Permitted	0.366							0.966				
Satd. Flow (perm)	559	1651	0	0	1566	0	0	1559	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					10			19				
Link Speed (mph)		40			40			30				30
Link Distance (ft)		450			839			925				282
Travel Time (s)		7.7			14.3			21.0				6.4
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	14%	9%	0%	0%	13%	2%	23%	0%	14%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	508	152	0	0	292	0	0	264	0	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA				
Protected Phases	5	6 5			6			8				
Permitted Phases	6 5						8					
Detector Phase	5	6 5			6		8	8				
Switch Phase												
Minimum Initial (s)	3.0				15.0		3.0	3.0				
Minimum Split (s)	9.3				21.3		9.1	9.1				
Total Split (s)	40.6				29.6		30.5	30.5				
Total Split (%)	40.3%				29.4%		30.3%	30.3%				
Yellow Time (s)	4.0				4.0		3.2	3.2				
All-Red Time (s)	2.3				2.3		2.9	2.9				
Lost Time Adjust (s)	-1.0				-1.0			-1.0				
Total Lost Time (s)	5.3				5.3			5.1				
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Recall Mode	None				Min		None	None				
Act Effct Green (s)	53.5	58.9			22.3			23.1				
Actuated g/C Ratio	0.58	0.64			0.24			0.25				
v/c Ratio	0.82	0.14			0.76			0.66				
Control Delay	13.5	1.4			46.9			39.0				
Queue Delay	0.0	0.0			0.0			0.0				
Total Delay	13.5	1.4			46.9			39.0				
LOS	B	A			D			D				
Approach Delay		10.7			46.9			39.0				
Approach LOS		B			D			D				
Queue Length 50th (ft)	88	8			167			141				
Queue Length 95th (ft)	m147	m9			#281			223				
Internal Link Dist (ft)		370			759			845			202	

Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	15.7	61.0	24.0
Total Split (%)	16%	61%	24%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	Min	None	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	50											
Base Capacity (vph)	696	1119			425			448				
Starvation Cap Reductn	0	0			0			0				
Spillback Cap Reductn	0	0			0			0				
Storage Cap Reductn	0	0			0			0				
Reduced v/c Ratio	0.73	0.14			0.69			0.59				

**Intersection Summary**

Area Type: Other  
 Cycle Length: 100.7  
 Actuated Cycle Length: 92.5  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.95  
 Intersection Signal Delay: 25.5 Intersection LOS: C  
 Intersection Capacity Utilization 67.8% ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

**Splits and Phases: 6: I-83 NB Ramps & Susquehanna Trail**



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Lane Group	Ø1	Ø2	Ø4
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	99	0	202	0	0	0	40	166	0	0	359	61
Future Volume (vph)	99	0	202	0	0	0	40	166	0	0	359	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			2%			-2%	
Link Speed (mph)		35			25			40			40	
Link Distance (ft)		1242			1074			3105			1664	
Travel Time (s)		24.2			29.3			52.9			28.4	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	0%	7%	0%	0%	6%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	338	0	0	0	0	0	232	0	0	472	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection												
Int Delay, s/veh	8.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	99	0	202	0	0	0	40	166	0	0	359	61
Future Vol, veh/h	99	0	202	0	0	0	40	166	0	0	359	61
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	2	-	-	-2	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	1	0	0	0	0	0	0	7	0	0	6	3
Mvmt Flow	111	0	227	0	0	0	45	187	0	0	403	69

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	715	715	438	828	749	187	472	0	0	187	0	0
Stage 1	438	438	-	277	277	-	-	-	-	-	-	-
Stage 2	277	277	-	551	472	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.11	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3	4	3.1	3	4	3.1	3	-	-	3	-	-
Pot Cap-1 Maneuver	389	359	656	325	343	911	826	-	-	1037	-	-
Stage 1	681	582	-	840	685	-	-	-	-	-	-	-
Stage 2	840	685	-	588	562	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	371	337	656	203	322	911	826	-	-	1037	-	-
Mov Cap-2 Maneuver	371	337	-	203	322	-	-	-	-	-	-	-
Stage 1	639	582	-	789	643	-	-	-	-	-	-	-
Stage 2	789	643	-	385	562	-	-	-	-	-	-	-

Approach	EB		WB			NB			SB		
HCM Control Delay, s	23.5		0			1.9			0		
HCM LOS	C		A								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	826	-	-	524	-	1037	-
HCM Lane V/C Ratio	0.054	-	-	0.645	-	-	-
HCM Control Delay (s)	9.6	0	-	23.5	0	0	-
HCM Lane LOS	A	A	-	C	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	4.6	-	0	-

Bull Road Logistics  
8: Bull Road & Church Road

2024 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	32	208	342	73	116	24	130	167	66	58	548	31
Future Volume (vph)	32	208	342	73	116	24	130	167	66	58	548	31
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	14	10	12	12	12	11	12	12	12	12	12
Grade (%)		-7%			2%			1%			0%	
Storage Length (ft)	0		5	0		5	175		0	90		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			90			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			40			35			40	
Link Distance (ft)		1991			2295			1045			638	
Travel Time (s)		38.8			39.1			20.4			10.9	
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 (%)	3%	2%	3%	3%	2%	0%	8%	7%	8%	3%	4%	6%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	619	0	0	227	0	138	248	0	62	616	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		3.0	10.0		10.0	10.0	
Minimum Split (s)	9.2	9.2		9.2	9.2		6.0	16.6		16.6	16.6	
Total Split (s)	37.0	37.0		37.0	37.0		10.0	48.4		38.4	38.4	
Total Split (%)	43.3%	43.3%		43.3%	43.3%		11.7%	56.7%		45.0%	45.0%	
Yellow Time (s)	4.8	4.8		4.8	4.8		3.0	4.0		4.0	4.0	
All-Red Time (s)	1.4	1.4		1.4	1.4		0.0	2.2		2.2	2.2	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		5.2			5.2		2.0	5.2		5.2	5.2	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Min		Min	Min	
v/c Ratio		0.90			0.67		0.55	0.30		0.15	0.92	
Control Delay		39.9			32.5		18.8	11.4		18.2	46.5	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		39.9			32.5		18.8	11.4		18.2	46.5	
Queue Length 50th (ft)		263			95		35	62		21	306	
Queue Length 95th (ft)		#469			180		69	110		48	#521	
Internal Link Dist (ft)		1911			2215			965			558	
Turn Bay Length (ft)							175			90		
Base Capacity (vph)		741			372		251	872		435	708	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.84			0.61		0.55	0.28		0.14	0.87	

Intersection Summary

Area Type: Other



Cycle Length: 85.4

Actuated Cycle Length: 81.4

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Bull Road & Church Road



Bull Road Logistics  
8: Bull Road & Church Road

2024 No-Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Volume (veh/h)	32	208	342	73	116	24	130	167	66	58	548	31
Future Volume (veh/h)	32	208	342	73	116	24	130	167	66	58	548	31
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2018	2114	2018	1736	1750	1778	1682	1696	1682	1758	1744	1716
Adj Flow Rate, veh/h	34	221	258	78	123	16	138	178	65	62	583	28
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
Percent Heavy Veh, %	3	2	3	3	2	0	8	7	8	3	4	6
Cap, veh/h	76	279	306	158	225	25	328	644	235	558	709	34
Arrive On Green	0.30	0.31	0.31	0.30	0.31	0.31	0.09	0.54	0.53	0.43	0.43	0.42
Sat Flow, veh/h	75	887	973	291	716	80	1602	1185	433	1069	1650	79
Grp Volume(v), veh/h	513	0	0	217	0	0	138	0	243	62	0	611
Grp Sat Flow(s),veh/h/ln	1934	0	0	1088	0	0	1602	0	1618	1069	0	1730
Q Serve(g_s), s	6.3	0.0	0.0	0.0	0.0	0.0	3.1	0.0	5.9	2.6	0.0	22.8
Cycle Q Clear(g_c), s	18.2	0.0	0.0	12.0	0.0	0.0	3.1	0.0	5.9	2.6	0.0	22.8
Prop In Lane	0.07		0.50	0.36		0.07	1.00		0.27	1.00		0.05
Lane Grp Cap(c), veh/h	634	0	0	394	0	0	328	0	879	558	0	743
V/C Ratio(X)	0.81	0.00	0.00	0.55	0.00	0.00	0.42	0.00	0.28	0.11	0.00	0.82
Avail Cap(c_a), veh/h	862	0	0	547	0	0	365	0	957	584	0	786
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.4	0.0	0.0	20.6	0.0	0.0	13.3	0.0	9.0	12.6	0.0	18.4
Incr Delay (d2), s/veh	4.2	0.0	0.0	1.2	0.0	0.0	0.9	0.0	0.8	0.4	0.0	10.0
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	13.2	0.0	0.0	5.4	0.0	0.0	1.8	0.0	3.5	1.1	0.0	15.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.6	0.0	0.0	21.9	0.0	0.0	14.1	0.0	9.8	13.0	0.0	28.4
LnGrp LOS	C	A	A	C	A	A	B	A	A	B	A	C
Approach Vol, veh/h		513			217			381			673	
Approach Delay, s/veh		27.6			21.9			11.4			26.9	
Approach LOS		C			C			B			C	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		44.9		28.2	8.3	36.6		28.2				
Change Period (Y+Rc), s		* 6.2		* 6.2	3.0	* 6.2		* 6.2				
Max Green Setting (Gmax), s		* 42		* 31	7.0	* 32		* 31				
Max Q Clear Time (g_c+I1), s		7.9		20.2	5.6	24.8		14.0				
Green Ext Time (p_c), s		7.5		1.7	0.1	5.6		0.8				

Intersection Summary

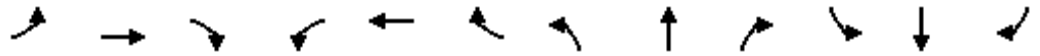
HCM 6th Ctrl Delay	23.2
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2024 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	248	1407	162	174	1328	320	160	153	69	489	297	202
Future Volume (vph)	248	1407	162	174	1328	320	160	153	69	489	297	202
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Grade (%)		-2%			-1%			-1%			1%	
Storage Length (ft)	270		370	410		410	530		150	400		320
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	80			75			50			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			25				35
Link Distance (ft)		1907			1983			690				1750
Travel Time (s)		32.5			33.8			18.8				34.1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	5%	14%	8%	18%	14%	4%	8%	4%	28%	3%	5%	4%
Shared Lane Traffic (%)							36%			47%		
Lane Group Flow (vph)	261	1481	171	183	1398	337	108	221	73	273	555	213
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6	4	5	2		4	4		8	8	
Permitted Phases			6			2			4			8
Detector Phase	1	6	4	5	2	2	4	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	5.0	4.5	10.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	17.0	12.5	11.5	17.0	17.0	12.5	12.5	12.5	12.5	12.5	12.5
Total Split (s)	31.0	50.0	22.0	23.0	42.0	42.0	22.0	22.0	22.0	30.0	30.0	30.0
Total Split (%)	24.8%	40.0%	17.6%	18.4%	33.6%	33.6%	17.6%	17.6%	17.6%	24.0%	24.0%	24.0%
Yellow Time (s)	3.0	4.5	3.0	4.5	4.5	4.5	3.0	3.0	3.0	3.5	3.5	3.5
All-Red Time (s)	3.5	2.5	4.5	2.5	2.5	2.5	4.5	4.5	4.5	4.0	4.0	4.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.5	6.0	6.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Min	None	None	C-Min	C-Min	None	None	None	None	None	None
v/c Ratio	0.84	0.97	0.21	0.92	1.06	0.49	0.65	0.63	0.22	0.93	0.92	0.46
Control Delay	71.9	56.2	4.1	98.3	84.7	6.2	71.9	61.0	1.6	86.7	71.7	8.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.9	56.2	4.1	98.3	84.7	6.2	71.9	61.0	1.6	86.7	71.7	8.7
Queue Length 50th (ft)	202	428	9	148	~476	0	92	93	0	242	247	0
Queue Length 95th (ft)	#330	#537	44	#291	#573	73	#162	139	0	#435	#368	64
Internal Link Dist (ft)		1827			1903			610			1670	
Turn Bay Length (ft)	270		370	410		410	530		150	400		320
Base Capacity (vph)	335	1533	820	200	1318	684	179	383	339	295	601	462
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.97	0.21	0.92	1.06	0.49	0.60	0.58	0.22	0.93	0.92	0.46

Intersection Summary

Area Type: Other  
Cycle Length: 125

Actuated Cycle Length: 125

Offset: 76 (61%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 100

Control Type: Actuated-Coordinated

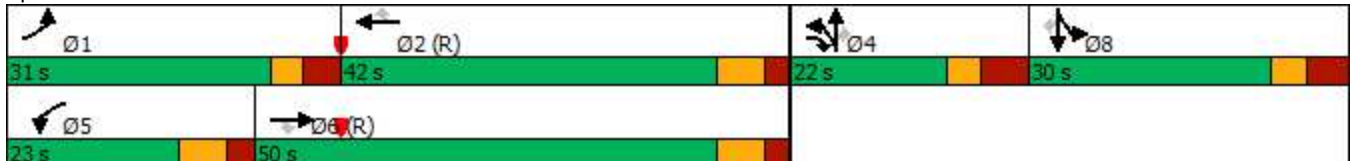
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 9: Roosevelt Ave & Loucks Road



Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2024 No-Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↕	↗	↘	↕	↗
Traffic Volume (veh/h)	248	1407	162	174	1328	320	160	153	69	489	297	202
Future Volume (veh/h)	248	1407	162	174	1328	320	160	153	69	489	297	202
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1803	1675	1761	1581	1638	1780	1724	1780	1439	1752	1724	1738
Adj Flow Rate, veh/h	261	1481	129	183	1398	0	184	139	0	515	313	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	5	14	8	18	14	4	8	4	28	3	5	4
Cap, veh/h	305	1691	710	205	1485		349	189		627	324	
Arrive On Green	0.18	0.37	0.37	0.14	0.33	0.00	0.11	0.11	0.00	0.19	0.19	0.00
Sat Flow, veh/h	1718	4574	1492	1506	4472	1509	3283	1780	1220	3338	1724	1473
Grp Volume(v), veh/h	261	1481	129	183	1398	0	184	139	0	515	313	0
Grp Sat Flow(s),veh/h/ln	1718	1525	1492	1506	1491	1509	1641	1780	1220	1669	1724	1473
Q Serve(g_s), s	18.4	37.7	6.2	14.9	38.0	0.0	6.6	9.5	0.0	18.5	22.5	0.0
Cycle Q Clear(g_c), s	18.4	37.7	6.2	14.9	38.0	0.0	6.6	9.5	0.0	18.5	22.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	305	1691	710	205	1485		349	189		627	324	
V/C Ratio(X)	0.85	0.88	0.18	0.89	0.94		0.53	0.73		0.82	0.97	
Avail Cap(c_a), veh/h	350	1691	710	205	1485		407	221		627	324	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	49.8	36.7	18.8	53.1	40.6	0.0	52.9	54.2	0.0	48.7	50.3	0.0
Incr Delay (d2), s/veh	16.6	6.7	0.6	35.3	13.0	0.0	1.2	10.2	0.0	8.5	40.7	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	14.1	20.8	4.9	12.1	21.6	0.0	5.1	8.4	0.0	13.1	19.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.5	43.4	19.3	88.5	53.6	0.0	54.1	64.3	0.0	57.3	91.0	0.0
LnGrp LOS	E	D	B	F	D		D	E		E	F	
Approach Vol, veh/h		1871			1581			323			828	
Approach Delay, s/veh		45.0			57.7			58.5			70.0	
Approach LOS		D			E			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	27.7	47.5		19.8	23.0	52.2		30.0				
Change Period (Y+Rc), s	6.5	7.0		7.5	7.0	7.0		7.5				
Max Green Setting (Gmax), s	24.5	35.0		14.5	16.0	43.0		22.5				
Max Q Clear Time (g_c+I1), s	20.9	40.5		12.0	17.4	40.2		25.0				
Green Ext Time (p_c), s	0.3	0.0		0.3	0.0	2.6		0.0				

Intersection Summary

HCM 6th Ctrl Delay	54.8
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.  
Unsignalized Delay for [NBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Bull Road Logistics  
1: Main St & Canal Rd

2024 No-Build PM

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	133	182	83	53	205	61	72	392	65	78	401	136
Future Volume (vph)	133	182	83	53	205	61	72	392	65	78	401	136
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	15	12	10	12	12	10	12	12
Grade (%)		1%			-1%			6%				-1%
Storage Length (ft)	0		0	0		0	70		0	60		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			70			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		25			25			25				25
Link Distance (ft)		933			1422			721				620
Travel Time (s)		25.4			38.8			19.7				16.9
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	5%	2%	4%	0%	4%	3%	4%	1%	0%	3%	2%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	419	0	0	336	0	76	481	0	82	565	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6		6
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		10.0	10.0		10.0		10.0
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		15.0		15.0
Total Split (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0		35.0
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%		50.0%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0		2.0
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0		-1.0
Total Lost Time (s)		4.0			4.0		4.0	4.0		4.0		4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min		Min
v/c Ratio		0.78			0.47		0.45	0.66		0.35		0.78
Control Delay		27.6			15.4		23.5	19.5		17.8		24.0
Queue Delay		0.0			0.0		0.0	0.0		0.0		0.0
Total Delay		27.6			15.4		23.5	19.5		17.8		24.0
Queue Length 50th (ft)		133			89		20	142		20		178
Queue Length 95th (ft)		#288			162		62	252		57		#321
Internal Link Dist (ft)		853			1342			641				540
Turn Bay Length (ft)							70			60		
Base Capacity (vph)		712			946		223	955		307		959
Starvation Cap Reductn		0			0		0	0		0		0
Spillback Cap Reductn		0			0		0	0		0		0
Storage Cap Reductn		0			0		0	0		0		0
Reduced v/c Ratio		0.59			0.36		0.34	0.50		0.27		0.59

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 58.5

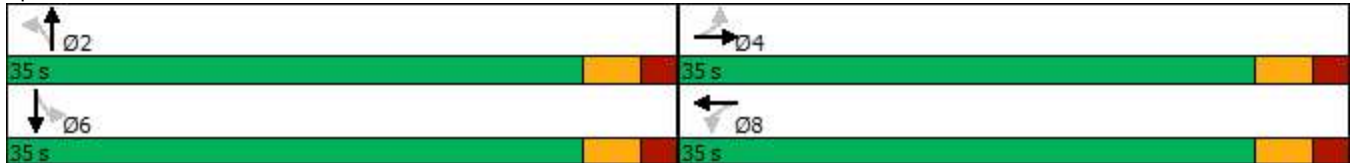
Natural Cycle: 55

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Main St & Canal Rd



Bull Road Logistics  
1: Main St & Canal Rd

2024 No-Build PM

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	133	182	83	53	205	61	72	392	65	78	401	136
Future Volume (veh/h)	133	182	83	53	205	61	72	392	65	78	401	136
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1724	1766	1738	1837	1852	1795	1543	1585	1599	1795	1809	1795
Adj Flow Rate, veh/h	140	192	87	56	216	64	76	413	68	82	422	143
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	5	2	4	0	4	3	4	1	0	3	2	3
Cap, veh/h	253	277	111	156	430	116	315	624	103	371	607	206
Arrive On Green	0.33	0.35	0.33	0.33	0.35	0.33	0.47	0.47	0.45	0.47	0.47	0.45
Sat Flow, veh/h	415	785	314	177	1218	328	698	1327	219	877	1292	438
Grp Volume(v), veh/h	419	0	0	336	0	0	76	0	481	82	0	565
Grp Sat Flow(s),veh/h/ln	1514	0	0	1723	0	0	698	0	1546	877	0	1730
Q Serve(g_s), s	4.1	0.0	0.0	0.0	0.0	0.0	4.3	0.0	10.8	3.5	0.0	11.7
Cycle Q Clear(g_c), s	11.1	0.0	0.0	7.0	0.0	0.0	15.4	0.0	10.8	13.9	0.0	11.7
Prop In Lane	0.33		0.21	0.17		0.19	1.00		0.14	1.00		0.25
Lane Grp Cap(c), veh/h	607	0	0	663	0	0	315	0	726	371	0	813
V/C Ratio(X)	0.69	0.00	0.00	0.51	0.00	0.00	0.24	0.00	0.66	0.22	0.00	0.69
Avail Cap(c_a), veh/h	1072	0	0	1201	0	0	467	0	1062	561	0	1189
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.1	0.0	0.0	11.8	0.0	0.0	15.3	0.0	9.3	14.3	0.0	9.5
Incr Delay (d2), s/veh	1.4	0.0	0.0	0.6	0.0	0.0	0.4	0.0	1.0	0.3	0.0	1.1
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	6.4	0.0	0.0	4.5	0.0	0.0	1.1	0.0	5.4	1.2	0.0	6.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.5	0.0	0.0	12.4	0.0	0.0	15.7	0.0	10.3	14.6	0.0	10.6
LnGrp LOS	B	A	A	B	A	A	B	A	B	B	A	B
Approach Vol, veh/h		419			336			557				647
Approach Delay, s/veh		14.5			12.4			11.0				11.1
Approach LOS		B			B			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		25.2		19.9		25.2		19.9				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		30.0		30.0		30.0		30.0				
Max Q Clear Time (g_c+I1), s		17.9		13.1		16.4		9.0				
Green Ext Time (p_c), s		2.3		1.8		2.8		1.4				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				12.0								
HCM 6th LOS				B								





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	14	316	63	94	309	34	163	183	85	68	119	24
Future Volume (vph)	14	316	63	94	309	34	163	183	85	68	119	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	5%	0%	2%	6%	1%	2%	2%	1%	3%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	418	0	0	465	0	0	458	0	0	225	0
Sign Control		Stop			Stop			Stop			Stop	

**Intersection Summary**

Area Type: Other  
Control Type: Unsignalized

Intersection	
Intersection Delay, s/veh	81.9
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	14	316	63	94	309	34	163	183	85	68	119	24
Future Vol, veh/h	14	316	63	94	309	34	163	183	85	68	119	24
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, %	0	3	5	0	2	6	1	2	2	1	3	4
Mvmt Flow	15	336	67	100	329	36	173	195	90	72	127	26
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	70.3	103.3	97.5	27
HCM LOS	F	F	F	D

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	38%	4%	22%	32%
Vol Thru, %	42%	80%	71%	56%
Vol Right, %	20%	16%	8%	11%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	431	393	437	211
LT Vol	163	14	94	68
Through Vol	183	316	309	119
RT Vol	85	63	34	24
Lane Flow Rate	459	418	465	224
Geometry Grp	1	1	1	1
Degree of Util (X)	1.079	0.978	1.097	0.591
Departure Headway (Hd)	8.833	9.022	8.853	10.223
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	413	406	414	355
Service Time	6.833	7.022	6.853	8.223
HCM Lane V/C Ratio	1.111	1.03	1.123	0.631
HCM Control Delay	97.5	70.3	103.3	27
HCM Lane LOS	F	F	F	D
HCM 95th-tile Q	15	11.6	15.6	3.6



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Traffic Volume (vph)	399	100	51	449	39	39
Future Volume (vph)	399	100	51	449	39	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	12
Grade (%)	4%			0%	4%	
Link Speed (mph)	40			40	40	
Link Distance (ft)	1159			3081	2342	
Travel Time (s)	19.8			52.5	39.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	3%	1%	0%	3%	0%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	509	0	0	510	80	0
Sign Control	Free			Free	Stop	

**Intersection Summary**

Area Type: Other  
 Control Type: Unsignalized

Intersection						
Int Delay, s/veh	2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	399	100	51	449	39	39
Future Vol, veh/h	399	100	51	449	39	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	4	-	-	0	4	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	3	1	0	3	0	3
Mvmt Flow	407	102	52	458	40	40

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	509	0	1020 458
Stage 1	-	-	-	-	458 -
Stage 2	-	-	-	-	562 -
Critical Hdwy	-	-	4.3	-	7.3 6.7
Critical Hdwy Stg 1	-	-	-	-	6.2 -
Critical Hdwy Stg 2	-	-	-	-	6.2 -
Follow-up Hdwy	-	-	3	-	3.1 3.2
Pot Cap-1 Maneuver	-	-	802	-	221 584
Stage 1	-	-	-	-	639 -
Stage 2	-	-	-	-	556 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	802	-	202 584
Mov Cap-2 Maneuver	-	-	-	-	202 -
Stage 1	-	-	-	-	639 -
Stage 2	-	-	-	-	508 -

Approach	EB	WB	NB
HCM Control Delay, s	0	1	21.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	300	-	-	802	-
HCM Lane V/C Ratio	0.265	-	-	0.065	-
HCM Control Delay (s)	21.3	-	-	9.8	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1	-	-	0.2	-

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 No-Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (vph)	222	148	39	20	345	70	57	330	10	42	218	296
Future Volume (vph)	222	148	39	20	345	70	57	330	10	42	218	296
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	0		0	0		0	0		0	0		160
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	5%	3%	0%	10%	2%	24%	0%	5%	30%	29%	7%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	475	0	0	505	0	0	462	0	0	302	344
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	16.3	16.3		16.3	16.3		9.6	9.6		9.6	9.6	9.6
Total Split (s)	45.7	45.7		45.7	45.7		32.2	32.2		32.2	32.2	32.2
Total Split (%)	58.7%	58.7%		58.7%	58.7%		41.3%	41.3%		41.3%	41.3%	41.3%
Yellow Time (s)	4.3	4.3		4.3	4.3		4.3	4.3		4.3	4.3	4.3
All-Red Time (s)	2.0	2.0		2.0	2.0		2.3	2.3		2.3	2.3	2.3
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)		5.3			5.3			5.6			5.6	5.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
v/c Ratio		1.02			0.61			1.02			0.66	0.46
Control Delay		68.4			17.3			75.3			30.2	4.6
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		68.4			17.3			75.3			30.2	4.6
Queue Length 50th (ft)		~228			162			~229			123	0
Queue Length 95th (ft)		#395			241			#387			197	45
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)												160
Base Capacity (vph)		467			823			454			456	746
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		1.02			0.61			1.02			0.66	0.46

Intersection Summary

Area Type: Other

Cycle Length: 77.9

Actuated Cycle Length: 77.9

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 No-Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (veh/h)	222	148	39	20	345	70	57	330	10	42	218	296
Future Volume (veh/h)	222	148	39	20	345	70	57	330	10	42	218	296
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1803	1832	1875	1807	1921	1608	1750	1680	1329	1499	1812	1883
Adj Flow Rate, veh/h	258	172	45	23	401	81	66	384	12	49	253	235
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	5	3	0	10	2	24	0	5	30	29	7	2
Cap, veh/h	344	204	50	70	762	149	98	407	12	104	463	565
Arrive On Green	0.49	0.50	0.49	0.49	0.50	0.49	0.34	0.35	0.34	0.34	0.35	0.35
Sat Flow, veh/h	539	407	99	40	1520	298	122	1149	34	138	1310	1596
Grp Volume(v), veh/h	475	0	0	505	0	0	462	0	0	302	0	235
Grp Sat Flow(s),veh/h/ln	1045	0	0	1858	0	0	1305	0	0	1448	0	1596
Q Serve(g_s), s	18.7	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	8.4
Cycle Q Clear(g_c), s	32.8	0.0	0.0	14.1	0.0	0.0	25.6	0.0	0.0	10.6	0.0	8.4
Prop In Lane	0.54		0.09	0.05		0.16	0.14		0.03	0.16		1.00
Lane Grp Cap(c), veh/h	584	0	0	957	0	0	499	0	0	549	0	565
V/C Ratio(X)	0.81	0.00	0.00	0.53	0.00	0.00	0.93	0.00	0.00	0.55	0.00	0.42
Avail Cap(c_a), veh/h	626	0	0	1022	0	0	499	0	0	549	0	565
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	1.00
Uniform Delay (d), s/veh	18.7	0.0	0.0	12.9	0.0	0.0	24.8	0.0	0.0	19.0	0.0	18.4
Incr Delay (d2), s/veh	6.9	0.0	0.0	0.2	0.0	0.0	23.4	0.0	0.0	1.2	0.0	0.5
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	12.6	0.0	0.0	8.9	0.0	0.0	16.3	0.0	0.0	7.1	0.0	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.6	0.0	0.0	13.1	0.0	0.0	48.1	0.0	0.0	20.1	0.0	18.9
LnGrp LOS	C	A	A	B	A	A	D	A	A	C	A	B
Approach Vol, veh/h		475			505			462				537
Approach Delay, s/veh		25.6			13.1			48.1				19.6
Approach LOS		C			B			D				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		43.0		32.2		43.0		32.2				
Change Period (Y+Rc), s		6.3		* 6.6		6.3		* 6.6				
Max Green Setting (Gmax), s		39.4		* 26		39.4		* 26				
Max Q Clear Time (g_c+I1), s		34.8		27.6		16.1		12.6				
Green Ext Time (p_c), s		1.9		0.0		5.1		1.7				

Intersection Summary

HCM 6th Ctrl Delay	26.0
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
5: I-83 SB Ramps & Susquehanna Trail

2024 No-Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗		↖	↗						↖	↗
Traffic Volume (vph)	0	588	203	97	309	0	0	0	0	57	3	485
Future Volume (vph)	0	588	203	97	309	0	0	0	0	57	3	485
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	11	12	12	12	12	12	12	15	12
Grade (%)		2%			0%			0%			1%	
Storage Length (ft)	0		0	50		0	0		0	0		275
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			35			25			25		
Satd. Flow (prot)	0	1539	0	1559	1607	0	0	0	0	0	1785	1335
Flt Permitted				0.150							0.954	
Satd. Flow (perm)	0	1539	0	246	1607	0	0	0	0	0	1785	1335
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		28										539
Link Speed (mph)		40			40			30				30
Link Distance (ft)		3254			450			1020				690
Travel Time (s)		55.5			7.7			23.2				15.7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	12%	11%	6%	12%	0%	0%	0%	0%	4%	33%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	879	0	108	343	0	0	0	0	0	66	539
Turn Type		NA		pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	2 1							4
Permitted Phases				2 1						4		4
Detector Phase		2		1	2 1					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		3.0						3.0	3.0	3.0
Minimum Split (s)		21.3		9.3						9.1	9.1	9.1
Total Split (s)		73.0		22.0						17.7	17.7	17.7
Total Split (%)		64.8%		19.5%						15.7%	15.7%	15.7%
Yellow Time (s)		4.0		4.0						3.2	3.2	3.2
All-Red Time (s)		2.3		2.3						2.9	2.9	2.9
Lost Time Adjust (s)		-1.0		-1.0							-1.0	0.0
Total Lost Time (s)		5.3		5.3							5.1	6.1
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		Min						None	None	None
Act Effct Green (s)		60.7		73.1	78.5						12.8	11.7
Actuated g/C Ratio		0.60		0.72	0.77						0.13	0.11
v/c Ratio		0.95		0.32	0.28						0.30	0.86
Control Delay		38.4		20.2	5.8						48.0	18.6
Queue Delay		0.0		0.0	0.8						0.0	0.0
Total Delay		38.4		20.2	6.5						48.0	18.6
LOS		D		C	A						D	B
Approach Delay		38.4			9.8						21.8	
Approach LOS		D			A						C	
Queue Length 50th (ft)		470		18	63						43	0
Queue Length 95th (ft)		#833		m68	150						88	#179
Internal Link Dist (ft)		3174			370			940			610	



Lane Group	Ø5	Ø6	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	5	6	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	35.0	59.0	18.7
Total Split (%)	31%	52%	17%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	None	Min	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			

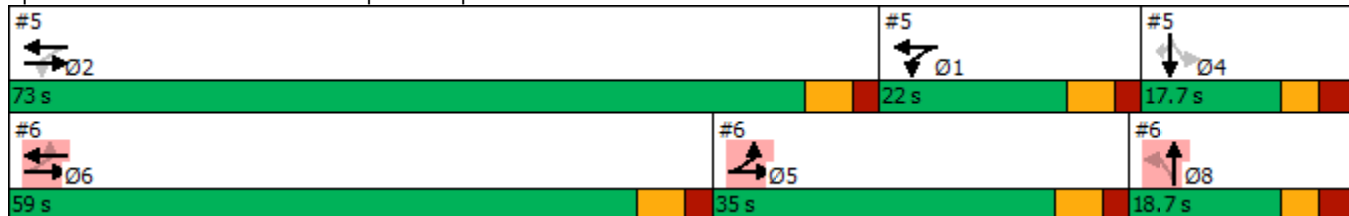


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)				50								275
Base Capacity (vph)		1045		405	1320						223	630
Starvation Cap Reductn		0		0	663						0	0
Spillback Cap Reductn		0		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.84		0.27	0.52						0.30	0.86

**Intersection Summary**

Area Type: Other  
 Cycle Length: 112.7  
 Actuated Cycle Length: 101.8  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.95  
 Intersection Signal Delay: 26.6 Intersection LOS: C  
 Intersection Capacity Utilization 73.3% ICU Level of Service D  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: I-83 SB Ramps & Susquehanna Trail



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Lane Group	Ø5	Ø6	Ø8
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
6: I-83 NB Ramps & Susquehanna Trail

2024 No-Build PM

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	448	197	0	0	224	49	179	1	123	0	0	0
Future Volume (vph)	448	197	0	0	224	49	179	1	123	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	11	12	12	12	12	12	12	16	12	12	12	12
Grade (%)		0%			2%			2%			0%	
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	35			25			25			25		
Satd. Flow (prot)	1437	1731	0	0	1652	0	0	1658	0	0	0	0
Flt Permitted	0.406							0.971				
Satd. Flow (perm)	614	1731	0	0	1652	0	0	1658	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					13			25				
Link Speed (mph)		40			40			30				30
Link Distance (ft)		450			839			925				282
Travel Time (s)		7.7			14.3			21.0				6.4
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	15%	4%	0%	0%	6%	2%	18%	100%	2%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	472	207	0	0	288	0	0	318	0	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA				
Protected Phases	5	6 5			6			8				
Permitted Phases	6 5						8					
Detector Phase	5	6 5			6		8	8				
Switch Phase												
Minimum Initial (s)	3.0				15.0		3.0	3.0				
Minimum Split (s)	9.3				21.3		9.1	9.1				
Total Split (s)	35.0				59.0		18.7	18.7				
Total Split (%)	31.1%				52.4%		16.6%	16.6%				
Yellow Time (s)	4.0				4.0		3.2	3.2				
All-Red Time (s)	2.3				2.3		2.9	2.9				
Lost Time Adjust (s)	-1.0				-1.0			-1.0				
Total Lost Time (s)	5.3				5.3			5.1				
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Recall Mode	None				Min		None	None				
Act Effct Green (s)	55.1	60.4			28.4			30.8				
Actuated g/C Ratio	0.54	0.59			0.28			0.30				
v/c Ratio	0.86	0.20			0.61			0.61				
Control Delay	21.1	3.8			35.9			37.2				
Queue Delay	0.0	0.0			0.0			0.0				
Total Delay	21.1	3.8			35.9			37.2				
LOS	C	A			D			D				
Approach Delay		15.8			35.9			37.2				
Approach LOS		B			D			D				
Queue Length 50th (ft)	113	29			168			172				
Queue Length 95th (ft)	m131	m13			225			#356				
Internal Link Dist (ft)		370			759			845			202	

Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	22.0	73.0	17.7
Total Split (%)	20%	65%	16%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	Min	None	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	50											
Base Capacity (vph)	595	1095			888			519				
Starvation Cap Reductn	0	0			0			0				
Spillback Cap Reductn	0	0			0			0				
Storage Cap Reductn	0	0			0			0				
Reduced v/c Ratio	0.79	0.19			0.32			0.61				

Intersection Summary

Area Type: Other  
 Cycle Length: 112.7  
 Actuated Cycle Length: 101.8  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.95  
 Intersection Signal Delay: 25.6 Intersection LOS: C  
 Intersection Capacity Utilization 73.3% ICU Level of Service D  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: I-83 NB Ramps & Susquehanna Trail

#5 ← Ø2	#5 ↙ Ø1	#5 ↓ Ø4
73 s	22 s	17.7 s
#6 ← Ø6	#6 ↗ Ø5	#6 ↑ Ø8
59 s	35 s	18.7 s

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Lane Group	Ø1	Ø2	Ø4
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	75	0	111	0	0	0	278	384	2	0	236	140
Future Volume (vph)	75	0	111	0	0	0	278	384	2	0	236	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			2%			-2%	
Link Speed (mph)		35			25			40			40	
Link Distance (ft)		1242			1074			3105			1664	
Travel Time (s)		24.2			29.3			52.9			28.4	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%	1%	2%	0%	0%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	191	0	0	0	0	0	685	0	0	387	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized



Intersection												
Int Delay, s/veh	15.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	75	0	111	0	0	0	278	384	2	0	236	140
Future Vol, veh/h	75	0	111	0	0	0	278	384	2	0	236	140
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	2	-	-	-2	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	4	0	0	0	0	0	1	2	0	0	1	1
Mvmt Flow	77	0	114	0	0	0	287	396	2	0	243	144

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1286	1287	315	1343	1358	397	387	0	0	398	0	0
Stage 1	315	315	-	971	971	-	-	-	-	-	-	-
Stage 2	971	972	-	372	387	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.5	6.2	7.1	6.5	6.2	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.14	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3	4	3.1	3	4	3.1	3	-	-	3	-	-
Pot Cap-1 Maneuver	153	166	771	141	150	692	884	-	-	877	-	-
Stage 1	797	659	-	338	334	-	-	-	-	-	-	-
Stage 2	334	333	-	743	613	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	103	97	771	81	87	692	884	-	-	877	-	-
Mov Cap-2 Maneuver	103	97	-	81	87	-	-	-	-	-	-	-
Stage 1	465	659	-	197	195	-	-	-	-	-	-	-
Stage 2	195	194	-	633	613	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	85.2		0		4.6		0	
HCM LOS	F		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	884	-	-	213	-	877	-
HCM Lane V/C Ratio	0.324	-	-	0.9	-	-	-
HCM Control Delay (s)	11	0	-	85.2	0	0	-
HCM Lane LOS	B	A	-	F	A	A	-
HCM 95th %tile Q(veh)	1.4	-	-	7.3	-	0	-

Bull Road Logistics  
8: Bull Road & Church Road

2024 No-Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	57	176	184	100	260	97	315	592	116	45	335	55
Future Volume (vph)	57	176	184	100	260	97	315	592	116	45	335	55
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	14	10	12	12	12	11	12	12	12	12	12
Grade (%)		-7%			2%			1%			0%	
Storage Length (ft)	0		5	0		5	175		0	90		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			90			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			40			35			40	
Link Distance (ft)		1991			2295			1045			638	
Travel Time (s)		38.8			39.1			20.4			10.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	1%	1%	2%	0%	2%	0%	4%	1%	9%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	426	0	0	466	0	321	722	0	46	398	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		3.0	10.0		10.0	10.0	
Minimum Split (s)	9.2	9.2		9.2	9.2		6.0	16.6		16.6	16.6	
Total Split (s)	43.0	43.0		43.0	43.0		18.0	52.4		34.4	34.4	
Total Split (%)	45.1%	45.1%		45.1%	45.1%		18.9%	54.9%		36.1%	36.1%	
Yellow Time (s)	4.8	4.8		4.8	4.8		3.0	4.0		4.0	4.0	
All-Red Time (s)	1.4	1.4		1.4	1.4		0.0	2.2		2.2	2.2	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		5.2			5.2		2.0	5.2		5.2	5.2	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Min		Min	Min	
v/c Ratio		0.64			0.89		0.74	0.86		0.35	0.81	
Control Delay		24.8			45.7		25.0	32.6		34.2	42.8	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		24.8			45.7		25.0	32.6		34.2	42.8	
Queue Length 50th (ft)		181			249		108	357		21	211	
Queue Length 95th (ft)		288			#443		#204	#589		56	#328	
Internal Link Dist (ft)		1911			2215			965			558	
Turn Bay Length (ft)							175			90		
Base Capacity (vph)		750			597		451	972		164	606	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.57			0.78		0.71	0.74		0.28	0.66	

Intersection Summary

Area Type: Other

Cycle Length: 95.4

Actuated Cycle Length: 86.3

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Bull Road & Church Road



Bull Road Logistics  
8: Bull Road & Church Road

2024 No-Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	57	176	184	100	260	97	315	592	116	45	335	55
Future Volume (veh/h)	57	176	184	100	260	97	315	592	116	45	335	55
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2032	2114	2032	1764	1764	1750	1794	1766	1794	1744	1786	1674
Adj Flow Rate, veh/h	58	180	87	102	265	53	321	604	103	46	342	51
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	1	1	2	0	2	0	4	1	9
Cap, veh/h	122	346	151	154	328	61	534	803	137	255	556	83
Arrive On Green	0.31	0.32	0.32	0.31	0.32	0.32	0.15	0.55	0.53	0.37	0.37	0.35
Sat Flow, veh/h	211	1077	471	301	1021	191	1709	1470	251	691	1519	226
Grp Volume(v), veh/h	325	0	0	420	0	0	321	0	707	46	0	393
Grp Sat Flow(s),veh/h/ln	1758	0	0	1512	0	0	1709	0	1721	691	0	1745
Q Serve(g_s), s	0.0	0.0	0.0	9.4	0.0	0.0	8.1	0.0	24.9	4.3	0.0	14.5
Cycle Q Clear(g_c), s	11.4	0.0	0.0	20.7	0.0	0.0	8.1	0.0	24.9	14.5	0.0	14.5
Prop In Lane	0.18		0.27	0.24		0.13	1.00		0.15	1.00		0.13
Lane Grp Cap(c), veh/h	597	0	0	524	0	0	534	0	940	255	0	639
V/C Ratio(X)	0.54	0.00	0.00	0.80	0.00	0.00	0.60	0.00	0.75	0.18	0.00	0.61
Avail Cap(c_a), veh/h	884	0	0	762	0	0	619	0	1036	259	0	650
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.8	0.0	0.0	25.0	0.0	0.0	12.3	0.0	13.8	24.6	0.0	20.4
Incr Delay (d2), s/veh	0.8	0.0	0.0	4.0	0.0	0.0	1.2	0.0	5.5	1.6	0.0	4.4
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	8.4	0.0	0.0	11.9	0.0	0.0	5.0	0.0	14.7	1.4	0.0	10.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.5	0.0	0.0	28.9	0.0	0.0	13.5	0.0	19.3	26.1	0.0	24.8
LnGrp LOS	C	A	A	C	A	A	B	A	B	C	A	C
Approach Vol, veh/h		325			420			1028				439
Approach Delay, s/veh		22.5			28.9			17.5				24.9
Approach LOS		C			C			B				C
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		48.0		30.4	14.1	33.9		30.4				
Change Period (Y+Rc), s		* 6.2		* 6.2	3.0	* 6.2		* 6.2				
Max Green Setting (Gmax), s		* 46		* 37	15.0	* 28		* 37				
Max Q Clear Time (g_c+I1), s		26.9		13.4	10.6	16.5		22.7				
Green Ext Time (p_c), s		15.0		1.3	0.5	5.8		1.5				

Intersection Summary

HCM 6th Ctrl Delay	21.9
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2024 No-Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↑↑	↗	↘	↑↑	↗
Traffic Volume (vph)	225	1726	238	116	1835	586	306	382	122	383	218	228
Future Volume (vph)	225	1726	238	116	1835	586	306	382	122	383	218	228
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		-2%			-1%			-1%			1%	
Storage Length (ft)	270		370	410		410	530		150	400		320
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	80			75			50			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			25				35
Link Distance (ft)		1907			1983			668				1750
Travel Time (s)		32.5			33.8			18.2				34.1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	6%	3%	9%	5%	2%	1%	1%	3%	1%	1%	2%
Shared Lane Traffic (%)							27%			49%		
Lane Group Flow (vph)	232	1779	245	120	1892	604	230	479	126	201	419	235
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6	4	5	2		4	4		8	8	
Permitted Phases			6			2			4			8
Detector Phase	1	6	4	5	2	2	4	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	5.0	4.5	10.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	17.0	12.5	11.5	17.0	17.0	12.5	12.5	12.5	12.5	12.5	12.5
Total Split (s)	26.0	63.0	33.0	25.0	62.0	62.0	33.0	33.0	33.0	29.0	29.0	29.0
Total Split (%)	17.3%	42.0%	22.0%	16.7%	41.3%	41.3%	22.0%	22.0%	22.0%	19.3%	19.3%	19.3%
Yellow Time (s)	3.0	4.5	3.0	4.5	4.5	4.5	3.0	3.0	3.0	3.5	3.5	3.5
All-Red Time (s)	3.5	2.5	4.5	2.5	2.5	2.5	4.5	4.5	4.5	4.0	4.0	4.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.5	6.0	6.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Min	None	Min	C-Min	C-Min	None	None	None	None	None	None
v/c Ratio	0.96	0.94	0.24	0.69	1.08	0.73	0.86	0.86	0.34	0.89	0.90	0.57
Control Delay	110.7	54.7	2.6	84.8	90.2	17.9	88.9	76.0	9.3	98.6	85.1	13.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	110.7	54.7	2.6	84.8	90.2	17.9	88.9	76.0	9.3	98.6	85.1	13.6
Queue Length 50th (ft)	230	626	7	114	~753	165	242	252	0	214	224	8
Queue Length 95th (ft)	#412	#756	44	184	#847	329	#402	#339	50	#376	#322	93
Internal Link Dist (ft)		1827			1903			588			1670	
Turn Bay Length (ft)	270		370	410		410	530		150	400		320
Base Capacity (vph)	242	1883	1014	199	1755	822	273	570	374	229	472	415
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.94	0.24	0.60	1.08	0.73	0.84	0.84	0.34	0.88	0.89	0.57

Intersection Summary

Area Type: Other

Cycle Length: 150  
 Actuated Cycle Length: 150  
 Offset: 80 (53%), Referenced to phase 2:WBT and 6:EBT, Start of Green  
 Natural Cycle: 140  
 Control Type: Actuated-Coordinated  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Roosevelt Ave & Loucks Road



Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2024 No-Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↕	↗	↘	↕	↗
Traffic Volume (veh/h)	225	1726	238	116	1835	586	306	382	122	383	218	228
Future Volume (veh/h)	225	1726	238	116	1835	586	306	382	122	383	218	228
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1860	1789	1832	1709	1766	1809	1823	1823	1795	1780	1780	1766
Adj Flow Rate, veh/h	232	1779	186	120	1892	0	236	504	0	395	225	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	6	3	9	5	2	1	1	3	1	1	2
Cap, veh/h	242	2079	915	156	1873		285	598		501	263	
Arrive On Green	0.14	0.43	0.43	0.10	0.39	0.00	0.16	0.16	0.00	0.15	0.15	0.00
Sat Flow, veh/h	1772	4885	1552	1628	4822	1533	1736	3646	1521	3391	1780	1497
Grp Volume(v), veh/h	232	1779	186	120	1892	0	236	504	0	395	225	0
Grp Sat Flow(s),veh/h/ln	1772	1628	1552	1628	1607	1533	1736	1823	1521	1696	1780	1497
Q Serve(g_s), s	19.5	49.4	8.4	10.8	58.3	0.0	19.7	20.1	0.0	16.9	18.5	0.0
Cycle Q Clear(g_c), s	19.5	49.4	8.4	10.8	58.3	0.0	19.7	20.1	0.0	16.9	18.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	242	2079	915	156	1873		285	598		501	263	
V/C Ratio(X)	0.96	0.86	0.20	0.77	1.01		0.83	0.84		0.79	0.86	
Avail Cap(c_a), veh/h	242	2079	915	206	1873		307	644		509	267	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	64.3	38.9	14.4	66.2	45.9	0.0	60.7	60.8	0.0	61.7	62.4	0.0
Incr Delay (d2), s/veh	46.1	4.8	0.5	11.7	23.4	0.0	16.2	9.4	0.0	8.0	22.6	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	17.4	27.5	7.9	8.6	35.4	0.0	15.3	15.4	0.0	12.4	15.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	110.4	43.7	14.9	77.9	69.2	0.0	76.9	70.3	0.0	69.7	85.0	0.0
LnGrp LOS	F	D	B	E	F		E	E		E	F	
Approach Vol, veh/h		2197			2012			740			620	
Approach Delay, s/veh		48.3			69.8			72.4			75.2	
Approach LOS		D			E			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	26.0	64.3		31.1	20.4	69.8		28.7				
Change Period (Y+Rc), s	6.5	7.0		7.5	7.0	7.0		7.5				
Max Green Setting (Gmax), s	19.5	55.0		25.5	18.0	56.0		21.5				
Max Q Clear Time (g_c+I1), s	22.0	60.8		22.6	13.3	51.9		21.0				
Green Ext Time (p_c), s	0.0	0.0		1.0	0.1	4.0		0.2				

Intersection Summary

HCM 6th Ctrl Delay	62.3
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.  
Unsignalized Delay for [NBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

## **2024 BUILD CONDITIONS**



Bull Road Logistics  
1: Main St & Canal Rd

2024 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	105	240	56	36	215	53	67	309	30	73	272	91
Future Volume (vph)	105	240	56	36	215	53	67	309	30	73	272	91
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	15	12	10	12	12	10	12	12
Grade (%)		1%			-1%			6%			-1%	
Storage Length (ft)	0		0	0		0	70		0	60		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			70			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		25			25			25				25
Link Distance (ft)		933			1422			721				620
Travel Time (s)		25.4			38.8			19.7				16.9
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	4%	7%	13%	3%	8%	6%	12%	3%	3%	8%	3%	9%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	461	0	0	349	0	77	389	0	84	418	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		15.0	15.0	
Total Split (s)	44.0	44.0		44.0	44.0		36.0	36.0		36.0	36.0	
Total Split (%)	55.0%	55.0%		55.0%	55.0%		45.0%	45.0%		45.0%	45.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
v/c Ratio		0.75			0.45		0.39	0.62		0.36	0.66	
Control Delay		22.0			13.1		22.0	20.6		20.3	22.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		22.0			13.1		22.0	20.6		20.3	22.1	
Queue Length 50th (ft)		112			70		17	98		19	108	
Queue Length 95th (ft)		265			161		62	225		63	246	
Internal Link Dist (ft)		853			1342			641			540	
Turn Bay Length (ft)							70			60		
Base Capacity (vph)		1006			1266		329	1044		386	1038	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.46			0.28		0.23	0.37		0.22	0.40	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 56.6

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Main St & Canal Rd



Bull Road Logistics  
1: Main St & Canal Rd

2024 Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	105	240	56	36	215	53	67	309	30	73	272	91
Future Volume (veh/h)	105	240	56	36	215	53	67	309	30	73	272	91
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1696	1612	1795	1792	1752	1431	1557	1557	1724	1795	1709
Adj Flow Rate, veh/h	121	276	64	41	247	61	77	355	34	84	313	105
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	4	7	13	3	8	6	12	3	3	8	3	9
Cap, veh/h	230	393	82	141	513	118	347	572	55	378	526	176
Arrive On Green	0.37	0.39	0.37	0.37	0.39	0.37	0.41	0.41	0.38	0.41	0.41	0.38
Sat Flow, veh/h	300	996	209	107	1301	298	741	1399	134	917	1286	431
Grp Volume(v), veh/h	461	0	0	349	0	0	77	0	389	84	0	418
Grp Sat Flow(s),veh/h/ln	1505	0	0	1707	0	0	741	0	1533	917	0	1717
Q Serve(g_s), s	4.4	0.0	0.0	0.0	0.0	0.0	3.6	0.0	8.2	3.2	0.0	7.8
Cycle Q Clear(g_c), s	10.8	0.0	0.0	6.3	0.0	0.0	10.9	0.0	8.2	10.9	0.0	7.8
Prop In Lane	0.26		0.14	0.12		0.17	1.00		0.09	1.00		0.25
Lane Grp Cap(c), veh/h	669	0	0	730	0	0	347	0	627	378	0	702
V/C Ratio(X)	0.69	0.00	0.00	0.48	0.00	0.00	0.22	0.00	0.62	0.22	0.00	0.60
Avail Cap(c_a), veh/h	1485	0	0	1666	0	0	626	0	1204	724	0	1349
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.7	0.0	0.0	9.5	0.0	0.0	13.5	0.0	9.6	13.6	0.0	9.5
Incr Delay (d2), s/veh	1.3	0.0	0.0	0.5	0.0	0.0	0.3	0.0	1.0	0.3	0.0	0.8
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	5.7	0.0	0.0	3.7	0.0	0.0	1.0	0.0	4.1	1.1	0.0	4.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.0	0.0	0.0	10.0	0.0	0.0	13.8	0.0	10.6	13.9	0.0	10.3
LnGrp LOS	B	A	A	A	A	A	B	A	B	B	A	B
Approach Vol, veh/h		461			349			466				502
Approach Delay, s/veh		12.0			10.0			11.1				10.9
Approach LOS		B			A			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		20.7		20.1		20.7		20.1				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		31.0		39.0		31.0		39.0				
Max Q Clear Time (g_c+I1), s		13.4		12.8		13.4		8.3				
Green Ext Time (p_c), s		2.1		2.3		2.3		1.6				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				11.1								
HCM 6th LOS				B								



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	49	356	90	87	177	104	52	169	153	96	180	21
Future Volume (vph)	49	356	90	87	177	104	52	169	153	96	180	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	7%	13%	3%	13%	4%	9%	3%	14%	8%	10%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	527	0	0	392	0	0	398	0	0	315	0
Sign Control		Stop			Stop			Stop			Stop	

**Intersection Summary**

Area Type: Other  
Control Type: Unsignalized

Intersection	
Intersection Delay, s/veh	115.7
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	49	356	90	87	177	104	52	169	153	96	180	21
Future Vol, veh/h	49	356	90	87	177	104	52	169	153	96	180	21
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, %	0	3	7	13	3	13	4	9	3	14	8	10
Mvmt Flow	52	379	96	93	188	111	55	180	163	102	191	22
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	201.4	84.4	81.1	55.4
HCM LOS	F	F	F	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	10%	24%	32%
Vol Thru, %	45%	72%	48%	61%
Vol Right, %	41%	18%	28%	7%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	374	495	368	297
LT Vol	52	49	87	96
Through Vol	169	356	177	180
RT Vol	153	90	104	21
Lane Flow Rate	398	527	391	316
Geometry Grp	1	1	1	1
Degree of Util (X)	1.001	1.353	1.01	0.862
Departure Headway (Hd)	10.164	9.358	10.402	11.035
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	362	395	352	332
Service Time	8.164	7.358	8.402	9.035
HCM Lane V/C Ratio	1.099	1.334	1.111	0.952
HCM Control Delay	81.1	201.4	84.4	55.4
HCM Lane LOS	F	F	F	F
HCM 95th-tile Q	11.6	24.8	11.7	7.8



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Traffic Volume (vph)	529	66	16	319	57	26
Future Volume (vph)	529	66	16	319	57	26
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	12
Grade (%)	4%			0%	4%	
Link Speed (mph)	40			40	40	
Link Distance (ft)	1159			3081	2342	
Travel Time (s)	19.8			52.5	39.9	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	5%	2%	0%	10%	5%	8%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	692	0	0	390	96	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	2.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	529	66	16	319	57	26
Future Vol, veh/h	529	66	16	319	57	26
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	4	-	-	0	4	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	5	2	0	10	5	8
Mvmt Flow	615	77	19	371	66	30

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	692	0	1063
Stage 1	-	-	-	-	654
Stage 2	-	-	-	-	409
Critical Hdwy	-	-	4.3	-	7.3
Critical Hdwy Stg 1	-	-	-	-	6.25
Critical Hdwy Stg 2	-	-	-	-	6.25
Follow-up Hdwy	-	-	3	-	3.1
Pot Cap-1 Maneuver	-	-	691	-	205
Stage 1	-	-	-	-	488
Stage 2	-	-	-	-	677
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	691	-	198
Mov Cap-2 Maneuver	-	-	-	-	198
Stage 1	-	-	-	-	488
Stage 2	-	-	-	-	653

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	29.9
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	239	-	-	691	-
HCM Lane V/C Ratio	0.404	-	-	0.027	-
HCM Control Delay (s)	29.9	-	-	10.4	0
HCM Lane LOS	D	-	-	B	A
HCM 95th %tile Q(veh)	1.8	-	-	0.1	-

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (vph)	266	263	55	10	135	35	20	178	13	42	276	213
Future Volume (vph)	266	263	55	10	135	35	20	178	13	42	276	213
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	0		0	0		0	0		0	0		160
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	8%	4%	4%	10%	7%	46%	10%	14%	31%	60%	7%	15%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	595	0	0	184	0	0	215	0	0	325	217
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	16.3	16.3		16.3	16.3		9.6	9.6		9.6	9.6	9.6
Total Split (s)	48.9	48.9		48.9	48.9		29.0	29.0		29.0	29.0	29.0
Total Split (%)	62.8%	62.8%		62.8%	62.8%		37.2%	37.2%		37.2%	37.2%	37.2%
Yellow Time (s)	4.3	4.3		4.3	4.3		4.3	4.3		4.3	4.3	4.3
All-Red Time (s)	2.0	2.0		2.0	2.0		2.3	2.3		2.3	2.3	2.3
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)		5.3			5.3			5.6			5.6	5.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
v/c Ratio		0.90			0.24			0.53			0.75	0.39
Control Delay		33.2			9.6			27.0			35.6	5.7
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		33.2			9.6			27.0			35.6	5.7
Queue Length 50th (ft)		220			41			81			133	0
Queue Length 95th (ft)		#438			75			154			#264	47
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)												160
Base Capacity (vph)		873			1003			508			542	642
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		0.68			0.18			0.42			0.60	0.34

Intersection Summary

Area Type: Other



Cycle Length: 77.9

Actuated Cycle Length: 66.1

Natural Cycle: 70

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (veh/h)	266	263	55	10	135	35	20	178	13	42	276	213
Future Volume (veh/h)	266	263	55	10	135	35	20	178	13	42	276	213
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1761	1818	1818	1807	1850	1295	1609	1553	1315	1059	1812	1698
Adj Flow Rate, veh/h	271	268	56	10	138	36	20	182	13	43	282	134
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	8	4	4	10	7	46	10	14	31	60	7	15
Cap, veh/h	432	373	73	91	729	181	89	277	18	119	414	369
Arrive On Green	0.50	0.52	0.50	0.50	0.52	0.50	0.24	0.26	0.24	0.24	0.26	0.26
Sat Flow, veh/h	623	713	139	28	1392	345	37	1079	72	143	1617	1439
Grp Volume(v), veh/h	595	0	0	184	0	0	215	0	0	325	0	134
Grp Sat Flow(s),veh/h/ln	1475	0	0	1766	0	0	1188	0	0	1759	0	1439
Q Serve(g_s), s	13.4	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	3.8
Cycle Q Clear(g_c), s	16.1	0.0	0.0	2.7	0.0	0.0	8.9	0.0	0.0	8.4	0.0	3.8
Prop In Lane	0.46		0.09	0.05		0.20	0.09		0.06	0.13		1.00
Lane Grp Cap(c), veh/h	848	0	0	965	0	0	360	0	0	498	0	369
V/C Ratio(X)	0.70	0.00	0.00	0.19	0.00	0.00	0.60	0.00	0.00	0.65	0.00	0.36
Avail Cap(c_a), veh/h	1363	0	0	1580	0	0	667	0	0	863	0	681
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	1.00
Uniform Delay (d), s/veh	9.5	0.0	0.0	6.3	0.0	0.0	16.1	0.0	0.0	16.8	0.0	15.1
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	1.5	0.0	0.6
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	6.4	0.0	0.0	1.3	0.0	0.0	3.5	0.0	0.0	5.5	0.0	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.9	0.0	0.0	6.4	0.0	0.0	17.7	0.0	0.0	18.3	0.0	15.7
LnGrp LOS	A	A	A	A	A	A	B	A	A	B	A	B
Approach Vol, veh/h		595			184			215				459
Approach Delay, s/veh		9.9			6.4			17.7				17.5
Approach LOS		A			A			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		31.2		18.3		31.2		18.3				
Change Period (Y+Rc), s		6.3		* 6.6		6.3		* 6.6				
Max Green Setting (Gmax), s		42.6		* 22		42.6		* 22				
Max Q Clear Time (g_c+I1), s		18.1		10.9		4.7		10.4				
Green Ext Time (p_c), s		6.8		0.5		1.8		1.3				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				13.0								
HCM 6th LOS				B								
<b>Notes</b>												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Bull Road Logistics  
5: I-83 SB Ramps & Susquehanna Trail

2024 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗		↖	↖						↖	↖
Traffic Volume (vph)	0	548	164	110	271	0	0	0	0	40	2	354
Future Volume (vph)	0	548	164	110	271	0	0	0	0	40	2	354
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	11	12	12	12	12	12	12	15	12
Grade (%)		2%			0%			0%			1%	
Storage Length (ft)	0		0	50		0	0		0	0		275
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			35			25			25		
Satd. Flow (prot)	0	1482	0	1476	1500	0	0	0	0	0	1683	1218
Flt Permitted				0.168							0.954	
Satd. Flow (perm)	0	1482	0	261	1500	0	0	0	0	0	1683	1218
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24										402
Link Speed (mph)		40			40			30				30
Link Distance (ft)		3254			450			1020				690
Travel Time (s)		55.5			7.7			23.2				15.7
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	14%	25%	12%	20%	0%	0%	0%	0%	10%	50%	25%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	809	0	125	308	0	0	0	0	0	47	402
Turn Type		NA		pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	2 1						4	
Permitted Phases				2 1						4		4
Detector Phase		2		1	2 1					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		3.0						3.0	3.0	3.0
Minimum Split (s)		21.3		9.3						9.1	9.1	9.1
Total Split (s)		61.0		15.7						24.0	24.0	24.0
Total Split (%)		60.6%		15.6%						23.8%	23.8%	23.8%
Yellow Time (s)		4.0		4.0						3.2	3.2	3.2
All-Red Time (s)		2.3		2.3						2.9	2.9	2.9
Lost Time Adjust (s)		-1.0		-1.0							-1.0	0.0
Total Lost Time (s)		5.3		5.3							5.1	6.1
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		Min						None	None	None
Act Effct Green (s)		53.4		63.9	69.2						15.4	14.4
Actuated g/C Ratio		0.56		0.67	0.73						0.16	0.15
v/c Ratio		0.96		0.41	0.28						0.17	0.77
Control Delay		44.1		26.4	8.1						36.4	14.6
Queue Delay		2.9		0.0	0.0						0.0	0.0
Total Delay		47.0		26.4	8.1						36.4	14.6
LOS		D		C	A						D	B
Approach Delay		47.0			13.4						16.9	
Approach LOS		D			B						B	
Queue Length 50th (ft)		458		34	89						26	0
Queue Length 95th (ft)		#725		m71	125						56	88
Internal Link Dist (ft)		3174			370			940			610	

Lane Group	Ø5	Ø6	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	5	6	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	40.6	29.6	30.5
Total Split (%)	40%	29%	30%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	None	Min	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)				50								275
Base Capacity (vph)		884		309	1092						337	557
Starvation Cap Reductn		0		0	0						0	0
Spillback Cap Reductn		32		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.95		0.40	0.28						0.14	0.72

**Intersection Summary**

Area Type: Other  
 Cycle Length: 100.7  
 Actuated Cycle Length: 95.1  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.96  
 Intersection Signal Delay: 30.4 Intersection LOS: C  
 Intersection Capacity Utilization 68.9% ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: I-83 SB Ramps & Susquehanna Trail



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Lane Group	Ø5	Ø6	Ø8
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
6: I-83 NB Ramps & Susquehanna Trail

2024 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	461	135	0	0	218	43	165	1	66	0	0	0
Future Volume (vph)	461	135	0	0	218	43	165	1	66	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	11	12	12	12	12	12	12	16	12	12	12	12
Grade (%)		0%			2%			2%			0%	
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	35			25			25			25		
Satd. Flow (prot)	1425	1651	0	0	1579	0	0	1559	0	0	0	0
Flt Permitted	0.345							0.966				
Satd. Flow (perm)	518	1651	0	0	1579	0	0	1559	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					9			19				
Link Speed (mph)		40			40			30				30
Link Distance (ft)		450			839			925				282
Travel Time (s)		7.7			14.3			21.0				6.4
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	16%	9%	0%	0%	12%	2%	23%	0%	14%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	524	153	0	0	297	0	0	264	0	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA				
Protected Phases	5	6 5			6			8				
Permitted Phases	6 5						8					
Detector Phase	5	6 5			6		8	8				
Switch Phase												
Minimum Initial (s)	3.0				15.0		3.0	3.0				
Minimum Split (s)	9.3				21.3		9.1	9.1				
Total Split (s)	40.6				29.6		30.5	30.5				
Total Split (%)	40.3%				29.4%		30.3%	30.3%				
Yellow Time (s)	4.0				4.0		3.2	3.2				
All-Red Time (s)	2.3				2.3		2.9	2.9				
Lost Time Adjust (s)	-1.0				-1.0			-1.0				
Total Lost Time (s)	5.3				5.3			5.1				
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Recall Mode	None				Min		None	None				
Act Effct Green (s)	54.9	60.2			22.4			24.4				
Actuated g/C Ratio	0.58	0.63			0.24			0.26				
v/c Ratio	0.86	0.15			0.79			0.64				
Control Delay	16.8	1.5			49.7			38.3				
Queue Delay	0.0	0.0			0.0			0.0				
Total Delay	16.8	1.5			49.7			38.3				
LOS	B	A			D			D				
Approach Delay		13.3			49.7			38.3				
Approach LOS		B			D			D				
Queue Length 50th (ft)	111	8			171			141				
Queue Length 95th (ft)	m160	m9			#288			223				
Internal Link Dist (ft)		370			759			845			202	

Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	15.7	61.0	24.0
Total Split (%)	16%	61%	24%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	Min	None	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	50											
Base Capacity (vph)	655	1084			413			433				
Starvation Cap Reductn	0	0			0			0				
Spillback Cap Reductn	0	0			0			0				
Storage Cap Reductn	0	0			0			0				
Reduced v/c Ratio	0.80	0.14			0.72			0.61				

Intersection Summary

Area Type: Other  
 Cycle Length: 100.7  
 Actuated Cycle Length: 95.1  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.96  
 Intersection Signal Delay: 27.4      Intersection LOS: C  
 Intersection Capacity Utilization 68.9%      ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: I-83 NB Ramps & Susquehanna Trail



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Lane Group	Ø1	Ø2	Ø4
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	134	0	202	0	0	0	40	235	0	0	382	70
Future Volume (vph)	134	0	202	0	0	0	40	235	0	0	382	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			2%			-2%	
Link Speed (mph)		35			25			40			40	
Link Distance (ft)		1242			1074			3105			1664	
Travel Time (s)		24.2			29.3			52.9			28.4	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	0%	9%	0%	0%	8%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	378	0	0	0	0	0	309	0	0	508	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection												
Int Delay, s/veh	14.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	134	0	202	0	0	0	40	235	0	0	382	70
Future Vol, veh/h	134	0	202	0	0	0	40	235	0	0	382	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	2	-	-	-2	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	1	0	0	0	0	0	0	9	0	0	8	3
Mvmt Flow	151	0	227	0	0	0	45	264	0	0	429	79

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	823	823	469	936	862	264	508	0	0	264	0	0
Stage 1	469	469	-	354	354	-	-	-	-	-	-	-
Stage 2	354	354	-	582	508	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.11	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3	4	3.1	3	4	3.1	3	-	-	3	-	-
Pot Cap-1 Maneuver	327	311	629	273	295	824	802	-	-	975	-	-
Stage 1	654	564	-	761	634	-	-	-	-	-	-	-
Stage 2	760	634	-	565	542	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	311	290	629	166	276	824	802	-	-	975	-	-
Mov Cap-2 Maneuver	311	290	-	166	276	-	-	-	-	-	-	-
Stage 1	611	564	-	711	592	-	-	-	-	-	-	-
Stage 2	710	592	-	361	542	-	-	-	-	-	-	-

Approach	EB		WB			NB			SB		
HCM Control Delay, s	43.5		0			1.4			0		
HCM LOS	E		A								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	802	-	-	447	-	975	-
HCM Lane V/C Ratio	0.056	-	-	0.845	-	-	-
HCM Control Delay (s)	9.8	0	-	43.5	0	0	-
HCM Lane LOS	A	A	-	E	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	8.3	-	0	-

Bull Road Logistics  
8: Bull Road & Church Road

2024 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	37	208	342	73	116	24	130	231	66	58	570	32
Future Volume (vph)	37	208	342	73	116	24	130	231	66	58	570	32
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	14	10	12	12	12	11	12	12	12	12	12
Grade (%)		-7%			2%			1%			0%	
Storage Length (ft)	0		5	0		5	175		0	90		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			90			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			40			35			40	
Link Distance (ft)		1991			2295			1045			638	
Travel Time (s)		38.8			39.1			20.4			10.9	
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 (%)	3%	2%	3%	3%	2%	0%	8%	10%	8%	3%	6%	6%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	624	0	0	227	0	138	316	0	62	640	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		3.0	10.0		10.0	10.0	
Minimum Split (s)	9.2	9.2		9.2	9.2		6.0	16.6		16.6	16.6	
Total Split (s)	37.0	37.0		37.0	37.0		11.0	48.4		37.4	37.4	
Total Split (%)	43.3%	43.3%		43.3%	43.3%		12.9%	56.7%		43.8%	43.8%	
Yellow Time (s)	4.8	4.8		4.8	4.8		3.0	4.0		4.0	4.0	
All-Red Time (s)	1.4	1.4		1.4	1.4		0.0	2.2		2.2	2.2	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		5.2			5.2		2.0	5.2		5.2	5.2	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Min		Min	Min	
v/c Ratio		0.92			0.68		0.56	0.38		0.16	0.98	
Control Delay		42.8			33.5		20.9	13.3		19.2	58.6	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		42.8			33.5		20.9	13.3		19.2	58.6	
Queue Length 50th (ft)		269			95		35	91		22	~338	
Queue Length 95th (ft)		#479			#182		79	151		49	#569	
Internal Link Dist (ft)		1911			2215			965			558	
Turn Bay Length (ft)							175			90		
Base Capacity (vph)		716			356		248	831		384	653	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.87			0.64		0.56	0.38		0.16	0.98	

Intersection Summary

Area Type: Other

Cycle Length: 85.4

Actuated Cycle Length: 83.5

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Bull Road & Church Road



Bull Road Logistics  
8: Bull Road & Church Road

2024 Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Volume (veh/h)	37	208	342	73	116	24	130	231	66	58	570	32
Future Volume (veh/h)	37	208	342	73	116	24	130	231	66	58	570	32
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2018	2114	2018	1736	1750	1778	1682	1654	1682	1758	1716	1716
Adj Flow Rate, veh/h	39	221	258	78	123	16	138	246	65	62	606	29
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
Percent Heavy Veh, %	3	2	3	3	2	0	8	10	8	3	6	6
Cap, veh/h	81	279	305	159	226	25	304	683	181	528	695	33
Arrive On Green	0.30	0.32	0.32	0.30	0.32	0.32	0.09	0.54	0.53	0.43	0.43	0.41
Sat Flow, veh/h	90	882	964	291	715	80	1602	1261	333	1004	1624	78
Grp Volume(v), veh/h	518	0	0	217	0	0	138	0	311	62	0	635
Grp Sat Flow(s),veh/h/ln	1936	0	0	1086	0	0	1602	0	1594	1004	0	1702
Q Serve(g_s), s	6.5	0.0	0.0	0.0	0.0	0.0	3.1	0.0	8.2	2.8	0.0	25.0
Cycle Q Clear(g_c), s	18.5	0.0	0.0	12.0	0.0	0.0	3.1	0.0	8.2	2.8	0.0	25.0
Prop In Lane	0.08		0.50	0.36		0.07	1.00		0.21	1.00		0.05
Lane Grp Cap(c), veh/h	638	0	0	395	0	0	304	0	864	528	0	728
V/C Ratio(X)	0.81	0.00	0.00	0.55	0.00	0.00	0.45	0.00	0.36	0.12	0.00	0.87
Avail Cap(c_a), veh/h	859	0	0	544	0	0	362	0	939	539	0	748
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.4	0.0	0.0	20.6	0.0	0.0	14.3	0.0	9.6	12.8	0.0	19.2
Incr Delay (d2), s/veh	4.4	0.0	0.0	1.2	0.0	0.0	1.1	0.0	1.2	0.5	0.0	13.6
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	13.4	0.0	0.0	5.4	0.0	0.0	1.8	0.0	4.9	1.1	0.0	16.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.8	0.0	0.0	21.8	0.0	0.0	15.4	0.0	10.8	13.2	0.0	32.8
LnGrp LOS	C	A	A	C	A	A	B	A	B	B	A	C
Approach Vol, veh/h		518			217			449				697
Approach Delay, s/veh		27.8			21.8			12.2				31.1
Approach LOS		C			C			B				C
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		44.9		28.4	8.4	36.6		28.4				
Change Period (Y+Rc), s		* 6.2		* 6.2	3.0	* 6.2		* 6.2				
Max Green Setting (Gmax), s		* 42		* 31	8.0	* 31		* 31				
Max Q Clear Time (g_c+I1), s		10.2		20.5	5.6	27.0		14.0				
Green Ext Time (p_c), s		9.6		1.7	0.1	3.4		0.8				

Intersection Summary

HCM 6th Ctrl Delay	24.6
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2024 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	253	1407	162	174	1328	356	160	169	69	501	301	207
Future Volume (vph)	253	1407	162	174	1328	356	160	169	69	501	301	207
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Grade (%)		-2%			-1%			-1%			1%	
Storage Length (ft)	270		370	410		410	530		150	400		320
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	80			75			50			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			25				35
Link Distance (ft)		1907			1983			690				1750
Travel Time (s)		32.5			33.8			18.8				34.1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	7%	14%	8%	18%	14%	5%	8%	4%	28%	4%	5%	6%
Shared Lane Traffic (%)							33%			48%		
Lane Group Flow (vph)	266	1481	171	183	1398	375	113	233	73	274	570	218
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6	4	5	2		4	4		8	8	
Permitted Phases			6			2			4			8
Detector Phase	1	6	4	5	2	2	4	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	5.0	4.5	10.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	17.0	12.5	11.5	17.0	17.0	12.5	12.5	12.5	12.5	12.5	12.5
Total Split (s)	31.0	50.0	22.0	23.0	42.0	42.0	22.0	22.0	22.0	30.0	30.0	30.0
Total Split (%)	24.8%	40.0%	17.6%	18.4%	33.6%	33.6%	17.6%	17.6%	17.6%	24.0%	24.0%	24.0%
Yellow Time (s)	3.0	4.5	3.0	4.5	4.5	4.5	3.0	3.0	3.0	3.5	3.5	3.5
All-Red Time (s)	3.5	2.5	4.5	2.5	2.5	2.5	4.5	4.5	4.5	4.0	4.0	4.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.5	6.0	6.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Min	None	None	C-Min	C-Min	None	None	None	None	None	None
v/c Ratio	0.86	0.97	0.21	0.92	1.08	0.53	0.68	0.65	0.22	0.94	0.95	0.48
Control Delay	74.3	56.3	4.2	100.5	90.0	6.4	73.4	61.8	1.5	89.2	76.5	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	74.3	56.3	4.2	100.5	90.0	6.4	73.4	61.8	1.5	89.2	76.5	9.4
Queue Length 50th (ft)	207	428	9	148	~476	0	96	99	0	245	255	0
Queue Length 95th (ft)	#344	#537	45	#291	#573	77	#178	146	0	#439	#384	69
Internal Link Dist (ft)		1827			1903			610			1670	
Turn Bay Length (ft)	270		370	410		410	530		150	400		320
Base Capacity (vph)	329	1532	819	198	1299	701	179	384	339	292	599	457
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.97	0.21	0.92	1.08	0.53	0.63	0.61	0.22	0.94	0.95	0.48

Intersection Summary

Area Type: Other  
Cycle Length: 125



Actuated Cycle Length: 125

Offset: 76 (61%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 9: Roosevelt Ave & Loucks Road



Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2024 Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	253	1407	162	174	1328	356	160	169	69	501	301	207
Future Volume (veh/h)	253	1407	162	174	1328	356	160	169	69	501	301	207
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1775	1675	1761	1581	1638	1766	1724	1780	1439	1738	1724	1710
Adj Flow Rate, veh/h	266	1481	129	183	1398	0	115	252	0	527	317	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	7	14	8	18	14	5	8	4	28	4	5	6
Cap, veh/h	309	1718	710	205	1489		165	358		622	324	
Arrive On Green	0.18	0.38	0.38	0.14	0.33	0.00	0.10	0.10	0.00	0.19	0.19	0.00
Sat Flow, veh/h	1690	4574	1492	1506	4472	1497	1641	3561	1220	3311	1724	1449
Grp Volume(v), veh/h	266	1481	129	183	1398	0	115	252	0	527	317	0
Grp Sat Flow(s),veh/h/ln	1690	1525	1492	1506	1491	1497	1641	1780	1220	1655	1724	1449
Q Serve(g_s), s	19.1	37.4	6.2	14.9	37.9	0.0	8.5	8.6	0.0	19.2	22.9	0.0
Cycle Q Clear(g_c), s	19.1	37.4	6.2	14.9	37.9	0.0	8.5	8.6	0.0	19.2	22.9	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	309	1718	710	205	1489		165	358		622	324	
V/C Ratio(X)	0.86	0.86	0.18	0.89	0.94		0.70	0.70		0.85	0.98	
Avail Cap(c_a), veh/h	345	1718	710	205	1489		204	442		622	324	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	49.5	36.0	18.8	53.1	40.5	0.0	54.4	54.4	0.0	49.0	50.5	0.0
Incr Delay (d2), s/veh	18.0	6.0	0.6	35.3	12.7	0.0	7.6	3.8	0.0	10.5	43.9	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	14.5	20.5	4.9	12.1	21.6	0.0	7.0	7.3	0.0	13.6	19.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.6	42.0	19.3	88.5	53.2	0.0	62.0	58.2	0.0	59.5	94.4	0.0
LnGrp LOS	E	D	B	F	D		E	E		E	F	
Approach Vol, veh/h		1876			1581			367			844	
Approach Delay, s/veh		44.1			57.3			59.4			72.6	
Approach LOS		D			E			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	28.3	47.6		19.1	23.0	52.9		30.0				
Change Period (Y+Rc), s	6.5	7.0		7.5	7.0	7.0		7.5				
Max Green Setting (Gmax), s	24.5	35.0		14.5	16.0	43.0		22.5				
Max Q Clear Time (g_c+I1), s	21.6	40.4		11.1	17.4	39.9		25.4				
Green Ext Time (p_c), s	0.3	0.0		0.5	0.0	2.9		0.0				

Intersection Summary

HCM 6th Ctrl Delay	54.9
HCM 6th LOS	D

Notes

User approved volume balancing among the lanes for turning movement.  
Unsignalized Delay for [NBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	65	212	110	232	42
Future Volume (vph)	10	65	212	110	232	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	0%			2%	-2%	
Storage Length (ft)	0	0	250			0
Storage Lanes	1	0	1			0
Taper Length (ft)	25		25			
Link Speed (mph)	25			40	40	
Link Distance (ft)	166			2021	1106	
Travel Time (s)	4.5			34.4	18.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	28%	9%	8%	5%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	83	0	236	122	305	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	4.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	65	212	110	232	42
Future Vol, veh/h	10	65	212	110	232	42
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	-	250	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	2	-2	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	28	9	8	5	0
Mvmt Flow	11	72	236	122	258	47

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	876	282	305	0	0
Stage 1	282	-	-	-	-
Stage 2	594	-	-	-	-
Critical Hdwy	6.4	7.4	4.4	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3	3.3	3.1	-	-
Pot Cap-1 Maneuver	356	693	910	-	-
Stage 1	882	-	-	-	-
Stage 2	624	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	264	693	910	-	-
Mov Cap-2 Maneuver	264	-	-	-	-
Stage 1	654	-	-	-	-
Stage 2	624	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.4	6.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	910	-	570	-	-
HCM Lane V/C Ratio	0.259	-	0.146	-	-
HCM Control Delay (s)	10.3	-	12.4	-	-
HCM Lane LOS	B	-	B	-	-
HCM 95th %tile Q(veh)	1	-	0.5	-	-

Bull Road Logistics  
1: Main St & Canal Rd

2024 Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	133	196	83	53	249	61	72	392	65	78	401	136
Future Volume (vph)	133	196	83	53	249	61	72	392	65	78	401	136
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	15	12	10	12	12	10	12	12
Grade (%)		1%			-1%			6%			-1%	
Storage Length (ft)	0		0	0		0	70		0	60		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			70			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		933			1422			721			620	
Travel Time (s)		25.4			38.8			19.7			16.9	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	5%	2%	4%	0%	3%	3%	4%	1%	0%	3%	2%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	433	0	0	382	0	76	481	0	82	565	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		15.0	15.0	
Total Split (s)	35.0	35.0		35.0	35.0		35.0	35.0		35.0	35.0	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
v/c Ratio		0.81			0.51		0.47	0.67		0.36	0.78	
Control Delay		30.0			16.1		25.0	20.1		18.5	24.9	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		30.0			16.1		25.0	20.1		18.5	24.9	
Queue Length 50th (ft)		144			107		22	154		22	194	
Queue Length 95th (ft)		#309			187		63	252		57	#321	
Internal Link Dist (ft)		853			1342			641			540	
Turn Bay Length (ft)							70			60		
Base Capacity (vph)		672			932		209	923		290	927	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.64			0.41		0.36	0.52		0.28	0.61	
Intersection Summary												
Area Type:	Other											

Cycle Length: 70

Actuated Cycle Length: 60.1

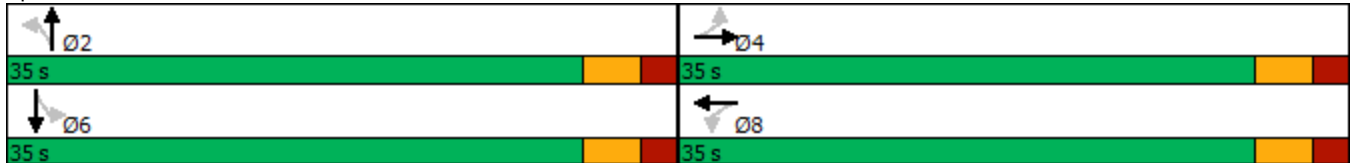
Natural Cycle: 55

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Main St & Canal Rd



Bull Road Logistics  
1: Main St & Canal Rd

2024 Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	133	196	83	53	249	61	72	392	65	78	401	136
Future Volume (veh/h)	133	196	83	53	249	61	72	392	65	78	401	136
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1724	1766	1738	1837	1866	1795	1543	1585	1599	1795	1809	1795
Adj Flow Rate, veh/h	140	206	87	56	262	64	76	413	68	82	422	143
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	5	2	4	0	3	3	4	1	0	3	2	3
Cap, veh/h	243	289	109	144	472	107	302	617	102	356	601	204
Arrive On Green	0.35	0.37	0.35	0.35	0.37	0.35	0.47	0.47	0.44	0.47	0.47	0.44
Sat Flow, veh/h	388	790	296	157	1290	291	698	1327	219	877	1292	438
Grp Volume(v), veh/h	433	0	0	382	0	0	76	0	481	82	0	565
Grp Sat Flow(s),veh/h/ln	1475	0	0	1738	0	0	698	0	1546	877	0	1730
Q Serve(g_s), s	4.1	0.0	0.0	0.0	0.0	0.0	4.6	0.0	11.5	3.8	0.0	12.4
Cycle Q Clear(g_c), s	12.5	0.0	0.0	8.4	0.0	0.0	16.4	0.0	11.5	14.8	0.0	12.4
Prop In Lane	0.32		0.20	0.15		0.17	1.00		0.14	1.00		0.25
Lane Grp Cap(c), veh/h	609	0	0	687	0	0	302	0	719	356	0	805
V/C Ratio(X)	0.71	0.00	0.00	0.56	0.00	0.00	0.25	0.00	0.67	0.23	0.00	0.70
Avail Cap(c_a), veh/h	1003	0	0	1158	0	0	433	0	1009	521	0	1129
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.5	0.0	0.0	12.3	0.0	0.0	16.4	0.0	9.9	15.4	0.0	10.2
Incr Delay (d2), s/veh	1.5	0.0	0.0	0.7	0.0	0.0	0.4	0.0	1.1	0.3	0.0	1.1
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	7.0	0.0	0.0	5.5	0.0	0.0	1.2	0.0	5.9	1.3	0.0	7.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.0	0.0	0.0	13.0	0.0	0.0	16.8	0.0	11.0	15.7	0.0	11.3
LnGrp LOS	B	A	A	B	A	A	B	A	B	B	A	B
Approach Vol, veh/h		433			382			557				647
Approach Delay, s/veh		15.0			13.0			11.8				11.9
Approach LOS		B			B			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		26.1		21.4		26.1		21.4				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		30.0		30.0		30.0		30.0				
Max Q Clear Time (g_c+I1), s		18.9		14.5		17.3		10.4				
Green Ext Time (p_c), s		2.2		1.9		2.7		1.6				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				12.7								
HCM 6th LOS				B								



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	28	316	63	94	309	63	163	225	85	131	221	68
Future Volume (vph)	28	316	63	94	309	63	163	225	85	131	221	68
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	5%	0%	2%	27%	1%	8%	2%	11%	8%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	433	0	0	496	0	0	502	0	0	446	0
Sign Control		Stop			Stop			Stop			Stop	

**Intersection Summary**

Area Type: Other  
Control Type: Unsignalized



Intersection	
Intersection Delay, s/veh	173.5
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	28	316	63	94	309	63	163	225	85	131	221	68
Future Vol, veh/h	28	316	63	94	309	63	163	225	85	131	221	68
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, %	0	3	5	0	2	27	1	8	2	11	8	1
Mvmt Flow	30	336	67	100	329	67	173	239	90	139	235	72
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	133.8	194.1	202.8	156
HCM LOS	F	F	F	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	34%	7%	20%	31%
Vol Thru, %	48%	78%	66%	53%
Vol Right, %	18%	15%	14%	16%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	473	407	466	420
LT Vol	163	28	94	131
Through Vol	225	316	309	221
RT Vol	85	63	63	68
Lane Flow Rate	503	433	496	447
Geometry Grp	1	1	1	1
Degree of Util (X)	1.335	1.145	1.313	1.207
Departure Headway (Hd)	11.691	12.258	11.714	12.302
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	317	299	312	299
Service Time	9.691	10.258	9.714	10.302
HCM Lane V/C Ratio	1.587	1.448	1.59	1.495
HCM Control Delay	202.8	133.8	194.1	156
HCM Lane LOS	F	F	F	F
HCM 95th-tile Q	20.4	14.2	19.7	15.9



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Traffic Volume (vph)	457	105	51	477	40	39
Future Volume (vph)	457	105	51	477	40	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	12
Grade (%)	4%			0%	4%	
Link Speed (mph)	40			40	40	
Link Distance (ft)	1159			3081	2342	
Travel Time (s)	19.8			52.5	39.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	6%	1%	0%	6%	0%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	573	0	0	539	81	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	457	105	51	477	40	39
Future Vol, veh/h	457	105	51	477	40	39
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	4	-	-	0	4	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	6	1	0	6	0	3
Mvmt Flow	466	107	52	487	41	40

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	573	0	1111 520
Stage 1	-	-	-	-	520 -
Stage 2	-	-	-	-	591 -
Critical Hdwy	-	-	4.3	-	7.3 6.7
Critical Hdwy Stg 1	-	-	-	-	6.2 -
Critical Hdwy Stg 2	-	-	-	-	6.2 -
Follow-up Hdwy	-	-	3	-	3.1 3.2
Pot Cap-1 Maneuver	-	-	761	-	190 534
Stage 1	-	-	-	-	588 -
Stage 2	-	-	-	-	535 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	761	-	172 534
Mov Cap-2 Maneuver	-	-	-	-	172 -
Stage 1	-	-	-	-	588 -
Stage 2	-	-	-	-	485 -

Approach	EB	WB	NB
HCM Control Delay, s	0	1	25.1
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	259	-	-	761	-
HCM Lane V/C Ratio	0.311	-	-	0.068	-
HCM Control Delay (s)	25.1	-	-	10.1	0
HCM Lane LOS	D	-	-	B	A
HCM 95th %tile Q(veh)	1.3	-	-	0.2	-

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (vph)	258	152	39	20	346	70	57	330	10	42	218	318
Future Volume (vph)	258	152	39	20	346	70	57	330	10	42	218	318
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	0		0	0		0	0		0	0		160
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	9%	3%	0%	10%	2%	24%	0%	5%	30%	29%	7%	6%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	522	0	0	506	0	0	462	0	0	302	370
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	16.3	16.3		16.3	16.3		9.6	9.6		9.6	9.6	9.6
Total Split (s)	45.7	45.7		45.7	45.7		32.2	32.2		32.2	32.2	32.2
Total Split (%)	58.7%	58.7%		58.7%	58.7%		41.3%	41.3%		41.3%	41.3%	41.3%
Yellow Time (s)	4.3	4.3		4.3	4.3		4.3	4.3		4.3	4.3	4.3
All-Red Time (s)	2.0	2.0		2.0	2.0		2.3	2.3		2.3	2.3	2.3
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)		5.3			5.3			5.6			5.6	5.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
v/c Ratio		1.18			0.62			1.02			0.66	0.50
Control Delay		122.8			17.3			75.3			30.2	4.9
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		122.8			17.3			75.3			30.2	4.9
Queue Length 50th (ft)		~308			163			~229			123	0
Queue Length 95th (ft)		#458			243			#387			197	46
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)												160
Base Capacity (vph)		444			822			454			456	743
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		1.18			0.62			1.02			0.66	0.50

Intersection Summary

Area Type: Other

Cycle Length: 77.9

Actuated Cycle Length: 77.9

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

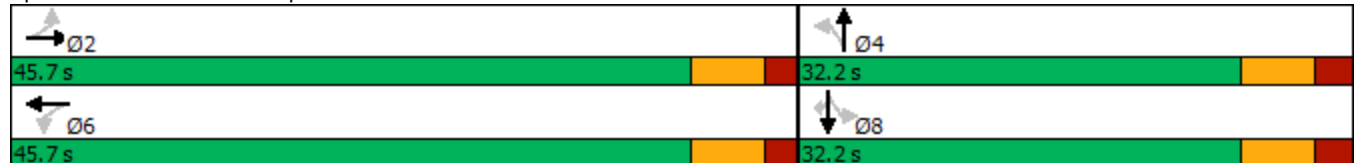
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (veh/h)	258	152	39	20	346	70	57	330	10	42	218	318
Future Volume (veh/h)	258	152	39	20	346	70	57	330	10	42	218	318
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1747	1832	1875	1807	1921	1608	1750	1680	1329	1499	1812	1826
Adj Flow Rate, veh/h	300	177	45	23	402	81	66	384	12	49	253	261
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	9	3	0	10	2	24	0	5	30	29	7	6
Cap, veh/h	366	182	45	69	791	155	91	370	11	101	444	529
Arrive On Green	0.51	0.52	0.51	0.51	0.52	0.51	0.33	0.34	0.33	0.33	0.34	0.34
Sat Flow, veh/h	565	351	86	40	1525	298	113	1084	32	139	1300	1548
Grp Volume(v), veh/h	522	0	0	506	0	0	462	0	0	302	0	261
Grp Sat Flow(s),veh/h/ln	1002	0	0	1863	0	0	1229	0	0	1439	0	1548
Q Serve(g_s), s	25.3	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	10.4
Cycle Q Clear(g_c), s	39.4	0.0	0.0	14.1	0.0	0.0	25.6	0.0	0.0	11.6	0.0	10.4
Prop In Lane	0.57		0.09	0.05		0.16	0.14		0.03	0.16		1.00
Lane Grp Cap(c), veh/h	580	0	0	991	0	0	457	0	0	527	0	529
V/C Ratio(X)	0.90	0.00	0.00	0.51	0.00	0.00	1.01	0.00	0.00	0.57	0.00	0.49
Avail Cap(c_a), veh/h	580	0	0	991	0	0	457	0	0	527	0	529
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	1.00
Uniform Delay (d), s/veh	20.9	0.0	0.0	12.5	0.0	0.0	27.2	0.0	0.0	20.5	0.0	20.3
Incr Delay (d2), s/veh	16.7	0.0	0.0	0.2	0.0	0.0	45.1	0.0	0.0	1.5	0.0	0.7
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	16.7	0.0	0.0	8.9	0.0	0.0	20.3	0.0	0.0	7.7	0.0	6.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	37.6	0.0	0.0	12.7	0.0	0.0	72.3	0.0	0.0	22.0	0.0	21.0
LnGrp LOS	D	A	A	B	A	A	F	A	A	C	A	C
Approach Vol, veh/h		522			506			462				563
Approach Delay, s/veh		37.6			12.7			72.3				21.5
Approach LOS		D			B			E				C
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		45.7		32.2		45.7		32.2				
Change Period (Y+Rc), s		6.3		* 6.6		6.3		* 6.6				
Max Green Setting (Gmax), s		39.4		* 26		39.4		* 26				
Max Q Clear Time (g_c+I1), s		41.4		27.6		16.1		13.6				
Green Ext Time (p_c), s		0.0		0.0		5.1		1.7				

Intersection Summary

HCM 6th Ctrl Delay	34.9
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
5: I-83 SB Ramps & Susquehanna Trail

2024 Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗		↖	↗						↖	↗
Traffic Volume (vph)	0	624	203	97	310	0	0	0	0	57	3	506
Future Volume (vph)	0	624	203	97	310	0	0	0	0	57	3	506
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	11	12	12	12	12	12	12	15	12
Grade (%)		2%			0%			0%			1%	
Storage Length (ft)	0		0	50		0	0		0	0		275
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			35			25			25		
Satd. Flow (prot)	0	1521	0	1559	1607	0	0	0	0	0	1785	1312
Flt Permitted				0.145							0.954	
Satd. Flow (perm)	0	1521	0	238	1607	0	0	0	0	0	1785	1312
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26										562
Link Speed (mph)		40			40			30				30
Link Distance (ft)		3254			450			1020				690
Travel Time (s)		55.5			7.7			23.2				15.7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	14%	11%	6%	12%	0%	0%	0%	0%	4%	33%	16%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	919	0	108	344	0	0	0	0	0	66	562
Turn Type		NA		pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	2 1							4
Permitted Phases				2 1						4		4
Detector Phase		2		1	2 1					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		3.0						3.0	3.0	3.0
Minimum Split (s)		21.3		9.3						9.1	9.1	9.1
Total Split (s)		73.0		22.0						17.7	17.7	17.7
Total Split (%)		64.8%		19.5%						15.7%	15.7%	15.7%
Yellow Time (s)		4.0		4.0						3.2	3.2	3.2
All-Red Time (s)		2.3		2.3						2.9	2.9	2.9
Lost Time Adjust (s)		-1.0		-1.0							-1.0	0.0
Total Lost Time (s)		5.3		5.3							5.1	6.1
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		Min						None	None	None
Act Effct Green (s)		67.4		80.0	85.3						12.6	11.6
Actuated g/C Ratio		0.62		0.74	0.79						0.12	0.11
v/c Ratio		0.96		0.33	0.27						0.32	0.88
Control Delay		41.4		20.5	5.4						49.3	20.1
Queue Delay		0.0		0.0	0.8						0.0	0.0
Total Delay		41.4		20.5	6.2						49.3	20.1
LOS		D		C	A						D	C
Approach Delay		41.4			9.6						23.2	
Approach LOS		D			A						C	
Queue Length 50th (ft)		535		18	64						43	0
Queue Length 95th (ft)		#918		m73	151						89	#187
Internal Link Dist (ft)		3174			370			940			610	

Lane Group	Ø5	Ø6	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	5	6	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	35.0	59.0	18.7
Total Split (%)	31%	52%	17%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	None	Min	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			



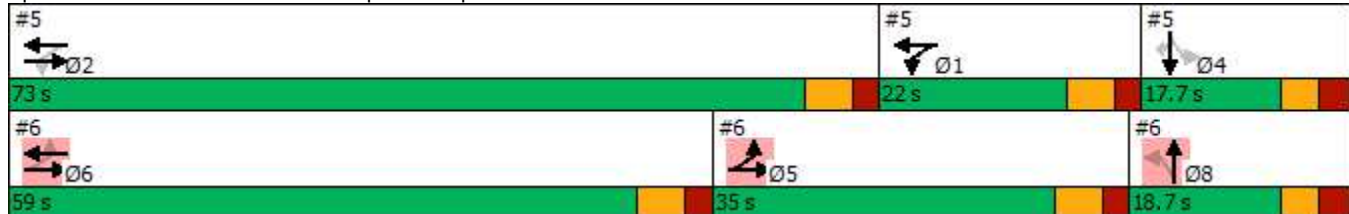


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)				50								275
Base Capacity (vph)		960		388	1315						207	642
Starvation Cap Reductn		0		0	665						0	0
Spillback Cap Reductn		0		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.96		0.28	0.53						0.32	0.88

**Intersection Summary**

Area Type: Other  
 Cycle Length: 112.7  
 Actuated Cycle Length: 108.3  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.96  
 Intersection Signal Delay: 28.5      Intersection LOS: C  
 Intersection Capacity Utilization 75.3%      ICU Level of Service D  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

**Splits and Phases: 5: I-83 SB Ramps & Susquehanna Trail**



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Lane Group	Ø5	Ø6	Ø8
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
6: I-83 NB Ramps & Susquehanna Trail

2024 Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	480	201	0	0	225	49	179	1	123	0	0	0
Future Volume (vph)	480	201	0	0	225	49	179	1	123	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	11	12	12	12	12	12	12	16	12	12	12	12
Grade (%)		0%			2%			2%			0%	
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	35			25			25			25		
Satd. Flow (prot)	1413	1748	0	0	1652	0	0	1663	0	0	0	0
Flt Permitted	0.389							0.971				
Satd. Flow (perm)	579	1748	0	0	1652	0	0	1663	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					13			25				
Link Speed (mph)		40			40			30				30
Link Distance (ft)		450			839			925				282
Travel Time (s)		7.7			14.3			21.0				6.4
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	17%	3%	0%	0%	6%	2%	18%	0%	2%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	505	212	0	0	289	0	0	318	0	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA				
Protected Phases	5	6 5			6			8				
Permitted Phases	6 5						8					
Detector Phase	5	6 5			6		8	8				
Switch Phase												
Minimum Initial (s)	3.0				15.0		3.0	3.0				
Minimum Split (s)	9.3				21.3		9.1	9.1				
Total Split (s)	35.0				59.0		18.7	18.7				
Total Split (%)	31.1%				52.4%		16.6%	16.6%				
Yellow Time (s)	4.0				4.0		3.2	3.2				
All-Red Time (s)	2.3				2.3		2.9	2.9				
Lost Time Adjust (s)	-1.0				-1.0			-1.0				
Total Lost Time (s)	5.3				5.3			5.1				
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Recall Mode	None				Min		None	None				
Act Effct Green (s)	58.3	63.6			29.4			34.3				
Actuated g/C Ratio	0.54	0.59			0.27			0.32				
v/c Ratio	0.95	0.21			0.63			0.59				
Control Delay	30.6	4.6			38.3			36.5				
Queue Delay	0.0	0.0			0.0			0.0				
Total Delay	30.6	4.6			38.3			36.5				
LOS	C	A			D			D				
Approach Delay		22.9			38.3			36.5				
Approach LOS		C			D			D				
Queue Length 50th (ft)	154	31			168			172				
Queue Length 95th (ft)	m135	m11			228			#354				
Internal Link Dist (ft)		370			759			845			202	

Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	22.0	73.0	17.7
Total Split (%)	20%	65%	16%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	Min	None	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			

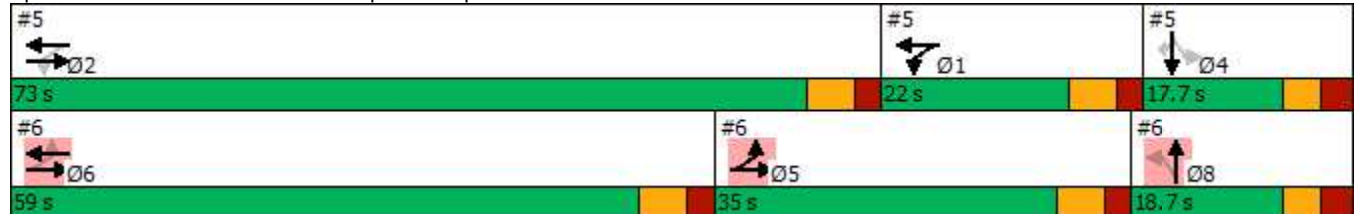


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	50											
Base Capacity (vph)	544	1040			825			543				
Starvation Cap Reductn	0	0			0			0				
Spillback Cap Reductn	0	0			0			0				
Storage Cap Reductn	0	0			0			0				
Reduced v/c Ratio	0.93	0.20			0.35			0.59				

Intersection Summary

Area Type: Other  
 Cycle Length: 112.7  
 Actuated Cycle Length: 108.3  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.96  
 Intersection Signal Delay: 29.6 Intersection LOS: C  
 Intersection Capacity Utilization 75.3% ICU Level of Service D  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: I-83 NB Ramps & Susquehanna Trail



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Lane Group	Ø1	Ø2	Ø4
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	85	0	111	0	0	0	278	416	2	0	305	173
Future Volume (vph)	85	0	111	0	0	0	278	416	2	0	305	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			2%			-2%	
Link Speed (mph)		35			25			40			40	
Link Distance (ft)		1242			1074			3105			1664	
Travel Time (s)		24.2			29.3			52.9			28.4	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%	1%	6%	0%	0%	6%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	202	0	0	0	0	0	718	0	0	492	0
Sign Control		Stop			Stop			Free			Free	

**Intersection Summary**

Area Type: Other  
 Control Type: Unsignalized

Intersection												
Int Delay, s/veh	33											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	85	0	111	0	0	0	278	416	2	0	305	173
Future Vol, veh/h	85	0	111	0	0	0	278	416	2	0	305	173
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	2	-	-	-2	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	4	0	0	0	0	0	1	6	0	0	6	1
Mvmt Flow	88	0	114	0	0	0	287	429	2	0	314	178

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1407	1408	403	1464	1496	430	492	0	0	431	0	0
Stage 1	403	403	-	1004	1004	-	-	-	-	-	-	-
Stage 2	1004	1005	-	460	492	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.5	6.2	7.1	6.5	6.2	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.14	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3	4	3.1	3	4	3.1	3	-	-	3	-	-
Pot Cap-1 Maneuver	125	140	687	116	124	663	813	-	-	854	-	-
Stage 1	710	603	-	323	322	-	-	-	-	-	-	-
Stage 2	320	322	-	663	551	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 80	75	687	61	66	663	813	-	-	854	-	-
Mov Cap-2 Maneuver	~ 80	75	-	61	66	-	-	-	-	-	-	-
Stage 1	381	603	-	173	173	-	-	-	-	-	-	-
Stage 2	172	173	-	553	551	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	214.3	0	4.7	0
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	813	-	-	160	-	854	-
HCM Lane V/C Ratio	0.353	-	-	1.263	-	-	-
HCM Control Delay (s)	11.8	0	-	214.3	0	0	-
HCM Lane LOS	B	A	-	F	A	A	-
HCM 95th %tile Q(veh)	1.6	-	-	11.7	-	0	-

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Bull Road Logistics  
8: Bull Road & Church Road

2024 Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	58	176	184	100	260	97	315	623	116	45	400	59
Future Volume (vph)	58	176	184	100	260	97	315	623	116	45	400	59
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	14	10	12	12	12	11	12	12	12	12	12
Grade (%)		-7%			2%			1%			0%	
Storage Length (ft)	0		5	0		5	175		0	90		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			90			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			40			35			40	
Link Distance (ft)		1991			2295			1045			638	
Travel Time (s)		38.8			39.1			20.4			10.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	1%	1%	2%	0%	4%	0%	4%	5%	8%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	427	0	0	466	0	321	754	0	46	468	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		3.0	10.0		10.0	10.0	
Minimum Split (s)	9.2	9.2		9.2	9.2		6.0	16.6		16.6	16.6	
Total Split (s)	43.0	43.0		43.0	43.0		18.0	52.4		34.4	34.4	
Total Split (%)	45.1%	45.1%		45.1%	45.1%		18.9%	54.9%		36.1%	36.1%	
Yellow Time (s)	4.8	4.8		4.8	4.8		3.0	4.0		4.0	4.0	
All-Red Time (s)	1.4	1.4		1.4	1.4		0.0	2.2		2.2	2.2	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		5.2			5.2		2.0	5.2		5.2	5.2	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Min		Min	Min	
v/c Ratio		0.66			0.92		0.82	0.89		0.37	0.91	
Control Delay		26.2			51.6		35.1	35.5		35.8	55.3	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		26.2			51.6		35.1	35.5		35.8	55.3	
Queue Length 50th (ft)		183			251		113	390		22	267	
Queue Length 95th (ft)		290			#448		#258	#640		58	#455	
Internal Link Dist (ft)		1911			2215			965			558	
Turn Bay Length (ft)							175			90		
Base Capacity (vph)		700			552		401	899		136	552	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.61			0.84		0.80	0.84		0.34	0.85	

Intersection Summary

Area Type: Other

Cycle Length: 95.4

Actuated Cycle Length: 90.6

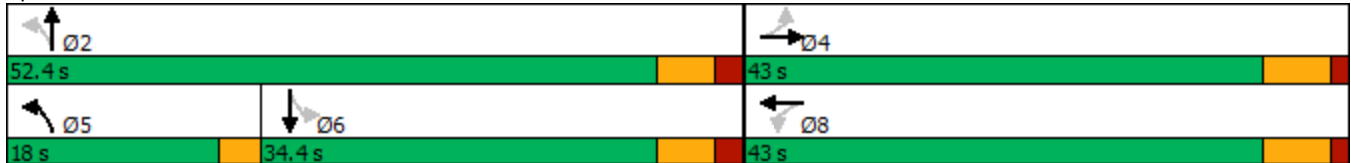
Natural Cycle: 75

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Bull Road & Church Road



Bull Road Logistics  
8: Bull Road & Church Road

2024 Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	58	176	184	100	260	97	315	623	116	45	400	59
Future Volume (veh/h)	58	176	184	100	260	97	315	623	116	45	400	59
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2032	2114	2032	1764	1764	1750	1794	1738	1794	1744	1730	1688
Adj Flow Rate, veh/h	59	180	87	102	265	53	321	636	103	46	408	55
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	1	1	2	0	4	0	4	5	8
Cap, veh/h	121	342	150	152	326	61	476	801	130	228	555	75
Arrive On Green	0.31	0.32	0.32	0.31	0.32	0.32	0.15	0.55	0.54	0.37	0.37	0.36
Sat Flow, veh/h	213	1063	465	300	1013	190	1709	1459	236	671	1492	201
Grp Volume(v), veh/h	326	0	0	420	0	0	321	0	739	46	0	463
Grp Sat Flow(s),veh/h/ln	1741	0	0	1503	0	0	1709	0	1696	671	0	1694
Q Serve(g_s), s	0.0	0.0	0.0	9.6	0.0	0.0	8.3	0.0	28.1	4.7	0.0	19.0
Cycle Q Clear(g_c), s	11.9	0.0	0.0	21.5	0.0	0.0	8.3	0.0	28.1	18.0	0.0	19.0
Prop In Lane	0.18		0.27	0.24		0.13	1.00		0.14	1.00		0.12
Lane Grp Cap(c), veh/h	591	0	0	521	0	0	476	0	931	228	0	630
V/C Ratio(X)	0.55	0.00	0.00	0.81	0.00	0.00	0.67	0.00	0.79	0.20	0.00	0.73
Avail Cap(c_a), veh/h	855	0	0	740	0	0	555	0	994	228	0	630
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.3	0.0	0.0	25.7	0.0	0.0	14.1	0.0	14.6	27.2	0.0	21.9
Incr Delay (d2), s/veh	0.8	0.0	0.0	4.4	0.0	0.0	2.6	0.0	6.9	2.0	0.0	7.5
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	8.7	0.0	0.0	12.3	0.0	0.0	5.5	0.0	16.4	1.5	0.0	12.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.1	0.0	0.0	30.1	0.0	0.0	16.7	0.0	21.5	29.2	0.0	29.4
LnGrp LOS	C	A	A	C	A	A	B	A	C	C	A	C
Approach Vol, veh/h		326			420			1060				509
Approach Delay, s/veh		23.1			30.1			20.0				29.4
Approach LOS		C			C			C				C
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		49.4		31.1	14.3	35.2		31.1				
Change Period (Y+Rc), s		* 6.2		* 6.2	3.0	* 6.2		* 6.2				
Max Green Setting (Gmax), s		* 46		* 37	15.0	* 28		* 37				
Max Q Clear Time (g_c+I1), s		30.1		13.9	10.8	21.0		23.5				
Green Ext Time (p_c), s		13.1		1.3	0.5	4.4		1.4				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				24.4								
HCM 6th LOS				C								
<b>Notes</b>												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2024 Build PM  
10/11/2023



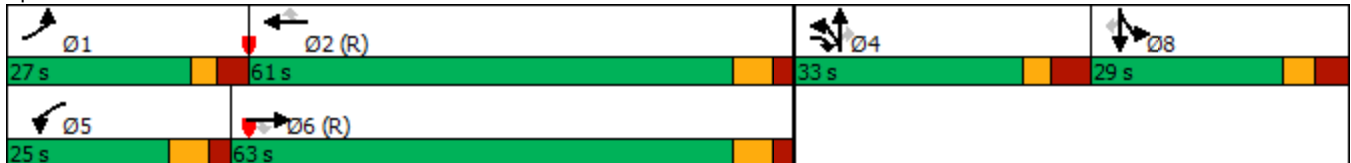
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	232	1726	238	116	1835	603	306	387	122	419	233	235
Future Volume (vph)	232	1726	238	116	1835	603	306	387	122	419	233	235
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		-2%			-1%			-1%				1%
Storage Length (ft)	270		370	410		410	530		150	400		320
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	80			75			50			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			25				35
Link Distance (ft)		1907			1983			668				1750
Travel Time (s)		32.5			33.8			18.2				34.1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	4%	6%	3%	9%	5%	3%	1%	1%	3%	3%	1%	5%
Shared Lane Traffic (%)							26%			49%		
Lane Group Flow (vph)	239	1779	245	120	1892	622	233	481	126	220	452	242
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6	4	5	2		4	4		8	8	
Permitted Phases			6			2			4			8
Detector Phase	1	6	4	5	2	2	4	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	5.0	4.5	10.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	17.0	12.5	11.5	17.0	17.0	12.5	12.5	12.5	12.5	12.5	12.5
Total Split (s)	27.0	63.0	33.0	25.0	61.0	61.0	33.0	33.0	33.0	29.0	29.0	29.0
Total Split (%)	18.0%	42.0%	22.0%	16.7%	40.7%	40.7%	22.0%	22.0%	22.0%	19.3%	19.3%	19.3%
Yellow Time (s)	3.0	4.5	3.0	4.5	4.5	4.5	3.0	3.0	3.0	3.5	3.5	3.5
All-Red Time (s)	3.5	2.5	4.5	2.5	2.5	2.5	4.5	4.5	4.5	4.0	4.0	4.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.5	6.0	6.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Min	None	Min	C-Min	C-Min	None	None	None	None	None	None
v/c Ratio	1.00	0.96	0.25	0.69	1.10	0.77	0.87	0.86	0.34	0.95	0.94	0.58
Control Delay	122.1	57.1	3.0	84.8	97.6	20.3	90.5	76.2	9.3	110.3	91.1	14.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	122.1	57.1	3.0	84.8	97.6	20.3	90.5	76.2	9.3	110.3	91.1	14.3
Queue Length 50th (ft)	~239	626	11	114	~765	190	246	253	0	239	245	11
Queue Length 95th (ft)	#424	#756	48	184	#859	366	#408	#341	50	#430	#364	98
Internal Link Dist (ft)		1827			1903			588				1670
Turn Bay Length (ft)	270		370	410		410	530		150	400		320
Base Capacity (vph)	238	1857	1004	199	1724	810	273	571	374	231	480	417
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.00	0.96	0.24	0.60	1.10	0.77	0.85	0.84	0.34	0.95	0.94	0.58

Intersection Summary

Area Type: Other

Cycle Length: 150  
 Actuated Cycle Length: 150  
 Offset: 80 (53%), Referenced to phase 2:WBT and 6:EBT, Start of Green  
 Natural Cycle: 130  
 Control Type: Actuated-Coordinated  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Roosevelt Ave & Loucks Road



Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2024 Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↕	↗	↘	↕	↗
Traffic Volume (veh/h)	232	1726	238	116	1835	603	306	387	122	419	233	235
Future Volume (veh/h)	232	1726	238	116	1835	603	306	387	122	419	233	235
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1818	1789	1832	1709	1766	1795	1823	1823	1795	1752	1780	1724
Adj Flow Rate, veh/h	239	1779	186	120	1892	0	238	507	0	432	240	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	4	6	3	9	5	3	1	1	3	3	1	5
Cap, veh/h	248	2065	912	156	1826		286	600		501	267	
Arrive On Green	0.14	0.42	0.42	0.10	0.38	0.00	0.16	0.16	0.00	0.15	0.15	0.00
Sat Flow, veh/h	1731	4885	1552	1628	4822	1521	1736	3646	1521	3338	1780	1461
Grp Volume(v), veh/h	239	1779	186	120	1892	0	238	507	0	432	240	0
Grp Sat Flow(s),veh/h/ln	1731	1628	1552	1628	1607	1521	1736	1823	1521	1669	1780	1461
Q Serve(g_s), s	20.6	49.6	8.4	10.8	56.8	0.0	19.9	20.2	0.0	19.0	19.9	0.0
Cycle Q Clear(g_c), s	20.6	49.6	8.4	10.8	56.8	0.0	19.9	20.2	0.0	19.0	19.9	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	248	2065	912	156	1826		286	600		501	267	
V/C Ratio(X)	0.96	0.86	0.20	0.77	1.04		0.83	0.85		0.86	0.90	
Avail Cap(c_a), veh/h	248	2065	912	206	1826		307	644		501	267	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	63.9	39.3	14.5	66.2	46.6	0.0	60.7	60.8	0.0	62.2	62.6	0.0
Incr Delay (d2), s/veh	46.8	5.0	0.5	11.7	31.0	0.0	16.7	9.6	0.0	14.4	30.2	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	17.9	27.6	8.0	8.6	36.8	0.0	15.4	15.5	0.0	13.9	16.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	110.6	44.3	15.0	77.9	77.6	0.0	77.4	70.4	0.0	76.6	92.9	0.0
LnGrp LOS	F	D	B	E	F		E	E		E	F	
Approach Vol, veh/h		2204			2012			745			672	
Approach Delay, s/veh		49.1			77.6			72.6			82.4	
Approach LOS		D			E			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	27.0	62.8		31.2	20.4	69.4		29.0				
Change Period (Y+Rc), s	6.5	7.0		7.5	7.0	7.0		7.5				
Max Green Setting (Gmax), s	20.5	54.0		25.5	18.0	56.0		21.5				
Max Q Clear Time (g_c+I1), s	23.1	59.3		22.7	13.3	52.1		22.4				
Green Ext Time (p_c), s	0.0	0.0		0.9	0.1	3.8		0.0				

Intersection Summary

HCM 6th Ctrl Delay	66.3
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.  
Unsignalized Delay for [NBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	39	209	85	231	211	12
Future Volume (vph)	39	209	85	231	211	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	0%			2%	-2%	
Storage Length (ft)	0	0	250			0
Storage Lanes	1	0	1			0
Taper Length (ft)	25		25			
Link Speed (mph)	25			40	40	
Link Distance (ft)	197			2128	915	
Travel Time (s)	5.4			36.3	15.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	14%	36%	3%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	275	0	94	257	247	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	5.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	39	209	85	231	211	12
Future Vol, veh/h	39	209	85	231	211	12
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	-	250	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	2	-2	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	14	36	3	2	0
Mvmt Flow	43	232	94	257	234	13

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	686	241	247	0	0
Stage 1	241	-	-	-	-
Stage 2	445	-	-	-	-
Critical Hdwy	6.4	7.2	4.6	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3	3.1	3.3	-	-
Pot Cap-1 Maneuver	465	794	889	-	-
Stage 1	923	-	-	-	-
Stage 2	737	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	416	794	889	-	-
Mov Cap-2 Maneuver	416	-	-	-	-
Stage 1	825	-	-	-	-
Stage 2	737	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.5	2.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	889	-	695	-	-
HCM Lane V/C Ratio	0.106	-	0.396	-	-
HCM Control Delay (s)	9.5	-	13.5	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.4	-	1.9	-	-



# **2024 BUILD WITH IMPROVEMENTS**

Bull Road Logistics  
2: Bull Rd & Canal Rd

2024 Build AM with Improvements

10/11/2023



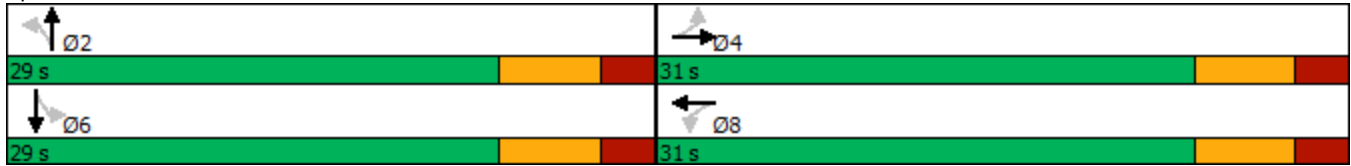
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	49	356	90	87	177	104	52	169	153	96	180	21
Future Volume (vph)	49	356	90	87	177	104	52	169	153	96	180	21
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	7%	13%	3%	13%	4%	9%	3%	14%	8%	10%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	527	0	0	392	0	0	398	0	0	315	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Total Split (s)	31.0	31.0		31.0	31.0		29.0	29.0		29.0	29.0	
Total Split (%)	51.7%	51.7%		51.7%	51.7%		48.3%	48.3%		48.3%	48.3%	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)		6.0			6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
v/c Ratio		0.85			0.87			0.74			0.69	
Control Delay		31.2			37.9			26.6			25.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		31.2			37.9			26.6			25.1	
Queue Length 50th (ft)		159			120			122			91	
Queue Length 95th (ft)		#317			#264			#256			#207	
Internal Link Dist (ft)		3155			1079			1098			965	
Turn Bay Length (ft)												
Base Capacity (vph)		688			502			538			458	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.77			0.78			0.74			0.69	
<b>Intersection Summary</b>												
Area Type:	Other											
Cycle Length:	60											
Actuated Cycle Length:	57.8											
Natural Cycle:	60											

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Bull Rd & Canal Rd



Bull Road Logistics  
2: Bull Rd & Canal Rd

2024 Build AM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	49	356	90	87	177	104	52	169	153	96	180	21
Future Volume (veh/h)	49	356	90	87	177	104	52	169	153	96	180	21
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1837	1795	1738	1595	1736	1595	1722	1651	1736	1675	1761	1732
Adj Flow Rate, veh/h	52	379	96	93	188	111	55	180	163	102	191	22
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
Percent Heavy Veh, %	0	3	7	13	3	13	4	9	3	14	8	10
Cap, veh/h	109	475	114	163	274	141	125	307	249	233	401	41
Arrive On Green	0.36	0.37	0.36	0.36	0.37	0.36	0.39	0.41	0.39	0.39	0.41	0.39
Sat Flow, veh/h	102	1273	306	224	734	378	125	745	604	358	972	100
Grp Volume(v), veh/h	527	0	0	392	0	0	398	0	0	315	0	0
Grp Sat Flow(s),veh/h/ln	1681	0	0	1335	0	0	1474	0	0	1430	0	0
Q Serve(g_s), s	1.5	0.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	16.2	0.0	0.0	14.7	0.0	0.0	12.0	0.0	0.0	8.7	0.0	0.0
Prop In Lane	0.10		0.18	0.24		0.28	0.14		0.41	0.32		0.07
Lane Grp Cap(c), veh/h	668	0	0	554	0	0	654	0	0	649	0	0
V/C Ratio(X)	0.79	0.00	0.00	0.71	0.00	0.00	0.61	0.00	0.00	0.49	0.00	0.00
Avail Cap(c_a), veh/h	789	0	0	654	0	0	654	0	0	649	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	16.1	0.0	0.0	15.3	0.0	0.0	13.3	0.0	0.0	12.1	0.0	0.0
Incr Delay (d2), s/veh	4.6	0.0	0.0	2.9	0.0	0.0	4.2	0.0	0.0	2.6	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	10.0	0.0	0.0	7.4	0.0	0.0	7.4	0.0	0.0	5.2	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.7	0.0	0.0	18.2	0.0	0.0	17.5	0.0	0.0	14.7	0.0	0.0
LnGrp LOS	C	A	A	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h		527			392			398				315
Approach Delay, s/veh		20.7			18.2			17.5				14.7
Approach LOS		C			B			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		29.0		26.8		29.0		26.8				
Change Period (Y+Rc), s		7.0		7.0		7.0		7.0				
Max Green Setting (Gmax), s		22.0		24.0		22.0		24.0				
Max Q Clear Time (g_c+I1), s		14.0		18.2		10.7		16.7				
Green Ext Time (p_c), s		1.5		1.6		1.4		1.5				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				18.2								
HCM 6th LOS				B								

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 Build AM with Improvements

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	266	263	55	10	135	35	20	178	13	42	276	213
Future Volume (vph)	266	263	55	10	135	35	20	178	13	42	276	213
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	350		0	0		0	0		0	0		160
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	8%	4%	4%	10%	7%	46%	10%	14%	31%	60%	7%	15%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	271	324	0	0	184	0	0	215	0	0	325	217
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Perm	NA	pm+ov
Protected Phases	5	2			6			4			8	5
Permitted Phases	6			6			4			8		8
Detector Phase	5	2		6	6		4	4		8	8	5
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	5.0
Minimum Split (s)	13.0	17.0		17.0	17.0		10.0	10.0		10.0	10.0	13.0
Total Split (s)	20.0	50.0		30.0	30.0		40.0	40.0		40.0	40.0	20.0
Total Split (%)	22.2%	55.6%		33.3%	33.3%		44.4%	44.4%		44.4%	44.4%	22.2%
Yellow Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	4.5
All-Red Time (s)	2.5	2.5		2.5	2.5		3.5	3.5		3.5	3.5	2.5
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	6.0	6.0			6.0			6.0			6.0	6.0
Lead/Lag	Lead			Lag	Lag							Lead
Lead-Lag Optimize?	Yes			Yes	Yes							Yes
Recall Mode	None	Min		Min	Min		None	None		None	None	None
v/c Ratio	0.52	0.40			0.60			0.50			0.70	0.24
Control Delay	16.2	13.8			35.1			23.0			29.4	1.7
Queue Delay	0.0	0.0			0.0			0.0			0.0	0.0
Total Delay	16.2	13.8			35.1			23.0			29.4	1.7
Queue Length 50th (ft)	61	75			68			68			111	0
Queue Length 95th (ft)	149	179			154			145			224	25
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)	350											160
Base Capacity (vph)	567	1125			541			715			759	932
Starvation Cap Reductn	0	0			0			0			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.48	0.29			0.34			0.30			0.43	0.23

Intersection Summary

Area Type: Other

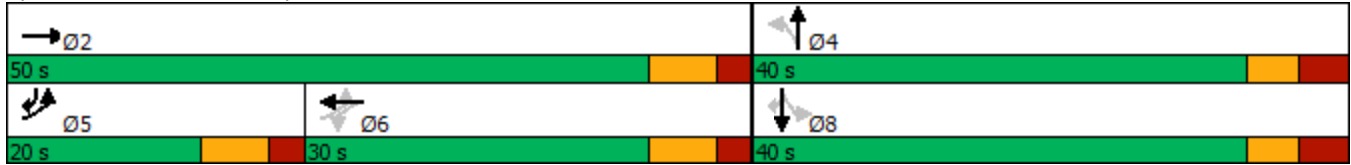
Cycle Length: 90

Actuated Cycle Length: 66.6

Natural Cycle: 60

Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 Build AM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	266	263	55	10	135	35	20	178	13	42	276	213
Future Volume (veh/h)	266	263	55	10	135	35	20	178	13	42	276	213
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1761	1818	1818	1807	1850	1295	1609	1553	1315	1059	1812	1698
Adj Flow Rate, veh/h	271	268	56	10	138	36	20	182	13	43	282	134
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	8	4	4	10	7	46	10	14	31	60	7	15
Cap, veh/h	703	742	155	82	294	73	86	281	19	116	416	628
Arrive On Green	0.18	0.51	0.49	0.19	0.21	0.19	0.24	0.26	0.24	0.24	0.26	0.26
Sat Flow, veh/h	1677	1458	305	40	1374	344	38	1091	73	143	1615	1439
Grp Volume(v), veh/h	271	0	324	184	0	0	215	0	0	325	0	134
Grp Sat Flow(s),veh/h/ln	1677	0	1763	1757	0	0	1202	0	0	1758	0	1439
Q Serve(g_s), s	6.0	0.0	5.7	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	3.0
Cycle Q Clear(g_c), s	6.0	0.0	5.7	4.7	0.0	0.0	9.2	0.0	0.0	8.7	0.0	3.0
Prop In Lane	1.00		0.17	0.05		0.20	0.09		0.06	0.13		1.00
Lane Grp Cap(c), veh/h	703	0	898	415	0	0	363	0	0	498	0	628
V/C Ratio(X)	0.39	0.00	0.36	0.44	0.00	0.00	0.59	0.00	0.00	0.65	0.00	0.21
Avail Cap(c_a), veh/h	860	0	1507	849	0	0	933	0	0	1177	0	1208
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	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.3	0.0	7.7	17.9	0.0	0.0	16.7	0.0	0.0	17.4	0.0	9.0
Incr Delay (d2), s/veh	0.3	0.0	0.1	0.3	0.0	0.0	1.5	0.0	0.0	1.5	0.0	0.2
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	3.2	0.0	2.7	3.1	0.0	0.0	3.7	0.0	0.0	5.8	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.7	0.0	7.7	18.1	0.0	0.0	18.2	0.0	0.0	18.9	0.0	9.2
LnGrp LOS	B	A	A	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h		595			184			215			459	
Approach Delay, s/veh		9.5			18.1			18.2			16.0	
Approach LOS		A			B			B			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		32.2		19.3	15.2	17.0		19.3				
Change Period (Y+Rc), s		7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s		43.0		33.0	13.0	23.0		33.0				
Max Q Clear Time (g_c+I1), s		7.7		11.2	8.0	6.7		10.7				
Green Ext Time (p_c), s		3.3		0.7	0.4	1.3		1.6				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				14.0								
HCM 6th LOS				B								

Bull Road Logistics  
7: Bull Road & Hilton Ave

2024 Build AM with Improvements

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘			↕	
Traffic Volume (vph)	134	0	202	0	0	0	40	235	0	0	382	70
Future Volume (vph)	134	0	202	0	0	0	40	235	0	0	382	70
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Grade (%)		0%			0%			2%			-2%	
Storage Length (ft)	0		0	0		0	275		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			Yes			No
Link Speed (mph)		35			25			40				40
Link Distance (ft)		1242			1074			3105				1664
Travel Time (s)		24.2			29.3			52.9				28.4
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	0%	9%	0%	0%	8%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	378	0	0	0	0	45	264	0	0	508	0
Turn Type	Perm	NA					D.P+P	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			6			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	10.0		10.0	10.0	
Minimum Split (s)	15.0	15.0		15.0	15.0		15.0	23.5		17.0	17.0	
Total Split (s)	23.0	23.0		23.0	23.0		15.0	37.0		22.0	22.0	
Total Split (%)	38.3%	38.3%		38.3%	38.3%		25.0%	61.7%		36.7%	36.7%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0			-1.0	
Total Lost Time (s)		6.0			6.0		6.0	6.0			6.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Max		Max	Max	
v/c Ratio		0.93					0.11	0.31			0.72	
Control Delay		55.8					8.2	9.6			28.2	
Queue Delay		0.0					0.0	0.0			0.0	
Total Delay		55.8					8.2	9.6			28.2	
Queue Length 50th (ft)		132					7	50			117	
Queue Length 95th (ft)		#276					20	90			#373	
Internal Link Dist (ft)		1162			994			3025			1584	
Turn Bay Length (ft)							275					
Base Capacity (vph)		405					433	844			701	
Starvation Cap Reductn		0					0	0			0	
Spillback Cap Reductn		0					0	0			0	
Storage Cap Reductn		0					0	0			0	
Reduced v/c Ratio		0.93					0.10	0.31			0.72	

Intersection Summary

Area Type: Other

Cycle Length: 60



Actuated Cycle Length: 60

Natural Cycle: 80

Control Type: Semi Act-Uncoord

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: Bull Road & Hilton Ave



Bull Road Logistics  
7: Bull Road & Hilton Ave

2024 Build AM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘			↕	
Traffic Volume (veh/h)	134	0	202	0	0	0	40	235	0	0	382	70
Future Volume (veh/h)	134	0	202	0	0	0	40	235	0	0	382	70
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1786	1800	1800	1800	1800	1800	1778	1651	1778	1875	1761	1832
Adj Flow Rate, veh/h	151	0	227	0	0	0	45	264	0	0	429	79
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	1	0	0	0	0	0	0	9	0	0	8	3
Cap, veh/h	234	17	250	0	510	0	294	853	0	0	515	95
Arrive On Green	0.27	0.00	0.27	0.00	0.00	0.00	0.06	0.52	0.00	0.00	0.36	0.34
Sat Flow, veh/h	529	58	884	0	1800	0	1693	1651	0	0	1446	266
Grp Volume(v), veh/h	378	0	0	0	0	0	45	264	0	0	0	508
Grp Sat Flow(s),veh/h/ln	1472	0	0	0	1800	0	1693	1651	0	0	0	1713
Q Serve(g_s), s	13.8	0.0	0.0	0.0	0.0	0.0	1.0	5.5	0.0	0.0	0.0	16.3
Cycle Q Clear(g_c), s	15.2	0.0	0.0	0.0	0.0	0.0	1.0	5.5	0.0	0.0	0.0	16.3
Prop In Lane	0.40		0.60	0.00		0.00	1.00		0.00	0.00		0.16
Lane Grp Cap(c), veh/h	476	0	0	0	510	0	294	853	0	0	0	610
V/C Ratio(X)	0.79	0.00	0.00	0.00	0.00	0.00	0.15	0.31	0.00	0.00	0.00	0.83
Avail Cap(c_a), veh/h	476	0	0	0	510	0	445	853	0	0	0	610
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	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	21.3	0.0	0.0	0.0	0.0	0.0	12.8	8.3	0.0	0.0	0.0	17.8
Incr Delay (d2), s/veh	8.9	0.0	0.0	0.0	0.0	0.0	0.2	0.9	0.0	0.0	0.0	12.6
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	10.0	0.0	0.0	0.0	0.0	0.0	0.6	3.1	0.0	0.0	0.0	12.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.2	0.0	0.0	0.0	0.0	0.0	13.1	9.3	0.0	0.0	0.0	30.4
LnGrp LOS	C	A	A	A	A	A	B	A	A	A	A	C
Approach Vol, veh/h		378			0			309				508
Approach Delay, s/veh		30.2			0.0			9.8				30.4
Approach LOS		C						A				C
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		37.0		23.0	9.6	27.4		23.0				
Change Period (Y+Rc), s		7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s		30.0		16.0	8.0	15.0		16.0				
Max Q Clear Time (g_c+I1), s		7.5		17.2	3.0	18.3		0.0				
Green Ext Time (p_c), s		1.4		0.0	0.0	0.0		0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				25.0								
HCM 6th LOS				C								

Bull Road Logistics  
2: Bull Rd & Canal Rd

2024 Build PM with Improvements

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	28	316	63	94	309	63	163	225	85	131	221	68
Future Volume (vph)	28	316	63	94	309	63	163	225	85	131	221	68
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	5%	0%	2%	27%	1%	8%	2%	11%	8%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	433	0	0	496	0	0	502	0	0	446	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Total Split (s)	27.0	27.0		27.0	27.0		33.0	33.0		33.0	33.0	
Total Split (%)	45.0%	45.0%		45.0%	45.0%		55.0%	55.0%		55.0%	55.0%	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)		6.0			6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
v/c Ratio		0.76			1.13			1.01			0.88	
Control Delay		28.6			107.2			64.6			37.5	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		28.6			107.2			64.6			37.5	
Queue Length 50th (ft)		136			~215			~176			133	
Queue Length 95th (ft)		#268			#376			#358			#304	
Internal Link Dist (ft)		3155			1079			1098			965	
Turn Bay Length (ft)												
Base Capacity (vph)		567			439			496			505	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.76			1.13			1.01			0.88	
<b>Intersection Summary</b>												
Area Type:	Other											
Cycle Length: 60												
Actuated Cycle Length: 60												
Natural Cycle: 90												

Control Type: Actuated-Uncoordinated

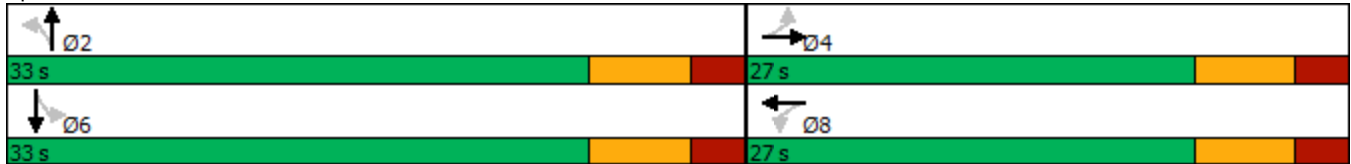
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Bull Rd & Canal Rd



Bull Road Logistics  
2: Bull Rd & Canal Rd

2024 Build PM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	28	316	63	94	309	63	163	225	85	131	221	68
Future Volume (veh/h)	28	316	63	94	309	63	163	225	85	131	221	68
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1837	1795	1766	1778	1750	1399	1764	1665	1750	1718	1761	1860
Adj Flow Rate, veh/h	30	336	67	100	329	67	173	239	90	139	235	72
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
Percent Heavy Veh, %	0	3	5	0	2	27	1	8	2	11	8	1
Cap, veh/h	85	479	91	150	363	69	241	287	98	219	338	92
Arrive On Green	0.33	0.35	0.33	0.33	0.35	0.33	0.43	0.45	0.43	0.43	0.45	0.43
Sat Flow, veh/h	60	1367	261	223	1038	197	356	638	217	312	750	204
Grp Volume(v), veh/h	433	0	0	496	0	0	502	0	0	446	0	0
Grp Sat Flow(s),veh/h/ln	1688	0	0	1458	0	0	1211	0	0	1267	0	0
Q Serve(g_s), s	0.0	0.0	0.0	6.6	0.0	0.0	6.4	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	13.4	0.0	0.0	20.0	0.0	0.0	24.2	0.0	0.0	17.9	0.0	0.0
Prop In Lane	0.07		0.15	0.20		0.14	0.34		0.18	0.31		0.16
Lane Grp Cap(c), veh/h	627	0	0	558	0	0	606	0	0	628	0	0
V/C Ratio(X)	0.69	0.00	0.00	0.89	0.00	0.00	0.83	0.00	0.00	0.71	0.00	0.00
Avail Cap(c_a), veh/h	627	0	0	558	0	0	606	0	0	628	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	17.1	0.0	0.0	19.3	0.0	0.0	15.8	0.0	0.0	13.6	0.0	0.0
Incr Delay (d2), s/veh	3.2	0.0	0.0	16.1	0.0	0.0	12.4	0.0	0.0	6.7	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	8.8	0.0	0.0	13.2	0.0	0.0	12.1	0.0	0.0	9.0	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.3	0.0	0.0	35.4	0.0	0.0	28.3	0.0	0.0	20.3	0.0	0.0
LnGrp LOS	C	A	A	D	A	A	C	A	A	C	A	A
Approach Vol, veh/h		433			496			502				446
Approach Delay, s/veh		20.3			35.4			28.3				20.3
Approach LOS		C			D			C				C
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		33.0		27.0		33.0		27.0				
Change Period (Y+Rc), s		7.0		7.0		7.0		7.0				
Max Green Setting (Gmax), s		26.0		20.0		26.0		20.0				
Max Q Clear Time (g_c+I1), s		26.2		15.4		19.9		22.0				
Green Ext Time (p_c), s		0.0		1.1		1.5		0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				26.4								
HCM 6th LOS				C								

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 Build PM with Improvements

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	258	152	39	20	346	70	57	330	10	42	218	318
Future Volume (vph)	258	152	39	20	346	70	57	330	10	42	218	318
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	350		0	0		0	0		0	0		160
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	9%	3%	0%	10%	2%	24%	0%	5%	30%	29%	7%	6%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	300	222	0	0	506	0	0	462	0	0	302	370
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Perm	NA	pm+ov
Protected Phases	5	2			6			4			8	5
Permitted Phases	6			6			4			8		8
Detector Phase	5	2		6	6		4	4		8	8	5
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	5.0
Minimum Split (s)	12.0	17.0		17.0	17.0		10.0	10.0		10.0	10.0	12.0
Total Split (s)	15.0	51.7		36.7	36.7		38.3	38.3		38.3	38.3	15.0
Total Split (%)	16.7%	57.4%		40.8%	40.8%		42.6%	42.6%		42.6%	42.6%	16.7%
Yellow Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	4.5
All-Red Time (s)	2.5	2.5		2.5	2.5		3.5	3.5		3.5	3.5	2.5
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	6.0	6.0			6.0			6.0			6.0	6.0
Lead/Lag	Lead			Lag	Lag							Lead
Lead-Lag Optimize?	Yes			Yes	Yes							Yes
Recall Mode	None	Min		Min	Min		None	None		None	None	None
v/c Ratio	0.93	0.27			0.95			0.94			0.62	0.42
Control Delay	54.2	13.7			59.8			59.1			30.2	6.1
Queue Delay	0.0	0.0			0.0			0.0			0.0	0.0
Total Delay	54.2	13.7			59.8			59.1			30.2	6.1
Queue Length 50th (ft)	99	68			274			253			140	38
Queue Length 95th (ft)	#212	107			#433			#417			215	84
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)	350											160
Base Capacity (vph)	324	858			555			490			491	889
Starvation Cap Reductn	0	0			0			0			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.93	0.26			0.91			0.94			0.62	0.42

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 88.7

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2024 Build PM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	258	152	39	20	346	70	57	330	10	42	218	318
Future Volume (veh/h)	258	152	39	20	346	70	57	330	10	42	218	318
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1747	1832	1875	1807	1921	1608	1750	1680	1329	1499	1812	1826
Adj Flow Rate, veh/h	300	177	45	23	402	81	66	384	12	49	253	261
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	9	3	0	10	2	24	0	5	30	29	7	6
Cap, veh/h	385	691	176	57	478	94	95	427	13	99	469	735
Arrive On Green	0.10	0.49	0.48	0.31	0.32	0.31	0.36	0.37	0.36	0.36	0.37	0.37
Sat Flow, veh/h	1663	1409	358	43	1503	295	127	1150	34	137	1262	1548
Grp Volume(v), veh/h	300	0	222	506	0	0	462	0	0	302	0	261
Grp Sat Flow(s),veh/h/ln	1663	0	1767	1841	0	0	1311	0	0	1399	0	1548
Q Serve(g_s), s	9.0	0.0	6.4	10.0	0.0	0.0	18.4	0.0	0.0	0.0	0.0	9.3
Cycle Q Clear(g_c), s	9.0	0.0	6.4	22.7	0.0	0.0	30.4	0.0	0.0	12.0	0.0	9.3
Prop In Lane	1.00		0.20	0.05		0.16	0.14		0.03	0.16		1.00
Lane Grp Cap(c), veh/h	385	0	867	607	0	0	519	0	0	552	0	735
V/C Ratio(X)	0.78	0.00	0.26	0.83	0.00	0.00	0.89	0.00	0.00	0.55	0.00	0.35
Avail Cap(c_a), veh/h	385	0	929	671	0	0	519	0	0	552	0	735
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	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.2	0.0	13.0	28.0	0.0	0.0	27.1	0.0	0.0	20.7	0.0	14.4
Incr Delay (d2), s/veh	9.9	0.0	0.1	7.4	0.0	0.0	17.2	0.0	0.0	1.1	0.0	0.3
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	8.6	0.0	4.1	16.0	0.0	0.0	16.9	0.0	0.0	8.1	0.0	5.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.1	0.0	13.0	35.4	0.0	0.0	44.3	0.0	0.0	21.9	0.0	14.7
LnGrp LOS	C	A	B	D	A	A	D	A	A	C	A	B
Approach Vol, veh/h		522			506			462				563
Approach Delay, s/veh		22.8			35.4			44.3				18.6
Approach LOS		C			D			D				B
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		48.6		38.3	15.0	33.6		38.3				
Change Period (Y+Rc), s		7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s		44.7		31.3	8.0	29.7		31.3				
Max Q Clear Time (g_c+I1), s		8.4		32.4	11.0	24.7		14.0				
Green Ext Time (p_c), s		2.1		0.0	0.0	1.9		2.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				29.6								
HCM 6th LOS				C								



Bull Road Logistics  
7: Bull Road & Hilton Ave

2024 Build PM with Improvements

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘			↕	
Traffic Volume (vph)	85	0	111	0	0	0	278	416	2	0	305	173
Future Volume (vph)	85	0	111	0	0	0	278	416	2	0	305	173
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			2%			-2%	
Storage Length (ft)	0		0	0		0	275		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			Yes			No
Link Speed (mph)		35			25			40				40
Link Distance (ft)		1242			1074			3105				1664
Travel Time (s)		24.2			29.3			52.9				28.4
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%	1%	6%	0%	0%	6%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	202	0	0	0	0	287	431	0	0	492	0
Turn Type	Perm	NA					D,P+P	NA			NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			6			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	10.0		10.0	10.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		12.0	24.0		20.0	20.0	
Total Split (s)	20.0	20.0		20.0	20.0		14.0	40.0		26.0	26.0	
Total Split (%)	33.3%	33.3%		33.3%	33.3%		23.3%	66.7%		43.3%	43.3%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0			-1.0	
Total Lost Time (s)		6.0			6.0		6.0	6.0			6.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Max		Max	Max	
v/c Ratio		0.67					0.72	0.44			0.87	
Control Delay		33.5					21.3	9.1			38.0	
Queue Delay		0.0					0.0	0.0			0.0	
Total Delay		33.5					21.3	9.1			38.0	
Queue Length 50th (ft)		66					48	81			165	
Queue Length 95th (ft)		#141					#131	139			#328	
Internal Link Dist (ft)		1162			994			3025			1584	
Turn Bay Length (ft)							275					
Base Capacity (vph)		335					396	975			566	
Starvation Cap Reductn		0					0	0			0	
Spillback Cap Reductn		0					0	0			0	
Storage Cap Reductn		0					0	0			0	
Reduced v/c Ratio		0.60					0.72	0.44			0.87	

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 58.6

Natural Cycle: 60

Control Type: Semi Act-Uncoord

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: Bull Road & Hilton Ave



Bull Road Logistics  
7: Bull Road & Hilton Ave

2024 Build PM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘			↕	
Traffic Volume (veh/h)	85	0	111	0	0	0	278	416	2	0	305	173
Future Volume (veh/h)	85	0	111	0	0	0	278	416	2	0	305	173
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1744	1800	1800	1800	1800	1800	1764	1693	1778	1875	1789	1860
Adj Flow Rate, veh/h	88	0	114	0	0	0	287	429	2	0	314	178
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	4	0	0	0	0	0	1	6	0	0	6	1
Cap, veh/h	192	18	153	0	330	0	441	1016	5	0	381	216
Arrive On Green	0.17	0.00	0.17	0.00	0.00	0.00	0.14	0.60	0.59	0.00	0.36	0.34
Sat Flow, veh/h	547	96	833	0	1800	0	1680	1684	8	0	1072	608
Grp Volume(v), veh/h	202	0	0	0	0	0	287	0	431	0	0	492
Grp Sat Flow(s),veh/h/ln	1475	0	0	0	1800	0	1680	0	1692	0	0	1680
Q Serve(g_s), s	6.2	0.0	0.0	0.0	0.0	0.0	5.8	0.0	7.6	0.0	0.0	15.1
Cycle Q Clear(g_c), s	7.4	0.0	0.0	0.0	0.0	0.0	5.8	0.0	7.6	0.0	0.0	15.1
Prop In Lane	0.44		0.56	0.00		0.00	1.00		0.00	0.00		0.36
Lane Grp Cap(c), veh/h	336	0	0	0	330	0	441	0	1021	0	0	596
V/C Ratio(X)	0.60	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.42	0.00	0.00	0.83
Avail Cap(c_a), veh/h	431	0	0	0	447	0	441	0	1021	0	0	596
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	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	22.2	0.0	0.0	0.0	0.0	0.0	11.5	0.0	5.9	0.0	0.0	16.7
Incr Delay (d2), s/veh	1.7	0.0	0.0	0.0	0.0	0.0	3.4	0.0	1.3	0.0	0.0	12.3
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	4.6	0.0	0.0	0.0	0.0	0.0	3.6	0.0	3.6	0.0	0.0	11.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.9	0.0	0.0	0.0	0.0	0.0	14.9	0.0	7.2	0.0	0.0	29.1
LnGrp LOS	C	A	A	A	A	A	B	A	A	A	A	C
Approach Vol, veh/h		202			0			718				492
Approach Delay, s/veh		23.9			0.0			10.3				29.1
Approach LOS		C						B				C
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		40.0		16.3	14.0	26.0		16.3				
Change Period (Y+Rc), s		7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s		33.0		13.0	7.0	19.0		13.0				
Max Q Clear Time (g_c+I1), s		9.6		9.4	7.8	17.1		0.0				
Green Ext Time (p_c), s		2.5		0.3	0.0	0.6		0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				18.8								
HCM 6th LOS				B								

## **2029 NO-BUILD CONDITIONS**

Bull Road Logistics  
1: Main St & Canal Rd

2029 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕↕			↕↕		↗	↘		↗	↘	
Traffic Volume (vph)	107	197	57	37	209	54	69	316	31	75	278	93
Future Volume (vph)	107	197	57	37	209	54	69	316	31	75	278	93
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	15	12	10	12	12	10	12	12
Grade (%)		1%			-1%			6%			-1%	
Storage Length (ft)	0		0	0		0	70		0	60		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			70			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		25			25			25				25
Link Distance (ft)		933			1422			721				620
Travel Time (s)		25.4			38.8			19.7				16.9
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	4%	8%	13%	3%	8%	6%	12%	3%	3%	8%	3%	9%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	415	0	0	345	0	79	399	0	86	427	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		15.0	15.0	
Total Split (s)	44.0	44.0		44.0	44.0		36.0	36.0		36.0	36.0	
Total Split (%)	55.0%	55.0%		55.0%	55.0%		45.0%	45.0%		45.0%	45.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
v/c Ratio		0.71			0.45		0.39	0.62		0.37	0.67	
Control Delay		20.6			13.2		21.7	20.2		19.9	21.5	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		20.6			13.2		21.7	20.2		19.9	21.5	
Queue Length 50th (ft)		94			67		17	95		18	104	
Queue Length 95th (ft)		232			159		64	232		65	253	
Internal Link Dist (ft)		853			1342			641			540	
Turn Bay Length (ft)							70			60		
Base Capacity (vph)		980			1269		338	1078		395	1074	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.42			0.27		0.23	0.37		0.22	0.40	

Intersection Summary

Area Type: Other

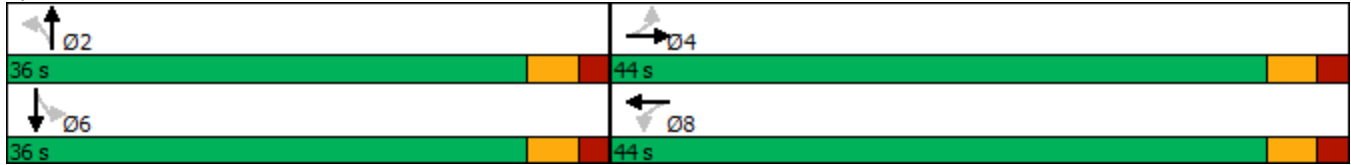
Cycle Length: 80

Actuated Cycle Length: 54.9

Natural Cycle: 40

Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Main St & Canal Rd



Bull Road Logistics  
1: Main St & Canal Rd

2029 No-Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Volume (veh/h)	107	197	57	37	209	54	69	316	31	75	278	93
Future Volume (veh/h)	107	197	57	37	209	54	69	316	31	75	278	93
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1682	1612	1795	1792	1752	1431	1557	1557	1724	1795	1709
Adj Flow Rate, veh/h	123	226	66	43	240	62	79	363	36	86	320	107
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	4	8	13	3	8	6	12	3	3	8	3	9
Cap, veh/h	247	337	88	149	474	113	366	589	58	397	544	182
Arrive On Green	0.34	0.37	0.34	0.34	0.37	0.34	0.42	0.42	0.40	0.42	0.42	0.40
Sat Flow, veh/h	340	912	237	118	1281	306	735	1394	138	908	1287	430
Grp Volume(v), veh/h	415	0	0	345	0	0	79	0	399	86	0	427
Grp Sat Flow(s),veh/h/ln	1488	0	0	1705	0	0	735	0	1532	908	0	1717
Q Serve(g_s), s	3.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	7.9	3.1	0.0	7.4
Cycle Q Clear(g_c), s	9.2	0.0	0.0	6.2	0.0	0.0	10.4	0.0	7.9	10.4	0.0	7.4
Prop In Lane	0.30		0.16	0.12		0.18	1.00		0.09	1.00		0.25
Lane Grp Cap(c), veh/h	633	0	0	691	0	0	366	0	647	397	0	726
V/C Ratio(X)	0.66	0.00	0.00	0.50	0.00	0.00	0.22	0.00	0.62	0.22	0.00	0.59
Avail Cap(c_a), veh/h	1534	0	0	1759	0	0	665	0	1272	768	0	1426
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.6	0.0	0.0	9.7	0.0	0.0	12.4	0.0	8.7	12.6	0.0	8.7
Incr Delay (d2), s/veh	1.2	0.0	0.0	0.6	0.0	0.0	0.3	0.0	1.0	0.3	0.0	0.8
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	4.8	0.0	0.0	3.6	0.0	0.0	0.9	0.0	3.7	1.0	0.0	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.7	0.0	0.0	10.3	0.0	0.0	12.7	0.0	9.7	12.8	0.0	9.4
LnGrp LOS	B	A	A	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h		415			345			478				513
Approach Delay, s/veh		11.7			10.3			10.2				10.0
Approach LOS		B			B			B				A
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		20.3		18.3		20.3		18.3				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		31.0		39.0		31.0		39.0				
Max Q Clear Time (g_c+I1), s		12.9		11.2		12.9		8.2				
Green Ext Time (p_c), s		2.2		2.1		2.3		1.6				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				10.5								
HCM 6th LOS				B								



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	2	364	92	89	181	44	553	67	156	76	152	10
Future Volume (vph)	2	364	92	89	181	44	553	67	156	76	152	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	7%	13%	3%	9%	4%	8%	3%	5%	4%	20%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	487	0	0	335	0	0	825	0	0	254	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other  
Control Type: Unsignalized



Intersection	
Intersection Delay, s/veh	233.4
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	364	92	89	181	44	553	67	156	76	152	10
Future Vol, veh/h	2	364	92	89	181	44	553	67	156	76	152	10
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, %	0	3	7	13	3	9	4	8	3	5	4	20
Mvmt Flow	2	387	98	95	193	47	588	71	166	81	162	11
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	111.6	51.6	439.8	34.7
HCM LOS	F	F	F	D

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	71%	0%	28%	32%
Vol Thru, %	9%	79%	58%	64%
Vol Right, %	20%	20%	14%	4%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	776	458	314	238
LT Vol	553	2	89	76
Through Vol	67	364	181	152
RT Vol	156	92	44	10
Lane Flow Rate	826	487	334	253
Geometry Grp	1	1	1	1
Degree of Util (X)	1.912	1.1	0.821	0.648
Departure Headway (Hd)	8.778	10.51	11.716	12.019
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	421	351	311	304
Service Time	6.778	8.51	9.716	10.019
HCM Lane V/C Ratio	1.962	1.387	1.074	0.832
HCM Control Delay	439.8	111.6	51.6	34.7
HCM Lane LOS	F	F	F	D
HCM 95th-tile Q	52.4	14.2	6.9	4.2



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	519	67	16	268	54	27
Future Volume (vph)	519	67	16	268	54	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	12
Grade (%)	4%			0%	4%	
Link Speed (mph)	40			40	40	
Link Distance (ft)	1159			3081	2342	
Travel Time (s)	19.8			52.5	39.9	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	3%	2%	0%	8%	6%	8%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	681	0	0	331	94	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	2.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	519	67	16	268	54	27
Future Vol, veh/h	519	67	16	268	54	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	4	-	-	0	4	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	3	2	0	8	6	8
Mvmt Flow	603	78	19	312	63	31

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	681	0	992 642
Stage 1	-	-	-	-	642 -
Stage 2	-	-	-	-	350 -
Critical Hdwy	-	-	4.3	-	7.3 6.68
Critical Hdwy Stg 1	-	-	-	-	6.26 -
Critical Hdwy Stg 2	-	-	-	-	6.26 -
Follow-up Hdwy	-	-	3	-	3.1 3.2
Pot Cap-1 Maneuver	-	-	697	-	231 449
Stage 1	-	-	-	-	495 -
Stage 2	-	-	-	-	732 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	697	-	223 449
Mov Cap-2 Maneuver	-	-	-	-	223 -
Stage 1	-	-	-	-	495 -
Stage 2	-	-	-	-	708 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	25.5
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	268	-	-	697	-
HCM Lane V/C Ratio	0.351	-	-	0.027	-
HCM Control Delay (s)	25.5	-	-	10.3	0
HCM Lane LOS	D	-	-	B	A
HCM 95th %tile Q(veh)	1.5	-	-	0.1	-

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (vph)	257	268	55	10	133	36	20	181	13	43	281	183
Future Volume (vph)	257	268	55	10	133	36	20	181	13	43	281	183
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	0		0	0		0	0		0	0		160
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	4%	4%	4%	10%	8%	46%	10%	14%	31%	60%	7%	12%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	591	0	0	183	0	0	218	0	0	331	187
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	16.3	16.3		16.3	16.3		9.6	9.6		9.6	9.6	9.6
Total Split (s)	48.9	48.9		48.9	48.9		29.0	29.0		29.0	29.0	29.0
Total Split (%)	62.8%	62.8%		62.8%	62.8%		37.2%	37.2%		37.2%	37.2%	37.2%
Yellow Time (s)	4.3	4.3		4.3	4.3		4.3	4.3		4.3	4.3	4.3
All-Red Time (s)	2.0	2.0		2.0	2.0		2.3	2.3		2.3	2.3	2.3
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)		5.3			5.3			5.6			5.6	5.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
v/c Ratio		0.88			0.25			0.53			0.75	0.34
Control Delay		31.2			9.8			26.5			35.3	5.6
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		31.2			9.8			26.5			35.3	5.6
Queue Length 50th (ft)		211			41			78			128	0
Queue Length 95th (ft)		#425			75			156			#272	44
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)												160
Base Capacity (vph)		906			1006			519			552	646
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		0.65			0.18			0.42			0.60	0.29

Intersection Summary

Area Type: Other

Cycle Length: 77.9

Actuated Cycle Length: 65

Natural Cycle: 65

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 No-Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (veh/h)	257	268	55	10	133	36	20	181	13	43	281	183
Future Volume (veh/h)	257	268	55	10	133	36	20	181	13	43	281	183
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1818	1818	1818	1807	1835	1295	1609	1553	1315	1059	1812	1741
Adj Flow Rate, veh/h	262	273	56	10	136	37	20	185	13	44	287	104
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	4	4	4	10	8	46	10	14	31	60	7	12
Cap, veh/h	420	383	73	92	711	184	89	278	18	120	417	382
Arrive On Green	0.50	0.52	0.50	0.50	0.52	0.50	0.24	0.26	0.24	0.24	0.26	0.26
Sat Flow, veh/h	606	737	141	28	1368	354	36	1073	70	144	1611	1476
Grp Volume(v), veh/h	591	0	0	183	0	0	218	0	0	331	0	104
Grp Sat Flow(s),veh/h/ln	1483	0	0	1750	0	0	1180	0	0	1755	0	1476
Q Serve(g_s), s	13.1	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	2.8
Cycle Q Clear(g_c), s	15.8	0.0	0.0	2.8	0.0	0.0	9.1	0.0	0.0	8.5	0.0	2.8
Prop In Lane	0.44		0.09	0.05		0.20	0.09		0.06	0.13		1.00
Lane Grp Cap(c), veh/h	846	0	0	951	0	0	361	0	0	502	0	382
V/C Ratio(X)	0.70	0.00	0.00	0.19	0.00	0.00	0.60	0.00	0.00	0.66	0.00	0.27
Avail Cap(c_a), veh/h	1376	0	0	1575	0	0	670	0	0	866	0	702
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	1.00
Uniform Delay (d), s/veh	9.5	0.0	0.0	6.4	0.0	0.0	16.0	0.0	0.0	16.7	0.0	14.5
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.0	0.0	0.0	1.6	0.0	0.0	1.5	0.0	0.4
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	6.4	0.0	0.0	1.3	0.0	0.0	3.5	0.0	0.0	5.5	0.0	1.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.9	0.0	0.0	6.4	0.0	0.0	17.6	0.0	0.0	18.2	0.0	14.9
LnGrp LOS	A	A	A	A	A	A	B	A	A	B	A	B
Approach Vol, veh/h		591			183			218				435
Approach Delay, s/veh		9.9			6.4			17.6				17.4
Approach LOS		A			A			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		30.9		18.3		30.9		18.3				
Change Period (Y+Rc), s		6.3		* 6.6		6.3		* 6.6				
Max Green Setting (Gmax), s		42.6		* 22		42.6		* 22				
Max Q Clear Time (g_c+I1), s		17.8		11.1		4.8		10.5				
Green Ext Time (p_c), s		6.7		0.5		1.8		1.2				

Intersection Summary

HCM 6th Ctrl Delay	12.9
HCM 6th LOS	B

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
5: I-83 SB Ramps & Susquehanna Trail

2029 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	544	168	113	273	0	0	0	0	41	2	331
Future Volume (vph)	0	544	168	113	273	0	0	0	0	41	2	331
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	11	12	12	12	12	12	12	15	12
Grade (%)		2%			0%			0%			1%	
Storage Length (ft)	0		0	50		0	0		0	0		275
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			35			25			25		
Satd. Flow (prot)	0	1489	0	1476	1500	0	0	0	0	0	1684	1228
Flt Permitted				0.165							0.954	
Satd. Flow (perm)	0	1489	0	256	1500	0	0	0	0	0	1684	1228
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		25										376
Link Speed (mph)		40			40			30				30
Link Distance (ft)		3254			450			1020				690
Travel Time (s)		55.5			7.7			23.2				15.7
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	13%	25%	12%	20%	0%	0%	0%	0%	10%	50%	24%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	809	0	128	310	0	0	0	0	0	49	376
Turn Type		NA		pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	2 1						4	
Permitted Phases				2 1						4		4
Detector Phase		2		1	2 1					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		3.0						3.0	3.0	3.0
Minimum Split (s)		21.3		9.3						9.1	9.1	9.1
Total Split (s)		61.0		15.7						24.0	24.0	24.0
Total Split (%)		60.6%		15.6%						23.8%	23.8%	23.8%
Yellow Time (s)		4.0		4.0						3.2	3.2	3.2
All-Red Time (s)		2.3		2.3						2.9	2.9	2.9
Lost Time Adjust (s)		-1.0		-1.0							-1.0	0.0
Total Lost Time (s)		5.3		5.3							5.1	6.1
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		Min						None	None	None
Act Effect Green (s)		52.9		63.4	68.7						15.4	14.4
Actuated g/C Ratio		0.56		0.67	0.73						0.16	0.15
v/c Ratio		0.96		0.42	0.28						0.18	0.74
Control Delay		44.1		27.6	8.1						36.5	14.1
Queue Delay		2.0		0.0	0.0						0.0	0.0
Total Delay		46.1		27.6	8.1						36.5	14.1
LOS		D		C	A						D	B
Approach Delay		46.1			13.8						16.6	
Approach LOS		D			B						B	
Queue Length 50th (ft)		460		35	91						27	0
Queue Length 95th (ft)		#722		m73	m127						58	84
Internal Link Dist (ft)		3174			370			940			610	

Lane Group	Ø5	Ø6	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	5	6	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	40.6	29.6	30.5
Total Split (%)	40%	29%	30%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	None	Min	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			



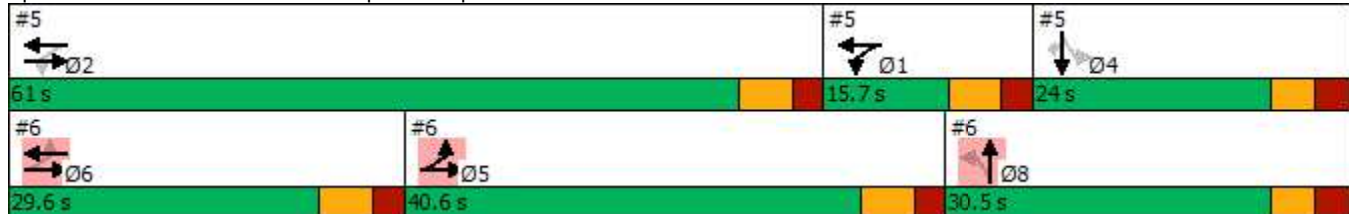


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)				50								275
Base Capacity (vph)		894		306	1089						339	538
Starvation Cap Reductn		0		0	0						0	0
Spillback Cap Reductn		28		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.93		0.42	0.28						0.14	0.70

**Intersection Summary**

Area Type: Other  
 Cycle Length: 100.7  
 Actuated Cycle Length: 94.7  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.96  
 Intersection Signal Delay: 30.2      Intersection LOS: C  
 Intersection Capacity Utilization 69.1%      ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: I-83 SB Ramps & Susquehanna Trail



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Lane Group	Ø5	Ø6	Ø8
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
6: I-83 NB Ramps & Susquehanna Trail

2029 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	456	137	0	0	219	44	169	1	68	0	0	0
Future Volume (vph)	456	137	0	0	219	44	169	1	68	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	11	12	12	12	12	12	12	16	12	12	12	12
Grade (%)		0%			2%			2%			0%	
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	35			25			25			25		
Satd. Flow (prot)	1450	1651	0	0	1566	0	0	1558	0	0	0	0
Flt Permitted	0.345							0.966				
Satd. Flow (perm)	527	1651	0	0	1566	0	0	1558	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					9			19				
Link Speed (mph)		40			40			30				30
Link Distance (ft)		450			839			925				282
Travel Time (s)		7.7			14.3			21.0				6.4
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	14%	9%	0%	0%	13%	2%	23%	0%	14%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	518	156	0	0	299	0	0	270	0	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA				
Protected Phases	5	6 5			6			8				
Permitted Phases	6 5						8					
Detector Phase	5	6 5			6		8	8				
Switch Phase												
Minimum Initial (s)	3.0				15.0		3.0	3.0				
Minimum Split (s)	9.3				21.3		9.1	9.1				
Total Split (s)	40.6				29.6		30.5	30.5				
Total Split (%)	40.3%				29.4%		30.3%	30.3%				
Yellow Time (s)	4.0				4.0		3.2	3.2				
All-Red Time (s)	2.3				2.3		2.9	2.9				
Lost Time Adjust (s)	-1.0				-1.0			-1.0				
Total Lost Time (s)	5.3				5.3			5.1				
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Recall Mode	None				Min		None	None				
Act Effct Green (s)	54.4	59.8			22.5			24.4				
Actuated g/C Ratio	0.57	0.63			0.24			0.26				
v/c Ratio	0.85	0.15			0.79			0.65				
Control Delay	15.6	1.6			50.1			38.7				
Queue Delay	0.0	0.0			0.0			0.0				
Total Delay	15.6	1.6			50.1			38.7				
LOS	B	A			D			D				
Approach Delay		12.4			50.1			38.7				
Approach LOS		B			D			D				
Queue Length 50th (ft)	104	8			174			145				
Queue Length 95th (ft)	m149	m10			#292			229				
Internal Link Dist (ft)		370			759			845			202	

Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	15.7	61.0	24.0
Total Split (%)	16%	61%	24%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	Min	None	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			

Bull Road Logistics  
 6: I-83 NB Ramps & Susquehanna Trail

2029 No-Build AM  
 10/11/2023

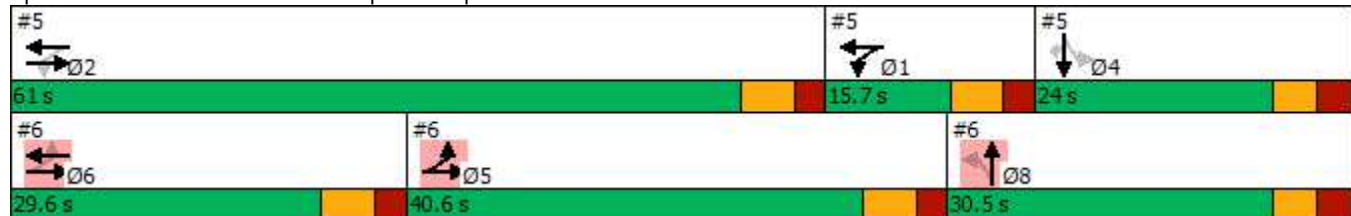


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	50											
Base Capacity (vph)	671	1091			412			436				
Starvation Cap Reductn	0	0			0			0				
Spillback Cap Reductn	0	0			0			0				
Storage Cap Reductn	0	0			0			0				
Reduced v/c Ratio	0.77	0.14			0.73			0.62				

Intersection Summary

Area Type: Other  
 Cycle Length: 100.7  
 Actuated Cycle Length: 94.7  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.96  
 Intersection Signal Delay: 27.2  
 Intersection LOS: C  
 Intersection Capacity Utilization 69.1%  
 ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: I-83 NB Ramps & Susquehanna Trail



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Lane Group	Ø1	Ø2	Ø4
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	101	0	207	0	0	0	41	170	0	0	367	62
Future Volume (vph)	101	0	207	0	0	0	41	170	0	0	367	62
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			2%			-2%	
Link Speed (mph)		35			25			40			40	
Link Distance (ft)		1242			1074			3105			1664	
Travel Time (s)		24.2			29.3			52.9			28.4	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	0%	7%	0%	0%	6%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	346	0	0	0	0	0	237	0	0	482	0
Sign Control		Stop			Stop			Free			Free	

**Intersection Summary**  
 Area Type: Other  
 Control Type: Unsignalized

Intersection												
Int Delay, s/veh	8.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	101	0	207	0	0	0	41	170	0	0	367	62
Future Vol, veh/h	101	0	207	0	0	0	41	170	0	0	367	62
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	2	-	-	-2	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	1	0	0	0	0	0	0	7	0	0	6	3
Mvmt Flow	113	0	233	0	0	0	46	191	0	0	412	70

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	730	730	447	847	765	191	482	0	0	191	0	0
Stage 1	447	447	-	283	283	-	-	-	-	-	-	-
Stage 2	283	283	-	564	482	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.11	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3	4	3.1	3	4	3.1	3	-	-	3	-	-
Pot Cap-1 Maneuver	380	352	648	315	336	906	819	-	-	1033	-	-
Stage 1	673	577	-	834	681	-	-	-	-	-	-	-
Stage 2	833	681	-	578	557	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	362	330	648	192	315	906	819	-	-	1033	-	-
Mov Cap-2 Maneuver	362	330	-	192	315	-	-	-	-	-	-	-
Stage 1	631	577	-	781	638	-	-	-	-	-	-	-
Stage 2	781	638	-	371	557	-	-	-	-	-	-	-

Approach	EB		WB			NB			SB		
HCM Control Delay, s	25.1		0			1.9			0		
HCM LOS	D		A								

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	819	-	-	515	-	1033	-
HCM Lane V/C Ratio	0.056	-	-	0.672	-	-	-
HCM Control Delay (s)	9.7	0	-	25.1	0	0	-
HCM Lane LOS	A	A	-	D	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	5	-	0	-



Bull Road Logistics  
8: Bull Road & Church Road

2029 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	33	213	350	75	119	25	133	171	68	59	561	32
Future Volume (vph)	33	213	350	75	119	25	133	171	68	59	561	32
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	14	10	12	12	12	11	12	12	12	12	12
Grade (%)		-7%			2%			1%			0%	
Storage Length (ft)	0		5	0		5	175		0	90		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			90			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			40			35			40	
Link Distance (ft)		1991			2295			1045			638	
Travel Time (s)		38.8			39.1			20.4			10.9	
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 (%)	3%	2%	3%	3%	2%	0%	8%	7%	8%	3%	4%	6%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	634	0	0	234	0	141	254	0	63	631	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		3.0	10.0		10.0	10.0	
Minimum Split (s)	9.2	9.2		9.2	9.2		6.0	16.6		16.6	16.6	
Total Split (s)	37.0	37.0		37.0	37.0		11.0	48.4		37.4	37.4	
Total Split (%)	43.3%	43.3%		43.3%	43.3%		12.9%	56.7%		43.8%	43.8%	
Yellow Time (s)	4.8	4.8		4.8	4.8		3.0	4.0		4.0	4.0	
All-Red Time (s)	1.4	1.4		1.4	1.4		0.0	2.2		2.2	2.2	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		5.2			5.2		2.0	5.2		5.2	5.2	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Min		Min	Min	
v/c Ratio		0.92			0.71		0.57	0.30		0.16	0.96	
Control Delay		43.2			35.4		21.4	11.6		19.0	53.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		43.2			35.4		21.4	11.6		19.0	53.4	
Queue Length 50th (ft)		275			100		36	64		22	325	
Queue Length 95th (ft)		#489			#208		82	113		50	#551	
Internal Link Dist (ft)		1911			2215			965			558	
Turn Bay Length (ft)							175			90		
Base Capacity (vph)		720			350		248	846		406	666	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.88			0.67		0.57	0.30		0.16	0.95	

Intersection Summary

Area Type: Other

Cycle Length: 85.4

Actuated Cycle Length: 83.4

Natural Cycle: 75

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Bull Road & Church Road



Bull Road Logistics  
8: Bull Road & Church Road

2029 No-Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	33	213	350	75	119	25	133	171	68	59	561	32
Future Volume (veh/h)	33	213	350	75	119	25	133	171	68	59	561	32
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2018	2114	2018	1736	1750	1778	1682	1696	1682	1758	1744	1716
Adj Flow Rate, veh/h	35	227	266	80	127	17	141	182	67	63	597	29
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
Percent Heavy Veh, %	3	2	3	3	2	0	8	7	8	3	4	6
Cap, veh/h	76	284	313	158	226	26	313	636	234	547	697	34
Arrive On Green	0.31	0.32	0.32	0.31	0.32	0.32	0.09	0.54	0.52	0.42	0.42	0.41
Sat Flow, veh/h	76	887	977	285	705	81	1602	1182	435	1063	1649	80
Grp Volume(v), veh/h	528	0	0	224	0	0	141	0	249	63	0	626
Grp Sat Flow(s),veh/h/ln	1940	0	0	1071	0	0	1602	0	1618	1063	0	1729
Q Serve(g_s), s	6.1	0.0	0.0	0.0	0.0	0.0	3.2	0.0	6.2	2.7	0.0	24.1
Cycle Q Clear(g_c), s	18.9	0.0	0.0	12.8	0.0	0.0	3.2	0.0	6.2	2.7	0.0	24.1
Prop In Lane	0.07		0.50	0.36		0.08	1.00		0.27	1.00		0.05
Lane Grp Cap(c), veh/h	647	0	0	395	0	0	313	0	871	547	0	731
V/C Ratio(X)	0.82	0.00	0.00	0.57	0.00	0.00	0.45	0.00	0.29	0.12	0.00	0.86
Avail Cap(c_a), veh/h	857	0	0	535	0	0	367	0	950	563	0	757
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.4	0.0	0.0	20.6	0.0	0.0	14.1	0.0	9.4	13.0	0.0	19.2
Incr Delay (d2), s/veh	4.6	0.0	0.0	1.3	0.0	0.0	1.0	0.0	0.8	0.4	0.0	12.3
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	13.7	0.0	0.0	5.7	0.0	0.0	1.9	0.0	3.7	1.1	0.0	16.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.0	0.0	0.0	21.9	0.0	0.0	15.1	0.0	10.2	13.5	0.0	31.5
LnGrp LOS	C	A	A	C	A	A	B	A	B	B	A	C
Approach Vol, veh/h		528			224			390				689
Approach Delay, s/veh		28.0			21.9			12.0				29.9
Approach LOS		C			C			B				C
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		44.8		28.8	8.5	36.3		28.8				
Change Period (Y+Rc), s		* 6.2		* 6.2	3.0	* 6.2		* 6.2				
Max Green Setting (Gmax), s		* 42		* 31	8.0	* 31		* 31				
Max Q Clear Time (g_c+I1), s		8.2		20.9	5.7	26.1		14.8				
Green Ext Time (p_c), s		7.7		1.7	0.1	4.0		0.8				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				24.6								
HCM 6th LOS				C								
<b>Notes</b>												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2029 No-Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	254	1440	166	178	1360	327	164	156	71	500	304	207
Future Volume (vph)	254	1440	166	178	1360	327	164	156	71	500	304	207
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Grade (%)		-2%			-1%			-1%				1%
Storage Length (ft)	270		370	410		410	530		150	400		320
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	80			75			50			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			25				35
Link Distance (ft)		1907			1983			690				1750
Travel Time (s)		32.5			33.8			18.8				34.1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	5%	14%	8%	18%	14%	4%	8%	4%	28%	3%	5%	4%
Shared Lane Traffic (%)							37%			47%		
Lane Group Flow (vph)	267	1516	175	187	1432	344	109	228	75	279	567	218
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6	4	5	2		4	4		8	8	
Permitted Phases			6			2			4			8
Detector Phase	1	6	4	5	2	2	4	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	5.0	4.5	10.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	17.0	12.5	11.5	17.0	17.0	12.5	12.5	12.5	12.5	12.5	12.5
Total Split (s)	31.0	50.0	22.0	23.0	42.0	42.0	22.0	22.0	22.0	30.0	30.0	30.0
Total Split (%)	24.8%	40.0%	17.6%	18.4%	33.6%	33.6%	17.6%	17.6%	17.6%	24.0%	24.0%	24.0%
Yellow Time (s)	3.0	4.5	3.0	4.5	4.5	4.5	3.0	3.0	3.0	3.5	3.5	3.5
All-Red Time (s)	3.5	2.5	4.5	2.5	2.5	2.5	4.5	4.5	4.5	4.0	4.0	4.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.5	6.0	6.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Min	None	None	C-Min	C-Min	None	None	None	None	None	None
v/c Ratio	0.85	0.99	0.22	0.94	1.10	0.50	0.66	0.64	0.23	0.95	0.94	0.47
Control Delay	73.0	61.0	4.6	104.8	97.7	6.3	71.7	61.5	1.6	90.1	74.3	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.0	61.0	4.6	104.8	97.7	6.3	71.7	61.5	1.6	90.1	74.3	9.2
Queue Length 50th (ft)	207	443	13	152	~497	0	93	97	0	249	253	0
Queue Length 95th (ft)	#340	#558	49	#299	#594	74	#164	143	0	#446	#379	69
Internal Link Dist (ft)		1827			1903			610			1670	
Turn Bay Length (ft)	270		370	410		410	530		150	400		320
Base Capacity (vph)	335	1532	817	198	1303	685	179	382	339	295	603	463
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.99	0.21	0.94	1.10	0.50	0.61	0.60	0.22	0.95	0.94	0.47

**Intersection Summary**  
 Area Type: Other  
 Cycle Length: 125

Actuated Cycle Length: 125

Offset: 76 (61%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

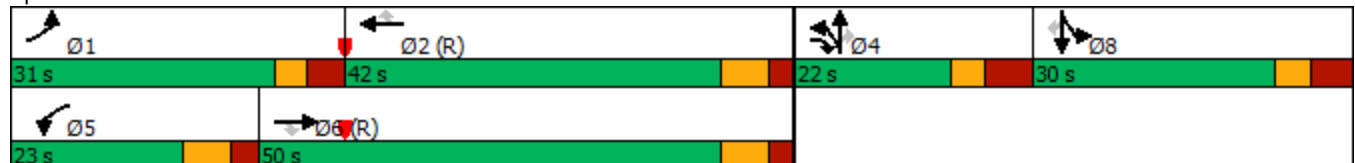
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 9: Roosevelt Ave & Loucks Road



Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2029 No-Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↕	↗	↘	↕	↗
Traffic Volume (veh/h)	254	1440	166	178	1360	327	164	156	71	500	304	207
Future Volume (veh/h)	254	1440	166	178	1360	327	164	156	71	500	304	207
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1803	1675	1761	1581	1638	1780	1724	1780	1439	1752	1724	1738
Adj Flow Rate, veh/h	267	1516	133	187	1432	0	188	143	0	526	320	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	5	14	8	18	14	4	8	4	28	3	5	4
Cap, veh/h	311	1682	710	205	1461		355	193		627	324	
Arrive On Green	0.18	0.37	0.37	0.14	0.33	0.00	0.11	0.11	0.00	0.19	0.19	0.00
Sat Flow, veh/h	1718	4574	1492	1506	4472	1509	3283	1780	1220	3338	1724	1473
Grp Volume(v), veh/h	267	1516	133	187	1432	0	188	143	0	526	320	0
Grp Sat Flow(s),veh/h/ln	1718	1525	1492	1506	1491	1509	1641	1780	1220	1669	1724	1473
Q Serve(g_s), s	18.8	39.2	6.4	15.3	39.6	0.0	6.8	9.7	0.0	19.0	23.1	0.0
Cycle Q Clear(g_c), s	18.8	39.2	6.4	15.3	39.6	0.0	6.8	9.7	0.0	19.0	23.1	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	311	1682	710	205	1461		355	193		627	324	
V/C Ratio(X)	0.86	0.90	0.19	0.91	0.98		0.53	0.74		0.84	0.99	
Avail Cap(c_a), veh/h	350	1682	710	205	1461		407	221		627	324	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	49.6	37.4	18.8	53.3	41.7	0.0	52.7	54.0	0.0	48.9	50.6	0.0
Incr Delay (d2), s/veh	17.4	8.2	0.6	39.6	19.2	0.0	1.2	11.0	0.0	9.8	46.4	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	14.5	21.8	5.1	12.6	23.4	0.0	5.2	8.6	0.0	13.5	20.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	67.0	45.6	19.4	92.9	60.9	0.0	53.9	65.0	0.0	58.7	97.0	0.0
LnGrp LOS	E	D	B	F	E		D	E		E	F	
Approach Vol, veh/h		1916			1619			331			846	
Approach Delay, s/veh		46.8			64.6			58.7			73.2	
Approach LOS		D			E			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	28.1	46.8		20.0	23.0	52.0		30.0				
Change Period (Y+Rc), s	6.5	7.0		7.5	7.0	7.0		7.5				
Max Green Setting (Gmax), s	24.5	35.0		14.5	16.0	43.0		22.5				
Max Q Clear Time (g_c+I1), s	21.3	42.1		12.2	17.8	41.7		25.6				
Green Ext Time (p_c), s	0.3	0.0		0.3	0.0	1.3		0.0				

Intersection Summary

HCM 6th Ctrl Delay	58.5
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.  
Unsignalized Delay for [NBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Bull Road Logistics  
1: Main St & Canal Rd

2029 No-Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	136	186	85	54	210	62	74	401	67	80	411	139
Future Volume (vph)	136	186	85	54	210	62	74	401	67	80	411	139
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	15	12	10	12	12	10	12	12
Grade (%)		1%			-1%			6%			-1%	
Storage Length (ft)	0		0	0		0	70		0	60		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			70			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		25			25			25				25
Link Distance (ft)		933			1422			721				620
Travel Time (s)		25.4			38.8			19.7				16.9
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	5%	2%	4%	0%	4%	3%	4%	1%	0%	3%	2%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	428	0	0	343	0	78	493	0	84	579	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6		6
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		10.0	10.0		10.0		10.0
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		15.0		15.0
Total Split (s)	36.0	36.0		36.0	36.0		34.0	34.0		34.0		34.0
Total Split (%)	51.4%	51.4%		51.4%	51.4%		48.6%	48.6%		48.6%		48.6%
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0		2.0
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0		-1.0
Total Lost Time (s)		4.0			4.0		4.0	4.0		4.0		4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min		Min
v/c Ratio		0.79			0.47		0.49	0.68		0.38		0.80
Control Delay		28.1			15.3		27.1	20.6		19.4		26.2
Queue Delay		0.0			0.0		0.0	0.0		0.0		0.0
Total Delay		28.1			15.3		27.1	20.6		19.4		26.2
Queue Length 50th (ft)		143			95		22	152		22		191
Queue Length 95th (ft)		#292			160		#73	268		61		#378
Internal Link Dist (ft)		853			1342			641				540
Turn Bay Length (ft)							70			60		
Base Capacity (vph)		713			953		197	901		277		906
Starvation Cap Reductn		0			0		0	0		0		0
Spillback Cap Reductn		0			0		0	0		0		0
Storage Cap Reductn		0			0		0	0		0		0
Reduced v/c Ratio		0.60			0.36		0.40	0.55		0.30		0.64

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 59.6

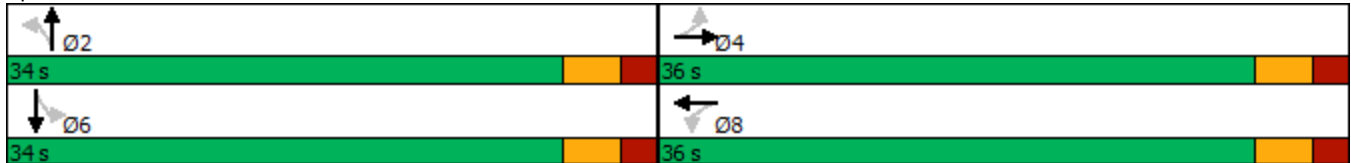
Natural Cycle: 50

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Main St & Canal Rd





Bull Road Logistics  
1: Main St & Canal Rd

2029 No-Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	136	186	85	54	210	62	74	401	67	80	411	139
Future Volume (veh/h)	136	186	85	54	210	62	74	401	67	80	411	139
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1724	1766	1738	1837	1852	1795	1543	1585	1599	1795	1809	1795
Adj Flow Rate, veh/h	143	196	89	57	221	65	78	422	71	84	433	146
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	5	2	4	0	4	3	4	1	0	3	2	3
Cap, veh/h	249	277	112	152	434	116	301	625	105	356	612	206
Arrive On Green	0.34	0.36	0.34	0.34	0.36	0.34	0.47	0.47	0.45	0.47	0.47	0.45
Sat Flow, veh/h	413	772	311	176	1210	324	689	1323	223	867	1294	436
Grp Volume(v), veh/h	428	0	0	343	0	0	78	0	493	84	0	579
Grp Sat Flow(s),veh/h/ln	1495	0	0	1711	0	0	689	0	1545	867	0	1730
Q Serve(g_s), s	4.7	0.0	0.0	0.0	0.0	0.0	4.8	0.0	11.8	3.9	0.0	12.7
Cycle Q Clear(g_c), s	12.2	0.0	0.0	7.5	0.0	0.0	16.9	0.0	11.8	15.2	0.0	12.7
Prop In Lane	0.33		0.21	0.17		0.19	1.00		0.14	1.00		0.25
Lane Grp Cap(c), veh/h	606	0	0	666	0	0	301	0	731	356	0	818
V/C Ratio(X)	0.71	0.00	0.00	0.51	0.00	0.00	0.26	0.00	0.67	0.24	0.00	0.71
Avail Cap(c_a), veh/h	1040	0	0	1170	0	0	409	0	974	492	0	1091
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.7	0.0	0.0	12.3	0.0	0.0	16.4	0.0	9.8	15.4	0.0	10.1
Incr Delay (d2), s/veh	1.5	0.0	0.0	0.6	0.0	0.0	0.5	0.0	1.1	0.3	0.0	1.4
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	7.0	0.0	0.0	4.9	0.0	0.0	1.3	0.0	6.1	1.3	0.0	7.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.2	0.0	0.0	12.9	0.0	0.0	16.9	0.0	10.9	15.7	0.0	11.4
LnGrp LOS	B	A	A	B	A	A	B	A	B	B	A	B
Approach Vol, veh/h		428			343			571				663
Approach Delay, s/veh		15.2			12.9			11.7				12.0
Approach LOS		B			B			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		26.5		21.1		26.5		21.1				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		29.0		31.0		29.0		31.0				
Max Q Clear Time (g_c+I1), s		19.4		14.2		17.7		9.5				
Green Ext Time (p_c), s		2.1		1.9		2.6		1.5				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				12.8								
HCM 6th LOS				B								



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	323	64	96	316	35	167	187	86	70	122	25
Future Volume (vph)	14	323	64	96	316	35	167	187	86	70	122	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	5%	0%	2%	6%	1%	2%	2%	1%	3%	4%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	427	0	0	475	0	0	468	0	0	231	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection	
Intersection Delay, s/veh	91.3
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	14	323	64	96	316	35	167	187	86	70	122	25
Future Vol, veh/h	14	323	64	96	316	35	167	187	86	70	122	25
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, %	0	3	5	0	2	6	1	2	2	1	3	4
Mvmt Flow	15	344	68	102	336	37	178	199	91	74	130	27
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	78.9	115.6	108.7	28.9
HCM LOS	F	F	F	D

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	38%	3%	21%	32%
Vol Thru, %	43%	81%	71%	56%
Vol Right, %	20%	16%	8%	12%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	440	401	447	217
LT Vol	167	14	96	70
Through Vol	187	323	316	122
RT Vol	86	64	35	25
Lane Flow Rate	468	427	476	231
Geometry Grp	1	1	1	1
Degree of Util (X)	1.111	1.008	1.131	0.615
Departure Headway (Hd)	9.037	9.251	9.065	10.492
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	407	397	404	346
Service Time	7.037	7.251	7.065	8.492
HCM Lane V/C Ratio	1.15	1.076	1.178	0.668
HCM Control Delay	108.7	78.9	115.6	28.9
HCM Lane LOS	F	F	F	D
HCM 95th-tile Q	15.9	12.3	16.6	3.9



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Traffic Volume (vph)	408	102	52	459	40	40
Future Volume (vph)	408	102	52	459	40	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	12
Grade (%)	4%			0%	4%	
Link Speed (mph)	40			40	40	
Link Distance (ft)	1159			3081	2342	
Travel Time (s)	19.8			52.5	39.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	3%	1%	0%	3%	0%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	520	0	0	521	82	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	408	102	52	459	40	40
Future Vol, veh/h	408	102	52	459	40	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	4	-	-	0	4	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	3	1	0	3	0	3
Mvmt Flow	416	104	53	468	41	41

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	520	0	1042
Stage 1	-	-	-	-	468
Stage 2	-	-	-	-	574
Critical Hdwy	-	-	4.3	-	7.3
Critical Hdwy Stg 1	-	-	-	-	6.2
Critical Hdwy Stg 2	-	-	-	-	6.2
Follow-up Hdwy	-	-	3	-	3.1
Pot Cap-1 Maneuver	-	-	795	-	213
Stage 1	-	-	-	-	630
Stage 2	-	-	-	-	548
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	795	-	194
Mov Cap-2 Maneuver	-	-	-	-	194
Stage 1	-	-	-	-	630
Stage 2	-	-	-	-	499

Approach	EB	WB	NB
HCM Control Delay, s	0	1	22.2
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	290	-	-	795	-
HCM Lane V/C Ratio	0.281	-	-	0.067	-
HCM Control Delay (s)	22.2	-	-	9.9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1.1	-	-	0.2	-

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 No-Build PM  
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (vph)	226	151	39	20	353	71	57	336	10	43	222	302
Future Volume (vph)	226	151	39	20	353	71	57	336	10	43	222	302
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	0		0	0		0	0		0	0		160
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	5%	3%	0%	10%	2%	24%	0%	5%	30%	29%	7%	2%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	484	0	0	516	0	0	469	0	0	308	351
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	16.3	16.3		16.3	16.3		9.6	9.6		9.6	9.6	9.6
Total Split (s)	46.1	46.1		46.1	46.1		32.2	32.2		32.2	32.2	32.2
Total Split (%)	58.9%	58.9%		58.9%	58.9%		41.1%	41.1%		41.1%	41.1%	41.1%
Yellow Time (s)	4.3	4.3		4.3	4.3		4.3	4.3		4.3	4.3	4.3
All-Red Time (s)	2.0	2.0		2.0	2.0		2.3	2.3		2.3	2.3	2.3
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)		5.3			5.3			5.6			5.6	5.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
v/c Ratio		1.04			0.62			1.05			0.69	0.47
Control Delay		75.8			17.5			85.3			31.7	4.6
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		75.8			17.5			85.3			31.7	4.6
Queue Length 50th (ft)		~260			167			~254			127	0
Queue Length 95th (ft)		#408			248			#401			204	46
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)												160
Base Capacity (vph)		464			828			446			449	748
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		1.04			0.62			1.05			0.69	0.47

Intersection Summary

Area Type: Other

Cycle Length: 78.3

Actuated Cycle Length: 78.3

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

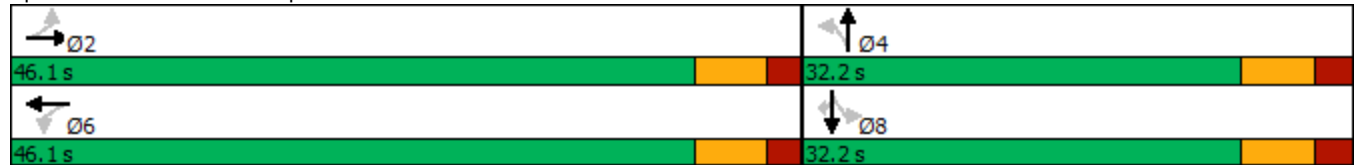
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 No-Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (veh/h)	226	151	39	20	353	71	57	336	10	43	222	302
Future Volume (veh/h)	226	151	39	20	353	71	57	336	10	43	222	302
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1803	1832	1875	1807	1921	1608	1750	1680	1329	1499	1812	1883
Adj Flow Rate, veh/h	263	176	45	23	410	83	66	391	12	50	258	242
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	5	3	0	10	2	24	0	5	30	29	7	2
Cap, veh/h	343	203	48	69	771	152	94	388	11	104	455	558
Arrive On Green	0.49	0.51	0.49	0.49	0.51	0.49	0.34	0.35	0.34	0.34	0.35	0.35
Sat Flow, veh/h	533	400	96	39	1521	299	113	1109	32	139	1300	1596
Grp Volume(v), veh/h	484	0	0	516	0	0	469	0	0	308	0	242
Grp Sat Flow(s),veh/h/ln	1028	0	0	1859	0	0	1255	0	0	1439	0	1596
Q Serve(g_s), s	20.3	0.0	0.0	0.0	0.0	0.0	14.2	0.0	0.0	0.0	0.0	8.8
Cycle Q Clear(g_c), s	34.8	0.0	0.0	14.5	0.0	0.0	25.6	0.0	0.0	11.4	0.0	8.8
Prop In Lane	0.54		0.09	0.04		0.16	0.14		0.03	0.16		1.00
Lane Grp Cap(c), veh/h	581	0	0	967	0	0	476	0	0	539	0	558
V/C Ratio(X)	0.83	0.00	0.00	0.53	0.00	0.00	0.98	0.00	0.00	0.57	0.00	0.43
Avail Cap(c_a), veh/h	615	0	0	1021	0	0	476	0	0	539	0	558
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	1.00
Uniform Delay (d), s/veh	19.2	0.0	0.0	12.9	0.0	0.0	26.0	0.0	0.0	19.5	0.0	18.9
Incr Delay (d2), s/veh	8.5	0.0	0.0	0.2	0.0	0.0	37.1	0.0	0.0	1.4	0.0	0.5
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	13.4	0.0	0.0	9.1	0.0	0.0	19.0	0.0	0.0	7.6	0.0	5.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.6	0.0	0.0	13.1	0.0	0.0	63.1	0.0	0.0	21.0	0.0	19.5
LnGrp LOS	C	A	A	B	A	A	E	A	A	C	A	B
Approach Vol, veh/h		484			516			469				550
Approach Delay, s/veh		27.6			13.1			63.1				20.3
Approach LOS		C			B			E				C
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		43.8		32.2		43.8		32.2				
Change Period (Y+Rc), s		6.3		* 6.6		6.3		* 6.6				
Max Green Setting (Gmax), s		39.8		* 26		39.8		* 26				
Max Q Clear Time (g_c+I1), s		36.8		27.6		16.5		13.4				
Green Ext Time (p_c), s		0.7		0.0		1.8		1.7				

Intersection Summary

HCM 6th Ctrl Delay	30.2
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.



Bull Road Logistics  
5: I-83 SB Ramps & Susquehanna Trail

2029 No-Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔		↔	↔						↔	↔
Traffic Volume (vph)	0	600	208	99	316	0	0	0	0	58	3	495
Future Volume (vph)	0	600	208	99	316	0	0	0	0	58	3	495
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	11	12	12	12	12	12	12	15	12
Grade (%)		2%			0%			0%			1%	
Storage Length (ft)	0		0	50		0	0		0	0		275
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			35			25			25		
Satd. Flow (prot)	0	1539	0	1559	1607	0	0	0	0	0	1785	1335
Flt Permitted				0.146							0.954	
Satd. Flow (perm)	0	1539	0	240	1607	0	0	0	0	0	1785	1335
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		28										550
Link Speed (mph)		40			40			30				30
Link Distance (ft)		3254			450			1020				690
Travel Time (s)		55.5			7.7			23.2				15.7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	12%	11%	6%	12%	0%	0%	0%	0%	4%	33%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	898	0	110	351	0	0	0	0	0	67	550
Turn Type		NA		pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	2 1							4
Permitted Phases				2 1						4		4
Detector Phase		2		1	2 1					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		3.0						3.0	3.0	3.0
Minimum Split (s)		21.3		9.3						9.1	9.1	9.1
Total Split (s)		73.0		22.0						17.7	17.7	17.7
Total Split (%)		64.8%		19.5%						15.7%	15.7%	15.7%
Yellow Time (s)		4.0		4.0						3.2	3.2	3.2
All-Red Time (s)		2.3		2.3						2.9	2.9	2.9
Lost Time Adjust (s)		-1.0		-1.0							-1.0	0.0
Total Lost Time (s)		5.3		5.3							5.1	6.1
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		Min						None	None	None
Act Effect Green (s)		63.5		76.2	81.5						12.7	11.7
Actuated g/C Ratio		0.61		0.73	0.78						0.12	0.11
v/c Ratio		0.95		0.33	0.28						0.31	0.86
Control Delay		39.3		21.3	5.7						49.1	19.1
Queue Delay		0.0		0.0	0.9						0.0	0.0
Total Delay		39.3		21.3	6.6						49.1	19.1
LOS		D		C	A						D	B
Approach Delay		39.3			10.1						22.4	
Approach LOS		D			B						C	
Queue Length 50th (ft)		495		20	69						43	0
Queue Length 95th (ft)		#878		m71	158						90	#183
Internal Link Dist (ft)		3174			370			940			610	

Lane Group	Ø5	Ø6	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	5	6	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	35.0	59.0	18.7
Total Split (%)	31%	52%	17%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	None	Min	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			

Bull Road Logistics  
 5: I-83 SB Ramps & Susquehanna Trail

2029 No-Build PM  
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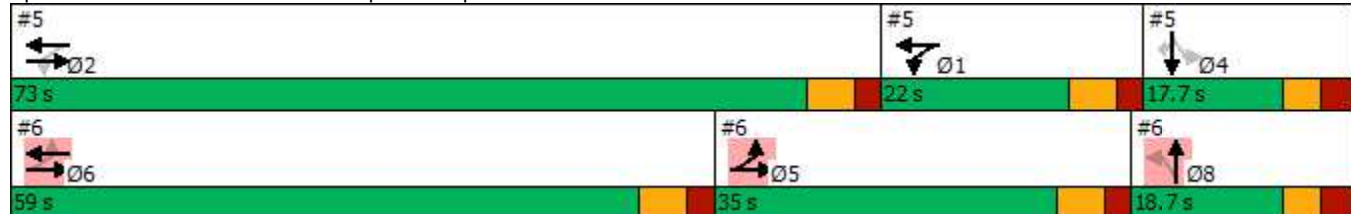


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)				50								275
Base Capacity (vph)		1012		396	1301						216	637
Starvation Cap Reductn		0		0	663						0	0
Spillback Cap Reductn		0		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.89		0.28	0.55						0.31	0.86

Intersection Summary

Area Type:	Other
Cycle Length:	112.7
Actuated Cycle Length:	104.7
Natural Cycle:	90
Control Type:	Actuated-Uncoordinated
Maximum v/c Ratio:	0.95
Intersection Signal Delay:	27.2
Intersection LOS:	C
Intersection Capacity Utilization	74.6%
ICU Level of Service	D
Analysis Period (min)	15
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.
m	Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: I-83 SB Ramps & Susquehanna Trail



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Lane Group	Ø5	Ø6	Ø8
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
6: I-83 NB Ramps & Susquehanna Trail

2029 No-Build PM  
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	457	201	0	0	229	50	183	1	126	0	0	0
Future Volume (vph)	457	201	0	0	229	50	183	1	126	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	11	12	12	12	12	12	12	16	12	12	12	12
Grade (%)		0%			2%			2%			0%	
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	35			25			25			25		
Satd. Flow (prot)	1437	1731	0	0	1652	0	0	1658	0	0	0	0
Flt Permitted	0.394							0.971				
Satd. Flow (perm)	596	1731	0	0	1652	0	0	1658	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					13			25				
Link Speed (mph)		40			40			30				30
Link Distance (ft)		450			839			925				282
Travel Time (s)		7.7			14.3			21.0				6.4
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	15%	4%	0%	0%	6%	2%	18%	100%	2%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	481	212	0	0	294	0	0	327	0	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA				
Protected Phases	5	6 5			6			8				
Permitted Phases	6 5						8					
Detector Phase	5	6 5			6		8	8				
Switch Phase												
Minimum Initial (s)	3.0				15.0		3.0	3.0				
Minimum Split (s)	9.3				21.3		9.1	9.1				
Total Split (s)	35.0				59.0		18.7	18.7				
Total Split (%)	31.1%				52.4%		16.6%	16.6%				
Yellow Time (s)	4.0				4.0		3.2	3.2				
All-Red Time (s)	2.3				2.3		2.9	2.9				
Lost Time Adjust (s)	-1.0				-1.0			-1.0				
Total Lost Time (s)	5.3				5.3			5.1				
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Recall Mode	None				Min		None	None				
Act Effct Green (s)	56.7	62.1			29.3			32.1				
Actuated g/C Ratio	0.54	0.59			0.28			0.31				
v/c Ratio	0.89	0.21			0.62			0.62				
Control Delay	23.2	4.0			36.8			38.0				
Queue Delay	0.0	0.0			0.0			0.0				
Total Delay	23.2	4.0			36.8			38.0				
LOS	C	A			D			D				
Approach Delay		17.3			36.8			38.0				
Approach LOS		B			D			D				
Queue Length 50th (ft)	120	29			171			179				
Queue Length 95th (ft)	m135	m12			231			#373				
Internal Link Dist (ft)		370			759			845			202	

Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	22.0	73.0	17.7
Total Split (%)	20%	65%	16%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	Min	None	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	50											
Base Capacity (vph)	577	1074			860			526				
Starvation Cap Reductn	0	0			0			0				
Spillback Cap Reductn	0	0			0			0				
Storage Cap Reductn	0	0			0			0				
Reduced v/c Ratio	0.83	0.20			0.34			0.62				

Intersection Summary

Area Type: Other  
 Cycle Length: 112.7  
 Actuated Cycle Length: 104.7  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.95  
 Intersection Signal Delay: 26.8 Intersection LOS: C  
 Intersection Capacity Utilization 74.6% ICU Level of Service D  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: I-83 NB Ramps & Susquehanna Trail



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Lane Group	Ø1	Ø2	Ø4
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	77	0	114	0	0	0	285	393	2	0	241	143
Future Volume (vph)	77	0	114	0	0	0	285	393	2	0	241	143
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			2%			-2%	
Link Speed (mph)		35			25			40			40	
Link Distance (ft)		1242			1074			3105			1664	
Travel Time (s)		24.2			29.3			52.9			28.4	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	4%	0%	0%	0%	0%	0%	1%	2%	0%	0%	1%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	197	0	0	0	0	0	701	0	0	395	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection												
Int Delay, s/veh	18.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	77	0	114	0	0	0	285	393	2	0	241	143
Future Vol, veh/h	77	0	114	0	0	0	285	393	2	0	241	143
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	2	-	-	-2	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	4	0	0	0	0	0	1	2	0	0	1	1
Mvmt Flow	79	0	118	0	0	0	294	405	2	0	248	147

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1316	1317	322	1375	1389	406	395	0	0	407	0	0
Stage 1	322	322	-	994	994	-	-	-	-	-	-	-
Stage 2	994	995	-	381	395	-	-	-	-	-	-	-
Critical Hdwy	7.14	6.5	6.2	7.1	6.5	6.2	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.14	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.14	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3	4	3.1	3	4	3.1	3	-	-	3	-	-
Pot Cap-1 Maneuver	145	159	764	134	144	684	879	-	-	870	-	-
Stage 1	790	655	-	328	326	-	-	-	-	-	-	-
Stage 2	324	325	-	734	608	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	96	90	764	75	82	684	879	-	-	870	-	-
Mov Cap-2 Maneuver	96	90	-	75	82	-	-	-	-	-	-	-
Stage 1	449	655	-	186	185	-	-	-	-	-	-	-
Stage 2	184	185	-	621	608	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	107.3		0		4.7		0	
HCM LOS	F		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	879	-	-	201	-	870	-
HCM Lane V/C Ratio	0.334	-	-	0.98	-	-	-
HCM Control Delay (s)	11.1	0	-	107.3	0	0	-
HCM Lane LOS	B	A	-	F	A	A	-
HCM 95th %tile Q(veh)	1.5	-	-	8.3	-	0	-

Bull Road Logistics  
8: Bull Road & Church Road

2029 No-Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	58	180	188	102	266	99	322	606	119	46	343	56
Future Volume (vph)	58	180	188	102	266	99	322	606	119	46	343	56
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	14	10	12	12	12	11	12	12	12	12	12
Grade (%)		-7%			2%			1%			0%	
Storage Length (ft)	0		5	0		5	175		0	90		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			90			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			40			35			40	
Link Distance (ft)		1991			2295			1045			638	
Travel Time (s)		38.8			39.1			20.4			10.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	1%	1%	2%	0%	2%	0%	4%	1%	9%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	435	0	0	476	0	329	739	0	47	407	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		3.0	10.0		10.0	10.0	
Minimum Split (s)	9.2	9.2		9.2	9.2		6.0	16.6		16.6	16.6	
Total Split (s)	43.0	43.0		43.0	43.0		18.0	52.4		34.4	34.4	
Total Split (%)	45.1%	45.1%		45.1%	45.1%		18.9%	54.9%		36.1%	36.1%	
Yellow Time (s)	4.8	4.8		4.8	4.8		3.0	4.0		4.0	4.0	
All-Red Time (s)	1.4	1.4		1.4	1.4		0.0	2.2		2.2	2.2	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		5.2			5.2		2.0	5.2		5.2	5.2	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Min		Min	Min	
v/c Ratio		0.65			0.90		0.78	0.89		0.41	0.83	
Control Delay		25.0			47.2		29.0	35.7		38.3	45.1	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		25.0			47.2		29.0	35.7		38.3	45.1	
Queue Length 50th (ft)		187			259		111	372		22	217	
Queue Length 95th (ft)		296			#458		#229	#612		58	#355	
Internal Link Dist (ft)		1911			2215			965			558	
Turn Bay Length (ft)							175			90		
Base Capacity (vph)		727			576		433	943		140	588	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.60			0.83		0.76	0.78		0.34	0.69	

Intersection Summary

Area Type: Other

Cycle Length: 95.4

Actuated Cycle Length: 88.2

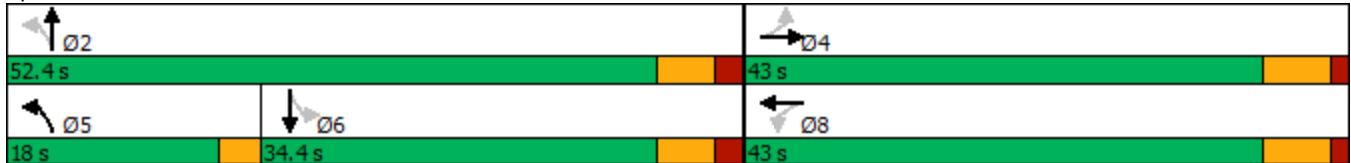
Natural Cycle: 65

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Bull Road & Church Road



Bull Road Logistics  
8: Bull Road & Church Road

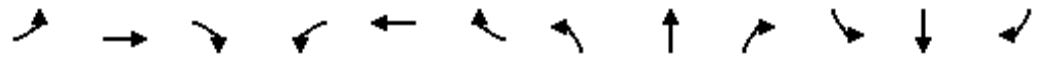
2029 No-Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	58	180	188	102	266	99	322	606	119	46	343	56
Future Volume (veh/h)	58	180	188	102	266	99	322	606	119	46	343	56
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2032	2114	2032	1764	1764	1750	1794	1766	1794	1744	1786	1674
Adj Flow Rate, veh/h	59	184	91	104	271	55	329	618	106	47	350	52
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	1	1	2	0	2	0	4	1	9
Cap, veh/h	121	349	156	154	332	63	522	796	136	235	547	81
Arrive On Green	0.32	0.33	0.33	0.32	0.33	0.33	0.16	0.54	0.53	0.36	0.36	0.35
Sat Flow, veh/h	208	1059	474	298	1007	192	1709	1469	252	680	1520	226
Grp Volume(v), veh/h	334	0	0	430	0	0	329	0	724	47	0	402
Grp Sat Flow(s),veh/h/ln	1740	0	0	1497	0	0	1709	0	1721	680	0	1745
Q Serve(g_s), s	0.0	0.0	0.0	10.0	0.0	0.0	8.7	0.0	26.9	4.7	0.0	15.5
Cycle Q Clear(g_c), s	12.1	0.0	0.0	22.1	0.0	0.0	8.7	0.0	26.9	16.4	0.0	15.5
Prop In Lane	0.18		0.27	0.24		0.13	1.00		0.15	1.00		0.13
Lane Grp Cap(c), veh/h	604	0	0	530	0	0	522	0	932	235	0	628
V/C Ratio(X)	0.55	0.00	0.00	0.81	0.00	0.00	0.63	0.00	0.78	0.20	0.00	0.64
Avail Cap(c_a), veh/h	852	0	0	736	0	0	593	0	1007	237	0	632
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.0	0.0	0.0	25.5	0.0	0.0	13.1	0.0	14.7	26.7	0.0	21.5
Incr Delay (d2), s/veh	0.8	0.0	0.0	4.8	0.0	0.0	1.8	0.0	6.3	1.9	0.0	4.9
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	8.8	0.0	0.0	12.6	0.0	0.0	5.6	0.0	16.0	1.5	0.0	10.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.8	0.0	0.0	30.3	0.0	0.0	14.9	0.0	21.0	28.6	0.0	26.4
LnGrp LOS	C	A	A	C	A	A	B	A	C	C	A	C
Approach Vol, veh/h		334			430			1053				449
Approach Delay, s/veh		22.8			30.3			19.1				26.7
Approach LOS		C			C			B				C
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		48.9		31.8	14.6	34.2		31.8				
Change Period (Y+Rc), s		* 6.2		* 6.2	3.0	* 6.2		* 6.2				
Max Green Setting (Gmax), s		* 46		* 37	15.0	* 28		* 37				
Max Q Clear Time (g_c+I1), s		28.9		14.1	11.2	17.5		24.1				
Green Ext Time (p_c), s		13.8		1.4	0.5	5.5		1.5				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				23.3								
HCM 6th LOS				C								
<b>Notes</b>												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2029 No-Build PM  
10/11/2023



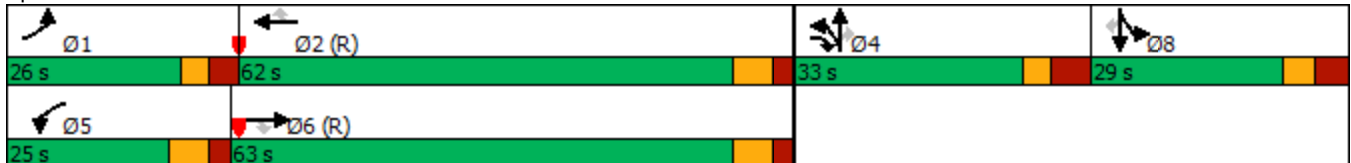
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↑↑	↗	↘	↑↑	↗
Traffic Volume (vph)	230	1767	244	119	1879	600	313	391	125	392	223	233
Future Volume (vph)	230	1767	244	119	1879	600	313	391	125	392	223	233
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		-2%			-1%			-1%			1%	
Storage Length (ft)	270		370	410		410	530		150	400		320
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	80			75			50			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			25				35
Link Distance (ft)		1907			1983			668				1750
Travel Time (s)		32.5			33.8			18.2				34.1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	1%	6%	3%	9%	5%	2%	1%	1%	3%	1%	1%	2%
Shared Lane Traffic (%)							27%			49%		
Lane Group Flow (vph)	237	1822	252	123	1937	619	236	490	129	206	428	240
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6	4	5	2		4	4		8	8	
Permitted Phases			6			2			4			8
Detector Phase	1	6	4	5	2	2	4	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	4.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	17.0	12.5	11.5	17.0	17.0	12.5	12.5	12.5	12.5	12.5	12.5
Total Split (s)	26.0	63.0	33.0	25.0	62.0	62.0	33.0	33.0	33.0	29.0	29.0	29.0
Total Split (%)	17.3%	42.0%	22.0%	16.7%	41.3%	41.3%	22.0%	22.0%	22.0%	19.3%	19.3%	19.3%
Yellow Time (s)	3.0	4.5	3.0	4.5	4.5	4.5	3.0	3.0	3.0	3.5	3.5	3.5
All-Red Time (s)	3.5	2.5	4.5	2.5	2.5	2.5	4.5	4.5	4.5	4.0	4.0	4.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.5	6.0	6.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Min	None	Min	C-Min	C-Min	None	None	None	None	None	None
v/c Ratio	0.99	0.97	0.25	0.71	1.10	0.75	0.88	0.88	0.35	0.90	0.91	0.58
Control Delay	118.3	59.5	3.1	85.6	99.4	19.6	91.6	77.6	9.8	101.3	86.9	14.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	118.3	59.5	3.1	85.6	99.4	19.6	91.6	77.6	9.8	101.3	86.9	14.7
Queue Length 50th (ft)	~240	~662	13	117	~786	187	249	258	0	220	229	13
Queue Length 95th (ft)	#422	#787	51	189	#880	358	#417	#351	55	#390	#334	101
Internal Link Dist (ft)		1827			1903			588			1670	
Turn Bay Length (ft)	270		370	410		410	530		150	400		320
Base Capacity (vph)	240	1872	1009	199	1755	820	273	570	374	229	472	415
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.97	0.25	0.62	1.10	0.75	0.86	0.86	0.34	0.90	0.91	0.58

Intersection Summary

Area Type: Other

Cycle Length: 150  
 Actuated Cycle Length: 150  
 Offset: 80 (53%), Referenced to phase 2:WBT and 6:EBT, Start of Green  
 Natural Cycle: 150  
 Control Type: Actuated-Coordinated  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Roosevelt Ave & Loucks Road



Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2029 No-Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↕	↗	↘	↕	↗
Traffic Volume (veh/h)	230	1767	244	119	1879	600	313	391	125	392	223	233
Future Volume (veh/h)	230	1767	244	119	1879	600	313	391	125	392	223	233
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1860	1789	1832	1709	1766	1809	1823	1823	1795	1780	1780	1766
Adj Flow Rate, veh/h	237	1822	193	123	1937	0	242	516	0	404	230	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	6	3	9	5	2	1	1	3	1	1	2
Cap, veh/h	242	2049	909	159	1851		289	607		508	266	
Arrive On Green	0.14	0.42	0.42	0.10	0.38	0.00	0.17	0.17	0.00	0.15	0.15	0.00
Sat Flow, veh/h	1772	4885	1552	1628	4822	1533	1736	3646	1521	3391	1780	1497
Grp Volume(v), veh/h	237	1822	193	123	1937	0	242	516	0	404	230	0
Grp Sat Flow(s),veh/h/ln	1772	1628	1552	1628	1607	1533	1736	1823	1521	1696	1780	1497
Q Serve(g_s), s	20.0	51.8	8.8	11.1	57.6	0.0	20.3	20.6	0.0	17.3	18.9	0.0
Cycle Q Clear(g_c), s	20.0	51.8	8.8	11.1	57.6	0.0	20.3	20.6	0.0	17.3	18.9	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	242	2049	909	159	1851		289	607		508	266	
V/C Ratio(X)	0.98	0.89	0.21	0.77	1.05		0.84	0.85		0.80	0.86	
Avail Cap(c_a), veh/h	242	2049	909	206	1851		307	644		509	267	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	64.5	40.3	14.7	66.0	46.2	0.0	60.6	60.7	0.0	61.6	62.3	0.0
Incr Delay (d2), s/veh	51.7	6.3	0.5	12.5	34.2	0.0	17.4	10.1	0.0	8.6	24.0	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	18.2	29.0	8.3	8.8	38.2	0.0	15.7	15.8	0.0	12.7	15.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	116.2	46.6	15.2	78.5	80.4	0.0	77.9	70.8	0.0	70.1	86.3	0.0
LnGrp LOS	F	D	B	E	F		E	E		E	F	
Approach Vol, veh/h		2252			2060			758			634	
Approach Delay, s/veh		51.2			80.3			73.1			76.0	
Approach LOS		D			F			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	26.0	63.6		31.5	20.7	68.9		28.9				
Change Period (Y+Rc), s	6.5	7.0		7.5	7.0	7.0		7.5				
Max Green Setting (Gmax), s	19.5	55.0		25.5	18.0	56.0		21.5				
Max Q Clear Time (g_c+I1), s	22.5	60.1		23.1	13.6	54.3		21.4				
Green Ext Time (p_c), s	0.0	0.0		0.8	0.1	1.6		0.0				

Intersection Summary

HCM 6th Ctrl Delay	67.4
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.  
Unsignalized Delay for [NBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



## **2029 BUILD CONDITIONS**

Bull Road Logistics  
1: Main St & Canal Rd

2029 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	107	244	57	37	220	54	69	316	31	75	278	93
Future Volume (vph)	107	244	57	37	220	54	69	316	31	75	278	93
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	15	12	10	12	12	10	12	12
Grade (%)		1%			-1%			6%				-1%
Storage Length (ft)	0		0	0		0	70		0	60		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			70			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		25			25			25				25
Link Distance (ft)		933			1422			721				620
Travel Time (s)		25.4			38.8			19.7				16.9
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Heavy Vehicles (%)	4%	7%	12%	3%	8%	6%	12%	3%	3%	8%	3%	9%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	469	0	0	358	0	79	399	0	86	427	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		15.0	15.0	
Total Split (s)	44.0	44.0		44.0	44.0		36.0	36.0		36.0	36.0	
Total Split (%)	55.0%	55.0%		55.0%	55.0%		45.0%	45.0%		45.0%	45.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
v/c Ratio		0.76			0.46		0.41	0.63		0.38	0.68	
Control Delay		22.6			13.3		23.5	21.4		21.4	22.9	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		22.6			13.3		23.5	21.4		21.4	22.9	
Queue Length 50th (ft)		118			74		19	106		20	116	
Queue Length 95th (ft)		273			166		64	232		66	253	
Internal Link Dist (ft)		853			1342			641			540	
Turn Bay Length (ft)							70			60		
Base Capacity (vph)		958			1207		309	1015		362	1011	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.49			0.30		0.26	0.39		0.24	0.42	
Intersection Summary												
Area Type:	Other											

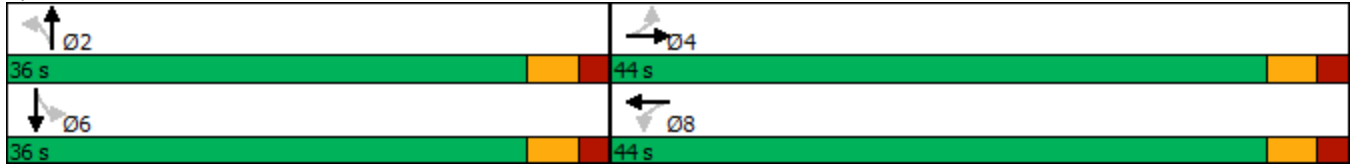
Cycle Length: 80

Actuated Cycle Length: 58

Natural Cycle: 45

Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Main St & Canal Rd



Bull Road Logistics  
1: Main St & Canal Rd

2029 Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕		↕	↕	
Traffic Volume (veh/h)	107	244	57	37	220	54	69	316	31	75	278	93
Future Volume (veh/h)	107	244	57	37	220	54	69	316	31	75	278	93
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1696	1626	1795	1792	1752	1431	1557	1557	1724	1795	1709
Adj Flow Rate, veh/h	123	280	66	43	253	62	79	363	36	86	320	107
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Percent Heavy Veh, %	4	7	12	3	8	6	12	3	3	8	3	9
Cap, veh/h	228	393	84	140	514	117	340	577	57	369	532	178
Arrive On Green	0.37	0.40	0.37	0.37	0.40	0.37	0.41	0.41	0.39	0.41	0.41	0.39
Sat Flow, veh/h	303	991	212	111	1295	295	735	1394	138	908	1287	430
Grp Volume(v), veh/h	469	0	0	358	0	0	79	0	399	86	0	427
Grp Sat Flow(s),veh/h/ln	1505	0	0	1701	0	0	735	0	1532	908	0	1717
Q Serve(g_s), s	4.6	0.0	0.0	0.0	0.0	0.0	3.9	0.0	8.7	3.4	0.0	8.2
Cycle Q Clear(g_c), s	11.4	0.0	0.0	6.8	0.0	0.0	11.6	0.0	8.7	11.7	0.0	8.2
Prop In Lane	0.26		0.14	0.12		0.17	1.00		0.09	1.00		0.25
Lane Grp Cap(c), veh/h	669	0	0	730	0	0	340	0	634	369	0	710
V/C Ratio(X)	0.70	0.00	0.00	0.49	0.00	0.00	0.23	0.00	0.63	0.23	0.00	0.60
Avail Cap(c_a), veh/h	1433	0	0	1606	0	0	593	0	1162	682	0	1302
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.1	0.0	0.0	9.8	0.0	0.0	14.0	0.0	9.8	14.2	0.0	9.8
Incr Delay (d2), s/veh	1.3	0.0	0.0	0.5	0.0	0.0	0.3	0.0	1.0	0.3	0.0	0.8
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	6.1	0.0	0.0	4.0	0.0	0.0	1.1	0.0	4.4	1.2	0.0	4.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.4	0.0	0.0	10.3	0.0	0.0	14.3	0.0	10.9	14.5	0.0	10.6
LnGrp LOS	B	A	A	B	A	A	B	A	B	B	A	B
Approach Vol, veh/h		469			358			478				513
Approach Delay, s/veh		12.4			10.3			11.5				11.2
Approach LOS		B			B			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		21.5		20.7		21.5		20.7				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		31.0		39.0		31.0		39.0				
Max Q Clear Time (g_c+I1), s		14.1		13.4		14.2		8.8				
Green Ext Time (p_c), s		2.2		2.3		2.3		1.7				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				11.4								
HCM 6th LOS				B								



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	49	364	92	89	181	105	53	171	156	98	184	21
Future Volume (vph)	49	364	92	89	181	105	53	171	156	98	184	21
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	7%	12%	3%	13%	4%	9%	3%	13%	8%	10%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	537	0	0	400	0	0	404	0	0	322	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection	
Intersection Delay, s/veh	123.4
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	49	364	92	89	181	105	53	171	156	98	184	21
Future Vol, veh/h	49	364	92	89	181	105	53	171	156	98	184	21
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, %	0	3	7	12	3	13	4	9	3	13	8	10
Mvmt Flow	52	387	98	95	193	112	56	182	166	104	196	22
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	214.6	90.4	86.3	58.9
HCM LOS	F	F	F	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	10%	24%	32%
Vol Thru, %	45%	72%	48%	61%
Vol Right, %	41%	18%	28%	7%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	380	505	375	303
LT Vol	53	49	89	98
Through Vol	171	364	181	184
RT Vol	156	92	105	21
Lane Flow Rate	404	537	399	322
Geometry Grp	1	1	1	1
Degree of Util (X)	1.018	1.384	1.029	0.879
Departure Headway (Hd)	10.342	9.496	10.57	11.209
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	356	387	347	326
Service Time	8.342	7.496	8.57	9.209
HCM Lane V/C Ratio	1.135	1.388	1.15	0.988
HCM Control Delay	86.3	214.6	90.4	58.9
HCM Lane LOS	F	F	F	F
HCM 95th-tile Q	11.9	25.8	12.1	8.1



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	540	68	16	325	58	27
Future Volume (vph)	540	68	16	325	58	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	12
Grade (%)	4%			0%	4%	
Link Speed (mph)	40			40	40	
Link Distance (ft)	1159			3081	2342	
Travel Time (s)	19.8			52.5	39.9	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	5%	1%	0%	10%	5%	7%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	707	0	0	397	98	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	2.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	540	68	16	325	58	27
Future Vol, veh/h	540	68	16	325	58	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	4	-	-	0	4	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	5	1	0	10	5	7
Mvmt Flow	628	79	19	378	67	31

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	707	0	1084
Stage 1	-	-	-	-	668
Stage 2	-	-	-	-	416
Critical Hdwy	-	-	4.3	-	7.3
Critical Hdwy Stg 1	-	-	-	-	6.25
Critical Hdwy Stg 2	-	-	-	-	6.25
Follow-up Hdwy	-	-	3	-	3.1
Pot Cap-1 Maneuver	-	-	683	-	198
Stage 1	-	-	-	-	479
Stage 2	-	-	-	-	671
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	683	-	191
Mov Cap-2 Maneuver	-	-	-	-	191
Stage 1	-	-	-	-	479
Stage 2	-	-	-	-	648

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	31.6
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	232	-	-	683	-
HCM Lane V/C Ratio	0.426	-	-	0.027	-
HCM Control Delay (s)	31.6	-	-	10.4	0
HCM Lane LOS	D	-	-	B	A
HCM 95th %tile Q(veh)	2	-	-	0.1	-



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (vph)	272	269	55	10	138	36	20	181	13	43	281	216
Future Volume (vph)	272	269	55	10	138	36	20	181	13	43	281	216
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	0		0	0		0	0		0	0		160
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	7%	4%	4%	10%	7%	44%	10%	14%	31%	58%	7%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	608	0	0	188	0	0	218	0	0	331	220
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	16.3	16.3		16.3	16.3		9.6	9.6		9.6	9.6	9.6
Total Split (s)	48.9	48.9		48.9	48.9		29.0	29.0		29.0	29.0	29.0
Total Split (%)	62.8%	62.8%		62.8%	62.8%		37.2%	37.2%		37.2%	37.2%	37.2%
Yellow Time (s)	4.3	4.3		4.3	4.3		4.3	4.3		4.3	4.3	4.3
All-Red Time (s)	2.0	2.0		2.0	2.0		2.3	2.3		2.3	2.3	2.3
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)		5.3			5.3			5.6			5.6	5.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
v/c Ratio		0.90			0.24			0.54			0.77	0.39
Control Delay		33.8			9.6			27.6			37.2	5.7
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		33.8			9.6			27.6			37.2	5.7
Queue Length 50th (ft)		229			42			86			142	0
Queue Length 95th (ft)		#452			76			156			#271	47
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)												160
Base Capacity (vph)		864			992			496			530	638
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		0.70			0.19			0.44			0.62	0.34

Intersection Summary

Area Type: Other

Cycle Length: 77.9

Actuated Cycle Length: 67.4

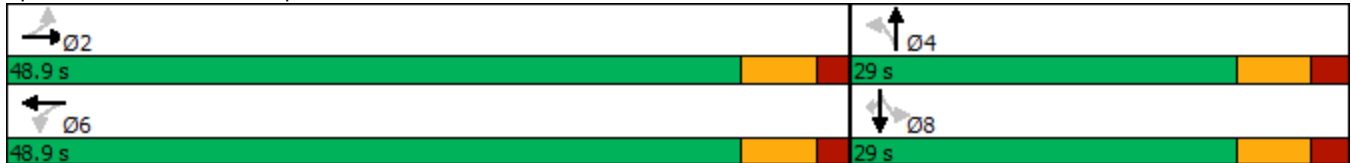
Natural Cycle: 75

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (veh/h)	272	269	55	10	138	36	20	181	13	43	281	216
Future Volume (veh/h)	272	269	55	10	138	36	20	181	13	43	281	216
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1775	1818	1818	1807	1850	1323	1609	1553	1315	1087	1812	1713
Adj Flow Rate, veh/h	278	274	56	10	141	37	20	185	13	44	287	137
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	7	4	4	10	7	44	10	14	31	58	7	14
Cap, veh/h	435	373	72	89	734	184	86	276	18	117	415	375
Arrive On Green	0.51	0.53	0.51	0.51	0.53	0.51	0.24	0.26	0.24	0.24	0.26	0.26
Sat Flow, veh/h	629	707	136	28	1390	347	35	1069	70	144	1606	1451
Grp Volume(v), veh/h	608	0	0	188	0	0	218	0	0	331	0	137
Grp Sat Flow(s),veh/h/ln	1472	0	0	1765	0	0	1175	0	0	1749	0	1451
Q Serve(g_s), s	14.3	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	4.0
Cycle Q Clear(g_c), s	17.2	0.0	0.0	2.9	0.0	0.0	9.5	0.0	0.0	8.9	0.0	4.0
Prop In Lane	0.46		0.09	0.05		0.20	0.09		0.06	0.13		1.00
Lane Grp Cap(c), veh/h	851	0	0	972	0	0	357	0	0	498	0	375
V/C Ratio(X)	0.71	0.00	0.00	0.19	0.00	0.00	0.61	0.00	0.00	0.67	0.00	0.37
Avail Cap(c_a), veh/h	1317	0	0	1530	0	0	640	0	0	833	0	664
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	1.00
Uniform Delay (d), s/veh	9.7	0.0	0.0	6.4	0.0	0.0	16.6	0.0	0.0	17.4	0.0	15.5
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	1.5	0.0	0.6
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	7.0	0.0	0.0	1.4	0.0	0.0	3.7	0.0	0.0	5.9	0.0	2.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.1	0.0	0.0	6.5	0.0	0.0	18.3	0.0	0.0	18.9	0.0	16.1
LnGrp LOS	B	A	A	A	A	A	B	A	A	B	A	B
Approach Vol, veh/h		608			188			218				468
Approach Delay, s/veh		10.1			6.5			18.3				18.1
Approach LOS		B			A			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		32.3		18.8		32.3		18.8				
Change Period (Y+Rc), s		6.3		* 6.6		6.3		* 6.6				
Max Green Setting (Gmax), s		42.6		* 22		42.6		* 22				
Max Q Clear Time (g_c+I1), s		19.2		11.5		4.9		10.9				
Green Ext Time (p_c), s		6.8		0.5		1.8		1.3				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				13.4								
HCM 6th LOS				B								
<b>Notes</b>												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Bull Road Logistics  
5: I-83 SB Ramps & Susquehanna Trail

2029 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗		↖	↖						↖	↖
Traffic Volume (vph)	0	559	168	113	277	0	0	0	0	41	2	360
Future Volume (vph)	0	559	168	113	277	0	0	0	0	41	2	360
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	11	12	12	12	12	12	12	15	12
Grade (%)		2%			0%			0%			1%	
Storage Length (ft)	0		0	50		0	0		0	0		275
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			35			25			25		
Satd. Flow (prot)	0	1485	0	1476	1513	0	0	0	0	0	1684	1228
Flt Permitted				0.160							0.954	
Satd. Flow (perm)	0	1485	0	249	1513	0	0	0	0	0	1684	1228
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		24										409
Link Speed (mph)		40			40			30				30
Link Distance (ft)		3254			450			1020				690
Travel Time (s)		55.5			7.7			23.2				15.7
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	0%	14%	24%	12%	19%	0%	0%	0%	0%	10%	50%	24%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	826	0	128	315	0	0	0	0	0	49	409
Turn Type		NA		pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	2 1							4
Permitted Phases				2 1						4		4
Detector Phase		2		1	2 1					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		3.0						3.0	3.0	3.0
Minimum Split (s)		21.3		9.3						9.1	9.1	9.1
Total Split (s)		61.0		15.7						24.0	24.0	24.0
Total Split (%)		60.6%		15.6%						23.8%	23.8%	23.8%
Yellow Time (s)		4.0		4.0						3.2	3.2	3.2
All-Red Time (s)		2.3		2.3						2.9	2.9	2.9
Lost Time Adjust (s)		-1.0		-1.0							-1.0	0.0
Total Lost Time (s)		5.3		5.3							5.1	6.1
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		Min						None	None	None
Act Effct Green (s)		55.2		65.6	70.9						15.7	14.7
Actuated g/C Ratio		0.57		0.68	0.73						0.16	0.15
v/c Ratio		0.97		0.43	0.29						0.18	0.77
Control Delay		45.4		27.7	7.4						36.5	14.6
Queue Delay		7.9		0.0	0.0						0.0	0.0
Total Delay		53.3		27.7	7.4						36.5	14.6
LOS		D		C	A						D	B
Approach Delay		53.3			13.3						16.9	
Approach LOS		D			B						B	
Queue Length 50th (ft)		483		35	91						27	0
Queue Length 95th (ft)		#749		m72	m125						58	89
Internal Link Dist (ft)		3174			370			940			610	

Lane Group	Ø5	Ø6	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	5	6	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	40.6	29.6	30.5
Total Split (%)	40%	29%	30%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	None	Min	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			

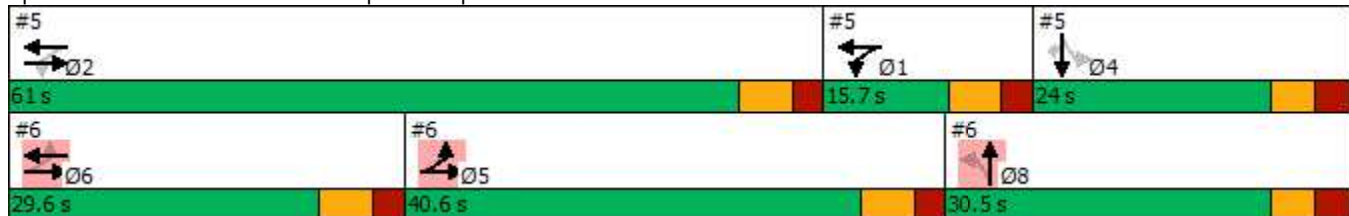


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)				50								275
Base Capacity (vph)		864		300	1096						328	560
Starvation Cap Reductn		0		0	0						0	0
Spillback Cap Reductn		38		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		1.00		0.43	0.29						0.15	0.73

Intersection Summary

Area Type: Other  
 Cycle Length: 100.7  
 Actuated Cycle Length: 97.1  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.97  
 Intersection Signal Delay: 33.4      Intersection LOS: C  
 Intersection Capacity Utilization 70.1%      ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 5: I-83 SB Ramps & Susquehanna Trail



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Lane Group	Ø5	Ø6	Ø8
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
6: I-83 NB Ramps & Susquehanna Trail

2029 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	470	138	0	0	223	44	169	1	68	0	0	0
Future Volume (vph)	470	138	0	0	223	44	169	1	68	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	11	12	12	12	12	12	12	16	12	12	12	12
Grade (%)		0%			2%			2%			0%	
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	35			25			25			25		
Satd. Flow (prot)	1425	1651	0	0	1579	0	0	1571	0	0	0	0
Flt Permitted	0.331							0.966				
Satd. Flow (perm)	496	1651	0	0	1579	0	0	1571	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					9			19				
Link Speed (mph)		40			40			30				30
Link Distance (ft)		450			839			925				282
Travel Time (s)		7.7			14.3			21.0				6.4
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	16%	9%	0%	0%	12%	2%	22%	0%	13%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	534	157	0	0	303	0	0	270	0	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA				
Protected Phases	5	6 5			6			8				
Permitted Phases	6 5						8					
Detector Phase	5	6 5			6		8	8				
Switch Phase												
Minimum Initial (s)	3.0				15.0		3.0	3.0				
Minimum Split (s)	9.3				21.3		9.1	9.1				
Total Split (s)	40.6				29.6		30.5	30.5				
Total Split (%)	40.3%				29.4%		30.3%	30.3%				
Yellow Time (s)	4.0				4.0		3.2	3.2				
All-Red Time (s)	2.3				2.3		2.9	2.9				
Lost Time Adjust (s)	-1.0				-1.0			-1.0				
Total Lost Time (s)	5.3				5.3			5.1				
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Recall Mode	None				Min		None	None				
Act Effct Green (s)	56.3	61.7			22.9			25.0				
Actuated g/C Ratio	0.58	0.64			0.24			0.26				
v/c Ratio	0.88	0.15			0.80			0.65				
Control Delay	17.6	1.5			51.4			39.0				
Queue Delay	1.4	0.0			0.0			0.0				
Total Delay	19.0	1.5			51.4			39.0				
LOS	B	A			D			D				
Approach Delay		15.0			51.4			39.0				
Approach LOS		B			D			D				
Queue Length 50th (ft)	124	8			177			145				
Queue Length 95th (ft)	m158	m9			#296			228				
Internal Link Dist (ft)		370			759			845			202	



Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	15.7	61.0	24.0
Total Split (%)	16%	61%	24%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	Min	None	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			

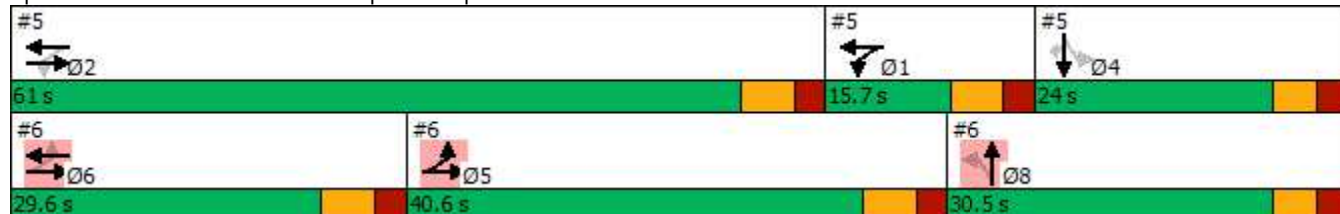


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	50											
Base Capacity (vph)	636	1080			402			433				
Starvation Cap Reductn	26	0			0			0				
Spillback Cap Reductn	0	0			0			0				
Storage Cap Reductn	0	0			0			0				
Reduced v/c Ratio	0.88	0.15			0.75			0.62				

Intersection Summary

Area Type: Other  
 Cycle Length: 100.7  
 Actuated Cycle Length: 97.1  
 Natural Cycle: 90  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.97  
 Intersection Signal Delay: 28.9      Intersection LOS: C  
 Intersection Capacity Utilization 70.1%      ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: I-83 NB Ramps & Susquehanna Trail



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Lane Group	Ø1	Ø2	Ø4
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
7: Bull Road & Hilton Ave

2029 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	136	0	207	0	0	0	41	239	0	0	390	71
Future Volume (vph)	136	0	207	0	0	0	41	239	0	0	390	71
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		0%			0%			2%			-2%	
Link Speed (mph)		35			25			40			40	
Link Distance (ft)		1242			1074			3105			1664	
Travel Time (s)		24.2			29.3			52.9			28.4	
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	0%	9%	0%	0%	8%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	386	0	0	0	0	0	315	0	0	518	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection												
Int Delay, s/veh	16											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	136	0	207	0	0	0	41	239	0	0	390	71
Future Vol, veh/h	136	0	207	0	0	0	41	239	0	0	390	71
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	2	-	-	-2	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	1	0	0	0	0	0	0	9	0	0	8	3
Mvmt Flow	153	0	233	0	0	0	46	269	0	0	438	80

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	839	839	478	956	879	269	518	0	0	269	0	0
Stage 1	478	478	-	361	361	-	-	-	-	-	-	-
Stage 2	361	361	-	595	518	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.11	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3	4	3.1	3	4	3.1	3	-	-	3	-	-
Pot Cap-1 Maneuver	319	304	622	264	288	819	796	-	-	971	-	-
Stage 1	646	559	-	754	629	-	-	-	-	-	-	-
Stage 2	753	629	-	555	536	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	302	283	622	157	268	819	796	-	-	971	-	-
Mov Cap-2 Maneuver	302	283	-	157	268	-	-	-	-	-	-	-
Stage 1	602	559	-	703	586	-	-	-	-	-	-	-
Stage 2	702	586	-	347	536	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	49.3		0		1.4		0	
HCM LOS	E		A					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	796	-	-	438	-	971	-
HCM Lane V/C Ratio	0.058	-	-	0.88	-	-	-
HCM Control Delay (s)	9.8	0	-	49.3	0	0	-
HCM Lane LOS	A	A	-	E	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	9.2	-	0	-

Bull Road Logistics  
8: Bull Road & Church Road

2029 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	38	213	350	75	119	25	133	235	68	59	583	33
Future Volume (vph)	38	213	350	75	119	25	133	235	68	59	583	33
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	14	10	12	12	12	11	12	12	12	12	12
Grade (%)		-7%			2%			1%			0%	
Storage Length (ft)	0		5	0		5	175		0	90		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			90			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			40			35			40	
Link Distance (ft)		1991			2295			1045			638	
Travel Time (s)		38.8			39.1			20.4			10.9	
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 (%)	3%	2%	3%	3%	2%	0%	8%	9%	7%	3%	5%	6%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	639	0	0	234	0	141	322	0	63	655	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		3.0	10.0		10.0	10.0	
Minimum Split (s)	9.2	9.2		9.2	9.2		6.0	16.6		16.6	16.6	
Total Split (s)	37.0	37.0		37.0	37.0		11.0	48.4		37.4	37.4	
Total Split (%)	43.3%	43.3%		43.3%	43.3%		12.9%	56.7%		43.8%	43.8%	
Yellow Time (s)	4.8	4.8		4.8	4.8		3.0	4.0		4.0	4.0	
All-Red Time (s)	1.4	1.4		1.4	1.4		0.0	2.2		2.2	2.2	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		5.2			5.2		2.0	5.2		5.2	5.2	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Min		Min	Min	
v/c Ratio		0.94			0.70		0.58	0.39		0.17	1.00	
Control Delay		45.4			35.4		21.7	13.4		19.3	63.3	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		45.4			35.4		21.7	13.4		19.3	63.3	
Queue Length 50th (ft)		280			100		36	92		22	~359	
Queue Length 95th (ft)		#498			#208		82	154		50	#584	
Internal Link Dist (ft)		1911			2215			965			558	
Turn Bay Length (ft)							175			90		
Base Capacity (vph)		712			348		247	834		379	656	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.90			0.67		0.57	0.39		0.17	1.00	

Intersection Summary

Area Type: Other

Cycle Length: 85.4

Actuated Cycle Length: 83.9

Natural Cycle: 80

Control Type: Actuated-Uncoordinated

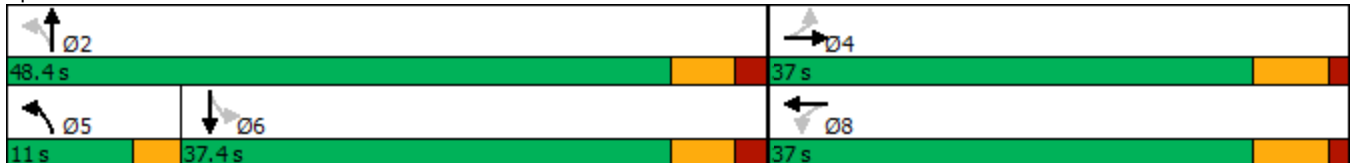
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Bull Road & Church Road



Bull Road Logistics  
8: Bull Road & Church Road

2029 Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	38	213	350	75	119	25	133	235	68	59	583	33
Future Volume (veh/h)	38	213	350	75	119	25	133	235	68	59	583	33
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2018	2114	2018	1736	1750	1778	1682	1668	1696	1758	1730	1716
Adj Flow Rate, veh/h	40	227	266	80	127	17	141	250	67	63	620	30
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
Percent Heavy Veh, %	3	2	3	3	2	0	8	9	7	3	5	6
Cap, veh/h	81	284	312	157	225	26	293	683	183	520	694	34
Arrive On Green	0.31	0.32	0.32	0.31	0.32	0.32	0.09	0.54	0.53	0.42	0.42	0.41
Sat Flow, veh/h	90	881	968	284	698	81	1602	1267	340	999	1636	79
Grp Volume(v), veh/h	533	0	0	224	0	0	141	0	317	63	0	650
Grp Sat Flow(s),veh/h/ln	1940	0	0	1062	0	0	1602	0	1607	999	0	1716
Q Serve(g_s), s	6.2	0.0	0.0	0.0	0.0	0.0	3.3	0.0	8.5	2.9	0.0	26.2
Cycle Q Clear(g_c), s	19.3	0.0	0.0	13.1	0.0	0.0	3.3	0.0	8.5	2.9	0.0	26.2
Prop In Lane	0.08		0.50	0.36		0.08	1.00		0.21	1.00		0.05
Lane Grp Cap(c), veh/h	650	0	0	393	0	0	293	0	866	520	0	728
V/C Ratio(X)	0.82	0.00	0.00	0.57	0.00	0.00	0.48	0.00	0.37	0.12	0.00	0.89
Avail Cap(c_a), veh/h	845	0	0	524	0	0	346	0	930	527	0	740
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.7	0.0	0.0	20.9	0.0	0.0	15.1	0.0	10.0	13.2	0.0	19.9
Incr Delay (d2), s/veh	5.0	0.0	0.0	1.3	0.0	0.0	1.2	0.0	1.2	0.5	0.0	15.6
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	14.1	0.0	0.0	5.8	0.0	0.0	1.9	0.0	5.1	1.2	0.0	17.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.7	0.0	0.0	22.2	0.0	0.0	16.3	0.0	11.2	13.7	0.0	35.5
LnGrp LOS	C	A	A	C	A	A	B	A	B	B	A	D
Approach Vol, veh/h		533			224			458				713
Approach Delay, s/veh		28.7			22.2			12.7				33.6
Approach LOS		C			C			B				C
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		45.4		29.2	8.5	36.9		29.2				
Change Period (Y+Rc), s		* 6.2		* 6.2	3.0	* 6.2		* 6.2				
Max Green Setting (Gmax), s		* 42		* 31	8.0	* 31		* 31				
Max Q Clear Time (g_c+I1), s		10.5		21.3	5.8	28.2		15.1				
Green Ext Time (p_c), s		9.7		1.7	0.1	2.5		0.8				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				26.0								
HCM 6th LOS				C								
<b>Notes</b>												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												



Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2029 Build AM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	259	1440	166	178	1360	363	164	172	71	512	308	212
Future Volume (vph)	259	1440	166	178	1360	363	164	172	71	512	308	212
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Grade (%)		-2%			-1%			-1%			1%	
Storage Length (ft)	270		370	410		410	530		150	400		320
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	80			75			50			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			25				35
Link Distance (ft)		1907			1983			690				1750
Travel Time (s)		32.5			33.8			18.8				34.1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	7%	13%	8%	18%	14%	5%	8%	3%	27%	4%	5%	6%
Shared Lane Traffic (%)							33%			48%		
Lane Group Flow (vph)	273	1516	175	187	1432	382	116	238	75	280	583	223
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6	4	5	2		4	4		8	8	
Permitted Phases			6			2			4			8
Detector Phase	1	6	4	5	2	2	4	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	4.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	17.0	12.5	11.5	17.0	17.0	12.5	12.5	12.5	12.5	12.5	12.5
Total Split (s)	31.0	50.0	22.0	23.0	42.0	42.0	22.0	22.0	22.0	30.0	30.0	30.0
Total Split (%)	24.8%	40.0%	17.6%	18.4%	33.6%	33.6%	17.6%	17.6%	17.6%	24.0%	24.0%	24.0%
Yellow Time (s)	3.0	4.5	3.0	4.5	4.5	4.5	3.0	3.0	3.0	3.5	3.5	3.5
All-Red Time (s)	3.5	2.5	4.5	2.5	2.5	2.5	4.5	4.5	4.5	4.0	4.0	4.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.5	6.0	6.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Min	None	None	C-Min	C-Min	None	None	None	None	None	None
v/c Ratio	0.87	0.98	0.22	0.94	1.11	0.54	0.69	0.66	0.23	0.96	0.97	0.48
Control Delay	75.6	59.1	4.7	104.8	102.4	6.5	74.6	62.0	1.6	94.0	81.5	9.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	75.6	59.1	4.7	104.8	102.4	6.5	74.6	62.0	1.6	94.0	81.5	9.4
Queue Length 50th (ft)	213	441	13	152	~497	0	100	101	0	~251	~273	0
Queue Length 95th (ft)	#357	#554	50	#299	#594	79	#185	149	0	#452	#396	71
Internal Link Dist (ft)		1827			1903			610			1670	
Turn Bay Length (ft)	270		370	410		410	530		150	400		320
Base Capacity (vph)	329	1545	816	198	1289	703	179	387	341	291	598	461
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.83	0.98	0.21	0.94	1.11	0.54	0.65	0.61	0.22	0.96	0.97	0.48

Intersection Summary

Area Type: Other  
Cycle Length: 125

Actuated Cycle Length: 125

Offset: 76 (61%), Referenced to phase 2:WBT and 6:EBT, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

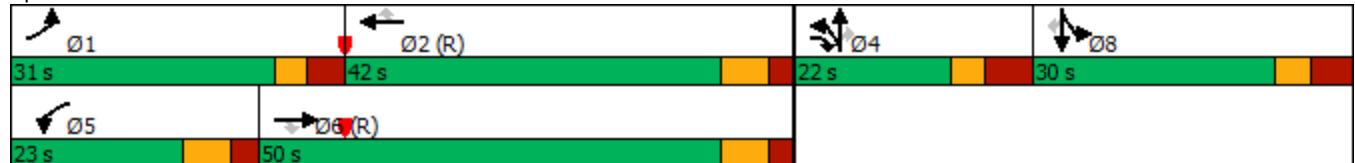
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 9: Roosevelt Ave & Loucks Road



Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2029 Build AM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↕	↗	↘	↕	↗
Traffic Volume (veh/h)	259	1440	166	178	1360	363	164	172	71	512	308	212
Future Volume (veh/h)	259	1440	166	178	1360	363	164	172	71	512	308	212
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1775	1690	1761	1581	1638	1766	1724	1795	1453	1738	1724	1710
Adj Flow Rate, veh/h	273	1516	133	187	1432	0	118	258	0	539	324	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	7	13	8	18	14	5	8	3	27	4	5	6
Cap, veh/h	315	1727	710	205	1467		167	364		622	324	
Arrive On Green	0.19	0.37	0.37	0.14	0.33	0.00	0.10	0.10	0.00	0.19	0.19	0.00
Sat Flow, veh/h	1690	4613	1492	1506	4472	1497	1641	3589	1232	3311	1724	1449
Grp Volume(v), veh/h	273	1516	133	187	1432	0	118	258	0	539	324	0
Grp Sat Flow(s),veh/h/ln	1690	1538	1492	1506	1491	1497	1641	1795	1232	1655	1724	1449
Q Serve(g_s), s	19.6	38.3	6.4	15.3	39.6	0.0	8.7	8.7	0.0	19.7	23.5	0.0
Cycle Q Clear(g_c), s	19.6	38.3	6.4	15.3	39.6	0.0	8.7	8.7	0.0	19.7	23.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	315	1727	710	205	1467		167	364		622	324	
V/C Ratio(X)	0.87	0.88	0.19	0.91	0.98		0.71	0.71		0.87	1.00	
Avail Cap(c_a), veh/h	345	1727	710	205	1467		204	445		622	324	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	49.3	36.4	18.8	53.3	41.5	0.0	54.4	54.4	0.0	49.2	50.7	0.0
Incr Delay (d2), s/veh	18.9	6.7	0.6	39.6	18.5	0.0	8.4	4.0	0.0	12.3	49.9	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	14.9	21.2	5.0	12.6	23.2	0.0	7.2	7.5	0.0	14.1	20.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	68.2	43.1	19.4	92.9	60.0	0.0	62.8	58.3	0.0	61.5	100.6	0.0
LnGrp LOS	E	D	B	F	E		E	E		E	F	
Approach Vol, veh/h		1922			1619			376			863	
Approach Delay, s/veh		45.0			63.8			59.7			76.2	
Approach LOS		D			E			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	28.8	47.0		19.2	23.0	52.8		30.0				
Change Period (Y+Rc), s	6.5	7.0		7.5	7.0	7.0		7.5				
Max Green Setting (Gmax), s	24.5	35.0		14.5	16.0	43.0		22.5				
Max Q Clear Time (g_c+I1), s	22.1	42.1		11.2	17.8	40.8		26.0				
Green Ext Time (p_c), s	0.2	0.0		0.5	0.0	2.1		0.0				

Intersection Summary

HCM 6th Ctrl Delay	58.2
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.  
Unsignalized Delay for [NBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	10	65	212	113	238	42
Future Volume (vph)	10	65	212	113	238	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	0%			2%	-2%	
Storage Length (ft)	0	0	250			0
Storage Lanes	1	0	1			0
Taper Length (ft)	25		25			
Link Speed (mph)	25			40	40	
Link Distance (ft)	166			2038	1106	
Travel Time (s)	4.5			34.7	18.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	28%	9%	8%	5%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	83	0	236	126	311	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	4.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔		↔	↑	↑	
Traffic Vol, veh/h	10	65	212	113	238	42
Future Vol, veh/h	10	65	212	113	238	42
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	-	250	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	2	-2	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	28	9	8	5	0
Mvmt Flow	11	72	236	126	264	47

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	886	288	311	0	0
Stage 1	288	-	-	-	-
Stage 2	598	-	-	-	-
Critical Hdwy	6.4	7.4	4.4	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3	3.3	3.1	-	-
Pot Cap-1 Maneuver	351	687	905	-	-
Stage 1	876	-	-	-	-
Stage 2	621	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	259	687	905	-	-
Mov Cap-2 Maneuver	259	-	-	-	-
Stage 1	647	-	-	-	-
Stage 2	621	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.5	6.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	905	-	563	-	-
HCM Lane V/C Ratio	0.26	-	0.148	-	-
HCM Control Delay (s)	10.4	-	12.5	-	-
HCM Lane LOS	B	-	B	-	-
HCM 95th %tile Q(veh)	1	-	0.5	-	-

Bull Road Logistics  
1: Main St & Canal Rd

2029 Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	136	200	85	54	254	62	74	401	67	80	411	139
Future Volume (vph)	136	200	85	54	254	62	74	401	67	80	411	139
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	15	12	10	12	12	10	12	12
Grade (%)		1%			-1%			6%			-1%	
Storage Length (ft)	0		0	0		0	70		0	60		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			70			25		
Right Turn on Red			No			No			No			No
Link Speed (mph)		25			25			25				25
Link Distance (ft)		933			1422			721				620
Travel Time (s)		25.4			38.8			19.7				16.9
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	4%	2%	4%	0%	3%	3%	4%	1%	0%	3%	2%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	443	0	0	389	0	78	493	0	84	579	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	8.0	8.0		8.0	8.0		15.0	15.0		15.0	15.0	
Total Split (s)	36.0	36.0		36.0	36.0		34.0	34.0		34.0	34.0	
Total Split (%)	51.4%	51.4%		51.4%	51.4%		48.6%	48.6%		48.6%	48.6%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		4.0			4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Min	Min		Min	Min	
v/c Ratio		0.82			0.52		0.52	0.69		0.39	0.81	
Control Delay		30.3			15.9		29.9	21.5		20.3	27.4	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		30.3			15.9		29.9	21.5		20.3	27.4	
Queue Length 50th (ft)		154			112		24	165		24	207	
Queue Length 95th (ft)		#312			185		#80	268		62	#378	
Internal Link Dist (ft)		853			1342			641			540	
Turn Bay Length (ft)							70			60		
Base Capacity (vph)		677			940		184	873		263	878	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.65			0.41		0.42	0.56		0.32	0.66	
Intersection Summary												
Area Type:	Other											

Cycle Length: 70

Actuated Cycle Length: 61.1

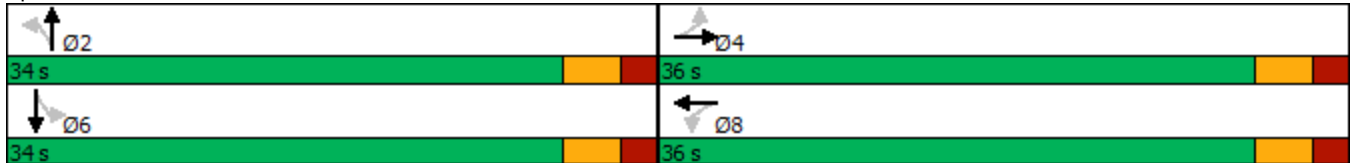
Natural Cycle: 45

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 1: Main St & Canal Rd



Bull Road Logistics  
1: Main St & Canal Rd

2029 Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	136	200	85	54	254	62	74	401	67	80	411	139
Future Volume (veh/h)	136	200	85	54	254	62	74	401	67	80	411	139
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1738	1766	1738	1837	1866	1795	1543	1585	1599	1795	1809	1795
Adj Flow Rate, veh/h	143	211	89	57	267	65	78	422	71	84	433	146
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	4	2	4	0	3	3	4	1	0	3	2	3
Cap, veh/h	238	290	109	140	478	108	286	618	104	340	605	204
Arrive On Green	0.35	0.37	0.35	0.35	0.37	0.35	0.47	0.47	0.45	0.47	0.47	0.45
Sat Flow, veh/h	385	775	292	156	1279	288	689	1323	223	867	1294	436
Grp Volume(v), veh/h	443	0	0	389	0	0	78	0	493	84	0	579
Grp Sat Flow(s),veh/h/ln	1452	0	0	1723	0	0	689	0	1545	867	0	1730
Q Serve(g_s), s	4.9	0.0	0.0	0.0	0.0	0.0	5.1	0.0	12.6	4.2	0.0	13.6
Cycle Q Clear(g_c), s	13.9	0.0	0.0	9.0	0.0	0.0	18.2	0.0	12.6	16.3	0.0	13.6
Prop In Lane	0.32		0.20	0.15		0.17	1.00		0.14	1.00		0.25
Lane Grp Cap(c), veh/h	609	0	0	692	0	0	286	0	722	340	0	809
V/C Ratio(X)	0.73	0.00	0.00	0.56	0.00	0.00	0.27	0.00	0.68	0.25	0.00	0.72
Avail Cap(c_a), veh/h	965	0	0	1119	0	0	374	0	919	450	0	1029
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.2	0.0	0.0	12.8	0.0	0.0	17.8	0.0	10.6	16.7	0.0	10.9
Incr Delay (d2), s/veh	1.7	0.0	0.0	0.7	0.0	0.0	0.5	0.0	1.5	0.4	0.0	1.7
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	7.8	0.0	0.0	6.0	0.0	0.0	1.4	0.0	6.8	1.4	0.0	8.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.9	0.0	0.0	13.5	0.0	0.0	18.3	0.0	12.0	17.1	0.0	12.6
LnGrp LOS	B	A	A	B	A	A	B	A	B	B	A	B
Approach Vol, veh/h		443			389			571				663
Approach Delay, s/veh		15.9			13.5			12.9				13.2
Approach LOS		B			B			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		27.6		22.9		27.6		22.9				
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0				
Max Green Setting (Gmax), s		29.0		31.0		29.0		31.0				
Max Q Clear Time (g_c+I1), s		20.7		15.9		18.8		11.0				
Green Ext Time (p_c), s		1.9		1.9		2.5		1.7				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				13.7								
HCM 6th LOS				B								





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	28	323	64	96	316	64	167	229	86	133	224	69
Future Volume (vph)	28	323	64	96	316	64	167	229	86	133	224	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	2%	5%	0%	2%	27%	1%	8%	2%	11%	8%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	442	0	0	506	0	0	513	0	0	452	0
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection	
Intersection Delay, s/veh	184.3
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	28	323	64	96	316	64	167	229	86	133	224	69
Future Vol, veh/h	28	323	64	96	316	64	167	229	86	133	224	69
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, %	0	2	5	0	2	27	1	8	2	11	8	1
Mvmt Flow	30	344	68	102	336	68	178	244	91	141	238	73
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	142.5	207.3	215.3	164.4
HCM LOS	F	F	F	F

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	35%	7%	20%	31%
Vol Thru, %	48%	78%	66%	53%
Vol Right, %	18%	15%	13%	16%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	482	415	476	426
LT Vol	167	28	96	133
Through Vol	229	323	316	224
RT Vol	86	64	64	69
Lane Flow Rate	513	441	506	453
Geometry Grp	1	1	1	1
Degree of Util (X)	1.364	1.167	1.344	1.227
Departure Headway (Hd)	11.922	12.528	11.938	12.575
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	308	296	309	295
Service Time	9.922	10.528	9.938	10.575
HCM Lane V/C Ratio	1.666	1.49	1.638	1.536
HCM Control Delay	215.3	142.5	207.3	164.4
HCM Lane LOS	F	F	F	F
HCM 95th-tile Q	21.1	14.6	20.4	16.2



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↻			↻	↻	
Traffic Volume (vph)	466	107	52	487	41	40
Future Volume (vph)	466	107	52	487	41	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	10	12
Grade (%)	4%			0%	4%	
Link Speed (mph)	40			40	40	
Link Distance (ft)	1159			3081	2342	
Travel Time (s)	19.8			52.5	39.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	6%	1%	0%	6%	0%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	585	0	0	550	83	0
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection						
Int Delay, s/veh	2.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	466	107	52	487	41	40
Future Vol, veh/h	466	107	52	487	41	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	4	-	-	0	4	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	6	1	0	6	0	3
Mvmt Flow	476	109	53	497	42	41

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	585	0	1134
Stage 1	-	-	-	-	531
Stage 2	-	-	-	-	603
Critical Hdwy	-	-	4.3	-	7.3
Critical Hdwy Stg 1	-	-	-	-	6.2
Critical Hdwy Stg 2	-	-	-	-	6.2
Follow-up Hdwy	-	-	3	-	3.1
Pot Cap-1 Maneuver	-	-	754	-	182
Stage 1	-	-	-	-	580
Stage 2	-	-	-	-	527
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	754	-	164
Mov Cap-2 Maneuver	-	-	-	-	164
Stage 1	-	-	-	-	580
Stage 2	-	-	-	-	476

Approach	EB	WB	NB
HCM Control Delay, s	0	1	26.6
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	248	-	-	754	-
HCM Lane V/C Ratio	0.333	-	-	0.07	-
HCM Control Delay (s)	26.6	-	-	10.1	0
HCM Lane LOS	D	-	-	B	A
HCM 95th %tile Q(veh)	1.4	-	-	0.2	-

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 Build PM  
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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (vph)	262	155	39	20	354	71	57	336	10	43	222	324
Future Volume (vph)	262	155	39	20	354	71	57	336	10	43	222	324
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	0		0	0		0	0		0	0		160
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	9%	3%	0%	10%	2%	24%	0%	5%	30%	28%	7%	6%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	530	0	0	518	0	0	469	0	0	308	377
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		2			6			4			8	
Permitted Phases	2			6			4			8		8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	3.0
Minimum Split (s)	16.3	16.3		16.3	16.3		9.6	9.6		9.6	9.6	9.6
Total Split (s)	46.1	46.1		46.1	46.1		32.2	32.2		32.2	32.2	32.2
Total Split (%)	58.9%	58.9%		58.9%	58.9%		41.1%	41.1%		41.1%	41.1%	41.1%
Yellow Time (s)	4.3	4.3		4.3	4.3		4.3	4.3		4.3	4.3	4.3
All-Red Time (s)	2.0	2.0		2.0	2.0		2.3	2.3		2.3	2.3	2.3
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)		5.3			5.3			5.6			5.6	5.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Min	Min		Min	Min		None	None		None	None	None
v/c Ratio		1.20			0.63			1.05			0.68	0.51
Control Delay		133.1			17.6			85.3			31.6	4.9
Queue Delay		0.0			0.0			0.0			0.0	0.0
Total Delay		133.1			17.6			85.3			31.6	4.9
Queue Length 50th (ft)		~319			169			~254			127	0
Queue Length 95th (ft)		#471			250			#401			204	47
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)												160
Base Capacity (vph)		441			825			446			450	746
Starvation Cap Reductn		0			0			0			0	0
Spillback Cap Reductn		0			0			0			0	0
Storage Cap Reductn		0			0			0			0	0
Reduced v/c Ratio		1.20			0.63			1.05			0.68	0.51

Intersection Summary

Area Type: Other

Cycle Length: 78.3

Actuated Cycle Length: 78.3

Natural Cycle: 100

Control Type: Actuated-Uncoordinated

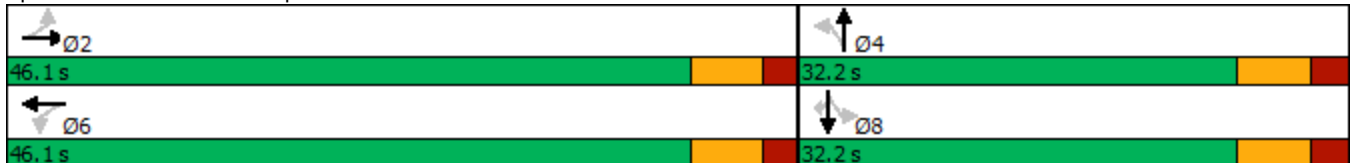
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Volume (veh/h)	262	155	39	20	354	71	57	336	10	43	222	324
Future Volume (veh/h)	262	155	39	20	354	71	57	336	10	43	222	324
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1747	1832	1875	1807	1921	1608	1750	1680	1329	1514	1812	1826
Adj Flow Rate, veh/h	305	180	45	23	412	83	66	391	12	50	258	268
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	9	3	0	10	2	24	0	5	30	28	7	6
Cap, veh/h	362	179	43	69	795	156	88	358	10	101	439	526
Arrive On Green	0.51	0.52	0.51	0.51	0.52	0.51	0.33	0.34	0.33	0.33	0.34	0.34
Sat Flow, veh/h	556	343	83	39	1526	299	106	1053	30	140	1292	1548
Grp Volume(v), veh/h	530	0	0	518	0	0	469	0	0	308	0	268
Grp Sat Flow(s),veh/h/ln	983	0	0	1864	0	0	1189	0	0	1432	0	1548
Q Serve(g_s), s	25.2	0.0	0.0	0.0	0.0	0.0	13.3	0.0	0.0	0.0	0.0	10.8
Cycle Q Clear(g_c), s	39.8	0.0	0.0	14.6	0.0	0.0	25.6	0.0	0.0	12.3	0.0	10.8
Prop In Lane	0.58		0.08	0.04		0.16	0.14		0.03	0.16		1.00
Lane Grp Cap(c), veh/h	572	0	0	996	0	0	441	0	0	522	0	526
V/C Ratio(X)	0.93	0.00	0.00	0.52	0.00	0.00	1.06	0.00	0.00	0.59	0.00	0.51
Avail Cap(c_a), veh/h	572	0	0	996	0	0	441	0	0	522	0	526
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	1.00
Uniform Delay (d), s/veh	21.6	0.0	0.0	12.5	0.0	0.0	27.5	0.0	0.0	20.8	0.0	20.6
Incr Delay (d2), s/veh	21.0	0.0	0.0	0.2	0.0	0.0	60.5	0.0	0.0	1.8	0.0	0.8
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	18.1	0.0	0.0	9.2	0.0	0.0	22.8	0.0	0.0	8.0	0.0	6.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.5	0.0	0.0	12.8	0.0	0.0	88.0	0.0	0.0	22.6	0.0	21.5
LnGrp LOS	D	A	A	B	A	A	F	A	A	C	A	C
Approach Vol, veh/h		530			518			469				576
Approach Delay, s/veh		42.5			12.8			88.0				22.0
Approach LOS		D			B			F				C
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		46.1		32.2		46.1		32.2				
Change Period (Y+Rc), s		6.3		* 6.6		6.3		* 6.6				
Max Green Setting (Gmax), s		39.8		* 26		39.8		* 26				
Max Q Clear Time (g_c+I1), s		41.8		27.6		16.6		14.3				
Green Ext Time (p_c), s		0.0		0.0		5.3		1.7				

Intersection Summary

HCM 6th Ctrl Delay	39.7
HCM 6th LOS	D

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
5: I-83 SB Ramps & Susquehanna Trail

2029 Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	636	208	99	317	0	0	0	0	58	3	516
Future Volume (vph)	0	636	208	99	317	0	0	0	0	58	3	516
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	11	12	12	12	12	12	12	15	12
Grade (%)		2%			0%			0%			1%	
Storage Length (ft)	0		0	50		0	0		0	0		275
Storage Lanes	0		0	1		0	0		0	0		1
Taper Length (ft)	25			35			25			25		
Satd. Flow (prot)	0	1521	0	1559	1607	0	0	0	0	0	1801	1312
Flt Permitted				0.133							0.954	
Satd. Flow (perm)	0	1521	0	218	1607	0	0	0	0	0	1801	1312
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26										573
Link Speed (mph)		40			40			30				30
Link Distance (ft)		3254			450			1020				690
Travel Time (s)		55.5			7.7			23.2				15.7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	14%	11%	6%	12%	0%	0%	0%	0%	3%	33%	16%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	938	0	110	352	0	0	0	0	0	67	573
Turn Type		NA		pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	2 1							4
Permitted Phases				2 1						4		4
Detector Phase		2		1	2 1					4	4	4
Switch Phase												
Minimum Initial (s)		15.0		3.0						3.0	3.0	3.0
Minimum Split (s)		21.3		9.3						9.1	9.1	9.1
Total Split (s)		73.0		22.0						17.7	17.7	17.7
Total Split (%)		64.8%		19.5%						15.7%	15.7%	15.7%
Yellow Time (s)		4.0		4.0						3.2	3.2	3.2
All-Red Time (s)		2.3		2.3						2.9	2.9	2.9
Lost Time Adjust (s)		-1.0		-1.0							-1.0	0.0
Total Lost Time (s)		5.3		5.3							5.1	6.1
Lead/Lag		Lead		Lag								
Lead-Lag Optimize?		Yes		Yes								
Recall Mode		None		Min						None	None	None
Act Effect Green (s)		67.7		80.5	85.8						12.6	11.6
Actuated g/C Ratio		0.62		0.74	0.79						0.12	0.11
v/c Ratio		0.98		0.35	0.28						0.32	0.88
Control Delay		45.9		23.5	5.7						49.6	20.3
Queue Delay		1.6		0.0	0.8						0.0	0.0
Total Delay		47.5		23.5	6.5						49.6	20.3
LOS		D		C	A						D	C
Approach Delay		47.5			10.5						23.3	
Approach LOS		D			B						C	
Queue Length 50th (ft)		565		20	69						43	0
Queue Length 95th (ft)		#962		m79	160						91	#191
Internal Link Dist (ft)		3174			370			940			610	



Lane Group	Ø5	Ø6	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	5	6	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	35.0	59.0	18.7
Total Split (%)	31%	52%	17%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	None	Min	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			

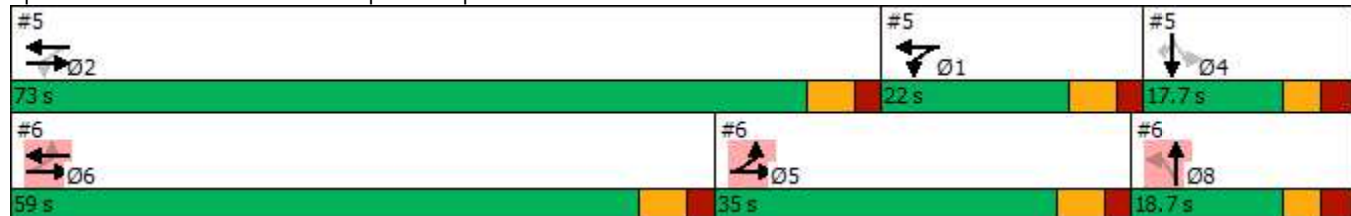


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)				50								275
Base Capacity (vph)		956		374	1324						208	651
Starvation Cap Reductn		0		0	663						0	0
Spillback Cap Reductn		8		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.99		0.29	0.53						0.32	0.88

**Intersection Summary**

Area Type: Other  
 Cycle Length: 112.7  
 Actuated Cycle Length: 108.8  
 Natural Cycle: 100  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.98  
 Intersection Signal Delay: 31.5      Intersection LOS: C  
 Intersection Capacity Utilization 76.6%      ICU Level of Service D  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

**Splits and Phases: 5: I-83 SB Ramps & Susquehanna Trail**



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Lane Group	Ø5	Ø6	Ø8
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Bull Road Logistics  
6: I-83 NB Ramps & Susquehanna Trail

2029 Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	489	205	0	0	230	50	183	1	126	0	0	0
Future Volume (vph)	489	205	0	0	230	50	183	1	126	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	11	12	12	12	12	12	12	16	12	12	12	12
Grade (%)		0%			2%			2%			0%	
Storage Length (ft)	50		0	0		0	0		0	0		0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (ft)	35			25			25			25		
Satd. Flow (prot)	1413	1748	0	0	1652	0	0	1672	0	0	0	0
Flt Permitted	0.384							0.971				
Satd. Flow (perm)	571	1748	0	0	1652	0	0	1672	0	0	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					13			25				
Link Speed (mph)		40			40			30				30
Link Distance (ft)		450			839			925				282
Travel Time (s)		7.7			14.3			21.0				6.4
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	17%	3%	0%	0%	6%	2%	17%	0%	2%	0%	0%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	515	216	0	0	295	0	0	327	0	0	0	0
Turn Type	pm+pt	NA			NA		Perm	NA				
Protected Phases	5	6 5			6			8				
Permitted Phases	6 5						8					
Detector Phase	5	6 5			6		8	8				
Switch Phase												
Minimum Initial (s)	3.0				15.0		3.0	3.0				
Minimum Split (s)	9.3				21.3		9.1	9.1				
Total Split (s)	35.0				59.0		18.7	18.7				
Total Split (%)	31.1%				52.4%		16.6%	16.6%				
Yellow Time (s)	4.0				4.0		3.2	3.2				
All-Red Time (s)	2.3				2.3		2.9	2.9				
Lost Time Adjust (s)	-1.0				-1.0			-1.0				
Total Lost Time (s)	5.3				5.3			5.1				
Lead/Lag	Lag				Lead							
Lead-Lag Optimize?	Yes				Yes							
Recall Mode	None				Min		None	None				
Act Effct Green (s)	59.0	64.3			30.0			34.1				
Actuated g/C Ratio	0.54	0.59			0.28			0.31				
v/c Ratio	0.96	0.21			0.63			0.61				
Control Delay	32.8	4.5			38.2			37.6				
Queue Delay	0.0	0.0			0.0			0.0				
Total Delay	32.8	4.5			38.2			37.6				
LOS	C	A			D			D				
Approach Delay		24.5			38.2			37.6				
Approach LOS		C			D			D				
Queue Length 50th (ft)	172	34			172			179				
Queue Length 95th (ft)	m146	m10			234			#370				
Internal Link Dist (ft)		370			759			845			202	

Lane Group	Ø1	Ø2	Ø4
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Grade (%)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	1	2	4
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	3.0	15.0	3.0
Minimum Split (s)	9.3	21.3	9.1
Total Split (s)	22.0	73.0	17.7
Total Split (%)	20%	65%	16%
Yellow Time (s)	4.0	4.0	3.2
All-Red Time (s)	2.3	2.3	2.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	
Recall Mode	Min	None	None
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (ft)			
Queue Length 95th (ft)			
Internal Link Dist (ft)			

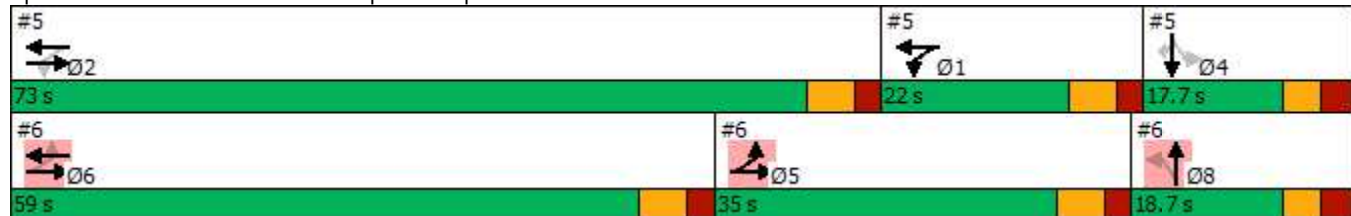


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Bay Length (ft)	50											
Base Capacity (vph)	543	1044			821			540				
Starvation Cap Reductn	0	0			0			0				
Spillback Cap Reductn	0	0			0			0				
Storage Cap Reductn	0	0			0			0				
Reduced v/c Ratio	0.95	0.21			0.36			0.61				

Intersection Summary

Area Type: Other  
 Cycle Length: 112.7  
 Actuated Cycle Length: 108.8  
 Natural Cycle: 100  
 Control Type: Actuated-Uncoordinated  
 Maximum v/c Ratio: 0.98  
 Intersection Signal Delay: 30.6 Intersection LOS: C  
 Intersection Capacity Utilization 76.6% ICU Level of Service D  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: I-83 NB Ramps & Susquehanna Trail



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Lane Group	Ø1	Ø2	Ø4
Turn Bay Length (ft)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	87	0	114	0	0	0	285	425	2	0	310	176
Future Volume (vph)	87	0	114	0	0	0	285	425	2	0	310	176
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			2%			-2%	
Link Speed (mph)		35			25			40			40	
Link Distance (ft)		1242			1074			3105			1664	
Travel Time (s)		24.2			29.3			52.9			28.4	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	0%	0%	0%	0%	0%	1%	6%	0%	0%	5%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	208	0	0	0	0	0	734	0	0	501	0
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized



Intersection												
Int Delay, s/veh	40.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	87	0	114	0	0	0	285	425	2	0	310	176
Future Vol, veh/h	87	0	114	0	0	0	285	425	2	0	310	176
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	2	-	-	-2	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	3	0	0	0	0	0	1	6	0	0	5	1
Mvmt Flow	90	0	118	0	0	0	294	438	2	0	320	181

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1438	1439	411	1497	1528	439	501	0	0	440	0	0
Stage 1	411	411	-	1027	1027	-	-	-	-	-	-	-
Stage 2	1027	1028	-	470	501	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.5	6.2	7.1	6.5	6.2	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.13	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3	4	3.1	3	4	3.1	3	-	-	3	-	-
Pot Cap-1 Maneuver	119	134	679	110	119	655	807	-	-	847	-	-
Stage 1	704	598	-	313	314	-	-	-	-	-	-	-
Stage 2	311	314	-	654	546	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	~ 74	69	679	57	62	655	807	-	-	847	-	-
Mov Cap-2 Maneuver	~ 74	69	-	57	62	-	-	-	-	-	-	-
Stage 1	365	598	-	162	163	-	-	-	-	-	-	-
Stage 2	161	163	-	541	546	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	264.1	0	4.8	0
HCM LOS	F	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	807	-	-	150	-	847	-
HCM Lane V/C Ratio	0.364	-	-	1.381	-	-	-
HCM Control Delay (s)	12	0	-	264.1	0	0	-
HCM Lane LOS	B	A	-	F	A	A	-
HCM 95th %tile Q(veh)	1.7	-	-	13.1	-	0	-

Notes  
 ~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Bull Road Logistics  
8: Bull Road & Church Road

2029 Build PM  
10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (vph)	59	180	188	102	266	99	322	637	119	46	408	60
Future Volume (vph)	59	180	188	102	266	99	322	637	119	46	408	60
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	14	10	12	12	12	11	12	12	12	12	12
Grade (%)		-7%			2%			1%			0%	
Storage Length (ft)	0		5	0		5	175		0	90		0
Storage Lanes	0		0	0		0	1		0	1		0
Taper Length (ft)	25			25			90			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		35			40			35			40	
Link Distance (ft)		1991			2295			1045			638	
Travel Time (s)		38.8			39.1			20.4			10.9	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	2%	2%	2%	1%	1%	2%	0%	4%	0%	4%	5%	8%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	436	0	0	476	0	329	771	0	47	477	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		Perm	NA	
Protected Phases		4			8		5	2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	3.0	3.0		3.0	3.0		3.0	10.0		10.0	10.0	
Minimum Split (s)	9.2	9.2		9.2	9.2		6.0	16.6		16.6	16.6	
Total Split (s)	43.0	43.0		43.0	43.0		18.0	52.4		34.4	34.4	
Total Split (%)	45.1%	45.1%		45.1%	45.1%		18.9%	54.9%		36.1%	36.1%	
Yellow Time (s)	4.8	4.8		4.8	4.8		3.0	4.0		4.0	4.0	
All-Red Time (s)	1.4	1.4		1.4	1.4		0.0	2.2		2.2	2.2	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)		5.2			5.2		2.0	5.2		5.2	5.2	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Min		Min	Min	
v/c Ratio		0.67			0.94		0.86	0.91		0.42	0.93	
Control Delay		26.7			55.2		41.3	38.6		39.8	58.5	
Queue Delay		0.0			0.0		0.0	0.0		0.0	0.0	
Total Delay		26.7			55.2		41.3	38.6		39.8	58.5	
Queue Length 50th (ft)		189			262		125	407		22	273	
Queue Length 95th (ft)		299			#464		#281	#665		60	#468	
Internal Link Dist (ft)		1911			2215			965			558	
Turn Bay Length (ft)							175			90		
Base Capacity (vph)		683			537		388	879		119	540	
Starvation Cap Reductn		0			0		0	0		0	0	
Spillback Cap Reductn		0			0		0	0		0	0	
Storage Cap Reductn		0			0		0	0		0	0	
Reduced v/c Ratio		0.64			0.89		0.85	0.88		0.39	0.88	

Intersection Summary

Area Type: Other

Cycle Length: 95.4

Actuated Cycle Length: 92

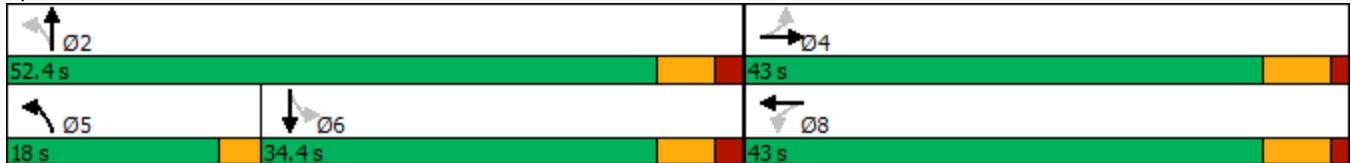
Natural Cycle: 80

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 8: Bull Road & Church Road



Bull Road Logistics  
8: Bull Road & Church Road

2029 Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘		↗	↘	
Traffic Volume (veh/h)	59	180	188	102	266	99	322	637	119	46	408	60
Future Volume (veh/h)	59	180	188	102	266	99	322	637	119	46	408	60
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2032	2114	2032	1764	1764	1750	1794	1738	1794	1744	1730	1688
Adj Flow Rate, veh/h	60	184	91	104	271	55	329	650	106	47	416	56
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	1	1	2	0	4	0	4	5	8
Cap, veh/h	121	345	154	152	330	63	463	793	129	208	545	73
Arrive On Green	0.32	0.33	0.33	0.32	0.33	0.33	0.15	0.54	0.53	0.37	0.37	0.35
Sat Flow, veh/h	210	1045	468	297	1001	190	1709	1458	238	660	1493	201
Grp Volume(v), veh/h	335	0	0	430	0	0	329	0	756	47	0	472
Grp Sat Flow(s),veh/h/ln	1724	0	0	1489	0	0	1709	0	1695	660	0	1694
Q Serve(g_s), s	0.0	0.0	0.0	10.3	0.0	0.0	8.9	0.0	30.3	5.2	0.0	20.3
Cycle Q Clear(g_c), s	12.5	0.0	0.0	22.8	0.0	0.0	8.9	0.0	30.3	20.2	0.0	20.3
Prop In Lane	0.18		0.27	0.24		0.13	1.00		0.14	1.00		0.12
Lane Grp Cap(c), veh/h	599	0	0	527	0	0	463	0	923	208	0	618
V/C Ratio(X)	0.56	0.00	0.00	0.82	0.00	0.00	0.71	0.00	0.82	0.23	0.00	0.76
Avail Cap(c_a), veh/h	827	0	0	716	0	0	529	0	969	208	0	618
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	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.5	0.0	0.0	26.1	0.0	0.0	15.0	0.0	15.5	29.7	0.0	23.1
Incr Delay (d2), s/veh	0.8	0.0	0.0	5.3	0.0	0.0	3.8	0.0	8.1	2.5	0.0	8.7
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	9.0	0.0	0.0	13.0	0.0	0.0	6.1	0.0	17.9	1.7	0.0	13.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.3	0.0	0.0	31.4	0.0	0.0	18.8	0.0	23.6	32.2	0.0	31.8
LnGrp LOS	C	A	A	C	A	A	B	A	C	C	A	C
Approach Vol, veh/h		335			430			1085				519
Approach Delay, s/veh		23.3			31.4			22.2				31.9
Approach LOS		C			C			C				C
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		50.1		32.4	14.8	35.3		32.4				
Change Period (Y+Rc), s		* 6.2		* 6.2	3.0	* 6.2		* 6.2				
Max Green Setting (Gmax), s		* 46		* 37	15.0	* 28		* 37				
Max Q Clear Time (g_c+I1), s		32.3		14.5	11.4	22.3		24.8				
Green Ext Time (p_c), s		11.6		1.4	0.4	3.8		1.4				

Intersection Summary

HCM 6th Ctrl Delay	26.1
HCM 6th LOS	C

Notes

\* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2029 Build PM  
10/11/2023



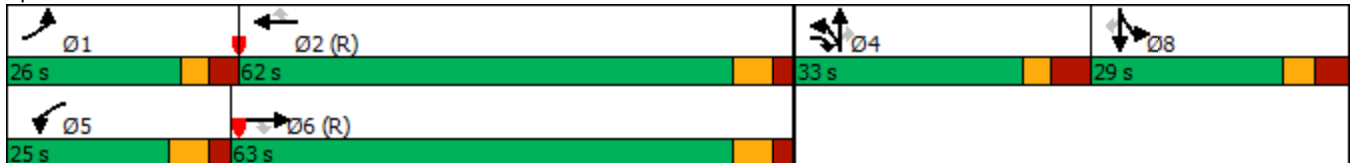
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	237	1767	244	119	1879	617	313	396	125	428	238	240
Future Volume (vph)	237	1767	244	119	1879	617	313	396	125	428	238	240
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		-2%			-1%			-1%			1%	
Storage Length (ft)	270		370	410		410	530		150	400		320
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	80			75			50			75		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		40			40			25				35
Link Distance (ft)		1907			1983			668				1750
Travel Time (s)		32.5			33.8			18.2				34.1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	4%	6%	2%	8%	5%	3%	1%	1%	3%	3%	1%	5%
Shared Lane Traffic (%)							27%			49%		
Lane Group Flow (vph)	244	1822	252	123	1937	636	236	495	129	225	461	247
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Split	NA	Perm	Split	NA	Perm
Protected Phases	1	6	4	5	2		4	4		8	8	
Permitted Phases			6			2			4			8
Detector Phase	1	6	4	5	2	2	4	4	4	8	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	5.0	4.5	10.0	10.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	11.5	17.0	12.5	11.5	17.0	17.0	12.5	12.5	12.5	12.5	12.5	12.5
Total Split (s)	26.0	63.0	33.0	25.0	62.0	62.0	33.0	33.0	33.0	29.0	29.0	29.0
Total Split (%)	17.3%	42.0%	22.0%	16.7%	41.3%	41.3%	22.0%	22.0%	22.0%	19.3%	19.3%	19.3%
Yellow Time (s)	3.0	4.5	3.0	4.5	4.5	4.5	3.0	3.0	3.0	3.5	3.5	3.5
All-Red Time (s)	3.5	2.5	4.5	2.5	2.5	2.5	4.5	4.5	4.5	4.0	4.0	4.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.5	6.0	6.5	6.0	6.0	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Recall Mode	None	C-Min	None	Min	C-Min	C-Min	None	None	None	None	None	None
v/c Ratio	1.07	0.98	0.25	0.70	1.10	0.78	0.88	0.88	0.35	0.98	0.97	0.60
Control Delay	140.0	61.7	3.5	85.0	99.4	21.8	91.2	78.3	9.8	117.1	96.2	16.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	140.0	61.7	3.5	85.0	99.4	21.8	91.2	78.3	9.8	117.1	96.2	16.1
Queue Length 50th (ft)	~265	~659	16	117	~786	214	249	262	0	245	250	19
Queue Length 95th (ft)	#445	#787	55	188	#880	395	#417	#358	55	#441	#375	111
Internal Link Dist (ft)		1827			1903			588			1670	
Turn Bay Length (ft)	270		370	410		410	530		150	400		320
Base Capacity (vph)	227	1854	1009	201	1755	813	273	570	374	229	477	411
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.07	0.98	0.25	0.61	1.10	0.78	0.86	0.87	0.34	0.98	0.97	0.60

Intersection Summary

Area Type: Other

Cycle Length: 150  
 Actuated Cycle Length: 150  
 Offset: 80 (53%), Referenced to phase 2:WBT and 6:EBT, Start of Green  
 Natural Cycle: 140  
 Control Type: Actuated-Coordinated  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 9: Roosevelt Ave & Loucks Road



Bull Road Logistics  
9: Roosevelt Ave & Loucks Road

2029 Build PM  
10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↘	↑↑↑	↗	↘	↑↑↑	↗	↘	↕	↗	↘	↕	↗
Traffic Volume (veh/h)	237	1767	244	119	1879	617	313	396	125	428	238	240
Future Volume (veh/h)	237	1767	244	119	1879	617	313	396	125	428	238	240
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1818	1789	1846	1724	1766	1795	1823	1823	1795	1752	1780	1724
Adj Flow Rate, veh/h	244	1822	193	123	1937	0	244	519	0	441	245	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	4	6	2	8	5	3	1	1	3	3	1	5
Cap, veh/h	237	2047	917	160	1847		290	609		501	267	
Arrive On Green	0.14	0.42	0.42	0.10	0.38	0.00	0.17	0.17	0.00	0.15	0.15	0.00
Sat Flow, veh/h	1731	4885	1564	1641	4822	1521	1736	3646	1521	3338	1780	1461
Grp Volume(v), veh/h	244	1822	193	123	1937	0	244	519	0	441	245	0
Grp Sat Flow(s),veh/h/ln	1731	1628	1564	1641	1607	1521	1736	1823	1521	1669	1780	1461
Q Serve(g_s), s	20.5	51.8	8.7	11.0	57.4	0.0	20.4	20.7	0.0	19.4	20.3	0.0
Cycle Q Clear(g_c), s	20.5	51.8	8.7	11.0	57.4	0.0	20.4	20.7	0.0	19.4	20.3	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	237	2047	917	160	1847		290	609		501	267	
V/C Ratio(X)	1.03	0.89	0.21	0.77	1.05		0.84	0.85		0.88	0.92	
Avail Cap(c_a), veh/h	237	2047	917	208	1847		307	644		501	267	
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	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	64.8	40.4	14.7	66.1	46.3	0.0	60.5	60.7	0.0	62.4	62.8	0.0
Incr Delay (d2), s/veh	66.9	6.3	0.5	12.2	35.1	0.0	17.9	10.3	0.0	16.5	34.0	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	19.6	29.0	8.3	8.8	38.4	0.0	15.9	15.9	0.0	14.4	17.3	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	131.6	46.7	15.2	78.2	81.4	0.0	78.4	71.0	0.0	79.0	96.9	0.0
LnGrp LOS	F	D	B	E	F		E	E		E	F	
Approach Vol, veh/h		2259			2060			763			686	
Approach Delay, s/veh		53.2			81.2			73.3			85.4	
Approach LOS		D			F			E			F	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	26.0	63.4		31.6	20.6	68.9		29.0				
Change Period (Y+Rc), s	6.5	7.0		7.5	7.0	7.0		7.5				
Max Green Setting (Gmax), s	19.5	55.0		25.5	18.0	56.0		21.5				
Max Q Clear Time (g_c+I1), s	23.0	59.9		23.2	13.5	54.3		22.8				
Green Ext Time (p_c), s	0.0	0.0		0.8	0.1	1.6		0.0				

Intersection Summary

HCM 6th Ctrl Delay	69.7
HCM 6th LOS	E

Notes

User approved volume balancing among the lanes for turning movement.  
Unsignalized Delay for [NBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	39	209	85	236	217	12
Future Volume (vph)	39	209	85	236	217	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Grade (%)	0%			2%	-2%	
Storage Length (ft)	0	0	250			0
Storage Lanes	1	0	1			0
Taper Length (ft)	25		25			
Link Speed (mph)	25			40	40	
Link Distance (ft)	197			2126	915	
Travel Time (s)	5.4			36.2	15.6	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	14%	36%	3%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	275	0	94	262	254	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized



Intersection						
Int Delay, s/veh	5.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	39	209	85	236	217	12
Future Vol, veh/h	39	209	85	236	217	12
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	-	250	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	2	-2	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	14	36	3	2	0
Mvmt Flow	43	232	94	262	241	13

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	698	248	254	0	0
Stage 1	248	-	-	-	-
Stage 2	450	-	-	-	-
Critical Hdwy	6.4	7.2	4.6	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3	3.1	3.3	-	-
Pot Cap-1 Maneuver	458	785	884	-	-
Stage 1	916	-	-	-	-
Stage 2	733	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	409	785	884	-	-
Mov Cap-2 Maneuver	409	-	-	-	-
Stage 1	819	-	-	-	-
Stage 2	733	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	13.7	2.5	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	884	-	686	-	-
HCM Lane V/C Ratio	0.107	-	0.402	-	-
HCM Control Delay (s)	9.6	-	13.7	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.4	-	1.9	-	-

## **2029 BUILD WITH IMPROVEMENTS**

Bull Road Logistics  
2: Bull Rd & Canal Rd

2029 Build AM with Improvements

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	49	364	92	89	181	105	53	171	156	98	184	21
Future Volume (vph)	49	364	92	89	181	105	53	171	156	98	184	21
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	3%	7%	12%	3%	13%	4%	9%	3%	13%	8%	10%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	537	0	0	400	0	0	404	0	0	322	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Total Split (s)	31.0	31.0		31.0	31.0		29.0	29.0		29.0	29.0	
Total Split (%)	51.7%	51.7%		51.7%	51.7%		48.3%	48.3%		48.3%	48.3%	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)		6.0			6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
v/c Ratio		0.86			0.88			0.76			0.71	
Control Delay		32.0			40.1			27.6			26.6	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		32.0			40.1			27.6			26.6	
Queue Length 50th (ft)		164			123			124			95	
Queue Length 95th (ft)		#326			#273			#261			#216	
Internal Link Dist (ft)		3155			1079			1098			965	
Turn Bay Length (ft)												
Base Capacity (vph)		685			497			535			453	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.78			0.80			0.76			0.71	

Intersection Summary

Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 58  
 Natural Cycle: 60

Lanes, Volumes, Timings  
Langan

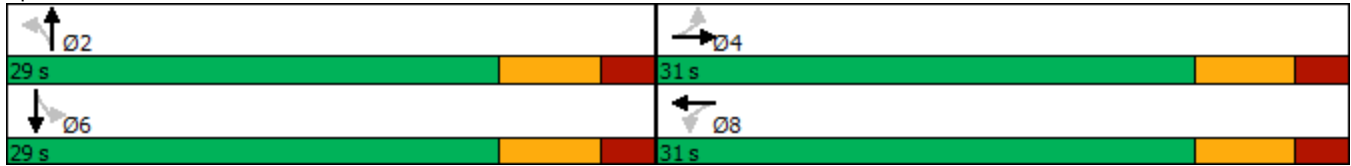
Lanes, Volumes, Timings

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Bull Rd & Canal Rd



Bull Road Logistics  
2: Bull Rd & Canal Rd

2029 Build AM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	49	364	92	89	181	105	53	171	156	98	184	21
Future Volume (veh/h)	49	364	92	89	181	105	53	171	156	98	184	21
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1837	1795	1738	1609	1736	1595	1722	1651	1736	1690	1761	1732
Adj Flow Rate, veh/h	52	387	98	95	193	112	56	182	166	104	196	22
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
Percent Heavy Veh, %	0	3	7	12	3	13	4	9	3	13	8	10
Cap, veh/h	108	481	116	163	275	140	125	304	248	229	397	40
Arrive On Green	0.36	0.38	0.36	0.36	0.38	0.36	0.39	0.41	0.39	0.39	0.41	0.39
Sat Flow, veh/h	100	1271	306	221	728	369	128	744	608	353	970	97
Grp Volume(v), veh/h	537	0	0	400	0	0	404	0	0	322	0	0
Grp Sat Flow(s),veh/h/ln	1677	0	0	1318	0	0	1479	0	0	1421	0	0
Q Serve(g_s), s	1.2	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	16.7	0.0	0.0	15.5	0.0	0.0	12.3	0.0	0.0	9.3	0.0	0.0
Prop In Lane	0.10		0.18	0.24		0.28	0.14		0.41	0.32		0.07
Lane Grp Cap(c), veh/h	675	0	0	554	0	0	651	0	0	640	0	0
V/C Ratio(X)	0.80	0.00	0.00	0.72	0.00	0.00	0.62	0.00	0.00	0.50	0.00	0.00
Avail Cap(c_a), veh/h	782	0	0	642	0	0	651	0	0	640	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	16.1	0.0	0.0	15.4	0.0	0.0	13.7	0.0	0.0	12.5	0.0	0.0
Incr Delay (d2), s/veh	5.0	0.0	0.0	3.4	0.0	0.0	4.4	0.0	0.0	2.8	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	10.3	0.0	0.0	7.7	0.0	0.0	7.7	0.0	0.0	5.4	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.1	0.0	0.0	18.8	0.0	0.0	18.1	0.0	0.0	15.3	0.0	0.0
LnGrp LOS	C	A	A	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h		537			400			404				322
Approach Delay, s/veh		21.1			18.8			18.1				15.3
Approach LOS		C			B			B				B
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		29.0		27.3		29.0		27.3				
Change Period (Y+Rc), s		7.0		7.0		7.0		7.0				
Max Green Setting (Gmax), s		22.0		24.0		22.0		24.0				
Max Q Clear Time (g_c+I1), s		14.3		18.7		11.3		17.5				
Green Ext Time (p_c), s		1.5		1.6		1.4		1.4				

Intersection Summary

HCM 6th Ctrl Delay	18.7
HCM 6th LOS	B

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 Build AM with Improvements

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	272	269	55	10	138	36	20	181	13	43	281	216
Future Volume (vph)	272	269	55	10	138	36	20	181	13	43	281	216
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	350		0	0		0	0		0	0		160
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	7%	4%	4%	10%	7%	44%	10%	14%	31%	58%	7%	14%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	278	330	0	0	188	0	0	218	0	0	331	220
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Perm	NA	pm+ov
Protected Phases	5	2			6			4			8	5
Permitted Phases	6			6			4			8		8
Detector Phase	5	2		6	6		4	4		8	8	5
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	5.0
Minimum Split (s)	12.0	18.0		18.0	18.0		9.6	9.6		9.6	9.6	12.0
Total Split (s)	20.0	50.0		30.0	30.0		40.0	40.0		40.0	40.0	20.0
Total Split (%)	22.2%	55.6%		33.3%	33.3%		44.4%	44.4%		44.4%	44.4%	22.2%
Yellow Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	4.5
All-Red Time (s)	2.5	3.5		3.5	3.5		2.5	2.5		2.5	2.5	2.5
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	6.0	7.0			7.0			5.0			5.0	6.0
Lead/Lag	Lead			Lag	Lag							Lead
Lead-Lag Optimize?	Yes			Yes	Yes							Yes
Recall Mode	None	Min		Min	Min		None	None		None	None	None
v/c Ratio	0.50	0.41			0.61			0.50			0.71	0.25
Control Delay	15.4	14.1			35.7			23.0			29.4	1.8
Queue Delay	0.0	0.0			0.0			0.0			0.0	0.0
Total Delay	15.4	14.1			35.7			23.0			29.4	1.8
Queue Length 50th (ft)	61	78			70			69			114	0
Queue Length 95th (ft)	151	186			159			148			231	26
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)	350											160
Base Capacity (vph)	598	1092			514			733			779	924
Starvation Cap Reductn	0	0			0			0			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.46	0.30			0.37			0.30			0.42	0.24

Intersection Summary

Area Type: Other

Lanes, Volumes, Timings  
Langan

Lanes, Volumes, Timings

Cycle Length: 90

Actuated Cycle Length: 67.3

Natural Cycle: 55

Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Susquehanna Trail & Canal Rd



Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 Build AM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	272	269	55	10	138	36	20	181	13	43	281	216
Future Volume (veh/h)	272	269	55	10	138	36	20	181	13	43	281	216
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1775	1818	1818	1807	1850	1323	1609	1553	1315	1087	1812	1713
Adj Flow Rate, veh/h	278	274	56	10	141	37	20	185	13	44	287	137
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	7	4	4	10	7	44	10	14	31	58	7	14
Cap, veh/h	703	744	152	81	290	73	85	285	19	116	420	642
Arrive On Green	0.18	0.51	0.49	0.19	0.21	0.19	0.24	0.26	0.24	0.24	0.26	0.26
Sat Flow, veh/h	1690	1464	299	39	1372	346	37	1091	72	144	1609	1451
Grp Volume(v), veh/h	278	0	330	188	0	0	218	0	0	331	0	137
Grp Sat Flow(s),veh/h/ln	1690	0	1764	1757	0	0	1200	0	0	1753	0	1451
Q Serve(g_s), s	6.2	0.0	5.9	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	3.0
Cycle Q Clear(g_c), s	6.2	0.0	5.9	4.9	0.0	0.0	9.4	0.0	0.0	9.0	0.0	3.0
Prop In Lane	1.00		0.17	0.05		0.20	0.09		0.06	0.13		1.00
Lane Grp Cap(c), veh/h	703	0	896	411	0	0	366	0	0	503	0	642
V/C Ratio(X)	0.40	0.00	0.37	0.46	0.00	0.00	0.60	0.00	0.00	0.66	0.00	0.21
Avail Cap(c_a), veh/h	852	0	1458	807	0	0	949	0	0	1195	0	1240
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	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.5	0.0	7.8	18.2	0.0	0.0	16.7	0.0	0.0	17.5	0.0	8.9
Incr Delay (d2), s/veh	0.4	0.0	0.1	0.3	0.0	0.0	1.6	0.0	0.0	1.5	0.0	0.2
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	2.8	3.2	0.0	0.0	3.8	0.0	0.0	6.0	0.0	1.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	11.8	0.0	7.9	18.5	0.0	0.0	18.3	0.0	0.0	19.0	0.0	9.1
LnGrp LOS	B	A	A	B	A	A	B	A	A	B	A	A
Approach Vol, veh/h		608			188			218			468	
Approach Delay, s/veh		9.7			18.5			18.3			16.1	
Approach LOS		A			B			B			B	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		33.4		18.6	15.4	18.0		18.6				
Change Period (Y+Rc), s		8.0		6.0	7.0	8.0		6.0				
Max Green Setting (Gmax), s		42.0		34.0	13.0	22.0		34.0				
Max Q Clear Time (g_c+I1), s		7.9		11.4	8.2	6.9		11.0				
Green Ext Time (p_c), s		3.4		0.7	0.4	1.3		1.6				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				14.1								
HCM 6th LOS				B								



Bull Road Logistics  
7: Bull Road & Hilton Ave

2029 Build AM with Improvements

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘			↕	
Traffic Volume (vph)	136	0	207	0	0	0	41	239	0	0	390	71
Future Volume (vph)	136	0	207	0	0	0	41	239	0	0	390	71
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Grade (%)		0%			0%			2%			-2%	
Storage Length (ft)	0		0	0		0	275		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			Yes			No
Link Speed (mph)		35			25			40				40
Link Distance (ft)		1242			1074			3105				1664
Travel Time (s)		24.2			29.3			52.9				28.4
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Heavy Vehicles (%)	1%	0%	0%	0%	0%	0%	0%	9%	0%	0%	8%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	386	0	0	0	0	46	269	0	0	518	0
Turn Type	Perm	NA					D.P+P	NA			NA	
Protected Phases		4			8		5	2				6
Permitted Phases	4			8			6			6		
Detector Phase	4	4		8	8		5	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	15.0	15.0		15.0	15.0		15.0	23.5		15.0	15.0	
Total Split (s)	23.0	23.0		23.0	23.0		15.0	37.0		22.0	22.0	
Total Split (%)	38.3%	38.3%		38.3%	38.3%		25.0%	61.7%		36.7%	36.7%	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.5	4.5		4.5	4.5	
All-Red Time (s)	3.0	3.0		3.0	3.0		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0			-1.0	
Total Lost Time (s)		6.0			6.0		6.0	6.0			6.0	
Lead/Lag							Lead			Lag	Lag	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode	None	None		None	None		None	Max		Max	Max	
v/c Ratio		0.95					0.13	0.32			0.83	
Control Delay		59.3					8.4	9.7			36.6	
Queue Delay		0.0					0.0	0.0			0.0	
Total Delay		59.3					8.4	9.7			36.6	
Queue Length 50th (ft)		136					8	51			~213	
Queue Length 95th (ft)		#283					20	92			#382	
Internal Link Dist (ft)		1162			994			3025			1584	
Turn Bay Length (ft)							275					
Base Capacity (vph)		406					401	844			627	
Starvation Cap Reductn		0					0	0			0	
Spillback Cap Reductn		0					0	0			0	
Storage Cap Reductn		0					0	0			0	
Reduced v/c Ratio		0.95					0.11	0.32			0.83	

Intersection Summary

Area Type: Other

Cycle Length: 60

Lanes, Volumes, Timings  
Langan

Lanes, Volumes, Timings

Actuated Cycle Length: 60

Natural Cycle: 80

Control Type: Semi Act-Uncoord

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: Bull Road & Hilton Ave



Bull Road Logistics  
7: Bull Road & Hilton Ave

2029 Build AM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘			↕	
Traffic Volume (veh/h)	136	0	207	0	0	0	41	239	0	0	390	71
Future Volume (veh/h)	136	0	207	0	0	0	41	239	0	0	390	71
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1786	1800	1800	1800	1800	1800	1778	1651	1778	1875	1761	1832
Adj Flow Rate, veh/h	153	0	233	0	0	0	46	269	0	0	438	80
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Percent Heavy Veh, %	1	0	0	0	0	0	0	9	0	0	8	3
Cap, veh/h	233	16	252	0	510	0	287	853	0	0	515	94
Arrive On Green	0.27	0.00	0.27	0.00	0.00	0.00	0.06	0.52	0.00	0.00	0.36	0.34
Sat Flow, veh/h	527	56	888	0	1800	0	1693	1651	0	0	1449	265
Grp Volume(v), veh/h	386	0	0	0	0	0	46	269	0	0	0	518
Grp Sat Flow(s),veh/h/ln	1472	0	0	0	1800	0	1693	1651	0	0	0	1713
Q Serve(g_s), s	14.2	0.0	0.0	0.0	0.0	0.0	1.0	5.6	0.0	0.0	0.0	16.8
Cycle Q Clear(g_c), s	15.6	0.0	0.0	0.0	0.0	0.0	1.0	5.6	0.0	0.0	0.0	16.8
Prop In Lane	0.40		0.60	0.00		0.00	1.00		0.00	0.00		0.15
Lane Grp Cap(c), veh/h	476	0	0	0	510	0	287	853	0	0	0	609
V/C Ratio(X)	0.81	0.00	0.00	0.00	0.00	0.00	0.16	0.32	0.00	0.00	0.00	0.85
Avail Cap(c_a), veh/h	476	0	0	0	510	0	438	853	0	0	0	609
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	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	21.4	0.0	0.0	0.0	0.0	0.0	13.0	8.4	0.0	0.0	0.0	17.9
Incr Delay (d2), s/veh	10.2	0.0	0.0	0.0	0.0	0.0	0.3	1.0	0.0	0.0	0.0	14.0
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	10.3	0.0	0.0	0.0	0.0	0.0	0.6	3.1	0.0	0.0	0.0	12.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	31.6	0.0	0.0	0.0	0.0	0.0	13.2	9.3	0.0	0.0	0.0	31.9
LnGrp LOS	C	A	A	A	A	A	B	A	A	A	A	C
Approach Vol, veh/h		386			0			315			518	
Approach Delay, s/veh		31.6			0.0			9.9			31.9	
Approach LOS		C						A			C	
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		37.0		23.0	9.7	27.3		23.0				
Change Period (Y+Rc), s		7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s		30.0		16.0	8.0	15.0		16.0				
Max Q Clear Time (g_c+I1), s		7.6		17.6	3.0	18.8		0.0				
Green Ext Time (p_c), s		1.4		0.0	0.0	0.0		0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				26.1								
HCM 6th LOS				C								

Bull Road Logistics  
2: Bull Rd & Canal Rd

2029 Build PM with Improvements

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	28	323	64	96	316	64	167	229	86	133	224	69
Future Volume (vph)	28	323	64	96	316	64	167	229	86	133	224	69
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	12	12	12	12	10	12	12	10	12
Grade (%)		-1%			2%			2%			-2%	
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		3235			1159			1178			1045	
Travel Time (s)		55.1			19.8			20.1			17.8	
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 (%)	0%	2%	5%	0%	2%	27%	1%	8%	2%	11%	8%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	442	0	0	506	0	0	513	0	0	452	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	25.0	25.0		25.0	25.0		25.0	25.0		25.0	25.0	
Total Split (s)	27.0	27.0		27.0	27.0		33.0	33.0		33.0	33.0	
Total Split (%)	45.0%	45.0%		45.0%	45.0%		55.0%	55.0%		55.0%	55.0%	
Yellow Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
All-Red Time (s)	2.5	2.5		2.5	2.5		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)		-1.0			-1.0			-1.0			-1.0	
Total Lost Time (s)		6.0			6.0			6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
v/c Ratio		0.77			1.17			1.04			0.90	
Control Delay		29.2			120.7			72.1			40.1	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		29.2			120.7			72.1			40.1	
Queue Length 50th (ft)		139			~225			~207			137	
Queue Length 95th (ft)		#275			#387			#370			#311	
Internal Link Dist (ft)		3155			1079			1098			965	
Turn Bay Length (ft)												
Base Capacity (vph)		571			434			494			502	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.77			1.17			1.04			0.90	

**Intersection Summary**  
 Area Type: Other  
 Cycle Length: 60  
 Actuated Cycle Length: 60  
 Natural Cycle: 100

Control Type: Actuated-Uncoordinated

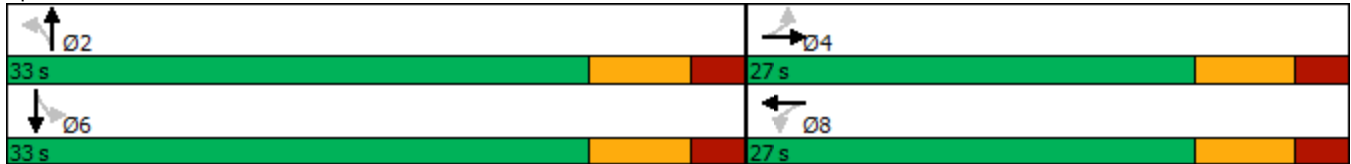
~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 2: Bull Rd & Canal Rd



Bull Road Logistics  
2: Bull Rd & Canal Rd

2029 Build PM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	28	323	64	96	316	64	167	229	86	133	224	69
Future Volume (veh/h)	28	323	64	96	316	64	167	229	86	133	224	69
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1837	1809	1766	1778	1750	1399	1764	1665	1750	1718	1761	1860
Adj Flow Rate, veh/h	30	344	68	102	336	68	178	244	91	141	238	73
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
Percent Heavy Veh, %	0	2	5	0	2	27	1	8	2	11	8	1
Cap, veh/h	85	484	92	150	360	68	241	282	95	217	332	91
Arrive On Green	0.33	0.35	0.33	0.33	0.35	0.33	0.43	0.45	0.43	0.43	0.45	0.43
Sat Flow, veh/h	59	1382	262	222	1029	194	355	626	212	307	738	201
Grp Volume(v), veh/h	442	0	0	506	0	0	513	0	0	452	0	0
Grp Sat Flow(s),veh/h/ln	1703	0	0	1446	0	0	1193	0	0	1246	0	0
Q Serve(g_s), s	0.0	0.0	0.0	6.3	0.0	0.0	7.2	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	13.7	0.0	0.0	20.0	0.0	0.0	25.7	0.0	0.0	18.5	0.0	0.0
Prop In Lane	0.07		0.15	0.20		0.13	0.35		0.18	0.31		0.16
Lane Grp Cap(c), veh/h	632	0	0	554	0	0	598	0	0	619	0	0
V/C Ratio(X)	0.70	0.00	0.00	0.91	0.00	0.00	0.86	0.00	0.00	0.73	0.00	0.00
Avail Cap(c_a), veh/h	632	0	0	554	0	0	598	0	0	619	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	17.1	0.0	0.0	19.6	0.0	0.0	16.3	0.0	0.0	13.8	0.0	0.0
Incr Delay (d2), s/veh	3.4	0.0	0.0	19.6	0.0	0.0	14.8	0.0	0.0	7.4	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	9.0	0.0	0.0	14.1	0.0	0.0	12.9	0.0	0.0	9.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.6	0.0	0.0	39.2	0.0	0.0	31.1	0.0	0.0	21.2	0.0	0.0
LnGrp LOS	C	A	A	D	A	A	C	A	A	C	A	A
Approach Vol, veh/h		442			506			513			452	
Approach Delay, s/veh		20.6			39.2			31.1			21.2	
Approach LOS		C			D			C			C	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		33.0		27.0		33.0		27.0				
Change Period (Y+Rc), s		7.0		7.0		7.0		7.0				
Max Green Setting (Gmax), s		26.0		20.0		26.0		20.0				
Max Q Clear Time (g_c+I1), s		27.7		15.7		20.5		22.0				
Green Ext Time (p_c), s		0.0		1.0		1.4		0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				28.5								
HCM 6th LOS				C								

Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 Build PM with Improvements

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	262	155	39	20	354	71	57	336	10	43	222	324
Future Volume (vph)	262	155	39	20	354	71	57	336	10	43	222	324
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	12	12	11	12	12	10	12	12	11	12
Grade (%)		-2%			-4%			3%			-3%	
Storage Length (ft)	350		0	0		0	0		0	0		160
Storage Lanes	1		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			No			Yes
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		2654			1572			1194			3035	
Travel Time (s)		45.2			26.8			20.4			51.7	
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	9%	3%	0%	10%	2%	24%	0%	5%	30%	28%	7%	6%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	305	225	0	0	518	0	0	469	0	0	308	377
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Perm	NA	pm+ov
Protected Phases	5	2			6			4			8	5
Permitted Phases	6			6			4			8		8
Detector Phase	5	2		6	6		4	4		8	8	5
Switch Phase												
Minimum Initial (s)	5.0	10.0		10.0	10.0		3.0	3.0		3.0	3.0	5.0
Minimum Split (s)	12.0	17.0		17.0	17.0		10.0	10.0		10.0	10.0	12.0
Total Split (s)	15.0	51.7		36.7	36.7		38.3	38.3		38.3	38.3	15.0
Total Split (%)	16.7%	57.4%		40.8%	40.8%		42.6%	42.6%		42.6%	42.6%	16.7%
Yellow Time (s)	4.5	4.5		4.5	4.5		3.5	3.5		3.5	3.5	4.5
All-Red Time (s)	2.5	2.5		2.5	2.5		3.5	3.5		3.5	3.5	2.5
Lost Time Adjust (s)	-1.0	-1.0			-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	6.0	6.0			6.0			6.0			6.0	6.0
Lead/Lag	Lead			Lag	Lag							Lead
Lead-Lag Optimize?	Yes			Yes	Yes							Yes
Recall Mode	None	Min		Min	Min		None	None		None	None	None
v/c Ratio	0.95	0.27			0.97			0.98			0.64	0.43
Control Delay	59.1	13.8			62.4			65.7			30.9	6.6
Queue Delay	0.0	0.0			0.0			0.0			0.0	0.0
Total Delay	59.1	13.8			62.4			65.7			30.9	6.6
Queue Length 50th (ft)	101	69			283			260			144	43
Queue Length 95th (ft)	#222	109			#449			#428			221	91
Internal Link Dist (ft)		2574			1492			1114			2955	
Turn Bay Length (ft)	350											160
Base Capacity (vph)	321	854			553			481			485	883
Starvation Cap Reductn	0	0			0			0			0	0
Spillback Cap Reductn	0	0			0			0			0	0
Storage Cap Reductn	0	0			0			0			0	0
Reduced v/c Ratio	0.95	0.26			0.94			0.98			0.64	0.43

Intersection Summary

Area Type: Other

Cycle Length: 90

Actuated Cycle Length: 89.1

Natural Cycle: 90

Control Type: Actuated-Uncoordinated

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 4: Susquehanna Trail & Canal Rd





Bull Road Logistics  
4: Susquehanna Trail & Canal Rd

2029 Build PM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	262	155	39	20	354	71	57	336	10	43	222	324
Future Volume (veh/h)	262	155	39	20	354	71	57	336	10	43	222	324
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1747	1832	1875	1807	1921	1608	1750	1680	1329	1514	1812	1826
Adj Flow Rate, veh/h	305	180	45	23	412	83	66	391	12	50	258	268
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Percent Heavy Veh, %	9	3	0	10	2	24	0	5	30	28	7	6
Cap, veh/h	380	698	175	57	485	95	91	412	12	97	456	731
Arrive On Green	0.10	0.49	0.48	0.31	0.32	0.31	0.36	0.37	0.36	0.36	0.37	0.37
Sat Flow, veh/h	1663	1415	354	42	1504	295	119	1115	32	135	1236	1548
Grp Volume(v), veh/h	305	0	225	518	0	0	469	0	0	308	0	268
Grp Sat Flow(s),veh/h/ln	1663	0	1768	1841	0	0	1267	0	0	1370	0	1548
Q Serve(g_s), s	9.0	0.0	6.5	10.5	0.0	0.0	18.4	0.0	0.0	0.0	0.0	9.7
Cycle Q Clear(g_c), s	9.0	0.0	6.5	23.5	0.0	0.0	31.3	0.0	0.0	12.9	0.0	9.7
Prop In Lane	1.00		0.20	0.04		0.16	0.14		0.03	0.16		1.00
Lane Grp Cap(c), veh/h	380	0	873	615	0	0	500	0	0	538	0	731
V/C Ratio(X)	0.80	0.00	0.26	0.84	0.00	0.00	0.94	0.00	0.00	0.57	0.00	0.37
Avail Cap(c_a), veh/h	380	0	924	667	0	0	500	0	0	538	0	731
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	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.7	0.0	12.9	28.1	0.0	0.0	28.3	0.0	0.0	21.2	0.0	14.7
Incr Delay (d2), s/veh	11.8	0.0	0.1	8.2	0.0	0.0	25.5	0.0	0.0	1.5	0.0	0.3
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	8.9	0.0	4.2	16.6	0.0	0.0	18.8	0.0	0.0	8.4	0.0	5.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.5	0.0	13.0	36.3	0.0	0.0	53.8	0.0	0.0	22.6	0.0	15.1
LnGrp LOS	C	A	B	D	A	A	D	A	A	C	A	B
Approach Vol, veh/h		530			518			469				576
Approach Delay, s/veh		24.2			36.3			53.8				19.1
Approach LOS		C			D			D				B
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		49.2		38.3	15.0	34.2		38.3				
Change Period (Y+Rc), s		7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s		44.7		31.3	8.0	29.7		31.3				
Max Q Clear Time (g_c+I1), s		8.5		33.3	11.0	25.5		14.9				
Green Ext Time (p_c), s		2.2		0.0	0.0	1.7		2.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				32.4								
HCM 6th LOS				C								

Bull Road Logistics  
7: Bull Road & Hilton Ave

2029 Build PM with Improvements

10/11/2023



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘			↕	
Traffic Volume (vph)	87	0	114	0	0	0	285	425	2	0	310	176
Future Volume (vph)	87	0	114	0	0	0	285	425	2	0	310	176
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			2%				-2%
Storage Length (ft)	0		0	0		0	275		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			No			No			Yes			No
Link Speed (mph)		35			25			40				40
Link Distance (ft)		1242			1074			3105				1664
Travel Time (s)		24.2			29.3			52.9				28.4
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	0%	0%	0%	0%	0%	1%	6%	0%	0%	5%	1%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	208	0	0	0	0	294	440	0	0	501	0
Turn Type	Perm	NA					D,P+P	NA			NA	
Protected Phases		4			8		5	2				6
Permitted Phases	4			8			6			6		
Detector Phase	4	4		8	8		5	2		6		6
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0		5.0
Minimum Split (s)	20.0	20.0		20.0	20.0		12.0	24.0		20.0		20.0
Total Split (s)	20.0	20.0		20.0	20.0		14.0	40.0		26.0		26.0
Total Split (%)	33.3%	33.3%		33.3%	33.3%		23.3%	66.7%		43.3%		43.3%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.5	4.5		4.5		4.5
All-Red Time (s)	3.0	3.0		3.0	3.0		2.5	2.5		2.5		2.5
Lost Time Adjust (s)		-1.0			-1.0		-1.0	-1.0				-1.0
Total Lost Time (s)		6.0			6.0		6.0	6.0				6.0
Lead/Lag							Lead			Lag		Lag
Lead-Lag Optimize?							Yes			Yes		Yes
Recall Mode	None	None		None	None		None	Max		Max		Max
v/c Ratio		0.68					0.76	0.45				0.88
Control Delay		34.2					24.0	9.2				39.4
Queue Delay		0.0					0.0	0.0				0.0
Total Delay		34.2					24.0	9.2				39.4
Queue Length 50th (ft)		68					50	83				169
Queue Length 95th (ft)		#147					#142	142				#334
Internal Link Dist (ft)		1162			994			3025				1584
Turn Bay Length (ft)							275					
Base Capacity (vph)		336					388	974				569
Starvation Cap Reductn		0					0	0				0
Spillback Cap Reductn		0					0	0				0
Storage Cap Reductn		0					0	0				0
Reduced v/c Ratio		0.62					0.76	0.45				0.88

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 58.7

Natural Cycle: 60

Control Type: Semi Act-Uncoord

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 7: Bull Road & Hilton Ave



Bull Road Logistics  
7: Bull Road & Hilton Ave

2029 Build PM with Improvements

10/11/2023



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘			↕	
Traffic Volume (veh/h)	87	0	114	0	0	0	285	425	2	0	310	176
Future Volume (veh/h)	87	0	114	0	0	0	285	425	2	0	310	176
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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1758	1800	1800	1800	1800	1800	1764	1693	1778	1875	1803	1860
Adj Flow Rate, veh/h	90	0	118	0	0	0	294	438	2	0	320	181
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	0	0	0	0	0	1	6	0	0	5	1
Cap, veh/h	193	18	157	0	338	0	433	1011	5	0	382	216
Arrive On Green	0.17	0.00	0.17	0.00	0.00	0.00	0.14	0.60	0.58	0.00	0.35	0.34
Sat Flow, veh/h	543	95	837	0	1800	0	1680	1684	8	0	1082	612
Grp Volume(v), veh/h	208	0	0	0	0	0	294	0	440	0	0	501
Grp Sat Flow(s),veh/h/ln	1476	0	0	0	1800	0	1680	0	1692	0	0	1693
Q Serve(g_s), s	6.4	0.0	0.0	0.0	0.0	0.0	6.1	0.0	7.9	0.0	0.0	15.4
Cycle Q Clear(g_c), s	7.7	0.0	0.0	0.0	0.0	0.0	6.1	0.0	7.9	0.0	0.0	15.4
Prop In Lane	0.43		0.57	0.00		0.00	1.00		0.00	0.00		0.36
Lane Grp Cap(c), veh/h	342	0	0	0	338	0	433	0	1016	0	0	598
V/C Ratio(X)	0.61	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.43	0.00	0.00	0.84
Avail Cap(c_a), veh/h	428	0	0	0	445	0	433	0	1016	0	0	598
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	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	1.00
Uniform Delay (d), s/veh	22.2	0.0	0.0	0.0	0.0	0.0	11.8	0.0	6.1	0.0	0.0	17.0
Incr Delay (d2), s/veh	1.8	0.0	0.0	0.0	0.0	0.0	4.2	0.0	1.3	0.0	0.0	13.2
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	4.7	0.0	0.0	0.0	0.0	0.0	3.9	0.0	3.8	0.0	0.0	11.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	7.5	0.0	0.0	30.1
LnGrp LOS	C	A	A	A	A	A	B	A	A	A	A	C
Approach Vol, veh/h		208			0			734				501
Approach Delay, s/veh		24.0			0.0			10.9				30.1
Approach LOS		C						B				C
Timer - Assigned Phs		2		4	5	6		8				
Phs Duration (G+Y+Rc), s		40.0		16.6	14.0	26.0		16.6				
Change Period (Y+Rc), s		7.0		7.0	7.0	7.0		7.0				
Max Green Setting (Gmax), s		33.0		13.0	7.0	19.0		13.0				
Max Q Clear Time (g_c+I1), s		9.9		9.7	8.1	17.4		0.0				
Green Ext Time (p_c), s		2.6		0.3	0.0	0.5		0.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				19.5								
HCM 6th LOS				B								

## **APPENDIX G**

### **EXISTING TRAFFIC SIGNAL PERMIT PLANS AND INTERSECTION SKETCHES**

# TRAFFIC SIGNAL PERMIT

Permit No. 005024Sheet 1 of 2

In accordance with the Vehicle Code, the Secretary of Transportation hereby approves the installation and operation of a traffic signal at the intersection of Main Street (SR 0074) & Canal Street (SR 0921 and SR 4002)  
in the Borough of Dover, County of York.

This permit is issued to, and accepted by the Borough of Dover  
hereinafter known as the Permittee, as follows:

This installation shall be in accordance with the Vehicle Code and the Regulations for traffic signs, signals, and markings of the Department of Transportation, and shall conform to the following requirements and those contained on the attached sheets.

## Type of Controller

Fully-Actuated

## Type of Signal Mounting

Post Mounted &amp; Overhead

## Hours of Operation as "Stop" and "Go"

Continuously

## Hours of Operation as "FLASHING"

Equipped for Emergency Flashing

## Controller Operation

Controller to provide the phasing, timing, and display indicated on the attached diagram. Preemption for emergency vehicles to provide the operation as indicated on the attached diagram.

All work performed by the Permittee in the erection of the traffic signal shall be under and subject to the direction of the Secretary of Transportation or his authorized representatives. The said Permittee shall use due diligence in the execution of the work authorized under this permit and shall not obstruct or endanger travel along the said road. All operations must be conducted so as to permit safe and reasonable free travel at all times over the road within the limits of the work herein permitted.

The Permittee covenants and agrees to fully indemnify and save harmless the Department of Transportation and assume all liability for damages or injury, occurring to any person, persons or property through or in consequence of any act or omission of anyone working on the construction, or from faulty maintenance or operation of such traffic signal.

The Secretary of Transportation, by law, reserves the right to revoke and annul this permit if the Permittee shall at any time willfully or negligently fail to comply with the conditions contained in this permit, or, upon changes in traffic conditions, fail to make any changes in the construction or operation of this signal, or to remove it, when so ordered by the Secretary of Transportation; or if this installation is not in operation within twenty-four (24) months of the receipt of this permit. The Permittee shall maintain the signal in a safe condition at all times. The Permittee shall not make any change in the construction or operation of this traffic signal without prior written approval of the Secretary of Transportation.

This permit cancels and supersedes all previous permits issued for this location upon completion of the installation specified herein.

INITIAL DATE September 21, 1955APPROVED Leslie S. Richards  
(Secretary of Transportation)REVISION DATE March 20, 2019BY for [Signature]  
(District Executive or approved designee)

MOVEMENT, SEQUENCE AND TIMING DIAGRAM

PHASE	2+6				4+8				PRE-EMPT 2				PRE-EMPT 6				PRE-EMPT 4				PRE-EMPT 8				EMERGENCY FLASHING				
INTERVAL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
1,2	G	G	Y	R	R	R	R	R					C	Y	R		R	R	R		R	R	R		R	R	R	Y	
5,6	G	G	Y	R	R	R	R	R									C	Y	R		R	R	R		R	R	R	Y	
3,4	R	R	R	R	G	G	Y	R													G	Y	R		R	R	R	R	
T,8	R	R	R	R	G	G	Y	R													R	R	R		R	R	R	R	
9,11,14,16	D	W	D	W	D	W	D	W					D	W	D	W	D	W	D	W	D	W	D	W	D	W	D	W	OFF
10,12,13,15	W	F	D	W	D	W	D	W					D	W	D	W	D	W	D	W	D	W	D	W	D	W	D	W	OFF
FAIL-SAFE LAMP									ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	
FIXED	3	2			3	2			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
MINIMUM	10				3																								
PASSAGE	3				3																								
MAX 1	42				28																								
MAX 2	41				29																								
MAX 3	36				24																								
PEDESTRIAN	7	13			7	13																							
MEMORY	MIN				NL																								

MAX 1: ALL OTHER TIMES  
 MAX 2: MONDAY THRU FRIDAY 7:00 AM TO 9:00 AM  
 MAX 3: MONDAY THRU FRIDAY 3:00 PM TO 7:00 PM  
 • UPON PEDESTRIAN ACTUATION ONLY  
 •• UPON PEDESTRIAN ACTUATION, OTHERWISE DW AT ALL TIMES  
 □ FOR DURATION OF PREEMPTION PHASE  
 ○ SELECTIVE YELLOW INTERVAL INCLUDES THE NORMAL ALL RED PHASE INTERVAL  
 ⊙ NORMAL YELLOW AND ALL RED PHASE TIMING SHALL BE UTILIZED

EMERGENCY VEHICLE PRE-EMPTION NOTES

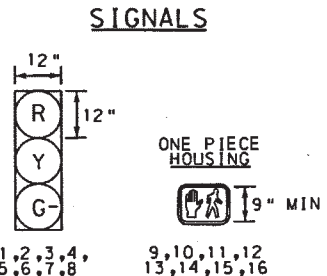
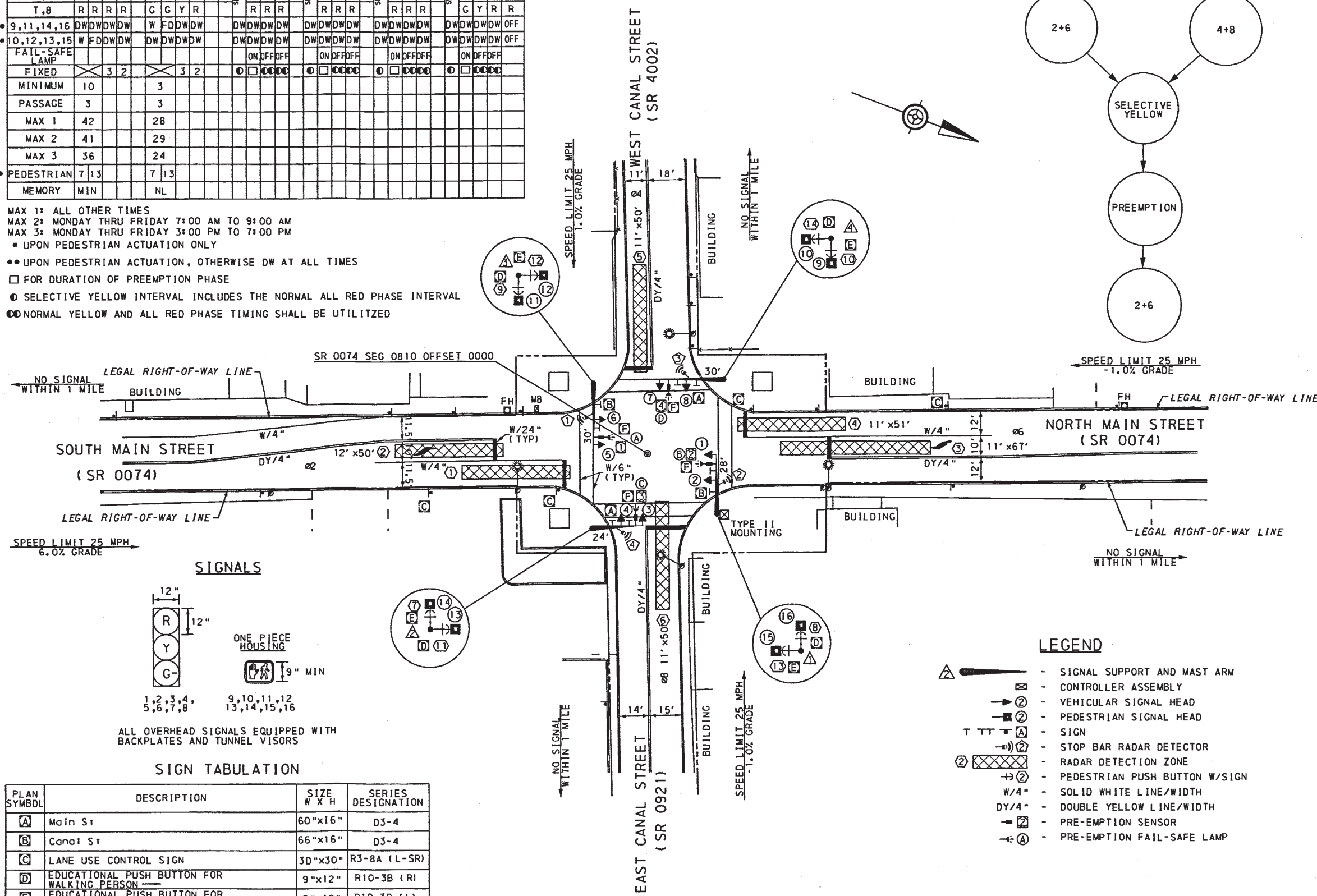
CONTROLLER TO BE EQUIPPED WITH EMERGENCY PREEMPTION EQUIPMENT FOR EACH APPROACH WHICH SHALL PROVIDE A SELECTIVE YELLOW INTERVAL, A GREEN INDICATION WILL BE GIVEN TO THE PREEMPTED APPROACH AND A RED INDICATION ON ALL OTHER APPROACHES.  
 IF PREEMPTION OCCURS DURING FLASHING OPERATION, SIGNALS REMAIN IN FLASH. UPON COMPLETION OF PREEMPTION, OPERATION RESUMES IN PHASE 2+6.  
 PREEMPTION APPROACH SHALL PROVIDE AN INDICATION (FAIL-SAFE LAMP) TO THE DRIVER OF THE APPROACHING EMERGENCY VEHICLE WHEN THE EQUIPMENT HAS PREEMPTED THE TRAFFIC SIGNAL FOR THAT APPROACH.  
 THE FAIL-SAFE INDICATION SHALL BE A FLASHING WHITE LIGHT ON THE APPROACH WHICH PREEMPTION IS PROVIDED.

GENERAL NOTES

INSTALLATION, OPERATION AND MAINTENANCE OF THIS TRAFFIC SIGNAL SHALL BE IN ACCORDANCE WITH PENNSYLVANIA DEPARTMENT OF TRANSPORTATION REGULATIONS ON OFFICIAL TRAFFIC CONTROL DEVICES.  
 NO MODIFICATION OF THIS INSTALLATION IS PERMITTED UNLESS PRIOR APPROVAL IS GRANTED, IN WRITING, BY THE DEPARTMENT.  
 ALL MAINTENANCE NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS, INCLUDING TRIMMING TREES, IS THE RESPONSIBILITY OF THE PERMITTEE.  
 ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE CONSIDERED PART OF THE PERMIT AND SHALL BE INSTALLED AND MAINTAINED BY THE PERMITTEE, UNLESS OTHERWISE INDICATED. EXCEPT THE LONGITUDINAL PAVEMENT MARKINGS ON STATE HIGHWAYS, WHICH WILL BE MAINTAINED BY THE DEPARTMENT.  
 POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF THE CURB OR EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS SHALL ALSO HAVE A MINIMUM HORIZONTAL CLEARANCE OF 2 FEET.  
 THE BOTTOM OF SIGNAL HEADS AND SIGNS ERECTED OVER THE ROADWAY SHALL NOT BE LESS THAN 15 FEET OR MORE THAN 19 FEET ABOVE THE ROADWAY. THE BOTTOM OF POST MOUNTED SIGNAL HEADS SHALL NOT BE LESS THAN 8 FEET NOR MORE THAN 15 FEET ABOVE THE SIDEWALK OR PAVEMENT GRADE.  
 THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNAL HEADS, MEASURED AT RIGHT ANGLES TO THE APPROACH, SHALL BE 8 FEET.  
 PERMITTEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR EMBANKMENT REMOVAL, CURBING AND/OR SIDEWALK, DRAINAGE STRUCTURES, CHANGES IN HIGHWAY GEOMETRY, PAVEMENT WIDENING, OR INSTALLATION OF ADDITIONAL LANES.  
 CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS, TC-8800 SERIES.  
 THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF ACT 50 (2018), PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES. PRIOR TO CONSTRUCTION, CONSULT WITH UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.  
 PAVEMENT MARKINGS SHALL BE PLACED IN ACCORDANCE WITH THE DEPARTMENT OF TRANSPORTATION PAVEMENT MARKING AND SIGNING STANDARDS, PUB 111, TC-8600 AND TC-8700 SERIES.  
 PERMITTEE IS RESPONSIBLE FOR OBTAINING APPROVAL FOR INSTALLATION OF TRAFFIC SIGNAL DEVICES LOCATED OUTSIDE HIGHWAY RIGHT-OF-WAY.  
 TRAFFIC SIGNALS INSTALLED USING LIQUID FUELS TAX FUNDS MUST CONFORM TO DEPARTMENT SPECIFICATIONS AS SET FORTH IN CURRENT PUBLICATION 408, SUPPLEMENTS AND STANDARD DRAWINGS.

DETECTOR NOTES

DETECTION ZONES 1 AND 2 CALL AND EXTEND PHASE 2.  
 DETECTION ZONES 3 AND 4 CALL AND EXTEND PHASE 6.  
 DETECTION ZONE 5 CALLS AND EXTENDS PHASE 4.  
 DETECTION ZONE 6 CALLS AND EXTENDS PHASE 8.



ALL OVERHEAD SIGNALS EQUIPPED WITH BACKPLATES AND TUNNEL VISORS

SIGN TABULATION

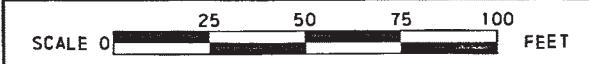
PLAN SYMBL	DESCRIPTION	SIZE W X H	SERIES DESIGNATION
A	Main St	60"x16"	D3-4
B	Canal St	66"x16"	D3-4
C	LANE USE CONTROL SIGN	30"x30"	R3-8A (L-SR)
D	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON	9"x12"	R10-3B (R)
E	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON	9"x12"	R10-3B (L)
F	NO TURN ON RED	30"x36"	R10-11

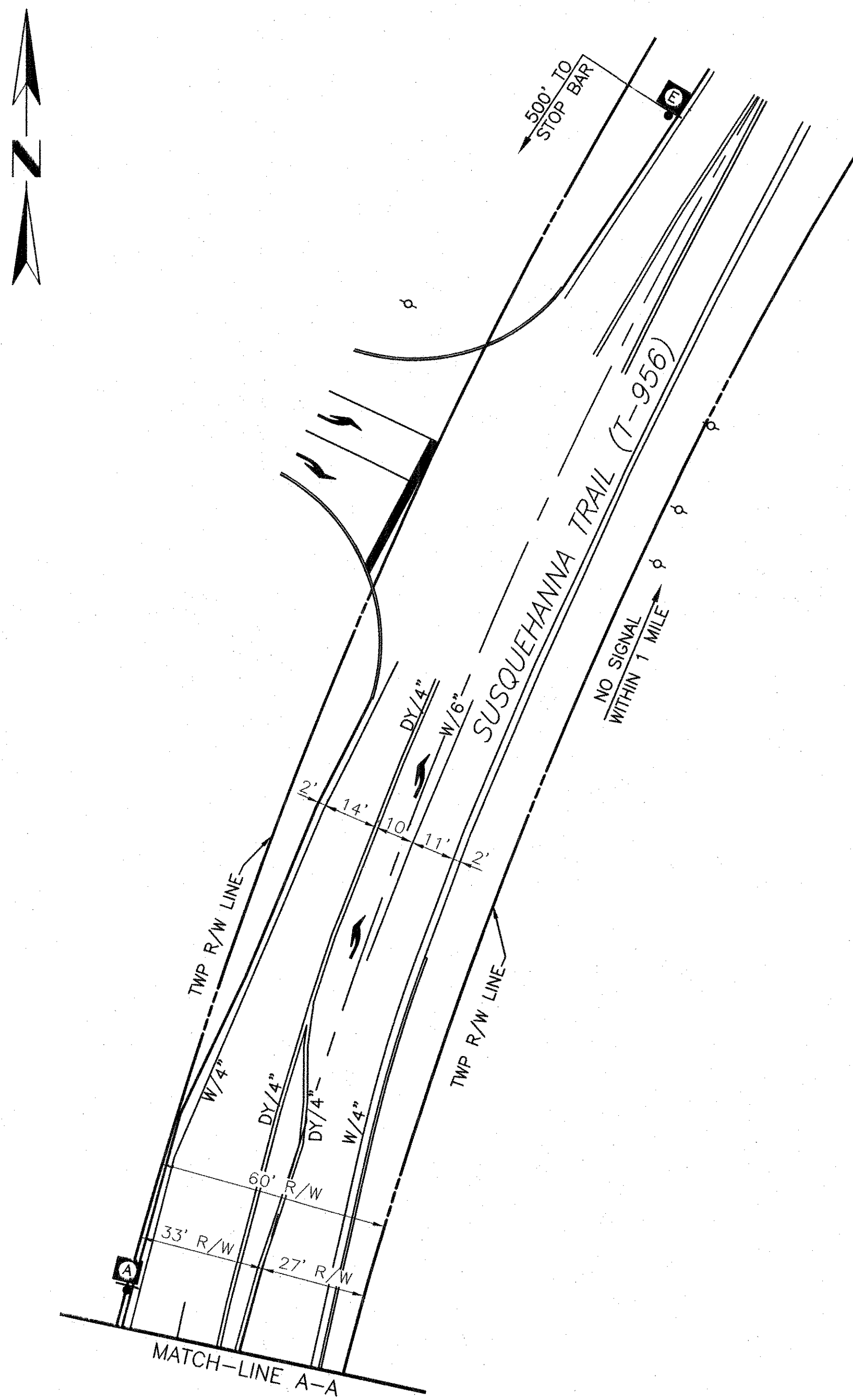
- LEGEND
- ▲ - SIGNAL SUPPORT AND MAST ARM
  - ⊠ - CONTROLLER ASSEMBLY
  - ⊙ - VEHICULAR SIGNAL HEAD
  - ⊙ - PEDESTRIAN SIGNAL HEAD
  - T TT ⊠ - SIGN
  - ⊙ - STOP BAR RADAR DETECTOR
  - ⊠ - RADAR DETECTION ZONE
  - ⊙ - PEDESTRIAN PUSH BUTTON W/SIGN
  - W/4" - SOLID WHITE LINE/WIDTH
  - DY/4" - DOUBLE YELLOW LINE/WIDTH
  - ⊠ - PRE-EMPTION SENSOR
  - ⊠ - PRE-EMPTION FAIL-SAFE LAMP

OPERATOR: Mde/lor/vo  
 TIME: 2/26/19 PM  
 FILE NAME: W:\Projects\PNDDT130811-RT-74\_Signal\ASIGN\AS-BUILD\TS\PNDDT130811-TSP\_01\_CANAL ST 1 of 1.dgn

COUNTY : YORK  
 MUNICIPALITY : DOVER BOROUGH  
 INTERSECTION : CARLISLE RD (SR 0074) AND W CANAL ST/E CANAL ST

APPROVED : *[Signature]* 2/25/19  
 MUNICIPAL OFFICIAL DATE  
 RECOMMENDED : *[Signature]* 3/20/19  
 DISTRICT TRAFFIC ENGINEER DATE





### EMERGENCY VEHICLE PRE-EMPTION SEQUENCE

EMERGENCY PRE-EMPTION NOTES

CONTROLLER TO BE EQUIPPED WITH EMERGENCY PREEMPTION FOR ALL APPROACHES TO THE INTERSECTION WITH A FAIL SAFE DEVICE FOR EACH DIRECTION OF OPERATION.

THIS FAIL SAFE DEVICE SHALL CONSIST OF A FLASHING WHITE FLOOD LIGHT AND SHALL FLASH WHEN THE EMERGENCY VEHICLE HAS CONTROL OF THE INTERSECTION FOR THE APPROPRIATE APPROACH.

THE SIGNAL WHEN ACTIVATED BY EMERGENCY VEHICLE SHALL TERMINATE ALL GREEN INDICATIONS EXCEPT THE GREEN INDICATIONS FOR THE PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE, FOLLOWED BY SELECTIVE CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PREEMPTION OCCURS. THE GREEN INDICATIONS FOR THE PREEMPTED PHASE SHALL REMAIN GREEN FOR THE DURATION OF THE SIGNAL PREEMPTION AND RED INDICATIONS DISPLAYED FOR ALL OTHERS PHASES.

FOR WIRELESS PREEMPTION, THE GREEN INTERVAL SHALL BE THE LENGTH OF THE PREEMPTION DETECTOR CALL PLUS SUFFICIENT TIME TO ALLOW THE EMERGENCY VEHICLE TO CLEAR THE INTERSECTION A MINIMUM DISTANCE OF 100' IN ANY DIRECTION.

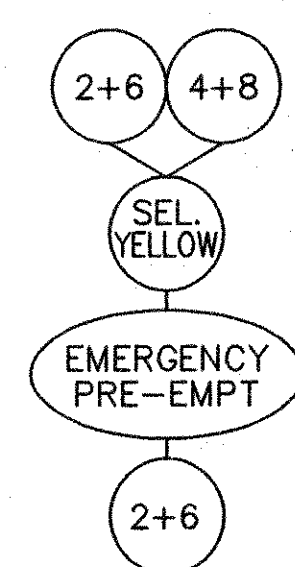
IF SIGNALS HAVE BEEN ACTUATED BY PEDESTRIAN PUSH BUTTON, AND SIGNAL IS PREEMPTED, THE PED WALK INTERVAL SHALL TERMINATE IMMEDIATELY, FOLLOWED BY THE PED CLEAR INTERVAL. THIS INTERVAL SHALL TIME OUT FOLLOWED BY THE APPROPRIATE SELECTIVE CLEARANCES BEFORE GOING INTO EMERGENCY PREEMPTION.

IF THE SIGNALS WHEN ACTIVATED BY AN EMERGENCY VEHICLE ARE FLASHING, ALL SIGNALS SHALL REMAIN FLASHING.

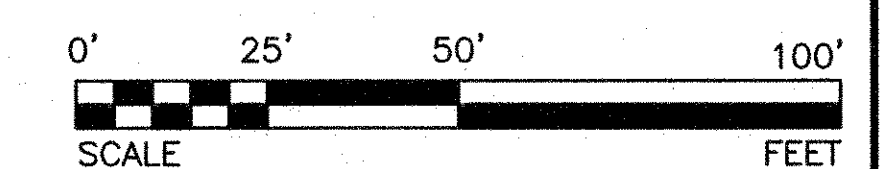
UPON COMPLETION OF THE PREEMPTION PHASE, RETURN TO INTERVAL 1 OF PHASE 2+6.

IN EMERGENCY PREEMPTION, NO PRIORITY SHALL BE ESTABLISHED. PREEMPTION SHALL BE A "FIRST COME, FIRST SERVE" OPERATION.

PREEMPTION LINE-OF-SIGHT TO BE WITHIN PUBLIC RIGHT-OF-WAY.



- LEGEND**
- MAST ARM
  - PEDESTAL
  - VEHICULAR SIGNAL HEAD
  - SIGN
  - VEHICLE DETECTOR
  - CONTROLLER ASSEMBLY
  - SOLID WHITE LINE/WIDTH
  - SOLID WHITE LINE/WIDTH
  - SOLID WHITE LINE/WIDTH
  - DOUBLE SOLID YELLOW LINE/WIDTH
  - LUMINAIRE
  - EMERGENCY PRE-EMPTION DEVICE



County: \_\_\_\_\_  
 YORK

Municipality: \_\_\_\_\_  
 CONEWAGO TOWNSHIP

Intersection: \_\_\_\_\_  
 CANAL ROAD (S.R.0921) AND  
 SUSQUEHANNA TRAIL (T-956)

Reviewed: \_\_\_\_\_ 11-7-12  
 Municipal Official Date

Recommended: \_\_\_\_\_ 11/20/12  
 District Traffic Engineer Date



MOVEMENT, SEQUENCE AND TIMING

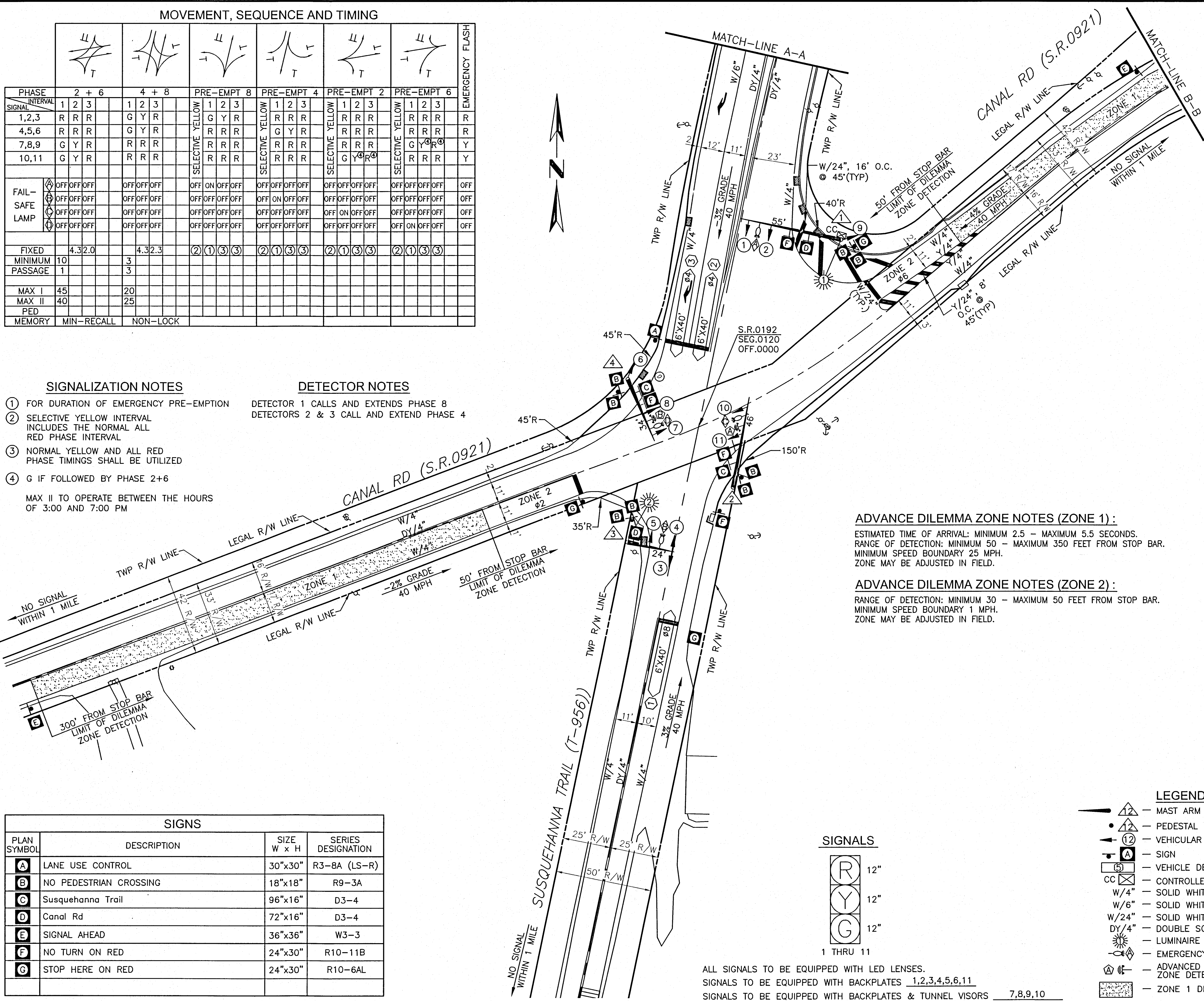
							EMERGENCY FLASH
PHASE	2 + 6	4 + 8	PRE-EMPT 8	PRE-EMPT 4	PRE-EMPT 2	PRE-EMPT 6	
SIGNAL INTERVAL	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3	
1,2,3	R R R	G Y R	G Y R	R R R	R R R	R R R	R
4,5,6	R R R	G Y R	R R R	G Y R	R R R	R R R	R
7,8,9	G Y R	R R R	R R R	R R R	R R R	G Y R	Y
10,11	G Y R	R R R	R R R	R R R	R R R	R R R	Y
FAIL-SAFE LAMP	OFF OFF OFF	OFF OFF OFF	OFF ON OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF OFF OFF OFF	OFF
FIXED	4.3.2.0	4.3.2.3	(2)(1)(3)(3)	(2)(1)(3)(3)	(2)(1)(3)(3)	(2)(1)(3)(3)	
MINIMUM PASSAGE	10	3					
MAX I	45	20					
MAX II	40	25					
MEMORY	MIN-RECALL	NON-LOCK					

SIGNALIZATION NOTES

- ① FOR DURATION OF EMERGENCY PRE-EMPTION
  - ② SELECTIVE YELLOW INTERVAL INCLUDES THE NORMAL ALL RED PHASE INTERVAL
  - ③ NORMAL YELLOW AND ALL RED PHASE TIMINGS SHALL BE UTILIZED
  - ④ G IF FOLLOWED BY PHASE 2+6
- MAX II TO OPERATE BETWEEN THE HOURS OF 3:00 AND 7:00 PM

DETECTOR NOTES

- DETECTOR 1 CALLS AND EXTENDS PHASE 8
- DETECTORS 2 & 3 CALL AND EXTEND PHASE 4



ADVANCE DILEMMA ZONE NOTES (ZONE 1):

ESTIMATED TIME OF ARRIVAL: MINIMUM 2.5 - MAXIMUM 5.5 SECONDS.  
RANGE OF DETECTION: MINIMUM 50 - MAXIMUM 350 FEET FROM STOP BAR.  
MINIMUM SPEED BOUNDARY 25 MPH.  
ZONE MAY BE ADJUSTED IN FIELD.

ADVANCE DILEMMA ZONE NOTES (ZONE 2):

RANGE OF DETECTION: MINIMUM 30 - MAXIMUM 50 FEET FROM STOP BAR.  
MINIMUM SPEED BOUNDARY 1 MPH.  
ZONE MAY BE ADJUSTED IN FIELD.

GENERAL NOTES

INSTALLATION, OPERATION AND MAINTENANCE OF THIS TRAFFIC SIGNAL SHALL BE IN ACCORDANCE WITH PENNSYLVANIA DEPARTMENT OF TRANSPORTATION REGULATIONS ON OFFICIAL TRAFFIC CONTROL DEVICES.

NO MODIFICATION OF THIS INSTALLATION IS PERMITTED UNLESS PRIOR APPROVAL IS GRANTED, IN WRITING, BY THE DEPARTMENT.

ALL MAINTENANCE NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS, INCLUDING TRIMMING TREES, IS THE RESPONSIBILITY OF THE PERMITTEE.

ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE CONSIDERED PART OF THE PERMIT AND SHALL BE INSTALLED AND MAINTAINED BY THE PERMITTEE, UNLESS OTHERWISE INDICATED. EXCEPT THE LONGITUDINAL PAVEMENT MARKINGS ON STATE HIGHWAYS, WHICH WILL BE MAINTAINED BY THE DEPARTMENT.

POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF THE CURB OR EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS SHALL ALSO HAVE A MINIMUM HORIZONTAL CLEARANCE OF 2 FEET.

THE BOTTOM OF SIGNAL HEADS AND SIGNS ERECTED OVER THE ROADWAY SHALL NOT BE LESS THAN 15 FEET OR MORE THAN 19 FEET ABOVE THE ROADWAY. THE BOTTOM OF POST MOUNTED SIGNAL HEADS SHALL NOT BE LESS THAN 8 FEET NOR MORE THAN 15 FEET ABOVE THE SIDEWALK OR PAVEMENT GRADE.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNAL HEADS, MEASURED AT RIGHT ANGLES TO THE APPROACH, SHALL BE 8 FEET.

PERMITTEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR EMBANKMENT REMOVAL, CURBING AND/OR SIDEWALK, DRAINAGE STRUCTURES, CHANGES IN HIGHWAY GEOMETRY, PAVEMENT WIDENING, OR INSTALLATION OF ADDITIONAL LANES.

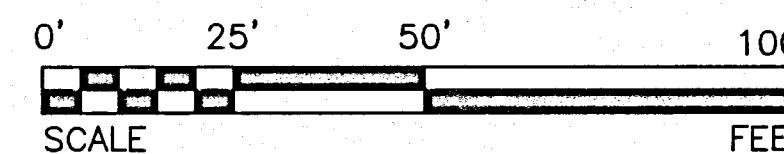
CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS, TC-8800. SERIES.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF ACT 287, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES. PRIOR TO CONSTRUCTION, CONSULT WITH UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

PAVEMENT MARKINGS SHALL BE PLACED IN ACCORDANCE WITH THE DEPARTMENT OF TRANSPORTATION PAVEMENT MARKING HANDBOOK.

PERMITTEE IS RESPONSIBLE FOR OBTAINING APPROVAL FOR INSTALLATION OF TRAFFIC SIGNAL DEVICES LOCATED OUTSIDE HIGHWAY RIGHT-OF-WAY.

TRAFFIC SIGNALS INSTALLED USING LIQUID FUELS TAX FUNDS MUST CONFORM TO DEPARTMENT SPECIFICATIONS AS SET FORTH IN CURRENT PUBLICATION 408, SUPPLEMENTS AND STANDARD DRAWINGS.



LEGEND

- MAST ARM
- PEDESTAL
- VEHICULAR SIGNAL HEAD
- SIGNAL
- VEHICLE DETECTOR
- CONTROLLER ASSEMBLY
- SOLID WHITE LINE/WIDTH
- SOLID WHITE LINE/WIDTH
- SOLID WHITE LINE/WIDTH
- DOUBLE SOLID YELLOW LINE/WIDTH
- LUMINAIRE
- EMERGENCY PRE-EMPTION DEVICE
- ADVANCED DILEMMA/DENSITY ZONE DETECTOR
- ZONE 1 DETECTION ZONE

SIGNALS

- 12"
- 12"
- 12"

1 THRU 11

ALL SIGNALS TO BE EQUIPPED WITH LED LENSES.  
SIGNALS TO BE EQUIPPED WITH BACKPLATES 1,2,3,4,5,6,11  
SIGNALS TO BE EQUIPPED WITH BACKPLATES & TUNNEL VISORS 7,8,9,10

SIGNS

PLAN SYMBOL	DESCRIPTION	SIZE W x H	SERIES DESIGNATION
	LANE USE CONTROL	30"x30"	R3-8A (LS-R)
	NO PEDESTRIAN CROSSING	18"x18"	R9-3A
	Susquehanna Trail	96"x16"	D3-4
	Canal Rd	72"x16"	D3-4
	SIGNAL AHEAD	36"x36"	W3-3
	NO TURN ON RED	24"x30"	R10-11B
	STOP HERE ON RED	24"x30"	R10-6AL

County: YORK

Municipality: CONEWAGO TOWNSHIP

Intersection: CANAL ROAD (S.R.0921) AND SUSQUEHANNA TRAIL (T-956)

Reviewed: *[Signature]* 12-11-13  
Municipal Official Date

Recommended: *[Signature]* 1/10/2014  
District Traffic Engineer Date



# TRAFFIC SIGNAL PERMIT

Permit No. 8220

Sheet 1 of 4

In accordance with the Vehicle Code, the Secretary of Transportation hereby approves the installation and operation of a traffic signal at the intersection of Susquehanna Trail (SR 0297) & I-83 Ramps in the Township of Conewago, County of York.

This permit is issued to, and accepted by the Township of Conewago hereinafter known as the Permittee, as follows:

This installation shall be in accordance with the Vehicle Code and the Regulations for traffic signs, signals and markings of the Department of Transportation, and shall conform to the following requirements and those contained on the attached sheets.

Type of Controller Fully Actuated with Dilemma Zone Protection

Type of Signal Mounting Post Mounted and Overhead

Hours of Operation as "Stop" and "Go" Continuously

Hours of Operation as "FLASHING" Equipped for Emergency Flashing

Controller Operation Controller to provide the phasing, timing, and signal display indicated on the attached diagram. Preemption for emergency vehicles and preemption for SR 0083 ramps to provide the operation indicated on the attached diagram.

This traffic signal is integrated into the PennDOT UCC software located on the Department's UCC Server that connects back to the TMC camera

All work performed by the Permittee in the erection of the traffic signal shall be under and subject to the direction of the Secretary of Transportation or their authorized representatives. The said Permittee shall use due diligence in the execution of the work authorized under this permit and shall not obstruct or endanger travel along the said road. All operations must be conducted so as to permit safe and reasonable free travel at all times over the road within the limits of the work herein permitted.

The Permittee covenants and agrees to fully indemnify and save harmless the Department of Transportation and assume all liability for damages or injury, occurring to any person, persons or property through or in consequence of any act or omission of anyone working on the construction, or from faulty maintenance or operation of such traffic signal.

The Secretary of Transportation, by law, reserves the right to revoke and annul this permit if the Permittee shall at any time willfully or negligently fail to comply with the conditions contained in this permit, or, upon changes in traffic conditions, fail to make any changes in the construction or operation of this signal, or to remove it, when so ordered by the Secretary of Transportation; or if this installation is not in operation within twenty-four (24) months of the receipt of this permit. The Permittee shall maintain the signal in a safe condition at all times. The Permittee shall not make any change in the construction or operation of this traffic signal without prior written approval of the Secretary of Transportation.

This permit cancels and supersedes all previous permits issued for this location upon completion of the installation specified herein.

INITIAL DATE: 05/30/2002

APPROVED Yassmin Gramian, P.E.

REVISION DATE: 09/01/2022

BY \_\_\_\_\_  
for District Executive

**GENERAL NOTES**

INSTALLATION, OPERATION, AND MAINTENANCE OF THIS TRAFFIC SIGNAL TO BE IN ACCORDANCE WITH PENNSYLVANIA DEPARTMENT OF TRANSPORTATION REGULATIONS ON OFFICIAL TRAFFIC CONTROL DEVICES.

NO MODIFICATIONS OF THIS INSTALLATION ARE PERMITTED UNLESS PRIOR APPROVAL IS GRANTED, IN WRITING, BY THE DEPARTMENT.

ALL MAINTENANCE NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS, INCLUDING TRIMMING TREES, IS THE RESPONSIBILITY OF THE PERMITTEE.

ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE CONSIDERED PART OF THE PERMIT AND ARE TO BE INSTALLED AND MAINTAINED BY THE PERMITTEE, UNLESS OTHERWISE INDICATED. EXCEPT THE LONGITUDINAL PAVEMENT MARKINGS ON STATE HIGHWAYS WHICH WILL BE MAINTAINED BY THE DEPARTMENT.

INSTALL POST MOUNTED SIGNALS WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF THE CURB OR EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS WILL HAVE A MINIMUM HORIZONTAL CLEARANCE OF 2 FEET.

THE BOTTOM OF SIGNAL HEADS AND SIGNS ERECTED OVER THE ROADWAY ARE NOT TO BE LESS THAN 15 FEET NOR MORE THAN 19 FEET ABOVE THE ROADWAY. THE BOTTOM OF POST MOUNTED SIGNAL HEADS ARE NOT TO BE LESS THAN 8 FEET NOR MORE THAN 15 FEET ABOVE THE SIDEWALK OR PAVEMENT GRADE.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNAL HEADS MEASURED AT RIGHT ANGLES TO THE APPROACH IS TO BE 8 FEET.

PERMITTEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR EMBANKMENT REMOVAL, CURBING AND/OR SIDEWALK, DRAINAGE STRUCTURES, CHANGES IN HIGHWAY GEOMETRY, PAVEMENT WIDENING, OR INSTALLATION OF ADDITIONAL LANES.

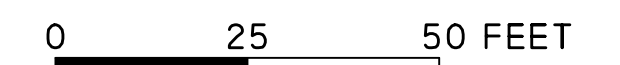
CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS TC-8800 SERIES.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF THE LATEST AMENDMENT TO ACT 50, UNDERGROUND UTILITY LINE PROTECTION ACT, DATED APRIL 28, 2018.

PAVEMENT MARKINGS WILL BE PLACED IN ACCORDANCE WITH THE DEPARTMENT OF TRANSPORTATION PAVEMENT MARKING HANDBOOK.

PERMITTEE IS RESPONSIBLE FOR OBTAINING APPROVAL FOR INSTALLATION OF TRAFFIC SIGNAL DEVICES LOCATED OUTSIDE HIGHWAY RIGHT-OF-WAY.

TRAFFIC SIGNALS INSTALLED USING LIQUID FUELS TAX FUNDS MUST CONFORM TO DEPARTMENT SPECIFICATIONS AS SET FORTH IN CURRENT PUBLICATION 408, SUPPLEMENTS AND STANDARD DRAWINGS.



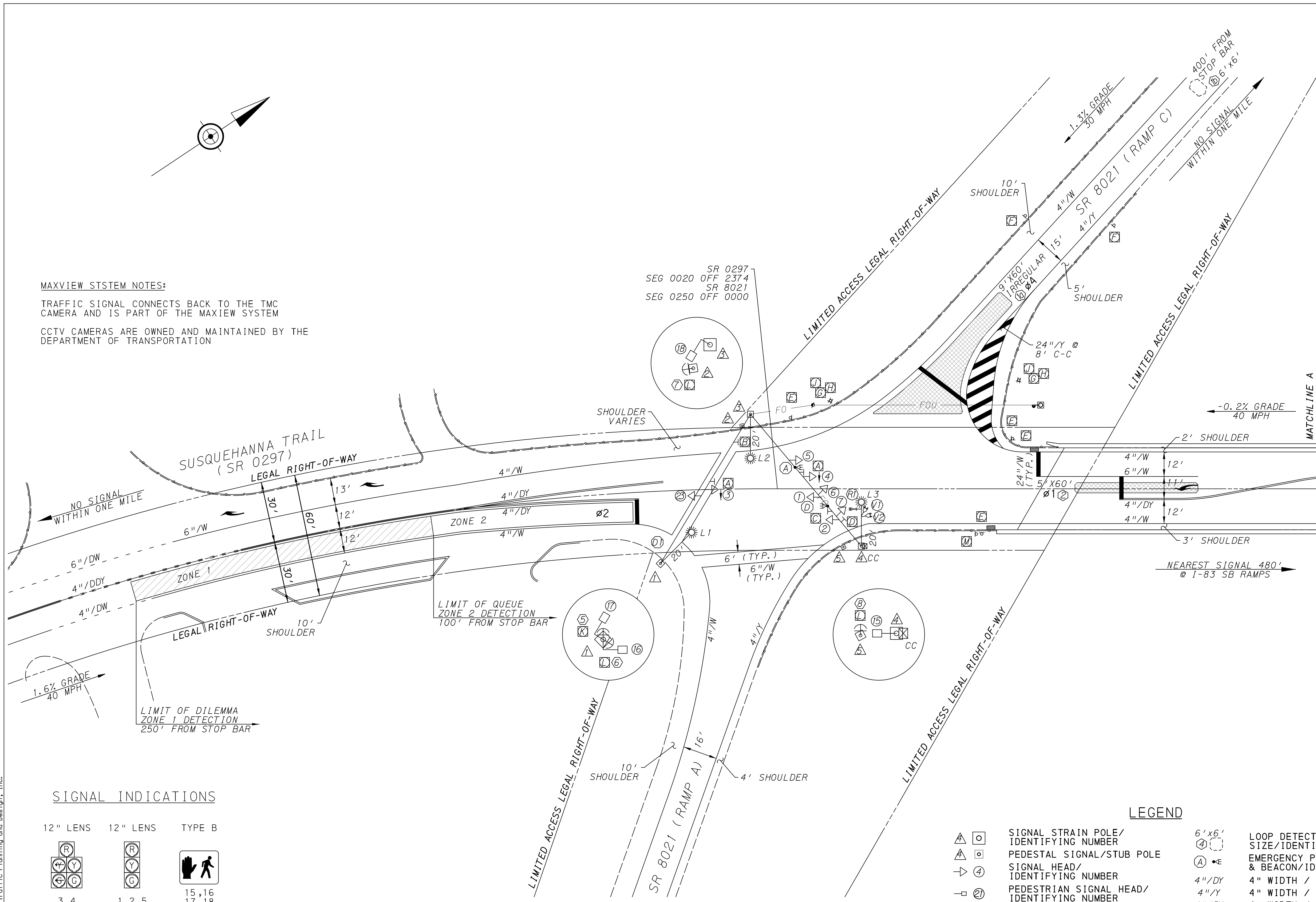
COUNTY: YORK  
 MUNICIPALITY: CONEWAGO TOWNSHIP  
 INTERSECTION: SUSQUEHANNA TRAIL (SR 0297) AND I-83 RAMPS

APPROVED: *[Signature]* 8/30/22  
 MUNICIPAL OFFICIAL DATE  
 RECOMMENDED:  
 DIST TRAFFIC ENGR DATE

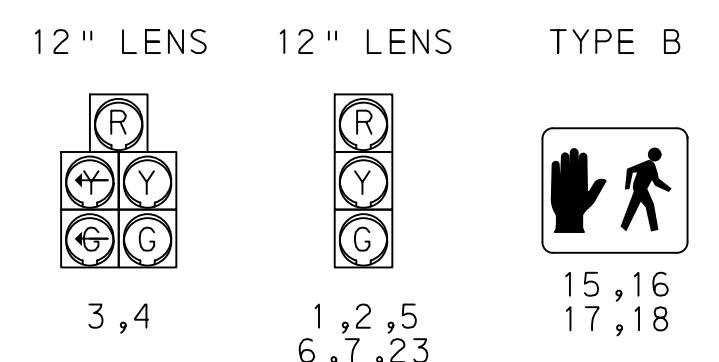
**MAXVIEW SYSTEM NOTES:**

TRAFFIC SIGNAL CONNECTS BACK TO THE TMC CAMERA AND IS PART OF THE MAXVIEW SYSTEM

CCTV CAMERAS ARE OWNED AND MAINTAINED BY THE DEPARTMENT OF TRANSPORTATION



**SIGNAL INDICATIONS**



ALL VEHICULAR SIGNAL HEADS SHALL HAVE RED, YELLOW, AND GREEN LEDS.

ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE LUNAR WHITE AND PORTLAND ORANGE LEDS.

ALL VEHICULAR SIGNALS TO BE EQUIPPED WITH BACKPLATES AND YELLOW RETROREFLECTIVE BORDERS

SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS: 1,2,3,4,5,23

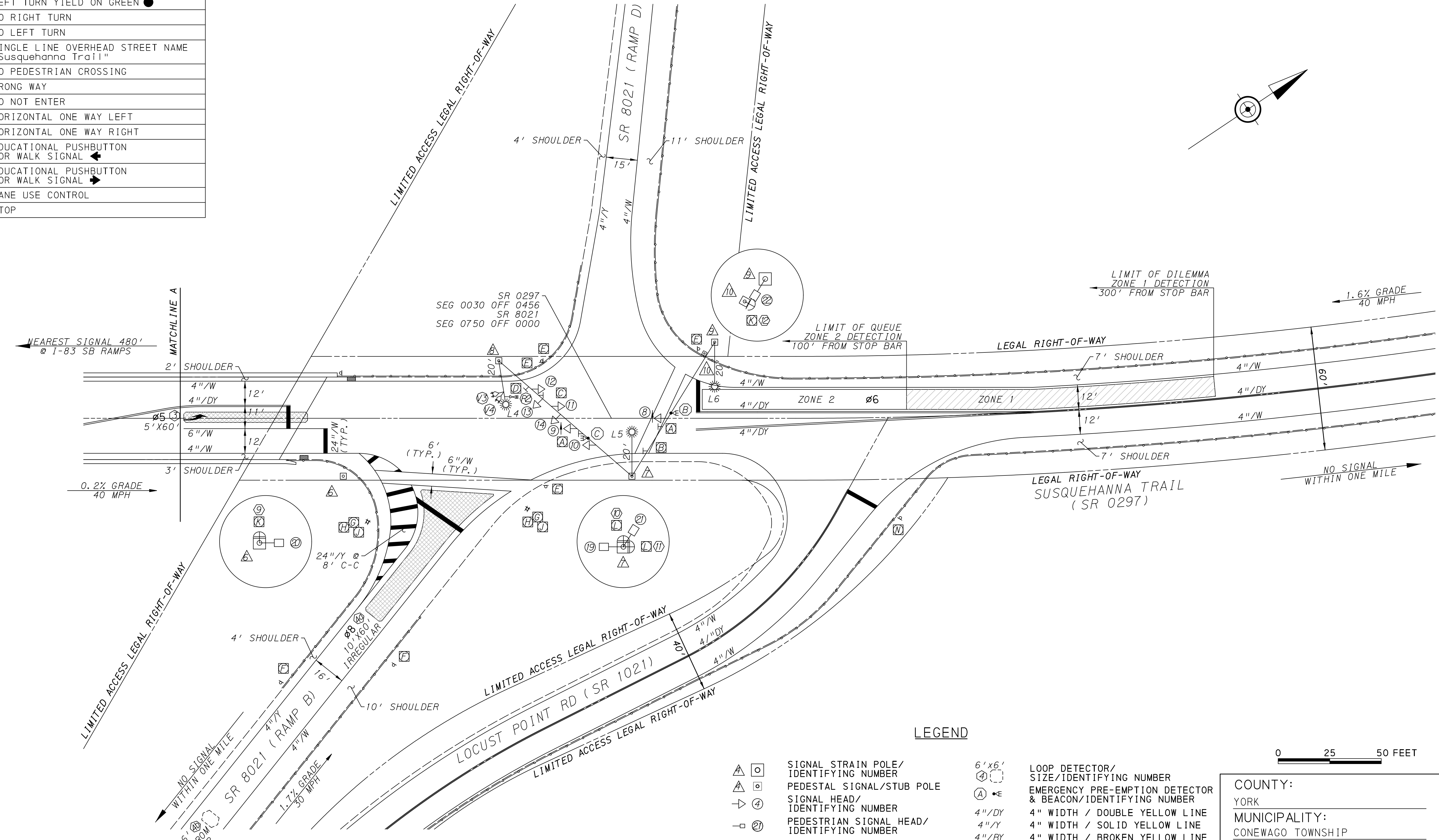
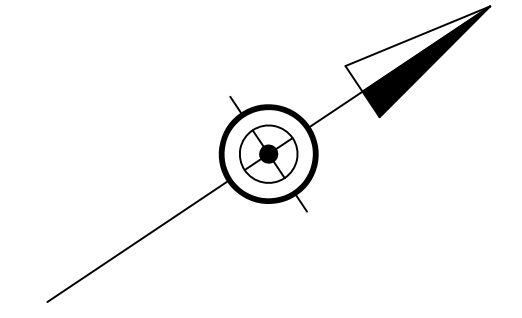
SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS AND LOUVERS: 6,7

**LEGEND**

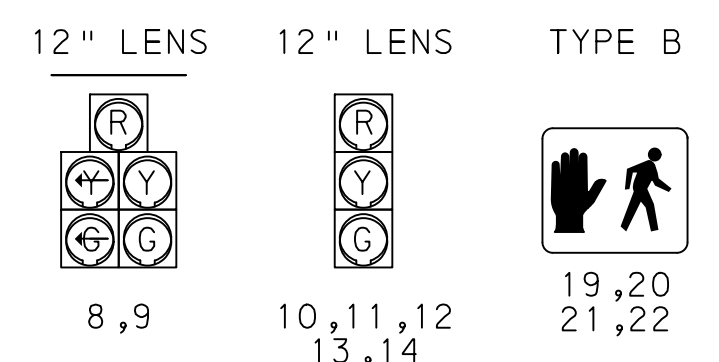
	SIGNAL STRAIN POLE/ IDENTIFYING NUMBER		6'x6' LOOP DETECTOR/ SIZE/IDENTIFYING NUMBER
	PEDESTAL SIGNAL/STUB POLE		EMERGENCY PRE-EMPTION DETECTOR & BEACON/IDENTIFYING NUMBER
	SIGNAL HEAD/ IDENTIFYING NUMBER		4" WIDTH / DOUBLE YELLOW LINE
	PEDESTRIAN SIGNAL HEAD/ IDENTIFYING NUMBER		4" WIDTH / SOLID YELLOW LINE
	PEDESTRIAN PUSHBUTTON/ IDENTIFYING NUMBER		4" WIDTH / BROKEN YELLOW LINE
	SIGN/IDENTIFYING LETTER		4" WIDTH / SOLID WHITE LINE
	THERMAL VIDEO CAMERA/ IDENTIFYING NUMBER		6" WIDTH / BROKEN WHITE LINE
	VIDEO DETECTION ZONE/SIZE/ IDENTIFYING NUMBER		6" WIDTH / SOLID WHITE LINE
	ADVANCE RADAR DETECTOR/ IDENTIFYING NUMBER		24" WIDTH / SOLID WHITE LINE
	DILEMMA/QUEUE DETECTION ZONE		24" WIDTH / SOLID YELLOW LINE
	QUEUE DETECTION ZONE 2		PHASE NUMBER
	CONTROLLER CABINET		UTILITY POLE
			LUMINAIRE
			GUIDERRAIL
			CCTV POLE
			OVERHEAD FIBER OPTIC CABLE
			UNDERGROUND FIBER OPTIC CABLE

p:\p\pw\_bentley.com\TPO\Project\wise\Documents\Activa\RL\1\00001 - Bol 1z Farm Ridge L Line WH Dev Conewago\CADD (HOP InRoads SS-) Dist 8\Signal\A-8-per-Susquehanna Trail I (SR 0297) of 1-83 Ramps.dgn  
 Traffic Planning and Design, Inc.  
 8/31/2022 11:43:26 PM

SIGN TABULATION			
PLAN SYMBOL	SERIES	SIZE	MESSAGE
A	R10-12	30"x36"	LEFT TURN YIELD ON GREEN ●
B	R3-1	30"x30"	NO RIGHT TURN
C	R3-2	48"x30"	NO LEFT TURN
D	D3-4	96"x16"	SINGLE LINE OVERHEAD STREET NAME "Susquehanna Trail"
E	R9-3A	24"x24"	NO PEDESTRIAN CROSSING
F	R5-1A	48"x36"	WRONG WAY
G	R5-1	36"x36"	DO NOT ENTER
H	R6-1L	48"x18"	HORIZONTAL ONE WAY LEFT
J	R6-1R	48"x18"	HORIZONTAL ONE WAY RIGHT
K	R10-3B(L)	9"x12"	EDUCATIONAL PUSHBUTTON FOR WALK SIGNAL ←
L	R10-3B(R)	9"x12"	EDUCATIONAL PUSHBUTTON FOR WALK SIGNAL →
M	R3-8A(L-S)	30"x30"	LANE USE CONTROL
N	R1-1	30"x30"	STOP



**SIGNAL INDICATIONS**



ALL VEHICULAR SIGNAL HEADS SHALL HAVE RED, YELLOW, AND GREEN LEDS.  
 ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE LUNAR WHITE AND PORTLAND ORANGE LEDS.  
 ALL VEHICULAR SIGNALS TO BE EQUIPPED WITH BACKPLATES WITH YELLOW RETROREFLECTIVE BORDERS  
 SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS: 8,9,10,11,12  
 SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS AND LOUVERS: 13,14

**LEGEND**

- ▲ ○ SIGNAL STRAIN POLE/ IDENTIFYING NUMBER
- ▲ □ PEDESTAL SIGNAL/STUB POLE
- ○ SIGNAL HEAD/ IDENTIFYING NUMBER
- ○ PEDESTRIAN SIGNAL HEAD/ IDENTIFYING NUMBER
- ⊕ ○ PEDESTRIAN PUSHBUTTON/ IDENTIFYING NUMBER
- ▲ □ SIGN/IDENTIFYING LETTER
- ⊕ ○ THERMAL VIDEO CAMERA/ IDENTIFYING NUMBER
- ⊕ ○ VIDEO DETECTION ZONE/SIZE/ IDENTIFYING NUMBER
- ⊕ ○ ADVANCE RADAR DETECTOR/ IDENTIFYING NUMBER
- ▨ □ DILEMMA/QUEUE DETECTION ZONE
- □ QUEUE DETECTION ZONE 2
- ⊕ □ CONTROLLER CABINET
- 6'x6' ○ LOOP DETECTOR/ SIZE/IDENTIFYING NUMBER
- ⊕ ○ EMERGENCY PRE-EMPTION DETECTOR & BEACON/IDENTIFYING NUMBER
- 4"/DY 4" WIDTH / DOUBLE YELLOW LINE
- 4"/Y 4" WIDTH / SOLID YELLOW LINE
- 4"/BY 4" WIDTH / BROKEN YELLOW LINE
- 4"/W 4" WIDTH / SOLID WHITE LINE
- 6"/BW 6" WIDTH / BROKEN WHITE LINE
- 6"/W 6" WIDTH / SOLID WHITE LINE
- 24"/W 24" WIDTH / SOLID WHITE LINE
- 24"/Y 24" WIDTH / SOLID YELLOW LINE
- PHASE NUMBER
- UTILITY POLE
- L1 ○ LUMINAIRE
- GUIDERAIL
- CCTV POLE
- FO- OVERHEAD FIBER OPTIC CABLE
- FOU- UNDERGROUND FIBER OPTIC CABLE



COUNTY: YORK  
 MUNICIPALITY: CONEWAGO TOWNSHIP  
 INTERSECTION: SUSQUEHANNA TRAIL (SR 0297) AND I-83 RAMPS  
 APPROVED: *[Signature]* 8/30/22  
 MUNICIPAL OFFICIAL DATE  
 RECOMMENDED:  
 DIST TRAFFIC ENGR DATE

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 Traffic Planning and Design, Inc.  
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MOVEMENT, SEQUENCE, AND TIMING DIAGRAM

SIGNALS	PHASE 2+6		PHASE 1+6 <sup>18</sup>		PHASE 2+5 <sup>19</sup>		PHASE 1+5		PHASE 4+8		PHASE 4+7 <sup>21</sup>		PHASE 3+8 <sup>21</sup>		EMERGENCY PREEMPTION PHASE 2+5		EMERGENCY PREEMPTION PHASE 1+6		RAMP PREEMPTION PHASE 4+7		RAMP PREEMPTION PHASE 3+8		EMERGENCY FLASHING OPERATION					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		23	24	25	26	27
1,2,23	G	G	Y	R	R	R	R	G	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	G	G	Y	R	
3,4	G	G	Y	R	R	R	R	G	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	G	G	Y	R	
5	G	G	Y	R	R	R	R	G	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	G	G	Y	R	
6,7	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
8,9	G	G	Y	R	R	R	R	G	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	G	G	Y	R	
10	G	G	Y	R	R	R	R	G	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	G	G	Y	R	
11,12	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
13,14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
15,16*	M*	FH*	H	H	H	H	H	M*	FH*	H	H	M*	FH*	H	H	M*	FH*	H	H	M*	FH*	H	H	M*	FH*	H	H	
17,18*	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	
19,20*	M*	FH*	H	H	M*	FH*	H	H	M*	FH*	H	H	M*	FH*	H	H	M*	FH*	H	H	M*	FH*	H	H	M*	FH*	H	H
21,22*	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	
FAIL SAFE A,B	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
FAIL SAFE C,D	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
FIXED																												
MINIMUM	15				4.0	2.3		3					3				3							3				
PASSAGE	1				6			6					6				6							6				
MAXIMUM I	47				9			9					21				21							21				
MAXIMUM II	42				9			9					31				31							31				
PEDESTRIAN*	7	19					24					24				24				7	15		23			23		
MEMORY		mR				NL				NL				NL					NL						NL			

OPERATION NOTES

- ① G IF FOLLOWED BY 2+5 OR 3+8
- ② G IF FOLLOWED BY 3+8 OR 2+6
- ③ G IF FOLLOWED BY 1+6, 2+5, 1+5 OR 3+8
- ④ G IF FOLLOWED BY 3+8 OR 2+6
- ⑤ G IF FOLLOWED BY 1+5
- ⑥ G IF FOLLOWED BY 3+8 OR 2+6
- ⑦ G IF FOLLOWED BY 1+5, 3+8 OR 2+6
- ⑧ G IF FOLLOWED BY 3+8 OR 2+6
- ⑨ G IF FOLLOWED BY 4+7
- ⑩ G IF FOLLOWED BY 1+6, 2+5, 1+5 OR 4+7
- ⑪ G IF FOLLOWED BY 1+5, 4+7 OR 2+6
- ⑫ G IF FOLLOWED BY 1+5
- ⑬ G IF FOLLOWED BY 4+7 OR 2+6
- ⑭ G IF FOLLOWED BY 4+7 OR 2+6
- ⑮ G IF FOLLOWED BY 4+7 OR 2+6
- ⑯ G IF FOLLOWED BY 1+6 OR 4+7
- ⑰ G IF FOLLOWED BY 3+8
- ⑱ CANNOT FOLLOW 2+5, BUT MAY BE FOLLOWED BY 1+5
- ⑲ CANNOT FOLLOW 1+6, BUT MAY BE FOLLOWED BY 1+5
- ⑳ WILL FOLLOW 4+8 IF 8 TIMES OUT BEFORE 4 AND THEN WILL BE FOLLOWED BY 2+6
- ㉑ WILL FOLLOW 4+8 IF 4 TIMES OUT BEFORE 8 AND THEN WILL BE FOLLOWED BY 2+6
- ㉒ FOR DURATION OF PRE-EMPTION; 60 SECOND MAXIMUM
- ㉓ NORMAL YELLOW AND ALL-RED PHASE TIMINGS BE UTILIZED
- ㉔ TIMING WILL BE AS SHOWN IN PHASE 2+6 (EXTENSION)
- ㉕ TIMING WILL BE AS SHOWN IN PHASE 4+8 (EXTENSION)

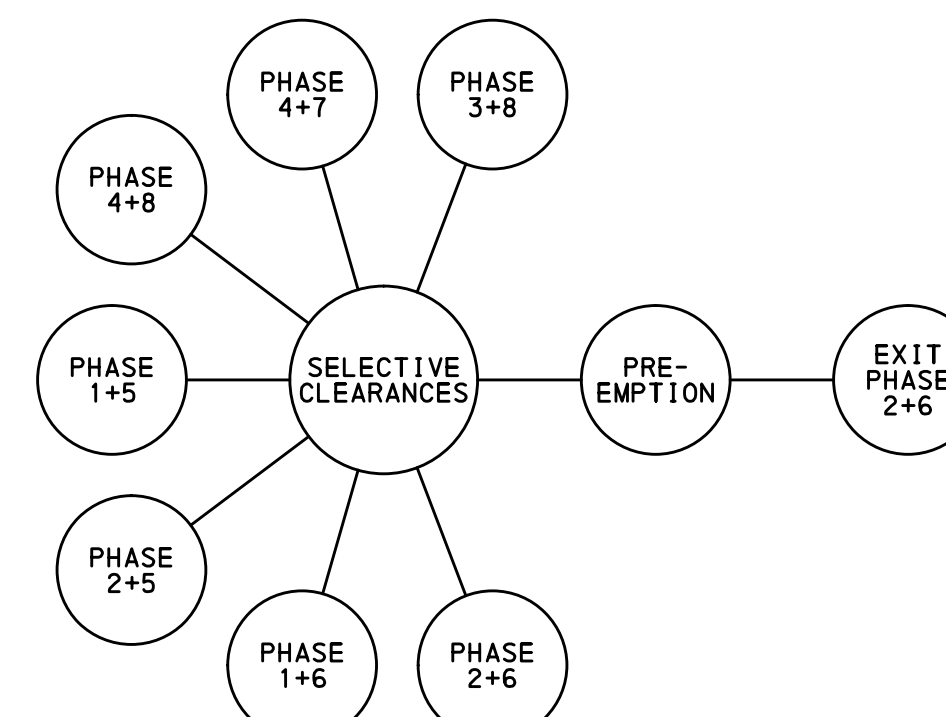
- \*ADVANCE RADAR ZONE NOTES (ZONE 1)
- ESTIMATED TIME OF ARRIVAL: MIN 2.5-MAX 5.5 SEC
  - RANGE OF DETECTION: MIN 0'-MAX 300' FT
  - MINIMUM SPEED BOUNDARY: 25 MPH
  - ZONE MAY BE ADJUSTED FOR FIELD CONDITIONS
- \*ADVANCED RADAR ZONE NOTES (ZONE 2)
- RANGE OF DETECTION: 0'-100' FT FROM STOP BAR
  - MINIMUM SPEED BOUNDARY: 1 MPH
  - ZONE MAY BE ADJUSTED FOR FIELD CONDITIONS

mR DENOTES MINIMUM RECALL \* UPON PEDESTRIAN ACTUATION ONLY OTHERWISE H AT ALL TIMES  
 NL DENOTES NON LOCKING \*\* SELECTIVE YELLOW INTERVAL INCLUDES THE NORMAL ALL RED PHASE INTERVAL

DETECTOR NOTES

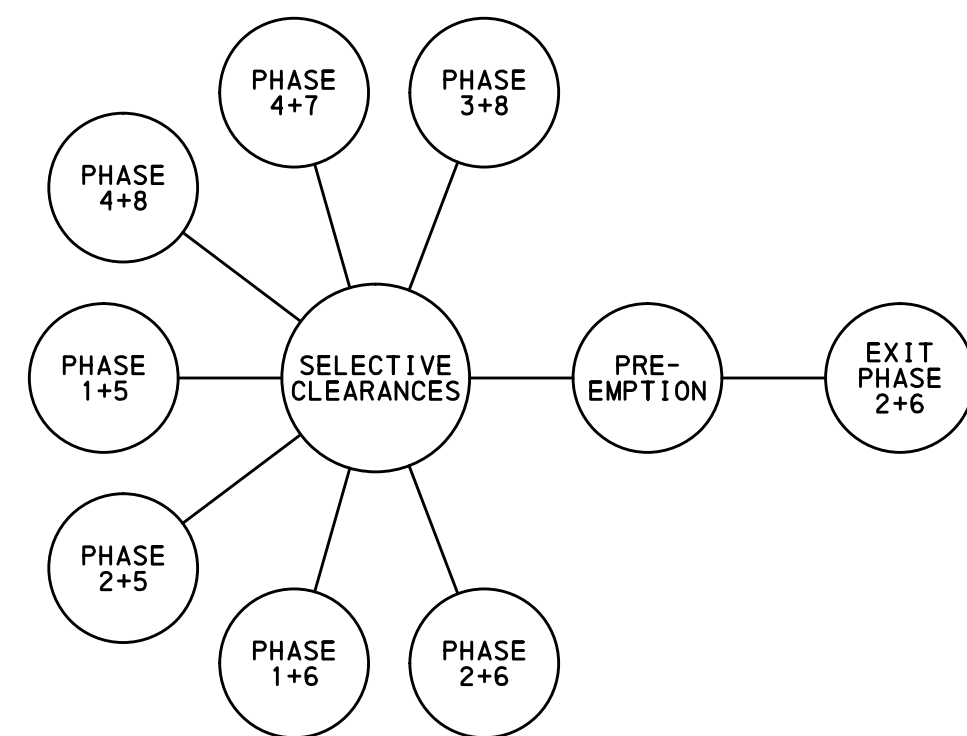
DETECTION ZONE 1a CALLS AND EXTENDS PHASE 4, PRESENCE  
 DETECTOR 1b CALLS AND EXTENDS RAMP PRE-EMPTION PHASE 4+7, PRESENCE  
 DETECTION ZONE 2 CALLS AND EXTENDS PHASE 1, PRESENCE, 5 SECOND DELAY  
 DETECTION ZONE 3 CALLS AND EXTENDS PHASE 5, PRESENCE, 5 SECOND DELAY  
 DETECTION ZONE 4a CALLS AND EXTENDS PHASE 8, PRESENCE  
 DETECTOR 4b CALLS AND EXTENDS RAMP PRE-EMPTION PHASE 3+8, PRESENCE

EMERGENCY VEHICLE PRE-EMPTION SEQUENCE



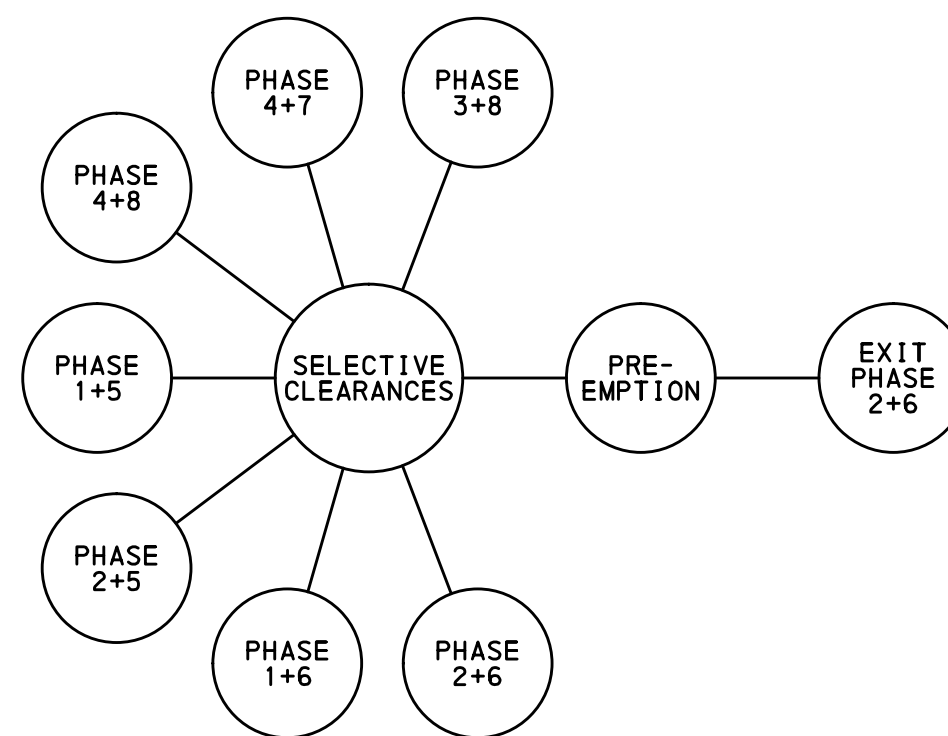
1. CONTROLLER TO BE EQUIPPED WITH EMERGENCY PRE-EMPTION FOR THE NORTHBOUND AND SOUTHBOUND APPROACH.
2. THE SIGNAL, WHEN ACTUATED BY EMERGENCY VEHICLES, SHALL PROVIDE AN APPROPRIATE SELECTIVE YELLOW INTERVAL, FOLLOWED BY A GREEN INDICATION FOR THE EMERGENCY VEHICLE PRE-EMPTION PHASE, AND A RED INDICATION FOR ALL OTHER APPROACHES.
3. UPON COMPLETION OF PRE-EMPTION, OPERATION RESUMES IN PHASE 2+6.
4. PRE-EMPTED APPROACH SHALL PROVIDE AN INDICATION (FAIL-SAFE LAMP) TO THE DRIVER OF THE APPROACHING EMERGENCY VEHICLE WHEN THE EQUIPMENT HAS PRE-EMPTED THE TRAFFIC SIGNAL FOR THAT APPROACH.
5. THE FAIL-SAFE INDICATION SHALL BE A FLASHING WHITE LIGHT ON THE APPROACH WHICH PRE-EMPTION IS PROVIDED.
6. IF PRE-EMPTION OCCURS DURING FLASHING OPERATION, SIGNAL SHALL REMAIN IN FLASH.
7. NOTE DETECTORS A & B CALL/EXTEND PHASE 1+6 PREEMPTION; DETECTORS C & D CALL/EXTEND PHASE 2+5 PREEMPTION

RAMP C PRE-EMPTION SEQUENCE 4 (SB)



1. WHEN A CONSTANT CALL IS REGISTERED ON DETECTOR 1b FOR 25 SECONDS, THE CURRENT PHASE TIMING TERMINATES IMMEDIATELY AND IS FOLLOWED BY A SELECTIVE YELLOW. THE RAMP PRE-EMPTION PHASE FOLLOWS.
2. UPON COMPLETEION OF RAMP PRE-EMTION, PHASE 2+6 FOLLOWS.
3. IF RAMP PRE-EMPTION OCCURS DURING EMERGENCY FLASH OPERATION, SIGNALS WILL REMAIN FLASHING.

RAMP B PRE-EMPTION SEQUENCE 8 (NB)



1. WHEN A CONSTANT CALL IS REGISTERED ON DETECTOR 4b FOR 25 SECONDS, THE CURRENT PHASE TIMING TERMINATES IMMEDIATELY AND IS FOLLOWED BY A SELECTIVE YELLOW. THE RAMP PRE-EMPTION PHASE FOLLOWS.
2. UPON COMPLETEION OF RAMP PRE-EMTION, PHASE 2+6 FOLLOWS.
3. IF RAMP PRE-EMPTION OCCURS DURING EMERGENCY FLASH OPERATION, SIGNALS WILL REMAIN FLASHING.

COUNTY: YORK  
 MUNICIPALITY: CONEWAGO TOWNSHIP  
 INTERSECTION: SUSQUEHANNA TRAIL (SR 0297) AND I-83 RAMPS

APPROVED: *[Signature]* 8/30/22  
 MUNICIPAL OFFICIAL DATE  
 RECOMMENDED:  
 DIST TRAFFIC ENGR DATE

Revised: To show extra Co-ordinations  
 FILE: T-087  
**T-087**

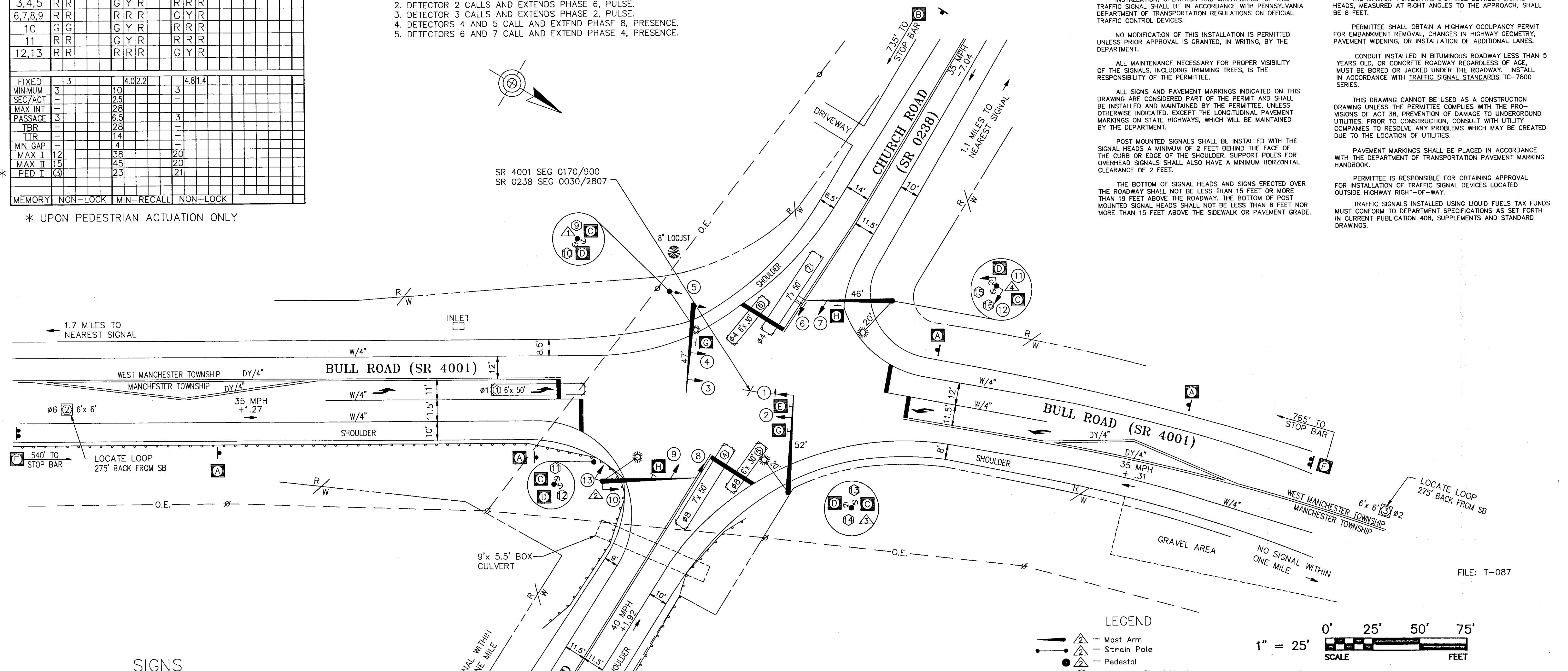
MOVEMENT, SEQUENCE AND TIMING

PHASE	INTERVAL	1 + 6	2 + 6	4 + 8	FLASH
SIGNAL 1	1 2		G Y R	R R R	
SIGNAL 2	3 4	G Y R	R R R		
SIGNAL 3,4,5	6 7 8	R R R	G Y R	R R R	
SIGNAL 6,7,8,9	10 11	R R R	R R R	G Y R	
SIGNAL 10	12 13	G Y R	R R R		
SIGNAL 11		R R R	G Y R	R R R	
SIGNAL 12,13		R R R	R R R	G Y R	
FIXED		3	4.02.2	4.81.4	
MINIMUM		3	10	3	
SEC/ACT		-	2.5	-	
MAX INT		-	28	-	
PASSAGE		3	6.5	3	
TBR		-	28	-	
TTR		-	14	-	
MIN GAP		-	4	-	
MAX I		12	38	20	
MAX II		15	45	20	
PED I		3	2.3	2.1	
MEMORY		NON-LOCK	MIN-RECALL	NON-LOCK	

- OPERATION NOTES**
- MAX II TO OPERATE 2:00-6:00 P.M. MON. THRU FRI.
  - Ø6 ON OMITTS Ø1
  - TIMING WILL BE AS SHOWN IN Ø2+6. IT MAY TIME OUT IN THIS Ø OR BE COMPLETED IN Ø2+6.
- DETECTOR NOTES**
- DETECTOR 1 CALLS AND EXTENDS PHASE 1, PRESENCE.
  - DETECTOR 2 CALLS AND EXTENDS PHASE 6, PULSE.
  - DETECTOR 3 CALLS AND EXTENDS PHASE 2, PULSE.
  - DETECTORS 4 AND 5 CALL AND EXTEND PHASE 8, PRESENCE.
  - DETECTORS 6 AND 7 CALL AND EXTEND PHASE 4, PRESENCE.

- GENERAL NOTES**
- THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNAL HEADS, MEASURED AT RIGHT ANGLES TO THE APPROACH, SHALL BE 8 FEET.
  - PERMITEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR EMBANKMENT REMOVAL, CHANGES IN HIGHWAY GEOMETRY, PAVEMENT WIDENING, OR INSTALLATION OF ADDITIONAL LANES.
  - CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS TC-7800 SERIES.
  - THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITEE COMPLIES WITH THE PROVISIONS OF ACT 38, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES. PRIOR TO CONSTRUCTION, CONSULT WITH UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.
  - PAVEMENT MARKINGS SHALL BE PLACED IN ACCORDANCE WITH THE DEPARTMENT OF TRANSPORTATION PAVEMENT MARKING HANDBOOK.
  - PERMITEE IS RESPONSIBLE FOR OBTAINING APPROVAL FOR INSTALLATION OF TRAFFIC SIGNAL DEVICES LOCATED OUTSIDE HIGHWAY RIGHT-OF-WAY.
  - TRAFFIC SIGNALS INSTALLED USING LIQUID FUELS TAX FUNDS MUST CONFORM TO DEPARTMENT SPECIFICATIONS AS SET FORTH IN CURRENT PUBLICATION 408, SUPPLEMENTS AND STANDARD DRAWINGS.

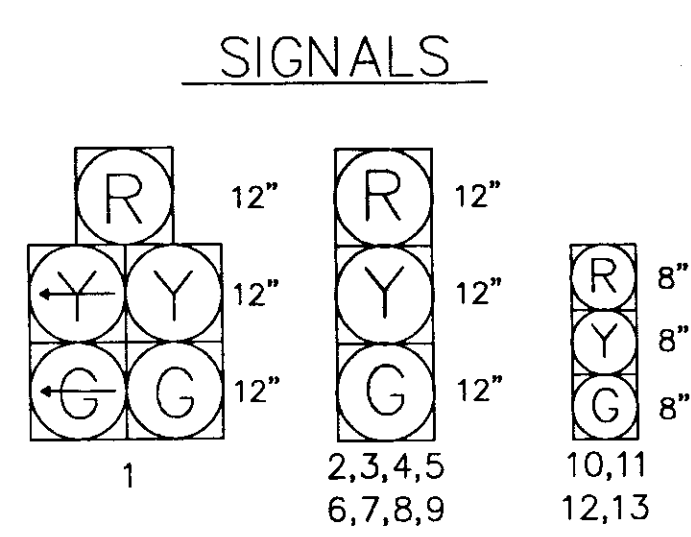
\* UPON PEDESTRIAN ACTUATION ONLY



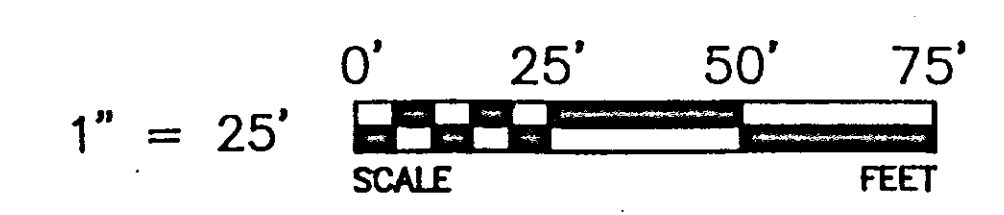
**SIGNS**

PLAN SYMBOL	DESCRIPTION	SIZE W x H	SERIES DESIGNATION
A	LANE USE CONTROL SIGN	30" x 30"	R3-BLSR
B	SIGNAL AHEAD SIGN	36" x 36"	W3-3
C	PUSH BUTTON FOR GREEN LIGHT	9" x 12"	R10-3L
D	PUSH BUTTON FOR GREEN LIGHT	9" x 12"	R10-3R
E	LEFT TURN YIELD ON GREEN	30" x 36"	R10-12
F	SIGNAL AHEAD SIGN	48" x 48"	W3-3
G	"CHURCH ROAD"	56" x 16"	D3-4
H	"BULL ROAD"	36" x 16"	D3-4

ALL SIGNALS TO BE EQUIPPED WITH BACKPLATES  
 SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS 1,2,3,4  
 SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS AND LOUVERS 10,11



- LEGEND**
- Mast Arm
  - Strain Pole
  - Pedestal
  - Vehicular Signal Head
  - Pedestrian Signal Head
  - Sign
  - Vehicle Detector
  - Pedestrian Push Button
  - Pedestrian Push Button/Sign
  - Controller Assembly
  - Solid White Line/Width
  - Broken White Line/Width
  - Solid Yellow Line/Width
  - Broken Yellow Line/Width
  - Double Solid Yellow Line/Width
  - Luminaire



66231087

Approved:

County: YORK

Municipality: WEST MANCHESTER & MANCHESTER TOWNSHIPS

Intersection: CHURCH ROAD (SR 0238) AND BULL ROAD (SR 4001)

Dist. Traffic Engr. Date: 4-13-95

Reviewed:

Municipal Official Date: 4-13-95

# TRAFFIC SIGNAL PERMIT

Permit No. 050010Sheet 1 of 4

In accordance with the Vehicle Code, the Secretary of Transportation hereby approves the installation and operation of a traffic signal at the intersection of Loucks Road (SR 0030) & Roosevelt Avenue (SR 4001)  
in the City of York & Township of West Manchester, County of York.

This permit is issued to, and accepted by the City of York & Township of West Manchester  
hereinafter known as the Permittee, as follows:

This installation shall be in accordance with the Vehicle Code and the Regulations for traffic signs, signals, and markings of the Department of Transportation, and shall conform to the following requirements and those contained on the attached sheets.

## Type of Controller

InSync Adaptive Traffic Signal Control

## Type of Signal Mounting

Post Mounted &amp; Overhead

## Hours of Operation as "Stop" and "Go"

Continuously

## Hours of Operation as "FLASHING"

Equipped for Emergency Flashing

## Controller Operation

Controller to provide the phasing, timing, and signal display indicated on the attached diagram. Coordination Program located on Signal Systems Permit No. I-0067. Controller to be interconnected with adjacent signal controllers along Loucks Road (SR 0030) to provide a progressive movement of traffic via InSync Adaptive Traffic Signal Control. Supervised by master controller located at Loucks Road & Pennsylvania Avenue. Pre-emption for emergency vehicles to provide the operation indicated on the attached diagram.

All work performed by the Permittee in the erection of the traffic signal shall be under and subject to the direction of the Secretary of Transportation or his authorized representatives. The said Permittee shall use due diligence in the execution of the work authorized under this permit and shall not obstruct or endanger travel along the said road. All operations must be conducted so as to permit safe and reasonable free travel at all times over the road within the limits of the work herein permitted.

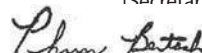
The Permittee covenants and agrees to fully indemnify and save harmless the Department of Transportation and assume all liability for damages or injury, occurring to any person, persons or property through or in consequence of any act or omission of anyone working on the construction, or from faulty maintenance or operation of such traffic signal.

The Secretary of Transportation, by law, reserves the right to revoke and annul this permit if the Permittee shall at any time willfully or negligently fail to comply with the conditions contained in this permit, or, upon changes in traffic conditions, fail to make any changes in the construction or operation of this signal, or to remove it, when so ordered by the Secretary of Transportation; or if this installation is not in operation within twenty-four (24) months of the receipt of this permit. The Permittee shall maintain the signal in a safe condition at all times. The Permittee shall not make any change in the construction or operation of this traffic signal without prior written approval of the Secretary of Transportation.

This permit cancels and supersedes all previous permits issued for this location upon completion of the installation specified herein.

INITIAL DATE October 16, 1968APPROVED Leslie S. Richards  
(Secretary of Transportation)REVISION DATE June 13, 2019

BY for:



(District Executive or approved designee)

Digitally signed by Pharon Bertsch  
Date: 2019.06.14 08:08:17 -04'00'

**GENERAL NOTES**

INSTALLATION, OPERATION AND MAINTENANCE OF THIS TRAFFIC SIGNAL SHALL BE IN ACCORDANCE WITH PENNSYLVANIA DEPARTMENT OF TRANSPORTATION REGULATIONS ON OFFICIAL TRAFFIC CONTROL DEVICES.

NO MODIFICATION OF THIS INSTALLATION IS PERMITTED UNLESS PRIOR APPROVAL IS GRANTED, IN WRITING, BY THE DEPARTMENT.

ALL MAINTENANCE NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS, INCLUDING TRIMMING TREES, IS THE RESPONSIBILITY OF THE PERMITTEE.

ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE CONSIDERED PART OF THE PERMIT AND SHALL BE INSTALLED AND MAINTAINED BY THE PERMITTEE, UNLESS OTHERWISE INDICATED. EXCEPT THE LONGITUDINAL PAVEMENT MARKINGS ON STATE HIGHWAYS, WHICH WILL BE MAINTAINED BY THE DEPARTMENT.

POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF THE CURB OR EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS SHALL ALSO HAVE A MINIMUM HORIZONTAL CLEARANCE OF 2 FEET.

THE BOTTOM OF SIGNAL HEADS AND SIGNS ERECTED OVER THE ROADWAY SHALL NOT BE LESS THAN 15 FEET OR MORE THAN 19 FEET ABOVE THE ROADWAY. THE BOTTOM OF POST MOUNTED SIGNAL HEADS SHALL NOT BE LESS THAN 8 FEET NOR MORE THAN 15 FEET ABOVE THE SIDEWALK OR PAVEMENT GRADE.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNAL HEADS, MEASURED AT RIGHT ANGLES TO THE APPROACH, SHALL BE 8 FEET.

PERMITTEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR EMBANKMENT REMOVAL, CURBING AND/OR SIDEWALK, DRAINAGE STRUCTURES, CHANGES IN HIGHWAY GEOMETRY, PAVEMENT WIDENING, OR INSTALLATION OF ADDITIONAL LANES.

CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS, TC-8800 SERIES.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF ACT 50 (2018), PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES. PRIOR TO CONSTRUCTION, CONSULT WITH UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

PAVEMENT MARKINGS SHALL BE PLACED IN ACCORDANCE WITH THE DEPARTMENT OF TRANSPORTATION PAVEMENT MARKING AND SIGNING STANDARDS, PUB 111, TC-8600 AND TC-8700 SERIES.

PERMITTEE IS RESPONSIBLE FOR OBTAINING APPROVAL FOR INSTALLATION OF TRAFFIC SIGNAL DEVICES LOCATED OUTSIDE HIGHWAY RIGHT-OF-WAY.

TRAFFIC SIGNALS INSTALLED USING LIQUID FUELS TAX FUNDS MUST CONFORM TO DEPARTMENT SPECIFICATIONS AS SET FORTH IN CURRENT PUBLICATION 408, SUPPLEMENTS AND STANDARD DRAWINGS.

COUNTY : YDRK  
 MUNICIPALITY : YORK CITY AND WEST MANCHESTER TWP  
 INTERSECTION : LOUCKS RD (SR D03D) AND  
RDDSEVELT AVE (SR 4DD1)

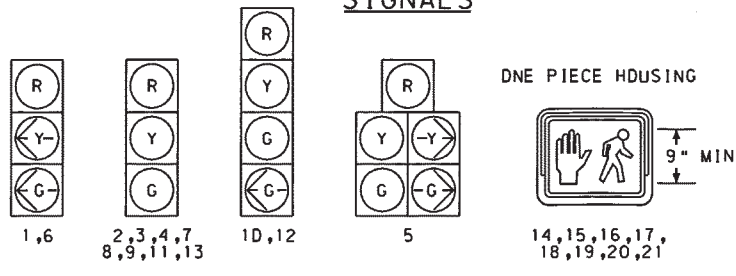
APPROVED: Chaz A. Green 3/22/2019  
 MUNICIPAL OFFICIAL City of York DATE

APPROVED: Kelly K. Kelch 3/25/2019  
 MUNICIPAL OFFICIAL West Manchester Township DATE

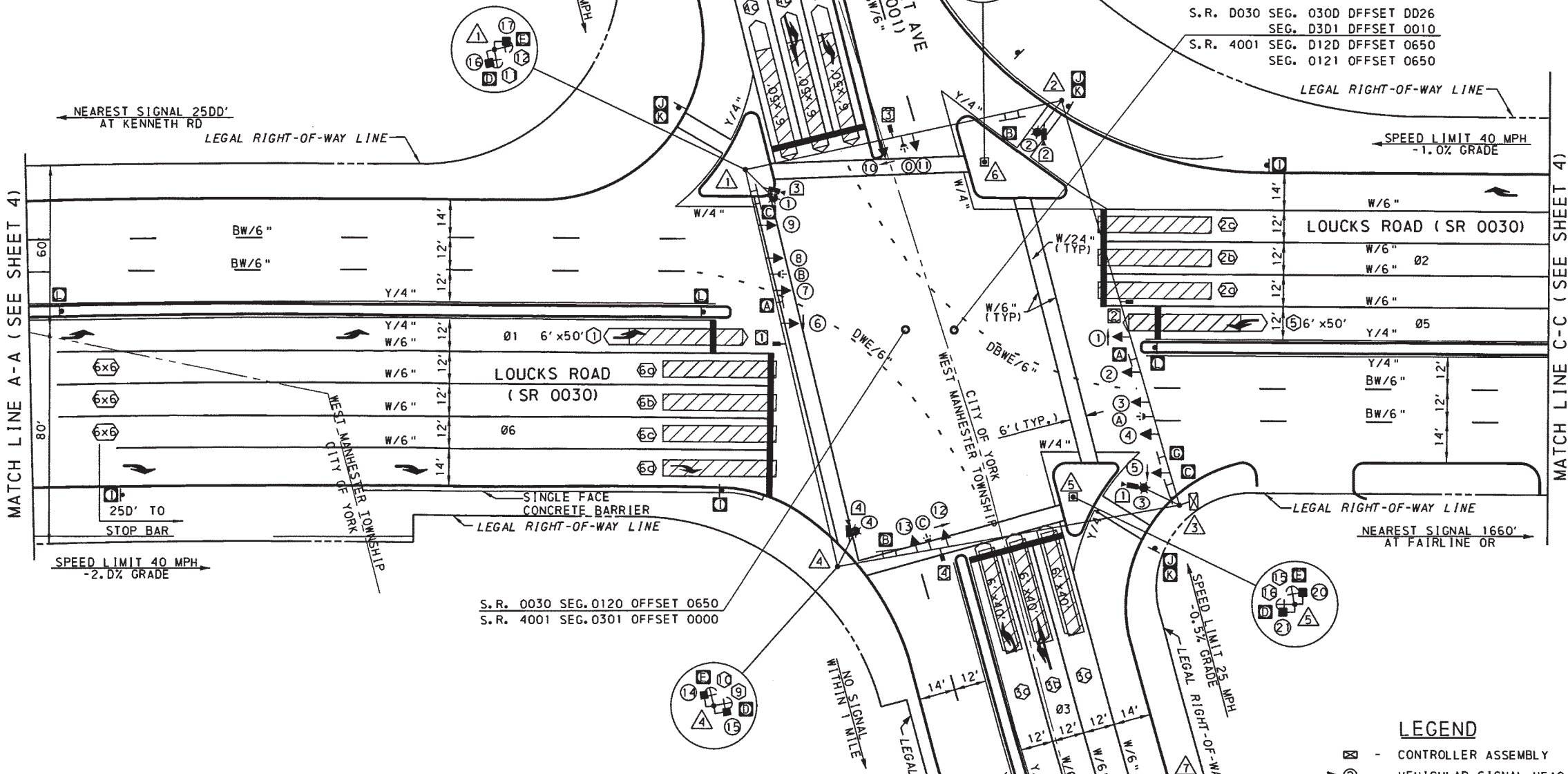
RECOMMENDED: Pharon Bertsch Digitally signed by Pharon Bertsch Date: 2019.06.14 08:11:58 -0400  
 DISTRICT TRAFFIC ENGINEER DATE

SCALE 0 25 50 75 100 FEET

**SIGNALS**



ALL OVERHEAD SIGNALS EQUIPPED WITH BACKPLATES AND TUNNEL VISORS



SIGN TABULATION				
PLAN SYMBOL	SERIES NUMBER	SIZE	QTY	REMARKS
A	R10-1DL	30"x30"	2	LEFT TURN SIGNAL
B	D3-4	54"x16"	2	Looucks
C	D3-4	54"x16"	2	Roosevelt
D	R10-3E	9"x14"	4	EDUCATIONAL PUSH BUTTDN, RIGHT
E	R10-3E	9"x14"	4	EDUCATIONAL PUSH BUTTDN, LEFT
F	R3-5L	30"x36"	4	LEFT TURN
G	R10-10R	30"x36"	1	RIGHT TURN SIGNAL
H	R3-7R	30"x30"	4	RIGHT LANE MUST TURN RIGHT
J	R1-2	36"x36"	3	YIELD
K	R1-5	24"x18"	3	YIELD TO PEOS IN CROSSWALK
L	R3-7L	30"x30"	4	LEFT LANE MUST TURN LEFT
N	R3-6LS	30"x36"	2	OPTIONAL LEFT TURN
D	R3-5R	30"x36"	4	RIGHT TURN
P	R3-5S	30"x36"	8	STRAIGHT THROUGH
S	SPECIAL	30"x36"	2	NO TRUCKS THIS LANE

- LEGEND**
- ☒ - CONTROLLER ASSEMBLY
  - ➡② - VEHICULAR SIGNAL HEAD
  - ➡② - PEDESTRIAN SIGNAL HEAD
  - ⊙ - STRAIN POLE
  - ⊙ - TRAFFIC SIGNAL SUPPRT PEDESTAL
  - ⊙ - SIGNAL SUPPRT AND MAST ARM
  - ⊙ - SIGN
  - ⊙ - LODP DETECTION ZONE
  - ➡② - ADAPTIVE VIDEO DETECTION CAMERA
  - ⊙ - ADAPTIVE VIDEO DETECTION ZONE
  - ➡② - PEDESTRIAN PUSH BUTTDN W/SIGN
  - W/4" - SOLID WHITE LINE/WIDTH
  - Y/4" - SOLID YELLOW LINE/WIDTH
  - BW/4" - BROKEN WHITE LINE/WIDTH
  - DWE/4" - DOTTED WHITE EXTENSION LINE/WIDTH
  - ⊙ - LUMINAIRE
  - ➡② - PRE-EMPTION SENSOR
  - ➡② - PRE-EMPTION FAIL-SAFE LIGHT

OPERATOR: Mde Igr Iva  
 PLOTTED: 1/28/2019  
 TIME: 11:17:32 AM  
 FILE NAME: \\permon1.com\locations\MCHA\Projects\INDT\130809-US 30 Adoptive Signal\DESIGN\INDT\005010-TSP-02-Roosevelt & US 30 2of4.dgn



MOVEMENT, SEQUENCE, AND TIMING DIAGRAM

SIGNAL	PHASE 1+5				PHASE 1+6				PHASE 2+5				PHASE 2+6				PHASE 3				PHASE 4				PRE-EMPT 6				PRE-EMPT 2				PRE-EMPT 3				PRE-EMPT 4				EMERGENCY FLASH																
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		1	2	3	4												
1	+G	-Y	R	(1)	+G	-G	(2)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	OFF												
2,3,4	R	R	R		G	G	(3)	R	R	R	R	R	G	G	(4)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Y												
5	R	R	R		G	G	(5)	R	R	R	R	R	G	G	(6)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	OFF												
6	+G	-Y	R	(7)	R	R	R	R	-G	-G	(8)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	OFF												
7,8,9	R	R	R		R	R	R	R	G	G	(9)	R	G	G	(10)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	Y												
10	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R												
11	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R												
12	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R												
13	R	R	R		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R												
14,16	H	H	H		H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	OFF												
15,21	H	H	H		M	FH	H	H	H	H	H	H	M	FH	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	OFF												
17,18	H	H	H		H	H	H	M	FH	H	H	M	FH	H	H	M	FH	H	H	M	FH	H	H	M	FH	H	H	M	FH	H	H	M	FH	H	H	M	FH	H	H	M	FH	H	H	M	OFF												
19,20	H	H	H		H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	OFF												
FIXEO	X	3	03	5	X	3	03	5	X	3	03	5	X	4	52	5	X	3	04	5	X	3	54	0	X	Y	4	52	5	X	Y	4	52	5	X	Y	3	04	5	X	Y	3	54	0													
MINIMUM	5				5				5				10				5				5																																				
PASSAGE	1#				1#				1#				1#				1#				1#																																				
MEMORY	NON-LOCK				NON-LOCK				NON-LOCK				SOFT RECALL				NON-LOCK				NON-LOCK				NON-LOCK																																

- UPON PEDESTRIAN ACTUATION ONLY
- CONTROLLER TO CALCULATE MAXIMUM WALK TIME FOR EACH CYCLE
- (1) +G-IF FOLLOWED BY 1+6
- (2) -G-IF FOLLOWED BY 2+5
- (3) +G-IF FOLLOWED BY 1+5
- (4) G IF FOLLOWED BY 2+6
- (5) G IF FOLLOWED BY 1+6
- (6) G IF FOLLOWED BY 2+5
- (7) R/-G-IF FOLLOWED BY 1+6 OR 2+6
- (8) Y/-G-IF FOLLOWED BY 3
- (9) R/-G-IF FOLLOWED BY 3
- (10) TIMING WILL BE AS SHOWN IN PHASE 2+6. IT MAY TIME OUT IN THIS PHASE OR BE COMPLETED IN PHASE 2+6.

DETECTOR NOTES

OETECTOR 1 CALLS ANO EXTENOS PHASE 1  
 OETECTOR 1a, 1b, 1c ANO 1d CALL ANO EXTENO PHASE 6  
 OETECTOR 3a, 3b, 3c CALL ANO EXTENO PHASE 3  
 OETECTOR 4a, 4b, 4c CALL ANO EXTENO PHASE 4  
 OETECTOR 5 CALLS ANO EXTENOS PHASE 5  
 OETECTOR 5a, 5b ANO 5c CALL ANO EXTEND PHASE 2

TRAFFIC ADAPTIVE OPERATION NOTES

1#PHASE PASSAGE CALCULATED BY TRAFFIC AOAPTIVE PROCESSOR  
 REFER TO SYSTEM PERMIT 1-0067 FOR TRAFFIC AOAPTIVE  
 OPERATIONS PHASE SEQUENCE SELECTEO BY TRAFFIC AOAPTIVE  
 PROCESSOR

EMERGENCY VEHICLE PREEMPTION NOTES

OPERATION: CONTROLLER TO BE EQUIPPED WITH EMERGENCY PRE-EMPTION FOR ALL APPROACHES WHICH WILL TERMINATE THE GREEN INTERVALS ANO PROVIDE A SELECTIVE CLEARANCE (YELLOW & ALL RED) WHEN ACTIVATED BY EMERGENCY TRANSMISSION.

CLEARANCE: IF PRE-EMPTION OCCURS OURING A PHASE CLEARANCE INTERVAL, THAT INTERVAL WILL CONTINUE TO TIME OUT FOLLOWEO BY PRE-EMPTEO PHASE.

GREEN PHASE: IF PRE-EMPTION OCCURS OURING A GREEN PHASE, THE CONTROLLER WILL REMAIN IN THAT PHASE FOR THE OURATION OF PRE-EMPTION.

FLASHING: IF PRE-EMPTION OCCURS OURING FLASHING OPERATION, ALL SIGNALS WILL REMAIN IN FLASH.

PEOESTRIAN: IF PRE-EMPTION OCCURS OURING A PEOESTRIAN PHASE, THE WALK/MAN INOICATIONS WILL TERMINATE IMMEOIATELY FOLLOWEO BY THE PEOESTRIAN CLEARANCE PHASE. IF PRE-EMPTION OCCURS OURING THE PEOESTRIAN CLEARANCE PHASE, "FLASHING HANO" CONTINUES IN ITS ENTIRETY FOLLOWEO BY THE PRE-EMPTIVE PHASE.

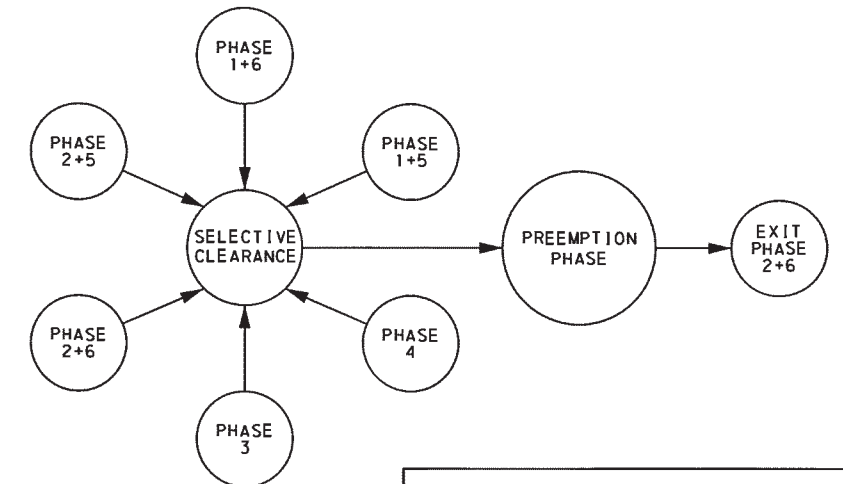
PRIORITY: IN EMERGENCY PRE-EMPTION, NO PRIORITY SHALL BE ESTABLISHED. PRE-EMPTION SHALL BE A "FIRST COME, FIRST SERVE" OPERATION.

RETURN: UPON COMPLETION OF PRE-EMPTION, OPERATION RESUMES IN PHASE 2+6.

FAIL SAFE: FAIL SAFE LIGHTS WILL CONSIST OF A WHITE LIGHT FOR EACH APPROACH WHICH WILL FLASH WHEN EMERGENCY TRANSMISSION HAS CONTROL OF THE PRE-EMPTEO APPROACH.

EQUIPMENT LOCATION: LOCATION OF EMERGENCY VEHICLE OETECTOR ARE TO BE FIELO AOJUSTEO TO ACHIEVE MAXIMUM OPERATION.

ENCOOING: IF THE PRE-EMPTION EQUIPMENT HAS ENCOOING CAPABILITIES FOR VEHICLE IOENTIFICATION, IT IS RECOMMENEO THEY BE SET TO THE ZERO (00) POSITION TO GIVE UNCOEO EMITTERS THE ABILITY TO ACTIVATE THE EMERGENCY PREEMPTION.

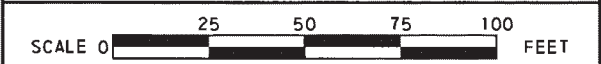


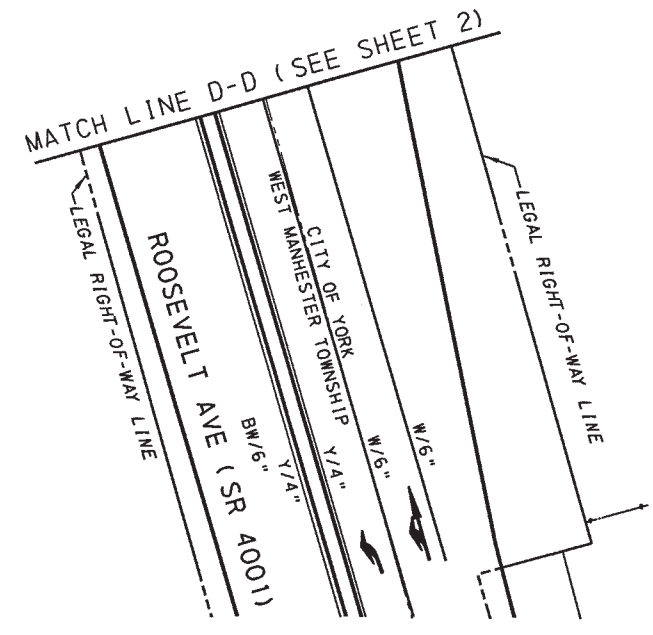
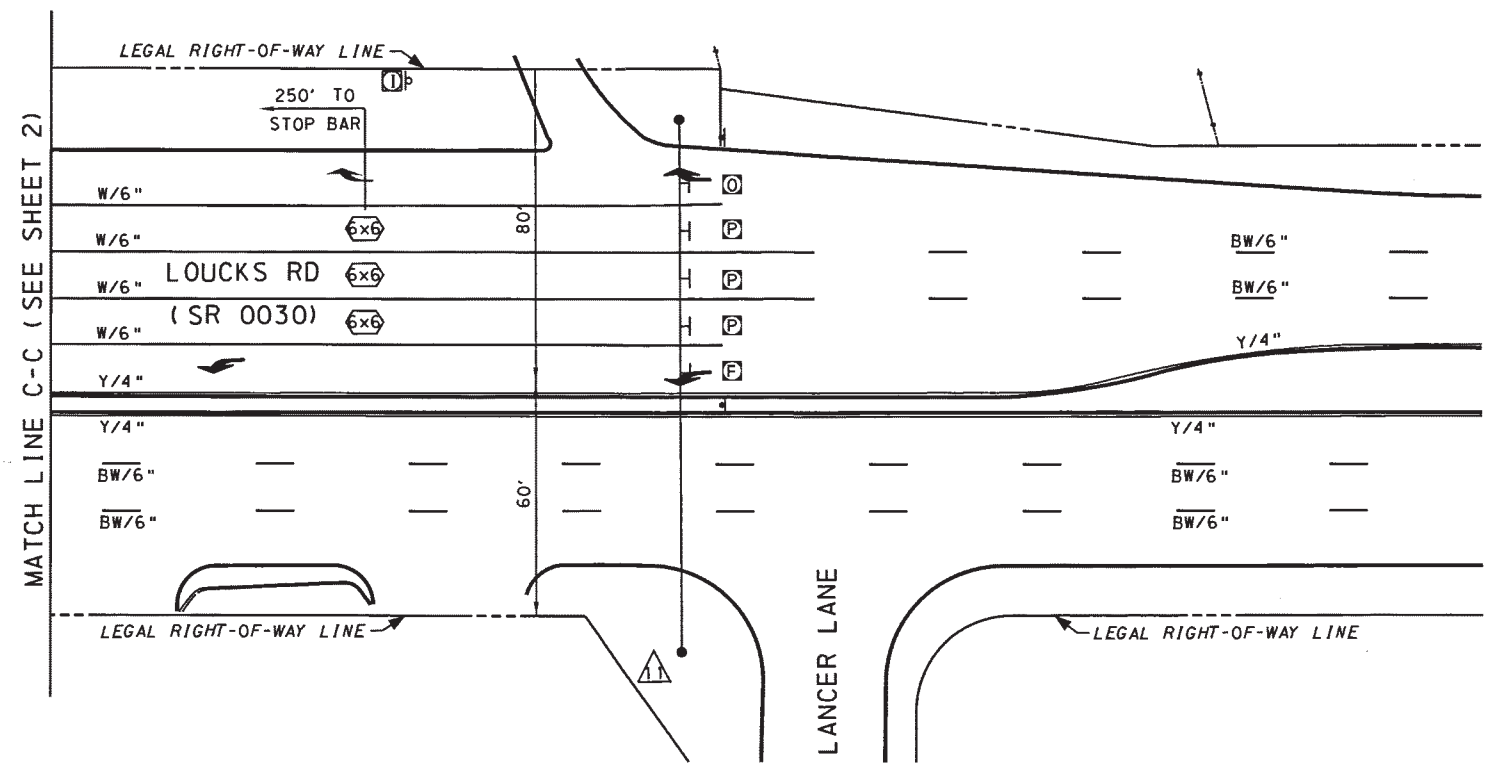
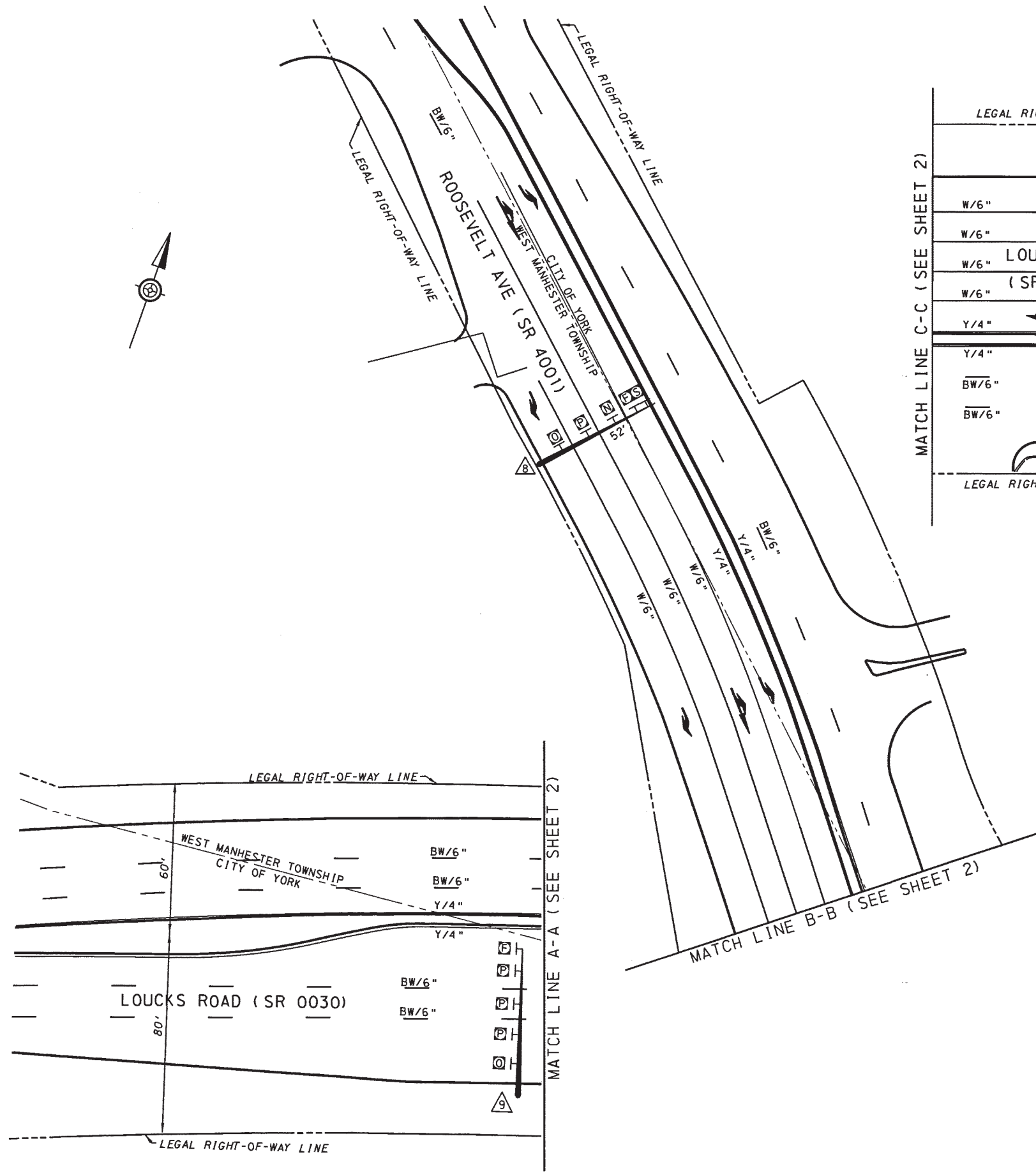
COUNTY : YORK  
 MUNICIPALITY : YORK CITY ANO WEST MANCHESTER TWP  
 INTERSECTION : LOUCKS RD (SR 0030) ANO ROOSEVELT AVE (SR 4001)

APPROVED: Chaz A. Green 3/22/2019  
 MUNICIPAL OFFICIAL City of York DATE

APPROVED: Kelly K. Kelch 3/25/2019  
 MUNICIPAL OFFICIAL West Manchester Township DATE

RECOMMENEO: Pharon Bertsch  
 Digitally signed by Pharon Bertsch Date: 2019.06.14 08:13:17 -0400  
 OISTRRICT TRAFFIC ENGINEER DATE



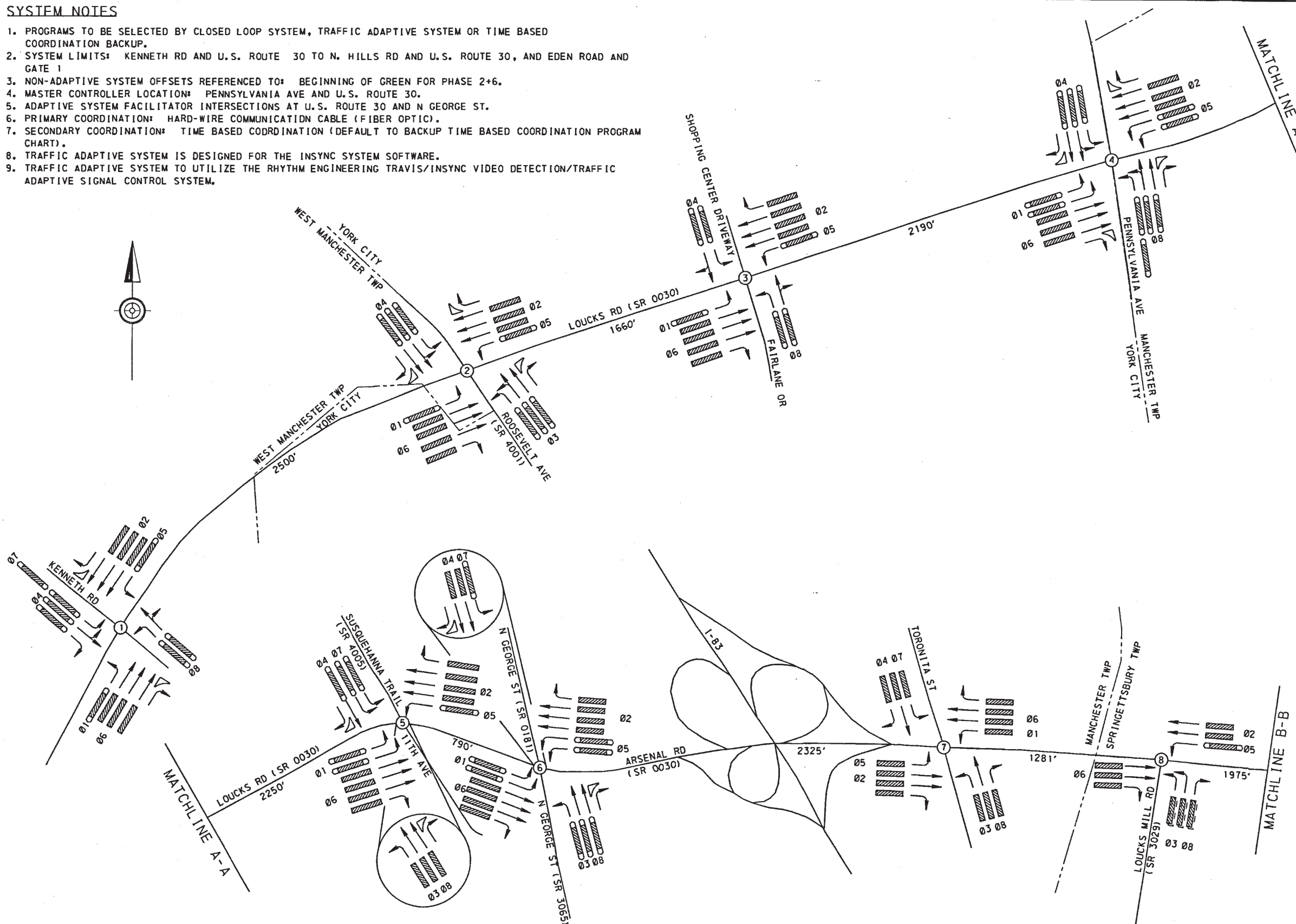


COUNTY :	YORK
MUNICIPALITY :	YORK CITY AND WEST MANCHESTER TWP
INTERSECTION :	LOUCKS RD (SR 0030) AND ROOSEVELT AVE (SR 4001)
APPROVED:	3/22/2019
Chaz A. Green	
MUNICIPAL OFFICIAL	City of York
DATE	
APPROVED:	3/25/2019
<i>Kelly K. Kelch</i>	
MUNICIPAL OFFICIAL	West Manchester Township
DATE	
RECOMMENDED:	Digitally signed by Pharon Bertsch Date: 2019.06.14 08:15:28 -0400'
<i>Pharon Bertsch</i>	
DISTRICT TRAFFIC ENGINEER	
DATE	
SCALE 0	25 50 75 100 FEET

OPERATOR: MdeIor1.via  
 PLOTTED: 1/16/2019  
 TIME: 9:05:52 PM  
 FILE NAME: M:\Projects\130809-US 30 Adaptive Signals\DESIGN\CT\DMN\Permits\PNDT130809\_TSP\_02-Roosevelt & US 30 4orf4.dgn

**SYSTEM NOTES**

- PROGRAMS TO BE SELECTED BY CLOSED LOOP SYSTEM, TRAFFIC ADAPTIVE SYSTEM OR TIME BASED COORDINATION BACKUP.
- SYSTEM LIMITS: KENNETH RD AND U.S. ROUTE 30 TO N. HILLS RD AND U.S. ROUTE 30, AND EDEN ROAD AND GATE 1
- NON-ADAPTIVE SYSTEM OFFSETS REFERENCED TO: BEGINNING OF GREEN FOR PHASE 2+6.
- MASTER CONTROLLER LOCATION: PENNSYLVANIA AVE AND U.S. ROUTE 30.
- ADAPTIVE SYSTEM FACILITATOR INTERSECTIONS AT U.S. ROUTE 30 AND N GEORGE ST.
- PRIMARY COORDINATION: HARD-WIRE COMMUNICATION CABLE (FIBER OPTIC).
- SECONDARY COORDINATION: TIME BASED COORDINATION (DEFAULT TO BACKUP TIME BASED COORDINATION PROGRAM CHART).
- TRAFFIC ADAPTIVE SYSTEM IS DESIGNED FOR THE INSYNC SYSTEM SOFTWARE.
- TRAFFIC ADAPTIVE SYSTEM TO UTILIZE THE RHYTHM ENGINEERING TRAVIS/INSYNC VIDEO DETECTION/TRAFFIC ADAPTIVE SIGNAL CONTROL SYSTEM.



**LEGEND**

- 04 - PHASE NUMBER
- LOOP DETECTOR
- ▨ ADAPTIVE VIDEO DETECTION AREA
- - - STANDARD VIDEO DETECTION AREA
- - - MUNICIPAL BOUNDARY

OPERATOR: Mgr/CR/ING  
 PLOTTED: 1/16/2019  
 TIME: 9:05:40 PM  
 FILE NAME: M:\Projects\130809-US 30 Adp1ive Signal\DESIGN\CT\OGN\Permit\130809-TSP\_system plan 1of6.dgn

PERMIT NO. I-0067 SHEET 1 OF 6  
 DATE ISSUED 6/13/2019 DATE REVISED

**GENERAL NOTES**

- NO MODIFICATIONS OF THIS INSTALLATION ARE PERMITTED UNLESS PRIOR APPROVAL IS GRANTED IN WRITING BY A REPRESENTATIVE OF THE DEPARTMENT OF TRANSPORTATION.
- REFER TO TRAFFIC SIGNAL PERMIT DRAWING FOR INDIVIDUAL INTERSECTION OPERATION, GEOMETRY, PHASING, AND CRITICAL TIMES.
- FOR CONSTRUCTION AND INSPECTION, THE SYSTEM PERMIT SHOULD ALWAYS BE ACCOMPANIED WITH TRAFFIC SIGNAL PERMIT DRAWING.
- TEST THE SYSTEM AT LOCAL INTERSECTION LEVEL, SUBSYSTEM LEVEL, MASTER CONTROLLER LEVEL AND PERSONAL COMPUTER REMOTE DIAL UP LEVEL.
- GATHER THE SYSTEM FAILURE CRITICAL ALARMS REPORT AND ARCHIVE THEM WHERE APPLICABLE.
- MAINTAIN MASTER CONTROLLER COMMUNICATION SUCH AS PHONE DROPS.
- PRIOR TO INSTALLATION OF THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF THE UTILITIES.
- THE DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF THE LATEST AMENDMENT OF ACT 287, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES, EFFECTIVE DATE DECEMBER 20, 1974.
- WHEN LIQUID FUELS MONEY IS USED, SIGNAL INSTALLATION MUST CONFORM TO FORM 408 AND A COPY OF THE PROPOSED SPECIFICATIONS MUST BE SUBMITTED TO THE DISTRICT TRAFFIC UNIT FOR REVIEW PRIOR TO BIDDING.
- PERMITTEE SHALL OBTAIN A HIGHWAY OCCUPANCY PERMIT FOR ANY CHANGES IN INTERSECTION GEOMETRY REGARDING EXCAVATION.
- CONDUIT INSTALLED IN BITUMINOUS ROADWAY LESS THAN 5 YEARS OLD, OR CONCRETE ROADWAY REGARDLESS OF AGE, MUST BE BORED OR JACKED UNDER THE ROADWAY. INSTALL IN ACCORDANCE WITH TRAFFIC SIGNAL STANDARDS TC-7800 SERIES.

COUNTY : YORK  
 MUNICIPALITY : CITY OF YORK, MANCHESTER, WEST MANCHESTER, AND SPRINGETTSBURY TOWNSHIPS  
 INTERSECTION : SR 0030 CORRIDOR FROM KENNETH ROAD TO NORTH HILLS ROAD

APPROVED : Chaz A. Green 3/22/2019  
 MUNICIPAL OFFICIAL City of York DATE

APPROVED : Kelly Kypkelchere 3/25/2019  
 MUNICIPAL OFFICIAL West Manchester Township DATE

APPROVED : [Signature] 5/30/19  
 MUNICIPAL OFFICIAL Springettsbury Township DATE

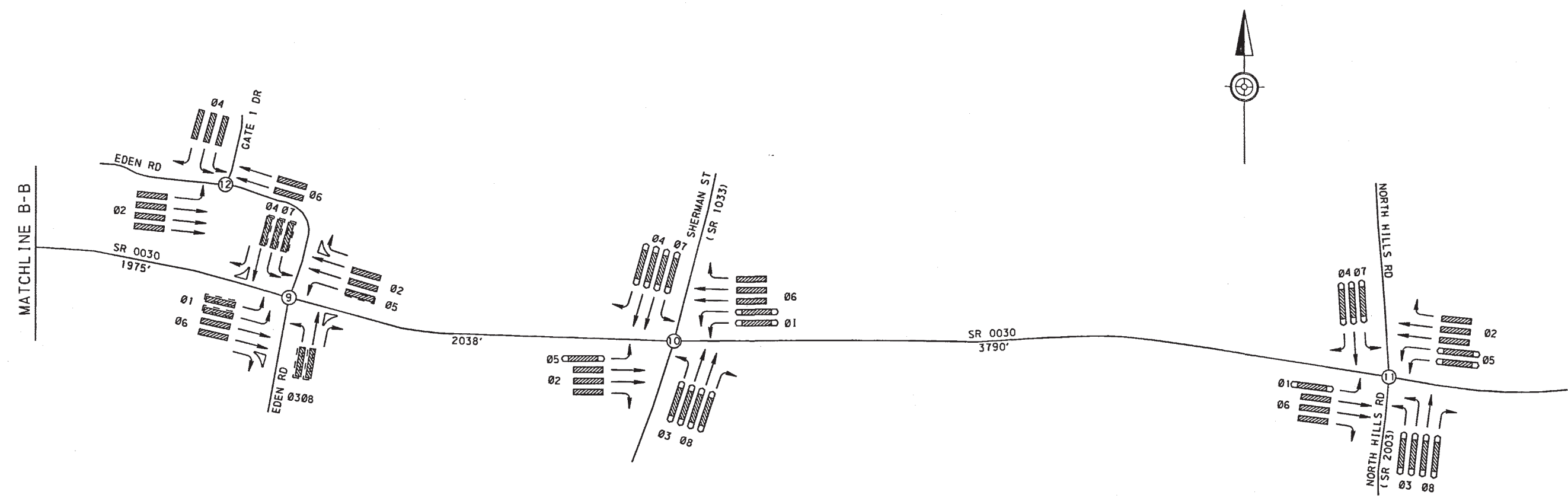
APPROVED : Timothy James 6/4/19  
 MUNICIPAL OFFICIAL Manchester Township DATE

RECOMMENDED : [Signature] Digitally signed by Pharon Bertsch Date: 2019.06.14 08:22:48 -0400  
 DISTRICT TRAFFIC ENGINEER DATE

**TRAFFIC SIGNAL SYSTEM PLAN**

SR 0030





COUNTY : YORK  
 MUNICIPALITY : CITY OF YORK, MANCHESTER, WEST MANCHESTER, AND SPRINGETTSBURY TOWNSHIPS  
 INTERSECTION : SR 0030 CORRIDOR FROM KENNETH ROAD TO NORTH HILLS ROAD

APPROVED Chaz A. Green 3/22/2019  
 MUNICIPAL OFFICIAL City of York DATE

APPROVED : Kelly Kypke 3/25/2019  
 MUNICIPAL OFFICIAL West Manchester Township DATE

APPROVED : Brian Martin 5/30/19  
 MUNICIPAL OFFICIAL Springettsbury Township DATE

APPROVED : Timothy James 6/4/19  
 MUNICIPAL OFFICIAL Manchester Township DATE

RECOMMENDED : Pharon Bertsch Digitally signed by Pharon Bertsch Date: 2019.06.14 08:51:45 -0400  
 DISTRICT TRAFFIC ENGINEER DATE

SCALE 0 25 50 75 100 FEET

**LEGEND**

- 04 - PHASE NUMBER
- LOOP DETECTOR
- ADAPTIVE VIDEO DETECTION AREA
- STANDARD VIDEO DETECTION AREA
- MUNICIPAL BOUNDARY

**TRAFFIC SIGNAL SYSTEM PLAN**  
SR 0030

OPERATOR: Mds\_lgr1vc  
 DATE: 6/13/2019 10:41:41 PM  
 FILE NAME: SR-0030-130809-US-30-Adaptive-Signal-Design\CON\Permits\PN01130809\_TSP\_system\_plan\_2of6.dgn

TRAFFIC ADAPTIVE TABLES

CONFIGURATION: AM			TUNNEL / PHASE DURATION								PER100	GLOBAL OFFSET	LOCAL OFFSET		TRAVEL TIME TO NEXT INTERSECTION		
INTERSECTION	TSAMS #		1	2	3	4	5	6	T	8			WB	EB	WB	EB	
1	SR 0030 AND KENNETH ROAD	008273		40				60			126			02=0	06=0	02=N/A	06=42
2	SR 0030 AND ROOSEVELT AVENUE (SR 4001)	005010		50				50			126			02=0	06=-20	02=42	06=28
3	SR 0030 AND FAIRLANE DRIVE / SHOPPING CENTER DRIVE	008286		50				70			126			02=0	06=-20	02=28	06=3T
4	SR 0030 AND PENNSYLVANIA AVENUE	008287		55				55			126			02=0	06=-23	02=3T	06=38
5	SR 0030 AND SUSQUEHANNA TRAIL (SR 4005) / 11TH AVENUE	004990		55				58			126			02=-5	06=-23	02=38	06=12
6	SR 0030 AND N. GEORGE STREET (SR 0181/3065)	004987		50				60			126	02=120	06=17	02=0	06=-25	02=12	06=39
7	SR 0030 AND TORONITA STREET	008262		64				69			126			02=-14	06=-14	02=39	06=21
8	SR 0030 AND LOUCKS MILL ROAD (SR 3029)	008261		60				65			126			02=-10	06=-5	02=21	06=33
9	SR 0030 AND EDEN ROAD	008260		59				65			126			02=-12	06=0	02=33	06=34
10	SR 0030 AND SHERMAN STREET (SR 1033)	005001		60				65			126			02=-10	06=-15	02=34	06=62
11	SR 0030 AND NORTH HILLS ROAD (SR 2003)	005000		65				60			126			02=-10	06=-T	02=62	06=N/A
12	EDEN ROAD AND GATE 1 DRIVE	010690		N/A				N/A			TUNNELLESS			N/A	N/A	N/A	N/A

CONFIGURATION: NEW AM 145			TUNNEL / PHASE DURATION								PER100	GLOBAL OFFSET	LOCAL OFFSET		TRAVEL TIME TO NEXT INTERSECTION		
INTERSECTION	TSAMS #		1	2	3	4	5	6	T	8			WB	EB	WB	EB	
1	SR 0030 AND KENNETH ROAD	008273		58				70			145			02=-35	06=-15	02=N/A	06=42
2	SR 0030 AND ROOSEVELT AVENUE (SR 4001)	005010		58				52			145			02=-30	06=-30	02=42	06=28
3	SR 0030 AND FAIRLANE DRIVE / SHOPPING CENTER DRIVE	008286		60				70			145			02=-25	06=0	02=28	06=3T
4	SR 0030 AND PENNSYLVANIA AVENUE	008287		68				52			145			02=-20	06=0	02=3T	06=38
5	SR 0030 AND SUSQUEHANNA TRAIL (SR 4005) / 11TH AVENUE	004990		68				75			145			02=-28	06=0	02=38	06=12
6	SR 0030 AND N. GEORGE STREET (SR 0181/3065)	004987		63				70			145	02=0	06=-28	02=-13	06=-13	02=12	06=39
T	SR 0030 AND TORONITA STREET	008262		83				80			145			02=-3	06=-30	02=39	06=21
8	SR 0030 AND LOUCKS MILL ROAD (SR 3029)	008261		65				75			145			02=25	06=-30	02=21	06=33
9	SR 0030 AND EDEN ROAD	008260		70				70			145			02=20	06=-30	02=33	06=34
10	SR 0030 AND SHERMAN STREET (SR 1033)	005001		70				75			145			02=20	06=-40	02=34	06=62
11	SR 0030 AND NORTH HILLS ROAD (SR 2003)	005000		7T				74			145			02=15	06=-40	02=62	06=N/A
12	EDEN ROAD AND GATE 1 DRIVE	010690		N/A				N/A			TUNNELLESS			N/A	N/A	N/A	N/A

NOTES

1. PHASE TIME INCLUDES CHANGE AND CLEARANCE INTERVALS.
2. REFER TO SIGNAL PERMIT PLAN FOR CHANGE, CLEARANCE, AND PEDESTRIAN TIMES.
3. GLOBAL OFFSET (AT FACILITATOR): VALUE IN SECONDS THAT OFFSETS A TUNNEL GLOBALLY AT THE REFERENCE INTERSECTION AS ENTERED IN CENTRAL SYNC.
4. LOCAL OFFSET: TUNNEL OFFSET AT INTERSECTION AS ENTERED IN CENTRAL SYNC.
5. TRAVEL TIME TO NEXT INTERSECTION: VALUE FOR TRAVEL TIME OF THE CHOSEN TUNNEL TO THE CORRESPONDING TUNNEL AT THE NEXT INTERSECTION AS ENTERED IN CENTRAL SYNC TO DEFINE THE COORDINATION.

ADAPTIVE WEEKLY PROGRAM CHART

EVENT	OAY	TIME	PERIOD	PROGRAM	REMARKS
1	1-5	05:30	126	AM	ADAPTIVE
2	1-5	06:30	145	NEW AM 145	ADAPTIVE
3	1-5	13:00	145	NEW PM	ADAPTIVE
4	1-6	19:30	126	MIDDAY	ADAPTIVE
5	1-6	22:00	N/A	TUNNELLESS	ADAPTIVE
6	6	06:00	126	AM	ADAPTIVE
T	T	07:00	126	AM	ADAPTIVE
8	6	07:30	145	NEW WEEKEND AM 145	ADAPTIVE
9	7	08:00	145	NEW WEEKEND AM 145	ADAPTIVE
10	6-7	13:00	145	NEW WEEKEND PM 145	ADAPTIVE
11	T	18:30	126	MIDDAY	ADAPTIVE
12	T	21:00	N/A	TUNNELLESS	ADAPTIVE

MONDAY = OAY 1  
 TUNNELLESS: UNCOORDINATED ADAPTIVE OPERATION

COUNTY: YORK  
 MUNICIPALITY: CITY OF YORK, MANCHESTER,  
 WEST MANCHESTER, AND SPRINGGETTSBURY TOWNSHIPS  
 INTERSECTION: SR 0030 CORRIDOR FROM  
 KENNETH ROAD TO NORTH HILLS ROAD

APPROVED: Chaz A. Green 3/22/2019  
 MUNICIPAL OFFICIAL City of York DATE

APPROVED: Kelly K. Kelch 3/25/2019  
 MUNICIPAL OFFICIAL West Manchester Township DATE

APPROVED: [Signature] 5/30/19  
 MUNICIPAL OFFICIAL Springettsbury Township DATE

APPROVED: Timothy James 6/4/19  
 MUNICIPAL OFFICIAL Manchester Township DATE

RECOMMENDED: [Signature] Digitally signed by Pharon Bertsch  
 Date: 2019.06.14 09:00:39 -0400  
 DISTRICT TRAFFIC ENGINEER DATE

TRAFFIC SIGNAL SYSTEM PLAN

SR 0030



OPERATOR: MCB/GR/IVG  
 PLOTTED: 1/28/2019  
 TIME: 11:21:38 AM  
 FILE NAME: \\dennoti.com\locations\MCH\Projects\PN01\130809-US 30 Adaptive Signal\DESIGN\ACT\ADGN\Permits\PN01\130809-TSP-system plan 3of6.dgn

TRAFFIC ADAPTIVE TABLES

CONFIGURATION: NEW PM			TUNNEL / PHASE DURATION								PERIOD	GLOBAL OFFSET		LOCAL OFFSET		TRAVEL TIME TO NEXT INTERSECTION	
INTERSECTION		TSAMS #	1	2	3	4	5	6	7	8				WB	EB	WB	EB
1	SR 0030 AND KENNETH ROAD	008273		58				70			145			02=-35	06=-15	02=N/A	06=42
2	SR 0030 AND ROOSEVELT AVENUE (SR 4001)	005010		58				52			145			02=-30	06=-30	02=42	06=28
3	SR 0030 AND FAIRLANE DRIVE / SHOPPING CENTER DRIVE	008286		60				70			145			02=-25	06=0	02=28	06=37
4	SR 0030 AND PENNSYLVANIA AVENUE	008287		68				52			145			02=-20	06=0	02=37	06=38
5	SR 0030 AND SUSQUEHANNA TRAIL (SR 4005) / 11TH AVENUE	004990		68				75			145			02=-28	06=0	02=38	06=12
6	SR 0030 AND N. GEORGE STREET (SR 0181/3065)	004987		63				70			145	02=0	06=-28	02=-13	06=-13	02=12	06=39
7	SR 0030 AND TORONITA STREET	008262		83				80			145			02=-3	06=-30	02=39	06=21
8	SR 0030 AND LOUCKS MILL ROAD (SR 3029)	008261		65				75			145			02=25	06=-30	02=21	06=33
9	SR 0030 AND EDEN ROAD	008260		70				70			145			02=20	06=-30	02=33	06=34
10	SR 0030 AND SHERMAN STREET (SR 1033)	005001		70				75			145			02=20	06=-40	02=34	06=62
11	SR 0030 AND NORTH HILLS ROAD (SR 2003)	005000		77				76			145			02=17	06=-40	02=62	06=N/A
12	EDEN ROAD AND GATE 1 DRIVE	010690		N/A				N/A			TUNNELLESS			N/A	N/A	N/A	N/A

CONFIGURATION: MIDDAY			TUNNEL / PHASE DURATION								PERIOD	GLOBAL OFFSET		LOCAL OFFSET		TRAVEL TIME TO NEXT INTERSECTION	
INTERSECTION		TSAMS #	1	2	3	4	5	6	7	8				WB	EB	WB	EB
1	SR 0030 AND KENNETH ROAD	008273		40				45			126			02=-10	06=0	02=N/A	06=42
2	SR 0030 AND ROOSEVELT AVENUE (SR 4001)	005010		50				50			126			02=0	06=-20	02=42	06=28
3	SR 0030 AND FAIRLANE DRIVE / SHOPPING CENTER DRIVE	008286		50				70			126			02=-2	06=-20	02=28	06=37
4	SR 0030 AND PENNSYLVANIA AVENUE	008287		55				55			126			02=0	06=-23	02=37	06=38
5	SR 0030 AND SUSQUEHANNA TRAIL (SR 4005) / 11TH AVENUE	004990		55				58			126			02=-5	06=-23	02=38	06=12
6	SR 0030 AND N. GEORGE STREET (SR 0181/3065)	004987		50				60			126	02=120	06=17	02=0	06=-25	02=12	06=39
7	SR 0030 AND TORONITA STREET	008262		64				69			126			02=-14	06=-14	02=39	06=21
8	SR 0030 AND LOUCKS MILL ROAD (SR 3029)	008261		60				65			126			02=-10	06=-5	02=21	06=33
9	SR 0030 AND EDEN ROAD	008260		59				65			126			02=-12	06=0	02=33	06=34
10	SR 0030 AND SHERMAN STREET (SR 1033)	005001		60				65			126			02=-10	06=-15	02=34	06=62
11	SR 0030 AND NORTH HILLS ROAD (SR 2003)	005000		65				60			126			02=-10	06=-7	02=62	06=N/A
12	EDEN ROAD AND GATE 1 DRIVE	010690		N/A				N/A			TUNNELLESS			N/A	N/A	N/A	N/A

NOTES

1. PHASE TIME INCLUDES CHANGE AND CLEARANCE INTERVALS.
2. REFER TO SIGNAL PERMIT PLAN FOR CHANGE, CLEARANCE, AND PEDESTRIAN TIMES.
3. GLOBAL OFFSET (AT FACILITATOR): VALUE IN SECONDS THAT OFFSETS A TUNNEL GLOBALLY AT THE REFERENCE INTERSECTION AS ENTERED IN CENTRAL SYNC.
4. LOCAL OFFSET: TUNNEL OFFSET AT INTERSECTION AS ENTERED IN CENTRAL SYNC.
5. TRAVEL TIME TO NEXT INTERSECTION: VALUE FOR TRAVEL TIME OF THE CHOSEN TUNNEL TO THE CORRESPONDING TUNNEL AT THE NEXT INTERSECTION AS ENTERED IN CENTRAL SYNC TO DEFINE THE COORDINATION.

COUNTY : YORK  
 MUNICIPALITY : CITY OF YORK, MANCHESTER,  
 WEST MANCHESTER, AND SPRINGGETTSBURY TOWNSHIPS  
 INTERSECTION : SR 0030 CORRIDOR FROM  
 KENNETH ROAD TO NORTH HILLS ROAD

APPROVED : Chaz A. Green 3/22/2019  
 MUNICIPAL OFFICIAL City of York DATE

APPROVED : Kelly Kypkelcher 3/25/2019  
 MUNICIPAL OFFICIAL West Manchester Township DATE

APPROVED : Brian Mahan 5/30/19  
 MUNICIPAL OFFICIAL Springettsbury Township DATE

APPROVED : Timothy James 6/4/19  
 MUNICIPAL OFFICIAL Manchester Township DATE

RECOMMENOE : Pharon Bertsch  
 Digitally signed by Pharon Bertsch  
 Date: 2019.06.14 09:09:57 -04'00'  
 DISTRICT TRAFFIC ENGINEER DATE

TRAFFIC SIGNAL SYSTEM PLAN

SR 0030



OPERATOR: W91601vg  
 PLOTTED: 3/05/19 4:33 PM  
 FILE NAME: M:\Projects\PNDT\130809-US\_30 Adaptive Signal\DESIGN\ACT\DCN\Permit\ts\PNDT\130809\_US\_30\_adaptiv\_4of6.dgn

TRAFFIC ADAPTIVE TABLES

CONFIGURATION: NEW WEEKEND AM 145			TUNNEL / PHASE DURATION								PERIOD	GLOBAL OFFSET	LOCAL OFFSET		TRAVEL TIME TO NEXT INTERSECTION	
INTERSECTION		TSAMS #	1	2	3	4	5	6	7	8			WB	EB	WB	EB
1	SR 0030 AND KENNETH ROAD	008273		58				70			145		02=-35	06=-15	02=N/A	06=42
2	SR 0030 AND ROOSEVELT AVENUE (SR 4001)	005010		58				52			145		02=-30	06=-30	02=42	06=28
3	SR 0030 AND FAIRLANE DRIVE / SHOPPING CENTER DRIVE	008286		60				70			145		02=-25	06=0	02=28	06=37
4	SR 0030 AND PENNSYLVANIA AVENUE	008287		68				52			145		02=-20	06=0	02=37	06=38
5	SR 0030 AND SUSQUEHANNA TRAIL (SR 40051/11TH AVENUE)	004990		68				75			145		02=-28	06=0	02=38	06=12
6	SR 0030 AND N. GEORGE STREET (SR 0181/30651)	004987		63				70		02=0	06=-28		02=-13	06=-13	02=12	06=39
7	SR 0030 AND TORONITA STREET	008262		83				80			145		02=-3	06=-30	02=39	06=21
8	SR 0030 AND LOUCKS MILL ROAD (SR 30291)	008261		65				75			145		02=25	06=-30	02=21	06=33
9	SR 0030 AND EDEN ROAD	008260		70				70			145		02=20	06=-30	02=33	06=34
10	SR 0030 AND SHERMAN STREET (SR 1033)	005001		70				75			145		02=20	06=-40	02=34	06=62
11	SR 0030 AND NORTH HILLS ROAD (SR 20031)	005000		77				72			145		02=15	06=-38	02=62	06=N/A
12	EDEN ROAD AND GATE 1 DRIVE	010690		N/A				N/A			TUNNELLESS		N/A	N/A	N/A	N/A

CONFIGURATION: NEW WEEKEND PM 145			TUNNEL / PHASE DURATION								PERIOD	GLOBAL OFFSET	LOCAL OFFSET		TRAVEL TIME TO NEXT INTERSECTION	
INTERSECTION		TSAMS #	1	2	3	4	5	6	7	8			WB	EB	WB	EB
1	SR 0030 AND KENNETH ROAD	008273		58				70			145		02=-35	06=-15	02=N/A	06=42
2	SR 0030 AND ROOSEVELT AVENUE (SR 4001)	005010		58				52			145		02=-30	06=-30	02=42	06=28
3	SR 0030 AND FAIRLANE DRIVE / SHOPPING CENTER DRIVE	008286		60				70			145		02=-25	06=0	02=28	06=37
4	SR 0030 AND PENNSYLVANIA AVENUE	008287		68				52			145		02=-20	06=0	02=37	06=38
5	SR 0030 AND SUSQUEHANNA TRAIL (SR 40051/11TH AVENUE)	004990		68				75			145		02=-28	06=0	02=38	06=12
6	SR 0030 AND N. GEORGE STREET (SR 0181/30651)	004987		63				70		02=0	06=-28		02=-13	06=-13	02=12	06=39
7	SR 0030 AND TORONITA STREET	008262		83				80			145		02=-3	06=-30	02=39	06=21
8	SR 0030 AND LOUCKS MILL ROAD (SR 30291)	008261		65				75			145		02=25	06=-30	02=21	06=33
9	SR 0030 AND EDEN ROAD	008260		70				70			145		02=20	06=-30	02=33	06=34
10	SR 0030 AND SHERMAN STREET (SR 1033)	005001		70				75			145		02=20	06=-40	02=34	06=62
11	SR 0030 AND NORTH HILLS ROAD (SR 20031)	005000		77				72			145		02=15	06=-38	02=62	06=N/A
12	EDEN ROAD AND GATE 1 DRIVE	010690		N/A				N/A			TUNNELLESS		N/A	N/A	N/A	N/A

NOTES

1. PHASE TIME INCLUDES CHANGE AND CLEARANCE INTERVALS.
2. REFER TO SIGNAL PERMIT PLAN FOR CHANGE, CLEARANCE, AND PEDESTRIAN TIMES.
3. GLOBAL OFFSET (AT FACILITATOR): VALUE IN SECONDS THAT OFFSETS A TUNNEL GLOBALLY AT THE REFERENCE INTERSECTION AS ENTERED IN CENTRAL SYNC.
4. LOCAL OFFSET: TUNNEL OFFSET AT INTERSECTION AS ENTERED IN CENTRAL SYNC.
5. TRAVEL TIME TO NEXT INTERSECTION: VALUE FOR TRAVEL TIME OF THE CHOSEN TUNNEL TO THE CORRESPONDING TUNNEL AT THE NEXT INTERSECTION AS ENTERED IN CENTRAL SYNC TO DEFINE THE COORDINATION.

COUNTY : YORK

MUNICIPALITY : CITY OF YORK, MANCHESTER, WEST MANCHESTER, AND SPRINGGETTSBURY TOWNSHIPS

INTERSECTION : SR 0030 CORRIDOR FROM KENNETH ROAD TO NORTH HILLS ROAD

APPROVED : Chaz A. Green 3/22/2019  
 MUNICIPAL OFFICIAL City of York DATE

APPROVED : Kelly K. Kelch 3/25/2019  
 MUNICIPAL OFFICIAL West Manchester Township DATE

APPROVED : [Signature] 5/30/19  
 MUNICIPAL OFFICIAL Springgettsbury Township DATE

APPROVED : Timothy James 6/4/19  
 MUNICIPAL OFFICIAL Manchester Township DATE

RECOMMENDED : [Signature] Digitally signed by Pharon Bertsch Date: 2019.06.14 09:11:18 -0400

DISTRICT TRAFFIC ENGINEER DATE

SCALE 0 25 50 75 100 FEET

TRAFFIC SIGNAL SYSTEM PLAN  
 SR 0030

OPERATOR: MdeJorlvg  
 PLOTTED: 01:05:24 PM  
 TIME: 01:05:24 PM  
 FILE NAME: N:\Projects\PN01\30809-US\_30\_Adaptive\_Signal\Design\CT\DCN\Permits\PN01\30809\_TSP\_system\_plan\_sofg.dgn

BACKUP TIME-OF-DAY TIMING PROGRAMS

PERMIT NO. 1-0067 SHEET 6 OF 6  
DATE ISSUED 6/13/2019 DATE REVISED

PROGRAM 1			PHASE								CYCLE	OFFSET	REMARKS	
INTERSECTIONS			1	2	3	4	5	6	7	8				
1	SR 0030 AND KENNETH ROAD	008273	4	24	54	-	33	13	65	33	14	125	3	
2	SR 0030 AND ROOSEVELT AVENUE (SR 4001)	005010	4	31	46	18	30	20	57	-	-	125	76	
3	SR 0030 AND FAIRLANE DRIVE / SHOPPING CENTER DRIVE	008286	4	15	84	-	26	20	79	-	26	125	64	
4	SR 0030 AND PENNSYLVANIA AVENUE	008287	4	22	68	-	19	22	68	-	16	125	0	
5	SR 0030 AND SUSQUEHANNA TRAIL (SR 4005) / 11TH AVENUE	004990	4	20	69	14	22	15	74	20	16	125	65	
6	SR 0030 AND N. GEORGE STREET (SR 0181/3065)	004987	4	22	62	14	27	22	62	21	20	125	67	
7	SR 0030 AND TORONITA STREET	008262	4	20	77	14	14	20	77	14	14	125	116	
8	SR 0030 AND LOUCKS MILL ROAD (SR 3029)	008261	4	-	110	-	15	22	88	-	15	125	2	
9	SR 0030 AND EDEN ROAD	008260	4	23	73	14	15	23	73	16	13	125	49	
10	SR 0030 AND SHERMAN STREET (SR 1033)	005001	4	16	77	14	18	16	77	14	18	125	30	
11	SR 0030 AND NORTH HILLS ROAD (SR 2003)	005000	4	23	71	14	17	25	69	14	17	125	101	
12	EDEN ROAD AND GATE 1 DRIVE	010690	4	-	26	-	39	-	26	-	-	65	9	

PROGRAM 2			PHASE								CYCLE	OFFSET	REMARKS	
INTERSECTIONS			1	2	3	4	5	6	7	8				
1	SR 0030 AND KENNETH ROAD	008273	4	22	48	-	38	18	52	38	17	125	88	
2	SR 0030 AND ROOSEVELT AVENUE (SR 4001)	005010	4	27	51	22	25	27	51	-	-	125	41	
3	SR 0030 AND FAIRLANE DRIVE / SHOPPING CENTER DRIVE	008286	4	18	73	-	34	25	66	-	34	125	48	
4	SR 0030 AND PENNSYLVANIA AVENUE	008287	4	20	63	-	20	25	58	-	22	125	0	
5	SR 0030 AND SUSQUEHANNA TRAIL (SR 4005) / 11TH AVENUE	004990	4	20	63	21	21	20	63	21	21	125	71	
6	SR 0030 AND N. GEORGE STREET (SR 0181/3065)	004987	4	28	54	21	22	18	64	21	22	125	68	
7	SR 0030 AND TORONITA STREET	008262	4	20	77	14	14	20	77	14	14	125	103	
8	SR 0030 AND LOUCKS MILL ROAD (SR 3029)	008261	4	-	110	-	-	15	95	-	15	125	111	
9	SR 0030 AND EDEN ROAD	008260	4	18	79	14	14	18	79	14	14	125	55	
10	SR 0030 AND SHERMAN STREET (SR 1033)	005001	4	15	80	15	15	15	80	15	15	125	34	
11	SR 0030 AND NORTH HILLS ROAD (SR 2003)	005000	4	20	73	16	16	20	73	14	18	125	102	
12	EDEN ROAD AND GATE 1 DRIVE	010690	4	-	-	-	-	-	-	-	-	FREE	-	

PROGRAM 3			PHASE								CYCLE	OFFSET	REMARKS	
INTERSECTIONS			1	2	3	4	5	6	7	8				
1	SR 0030 AND KENNETH ROAD	008273	4	29	61	-	41	22	68	41	19	150	139	
2	SR 0030 AND ROOSEVELT AVENUE (SR 4001)	005010	4	26	67	32	25	26	67	-	-	150	80	
3	SR 0030 AND FAIRLANE DRIVE / SHOPPING CENTER DRIVE	008286	4	16	100	-	34	30	86	-	34	150	85	
4	SR 0030 AND PENNSYLVANIA AVENUE	008287	4	18	81	-	27	21	78	-	24	150	0	
5	SR 0030 AND SUSQUEHANNA TRAIL (SR 4005) / 11TH AVENUE	004990	4	23	80	25	22	15	88	25	22	150	80	
6	SR 0030 AND N. GEORGE STREET (SR 0181/3065)	004987	4	26	76	21	27	26	76	21	27	150	70	
7	SR 0030 AND TORONITA STREET	008262	4	17	101	16	16	22	96	16	16	150	86	
8	SR 0030 AND LOUCKS MILL ROAD (SR 3029)	008261	4	-	127	23	-	16	111	-	23	150	95	
9	SR 0030 AND EDEN ROAD	008260	4	25	86	26	13	25	86	26	13	150	57	
10	SR 0030 AND SHERMAN STREET (SR 1033)	005001	4	28	88	17	17	19	97	17	17	150	16	
11	SR 0030 AND NORTH HILLS ROAD (SR 2003)	005000	4	23	88	16	23	23	88	16	23	150	86	
12	EDEN ROAD AND GATE 1 DRIVE	010690	4	-	25	-	50	-	25	-	-	75	68	

PROGRAM 4			PHASE								CYCLE	OFFSET	REMARKS	
INTERSECTIONS			1	2	3	4	5	6	7	8				
1	SR 0030 AND KENNETH ROAD	008273	4	23	49	-	29	12	60	29	19	120	97	
2	SR 0030 AND ROOSEVELT AVENUE (SR 4001)	005010	4	26	51	20	23	20	57	-	-	120	49	
3	SR 0030 AND FAIRLANE DRIVE / SHOPPING CENTER DRIVE	008286	4	20	70	-	30	21	69	-	30	120	50	
4	SR 0030 AND PENNSYLVANIA AVENUE	008287	4	15	69	-	17	18	66	-	19	120	0	
5	SR 0030 AND SUSQUEHANNA TRAIL (SR 4005) / 11TH AVENUE	004990	4	16	65	19	20	18	63	22	17	120	85	
6	SR 0030 AND N. GEORGE STREET (SR 0181/3065)	004987	4	19	61	22	18	13	67	19	21	120	84	
7	SR 0030 AND TORONITA STREET	008262	4	17	75	14	14	17	75	14	14	120	0	
8	SR 0030 AND LOUCKS MILL ROAD (SR 3029)	008261	4	-	101	-	-	17	84	-	19	120	12	
9	SR 0030 AND EDEN ROAD	008260	4	25	51	31	13	25	51	31	13	120	61	
10	SR 0030 AND SHERMAN STREET (SR 1033)	005001	4	20	74	12	14	14	80	12	14	120	53	
11	SR 0030 AND NORTH HILLS ROAD (SR 2003)	005000	4	26	64	13	17	21	69	13	17	120	0	
12	EDEN ROAD AND GATE 1 DRIVE	010690	4	-	-	-	-	-	-	-	-	FREE	-	

FREE PROGRAM			PHASE								CYCLE	OFFSET	REMARKS	
INTERSECTIONS			1	2	3	4	5	6	7	8				
1	SR 0030 AND KENNETH ROAD	008273	-	25	60	-	35	25	60	35	15	FREE	-	
2	SR 0030 AND ROOSEVELT AVENUE (SR 4001)	005010	-	25	65	-	25	25	65	-	25	FREE	-	
3	SR 0030 AND FAIRLANE DRIVE / SHOPPING CENTER DRIVE	008286	-	25	70	-	30	25	70	-	30	FREE	-	
4	SR 0030 AND PENNSYLVANIA AVENUE	008287	-	20	70	-	20	20	70	-	20	FREE	-	
5	SR 0030 AND SUSQUEHANNA TRAIL (SR 4005) / 11TH AVENUE	004990	-	20	70	20	20	20	70	20	20	FREE	-	
6	SR 0030 AND N. GEORGE STREET (SR 0181/3065)	004987	-	20	70	15	25	20	70	15	25	FREE	-	
7	SR 0030 AND TORONITA STREET	008262	-	15	90	12	12	15	90	12	12	FREE	-	
8	SR 0030 AND LOUCKS MILL ROAD (SR 3029)	008261	-	-	110	20	-	12	98	-	20	FREE	-	
9	SR 0030 AND EDEN ROAD	008260	-	20	80	20	10	20	80	20	10	FREE	-	
10	SR 0030 AND SHERMAN STREET (SR 1033)	005001	-	20	85	10	15	20	85	10	15	FREE	-	
11	SR 0030 AND NORTH HILLS ROAD (SR 2003)	005000	-	20	85	10	15	20	85	10	15	FREE	-	
12	EDEN ROAD AND GATE 1 DRIVE	010690	-	-	41	-	41	-	41	-	-	FREE	-	

BACKUP WEEKLY PROGRAM CHART					
EVENT	DAY	TIME	CYCLE	PROGRAM NO. (DIAL-SPLIT)	REMARKS
1	1-5	0:00	-	-	FREE
2	1-5	5:30	125	1	AM PEAK
3	1-5	9:30	125	2	MID-DAY PEAK
4	1-5	15:00	150	3	PM PEAK
5	1-5	19:30	125	2	MID-DAY PEAK
6	1-5	22:00	-	-	FREE
7	6-7	0:00	-	-	FREE
8	6-7	8:00	120	4	WEEKEND PEAK
9	6-7	22:00	-	-	FREE

MONDAY = DAY 1

COUNTY : YORK  
MUNICIPALITY : CITY OF YORK, MANCHESTER, WEST MANCHESTER, AND SPRINGETTSBURY TOWNSHIPS  
INTERSECTION : SR 0030 CORRIDOR FROM KENNETH ROAD TO NORTH HILLS ROAD

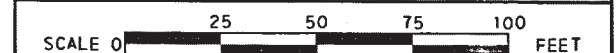
APPROVED : Chaz A. Green 3/22/2019  
MUNICIPAL OFFICIAL : City of York DATE

APPROVED : Kelly K. Kelch 3/25/2019  
MUNICIPAL OFFICIAL : West Manchester Township DATE

APPROVED : Benj. Mulvaney 5/30/19  
MUNICIPAL OFFICIAL : Springettsbury Township DATE

APPROVED : Timothy James 6/4/19  
MUNICIPAL OFFICIAL : Manchester Township DATE

RECOMMENDED : Pharon Bertsch 2019.06.14 09:14:57 -0400  
DISTRICT TRAFFIC ENGINEER : DATE



TRAFFIC SIGNAL SYSTEM PLAN

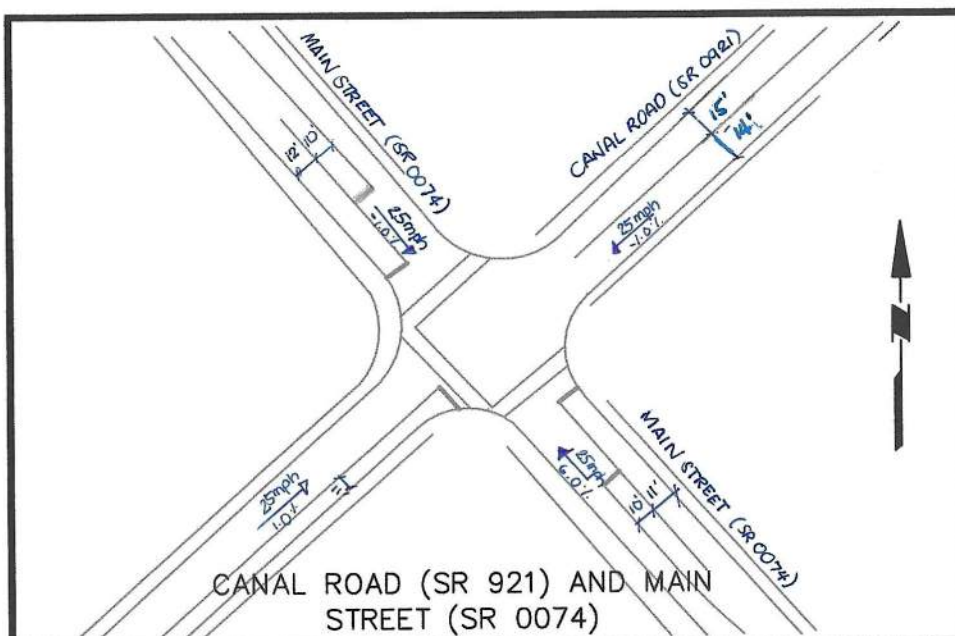
SR 0030

NOTES

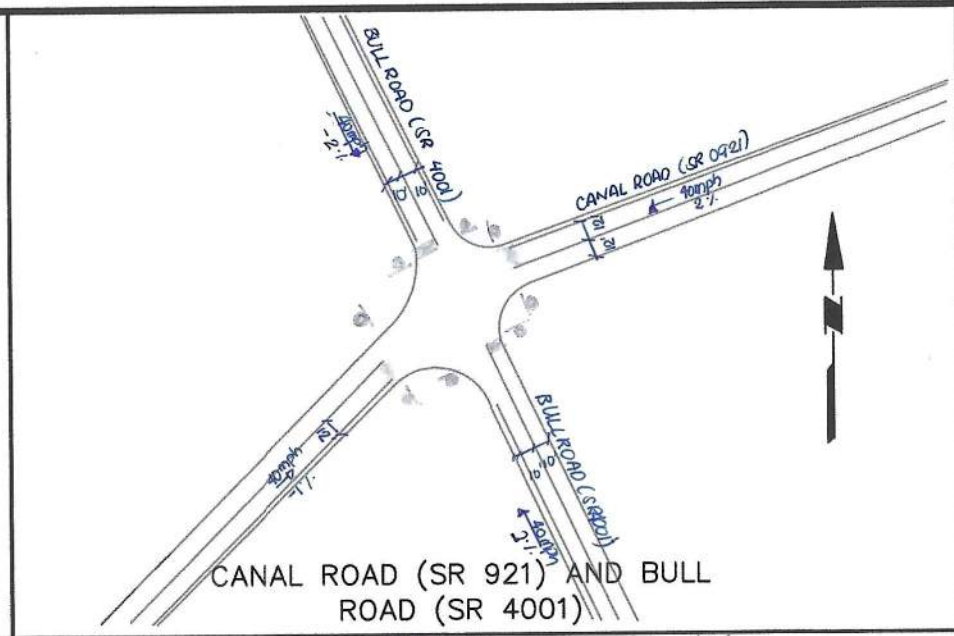
1. PHASE TIME INCLUDES CHANGE AND CLEARANCE INTERVAL TIMES.
2. REFER TO SIGNAL PERMIT PLAN FOR CHANGE, CLEARANCE AND PEDESTRIAN TIMES.

OPERATOR: M29820195 PLOTTED: 11:42:17 AM FILE NAME: \\pennoni.com\locations\WCH\Projects\PNDT\130809-US\_30\_Acceptive\_Signals\DESIGN\CDN\Permit\130809-TSP-system plan for b. dgn

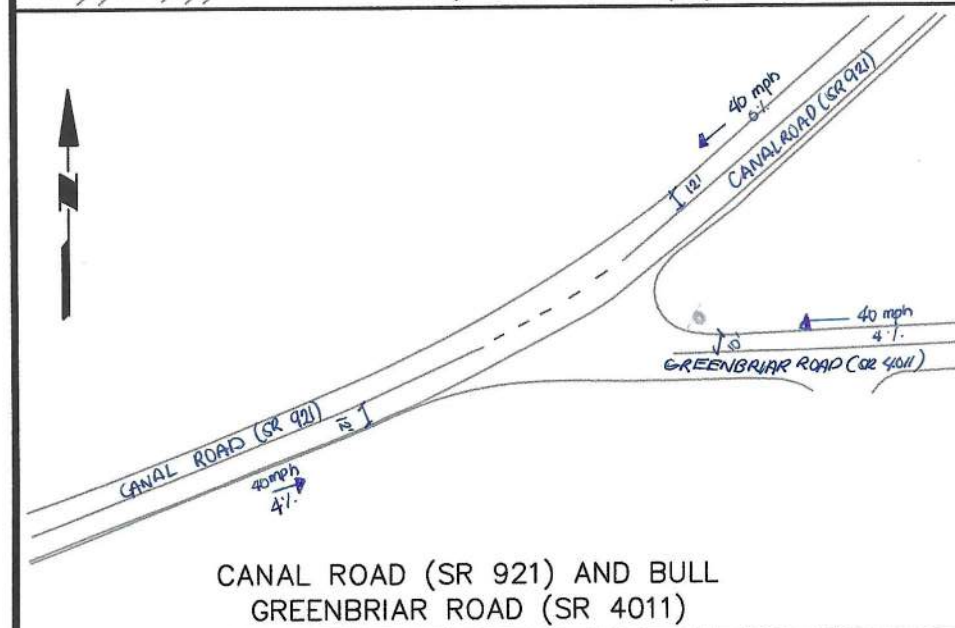




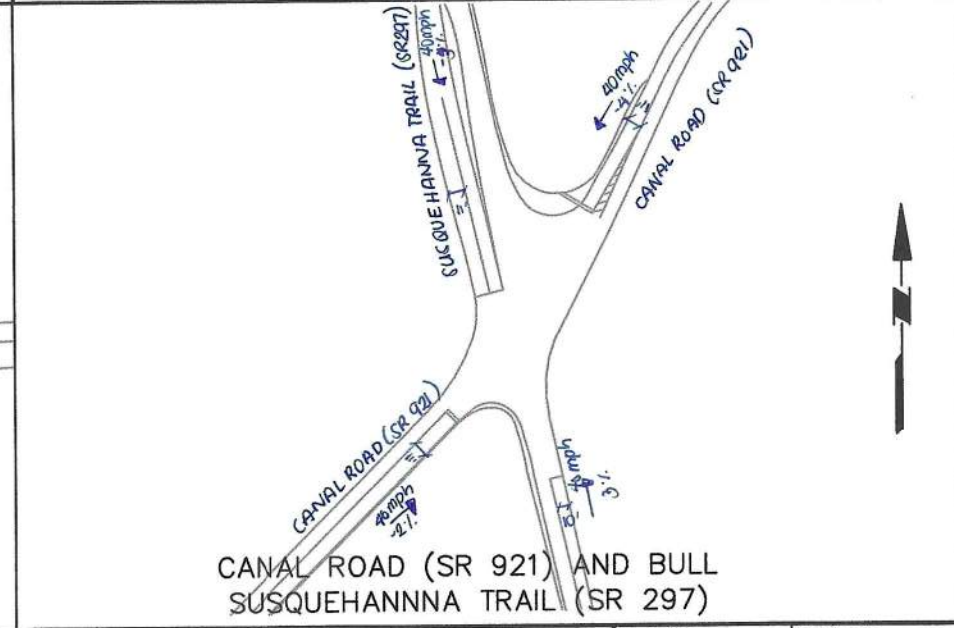
CANAL ROAD (SR 921) AND MAIN STREET (SR 0074)



CANAL ROAD (SR 921) AND BULL ROAD (SR 4001)



CANAL ROAD (SR 921) AND BULL GREENBRIAR ROAD (SR 4011)



CANAL ROAD (SR 921) AND BULL SUSQUEHANNA TRAIL (SR 297)

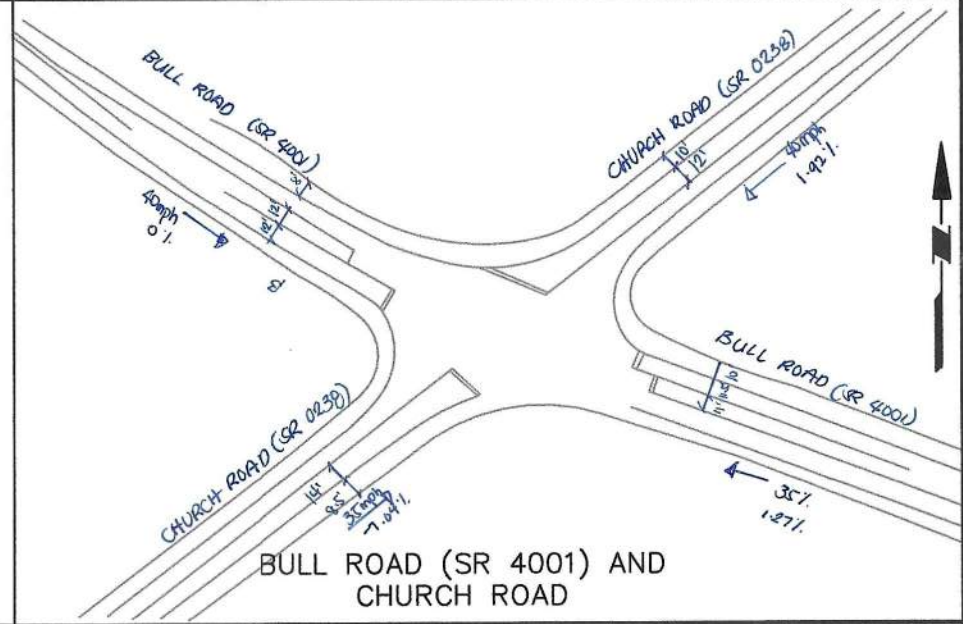
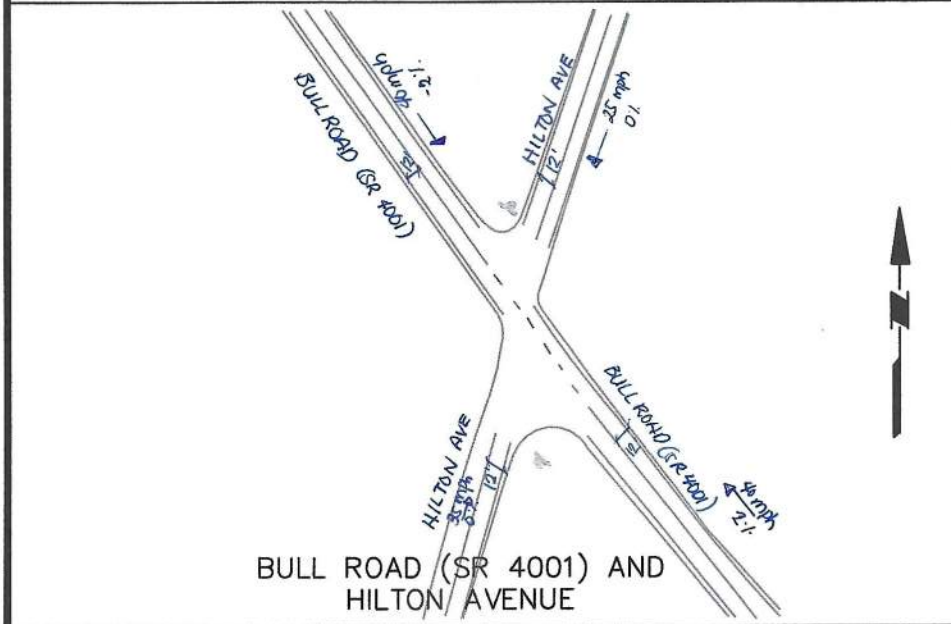
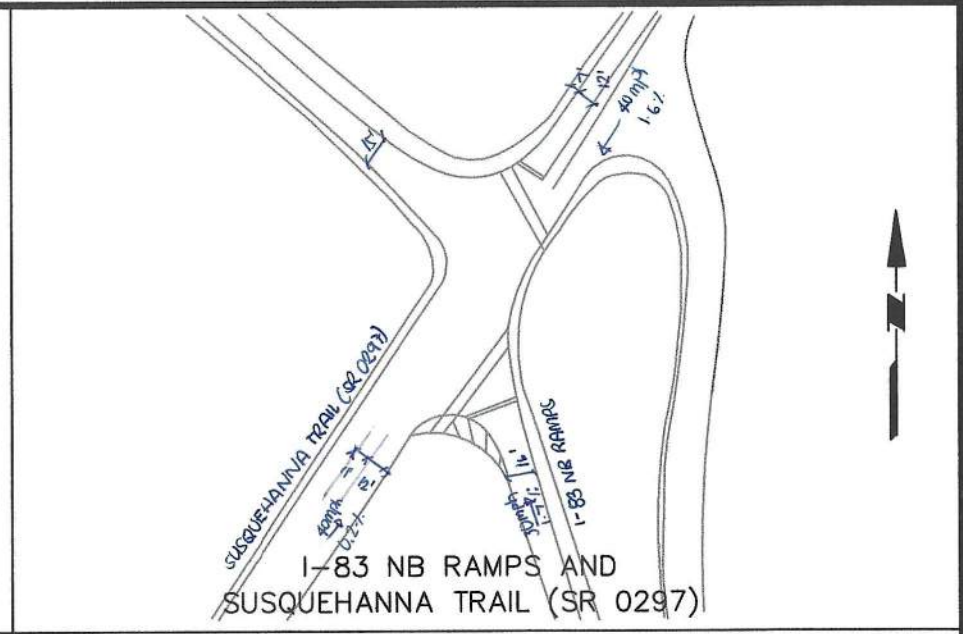
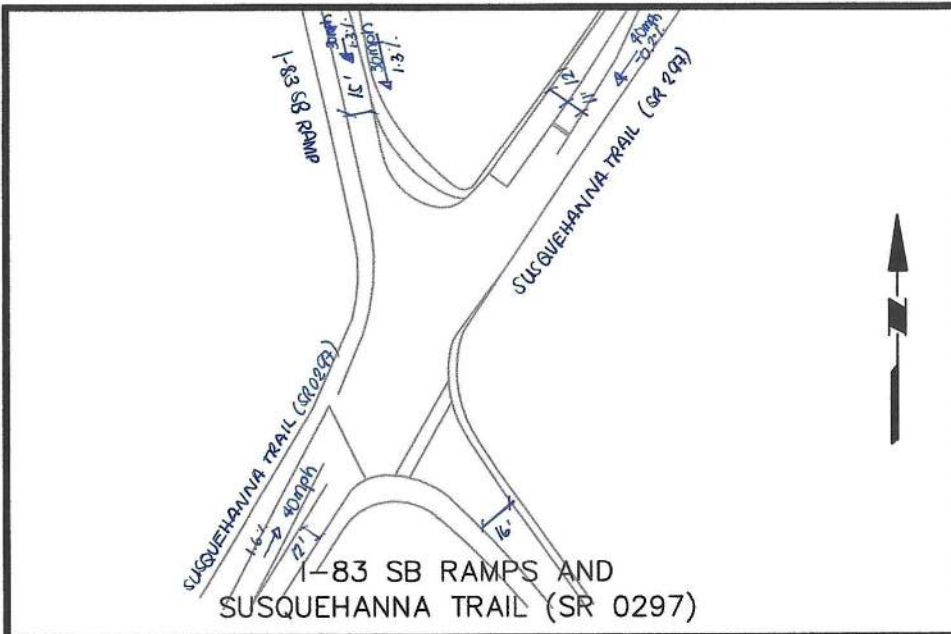
**LANGAN**  
 Langan Engineering and Environmental Services, Inc.  
 Stone Manor Corporate Center, 2700 Kelly Road, Suite 200  
 Warrington, PA 18976  
 T: 215.491.6500 F: 215.491.6501 www.langan.com

Project  
**BULL ROAD LOGISTICS**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title  
**INTERSECTION SKETCHES**

Project No.  
 200164401  
 Date  
 10/20/2022  
 Drawn By  
 KLP  
 Checked By  
 R.J.L.

Drawing No.



**LANGAN**

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Environmental Services, Inc.  
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Warrington, PA 18976

T: 215.491.6500 F: 215.491.6501 www.langan.com

Project

**BULL ROAD  
LOGISTICS**

DOVER TOWNSHIP  
YORK COUNTY PENNSYLVANIA

Drawing Title

**INTERSECTION  
SKETCHES**

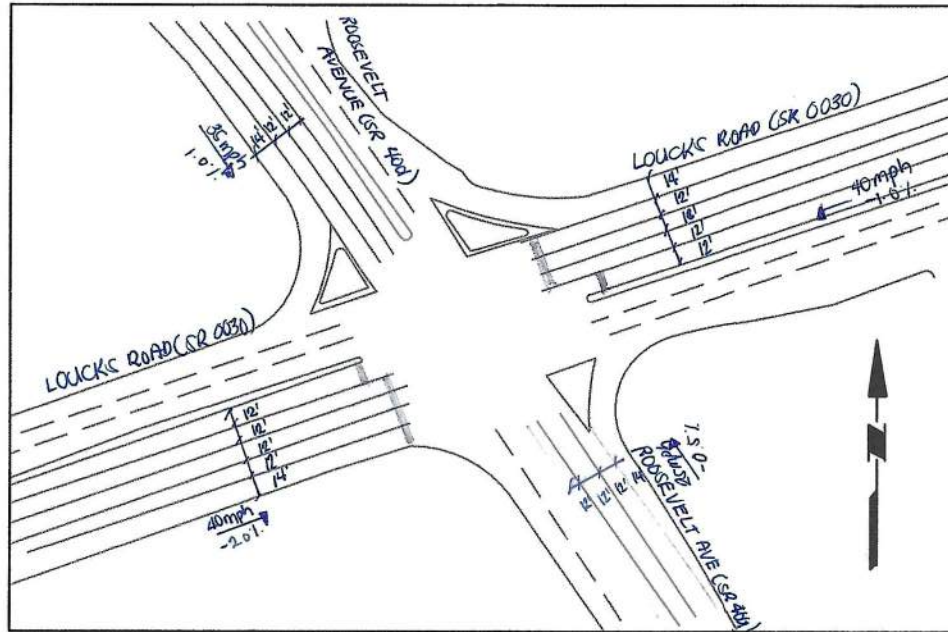
Project No.  
200184401

Date  
10/20/2022

Drawn By  
KLP

Checked By  
RJL

Drawing No.



LOUCKS ROAD (SR 0030) AND  
ROOSEVELT AVE (SR 4001)

<p><b>LANGAN</b> Langan Engineering and Environmental Services, Inc. Stone Manor Corporate Center, 2700 Kelly Road, Suite 200 Warrington, PA 18976 T: 215.491.6500 F: 215.491.6501 www.langan.com</p>	Project	Drawing Title	Project No.	Drawing No.
	<p><b>BULL ROAD LOGISTICS</b></p> <p>DOVER TOWNSHIP YORK COUNTY PENNSYLVANIA</p>	<p><b>INTERSECTION SKETCHES</b></p>	200164401	
			Date	
			10/20/2022	
			Drawn By	
			KLP	
			Checked By	
			RJL	

## **APPENDIX H**

**TURN LANE WARRANT ANALYSIS, TRAFFIC SIGNAL  
WARRANT ANALYSIS/TE-150 FORMS AND  
ADVANCE PHASE CALCULATIONS, CLEARANCE  
INTERVAL CALCULATIONS**

## Turn Lane Warrant and Length Analysis Workbook

### STUDY LOCATION AND ANALYSIS INFORMATION

Municipality: <input type="text" value="Dover Township"/> County: <input type="text" value="York County"/> PennDOT Engineering District: <input type="text" value="8"/>	Analysis Date: <input type="text" value="rev 6/5/2023"/> Conducted By: <input type="text" value="KLP"/> Checked By: <input type="text" value="RJL"/> Agency/Company Name: <input type="text" value="LANGAN"/>
Intersection & Approach Description: <input style="width: 100%;" type="text" value="Bull Road (SR 4001) and Site Driveway - Northbound Left"/>	
Analysis Period: <input type="text" value="2029 Build"/> Design Hour: <input type="text" value="AM Peak Hour"/> Intersection Control: <input type="text" value="Unsignalized"/> Posted Speed Limit (MPH): <input type="text" value="40"/> Type of Terrain: <input type="text" value="Level"/>	Number of Approach Lanes: <input type="text" value="1"/> Undivided or Divided Highway: <input type="text" value="Undivided"/> <div style="border: 1px solid red; padding: 2px; display: inline-block; color: red; font-weight: bold;">Type of Analysis</div> 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	212	9.0%	222	Advancing Volume: <input type="text" value="340"/> Opposing Volume: <input type="text" value="286"/> Left Turn Volume: <input type="text" value="222"/>
	Through	-	113	8.0%	118	
	Right	No	0	0.0%	N/A	
Opposing	Left	No	0	0.0%	N/A	% Left Turns in Advancing Volume: <input type="text" value="65.29%"/>
	Through	-	238	5.0%	244	
	Right	Yes	42	0.0%	42	
Right Turn Lane Volume Calculations						
Movement	Include?	Volume	% Trucks	PCEV		
Advancing	Left	Yes	0	0.0%	N/A	Advancing Volume: <input type="text" value="N/A"/> Right Turn Volume: <input type="text" value="N/A"/>
	Through	-	0	0.0%	N/A	
	Right	-	0	0.0%	N/A	

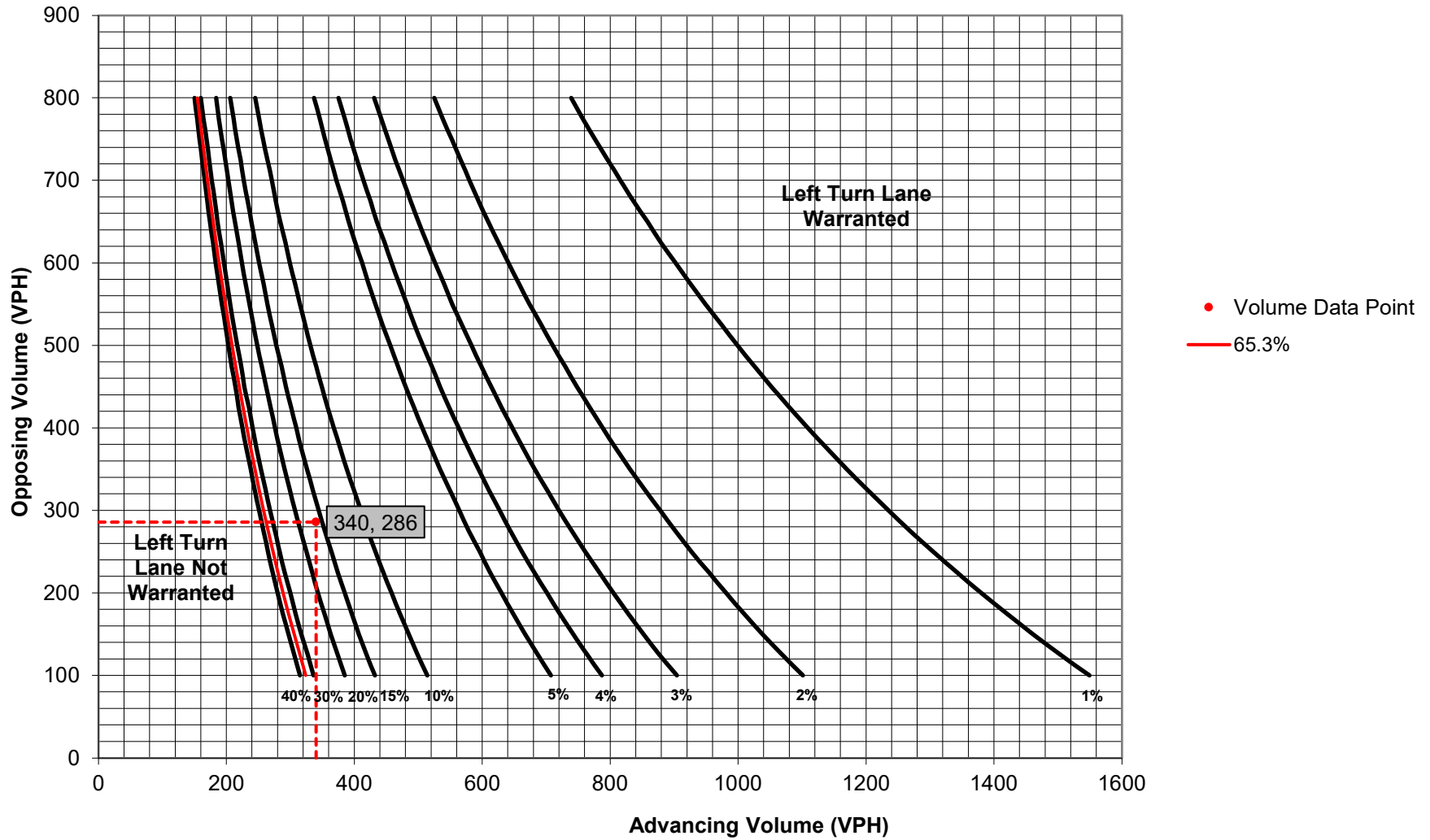
### TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings	Right Turn Lane Warrant Findings
Applicable Warrant Figure: <input style="width: 100px;" type="text" value="Figure 2"/> Warrant Met?: <input style="width: 100px;" type="text" value="Yes"/>	Applicable Warrant Figure: <input style="width: 100px;" type="text" value="N/A"/> Warrant Met?: <input style="width: 100px;" type="text" value="N/A"/>

### TURN LANE LENGTH CALCULATIONS

Intersection Control: <input type="text" value="Unsignalized"/> Design Hour Volume of Turning Lane: <input type="text" value="222"/> Cycles Per Hour (Assumed): <input type="text" value="60"/> Cycles Per Hour (If Known): <input type="text"/>	Average # of Vehicles/Cycle: <input style="width: 100px;" type="text" value="4.0"/>																																								
PennDOT Publication 46, Exhibit 11-6																																									
	<table border="1" style="width: 100%; border-collapse: collapse; font-size: 8px;"> <thead> <tr> <th rowspan="3" style="width: 20%;">Type of Traffic Control</th> <th colspan="6" style="background-color: #FFDAB9;">Speed (MPH)</th> </tr> <tr> <th colspan="2" style="background-color: #FFDAB9;">25-35</th> <th colspan="2" style="background-color: #FFDAB9;">40-45</th> <th colspan="2" style="background-color: #FFDAB9;">50-60</th> </tr> <tr> <th colspan="6" style="background-color: #FFDAB9;">Turn Demand Volume</th> </tr> <tr> <th></th> <th style="background-color: #FFDAB9;">High</th> <th style="background-color: #FFDAB9;">Low</th> <th style="background-color: #FFDAB9;">High</th> <th style="background-color: #FFDAB9;">Low</th> <th style="background-color: #FFDAB9;">High</th> <th style="background-color: #FFDAB9;">Low</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Signalized</td> <td style="text-align: center;">A</td> <td style="text-align: center;">A</td> <td style="text-align: center;">B or C</td> <td style="text-align: center;">B or C</td> <td style="text-align: center;">B or C</td> <td style="text-align: center;">B or C</td> </tr> <tr> <td style="text-align: center;">Unsignalized</td> <td style="text-align: center;">A</td> <td style="text-align: center;">A</td> <td style="text-align: center; background-color: #FFC0CB;">C</td> <td style="text-align: center;">B</td> <td style="text-align: center;">B or C</td> <td style="text-align: center;">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																																			
	Left Turn Lane Storage Length, Condition A: <input style="width: 100px;" type="text" value="N/A"/> Feet Condition B: <input style="width: 100px;" type="text" value="N/A"/> Feet Condition C: <input style="width: 100px;" type="text" value="236"/> Feet Required Left Turn Lane Storage Length: <input style="width: 100px;" type="text" value="250"/> Feet																																								
Additional Findings: <input style="width: 150px;" type="text" value="N/A"/>																																									
Additional Comments / Justifications: <input style="width: 100%; height: 40px;" type="text"/>																																									

**Figure 2. Warrant for left turn lanes on two-lane highways  
 (40 mph speed, unsignalized and signalized intersections)**  
 (L = % Left Turns in Advancing Volume)



## Turn Lane Warrant and Length Analysis Workbook

### STUDY LOCATION AND ANALYSIS INFORMATION

Municipality: <input type="text" value="Dover Township"/> County: <input type="text" value="York County"/> PennDOT Engineering District: <input type="text" value="8"/>	Analysis Date: <input type="text" value="rev 6/5/2023"/> Conducted By: <input type="text" value="KLP"/> Checked By: <input type="text" value="RJL"/> Agency/Company Name: <input type="text" value="LANGAN"/>
Intersection & Approach Description: <input type="text" value="Bull Road (SR 4001) and Site Driveway - Northbound Left"/>	
Analysis Period: <input type="text" value="2029 Build"/> Design Hour: <input type="text" value="PM Peak Hour"/> Intersection Control: <input type="text" value="Unsignalized"/> Posted Speed Limit (MPH): <input type="text" value="40"/> Type of Terrain: <input type="text" value="Level"/>	Number of Approach Lanes: <input type="text" value="1"/> Undivided or Divided Highway: <input type="text" value="Undivided"/> <div style="border: 2px solid red; padding: 2px; display: inline-block;">Type of Analysis</div> 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	85	36.0%	101	Advancing Volume: <input type="text" value="341"/> Opposing Volume: <input type="text" value="232"/> Left Turn Volume: <input type="text" value="101"/>
	Through	-	236	3.0%	240	
	Right	No	0	0.0%	N/A	
Opposing	Left	No	0	0.0%	N/A	% Left Turns in Advancing Volume: <input type="text" value="29.62%"/>
	Through	-	217	2.0%	220	
	Right	Yes	12	0.0%	12	

Right Turn Lane Volume Calculations						
Movement	Include?	Volume	% Trucks	PCEV		
Advancing	Left	Yes	0	0.0%	N/A	Advancing Volume: <input type="text" value="N/A"/> Right Turn Volume: <input type="text" value="N/A"/>
	Through	-	0	0.0%	N/A	
	Right	-	0	0.0%	N/A	

### TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings	Right Turn Lane Warrant Findings
Applicable Warrant Figure: <input type="text" value="Figure 2"/> Warrant Met?: <input type="text" value="Yes"/>	Applicable Warrant Figure: <input type="text" value="N/A"/> Warrant Met?: <input type="text" value="N/A"/>

### TURN LANE LENGTH CALCULATIONS

Intersection Control:	<input type="text" value="Unsignalized"/>
Design Hour Volume of Turning Lane:	<input type="text" value="101"/>
Cycles Per Hour (Assumed):	<input type="text" value="60"/>
Cycles Per Hour (If Known):	<input type="text" value=""/>
Average # of Vehicles/Cycle:	<input type="text" value="2.0"/>

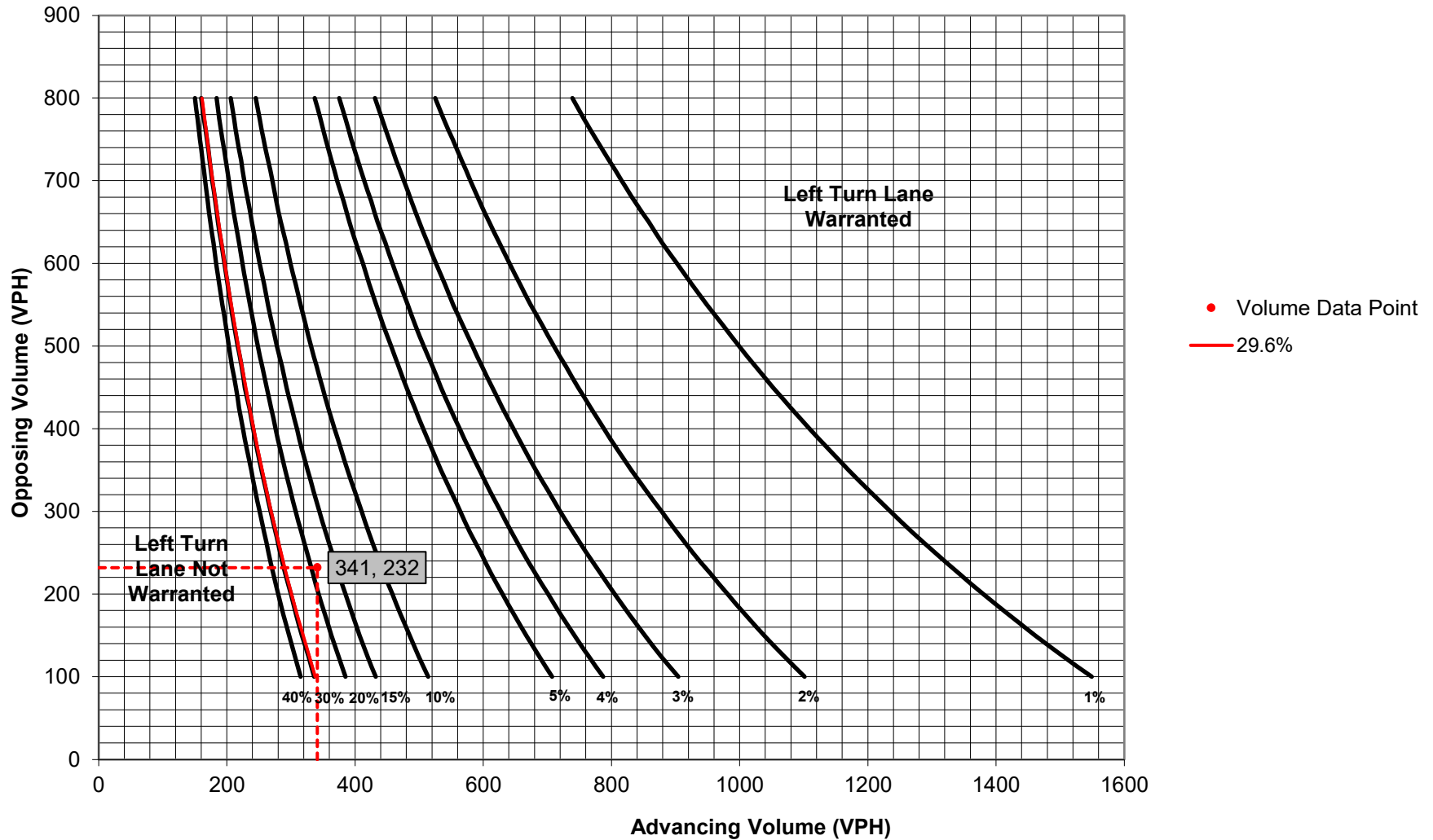
Type of Traffic Control	PennDOT Publication 46, Exhibit 11-6					
	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B

Left Turn Lane Storage Length, Condition A:	<input type="text" value="N/A"/>	Feet
Condition B:	<input type="text" value="N/A"/>	Feet
Condition C:	<input type="text" value="161"/>	Feet
Required Left Turn Lane Storage Length:	<input type="text" value="175"/>	Feet

Additional Findings:

Additional Comments / Justifications:

**Figure 2. Warrant for left turn lanes on two-lane highways  
(40 mph speed, unsignalized and signalized intersections)**  
(L = % Left Turns in Advancing Volume)





## Turn Lane Warrant and Length Analysis Workbook

### STUDY LOCATION AND ANALYSIS INFORMATION

Municipality: <input type="text" value="Dover Township"/>	Analysis Date: <input type="text" value="rev 6/5/23"/>
County: <input type="text" value="York County"/>	Conducted By: <input type="text" value="KLP"/>
PennDOT Engineering District: <input type="text" value="8"/>	Checked By: <input type="text" value="RJL"/>
	Agency/Company Name: <input type="text" value="LANGAN"/>
Intersection & Approach Description: <input type="text" value="Bull Road (SR 4001) and Site Driveway - Southbound Right"/>	
Analysis Period: <input type="text" value="2029 Build"/>	Number of Approach Lanes: <input type="text" value="1"/>
Design Hour: <input type="text" value="AM Peak Hour"/>	Undivided or Divided Highway: <input type="text" value="Undivided"/>
Intersection Control: <input type="text" value="Unsignalized"/>	
Posted Speed Limit (MPH): <input type="text" value="40"/>	Type of Analysis: <input type="text" value="Right Turn Lane"/>
Type of Terrain: <input type="text" value="Level"/>	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			N/A
	Through	-			N/A
	Right	Yes			N/A
Opposing	Left	Yes			N/A
	Through	-			N/A
	Right	Yes			N/A

Advancing Volume:

Opposing Volume:

Left Turn Volume:

% Left Turns in Advancing Volume:

Right Turn Lane Volume Calculations					
Movement		Include?	Volume	% Trucks	PCEV
Advancing	Left	No	0	0.0%	N/A
	Through	-	238	5.0%	244
	Right	-	42	0.0%	42

Advancing Volume:

Right Turn Volume:

### TURN LANE WARRANT FINDINGS

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

### TURN LANE LENGTH CALCULATIONS

Intersection Control: <input type="text" value="Unsignalized"/>	Average # of Vehicles/Cycle: <input type="text" value="N/A"/>
Design Hour Volume of Turning Lane: <input type="text" value="42"/>	
Cycles Per Hour (Assumed): <input type="text" value="60"/>	
Cycles Per Hour (If Known): <input type="text" value=""/>	

PennDOT Publication 46, Exhibit 11-6

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

Right 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 Right 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="Dover Township"/> County: <input type="text" value="York County"/> PennDOT Engineering District: <input type="text" value="8"/>	Analysis Date: <input type="text" value="rev 6/5/23"/> Conducted By: <input type="text" value="KLP"/> Checked By: <input type="text" value="RJL"/> Agency/Company Name: <input type="text" value="LANGAN"/>
Intersection & Approach Description: <input type="text" value="Bull Road (SR 4001) and Site Driveway - Southbound Right"/>	
Analysis Period: <input type="text" value="2029 Build"/> Design Hour: <input type="text" value="PM Peak Hour"/> Intersection Control: <input type="text" value="Unsignalized"/> Posted Speed Limit (MPH): <input type="text" value="40"/> Type of Terrain: <input type="text" value="Level"/>	Number of Approach Lanes: <input type="text" value="1"/> Undivided or Divided Highway: <input type="text" value="Undivided"/> 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			N/A	Advancing Volume: <input type="text" value="N/A"/> Opposing Volume: <input type="text" value="N/A"/> Left Turn Volume: <input type="text" value="N/A"/>
	Through	-			N/A	
	Right	Yes			N/A	
Opposing	Left	Yes			N/A	% Left Turns in Advancing Volume: <input type="text" value="N/A"/>
	Through	-			N/A	
	Right	Yes			N/A	

Right Turn Lane Volume Calculations						
Movement	Include?	Volume	% Trucks	PCEV		
Advancing	Left	No	0	0.0%	N/A	Advancing Volume: <input type="text" value="232"/> Right Turn Volume: <input type="text" value="12"/>
	Through	-	217	2.0%	220	
	Right	-	12	0.0%	12	

## TURN LANE WARRANT FINDINGS

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

## TURN LANE LENGTH CALCULATIONS

Intersection Control: <input type="text" value="Unsignalized"/> Design Hour Volume of Turning Lane: <input type="text" value="12"/> Cycles Per Hour (Assumed): <input type="text" value="60"/> 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	
	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

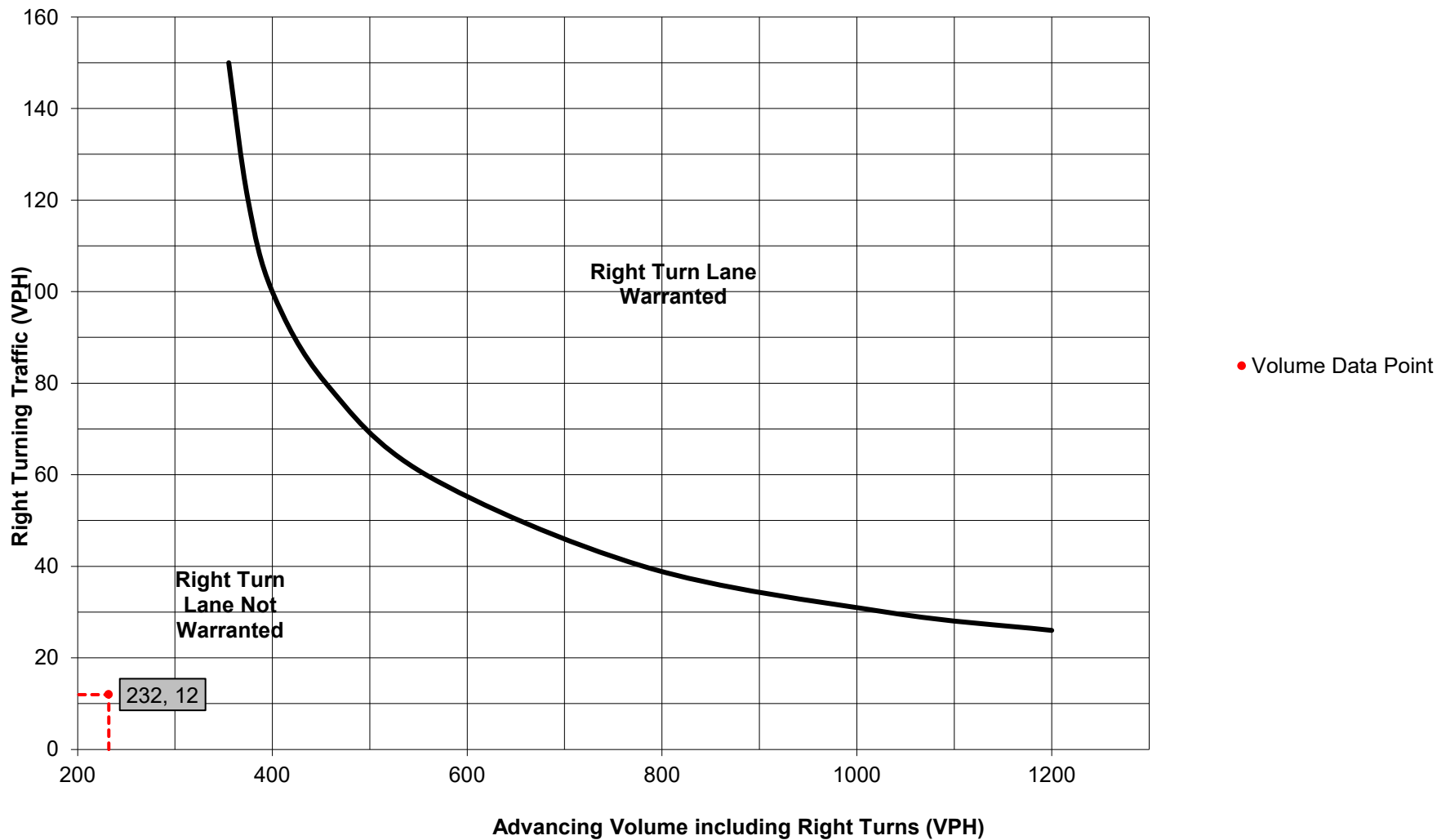
Right Turn Lane Storage Length, Condition A:	<input type="text" value="N/A"/>	Feet
Condition B:	<input type="text" value="N/A"/>	Feet
Condition C:	<input type="text" value="N/A"/>	Feet
Required Right Turn Lane Storage Length:	<input type="text" value="N/A"/>	Feet

Additional Findings:

Additional Comments / Justifications:

**Figure 9. Warrant for right turn lanes on two-lane roadways  
(40 mph or lower speeds, unsignalized and signalized intersections)**



# Turn Lane Warrant and Length Analysis Workbook

## STUDY LOCATION AND ANALYSIS INFORMATION

Municipality: <input type="text" value="Dover Township"/>	Analysis Date: <input type="text" value="6/6/2023"/>
County: <input type="text" value="York County"/>	Conducted By: <input type="text" value="KLP"/>
PennDOT Engineering District: <input type="text" value="8"/>	Checked By: <input type="text" value="RJL"/>
	Agency/Company Name: <input type="text" value="LANGAN"/>
Intersection & Approach Description: <input type="text" value="CANAL ROAD (SR 921) AND SUSQUEHANNA TRAIL (SR 297) - EASTBOUND LEFT"/>	
Analysis Period: <input type="text" value="2029 Build"/>	Number of Approach Lanes: <input type="text" value="1"/>
Design Hour: <input type="text" value="AM Peak Hour"/>	Undivided or Divided Highway: <input type="text" value="Undivided"/>
Intersection Control: <input type="text" value="Signalized"/>	
Posted Speed Limit (MPH): <input type="text" value="40"/>	Type of Analysis: <input type="text" value="Left Turn Lane"/>
Type of Terrain: <input type="text" value="Level"/>	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	272	7.0%	282	Advancing Volume: <input type="text" value="614"/>	
	Through	-	269	4.0%	275		Opposing Volume: <input type="text" value="198"/>
	Right	Yes	55	4.0%	57		Left Turn Volume: <input type="text" value="282"/>
Opposing	Left	Yes	10	10.0%	11	% Left Turns in Advancing Volume: <input type="text" value="45.93%"/>	
	Through	-	138	7.0%	143		
	Right	Yes	36	44.0%	44		
Right Turn Lane Volume Calculations							
Movement	Include?	Volume	% Trucks	PCEV			
Advancing	Left	Yes	0	0.0%	N/A	Advancing Volume: <input type="text" value="N/A"/>	
	Through	-	0	0.0%	N/A	Right Turn Volume: <input type="text" value="N/A"/>	
	Right	-	0	0.0%	N/A		

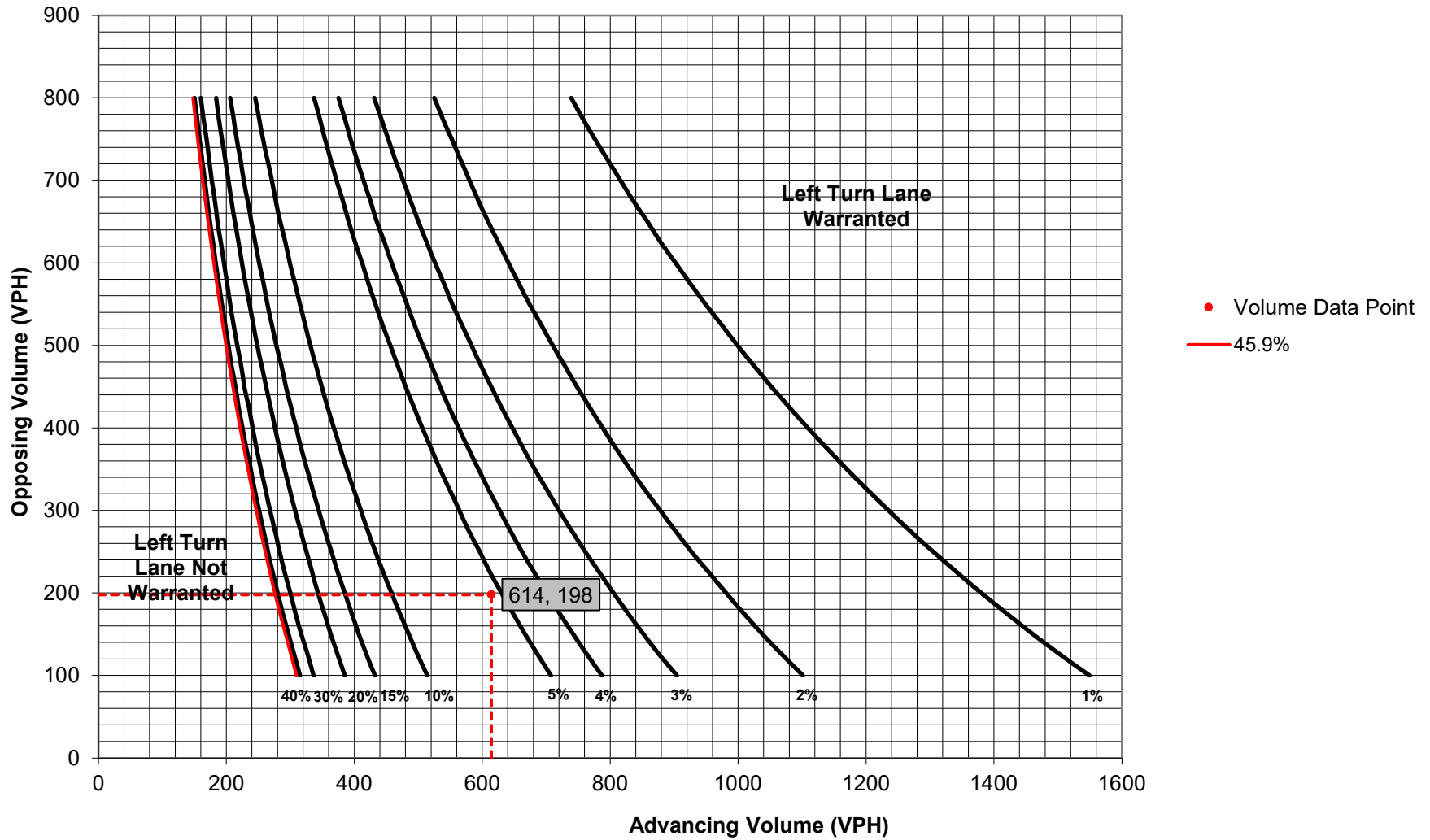
## TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings	Right Turn Lane Warrant Findings
Applicable Warrant Figure: <input type="text" value="Figure 2"/>	Applicable Warrant Figure: <input type="text" value="N/A"/>
Warrant Met?: <input type="text" value="Yes"/>	Warrant Met?: <input type="text" value="N/A"/>

## TURN LANE LENGTH CALCULATIONS

Intersection Control: <input type="text" value="Signalized"/>						
Design Hour Volume of Turning Lane: <input type="text" value="282"/>						
Cycles Per Hour (Assumed): <input type="text" value="Known"/>						
Cycles Per Hour (If Known): <input type="text" value="40"/>	Average # of Vehicles/Cycle: <input type="text" value="7.0"/>					
PennDOT Publication 46, Exhibit 11-6						
Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B
Left Turn Lane Storage Length, Condition A: <input type="text" value="N/A"/>		Feet				
Condition B: <input type="text" value="75"/>		Feet				
Condition C: <input type="text" value="336"/>		Feet				
Required Left Turn Lane Storage Length: <input type="text" value="350"/>		Feet				
Additional Findings: <input type="text" value="N/A"/>						
Additional Comments / Justifications: <input style="height: 40px;" type="text"/>						

**Figure 2. Warrant for left turn lanes on two-lane highways  
(40 mph speed, unsignalized and signalized intersections)**  
(L = % Left Turns in Advancing Volume)



# Turn Lane Warrant and Length Analysis Workbook

## STUDY LOCATION AND ANALYSIS INFORMATION

Municipality: <input type="text" value="Dover Township"/>	Analysis Date: <input type="text" value="rev 6/6/2023"/>
County: <input type="text" value="York County"/>	Conducted By: <input type="text" value="KLP"/>
PennDOT Engineering District: <input type="text" value="8"/>	Checked By: <input type="text" value="RJL"/>
	Agency/Company Name: <input type="text" value="LANGAN"/>
Intersection & Approach Description: <input type="text" value="CANAL ROAD (SR 921) AND SUSQUEHANNA TRAIL (SR 297) - EASTBOUND LEFT"/>	
Analysis Period: <input type="text" value="2029 Build"/>	Number of Approach Lanes: <input type="text" value="1"/>
Design Hour: <input type="text" value="PM Peak Hour"/>	Undivided or Divided Highway: <input type="text" value="Undivided"/>
Intersection Control: <input type="text" value="Signalized"/>	
Posted Speed Limit (MPH): <input type="text" value="40"/>	Type of Analysis: <input type="text" value="Left Turn Lane"/>
Type of Terrain: <input type="text" value="Level"/>	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	262	9.0%	274	Advancing Volume: <input type="text" value="471"/>	
	Through	-	155	3.0%	158		Opposing Volume: <input type="text" value="459"/>
	Right	Yes	39	0.0%	39		Left Turn Volume: <input type="text" value="274"/>
Opposing	Left	Yes	20	10.0%	21	% Left Turns in Advancing Volume: <input type="text" value="58.17%"/>	
	Through	-	354	2.0%	358		
	Right	Yes	71	24.0%	80		
Right Turn Lane Volume Calculations							
Movement	Include?	Volume	% Trucks	PCEV			
Advancing	Left	Yes	0	0.0%	N/A	Advancing Volume: <input type="text" value="N/A"/>	
	Through	-	0	0.0%	N/A	Right Turn Volume: <input type="text" value="N/A"/>	
	Right	-	0	0.0%	N/A		

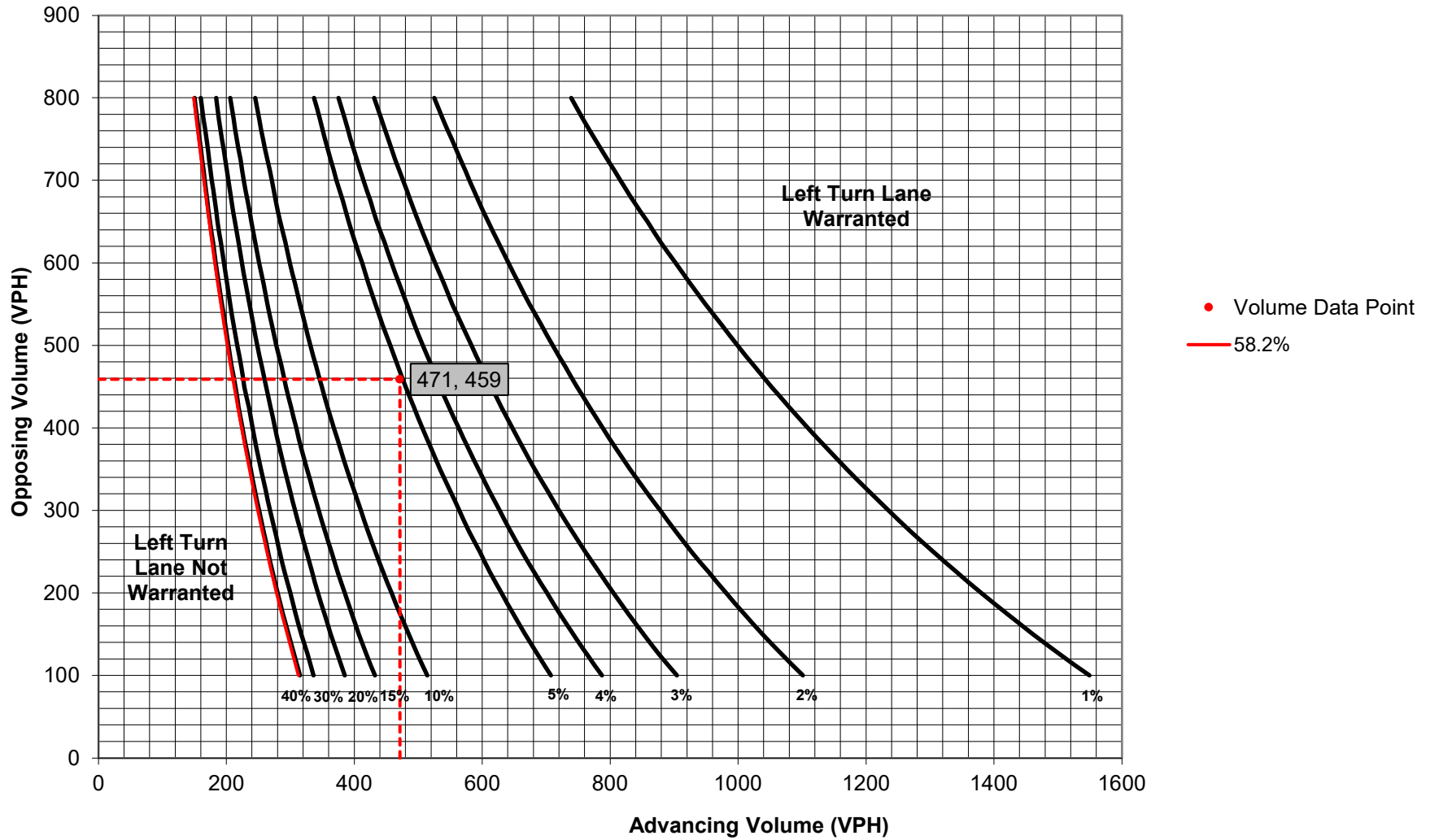
## TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings	Right Turn Lane Warrant Findings
Applicable Warrant Figure: <input type="text" value="Figure 2"/>	Applicable Warrant Figure: <input type="text" value="N/A"/>
Warrant Met?: <input type="text" value="Yes"/>	Warrant Met?: <input type="text" value="N/A"/>

## TURN LANE LENGTH CALCULATIONS

Intersection Control: <input type="text" value="Signalized"/>						
Design Hour Volume of Turning Lane: <input type="text" value="274"/>						
Cycles Per Hour (Assumed): <input type="text" value="Known"/>						
Cycles Per Hour (If Known): <input type="text" value="40"/>	Average # of Vehicles/Cycle: <input type="text" value="7.0"/>					
PennDOT Publication 46, Exhibit 11-6						
Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B
Left Turn Lane Storage Length, Condition A: <input type="text" value="N/A"/> Feet						
Condition B: <input type="text" value="75"/> Feet						
Condition C: <input type="text" value="336"/> Feet						
Required Left Turn Lane Storage Length: <input type="text" value="350"/> Feet						
Additional Findings: <input type="text" value="N/A"/>						
Additional Comments / Justifications:						

**Figure 2. Warrant for left turn lanes on two-lane highways  
(40 mph speed, unsignalized and signalized intersections)**  
(L = % Left Turns in Advancing Volume)



## Turn Lane Warrant and Length Analysis Workbook

### STUDY LOCATION AND ANALYSIS INFORMATION

Municipality: <input type="text" value="Dover Township"/>	Analysis Date: <input type="text" value="6/6/2023"/>
County: <input type="text" value="York County"/>	Conducted By: <input type="text" value="KLP"/>
PennDOT Engineering District: <input type="text" value="8"/>	Checked By: <input type="text" value="RJL"/>
	Agency/Company Name: <input type="text" value="LANGAN"/>
Intersection & Approach Description: <input type="text" value="BULL ROAD (SR 4001) AND HILTON AVENUE - NORTHBOUND LEFT"/>	
Analysis Period: <input type="text" value="2029 Build"/>	Number of Approach Lanes: <input type="text" value="1"/>
Design Hour: <input type="text" value="AM Peak Hour"/>	Undivided or Divided Highway: <input type="text" value="Undivided"/>
Intersection Control: <input type="text" value="Signalized"/>	
Posted Speed Limit (MPH): <input type="text" value="40"/>	Type of Analysis: <input type="text" value="Left Turn Lane"/>
Type of Terrain: <input type="text" value="Level"/>	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	41	0.0%	41	Advancing Volume: <input type="text" value="291"/>	
	Through	239	9.0%	250		Opposing Volume: <input type="text" value="479"/>
	Right	0	0.0%	0		Left Turn Volume: <input type="text" value="41"/>
Opposing	Left	0	0.0%	0	% Left Turns in Advancing Volume: <input type="text" value="14.09%"/>	
	Through	390	8.0%	406		
	Right	71	3.0%	73		
Right Turn Lane Volume Calculations						
Movement	Include?	Volume	% Trucks	PCEV		
Advancing	Left	0	0.0%	N/A	Advancing Volume: <input type="text" value="N/A"/>	
	Through	0	0.0%	N/A		Right Turn Volume: <input type="text" value="N/A"/>
	Right	0	0.0%	N/A		

### TURN LANE WARRANT FINDINGS

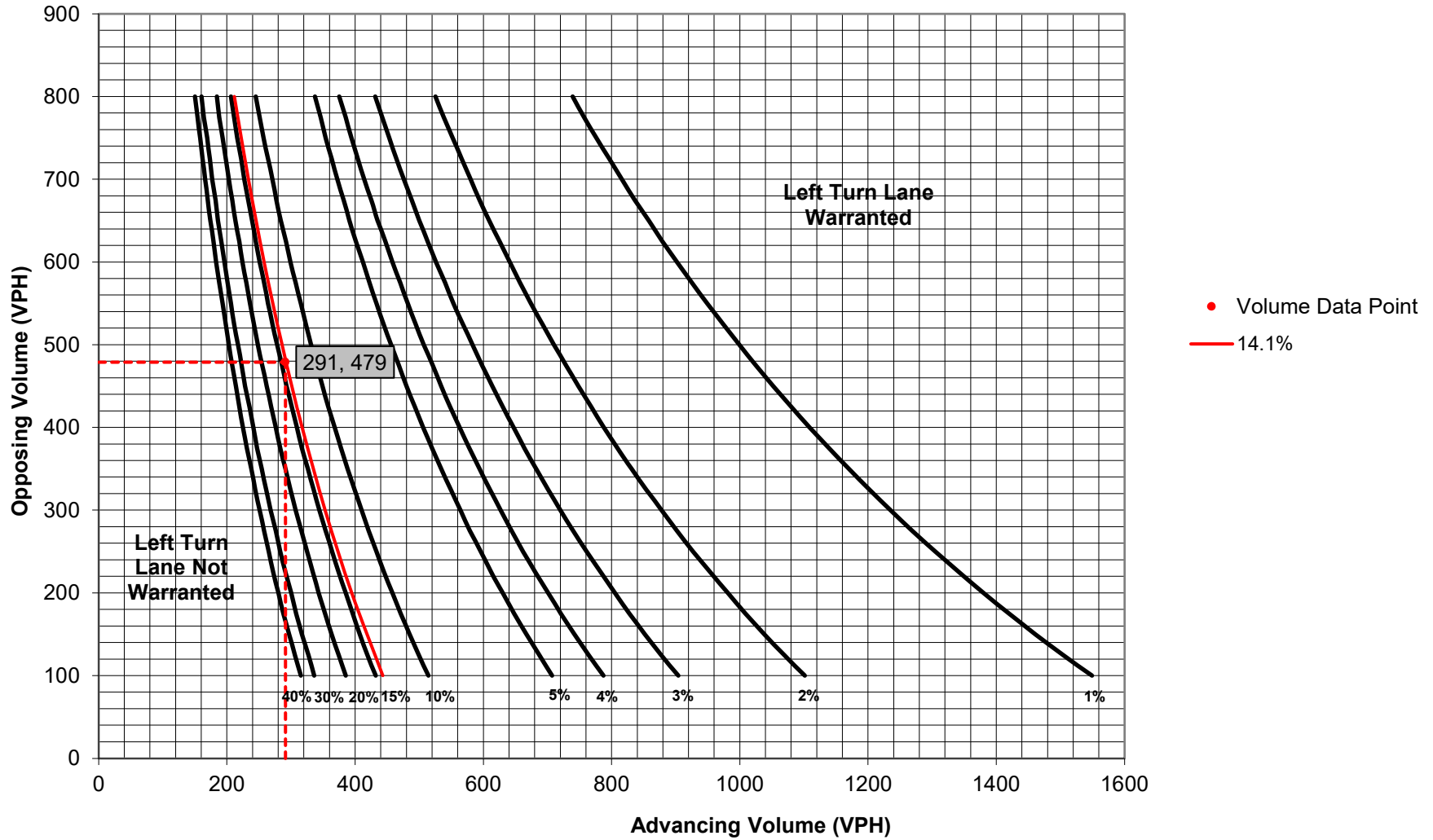
Left Turn Lane Warrant Findings	Right Turn Lane Warrant Findings
Applicable Warrant Figure: <input type="text" value="Figure 2"/>	Applicable Warrant Figure: <input type="text" value="N/A"/>
Warrant Met?: <input type="text" value="No"/>	Warrant Met?: <input type="text" value="N/A"/>

### TURN LANE LENGTH CALCULATIONS

Intersection Control: <input type="text" value="Signalized"/>						
Design Hour Volume of Turning Lane: <input type="text" value="41"/>						
Cycles Per Hour (Assumed): <input type="text" value="Known"/>						
Cycles Per Hour (If Known): <input type="text" value="60"/>	Average # of Vehicles/Cycle: <input type="text" value="N/A"/>					
PennDOT Publication 46, Exhibit 11-6						
Type of Traffic Control	Speed (MPH)					
	25-35		40-45		50-60	
	Turn Demand Volume					
	High	Low	High	Low	High	Low
Signalized	A	A	B or C	B or C	B or C	B or C
Unsignalized	A	A	C	B	B or C	B
Left Turn Lane Storage Length, Condition A: <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: <input type="text" value="N/A"/>						
Additional Comments / Justifications: <input style="height: 40px;" type="text"/>						



**Figure 2. Warrant for left turn lanes on two-lane highways  
(40 mph speed, unsignalized and signalized intersections)**  
(L = % Left Turns in Advancing Volume)



# Turn Lane Warrant and Length Analysis Workbook

## STUDY LOCATION AND ANALYSIS INFORMATION

Municipality: <input type="text" value="Dover Township"/>	Analysis Date: <input type="text" value="6/6/2023"/>
County: <input type="text" value="York County"/>	Conducted By: <input type="text" value="KLP"/>
PennDOT Engineering District: <input type="text" value="8"/>	Checked By: <input type="text" value="RJL"/>
	Agency/Company Name: <input type="text" value="LANGAN"/>
Intersection & Approach Description: <input type="text" value="BULL ROAD (SR 4001) AND HILTON AVENUE - NORTHBOUND LEFT"/>	
Analysis Period: <input type="text" value="2029 Build"/>	Number of Approach Lanes: <input type="text" value="1"/>
Design Hour: <input type="text" value="PM Peak Hour"/>	Undivided or Divided Highway: <input type="text" value="Undivided"/>
Intersection Control: <input type="text" value="Signalized"/>	
Posted Speed Limit (MPH): <input type="text" value="40"/>	Type of Analysis: <input type="text" value="Left Turn Lane"/>
Type of Terrain: <input type="text" value="Level"/>	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	285	1.0%	287	Advancing Volume: <input type="text" value="727"/>
	Through	-	6.0%	438	Opposing Volume: <input type="text" value="495"/>
	Right	2	0.0%	2	Left Turn Volume: <input type="text" value="287"/>
Opposing	Left	0	0.0%	0	
	Through	-	5.0%	318	
	Right	Yes	176	1.0%	177

Right Turn Lane Volume Calculations					
Movement	Include?	Volume	% Trucks	PCEV	
Advancing	Left	0	0.0%	N/A	Advancing Volume: <input type="text" value="N/A"/>
	Through	-	0.0%	N/A	Right Turn Volume: <input type="text" value="N/A"/>
	Right	-	0	0.0%	N/A

## TURN LANE WARRANT FINDINGS

Left Turn Lane Warrant Findings	Right Turn Lane Warrant Findings
Applicable Warrant Figure: <input type="text" value="Figure 2"/>	Applicable Warrant Figure: <input type="text" value="N/A"/>
Warrant Met?: <input type="text" value="Yes"/>	Warrant Met?: <input type="text" value="N/A"/>

## TURN LANE LENGTH CALCULATIONS

Intersection Control: <input type="text" value="Signalized"/>	
Design Hour Volume of Turning Lane: <input type="text" value="287"/>	
Cycles Per Hour (Assumed): <input type="text" value="Known"/>	
Cycles Per Hour (If Known): <input type="text" value="60"/>	Average # of Vehicles/Cycle: <input type="text" value="5.0"/>

PennDOT Publication 46, Exhibit 11-6

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

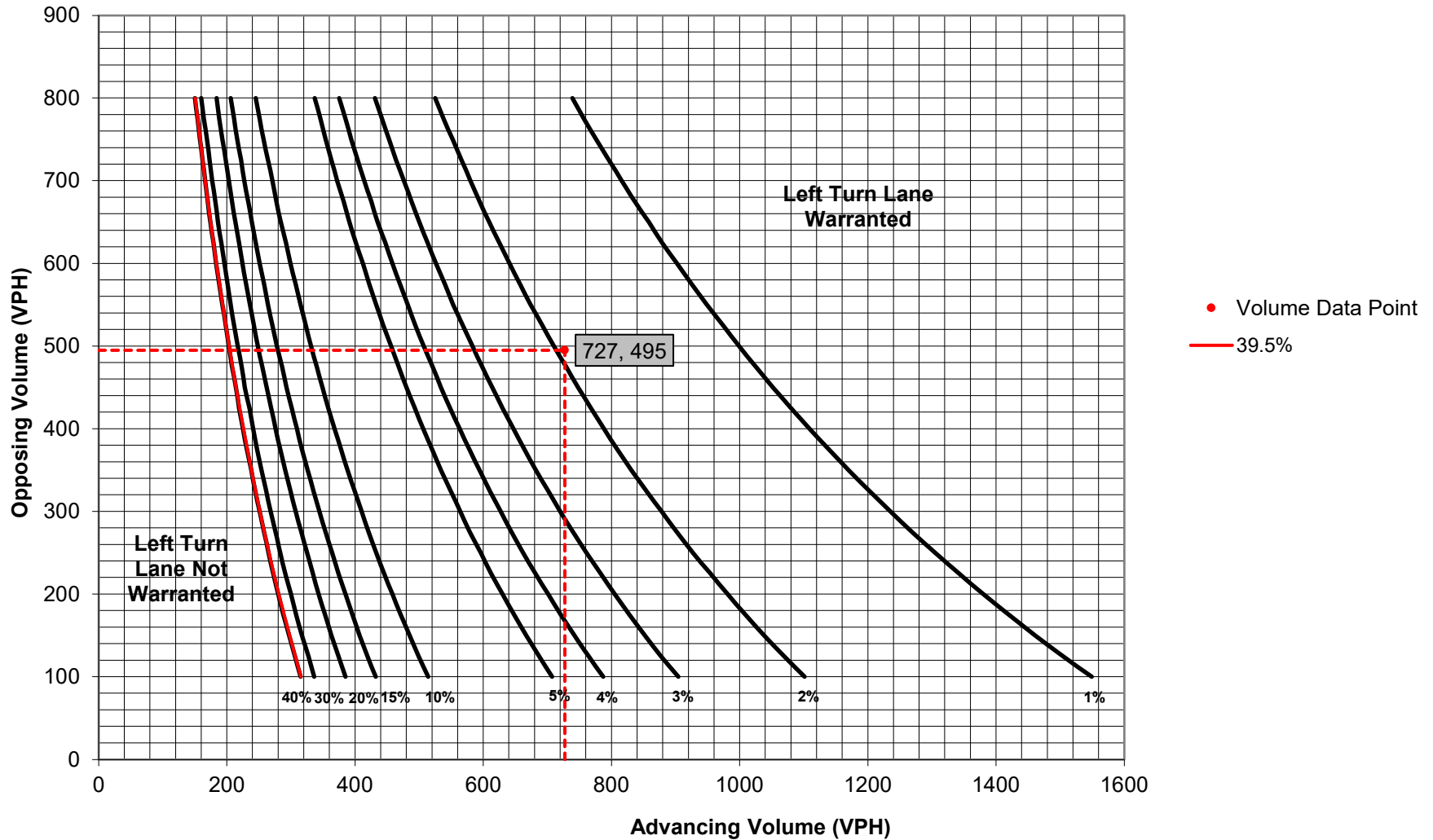
  

Left Turn Lane Storage Length, Condition A:	<input type="text" value="N/A"/>	Feet
Condition B:	<input type="text" value="75"/>	Feet
Condition C:	<input type="text" value="261"/>	Feet
Required Left Turn Lane Storage Length:	<input type="text" value="275"/>	Feet

Additional Findings:

Additional Comments / Justifications:

**Figure 2. Warrant for left turn lanes on two-lane highways  
(40 mph speed, unsignalized and signalized intersections)**  
(L = % Left Turns in Advancing Volume)



# TRAFFIC SIGNAL WARRANT ANALYSIS ENGINEERING AND TRAFFIC STUDY



PLEASE TYPE OR PRINT ALL INFORMATION IN BLUE OR BLACK INK

## A - LOCATION INFORMATION

COUNTY York County	MUNICIPALITY(S) Dover Township
-----------------------	-----------------------------------

### MAJOR STREET INFORMATION

SR#/LOCAL HIGHWAY SR 4001	SEGMENT 0230	OFFSET 21
------------------------------	-----------------	--------------

STREET NAME Bull Road
--------------------------

### MINOR STREET INFORMATION

SR#/LOCAL HIGHWAY SR 0921	SEGMENT 0040	OFFSET 2555
------------------------------	-----------------	----------------

STREET NAME Canal Road
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## B - REFERENCE INFORMATION

REFERENCE Chapter 212	SECTION(S) 212.302
--------------------------	-----------------------

REFERENCE MUTCD	SECTION(S) 4C.01 THROUGH 4C.09
--------------------	-----------------------------------

REFERENCE Vehicle Code Title 75 Pa. C.S.	SECTION(S) §3111
---	---------------------

## C - STUDY ELEMENTS

### FROM MUTCD AND PENNDOT PUBLICATION 212:

- |  |  |   |
|--|--|---|
| <input checked="" type="checkbox"/> WARRANT 1-Eight-Hour (Section 4C.02) | <input type="checkbox"/> WARRANT 4-Pedestrian Volume (Section 4C.05)         | <input type="checkbox"/> WARRANT 7-Crash Experience (Section 4C.08) |
| <input checked="" type="checkbox"/> WARRANT 2-Four-Hour (Section 4C.03)  | <input type="checkbox"/> WARRANT 5-School Crossing (Section 4C.06)           | <input type="checkbox"/> WARRANT 8-Roadway Network (Section 4C.09)  |
| <input checked="" type="checkbox"/> WARRANT 3-Peak-Hour (Section 4C.04)  | <input type="checkbox"/> WARRANT 6-Coordinated Signal System (Section 4C.07) | <input type="checkbox"/> WARRANT 9-ADT Volume (§212.302 (b)(3))     |

### FROM PENNDOT PUBLICATION 212 APPENDIX:

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Crash Analysis (1)               | <input type="checkbox"/> Pedestrian Volumes (12) | <input type="checkbox"/> Traffic Signals (19)            |
| <input checked="" type="checkbox"/> Capacity Analysis (6) | <input type="checkbox"/> Sight Distance (16)     | <input checked="" type="checkbox"/> Traffic Volumes (20) |
| <input type="checkbox"/> Geometric Review (8)             | <input type="checkbox"/> Speed Data (17)         | <input type="checkbox"/> Other _____                     |

## D - ATTACHMENTS LISTING

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

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> 1. Municipal Letter or Memo Requesting Study | <input type="checkbox"/> 7. Fieldview Drawing or Condition Diagram   | <input checked="" type="checkbox"/> 13. Capacity Analysis           |
| <input type="checkbox"/> 2. Completed Application (TE-952)            | <input type="checkbox"/> 8. Crash Extract                            | <input type="checkbox"/> 14. RMS/STAMPP Identification Data         |
| <input type="checkbox"/> 3. Financial Commitment Letter               | <input type="checkbox"/> 9. Crash Rate                               | <input checked="" type="checkbox"/> 15. Traffic/Pedestrian Volumes  |
| <input type="checkbox"/> 4. Location Map                              | <input type="checkbox"/> 10. Collision Diagram Plot                  | <input type="checkbox"/> 16. Traffic Signal Permit Plan             |
| <input type="checkbox"/> 5. Photographs                               | <input type="checkbox"/> 11. Speed Study and Speed Limit Information | <input type="checkbox"/> 17. Other <u>See attached TIS for info</u> |
| <input type="checkbox"/> 6. Straight Line Diagram                     | <input checked="" type="checkbox"/> 12. Warrant Analysis             |   |

### Confidential - Traffic Engineering and Safety Study

This document is the property of the Commonwealth of Pennsylvania, Department of Transportation. The data and information contained herein are part of a traffic engineering and safety study. This safety study is only provided to those official agencies or persons who have responsibility in the highway transportation system and may only be used by such agencies or persons for traffic safety related planning or research. The document and information are confidential pursuant to 75 Pa. C.S.3754 and 23 U.S.C. 409 and may not be published, reproduced, released or discussed without the written permission of the Pennsylvania Department of Transportation.

**E - SITE OBSERVATION CHECKLIST**

1. Study Information:

Study performed by: Ryan Lothian, P.E. Date Study was performed: 06/23/2023  
 Company Name: Langan Engineering & Environmental Services, Inc. Phone Number: (215) 491-6500

2. Were other alternatives considered as indicated in the Manual on Uniform Traffic Control

Devices (MUTCD) Section 4B.04 "Alternatives to Traffic Control Signals" and the Transportation Impact

Study (TIS) Guidelines? (Explain) .....  YES  No

A PennDOT Stage 1 ICE Form was completed for this intersection that discusses various intersection control strategies and alternatives.

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

If yes, please indicate last date intersection was studied or Signal Permit Date: \_\_\_\_\_

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

5. Traffic Signal Warrant Analysis is based on the York Industrial Development  
 (Project/Development) that is expected to be completed on 12/31/2024 (date).

6. Automated Traffic Recorder (ATR) Counts:

Type of Count Device: \_\_\_\_\_ Date: \_\_\_\_\_

Company Performing Count: \_\_\_\_\_

7. Manual Vehicular Turning Movement Counts:

Individual Performing Count: \_\_\_\_\_ Date: 05/18/2023

Company Performing Count: Tri-State Traffic Data Inc

Count Parameters: 6:00 AM - 6:00 PM

8. Pedestrian Counts (if applicable):

Individual Performing Count: \_\_\_\_\_ Date: \_\_\_\_\_

Company Performing Count: Same as above. Pedestrian counts were included.

9. Warrant 1 (MUTCD Section 4C.02)	<input checked="" type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input type="checkbox"/> Not Evaluated
10. Warrant 2 (MUTCD Section 4C.03)	<input checked="" type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input type="checkbox"/> Not Evaluated
11. Warrant 3 (MUTCD Section 4C.04)	<input checked="" type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input type="checkbox"/> Not Evaluated
12. Warrant 4 (MUTCD Section 4C.05)	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated
13. Warrant 5 (MUTCD Section 4C.06)	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated
14. Warrant 6 (MUTCD Section 4C.07)	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated
15. Warrant 7 (MUTCD Section 4C.08)	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated
16. Warrant 8 (MUTCD Section 4C.09)	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated
17. Warrant 9 (§212.302 (b)(3))	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated

This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. 3754 and 23 U.S.C. 409 and may not be disclosed or used in litigation without written permission from PennDOT.

**F - SITE DATA**

Please refer to the attached TIS for any additional site data information required.

**G - REMARKS**

Based on the signal warrant analysis, a traffic signal is warranted at the intersection of Bull Road (SR 4001) and Canal Road (SR 0921) based on the 2023 existing traffic volumes. The intersection satisfies the criteria of MUTCD Warrant 1, Eight-Hour Vehicular Volume, Warrant 2, Four-Hour Vehicular Volume and Warrant 3, Peak Hour Volume. Based on this, it is recommended to allow the activation of a traffic signal at the intersection of Bull Road (SR 4001) and Canal Road (SR 0921) once it has been constructed. Please note that a separate formal Traffic Signal Report will be submitted in the future during the HOP submissions when the Traffic Signal Permit Plans are prepared.

**H - ENGINEERING JUDGMENT**

We believe that installing a traffic signal at the intersection of Bull Road (SR 4001) and Canal Road (SR 0921) will alleviate existing capacity and congestion issues that have been identified as needing improvements by PennDOT, the MPO and the municipalities.

**I - APPROVALS**

Comments:

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

This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. 3754 and 23 U.S.C. 409 and may not be disclosed or used in litigation without written permission from PennDOT.

**STUDY AND ANALYSIS INFORMATION**

Municipality:   
 County:   
 PennDOT Engineering District:

Analysis Date:   
 Conducted By:   
 Agency/Company Name:

**Analysis Information**

Data Collection Date:   
 Day of the Week:

Is the intersection in a built-up area of an isolated community of <10,000 population?

**Major Street Information**

Major Street Name and Route Number:   
 Major Street Approach #1 Direction:   
 Major Street Approach #2 Direction:

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

**Minor Street Information**

Minor Street Name and Route Number:   
 Minor Street Approach #1 Direction:   
 Minor Street Approach #2 Direction:

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

**TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS**

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

ENTER VOLUME DATA PER 15 MINUTE INTERVAL, PER APPROACH						
Time Interval		Major Street Approach #1 (E-Bound)	Major Street Approach #2 (W-Bound)	Major Street Combined	Minor Street Approach #1 (S-Bound)	Minor Street Approach #2 (N-Bound)
Begin At	End Of	Volume	Volume	Total Volume	Volume	Volume
12:00 AM	12:14 AM			0		
12:15 AM	12:29 AM			0		
12:30 AM	12:44 AM			0		
12:45 AM	12:59 AM			0		
1:00 AM	1:14 AM			0		
1:15 AM	1:29 AM			0		
1:30 AM	1:44 AM			0		
1:45 AM	1:59 AM			0		
2:00 AM	2:14 AM			0		
2:15 AM	2:29 AM			0		
2:30 AM	2:44 AM			0		
2:45 AM	2:59 AM			0		
3:00 AM	3:14 AM			0		
3:15 AM	3:29 AM			0		
3:30 AM	3:44 AM			0		
3:45 AM	3:59 AM			0		
4:00 AM	4:14 AM			0		
4:15 AM	4:29 AM			0		
4:30 AM	4:44 AM			0		
4:45 AM	4:59 AM			0		
5:00 AM	5:14 AM			0		
5:15 AM	5:29 AM			0		
5:30 AM	5:44 AM			0		
5:45 AM	5:59 AM			0		
6:00 AM	6:14 AM	79	39	118	37	36
6:15 AM	6:29 AM	117	58	175	48	53
6:30 AM	6:44 AM	122	68	190	58	83
6:45 AM	6:59 AM	87	81	168	55	53
7:00 AM	7:14 AM	112	64	176	59	66
7:15 AM	7:29 AM	124	70	194	68	60
7:30 AM	7:44 AM	125	81	206	61	64
7:45 AM	7:59 AM	110	89	199	56	60
8:00 AM	8:14 AM	65	58	123	50	38
8:15 AM	8:29 AM	57	75	132	45	47
8:30 AM	8:44 AM	87	59	146	30	42
8:45 AM	8:59 AM	94	77	171	41	48
9:00 AM	9:14 AM	70	76	146	32	41
9:15 AM	9:29 AM	66	50	116	44	45
9:30 AM	9:44 AM	51	52	103	43	37
9:45 AM	9:59 AM	62	70	132	36	53
10:00 AM	10:14 AM	66	80	146	25	59
10:15 AM	10:29 AM	83	55	138	37	57
10:30 AM	10:44 AM	71	57	128	22	44
10:45 AM	10:59 AM	66	63	129	27	48
11:00 AM	11:14 AM	60	62	122	31	58
11:15 AM	11:29 AM	73	72	145	34	45
11:30 AM	11:44 AM	88	67	155	30	50
11:45 AM	11:59 AM	64	50	114	27	46



ENTER VOLUME DATA PER 15 MINUTE INTERVAL, PER APPROACH						
Time Interval		Major Street Approach #1 (E-Bound)	Major Street Approach #2 (W-Bound)	Major Street Combined	Minor Street Approach #1 (S-Bound)	Minor Street Approach #2 (N-Bound)
Begin At	End Of	Volume	Volume	Total Volume	Volume	Volume
12:00 PM	12:14 PM	57	64	121	26	45
12:15 PM	12:29 PM	77	89	166	35	59
12:30 PM	12:44 PM	76	65	141	37	69
12:45 PM	12:59 PM	72	80	152	29	55
1:00 PM	1:14 PM	74	66	140	25	51
1:15 PM	1:29 PM	66	66	132	32	64
1:30 PM	1:44 PM	45	83	128	40	63
1:45 PM	1:59 PM	72	61	133	37	74
2:00 PM	2:14 PM	64	102	166	32	64
2:15 PM	2:29 PM	76	91	167	30	57
2:30 PM	2:44 PM	88	86	174	40	66
2:45 PM	2:59 PM	100	102	202	45	88
3:00 PM	3:14 PM	91	104	195	41	80
3:15 PM	3:29 PM	82	96	178	27	101
3:30 PM	3:44 PM	93	114	207	54	85
3:45 PM	3:59 PM	100	104	204	36	86
4:00 PM	4:14 PM	103	102	205	36	87
4:15 PM	4:29 PM	90	103	193	44	101
4:30 PM	4:44 PM	90	106	196	49	97
4:45 PM	4:59 PM	75	103	178	47	99
5:00 PM	5:14 PM	82	100	182	54	95
5:15 PM	5:29 PM	85	108	193	47	106
5:30 PM	5:44 PM	94	108	202	41	97
5:45 PM	5:59 PM	94	86	180	39	78
6:00 PM	6:14 PM			0		
6:15 PM	6:29 PM			0		
6:30 PM	6:44 PM			0		
6:45 PM	6:59 PM			0		
7:00 PM	7:14 PM			0		
7:15 PM	7:29 PM			0		
7:30 PM	7:44 PM			0		
7:45 PM	7:59 PM			0		
8:00 PM	8:14 PM			0		
8:15 PM	8:29 PM			0		
8:30 PM	8:44 PM			0		
8:45 PM	8:59 PM			0		
9:00 PM	9:14 PM			0		
9:15 PM	9:29 PM			0		
9:30 PM	9:44 PM			0		
9:45 PM	9:59 PM			0		
10:00 PM	10:14 PM			0		
10:15 PM	10:29 PM			0		
10:30 PM	10:44 PM			0		
10:45 PM	10:59 PM			0		
11:00 PM	11:14 PM			0		
11:15 PM	11:29 PM			0		
11:30 PM	11:44 PM			0		
11:45 PM	11:59 PM			0		
<b>Approach Totals:</b>		3945	3762	7707	1919	3100

**MUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME**

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No
---	----

Combination of Conditions A and B Necessary?\*: No

*\*Only applicable for Warrant 1 if after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems. See Section 4C.02 of the 2009 MUTCD for application.*

Condition A - Minimum Vehicular Volume									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or More	1	600	480	420	336	150	120	105	84
2 or More	2 or More	600	480	420	336	200	160	140	112
1	2 or More	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or More	1	900	720	630	504	75	60	53	42
2 or More	2 or More	900	720	630	504	100	80	70	56
1	2 or More	750	600	525	420	100	80	70	56

**Condition A Evaluation**

Number of Unique Hours Met: 11      Condition A Satisfied? Yes

**Condition B Evaluation**

Number of Unique Hours Met: 4      Condition B Satisfied? No

**Combination of Condition A and Condition B Evaluation**

Number of Unique Hours Met for Condition A: N/A

Number of Unique Hours Met for Condition B: N/A

Combination of Condition A and Condition B Satisfied? N/A

**MUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME**

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

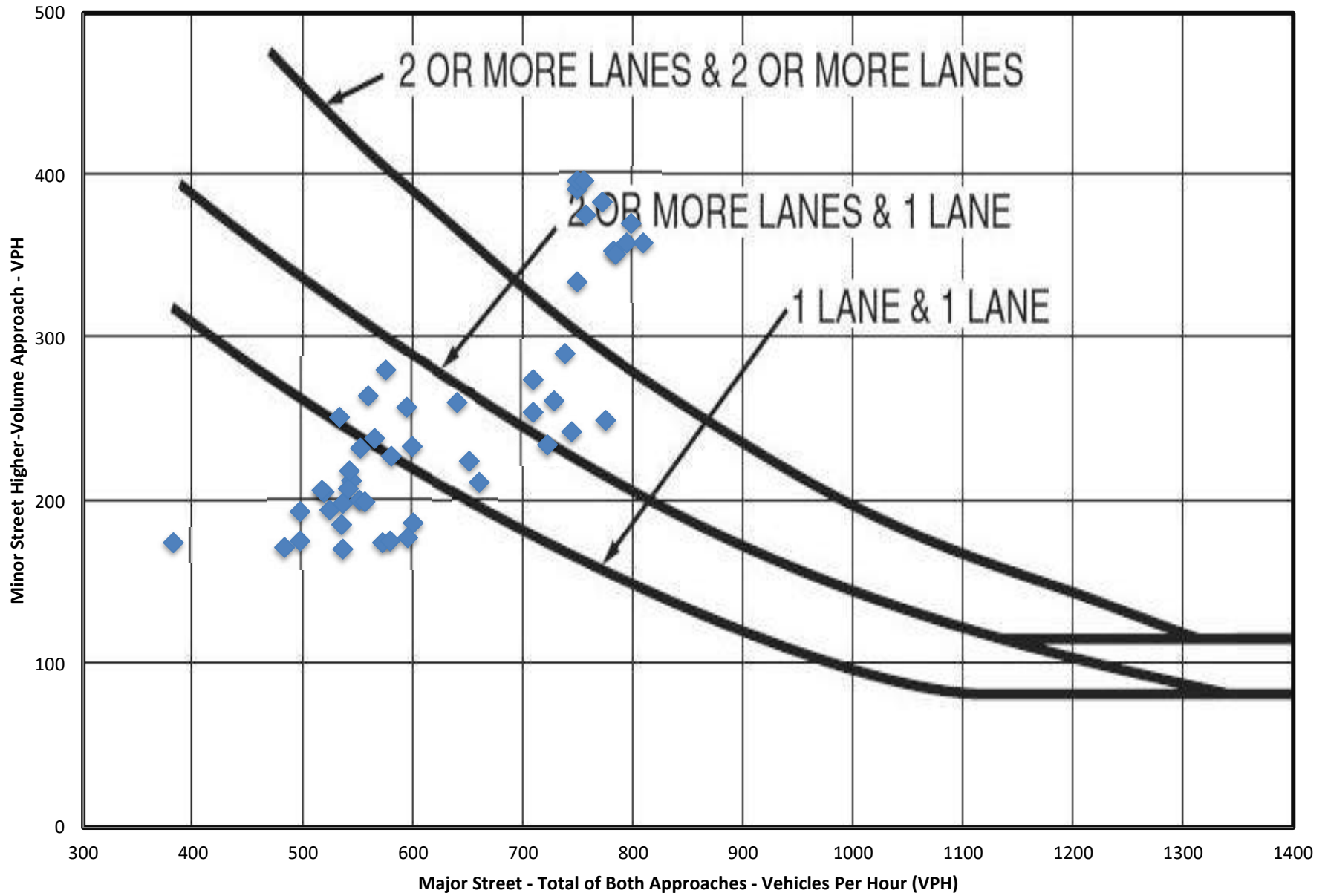
Total Number of Unique Hours Met On Figure 4C-1
<b>8</b>

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?
No

Hourly Vehicular Volume			
Hour Interval	Major Street Combined	Highest Minor Street Approach	Hour Met?
Beginning At	Vehicles Per Hour (VPH)	Vehicles Per Hour (VPH)	
12:00 AM	0	0	
12:15 AM	0	0	
12:30 AM	0	0	
12:45 AM	0	0	
1:00 AM	0	0	
1:15 AM	0	0	
1:30 AM	0	0	
1:45 AM	0	0	
2:00 AM	0	0	
2:15 AM	0	0	
2:30 AM	0	0	
2:45 AM	0	0	
3:00 AM	0	0	
3:15 AM	0	0	
3:30 AM	0	0	
3:45 AM	0	0	
4:00 AM	0	0	
4:15 AM	0	0	
4:30 AM	0	0	
4:45 AM	0	0	
5:00 AM	0	0	
5:15 AM	118	37	
5:30 AM	293	89	
5:45 AM	483	172	
6:00 AM	651	225	Met
6:15 AM	709	255	Met
6:30 AM	728	262	Met
6:45 AM	744	243	Met
7:00 AM	775	250	Met
7:15 AM	722	235	Met
7:30 AM	660	212	Met
7:45 AM	600	187	
8:00 AM	572	175	
8:15 AM	595	178	
8:30 AM	579	176	
8:45 AM	536	171	
9:00 AM	497	176	
9:15 AM	497	194	
9:30 AM	519	206	
9:45 AM	544	213	
10:00 AM	541	208	
10:15 AM	517	207	
10:30 AM	524	195	
10:45 AM	551	201	
11:00 AM	536	199	
11:15 AM	535	186	
11:30 AM	556	200	
11:45 AM	542	219	

Hourly Vehicular Volume			
Hour Interval	Major Street Combined	Highest Minor Street Approach	Hour Met?
Beginning At	Vehicles Per Hour (VPH)	Vehicles Per Hour (VPH)	
12:00 PM	580	228	Met
12:15 PM	599	234	Met
12:30 PM	565	239	Met
12:45 PM	552	233	
1:00 PM	533	252	Met
1:15 PM	559	265	Met
1:30 PM	594	258	Met
1:45 PM	640	261	Met
2:00 PM	709	275	Met
2:15 PM	738	291	Met
2:30 PM	749	335	Met
2:45 PM	782	354	Met
3:00 PM	784	352	Met
3:15 PM	794	359	Met
3:30 PM	809	359	Met
3:45 PM	798	371	Met
4:00 PM	772	384	Met
4:15 PM	749	392	Met
4:30 PM	749	397	Met
4:45 PM	755	397	Met
5:00 PM	757	376	Met
5:15 PM	575	281	Met
5:30 PM	382	175	
5:45 PM	180	78	
6:00 PM	0	0	
6:15 PM	0	0	
6:30 PM	0	0	
6:45 PM	0	0	
7:00 PM	0	0	
7:15 PM	0	0	
7:30 PM	0	0	
7:45 PM	0	0	
8:00 PM	0	0	
8:15 PM	0	0	
8:30 PM	0	0	
8:45 PM	0	0	
9:00 PM	0	0	
9:15 PM	0	0	
9:30 PM	0	0	
9:45 PM	0	0	
10:00 PM	0	0	
10:15 PM	0	0	
10:30 PM	0	0	
10:45 PM	0	0	
11:00 PM	0	0	

MUTCD Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



**MUTCD WARRANT 3, PEAK HOUR**

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No
---	----

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

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

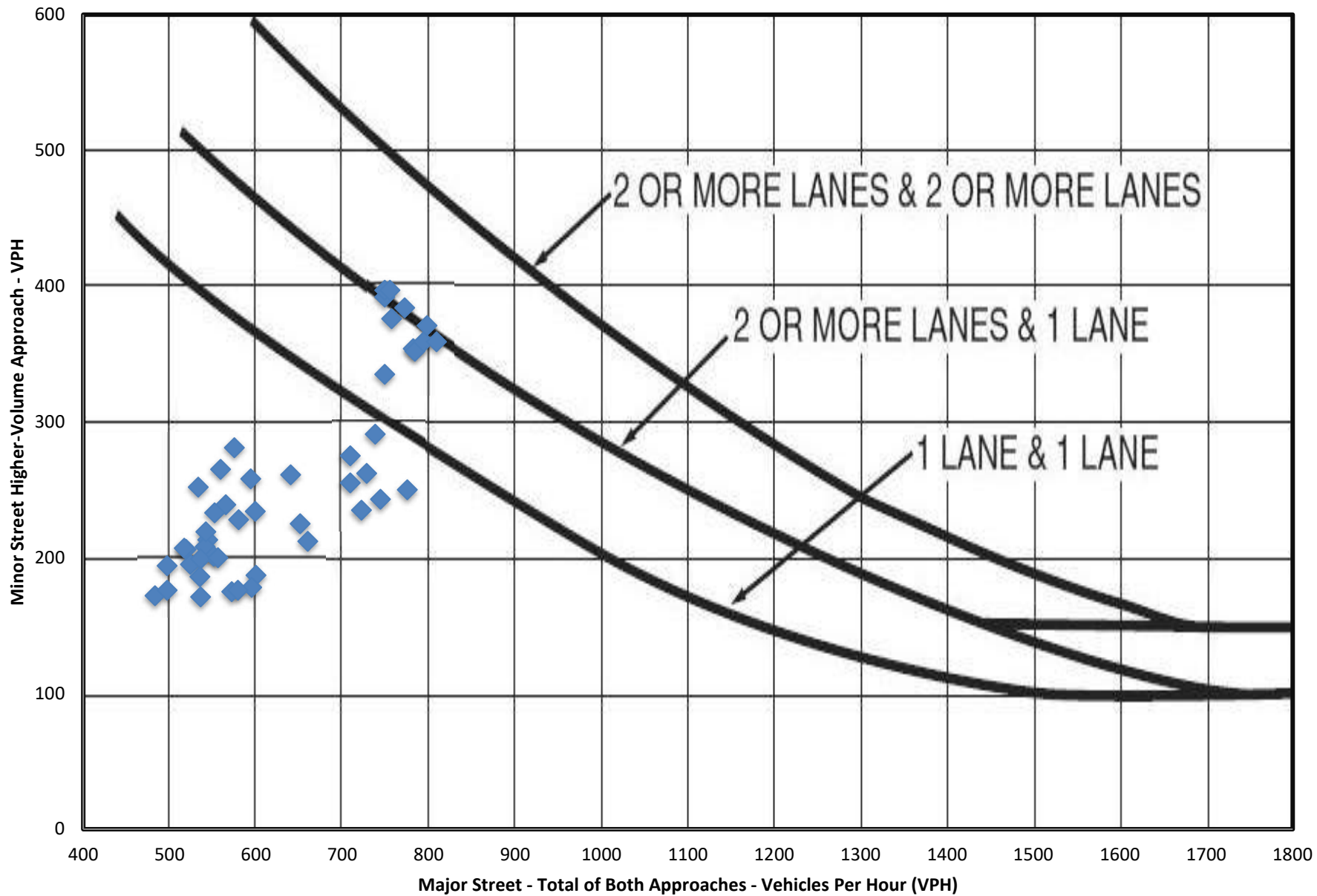
*\*If applicable, attach all supporting calculations and documentation.*

Total Number of Unique Hours Met On Figure 4C-3
<b>3</b>

Hourly Vehicular Volume			
Hour Interval	Major Street Combined	Highest Minor Street Approach	Hour Met?
Beginning At	Vehicles Per Hour (VPH)	Vehicles Per Hour (VPH)	
12:00 AM	0	0	
12:15 AM	0	0	
12:30 AM	0	0	
12:45 AM	0	0	
1:00 AM	0	0	
1:15 AM	0	0	
1:30 AM	0	0	
1:45 AM	0	0	
2:00 AM	0	0	
2:15 AM	0	0	
2:30 AM	0	0	
2:45 AM	0	0	
3:00 AM	0	0	
3:15 AM	0	0	
3:30 AM	0	0	
3:45 AM	0	0	
4:00 AM	0	0	
4:15 AM	0	0	
4:30 AM	0	0	
4:45 AM	0	0	
5:00 AM	0	0	
5:15 AM	118	37	
5:30 AM	293	89	
5:45 AM	483	172	
6:00 AM	651	225	
6:15 AM	709	255	
6:30 AM	728	262	
6:45 AM	744	243	
7:00 AM	775	250	
7:15 AM	722	235	
7:30 AM	660	212	
7:45 AM	600	187	
8:00 AM	572	175	
8:15 AM	595	178	

Hourly Vehicular Volume			
Hour Interval	Major Street Combined	Highest Minor Street Approach	Hour Met?
Beginning At	Vehicles Per Hour (VPH)	Vehicles Per Hour (VPH)	
8:30 AM	579	176	
8:45 AM	536	171	
9:00 AM	497	176	
9:15 AM	497	194	
9:30 AM	519	206	
9:45 AM	544	213	
10:00 AM	541	208	
10:15 AM	517	207	
10:30 AM	524	195	
10:45 AM	551	201	
11:00 AM	536	199	
11:15 AM	535	186	
11:30 AM	556	200	
11:45 AM	542	219	
12:00 PM	580	228	
12:15 PM	599	234	
12:30 PM	565	239	
12:45 PM	552	233	
1:00 PM	533	252	
1:15 PM	559	265	
1:30 PM	594	258	
1:45 PM	640	261	
2:00 PM	709	275	
2:15 PM	738	291	
2:30 PM	749	335	Met
2:45 PM	782	354	Met
3:00 PM	784	352	Met
3:15 PM	794	359	Met
3:30 PM	809	359	Met
3:45 PM	798	371	Met
4:00 PM	772	384	Met
4:15 PM	749	392	Met
4:30 PM	749	397	Met
4:45 PM	755	397	Met
5:00 PM	757	376	Met
5:15 PM	575	281	
5:30 PM	382	175	
5:45 PM	180	78	
6:00 PM	0	0	
6:15 PM	0	0	
6:30 PM	0	0	
6:45 PM	0	0	
7:00 PM	0	0	
7:15 PM	0	0	
7:30 PM	0	0	
7:45 PM	0	0	
8:00 PM	0	0	
8:15 PM	0	0	
8:30 PM	0	0	
8:45 PM	0	0	
9:00 PM	0	0	
9:15 PM	0	0	
9:30 PM	0	0	
9:45 PM	0	0	
10:00 PM	0	0	
10:15 PM	0	0	
10:30 PM	0	0	
10:45 PM	0	0	
11:00 PM	0	0	

MUTCD Figure 4C-3. Warrant 3, Peak Hour





# TRAFFIC SIGNAL WARRANT ANALYSIS ENGINEERING AND TRAFFIC STUDY



PLEASE TYPE OR PRINT ALL INFORMATION IN BLUE OR BLACK INK

## A - LOCATION INFORMATION

COUNTY York County	MUNICIPALITY(S) Dover Township
-----------------------	-----------------------------------

### MAJOR STREET INFORMATION

SR#/LOCAL HIGHWAY SR 4001	SEGMENT 0200	OFFSET 3146
------------------------------	-----------------	----------------

STREET NAME Bull Road
--------------------------

### MINOR STREET INFORMATION

SR#/LOCAL HIGHWAY -	SEGMENT 0100	OFFSET 3590
------------------------	-----------------	----------------

STREET NAME Hilton Ave
---------------------------

## B - REFERENCE INFORMATION

REFERENCE Chapter 212	SECTION(S) 212.302
--------------------------	-----------------------

REFERENCE MUTCD	SECTION(S) 4C.01 THROUGH 4C.09
--------------------	-----------------------------------

REFERENCE Vehicle Code Title 75 Pa. C.S.	SECTION(S) §3111
---	---------------------

## C - STUDY ELEMENTS

### FROM MUTCD AND PENNDOT PUBLICATION 212:

- |  |  |   |
|--|--|---|
| <input checked="" type="checkbox"/> WARRANT 1-Eight-Hour (Section 4C.02) | <input type="checkbox"/> WARRANT 4-Pedestrian Volume (Section 4C.05)         | <input type="checkbox"/> WARRANT 7-Crash Experience (Section 4C.08) |
| <input checked="" type="checkbox"/> WARRANT 2-Four-Hour (Section 4C.03)  | <input type="checkbox"/> WARRANT 5-School Crossing (Section 4C.06)           | <input type="checkbox"/> WARRANT 8-Roadway Network (Section 4C.09)  |
| <input checked="" type="checkbox"/> WARRANT 3-Peak-Hour (Section 4C.04)  | <input type="checkbox"/> WARRANT 6-Coordinated Signal System (Section 4C.07) | <input type="checkbox"/> WARRANT 9-ADT Volume (§212.302 (b)(3))     |

### FROM PENNDOT PUBLICATION 212 APPENDIX:

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Crash Analysis (1)               | <input type="checkbox"/> Pedestrian Volumes (12) | <input type="checkbox"/> Traffic Signals (19)            |
| <input checked="" type="checkbox"/> Capacity Analysis (6) | <input type="checkbox"/> Sight Distance (16)     | <input checked="" type="checkbox"/> Traffic Volumes (20) |
| <input type="checkbox"/> Geometric Review (8)             | <input type="checkbox"/> Speed Data (17)         | <input type="checkbox"/> Other _____                     |

## D - ATTACHMENTS LISTING

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

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> 1. Municipal Letter or Memo Requesting Study | <input type="checkbox"/> 7. Fieldview Drawing or Condition Diagram   | <input checked="" type="checkbox"/> 13. Capacity Analysis           |
| <input type="checkbox"/> 2. Completed Application (TE-952)            | <input type="checkbox"/> 8. Crash Extract                            | <input type="checkbox"/> 14. RMS/STAMPP Identification Data         |
| <input type="checkbox"/> 3. Financial Commitment Letter               | <input type="checkbox"/> 9. Crash Rate                               | <input checked="" type="checkbox"/> 15. Traffic/Pedestrian Volumes  |
| <input type="checkbox"/> 4. Location Map                              | <input type="checkbox"/> 10. Collision Diagram Plot                  | <input type="checkbox"/> 16. Traffic Signal Permit Plan             |
| <input type="checkbox"/> 5. Photographs                               | <input type="checkbox"/> 11. Speed Study and Speed Limit Information | <input type="checkbox"/> 17. Other <u>See attached TIS for info</u> |
| <input type="checkbox"/> 6. Straight Line Diagram                     | <input checked="" type="checkbox"/> 12. Warrant Analysis             |   |

### Confidential - Traffic Engineering and Safety Study

This document is the property of the Commonwealth of Pennsylvania, Department of Transportation. The data and information contained herein are part of a traffic engineering and safety study. This safety study is only provided to those official agencies or persons who have responsibility in the highway transportation system and may only be used by such agencies or persons for traffic safety related planning or research. The document and information are confidential pursuant to 75 Pa. C.S.3754 and 23 U.S.C. 409 and may not be published, reproduced, released or discussed without the written permission of the Pennsylvania Department of Transportation.

**E - SITE OBSERVATION CHECKLIST**

1. Study Information:

Study performed by: Ryan Lothian, P.E. Date Study was performed: 06/23/2023  
 Company Name: Langan Engineering & Environmental Services, Inc. Phone Number: (215) 491-6500

2. Were other alternatives considered as indicated in the Manual on Uniform Traffic Control

Devices (MUTCD) Section 4B.04 "Alternatives to Traffic Control Signals" and the Transportation Impact

Study (TIS) Guidelines? (Explain) .....  YES  No

A PennDOT Stage 1 ICE Form was completed for this intersection that discusses various intersection control strategies and alternatives.

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

If yes, please indicate last date intersection was studied or Signal Permit Date: \_\_\_\_\_

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

5. Traffic Signal Warrant Analysis is based on the York Industrial Development  
 (Project/Development) that is expected to be completed on 12/31/2024 (date).

6. Automated Traffic Recorder (ATR) Counts:

Type of Count Device: \_\_\_\_\_ Date: \_\_\_\_\_

Company Performing Count: \_\_\_\_\_

7. Manual Vehicular Turning Movement Counts:

Individual Performing Count: \_\_\_\_\_ Date: 05/18/2023

Company Performing Count: Tri-State Traffic Data Inc

Count Parameters: 6:00 AM - 6:00 PM

8. Pedestrian Counts (if applicable):

Individual Performing Count: \_\_\_\_\_ Date: \_\_\_\_\_

Company Performing Count: Same as above. Pedestrian counts were included.

9. Warrant 1 (MUTCD Section 4C.02)	<input checked="" type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input type="checkbox"/> Not Evaluated
10. Warrant 2 (MUTCD Section 4C.03)	<input checked="" type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input type="checkbox"/> Not Evaluated
11. Warrant 3 (MUTCD Section 4C.04)	<input checked="" type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input type="checkbox"/> Not Evaluated
12. Warrant 4 (MUTCD Section 4C.05)	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated
13. Warrant 5 (MUTCD Section 4C.06)	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated
14. Warrant 6 (MUTCD Section 4C.07)	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated
15. Warrant 7 (MUTCD Section 4C.08)	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated
16. Warrant 8 (MUTCD Section 4C.09)	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated
17. Warrant 9 (§212.302 (b)(3))	<input type="checkbox"/> Satisfied	<input type="checkbox"/> Unsatisfied	<input checked="" type="checkbox"/> Not Evaluated

This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. 3754 and 23 U.S.C. 409 and may not be disclosed or used in litigation without written permission from PennDOT.

**F - SITE DATA**

Please refer to the attached TIS for any additional site data information required.

**G - REMARKS**

Based on the signal warrant analysis, a traffic signal is warranted at the intersection of Bull Road (SR 4001) and Hilton Avenue based on the 2024 build condition traffic volumes. The intersection satisfies the criteria of MUTCD Warrant 1, Eight-Hour Vehicular Volume, Warrant 2, Four-Hour Vehicular Volume and Warrant 3, Peak Hour Volume. Based on this, it is recommended to allow the activation of a traffic signal at the intersection of Bull Road (SR 4001) and Hilton Avenue once it has been constructed. Please note that a separate formal Traffic Signal Report will be submitted in the future during the HOP submissions when the Traffic Signal Permit Plans are prepared.

**H - ENGINEERING JUDGMENT**

We believe that installing a traffic signal at the intersection of Bull Road (SR 4001) and Hilton Avenue will alleviate existing capacity and congestion issues that have been identified as needing improvements by PennDOT, the MPO and the municipalities.

**I - APPROVALS**

**Comments:**

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

This traffic engineering and safety study is confidential pursuant to 75 Pa. C.S. 3754 and 23 U.S.C. 409 and may not be disclosed or used in litigation without written permission from PennDOT.

**BULL ROAD LOGISTICS - TRAFFIC SIGNAL WARRANT CALCULATIONS  
BULL ROAD (SR 4001) AND HILTON AVENUE  
EASTBOUND MINOR STREET APPROACH VOLUME JUSTIFICATION**

TIME INTERVAL	2023 EXISTING	2024 NO-BUILD	OTHER DEVELOPMENTS	SITE GENERATED VOLUMES	2024 BUILD
	TRAFFIC VOLUMES	TRAFFIC VOLUMES	SITE GENERATED VOLUMES	SITE GENERATED VOLUMES	TRAFFIC VOLUMES
	MINOR STREET APPROACH	MINOR STREET APPROACH	MINOR STREET APPROACH	MINOR STREET APPROACH	MINOR STREET APPROACH
	<u>EASTBOUND</u>	<u>EASTBOUND</u>	<u>EASTBOUND</u>	<u>EASTBOUND</u>	<u>EASTBOUND</u>
6:00 AM to 6:15 AM	39	39	2	10	51
6:15 AM to 6:30 AM	46	46	1	9	56
6:30 AM to 6:45 AM	68	68	1	9	78
6:45 AM to 7:00 AM	58	58	1	9	68
7:00 AM to 7:15 AM	49	49	2	9	60
7:15 AM to 7:30 AM	57	57	1	9	67
7:30 AM to 7:45 AM	69	69	1	9	79
7:45 AM to 8:00 AM	65	65	0	8	73
8:00 AM to 8:15 AM	41	41	2	9	52
8:15 AM to 8:30 AM	34	34	2	9	45
8:30 AM to 8:45 AM	62	62	2	9	73
8:45 AM to 9:00 AM	51	51	0	8	59
9:00 AM to 9:15 AM	30	30	3	9	42
9:15 AM to 9:30 AM	31	31	2	9	42
9:30 AM to 9:45 AM	26	26	2	9	37
9:45 AM to 10:00 AM	36	36	1	9	46
10:00 AM to 10:15 AM	33	33	2	7	42
10:15 AM to 10:30 AM	21	21	2	6	29
10:30 AM to 10:45 AM	31	31	2	6	39
10:45 AM to 11:00 AM	33	33	1	6	40
11:00 AM to 11:15 AM	30	30	2	8	40
11:15 AM to 11:30 AM	29	29	2	7	38
11:30 AM to 11:45 AM	31	31	1	7	39
11:45 AM to 12:00 PM	25	25	1	7	33
12:00 PM to 12:15 PM	26	26	2	5	33
12:15 PM to 12:30 PM	37	37	2	5	44
12:30 PM to 12:45 PM	37	37	1	5	43
12:45 PM to 1:00 PM	44	44	0	4	48
1:00 PM to 1:15 PM	33	33	2	4	39
1:15 PM to 1:30 PM	30	30	2	4	36
1:30 PM to 1:45 PM	39	39	1	3	43
1:45 PM to 2:00 PM	34	34	0	3	37
2:00 PM to 2:15 PM	46	46	2	4	52
2:15 PM to 2:30 PM	32	32	2	4	38
2:30 PM to 2:45 PM	38	38	1	4	43
2:45 PM to 3:00 PM	43	43	0	4	47
3:00 PM to 3:15 PM	41	41	3	4	48
3:15 PM to 3:30 PM	36	36	2	3	41
3:30 PM to 3:45 PM	30	30	1	3	34
3:45 PM to 4:00 PM	39	39	1	3	43
4:00 PM to 4:15 PM	34	34	3	3	40
4:15 PM to 4:30 PM	48	48	2	3	53
4:30 PM to 4:45 PM	41	41	1	2	44
4:45 PM to 5:00 PM	46	46	1	2	49
5:00 PM to 5:15 PM	55	55	3	3	61
5:15 PM to 5:30 PM	47	47	2	3	52
5:30 PM to 5:45 PM	42	42	1	2	45
5:45 PM to 6:00 PM	49	49	1	2	52

**BULL ROAD LOGISTICS - TRAFFIC SIGNAL WARRANT CALCULATIONS  
 BULL ROAD (SR 4001) AND HILTON AVENUE  
 WESTBOUND MINOR STREET APPROACH VOLUME JUSTIFICATION**

TIME INTERVAL	2023 EXISTING	2024 NO-BUILD	OTHER DEVELOPMENTS	SITE GENERATED VOLUMES	2024 BUILD
	TRAFFIC VOLUMES	TRAFFIC VOLUMES	SITE GENERATED VOLUMES	SITE GENERATED VOLUMES	TRAFFIC VOLUMES
	MINOR STREET APPROACH	MINOR STREET APPROACH	MINOR STREET APPROACH	MINOR STREET APPROACH	MINOR STREET APPROACH
	<u>WESTBOUND</u>	<u>WESTBOUND</u>	<u>WESTBOUND</u>	<u>WESTBOUND</u>	<u>WESTBOUND</u>
6:00 AM to 6:15 AM	1	1	0	0	1
6:15 AM to 6:30 AM	0	0	0	0	0
6:30 AM to 6:45 AM	0	0	0	0	0
6:45 AM to 7:00 AM	0	0	0	0	0
7:00 AM to 7:15 AM	0	0	0	0	0
7:15 AM to 7:30 AM	0	0	0	0	0
7:30 AM to 7:45 AM	0	0	0	0	0
7:45 AM to 8:00 AM	0	0	0	0	0
8:00 AM to 8:15 AM	0	0	0	0	0
8:15 AM to 8:30 AM	0	0	0	0	0
8:30 AM to 8:45 AM	0	0	0	0	0
8:45 AM to 9:00 AM	0	0	0	0	0
9:00 AM to 9:15 AM	0	0	0	0	0
9:15 AM to 9:30 AM	0	0	0	0	0
9:30 AM to 9:45 AM	0	0	0	0	0
9:45 AM to 10:00 AM	1	1	0	0	1
10:00 AM to 10:15 AM	0	0	0	0	0
10:15 AM to 10:30 AM	1	1	0	0	1
10:30 AM to 10:45 AM	0	0	0	0	0
10:45 AM to 11:00 AM	0	0	0	0	0
11:00 AM to 11:15 AM	0	0	0	0	0
11:15 AM to 11:30 AM	0	0	0	0	0
11:30 AM to 11:45 AM	0	0	0	0	0
11:45 AM to 12:00 PM	0	0	0	0	0
12:00 PM to 12:15 PM	0	0	0	0	0
12:15 PM to 12:30 PM	1	1	0	0	1
12:30 PM to 12:45 PM	1	1	0	0	1
12:45 PM to 1:00 PM	0	0	0	0	0
1:00 PM to 1:15 PM	0	0	0	0	0
1:15 PM to 1:30 PM	1	1	0	0	1
1:30 PM to 1:45 PM	0	0	0	0	0
1:45 PM to 2:00 PM	0	0	0	0	0
2:00 PM to 2:15 PM	0	0	0	0	0
2:15 PM to 2:30 PM	0	0	0	0	0
2:30 PM to 2:45 PM	1	1	0	0	1
2:45 PM to 3:00 PM	0	0	0	0	0
3:00 PM to 3:15 PM	0	0	0	0	0
3:15 PM to 3:30 PM	0	0	0	0	0
3:30 PM to 3:45 PM	0	0	0	0	0
3:45 PM to 4:00 PM	1	1	0	0	1
4:00 PM to 4:15 PM	0	0	0	0	0
4:15 PM to 4:30 PM	2	2	0	0	2
4:30 PM to 4:45 PM	0	0	0	0	0
4:45 PM to 5:00 PM	0	0	0	0	0
5:00 PM to 5:15 PM	0	0	0	0	0
5:15 PM to 5:30 PM	0	0	0	0	0
5:30 PM to 5:45 PM	0	0	0	0	0
5:45 PM to 6:00 PM	1	1	0	0	1

**BULL ROAD LOGISTICS - TRAFFIC SIGNAL WARRANT CALCULATIONS**  
**BULL ROAD (SR 4001) AND HILTON AVENUE**  
**NORTHBOUND MAJOR STREET APPROACH VOLUME JUSTIFICATION**

TIME INTERVAL	2023 EXISTING	2024 NO-BUILD	OTHER DEVELOPMENTS	SITE GENERATED VOLUMES	2024 BUILD
	TRAFFIC VOLUMES	TRAFFIC VOLUMES	SITE GENERATED VOLUMES	SITE GENERATED VOLUMES	TRAFFIC VOLUMES
	MAJOR STREET APPROACH	MAJOR STREET APPROACH	MAJOR STREET APPROACH	MAJOR STREET APPROACH	MAJOR STREET APPROACH
	<u>NORTHBOUND</u>	<u>NORTHBOUND</u>	<u>NORTHBOUND</u>	<u>NORTHBOUND</u>	<u>NORTHBOUND</u>
6:00 AM to 6:15 AM	24	24	5	19	48
6:15 AM to 6:30 AM	48	48	4	18	70
6:30 AM to 6:45 AM	54	54	3	18	75
6:45 AM to 7:00 AM	47	47	3	18	68
7:00 AM to 7:15 AM	54	54	4	18	76
7:15 AM to 7:30 AM	60	60	3	17	80
7:30 AM to 7:45 AM	51	51	3	17	71
7:45 AM to 8:00 AM	51	51	3	17	71
8:00 AM to 8:15 AM	43	43	5	18	66
8:15 AM to 8:30 AM	47	47	4	17	68
8:30 AM to 8:45 AM	39	39	3	17	59
8:45 AM to 9:00 AM	55	55	3	17	75
9:00 AM to 9:15 AM	42	42	6	18	66
9:15 AM to 9:30 AM	51	51	6	18	75
9:30 AM to 9:45 AM	41	41	4	18	63
9:45 AM to 10:00 AM	70	70	4	17	91
10:00 AM to 10:15 AM	64	64	5	13	82
10:15 AM to 10:30 AM	56	56	5	12	73
10:30 AM to 10:45 AM	54	54	4	12	70
10:45 AM to 11:00 AM	63	63	4	12	79
11:00 AM to 11:15 AM	65	65	4	15	84
11:15 AM to 11:30 AM	53	53	3	15	71
11:30 AM to 11:45 AM	65	65	3	14	82
11:45 AM to 12:00 PM	65	65	2	14	81
12:00 PM to 12:15 PM	71	71	4	16	91
12:15 PM to 12:30 PM	74	74	4	15	93
12:30 PM to 12:45 PM	72	72	4	15	91
12:45 PM to 1:00 PM	59	59	3	15	77
1:00 PM to 1:15 PM	58	58	4	11	73
1:15 PM to 1:30 PM	76	76	4	11	91
1:30 PM to 1:45 PM	78	78	4	11	93
1:45 PM to 2:00 PM	88	88	3	10	101
2:00 PM to 2:15 PM	73	73	4	13	90
2:15 PM to 2:30 PM	75	75	4	13	92
2:30 PM to 2:45 PM	94	94	4	13	111
2:45 PM to 3:00 PM	108	109	4	12	125
3:00 PM to 3:15 PM	92	92	6	11	109
3:15 PM to 3:30 PM	111	112	5	10	127
3:30 PM to 3:45 PM	119	120	5	10	135
3:45 PM to 4:00 PM	105	105	4	10	119
4:00 PM to 4:15 PM	125	126	5	8	139
4:15 PM to 4:30 PM	130	131	5	8	144
4:30 PM to 4:45 PM	112	113	5	8	126
4:45 PM to 5:00 PM	108	109	4	8	121
5:00 PM to 5:15 PM	122	123	5	8	136
5:15 PM to 5:30 PM	136	137	5	8	150
5:30 PM to 5:45 PM	110	111	5	8	124
5:45 PM to 6:00 PM	84	84	4	8	96

**BULL ROAD LOGISTICS - TRAFFIC SIGNAL WARRANT CALCULATIONS  
BULL ROAD (SR 4001) AND HILTON AVENUE  
SOUTHBOUND MAJOR STREET APPROACH VOLUME JUSTIFICATION**

TIME INTERVAL	2023 EXISTING	2024 NO-BUILD	OTHER DEVELOPMENTS	SITE GENERATED VOLUMES	2024 BUILD
	TRAFFIC VOLUMES	TRAFFIC VOLUMES	SITE GENERATED VOLUMES	SITE GENERATED VOLUMES	TRAFFIC VOLUMES
	MAJOR STREET APPROACH	MAJOR STREET APPROACH	MAJOR STREET APPROACH	MAJOR STREET APPROACH	MAJOR STREET APPROACH
	<u>SOUTHBOUND</u>	<u>SOUTHBOUND</u>	<u>SOUTHBOUND</u>	<u>SOUTHBOUND</u>	<u>SOUTHBOUND</u>
6:00 AM to 6:15 AM	53	53	3	6	62
6:15 AM to 6:30 AM	74	74	3	6	83
6:30 AM to 6:45 AM	79	79	2	4	85
6:45 AM to 7:00 AM	74	74	1	4	79
7:00 AM to 7:15 AM	90	90	6	9	105
7:15 AM to 7:30 AM	107	108	5	8	121
7:30 AM to 7:45 AM	92	92	4	8	104
7:45 AM to 8:00 AM	92	92	4	7	103
8:00 AM to 8:15 AM	72	72	6	9	87
8:15 AM to 8:30 AM	60	60	5	8	73
8:30 AM to 8:45 AM	74	74	4	8	86
8:45 AM to 9:00 AM	77	77	4	7	88
9:00 AM to 9:15 AM	70	70	3	11	84
9:15 AM to 9:30 AM	54	54	3	10	67
9:30 AM to 9:45 AM	71	71	3	10	84
9:45 AM to 10:00 AM	55	55	1	9	65
10:00 AM to 10:15 AM	55	55	2	11	68
10:15 AM to 10:30 AM	58	58	2	11	71
10:30 AM to 10:45 AM	55	55	1	10	66
10:45 AM to 11:00 AM	54	54	1	10	65
11:00 AM to 11:15 AM	60	60	3	14	77
11:15 AM to 11:30 AM	63	63	3	13	79
11:30 AM to 11:45 AM	67	67	2	13	82
11:45 AM to 12:00 PM	52	52	1	12	65
12:00 PM to 12:15 PM	62	62	6	21	89
12:15 PM to 12:30 PM	69	69	3	21	93
12:30 PM to 12:45 PM	53	53	3	20	76
12:45 PM to 1:00 PM	69	69	3	19	91
1:00 PM to 1:15 PM	58	58	5	15	78
1:15 PM to 1:30 PM	68	68	3	15	86
1:30 PM to 1:45 PM	66	66	3	15	84
1:45 PM to 2:00 PM	59	59	3	14	76
2:00 PM to 2:15 PM	64	64	7	17	88
2:15 PM to 2:30 PM	56	56	4	16	76
2:30 PM to 2:45 PM	68	68	4	16	88
2:45 PM to 3:00 PM	96	96	3	16	115
3:00 PM to 3:15 PM	91	91	5	31	127
3:15 PM to 3:30 PM	86	86	5	30	121
3:30 PM to 3:45 PM	89	89	3	30	122
3:45 PM to 4:00 PM	87	87	3	29	119
4:00 PM to 4:15 PM	108	109	6	27	142
4:15 PM to 4:30 PM	102	102	3	25	130
4:30 PM to 4:45 PM	92	92	3	25	120
4:45 PM to 5:00 PM	89	89	3	25	117
5:00 PM to 5:15 PM	97	97	6	27	130
5:15 PM to 5:30 PM	93	93	3	25	121
5:30 PM to 5:45 PM	82	82	3	25	110
5:45 PM to 6:00 PM	96	96	3	25	124

NO-BUILD												
EASTBOUND			WESTBOUND			NORTHBOUND			SOUTHBOUND			
L	T	R	L	T	R	L	T	R	L	T	R	
6:00	4						13			0	0	
6:15	1	0	0	0	0	0	4	0	0	0	0	
6:30	1	0	0	0	0	0	3	0	0	0	0	
6:45	1	0	0	0	0	0	3	0	0	0	0	
7:00	3						9			0	0	
7:15	1	0	0	0	0	0	3	0	0	0	0	
7:30	1	0	0	0	0	0	2	0	0	0	0	
7:45	0	0	0	0	0	0	2	0	0	0	0	
8:00	3						9			0	0	
8:15	1	0	0	0	0	0	3	0	0	0	0	
8:30	1	0	0	0	0	0	2	0	0	0	0	
8:45	0	0	0	0	0	0	2	0	0	0	0	
9:00	6						14			0	0	
9:15	2	0	0	0	0	0	4	0	0	0	0	
9:30	1	0	0	0	0	0	4	0	0	0	0	
9:45	1	0	0	0	0	0	3	0	0	0	0	
10:00	4						12			0	0	
10:15	1	0	0	0	0	0	3	0	0	0	0	
10:30	1	0	0	0	0	0	3	0	0	0	0	
10:45	1	0	0	0	0	0	3	0	0	0	0	
11:00	2						6			0	0	
11:15	1	0	0	0	0	0	2	0	0	0	0	
11:30	1	0	0	0	0	0	1	0	0	0	0	
11:45	0	0	0	0	0	0	1	0	0	0	0	
12:00	2						7			1	1	
12:15	1	0	0	0	0	0	2	0	0	1	1	
12:30	0	0	0	0	0	0	2	0	0	0	0	
12:45	0	0	0	0	0	0	1	0	0	0	0	
1:00	2						8			1	1	
1:15	1	0	0	0	0	0	2	0	0	1	1	
1:30	0	0	0	0	0	0	2	0	0	0	0	
1:45	0	0	0	0	0	0	2	0	0	0	0	
2:00	2						8			1	1	
2:15	1	0	0	0	0	0	2	0	0	1	1	
2:30	0	0	0	0	0	0	2	0	0	0	0	
2:45	0	0	0	0	0	0	2	0	0	0	0	
3:00	2						7			2	2	
3:15	1	0	0	0	0	0	2	0	0	1	1	
3:30	0	0	0	0	0	0	2	0	0	1	1	
3:45	0	0	0	0	0	0	1	0	0	0	0	
4:00	1						4			1	1	
4:15	0	0	0	0	0	0	1	0	0	0	0	
4:30	0	0	0	0	0	0	1	0	0	0	0	
4:45	0	0	0	0	0	0	1	0	0	0	0	
5:00	1						4			1	1	
5:15	0	0	0	0	0	0	1	0	0	0	0	
5:30	0	0	0	0	0	0	1	0	0	0	0	
5:45	0	0	0	0	0	0	1	0	0	0	0	

Land Use Code	154		
Land Use	Residential and Short-Term Storage		
Setting	General Urban/Suburban		
Time Period	Weekday		
# Data Sites	3		
Time	% of 24-Hour Vehicle Trips		
	Total Entering Exiting		
12:00 - 1:00 AM	1.5%	1.0%	2.0%
12:15 - 1:15 AM	1.2%	0.8%	1.6%
12:30 - 1:30 AM	1.1%	0.8%	1.3%
12:45 - 1:45 AM	1.1%	0.6%	1.7%
1:00 - 2:00 AM	1.4%	0.9%	2.0%
1:15 - 2:15 AM	1.3%	0.8%	1.7%
1:30 - 2:30 AM	1.4%	0.9%	1.8%
1:45 - 2:45 AM	1.3%	1.0%	1.6%
2:00 - 3:00 AM	1.0%	0.8%	1.2%
2:15 - 3:15 AM	0.9%	0.9%	0.9%
2:30 - 3:30 AM	0.7%	0.7%	0.8%
2:45 - 3:45 AM	0.6%	0.7%	0.4%
3:00 - 4:00 AM	0.4%	0.4%	0.3%
3:15 - 4:15 AM	0.3%	0.3%	0.4%
3:30 - 4:30 AM	0.4%	0.5%	0.3%
3:45 - 4:45 AM	1.4%	0.5%	2.3%
4:00 - 5:00 AM	2.3%	1.3%	3.2%
4:15 - 5:15 AM	2.6%	1.7%	3.6%
4:30 - 5:30 AM	2.9%	1.8%	4.1%
4:45 - 5:45 AM	3.7%	2.6%	4.7%
5:00 - 6:00 AM	4.1%	3.1%	5.1%
5:15 - 6:15 AM	5.3%	5.3%	5.2%
5:30 - 6:30 AM	7.2%	9.0%	5.3%
5:45 - 6:45 AM	6.3%	9.4%	3.1%
<b>6:00 - 7:00 AM</b>	<b>6.2%</b>	<b>10.2%</b>	<b>2.1%</b>
6:15 - 7:15 AM	5.6%	9.0%	2.2%
6:30 - 7:30 AM	4.2%	6.5%	1.9%
6:45 - 7:45 AM	4.3%	6.7%	1.9%
<b>7:00 - 8:00 AM</b>	<b>4.8%</b>	<b>7.3%</b>	<b>2.3%</b>
7:15 - 8:15 AM	4.8%	7.4%	2.2%
7:30 - 8:30 AM	4.7%	6.8%	2.5%
7:45 - 8:45 AM	4.5%	6.2%	2.8%
8:00 - 9:00 AM	3.9%	5.1%	2.8%
8:15 - 9:15 AM	4.4%	6.3%	2.5%
8:30 - 9:30 AM	5.8%	8.9%	2.7%
8:45 - 9:45 AM	7.3%	11.9%	2.6%
<b>9:00 - 10:00 AM</b>	<b>7.2%</b>	<b>11.8%</b>	<b>2.6%</b>
9:15 - 10:15 AM	7.2%	11.4%	3.0%
9:30 - 10:30 AM	6.7%	10.4%	2.9%
9:45 - 10:45 AM	6.6%	10.0%	3.1%
<b>10:00 - 11:00 AM</b>	<b>6.2%</b>	<b>9.5%</b>	<b>2.9%</b>
10:15 - 11:15 AM	5.7%	8.3%	3.0%
10:30 - 11:30 AM	4.7%	6.3%	3.1%
10:45 - 11:45 AM	3.5%	3.9%	3.2%
<b>11:00 - 12:00 PM</b>	<b>3.7%</b>	<b>3.5%</b>	<b>3.7%</b>
11:15 - 12:15 PM	4.5%	4.3%	4.6%
11:30 - 12:30 PM	4.9%	4.6%	5.3%
11:45 - 12:45 PM	5.0%	4.5%	5.5%
<b>12:00 - 1:00 PM</b>	<b>6.6%</b>	<b>5.1%</b>	<b>6.9%</b>
12:15 - 1:15 PM	6.0%	5.0%	6.9%
12:30 - 1:30 PM	5.9%	5.5%	6.3%
12:45 - 1:45 PM	6.3%	5.9%	6.7%
<b>1:00 - 2:00 PM</b>	<b>5.9%</b>	<b>5.9%</b>	<b>5.9%</b>
1:15 - 2:15 PM	5.7%	6.2%	5.1%
1:30 - 2:30 PM	5.9%	6.0%	5.8%
1:45 - 2:45 PM	5.6%	5.8%	5.3%
<b>2:00 - 3:00 PM</b>	<b>5.2%</b>	<b>6.0%</b>	<b>4.9%</b>
2:15 - 3:15 PM	7.1%	5.7%	6.6%
2:30 - 3:30 PM	7.1%	6.0%	6.2%
2:45 - 3:45 PM	7.6%	5.8%	9.5%
<b>3:00 - 4:00 PM</b>	<b>7.6%</b>	<b>5.3%</b>	<b>10.0%</b>
3:15 - 4:15 PM	5.5%	5.0%	6.1%
3:30 - 4:30 PM	5.2%	3.9%	6.5%
3:45 - 4:45 PM	4.7%	3.4%	6.1%
<b>4:00 - 5:00 PM</b>	<b>4.7%</b>	<b>3.1%</b>	<b>6.3%</b>
4:15 - 5:15 PM	5.1%	2.9%	7.4%
4:30 - 5:30 PM	5.6%	2.8%	8.4%
4:45 - 5:45 PM	5.6%	3.0%	8.2%
<b>5:00 - 6:00 PM</b>	<b>5.0%</b>	<b>2.2%</b>	<b>7.8%</b>
5:15 - 6:15 PM	4.6%	2.1%	7.1%
5:30 - 6:30 PM	4.2%	2.2%	6.1%
5:45 - 6:45 PM	4.7%	2.0%	7.4%
6:00 - 7:00 PM	5.7%	2.7%	8.8%
6:15 - 7:15 PM	6.2%	2.6%	9.9%
6:30 - 7:30 PM	6.3%	3.1%	9.6%
6:45 - 7:45 PM	6.7%	4.7%	8.6%
7:00 - 8:00 PM	7.6%	5.8%	9.4%
7:15 - 8:15 PM	6.7%	5.8%	7.6%
7:30 - 8:30 PM	7.1%	5.7%	8.4%
7:45 - 8:45 PM	6.7%	5.4%	8.1%
8:00 - 9:00 PM	5.6%	5.4%	5.8%
8:15 - 9:15 PM	5.0%	4.8%	5.3%
8:30 - 9:30 PM	3.6%	3.9%	3.4%
8:45 - 9:45 PM	2.2%	2.3%	2.1%
9:00 - 10:00 PM	1.1%	0.6%	1.5%
9:15 - 10:15 PM	1.1%	0.9%	1.3%
9:30 - 10:30 PM	1.2%	1.1%	1.4%
9:45 - 10:45 PM	1.3%	1.2%	1.3%
10:00 - 11:00 PM	1.3%	1.2%	1.4%
10:15 - 11:15 PM	1.1%	1.0%	1.1%
10:30 - 11:30 PM	1.1%	1.1%	1.1%
10:45 - 11:45 PM	1.3%	1.2%	1.3%
11:00 - 12:00 AM	1.6%	1.3%	1.9%
11:15 - 12:15 AM	2.0%	1.4%	2.6%
11:30 - 12:30 AM	2.1%	1.3%	2.8%
11:45 - 12:45 AM	1.8%	1.1%	2.5%

Manchester		
Entering	From ITE	
6:00	10.2%	100.00%
<b>7:00</b>	<b>7.3%</b>	<b>100.00%</b>
8:00	5.1%	100.00%
9:00	11.8%	160.83%
10:00	9.5%	129.49%
11:00	3.8%	51.61%
12:00	5.1%	163.04%
1:00	5.9%	191.30%
2:00	6.0%	193.48%
3:00	5.3%	171.74%
<b>4:00</b>	<b>3.3%</b>	<b>100.00%</b>
5:00	2.2%	100.00%

Manchester		
Exiting	From ITE	
6:00	2.1%	91.04%
<b>7:00</b>	<b>2.3%</b>	<b>100.00%</b>
8:00	2.8%	100.00%
9:00	2.8%	113.43%
10:00	2.9%	125.37%
11:00	3.7%	162.69%
12:00	6.9%	109.19%
1:00	5.9%	94.05%
2:00	4.3%	68.65%
3:00	10.0%	158.38%
<b>4:00</b>	<b>6.3%</b>	<b>100.00%</b>
5:00	7.8%	100.00%

Other Dev Site Gen	Assumed Peak Hours						
	AM		PM				
	7-8AM	8-9 AM	4-5 PM	5-6 PM			
Bull Road (SR 400)							
Hilton Avenue							
EB	L	2	6	3	1	0	0
	T						
WB	L						
	T						
NB	L						
	T	4	15	9	4	0	0
SB	L						
	T	13	9	0	1	0	0
	R	6	4	0	1	0	0

enter  
exit



OTHER DEVELOPMENTS

	NO-BUILD												
	EASTBOUND			WESTBOUND			NORTHBOUND			SOUTHBOUND			
	L	T	R	L	T	R	L	T	R	L	T	R	
6:00	1	0	0	0	0	0	0	2	1	0	0	2	1
6:15	0	0	0	0	0	0	0	1	0	0	0	2	1
6:30	0	0	0	0	0	0	0	0	0	0	0	2	1
6:45	0	0	0	0	0	0	0	0	0	0	0	1	0
7:00	2	1	0	0	0	0	0	4	1	0	0	4	2
7:15	0	0	0	0	0	0	0	1	0	0	3	2	
7:30	0	0	0	0	0	0	0	1	0	0	3	1	
7:45	0	0	0	0	0	0	0	1	0	0	3	1	
8:00	2	1	0	0	0	0	0	4	1	0	0	4	2
8:15	1	0	0	0	0	0	0	2	0	0	3	2	
8:30	1	0	0	0	0	0	0	1	0	0	3	1	
8:45	0	0	0	0	0	0	0	1	0	0	3	1	
9:00	1	0	0	0	0	0	0	2	0	0	2	1	
9:15	1	0	0	0	0	0	0	2	0	0	2	1	
9:30	1	0	0	0	0	0	0	1	0	0	2	1	
9:45	0	0	0	0	0	0	0	1	0	0	1	0	
10:00	1	0	0	0	0	0	0	2	0	0	1	1	
10:15	1	0	0	0	0	0	0	2	0	0	1	1	
10:30	1	0	0	0	0	0	0	1	0	0	1	0	
10:45	0	0	0	0	0	0	0	1	0	0	1	0	
11:00	1	0	0	0	0	0	0	2	0	0	2	1	
11:15	1	0	0	0	0	0	0	2	0	0	2	1	
11:30	1	0	0	0	0	0	0	2	0	0	1	1	
11:45	1	0	0	0	0	0	0	1	0	0	1	0	
12:00	1	0	0	0	0	0	0	2	0	0	3	1	
12:15	1	0	0	0	0	0	0	2	0	0	2	1	
12:30	1	0	0	0	0	0	0	2	0	0	2	1	
12:45	0	0	0	0	0	0	0	2	0	0	2	1	
1:00	1	0	0	0	0	0	0	7	0	0	8	4	
1:15	1	0	0	0	0	0	0	2	0	0	2	1	
1:30	1	0	0	0	0	0	0	2	0	0	2	1	
1:45	0	0	0	0	0	0	0	1	0	0	2	1	
2:00	1	0	0	0	0	0	0	8	0	0	11	5	
2:15	1	0	0	0	0	0	0	2	0	0	3	2	
2:30	1	0	0	0	0	0	0	2	0	0	3	1	
2:45	1	0	0	0	0	0	0	2	0	0	2	1	
3:00	5	2	0	0	0	0	0	13	4	0	8	4	
3:15	1	0	0	0	0	0	0	4	0	0	2	1	
3:30	1	0	0	0	0	0	0	3	0	0	2	1	
3:45	1	0	0	0	0	0	0	3	0	0	2	1	
4:00	2	0	0	0	0	0	0	4	0	0	3	1	
4:15	2	0	0	0	0	0	0	4	0	0	2	1	
4:30	1	0	0	0	0	0	0	4	0	0	2	1	
4:45	1	0	0	0	0	0	0	3	0	0	2	1	
5:00	6	2	0	0	0	0	0	15	5	0	9	4	
5:15	2	0	0	0	0	0	0	4	0	0	2	1	
5:30	1	0	0	0	0	0	0	4	0	0	2	1	
5:45	1	0	0	0	0	0	0	3	0	0	2	1	

Land Use Code	215		
Land Use	Single-Family Attached Housing		
Setting	General Urban/Suburban		
Time Period	Weekday		
# Data Sites	7		
% of 24-Hour Vehicle Trips			
Time	Total	Entering	Exiting
12:00 - 1:00 AM	0.5%	0.7%	0.3%
12:15 - 1:15 AM	0.5%	0.7%	0.3%
12:30 - 1:30 AM	0.4%	0.6%	0.2%
12:45 - 1:45 AM	0.4%	0.5%	0.2%
1:00 - 2:00 AM	0.2%	0.4%	0.1%
1:15 - 2:15 AM	0.2%	0.2%	0.1%
1:30 - 2:30 AM	0.2%	0.1%	0.2%
1:45 - 2:45 AM	0.2%	0.2%	0.3%
2:00 - 3:00 AM	0.3%	0.2%	0.3%
2:15 - 3:15 AM	0.4%	0.3%	0.5%
2:30 - 3:30 AM	0.4%	0.4%	0.5%
2:45 - 3:45 AM	0.3%	0.3%	0.4%
3:00 - 4:00 AM	0.3%	0.3%	0.4%
3:15 - 4:15 AM	0.3%	0.2%	0.4%
3:30 - 4:30 AM	0.4%	0.3%	0.5%
3:45 - 4:45 AM	0.6%	0.3%	0.8%
4:00 - 5:00 AM	0.7%	0.4%	1.0%
4:15 - 5:15 AM	0.8%	0.4%	1.2%
4:30 - 5:30 AM	0.9%	0.2%	1.6%
4:45 - 5:45 AM	1.0%	0.2%	1.9%
5:00 - 6:00 AM	1.4%	1.1%	2.6%
5:15 - 6:15 AM	1.8%	0.4%	3.3%
5:30 - 6:30 AM	2.3%	0.5%	4.0%
5:45 - 6:45 AM	2.8%	0.8%	4.9%
6:00 - 7:00 AM	3.2%	1.1%	5.3%
6:15 - 7:15 AM	4.3%	1.3%	7.2%
6:30 - 7:30 AM	5.3%	1.8%	8.8%
6:45 - 7:45 AM	6.8%	2.2%	11.4%
7:00 - 8:00 AM	7.9%	2.7%	13.2%
7:15 - 8:15 AM	8.2%	3.0%	13.4%
7:30 - 8:30 AM	7.8%	2.9%	12.8%
7:45 - 8:45 AM	7.1%	3.1%	11.0%
8:00 - 9:00 AM	6.6%	3.8%	9.3%
8:15 - 9:15 AM	6.9%	3.7%	8.9%
8:30 - 9:30 AM	6.1%	4.2%	8.1%
8:45 - 9:45 AM	5.8%	4.3%	7.3%
9:00 - 10:00 AM	5.3%	3.7%	6.9%
9:15 - 10:15 AM	4.8%	3.8%	5.7%
9:30 - 10:30 AM	4.4%	3.6%	5.1%
9:45 - 10:45 AM	4.0%	3.4%	4.6%
10:00 - 11:00 AM	4.1%	4.0%	4.3%
10:15 - 11:15 AM	4.5%	4.2%	4.7%
10:30 - 11:30 AM	4.8%	4.4%	5.2%
10:45 - 11:45 AM	5.3%	4.7%	5.9%
11:00 - 12:00 PM	5.3%	4.8%	5.7%
11:15 - 12:15 PM	5.2%	4.8%	5.6%
11:30 - 12:30 PM	5.1%	5.3%	5.0%
11:45 - 12:45 PM	5.0%	5.2%	4.6%
12:00 - 1:00 PM	5.2%	5.4%	5.3%
12:15 - 1:15 PM	5.2%	5.1%	5.2%
12:30 - 1:30 PM	5.2%	5.0%	5.5%
12:45 - 1:45 PM	5.1%	5.1%	5.2%
1:00 - 2:00 PM	4.7%	4.5%	4.8%
1:15 - 2:15 PM	5.2%	5.4%	5.0%
1:30 - 2:30 PM	5.2%	5.3%	5.2%
1:45 - 2:45 PM	5.6%	5.4%	5.8%
2:00 - 3:00 PM	5.8%	5.5%	6.0%
2:15 - 3:15 PM	5.8%	5.8%	5.8%
2:30 - 3:30 PM	6.3%	6.7%	6.0%
2:45 - 3:45 PM	6.0%	7.0%	5.0%
3:00 - 4:00 PM	6.5%	8.2%	4.8%
3:15 - 4:15 PM	6.7%	8.7%	4.8%
3:30 - 4:30 PM	6.5%	8.7%	4.2%
3:45 - 4:45 PM	7.2%	9.5%	4.8%
4:00 - 5:00 PM	7.5%	9.8%	5.1%
4:15 - 5:15 PM	8.1%	10.8%	5.8%
4:30 - 5:30 PM	9.0%	11.9%	6.1%
4:45 - 5:45 PM	9.2%	12.2%	6.3%
5:00 - 6:00 PM	9.4%	12.1%	6.8%
5:15 - 6:15 PM	9.6%	11.8%	7.4%
5:30 - 6:30 PM	9.3%	11.0%	7.6%
5:45 - 6:45 PM	8.7%	10.2%	7.3%
6:00 - 7:00 PM	8.2%	9.8%	6.6%
6:15 - 7:15 PM	7.4%	8.7%	6.1%
6:30 - 7:30 PM	6.6%	8.1%	5.2%
6:45 - 7:45 PM	6.6%	8.2%	5.0%
7:00 - 8:00 PM	5.9%	7.3%	4.5%
7:15 - 8:15 PM	5.3%	7.0%	3.6%
7:30 - 8:30 PM	5.4%	7.1%	3.8%
7:45 - 8:45 PM	4.8%	6.0%	3.6%
8:00 - 9:00 PM	4.7%	5.9%	3.5%
8:15 - 9:15 PM	4.4%	5.7%	3.1%
8:30 - 9:30 PM	3.7%	5.1%	2.3%
8:45 - 9:45 PM	3.5%	5.2%	1.7%
9:00 - 10:00 PM	3.0%	4.8%	1.3%
9:15 - 10:15 PM	2.9%	4.6%	1.3%
9:30 - 10:30 PM	2.6%	4.1%	1.1%
9:45 - 10:45 PM	2.3%	3.3%	1.3%
10:00 - 11:00 PM	2.0%	3.0%	1.1%
10:15 - 11:15 PM	1.5%	2.2%	0.8%
10:30 - 11:30 PM	1.4%	1.9%	0.8%
10:45 - 11:45 PM	1.1%	1.8%	0.5%
11:00 - 12:00 AM	0.9%	1.5%	0.4%
11:15 - 12:15 AM	0.8%	1.1%	0.4%
11:30 - 12:30 AM	0.6%	0.8%	0.4%
11:45 - 12:45 AM	0.5%	0.6%	0.3%

For Freedom Square Phase 1

Entering	From ITE	
6:00	1.1%	40.12%
7:00	3.7%	100.00%
8:00	3.8%	100.00%
9:00	3.7%	140.12%
10:00	4.0%	150.62%
11:00	4.8%	181.48%
12:00	5.4%	55.46%
1:00	4.5%	46.39%
2:00	5.5%	56.64%
3:00	8.2%	83.70%
4:00	9.8%	100.00%
5:00	12.1%	100.00%

For Freedom Square Phase 1

Exiting	From ITE	
6:00	5.8%	44.36%
7:00	13.2%	100.00%
8:00	9.9%	100.00%
9:00	6.9%	52.54%
10:00	5.3%	32.47%
11:00	5.7%	43.00%
12:00	5.1%	98.41%
1:00	4.8%	93.02%
2:00	6.0%	117.14%
3:00	4.8%	93.33%
4:00	5.1%	100.00%
5:00	6.8%	100.00%

Assumed Peak Hours			
AM	7-8 AM	8-9 AM	
PM	4-5 PM	5-6 PM	

Other Dev Site Gen		Freedom Sq Phase 1			Northpoint Pass Car		Northpoint (HV)	
		AM	PM	AM	PM	AM	PM	
Bull Road (SR 4001) and Hilton Avenue	EB	L	2	6	3	1	0	0
		T						
		R						
Hilton Avenue	WB	L						
		T						
		R						
Hilton Avenue	NB	L	4	15	9	4	0	0
		T						
		R						
Hilton Avenue	SB	L	13	9	0	1	0	0
		T	6	4	0	1	0	0
		R						

enter  
exit

NO-BUILD															
EASTBOUND				WESTBOUND				NORTHBOUND				SOUTHBOUND			
L	T	R		L	T	R		L	T	R		L	T	R	
6:00	37							73				14	6	2	
6:15	9	0	0	0	0	0	0	18	0	0	0	4	2		
6:30	9	0	0	0	0	0	0	18	0	0	0	3	1		
6:45	9	0	0	0	0	0	0	18	0	0	0	3	1		
7:00	35							69				23	9		
7:15	9	0	0	0	0	0	0	18	0	0	0	6	3		
7:30	9	0	0	0	0	0	0	17	0	0	0	6	2		
7:45	8	0	0	0	0	0	0	17	0	0	0	5	2		
8:00	35							69				23	9		
8:15	9	0	0	0	0	0	0	18	0	0	0	6	3		
8:30	9	0	0	0	0	0	0	17	0	0	0	6	2		
8:45	8	0	0	0	0	0	0	17	0	0	0	5	2		
9:00	36							71				29	11		
9:15	9	0	0	0	0	0	0	18	0	0	0	8	3		
9:30	9	0	0	0	0	0	0	18	0	0	0	7	3		
9:45	9	0	0	0	0	0	0	17	0	0	0	7	2		
10:00	25							49				30	12		
10:15	7	0	0	0	0	0	0	13	0	0	0	8	3		
10:30	6	0	0	0	0	0	0	12	0	0	0	7	3		
10:45	6	0	0	0	0	0	0	12	0	0	0	7	3		
11:00	29							58				37	15		
11:15	8	0	0	0	0	0	0	15	0	0	0	10	4		
11:30	7	0	0	0	0	0	0	14	0	0	0	9	4		
11:45	7	0	0	0	0	0	0	14	0	0	0	9	3		
12:00	19							61				26			
12:15	5	0	0	0	0	0	0	16	0	0	0	14	7		
12:30	5	0	0	0	0	0	0	15	0	0	0	14	6		
12:45	4	0	0	0	0	0	0	15	0	0	0	13	6		
1:00	14							43				40	19		
1:15	4	0	0	0	0	0	0	11	0	0	0	10	5		
1:30	3	0	0	0	0	0	0	11	0	0	0	10	5		
1:45	3	0	0	0	0	0	0	10	0	0	0	10	4		
2:00	16							51				44	21		
2:15	4	0	0	0	0	0	0	13	0	0	0	11	5		
2:30	4	0	0	0	0	0	0	13	0	0	0	11	5		
2:45	4	0	0	0	0	0	0	12	0	0	0	11	5		
3:00	13							44				41	39		
3:15	4	0	0	0	0	0	0	11	0	0	0	21	10		
3:30	3	0	0	0	0	0	0	10	0	0	0	20	10		
3:45	3	0	0	0	0	0	0	10	0	0	0	20	9		
4:00	10							32				69	33		
4:15	3	0	0	0	0	0	0	8	0	0	0	18	9		
4:30	3	0	0	0	0	0	0	8	0	0	0	17	8		
4:45	2	0	0	0	0	0	0	8	0	0	0	17	8		
5:00	10							32				69	33		
5:15	3	0	0	0	0	0	0	8	0	0	0	18	9		
5:30	3	0	0	0	0	0	0	8	0	0	0	17	8		
5:45	2	0	0	0	0	0	0	8	0	0	0	17	8		

Land Use Code	150		
Land Use	Warehousing		
Setting	General Urban/Suburban		
Time Period	Weekday		
# Data Sites	15		
% of 24-Hour Vehicle Trips			
Time	Total	Entering	Exiting
12:00 - 1:00 AM	0.2%	0.2%	0.2%
12:15 - 1:15 AM	0.5%	0.2%	0.7%
12:30 - 1:30 AM	0.4%	0.1%	0.7%
12:45 - 1:45 AM	0.4%	0.2%	0.7%
1:00 - 2:00 AM	0.5%	0.2%	0.8%
1:15 - 2:15 AM	0.3%	0.2%	0.3%
1:30 - 2:30 AM	0.4%	0.2%	0.4%
1:45 - 2:45 AM	0.4%	0.2%	0.5%
2:00 - 3:00 AM	0.3%	0.2%	0.4%
2:15 - 3:15 AM	0.4%	0.4%	0.5%
2:30 - 3:30 AM	0.4%	0.5%	0.4%
2:45 - 3:45 AM	0.4%	0.4%	0.3%
3:00 - 4:00 AM	0.5%	0.5%	0.5%
3:15 - 4:15 AM	0.7%	0.7%	0.6%
3:30 - 4:30 AM	0.9%	0.7%	1.0%
3:45 - 4:45 AM	1.1%	0.9%	1.2%
4:00 - 5:00 AM	1.2%	1.2%	1.2%
4:15 - 5:15 AM	1.4%	1.5%	1.3%
4:30 - 5:30 AM	1.6%	2.0%	1.1%
4:45 - 5:45 AM	2.4%	3.0%	1.8%
5:00 - 6:00 AM	3.0%	3.9%	2.2%
5:15 - 6:15 AM	3.7%	4.7%	2.7%
5:30 - 6:30 AM	4.1%	5.2%	3.0%
5:45 - 6:45 AM	4.7%	6.7%	2.7%
6:00 - 7:00 AM	5.3%	8.0%	3.2%
6:15 - 7:15 AM	6.3%	9.4%	3.4%
6:30 - 7:30 AM	6.6%	9.3%	4.1%
6:45 - 7:45 AM	6.5%	9.1%	4.1%
7:00 - 8:00 AM	6.5%	8.6%	4.6%
7:15 - 8:15 AM	6.7%	9.3%	4.1%
7:30 - 8:30 AM	7.1%	9.8%	4.5%
7:45 - 8:45 AM	6.9%	8.8%	5.1%
8:00 - 9:00 AM	6.2%	7.6%	4.9%
8:15 - 9:15 AM	5.7%	6.4%	5.0%
8:30 - 9:30 AM	5.3%	6.7%	4.2%
8:45 - 9:45 AM	6.7%	8.0%	5.4%
9:00 - 10:00 AM	7.2%	8.8%	5.7%
9:15 - 10:15 AM	7.9%	9.5%	6.4%
9:30 - 10:30 AM	8.0%	9.1%	6.9%
9:45 - 10:45 AM	7.0%	8.0%	6.1%
10:00 - 11:00 AM	6.0%	6.0%	6.0%
10:15 - 11:15 AM	6.1%	6.1%	6.0%
10:30 - 11:30 AM	6.3%	5.8%	6.7%
10:45 - 11:45 AM	6.3%	6.0%	6.8%
11:00 - 12:00 PM	7.3%	7.2%	7.4%
11:15 - 12:15 PM	7.8%	6.8%	8.7%
11:30 - 12:30 PM	8.2%	8.3%	8.2%
11:45 - 12:45 PM	8.2%	8.7%	7.8%
12:00 - 1:00 PM	8.7%	9.6%	7.8%
12:15 - 1:15 PM	7.9%	9.7%	6.1%
12:30 - 1:30 PM	7.3%	8.8%	5.8%
12:45 - 1:45 PM	6.8%	6.0%	5.6%
1:00 - 2:00 PM	6.7%	6.7%	5.6%
1:15 - 2:15 PM	6.3%	6.7%	6.0%
1:30 - 2:30 PM	6.8%	7.2%	6.4%
1:45 - 2:45 PM	7.4%	7.8%	6.9%
2:00 - 3:00 PM	7.1%	7.9%	6.2%
2:15 - 3:15 PM	7.7%	7.5%	8.0%
2:30 - 3:30 PM	7.6%	6.7%	8.5%
2:45 - 3:45 PM	8.3%	6.3%	10.3%
3:00 - 4:00 PM	9.0%	6.4%	11.4%
3:15 - 4:15 PM	8.1%	6.4%	10.0%
3:30 - 4:30 PM	8.1%	6.0%	10.2%
3:45 - 4:45 PM	7.7%	5.5%	9.8%
4:00 - 5:00 PM	7.4%	5.0%	9.7%
4:15 - 5:15 PM	8.4%	5.3%	11.4%
4:30 - 5:30 PM	8.2%	5.0%	11.3%
4:45 - 5:45 PM	7.5%	5.1%	9.9%
5:00 - 6:00 PM	6.8%	4.7%	8.8%
5:15 - 6:15 PM	5.4%	3.7%	6.9%
5:30 - 6:30 PM	4.4%	3.3%	5.5%
5:45 - 6:45 PM	4.1%	2.3%	5.9%
6:00 - 7:00 PM	3.8%	1.9%	5.6%
6:15 - 7:15 PM	3.0%	1.7%	4.2%
6:30 - 7:30 PM	2.5%	1.3%	3.7%
6:45 - 7:45 PM	1.7%	1.3%	2.1%
7:00 - 8:00 PM	1.3%	1.0%	1.5%
7:15 - 8:15 PM	1.1%	0.9%	1.3%
7:30 - 8:30 PM	1.1%	1.0%	1.2%
7:45 - 8:45 PM	0.9%	0.8%	0.9%
8:00 - 9:00 PM	0.8%	0.8%	0.9%
8:15 - 9:15 PM	0.9%	0.7%	1.2%
8:30 - 9:30 PM	1.0%	0.6%	1.3%
8:45 - 9:45 PM	2.1%	0.7%	3.4%
9:00 - 10:00 PM	2.3%	0.7%	3.8%
9:15 - 10:15 PM	2.2%	1.0%	3.5%
9:30 - 10:30 PM	2.0%	0.9%	3.1%
9:45 - 10:45 PM	1.1%	1.1%	1.0%
10:00 - 11:00 PM	0.9%	1.3%	0.5%
10:15 - 11:15 PM	1.0%	1.0%	1.0%
10:30 - 11:30 PM	1.0%	0.9%	1.1%
10:45 - 11:45 PM	0.9%	0.5%	1.2%
11:00 - 12:00 AM	0.9%	0.6%	1.2%
11:15 - 12:15 AM	0.6%	0.4%	0.7%
11:30 - 12:30 AM	0.6%	0.5%	0.7%
11:45 - 12:45 AM	0.5%	0.5%	0.4%

Site Generated	
Entering	From ITE
6:00	9.0%
7:00	8.6%
8:00	7.6%
9:00	8.8%
10:00	6.0%
11:00	7.2%
12:00	9.6%
1:00	6.7%
2:00	7.9%
3:00	6.4%
4:00	5.0%
5:00	4.7%

Site Generated	
Exiting	From ITE
6:00	2.8%
7:00	4.6%
8:00	4.9%
9:00	5.7%
10:00	6.0%
11:00	7.4%
12:00	7.8%
1:00	5.6%
2:00	6.2%
3:00	11.4%
4:00	9.7%
5:00	8.8%

Assumed Peak Hours			
		AM	7-9AM
		PM	4-6 PM
Site Generated			
		AM	PM
		35	10
EB	L		
	T		
	R		
WB	L		
	T		
	R		
NB	L		
	T	69	32
	R		
SB	L		
	T	23	69
	R	9	33

enter   exit

**STUDY AND ANALYSIS INFORMATION**

Municipality:   
 County:   
 PennDOT Engineering District:

Analysis Date:   
 Conducted By:   
 Agency/Company Name:

**Analysis Information**

Data Collection Date:   
 Day of the Week:

Is the intersection in a built-up area of an isolated community of <10,000 population?

**Major Street Information**

Major Street Name and Route Number:   
 Major Street Approach #1 Direction:   
 Major Street Approach #2 Direction:

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

**Minor Street Information**

Minor Street Name and Route Number:   
 Minor Street Approach #1 Direction:   
 Minor Street Approach #2 Direction:

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

**TRAFFIC SIGNAL WARRANT ANALYSIS FINDINGS**

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

ENTER VOLUME DATA PER 15 MINUTE INTERVAL, PER APPROACH						
Time Interval		Major Street Approach #1 (N-Bound)	Major Street Approach #2 (S-Bound)	Major Street Combined	Minor Street Approach #1 (E-Bound)	Minor Street Approach #2 (W-Bound)
Begin At	End Of	Volume	Volume	Total Volume	Volume	Volume
12:00 AM	12:14 AM			0		
12:15 AM	12:29 AM			0		
12:30 AM	12:44 AM			0		
12:45 AM	12:59 AM			0		
1:00 AM	1:14 AM			0		
1:15 AM	1:29 AM			0		
1:30 AM	1:44 AM			0		
1:45 AM	1:59 AM			0		
2:00 AM	2:14 AM			0		
2:15 AM	2:29 AM			0		
2:30 AM	2:44 AM			0		
2:45 AM	2:59 AM			0		
3:00 AM	3:14 AM			0		
3:15 AM	3:29 AM			0		
3:30 AM	3:44 AM			0		
3:45 AM	3:59 AM			0		
4:00 AM	4:14 AM			0		
4:15 AM	4:29 AM			0		
4:30 AM	4:44 AM			0		
4:45 AM	4:59 AM			0		
5:00 AM	5:14 AM			0		
5:15 AM	5:29 AM			0		
5:30 AM	5:44 AM			0		
5:45 AM	5:59 AM			0		
6:00 AM	6:14 AM	48	62	110	51	1
6:15 AM	6:29 AM	70	83	153	56	0
6:30 AM	6:44 AM	75	85	160	78	0
6:45 AM	6:59 AM	68	79	147	68	0
7:00 AM	7:14 AM	76	105	181	60	0
7:15 AM	7:29 AM	80	121	201	67	0
7:30 AM	7:44 AM	71	104	175	79	0
7:45 AM	7:59 AM	71	103	174	73	0
8:00 AM	8:14 AM	66	87	153	52	0
8:15 AM	8:29 AM	68	73	141	45	0
8:30 AM	8:44 AM	59	86	145	73	0
8:45 AM	8:59 AM	75	88	163	59	0
9:00 AM	9:14 AM	66	84	150	42	0
9:15 AM	9:29 AM	75	67	142	42	0
9:30 AM	9:44 AM	63	84	147	37	0
9:45 AM	9:59 AM	91	65	156	46	1
10:00 AM	10:14 AM	82	68	150	42	0
10:15 AM	10:29 AM	73	71	144	29	1
10:30 AM	10:44 AM	70	66	136	39	0
10:45 AM	10:59 AM	79	65	144	40	0
11:00 AM	11:14 AM	84	77	161	40	0
11:15 AM	11:29 AM	71	79	150	38	0
11:30 AM	11:44 AM	82	82	164	39	0
11:45 AM	11:59 AM	81	65	146	33	0

ENTER VOLUME DATA PER 15 MINUTE INTERVAL, PER APPROACH						
Time Interval		Major Street Approach #1 (N-Bound)	Major Street Approach #2 (S-Bound)	Major Street Combined	Minor Street Approach #1 (E-Bound)	Minor Street Approach #2 (W-Bound)
Begin At	End Of	Volume	Volume	Total Volume	Volume	Volume
12:00 PM	12:14 PM	91	89	180	33	0
12:15 PM	12:29 PM	93	93	186	44	1
12:30 PM	12:44 PM	91	76	167	43	1
12:45 PM	12:59 PM	77	91	168	48	0
1:00 PM	1:14 PM	73	78	151	39	0
1:15 PM	1:29 PM	91	86	177	36	1
1:30 PM	1:44 PM	93	84	177	43	0
1:45 PM	1:59 PM	101	76	177	37	0
2:00 PM	2:14 PM	90	88	178	52	0
2:15 PM	2:29 PM	92	76	168	38	0
2:30 PM	2:44 PM	111	88	199	43	1
2:45 PM	2:59 PM	125	115	240	47	0
3:00 PM	3:14 PM	109	127	236	48	0
3:15 PM	3:29 PM	127	121	248	41	0
3:30 PM	3:44 PM	135	122	257	34	0
3:45 PM	3:59 PM	119	119	238	43	1
4:00 PM	4:14 PM	139	142	281	40	0
4:15 PM	4:29 PM	144	130	274	53	2
4:30 PM	4:44 PM	126	120	246	44	0
4:45 PM	4:59 PM	121	117	238	49	0
5:00 PM	5:14 PM	136	130	266	61	0
5:15 PM	5:29 PM	150	121	271	52	0
5:30 PM	5:44 PM	124	110	234	45	0
5:45 PM	5:59 PM	96	124	220	52	1
6:00 PM	6:14 PM			0		
6:15 PM	6:29 PM			0		
6:30 PM	6:44 PM			0		
6:45 PM	6:59 PM			0		
7:00 PM	7:14 PM			0		
7:15 PM	7:29 PM			0		
7:30 PM	7:44 PM			0		
7:45 PM	7:59 PM			0		
8:00 PM	8:14 PM			0		
8:15 PM	8:29 PM			0		
8:30 PM	8:44 PM			0		
8:45 PM	8:59 PM			0		
9:00 PM	9:14 PM			0		
9:15 PM	9:29 PM			0		
9:30 PM	9:44 PM			0		
9:45 PM	9:59 PM			0		
10:00 PM	10:14 PM			0		
10:15 PM	10:29 PM			0		
10:30 PM	10:44 PM			0		
10:45 PM	10:59 PM			0		
11:00 PM	11:14 PM			0		
11:15 PM	11:29 PM			0		
11:30 PM	11:44 PM			0		
11:45 PM	11:59 PM			0		
<b>Approach Totals:</b>		4398	4472	8870	2293	11

**MUTCD WARRANT 1, EIGHT-HOUR VEHICULAR VOLUME**

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No
---	----

Combination of Conditions A and B Necessary?\*: No

*\*Only applicable for Warrant 1 if after an adequate trial of other alternatives that could cause less delay and inconvenience to traffic has failed to solve the traffic problems. See Section 4C.02 of the 2009 MUTCD for application.*

Condition A - Minimum Vehicular Volume									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	500	400	350	280	150	120	105	84
2 or More	1	600	480	420	336	150	120	105	84
2 or More	2 or More	600	480	420	336	200	160	140	112
1	2 or More	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor street approach (one direction only)			
Major Street	Minor Street	100%	80%	70%	56%	100%	80%	70%	56%
1	1	750	600	525	420	75	60	53	42
2 or More	1	900	720	630	504	75	60	53	42
2 or More	2 or More	900	720	630	504	100	80	70	56
1	2 or More	750	600	525	420	100	80	70	56

**Condition A Evaluation**

Number of Unique Hours Met: 12      Condition A Satisfied? Yes

**Condition B Evaluation**

Number of Unique Hours Met: 4      Condition B Satisfied? No

**Combination of Condition A and Condition B Evaluation**

Number of Unique Hours Met for Condition A: N/A

Number of Unique Hours Met for Condition B: N/A

Combination of Condition A and Condition B Satisfied? N/A

**MUTCD WARRANT 2, FOUR-HOUR VEHICULAR VOLUME**

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

Total Number of Unique Hours Met On Figure 4C-1
<b>7</b>

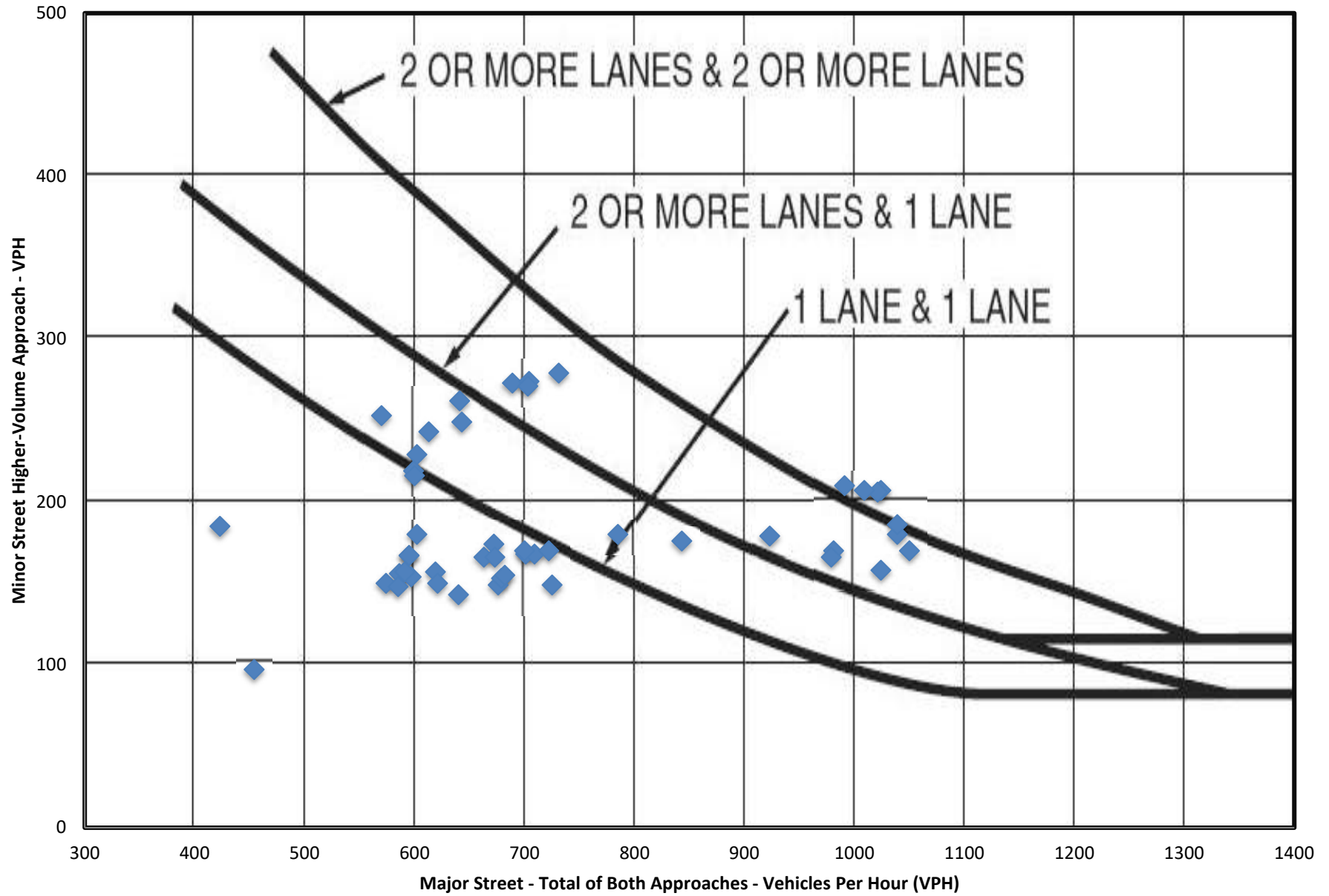
Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?
No

Hourly Vehicular Volume			
Hour Interval	Major Street Combined	Highest Minor Street Approach	Hour Met?
Beginning At	Vehicles Per Hour (VPH)	Vehicles Per Hour (VPH)	
12:00 AM	0	0	
12:15 AM	0	0	
12:30 AM	0	0	
12:45 AM	0	0	
1:00 AM	0	0	
1:15 AM	0	0	
1:30 AM	0	0	
1:45 AM	0	0	
2:00 AM	0	0	
2:15 AM	0	0	
2:30 AM	0	0	
2:45 AM	0	0	
3:00 AM	0	0	
3:15 AM	0	0	
3:30 AM	0	0	
3:45 AM	0	0	
4:00 AM	0	0	
4:15 AM	0	0	
4:30 AM	0	0	
4:45 AM	0	0	
5:00 AM	0	0	
5:15 AM	110	51	
5:30 AM	263	107	
5:45 AM	423	185	
6:00 AM	570	253	Met
6:15 AM	641	262	Met
6:30 AM	689	273	Met
6:45 AM	704	274	Met
7:00 AM	731	279	Met
7:15 AM	703	271	Met
7:30 AM	643	249	Met
7:45 AM	613	243	Met
8:00 AM	602	229	Met
8:15 AM	599	219	
8:30 AM	600	216	
8:45 AM	602	180	
9:00 AM	595	167	
9:15 AM	595	167	
9:30 AM	597	154	
9:45 AM	586	156	
10:00 AM	574	150	
10:15 AM	585	148	
10:30 AM	591	157	
10:45 AM	619	157	
11:00 AM	621	150	
11:15 AM	640	143	
11:30 AM	676	149	
11:45 AM	679	153	

Hourly Vehicular Volume			
Hour Interval	Major Street Combined	Highest Minor Street Approach	Hour Met?
Beginning At	Vehicles Per Hour (VPH)	Vehicles Per Hour (VPH)	
12:00 PM	701	168	
12:15 PM	672	174	
12:30 PM	663	166	
12:45 PM	673	166	
1:00 PM	682	155	
1:15 PM	709	168	
1:30 PM	700	170	
1:45 PM	722	170	
2:00 PM	785	180	Met
2:15 PM	843	176	Met
2:30 PM	923	179	Met
2:45 PM	981	170	Met
3:00 PM	979	166	Met
3:15 PM	1024	158	Met
3:30 PM	1050	170	Met
3:45 PM	1039	180	Met
4:00 PM	1039	186	Met
4:15 PM	1024	207	Met
4:30 PM	1021	206	Met
4:45 PM	1009	207	Met
5:00 PM	991	210	Met
5:15 PM	725	149	
5:30 PM	454	97	
5:45 PM	220	52	
6:00 PM	0	0	
6:15 PM	0	0	
6:30 PM	0	0	
6:45 PM	0	0	
7:00 PM	0	0	
7:15 PM	0	0	
7:30 PM	0	0	
7:45 PM	0	0	
8:00 PM	0	0	
8:15 PM	0	0	
8:30 PM	0	0	
8:45 PM	0	0	
9:00 PM	0	0	
9:15 PM	0	0	
9:30 PM	0	0	
9:45 PM	0	0	
10:00 PM	0	0	
10:15 PM	0	0	
10:30 PM	0	0	
10:45 PM	0	0	
11:00 PM	0	0	



MUTCD Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



**MUTCD WARRANT 3, PEAK HOUR**

Number of Lanes for Moving Traffic on Each Approach	
Major Street:	1 Lane
Minor Street:	1 Lane

Built-up Isolated Community With Less Than 10,000 Population or Above 40 MPH on Major Street?	No
---	----

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

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

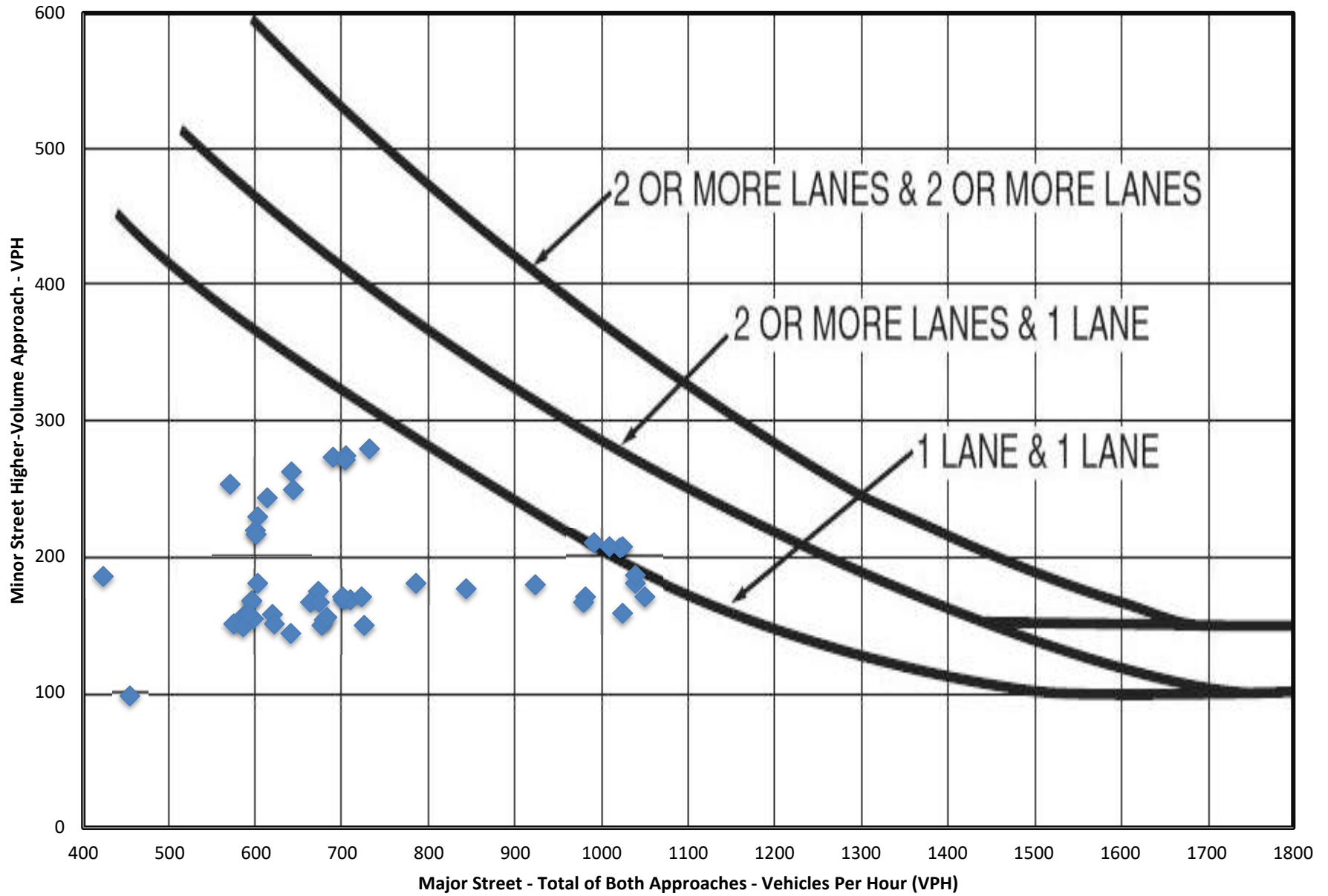
*\*If applicable, attach all supporting calculations and documentation.*

Total Number of Unique Hours Met On Figure 4C-3
<b>1</b>

Hourly Vehicular Volume			
Hour Interval	Major Street Combined	Highest Minor Street Approach	Hour Met?
Beginning At	Vehicles Per Hour (VPH)	Vehicles Per Hour (VPH)	
12:00 AM	0	0	
12:15 AM	0	0	
12:30 AM	0	0	
12:45 AM	0	0	
1:00 AM	0	0	
1:15 AM	0	0	
1:30 AM	0	0	
1:45 AM	0	0	
2:00 AM	0	0	
2:15 AM	0	0	
2:30 AM	0	0	
2:45 AM	0	0	
3:00 AM	0	0	
3:15 AM	0	0	
3:30 AM	0	0	
3:45 AM	0	0	
4:00 AM	0	0	
4:15 AM	0	0	
4:30 AM	0	0	
4:45 AM	0	0	
5:00 AM	0	0	
5:15 AM	110	51	
5:30 AM	263	107	
5:45 AM	423	185	
6:00 AM	570	253	
6:15 AM	641	262	
6:30 AM	689	273	
6:45 AM	704	274	
7:00 AM	731	279	
7:15 AM	703	271	
7:30 AM	643	249	
7:45 AM	613	243	
8:00 AM	602	229	
8:15 AM	599	219	

Hourly Vehicular Volume			
Hour Interval	Major Street Combined	Highest Minor Street Approach	Hour Met?
Beginning At	Vehicles Per Hour (VPH)	Vehicles Per Hour (VPH)	
8:30 AM	600	216	
8:45 AM	602	180	
9:00 AM	595	167	
9:15 AM	595	167	
9:30 AM	597	154	
9:45 AM	586	156	
10:00 AM	574	150	
10:15 AM	585	148	
10:30 AM	591	157	
10:45 AM	619	157	
11:00 AM	621	150	
11:15 AM	640	143	
11:30 AM	676	149	
11:45 AM	679	153	
12:00 PM	701	168	
12:15 PM	672	174	
12:30 PM	663	166	
12:45 PM	673	166	
1:00 PM	682	155	
1:15 PM	709	168	
1:30 PM	700	170	
1:45 PM	722	170	
2:00 PM	785	180	
2:15 PM	843	176	
2:30 PM	923	179	
2:45 PM	981	170	
3:00 PM	979	166	
3:15 PM	1024	158	
3:30 PM	1050	170	
3:45 PM	1039	180	
4:00 PM	1039	186	
4:15 PM	1024	207	Met
4:30 PM	1021	206	Met
4:45 PM	1009	207	Met
5:00 PM	991	210	
5:15 PM	725	149	
5:30 PM	454	97	
5:45 PM	220	52	
6:00 PM	0	0	
6:15 PM	0	0	
6:30 PM	0	0	
6:45 PM	0	0	
7:00 PM	0	0	
7:15 PM	0	0	
7:30 PM	0	0	
7:45 PM	0	0	
8:00 PM	0	0	
8:15 PM	0	0	
8:30 PM	0	0	
8:45 PM	0	0	
9:00 PM	0	0	
9:15 PM	0	0	
9:30 PM	0	0	
9:45 PM	0	0	
10:00 PM	0	0	
10:15 PM	0	0	
10:30 PM	0	0	
10:45 PM	0	0	
11:00 PM	0	0	

MUTCD Figure 4C-3. Warrant 3, Peak Hour



## ADVANCE PHASE CALCULATIONS CONFLICT FACTORS

### CANAL ROAD (SR 921) AND SUSQUEHANNA TRAIL (SR 297) - EASTBOUND LEFT

		LEFT TURN	OPPOSING		
6:00-7:00 AM	(1)	250	92	23000	NOT WARRANTED
7:00-8:00 AM	(1)	236	156	36816	WARRANTED
8:00-9:00 AM	(1)	166	140	23240	NOT WARRANTED
3:00-4:00 PM	(1)	137	398	54526	WARRANTED
4:00-5:00 PM	(1)	162	393	63666	WARRANTED
5:00-6:00 PM	(1)	175	260	45500	WARRANTED

### BULL ROAD (SR 4001) AND HILTON AVENUE - NORTHBOUND LEFT

		LEFT TURN	OPPOSING		
6:00-7:00 AM	(1)	29	266	7714	NOT WARRANTED
7:00-8:00 AM	(1)	40	397	15880	NOT WARRANTED
8:00-9:00 AM	(1)	51	304	15504	NOT WARRANTED
3:00-4:00 PM	(1)	228	354	80712	WARRANTED
4:00-5:00 PM	(1)	281	355	99755	WARRANTED
5:00-6:00 PM	(1)	229	374	85646	WARRANTED

#### CONSIDER PROTECTED/PERMITTED LEFT TURN PHASING

When a separate Left-Turn lane is not present:

- (1) One opposing lane exists; then two or more one-hour period conflict factors (CF) need to be greater than 35,000
- (2) Two opposing lane exists; then two or more one-hour period conflict factors (CF) need to be greater than 45,000

When a separate Left-Turn lane is present:

- (3) One opposing lane exists; then two or more one-hour period conflict factors (CF) need to be greater than 50,000
- (4) Two opposing lane exists; then two or more one-hour period conflict factors (CF) need to be greater than 65,000

#### CONSIDER PROTECTED/PROHIBITED LEFT TURN PHASING

When a separate Left-Turn lane is present:

- (5) One opposing lane exists; then two or more one-hour period conflict factors (CF) need to be greater than 67,500
- (6) Two opposing lane exists; then two or more one-hour period conflict factors (CF) need to be greater than 90,000
- (7) For dual left turn lanes

**STUDY LOCATION AND ANALYSIS INFORMATION**

Municipality:   
 County:   
 PennDOT Engineering District:

Analysis Date:   
 Conducted By:   
 Checked By:   
 Agency/Company Name:

Intersection Description:

**VEHICLE AND PEDESTRIAN INTERVAL FINDINGS**

**Vehicle Change and Clearance Interval Findings**

Approach Description	Direction	Calculated Yellow Change Interval, Y	User Defined Yellow Change Interval, Y	Calculated All-Red Clearance Interval, AR	User Defined All-Red Clearance Interval, AR	To Be Implemented	
						Y (s)	AR (s)
SR 4001 (Phase 6)	SB	4.2	4.5	1.9	2.5	4.5	2.5
SR 4001 (Phase 2)	NB	3.8	4.5	1.6	2.5	4.5	2.5
SR 0921 (Phase 4)	EB	4.1	4.5	1.5	2.5	4.5	2.5
SR 0921 (Phase 8)	WB	3.8	4.5	1.6	2.5	4.5	2.5

Additional Comments/Justifications:

**Pedestrian Interval Findings**

WITH PEDESTRIAN SIGNALS	Calculated Walk Interval, T <sub>w</sub>	User Defined Walk Interval, T <sub>w</sub>	Calculated Ped. Change Interval, T <sub>pc</sub>	User Defined Ped. Change Interval, T <sub>pc</sub>	Greater than (T <sub>w</sub> +T <sub>pc</sub> ) <sub>min</sub> ?	To Be Implemented	
						T <sub>w</sub> (s)	T <sub>pc</sub> (s)
Description of Pedestrian Crossing		7					
		7					
		7					
		7					

WITHOUT PEDESTRIAN SIGNALS	Calculated Min. Green Interval, T <sub>p</sub>
Description of Pedestrian Crossing	

Additional Comments/Justifications:

## VEHICLE CHANGE AND CLEARANCE INTERVALS

### Assumptions and Calibration Inputs

Change and Clearance Intervals (CCI, seconds)

$$CCI = Y + AR$$

**Yellow Change Interval (Y, seconds)**

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

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

**All-Red Clearance Interval (AR, seconds)**

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

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

### Calculations

Through Movement Phases								
Approach Description	Direction	V	g (%)	W	Y	AR	CCI	Comments
SR 4001 (Phase 6)	SB	40	-2	90	4.2	1.9	6.1	
SR 4001 (Phase 2)	NB	40	2	70	3.8	1.6	5.4	
SR 0921 (Phase 4)	EB	40	-1	64	4.1	1.5	5.6	
SR 0921 (Phase 8)	WB	40	2	70	3.8	1.6	5.4	
Left-Turn Movement Phases								
Approach Description	Direction	V	g (%)	W	Y	AR	CCI	Comments

## PEDESTRIAN INTERVALS

### Assumptions and Calibration Inputs

<b>Walk Interval<sup>1</sup></b> ( $T_w$ , seconds)	$T_w = \frac{\left(\frac{1}{2} L\right)}{S_w} + 3$
<b>Pedestrian Change Interval</b> ( $T_{pc}$ , seconds)	$T_{pc} = \frac{L}{S_w}$
<b>Minimum Duration</b> ( $(T_w + T_{pc})_{min}$ , seconds)	$(T_w + T_{pc})_{min} = \frac{(L + 6)}{3}$

**Pedestrian Interval Variables**

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

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

**Minimum Green Interval<sup>2</sup>**

( $T_p$ , seconds)  $T_p = \frac{L}{S_w} + 3$

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

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

### Calculations

Description of Pedestrian Crossing	Ped Signal	L	T <sub>w</sub>	T <sub>pc</sub>	(T <sub>w</sub> +T <sub>pc</sub> ) <sub>min</sub>		T <sub>p</sub>		Comments



**STUDY LOCATION AND ANALYSIS INFORMATION**

Municipality:   
 County:   
 PennDOT Engineering District:

Analysis Date:   
 Conducted By:   
 Checked By:   
 Agency/Company Name:

Intersection Description:

**VEHICLE AND PEDESTRIAN INTERVAL FINDINGS**

**Vehicle Change and Clearance Interval Findings**

Approach Description	Direction	Calculated Yellow Change Interval, Y	User Defined Yellow Change Interval, Y	Calculated All-Red Clearance Interval, AR	User Defined All-Red Clearance Interval, AR	To Be Implemented	
						Y (s)	AR (s)
SR 4001 (Phase 6)	SB	4.2	4.5	1.9	2.5	4.5	2.5
SR 4001 (Phase 2)	NB	3.8	4.5	1.8	2.5	4.5	2.5
Hilton Ave (Phase 4)	EB	3.6	4	2.5	3	4	3
Hilton Ave (Phase 8)	WB	2.9	4	2.9	3	4	3
SR 4001 (Phase 5 Split)	NB	3.5	4.5	2.2	2.5	4.5	2.5

Additional Comments/Justifications:

**Pedestrian Interval Findings**

WITH PEDESTRIAN SIGNALS	Description of Pedestrian Crossing	Calculated Walk Interval, T <sub>w</sub>	User Defined Walk Interval, T <sub>w</sub>	Calculated Ped. Change Interval, T <sub>pc</sub>	User Defined Ped. Change Interval, T <sub>pc</sub>	Greater than (T <sub>w</sub> +T <sub>pc</sub> ) <sub>min</sub> ?	To Be Implemented	
							T <sub>w</sub> (s)	T <sub>pc</sub> (s)

WITHOUT PEDESTRIAN SIGNALS	Calculated Min. Green Interval, T <sub>p</sub>
Description of Pedestrian Crossing	

Additional Comments/Justifications:

**VEHICLE CHANGE AND CLEARANCE INTERVALS**

**Assumptions and Calibration Inputs**

Change and Clearance Intervals (CCI, seconds)

$$CCI = Y + AR$$

**Yellow Change Interval (Y, seconds)**

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

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

**All-Red Clearance Interval (AR, seconds)**

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

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

**Calculations**

Through Movement Phases								
Approach Description	Direction	V	g (%)	W	Y	AR	CCI	Comments
SR 4001 (Phase 6)	SB	40	-2	88	4.2	1.9	6.1	
SR 4001 (Phase 2)	NB	40	2	82	3.8	1.8	5.6	
Hilton Ave (Phase 4)	EB	35	0	105	3.6	2.5	6.1	
Hilton Ave (Phase 8)	WB	25	0	84	2.9	2.9	5.8	
Left-Turn Movement Phases								
Approach Description	Direction	V	g (%)	W	Y	AR	CCI	Comments
SR 4001 (Phase 5 Split)	NB	35	2	92	3.5	2.2	5.7	

## PEDESTRIAN INTERVALS

### Assumptions and Calibration Inputs

<b>Walk Interval<sup>1</sup></b> (T <sub>w</sub> , seconds)	$T_w = \frac{\left(\frac{1}{2} L\right)}{S_w} + 3$
<b>Pedestrian Change Interval</b> (T <sub>pc</sub> , seconds)	$T_{pc} = \frac{L}{S_w}$
<b>Minimum Duration</b> ((T <sub>w</sub> +T <sub>pc</sub> ) <sub>min</sub> , seconds)	$(T_w + T_{pc})_{min} = \frac{(L + 6)}{3}$

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

**Pedestrian Interval Variables**

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

S<sub>w</sub> = Walking Speed, ft/s (3.5 ft/s) ← 3.5

**Minimum Green Interval<sup>2</sup>**

(T<sub>p</sub>, seconds) 
$$T_p = \frac{L}{S_w} + 3$$

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

### Calculations

Description of Pedestrian Crossing	Ped Signal	L	T <sub>w</sub>	T <sub>pc</sub>	(T <sub>w</sub> +T <sub>pc</sub> ) <sub>min</sub>		T <sub>p</sub>		Comments

**STUDY LOCATION AND ANALYSIS INFORMATION**

Municipality:   
 County:   
 PennDOT Engineering District:

Analysis Date:   
 Conducted By:   
 Checked By:   
 Agency/Company Name:

Intersection Description:

**VEHICLE AND PEDESTRIAN INTERVAL FINDINGS**

**Vehicle Change and Clearance Interval Findings**

Approach Description	Direction	Calculated Yellow Change Interval, Y	User Defined Yellow Change Interval, Y	Calculated All-Red Clearance Interval, AR	User Defined All-Red Clearance Interval, AR	To Be Implemented	
						Y (s)	AR (s)
SR 0921 (Phase 2)	EB	4.2	4.5	1.9	2.5	4.5	2.5
SR 0921 (Phase 6)	WB	4.4	4.5	2.5	2.5	4.5	2.5
Susquehanna Trl (Phase 4)	NB	3.4	3.5	3.3	3.5	3.5	3.5
Susquehanna Trl (Phase 8)	SB	3.1	3.5	2.3	3.5	3.5	3.5
SR 0921 (Phase 5 Split)	EB	3.5	4.5	2.5	2.5	4.5	2.5

Additional Comments/Justifications:

**Pedestrian Interval Findings**

WITH PEDESTRIAN SIGNALS	Description of Pedestrian Crossing	Calculated Walk Interval, T <sub>w</sub>	User Defined Walk Interval, T <sub>w</sub>	Calculated Ped. Change Interval, T <sub>pc</sub>	User Defined Ped. Change Interval, T <sub>pc</sub>	Greater than (T <sub>w</sub> +T <sub>pc</sub> ) <sub>min</sub> ?	To Be Implemented	
							T <sub>w</sub> (s)	T <sub>pc</sub> (s)

WITHOUT PEDESTRIAN SIGNALS	Description of Pedestrian Crossing	Calculated Min. Green Interval, T <sub>p</sub>

Additional Comments/Justifications:

## VEHICLE CHANGE AND CLEARANCE INTERVALS

### Assumptions and Calibration Inputs

**Change and Clearance Intervals (CCI, seconds)**

$$CCI = Y + AR$$

**Yellow Change Interval (Y, seconds)**

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

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

**All-Red Clearance Interval (AR, seconds)**

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

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

### Calculations

Through Movement Phases								
Approach Description	Direction	V	g (%)	W	Y	AR	CCI	Comments
SR 0921 (Phase 2)	EB	40	-2	91	4.2	1.9	6.1	
SR 0921 (Phase 6)	WB	40	-4	123	4.4	2.5	6.9	
Susquehanna Trl (Phase 4)	NB	35	3	146	3.4	3.3	6.7	
Susquehanna Trl (Phase 8)	SB	25	-3	62	3.1	2.3	5.4	
Left-Turn Movement Phases								
Approach Description	Direction	V	g (%)	W	Y	AR	CCI	Comments
SR 0921 (Phase 5 Split)	EB	35	2	107	3.5	2.5	6.0	

## PEDESTRIAN INTERVALS

### Assumptions and Calibration Inputs

<b>Walk Interval<sup>1</sup></b> ( $T_w$ , seconds)	$T_w = \frac{\left(\frac{1}{2} L\right)}{S_w} + 3$
<b>Pedestrian Change Interval</b> ( $T_{pc}$ , seconds)	$T_{pc} = \frac{L}{S_w}$
<b>Minimum Duration</b> ( $(T_w + T_{pc})_{min}$ , seconds)	$(T_w + T_{pc})_{min} = \frac{(L + 6)}{3}$

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

**Pedestrian Interval Variables**

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

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

**Minimum Green Interval<sup>2</sup>**

( $T_p$ , seconds) 
$$T_p = \frac{L}{S_w} + 3$$

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

### Calculations

Description of Pedestrian Crossing	Ped Signal	L	T <sub>w</sub>	T <sub>pc</sub>	(T <sub>w</sub> +T <sub>pc</sub> ) <sub>min</sub>		T <sub>p</sub>		Comments

## **APPENDIX I**

### **PENNDOT AND MUNICIPAL CORRESPONDENCE**



**pennsylvania**  
DEPARTMENT OF TRANSPORTATION

**Date:** 11/01/2023  
**Subject:** Highway Occupancy Permit Application No. 291441, Cycle No.5 - Returned For Revisions  
**To:** Bull Canal Dover Owner, LLC  
845 Texas Avenue  
Suite 3300  
Houston, TX 77002  
**From:** PennDOT Engineering District 8-0  
2140 Herr Street  
Harrisburg, PA 17103-1699

Dear Applicant,

PennDOT has reviewed your application for completeness, consistency and compliance with applicable Department Regulations. This review has identified issues that must be addressed in order for our review to continue.

The Department's review comments are attached.

Once the comments have been addressed, please resubmit the application and associated material for further review.

Upon resubmission, the applicant's engineer should put together a letter that describes how each comment has been addressed and where each can be found. This will help expedite the review. For guidance on HOP applications refer to 67 PA Code, Chapter 441, Chapter 459 and PennDOT Publication 282, "Highway Occupancy Permit Guidelines". Additional comments may follow upon review of the resubmitted application.

If you have any questions regarding this matter, you may contact William Warden, District Permit Manager, at (717) 705-0925.



## **Response Comments**

**Date:** 11/01/2023

**Application Number:** 291441, Cycle No.5

## **Form Letter Notes**

(1) \* Upon resubmission, the applicants engineer should put together a response letter that includes each comment, describes how each comment has been addressed, and where each can be found in the report. A copy of these comments and any previously submitted reports should also be provided. This will help expedite the review.

\* Additional comments may follow upon subsequent review of the revised Transportation Impact Study (TIS). If you have any questions pertaining to the technical aspects of this review, please contact Mr. Eric Kinard of the District 8-0 Traffic Unit at (717) 787-9237.

## **Transportation Impact Study/Transportation Impact Assessment**

(1) The Traffic Unit has reviewed the Traffic Impact Study (TIS) dated October 2023 for the proposed Bull Road Logistics development and has found the study to be conditionally acceptable. PennDOT concurs with the improvements that are deemed necessary to mitigate the impact of this project. Please proceed with the remaining Highway Occupancy Permit process, being sure to conform to all Department regulations and policies as outlined in Chapter 441 and Publication 282.

The comments below outline items noted in our Cycle 5 review for inclusion in the revised TIS and/or evaluation in the HOP/design phase. A revised traffic study which fully addresses all outstanding comments must be provided with the first design submission or the entire submission will be returned without review.

The concept plans included in the TIS were only reviewed for consistency with the information provided in the TIS. Actual review of the design criteria (e.g., driveway alignment, width, radii, throat length, ADA accommodations) will follow submission of the Highway Occupancy Permit (HOP) package. Approval of the TIS does not imply that the concept plans included with the study are acceptable as they pertain to roadway improvements and driveway/local road design.

(2) The following comments on the crash study should be addressed:

a) The footnote provided for the rate summary tables for Susquehanna Trail (SR 0297) references Bull Road. Furthermore, the footnote should be revised to clarify that there is a significant reduction in ADT between SEG 0020 and SEG 0030 of SR 0297.

- b) Revise the footnote provided for Bull Road/Roosevelt Avenue (SR 4001) to list the ADT for SR 0030 for reference. Evaluate whether this footnote is applicable to SEG 0121.
- (3) Provide documentation of acceptance from the municipalities for the traffic study. The comment letter dated October 13, 2023 from Dover Township appears to be focused on the land development plans only and does not include any input from the Township Traffic Engineer (ELA Group, Inc.).
- (4) As previously noted, the Canal Road Betterment project is anticipated to make significant modifications to the intersection of Canal Road (S.R. 0921) and Susquehanna Trail (S.R. 0297) in a similar time frame as this project. As shown on the provided concept plans, the improvements proposed by the two projects will require further coordination, particularly on the westbound approach. Continue to coordinate improvements with the Canal Road Betterment project and update correspondence accordingly. Include minutes from any associated meetings.
- (5) As previously requested, revise the recommendations of the traffic study to indicate which approaches at the proposed traffic signals to be located at the intersections of Canal Road (S.R. 0921)/Bull Road (S.R. 4001) and Bull Road (S.R. 4001)/Hilton Ave will have right turn on red restrictions.
- (6) As previously requested, verify that all sight line profiles are labeled correctly. Inconsistencies were noted on sheets 1, 5, 6, 10, and 13. Furthermore, the sight line easement depicted on sheet 7 passes through a building on the southwest corner of the intersection of Bull Road (S.R. 4001) and Canal Road (S.R. 0921).
- (7) Considering that the sight line for the southbound left turn approaching the intersection of Bull Road (S.R. 4001) and Hilton Avenue passes within 6" of the existing roadway surface and the roadway is anticipated to be widened, a sight line profile in finished conditions is required.
- (8) Revise the M-950S form for the site driveway to list available sight distance in the boxes (as previously submitted), with both minimum safe stopping sight distance and desirable sight distance listed under distance required.
- (9) As previously noted, the TIS text discussion of the traffic signal warrant analysis indicates that Warrant 1 is not satisfied at the intersection of Bull Road (SR 4001) and Hilton Avenue, while indicating later in the next sentence that the warrant is met. This intersection appears to meet traffic signal warrants 1, 2 and 3 per the analysis in the appendix for 2024 with development conditions, and signal installation is recommended by the developer.



**pennsylvania**  
DEPARTMENT OF TRANSPORTATION

**Date:** 09/27/2023  
**Subject:** Highway Occupancy Permit Application No. 291441, Cycle No.4 - Returned For Revisions  
**To:** Bull Canal Dover Owner, LLC  
845 Texas Avenue  
Suite 3300  
Houston, TX 77002  
**From:** PennDOT Engineering District 8-0  
2140 Herr Street  
Harrisburg, PA 17103-1699

Dear Applicant,

PennDOT has reviewed your application for completeness, consistency and compliance with applicable Department Regulations. This review has identified issues that must be addressed in order for our review to continue.

The Department's review comments are attached.

Once the comments have been addressed, please resubmit the application and associated material for further review.

Upon resubmission, the applicant's engineer should put together a letter that describes how each comment has been addressed and where each can be found. This will help expedite the review. For guidance on HOP applications refer to 67 PA Code, Chapter 441, Chapter 459 and PennDOT Publication 282, "Highway Occupancy Permit Guidelines". Additional comments may follow upon review of the resubmitted application.

If you have any questions regarding this matter, you may contact William Warden, District Permit Manager, at (717) 705-0925.

**Response Comments**

**Date:** 09/27/2023

**Application Number:** 291441, Cycle No.4

**Form Letter Notes**

(1) \* Upon resubmission, the applicants engineer should put together a response letter that includes each comment, describes how each comment has been addressed, and where each can be found in the report. A copy of these comments and any previously submitted reports should also be provided. This will help expedite the review.

\* Additional comments may follow upon subsequent review of the revised Transportation Impact Study (TIS). If you have any questions pertaining to the technical aspects of this review, please contact Mr. Eric Kinard of the District 8-0 Traffic Unit at (717) 787-9237.

**Transportation Impact Study/Transportation Impact Assessment**

- (1) Provide review documentation and/or acceptance from the municipalities and the MPO for the traffic study. Address all comments to their satisfaction. The most recent Dover Township review letter appears to be focused on the land development plans only and does not include any input from the Township Traffic Engineer (ELA Group, Inc.).
- (2) The Department is aware of a municipal roadway improvement project along Canal Road (S.R. 0921) in Conewago and East Manchester Townships known as Canal Road Betterment. The western limit of the project is the intersection of Canal Road (S.R. 0921) and Susquehanna Trail (S.R. 0297). The applicant should contact Conewago Township and coordinate with them regarding the project. Provide documentation of coordination in the correspondence appendix.
- (3) As noted in the response to comments, sight line profiles and plans have been provided for Case B2 for right turns which will be permitted. As no sight line profiles have been provided for the eastbound or westbound approach to the intersection of Canal Road (S.R. 0921) and Bull Road (S.R. 4001) or for the southbound, eastbound, or westbound approaches to the intersection of Bull Road (SR 4001) and Hilton Avenue, it is presumed that a right-turn on red restriction will be implemented for these movements. Revise the analysis accordingly and revise the recommendations to indicate which approaches are anticipated to be restricted.
- (4) The following comments pertain to the sight line plans/profiles provided for the proposed traffic signals to be located at the intersections of Canal Road (SR 0921)/Bull Road (SR 4001) and Bull Road (SR 4001)/Hilton Avenue:
  - a) Verify that all sight line profiles are labeled correctly and match with the sight line plans shown

on the same sheet. Several inconsistencies were noted.

b) Verify that all roadway labels are accurate. Relocate the Bull Road (SR 4001) label at the Canal Road (SR 0921) intersection further away from Canal Road to eliminate confusion.

c) The intersection of Canal Road (SR 0921) and Bull Road (SR 4001) is being improved to accommodate anticipated truck turning traffic. All sight line plans/profiles must be taken at the final stop bar locations (set to allow truck movements).

d) Clearly label any truck sight distance analysis and associated plan/profile views accordingly.

(5) Provide Chapter 441 desirable sight distances on the M-950S form for the site driveway.

(6) Please provide copies of the supplemental SimTraffic analysis conducted for the S.R. 0297/I-83 interchange and the intersection of Roosevelt Avenue (S.R. 4001) and Loucks Road (S.R. 0030) along with a summary table. This information may be attached to the next response to comment letter and included within the correspondence appendix of the TIS.

(7) The following comments pertain to the provided Intersection Control Evaluations (ICE):

a) Verify the southbound through traffic volumes for the intersection of Canal Road (SR 0921) and Susquehanna Trail (SR 0297)

b) Verify all traffic volumes for the intersection of Bull Road (SR 4001) and Hilton Avenue. 2029 Build traffic volumes should be used.

(8) Please verify the queue tables for consistency with the analysis results during the morning peak hour in the 2024 build with improvements scenario.

(9) As previously requested, revise the capacity analysis to reflect the proposed Flashing Yellow Arrow (FYA) operation for the eastbound left turn phase at the intersection of Canal Road (S.R. 0921)/Susquehanna Trail (S.R. 0297) and for the northbound left turn phase at the intersection of Bull Road (SR 4001)/Hilton Avenue. Please note that per the Synchro 11 user guide, FYA protected permitted operations are to be coded in the software using the D.P+P turn type.

(10) Verify the time periods listed on the signal warrant volume justifications provided for the northbound and southbound approaches at the intersection of Bull Road (SR 4001). Furthermore, verify that the correct ITE Time of Day percentages are being utilized to estimate traffic from Manchester Commerce Center as it appears a residential land use is being considered.

(11) The TIS text discussion of the traffic signal warrant analysis indicates that Warrant 1 is not satisfied at the intersection of Bull Road (SR 4001) and Hilton Avenue while the warrant analysis worksheets indicate that the warrant is met. Verify and revise for consistency.

(12) Revise the summary of corridor crash rates to indicate the approximate length and start/end location of each noted segment based on intersections and/or landmarks. Additionally, please

clearly indicate any/all segments which include intersections with a roadway of significantly higher ADT. For instance, the excessive crash rate for SR 4001 SEG 0120 appears to be in part due to the fact that this segment includes all crashes at the intersection of S.R. 4001 and S.R. 0030 but the rate calculation is utilizing S.R. 4001's significantly smaller ADT and a very short length (0.25 mi).

- (13) Include S.R. 4001 SEG 0230 and SEG 0170 in the discussion of locations with crash rates greater than statewide averages.
- (14) Include the non-reportable crash data in the overall intersection crash summaries and clearly label it as such.
- (15) The following comments pertain to the provided concept plans. Please note that this review is preliminary and conceptual in nature and that additional comments will be provided with the first design submission(s).
  - a) Maintain the proposed 5' shoulder width along Bull Road (S.R. 4001) on either side of the site access as close to the limits of work as possible, and reduce shoulder tapers accordingly.
  - b) Provide the full required shoulder width per PennDOT's 3R Criteria along the northbound side of Bull Road (S.R. 4001) approaching and departing the Hilton Avenue intersection. This may require additional shift to the east.
  - c) Evaluate if removal of the existing stone wall shown on the concept plans just to the east of northbound Bull Road (S.R. 4001) approaching Hilton Avenue is feasible. We note that the stone wall appears to be almost entirely within Department right-of-way.
  - d) As shown, the improvements proposed for the intersection of Susquehanna Trail (S.R. 0297) and Canal Road (S.R. 0921) will ultimately result in a larger lateral transition through the intersection for westbound through traffic than is present with existing skew. Consider installing the full width westbound shadow left turn lane or widening the eastbound approach on center to mitigate this issue.
- (16) The provided truck turning templates at the intersection of Bull Road (S.R. 4001) and Canal Road (S.R. 0921) depict the design vehicle overrunning existing pavement outside the right-of-way onto the Twofold property. Additional pavement replacement on that side of the intersection may be necessary along with additional right-of-way acquisition that may be required. This will be further evaluated as the design progresses.

SIMTRAFFIC QUEUEING SUMMARY

I83 SB and Susquehanna Trail (SR 297)		
Eastbound Through and Right		
Run	2024 Build AM with Improvements	2024 Build PM with Improvements
1	2256'	2603'
2	2272'	2363'
3	2182'	2219'
4	2037'	2474'
5	2242'	2381'
6	2424'	2760'
7	1726'	2342'
8	2181'	2551'
9	2358'	2506'
10	2358'	2199'
<b>Average</b>	<b>2204'</b>	<b>2440'</b>

I83 NB and Susquehanna Trail (SR 297)		
Eastbound Left		
Run	2024 Build AM with Improvements	2024 Build PM with Improvements
1	97'	105'
2	99'	99'
3	93'	94'
4	94'	107'
5	101'	103'
6	96	90'
7	105'	103'
8	101'	105'
9	96'	94'
10	96'	104'
<b>Average</b>	<b>98'</b>	<b>100'</b>

Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001)		
Southbound Left		
Run	2024 Build AM with Improvements	2024 Build PM with Improvements
1	293'	390'
2	471'	371'
3	331'	355'
4	408'	326'
5	298'	347'
6	466'	485'
7	356'	433'
8	523'	563'
9	338'	350'
10	338'	349'
<b>Average</b>	<b>382'</b>	<b>397'</b>

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	320	267	278	182	241	72
Average Queue (ft)	133	108	108	89	109	17
95th Queue (ft)	253	222	205	166	207	51
Link Distance (ft)		2570	1481	1132	2917	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					5	
Queuing Penalty (veh)					10	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	1982	84	287	108	284
Average Queue (ft)	1570	58	118	29	122
95th Queue (ft)	2256	98	223	75	222
Link Distance (ft)	3135		226	623	
Upstream Blk Time (%)			2		
Queuing Penalty (veh)			9		
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		17	11		0
Queuing Penalty (veh)		47	13		0

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	247	330	292
Average Queue (ft)	79	170	158	151
95th Queue (ft)	97	299	271	268
Link Distance (ft)		226	810	827
Upstream Blk Time (%)		6		
Queuing Penalty (veh)		34		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	37	4		
Queuing Penalty (veh)	49	18		



Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	474	422	447	445	360	618	612	527	484	196	241
Average Queue (ft)	201	315	303	278	28	221	370	356	317	49	110	154
95th Queue (ft)	340	435	400	382	158	359	524	520	463	194	187	214
Link Distance (ft)		1836	1836	1836			1923	1923	1923			594
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	4	13		1			8		2			
Queuing Penalty (veh)	18	33		1			13		7			

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	SB	SB	SB
Directions Served	T	L	LT	T
Maximum Queue (ft)	180	314	295	252
Average Queue (ft)	94	220	236	168
95th Queue (ft)	173	293	285	247
Link Distance (ft)	594		1655	1655
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		400		
Storage Blk Time (%)	0			
Queuing Penalty (veh)	0			

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	73	131	22
Average Queue (ft)	45	37	1
95th Queue (ft)	79	88	10
Link Distance (ft)	124		1065
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 545

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	241	231	253	200	239	68
Average Queue (ft)	100	110	111	88	117	15
95th Queue (ft)	189	206	196	171	214	47
Link Distance (ft)		2570	1481	1132	2917	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					3	
Queuing Penalty (veh)					6	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2024	85	257	90	276
Average Queue (ft)	1200	72	138	30	102
95th Queue (ft)	2272	101	249	67	181
Link Distance (ft)	3135		226	623	
Upstream Blk Time (%)			4		
Queuing Penalty (veh)			16		
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		31	14		0
Queuing Penalty (veh)		84	16		0

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	258	408	330
Average Queue (ft)	77	143	188	149
95th Queue (ft)	99	276	354	262
Link Distance (ft)		226	810	827
Upstream Blk Time (%)		1		
Queuing Penalty (veh)		8		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	34	4		
Queuing Penalty (veh)	46	18		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	586	500	468	60	484	687	692	665	485	180	216
Average Queue (ft)	203	316	296	277	15	280	381	356	320	94	85	141
95th Queue (ft)	337	469	415	404	46	483	614	588	553	349	169	198
Link Distance (ft)		1836	1836	1836			1923	1923	1923			594
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	2	13		1		2	12		8			
Queuing Penalty (veh)	11	32		2		9	21		27			

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	SB	SB	SB	SB
Directions Served	T	L	LT	T	R
Maximum Queue (ft)	168	474	568	419	170
Average Queue (ft)	86	315	330	237	6
95th Queue (ft)	151	471	501	391	56
Link Distance (ft)	594		1655	1655	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		400			320
Storage Blk Time (%)	0	2	7	1	
Queuing Penalty (veh)	0	7	18	3	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	168	132	22
Average Queue (ft)	46	45	1
95th Queue (ft)	96	97	7
Link Distance (ft)	124		1065
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 456

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	261	216	287	247	415	300
Average Queue (ft)	110	93	105	93	150	25
95th Queue (ft)	209	178	196	193	295	118
Link Distance (ft)		2570	1481	1132	2917	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					9	
Queuing Penalty (veh)					18	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	1940	84	244	124	242
Average Queue (ft)	1403	40	95	33	118
95th Queue (ft)	2182	82	194	85	212
Link Distance (ft)	3135		226	623	
Upstream Blk Time (%)			1		
Queuing Penalty (veh)			2		
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		9	11		
Queuing Penalty (veh)		23	12		

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	254	300	360
Average Queue (ft)	77	136	148	147
95th Queue (ft)	93	285	272	254
Link Distance (ft)		226	810	827
Upstream Blk Time (%)		9		
Queuing Penalty (veh)		56		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	33	6		
Queuing Penalty (veh)	45	26		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	594	542	464	444	485	982	959	887	485	221	301
Average Queue (ft)	239	358	330	282	26	348	608	556	490	187	112	168
95th Queue (ft)	405	527	483	427	157	627	1012	936	831	562	203	239
Link Distance (ft)		1836	1836	1836			1923	1923	1923			594
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	12	15		2		18	29		24			
Queuing Penalty (veh)	55	38		3		81	50		87			

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	SB	SB	SB	SB
Directions Served	T	L	LT	T	R
Maximum Queue (ft)	207	385	417	316	208
Average Queue (ft)	105	215	237	182	7
95th Queue (ft)	192	331	334	295	69
Link Distance (ft)	594		1655	1655	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		400			320
Storage Blk Time (%)	0	0	0	0	
Queuing Penalty (veh)	0	0	1	0	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	86	90
Average Queue (ft)	41	34
95th Queue (ft)	71	70
Link Distance (ft)	124	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 668

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	232	225	218	171	230	47
Average Queue (ft)	107	92	88	76	101	9
95th Queue (ft)	180	169	157	144	192	32
Link Distance (ft)		2570	1481	1132	2917	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					3	
Queuing Penalty (veh)					6	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	1958	84	260	130	352
Average Queue (ft)	1728	64	125	34	104
95th Queue (ft)	2037	98	228	90	220
Link Distance (ft)	3135		226	623	
Upstream Blk Time (%)			2		
Queuing Penalty (veh)			9		
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		26	14		2
Queuing Penalty (veh)		70	16		1

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	254	283	348
Average Queue (ft)	78	153	165	146
95th Queue (ft)	94	315	281	256
Link Distance (ft)		226	810	827
Upstream Blk Time (%)		9		
Queuing Penalty (veh)		52		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	41	2		
Queuing Penalty (veh)	56	7		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	478	416	395	59	485	629	562	490	90	226	261
Average Queue (ft)	226	328	324	287	7	225	336	332	304	30	119	161
95th Queue (ft)	382	459	430	367	31	432	509	474	438	82	196	220
Link Distance (ft)		1836	1836	1836			1923	1923	1923			594
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	2	18		0			5		3			
Queuing Penalty (veh)	11	45		0			9		10			

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	SB	SB	SB	SB
Directions Served	T	L	LT	T	R
Maximum Queue (ft)	207	475	569	422	415
Average Queue (ft)	109	272	296	218	28
95th Queue (ft)	166	408	450	352	197
Link Distance (ft)	594		1655	1655	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		400			320
Storage Blk Time (%)	0	6	6	2	
Queuing Penalty (veh)	0	24	15	4	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	93	72
Average Queue (ft)	45	37
95th Queue (ft)	78	70
Link Distance (ft)	124	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 514

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	348	246	195	419	276	296
Average Queue (ft)	123	119	96	111	123	33
95th Queue (ft)	242	210	170	278	228	126
Link Distance (ft)		2570	1481	1132	2917	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)	0				5	
Queuing Penalty (veh)	0				11	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2005	85	263	84	254
Average Queue (ft)	1389	60	128	28	124
95th Queue (ft)	2242	105	230	66	218
Link Distance (ft)	3135		226	623	
Upstream Blk Time (%)			2		
Queuing Penalty (veh)			8		
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		25	13		
Queuing Penalty (veh)		67	14		

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	254	260	300
Average Queue (ft)	72	128	139	140
95th Queue (ft)	101	282	255	238
Link Distance (ft)		226	810	827
Upstream Blk Time (%)		4		
Queuing Penalty (veh)		22		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	36	7		
Queuing Penalty (veh)	49	30		



Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	535	486	447	433	484	520	522	487	484	267	280
Average Queue (ft)	202	331	317	281	24	234	354	340	312	34	95	159
95th Queue (ft)	326	451	429	395	151	421	478	449	441	177	200	219
Link Distance (ft)		1836	1836	1836			1923	1923	1923			594
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	2	15		2		0	3		1			
Queuing Penalty (veh)	8	37		3		2	6		3			

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	SB	SB	SB
Directions Served	T	L	LT	T
Maximum Queue (ft)	167	308	340	310
Average Queue (ft)	105	219	242	173
95th Queue (ft)	157	298	329	270
Link Distance (ft)	594		1655	1655
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		400		
Storage Blk Time (%)	0			0
Queuing Penalty (veh)	0			0

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	138	100	55
Average Queue (ft)	44	41	2
95th Queue (ft)	88	81	18
Link Distance (ft)	124		1065
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 351

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	270	239	180	306	257	85
Average Queue (ft)	114	100	86	84	118	12
95th Queue (ft)	199	192	151	176	220	43
Link Distance (ft)		2570	1481	1132	2917	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					5	
Queuing Penalty (veh)					10	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2214	84	254	88	313
Average Queue (ft)	1349	62	103	34	116
95th Queue (ft)	2424	100	228	80	228
Link Distance (ft)	3135		226	623	
Upstream Blk Time (%)			1		
Queuing Penalty (veh)			4		
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		22	11		1
Queuing Penalty (veh)		61	12		0

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	84	254	397	316
Average Queue (ft)	77	147	146	130
95th Queue (ft)	96	288	286	245
Link Distance (ft)		226	810	827
Upstream Blk Time (%)		8		
Queuing Penalty (veh)		50		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	38	9		
Queuing Penalty (veh)	51	40		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	532	524	399	103	484	639	621	617	485	210	225
Average Queue (ft)	228	335	320	276	15	204	384	393	342	52	95	154
95th Queue (ft)	353	478	433	375	51	420	582	594	546	247	182	218
Link Distance (ft)		1836	1836	1836			1923	1923	1923			594
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	3	13		1			11		4			
Queuing Penalty (veh)	16	32		2			18		14			

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	SB	SB	SB	SB
Directions Served	T	L	LT	T	R
Maximum Queue (ft)	161	474	558	466	169
Average Queue (ft)	83	309	325	244	10
95th Queue (ft)	151	466	496	419	73
Link Distance (ft)	594		1655	1655	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		400			320
Storage Blk Time (%)	0	2	7	0	
Queuing Penalty (veh)	0	10	17	1	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	73	118	22
Average Queue (ft)	38	35	1
95th Queue (ft)	71	80	7
Link Distance (ft)	124		1065
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 470

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	171	194	175	267	243	105
Average Queue (ft)	82	98	93	93	134	16
95th Queue (ft)	136	181	162	204	248	54
Link Distance (ft)		2570	1481	1132	2917	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					8	
Queuing Penalty (veh)					18	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	1798	84	261	65	206
Average Queue (ft)	1130	59	115	20	100
95th Queue (ft)	1726	100	238	49	175
Link Distance (ft)	3135		226	623	
Upstream Blk Time (%)			4		
Queuing Penalty (veh)			15		
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		21	13		
Queuing Penalty (veh)		58	14		

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	256	484	293
Average Queue (ft)	72	131	211	141
95th Queue (ft)	105	278	382	258
Link Distance (ft)		226	810	827
Upstream Blk Time (%)		4		
Queuing Penalty (veh)		24		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	32	5		
Queuing Penalty (veh)	44	25		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	498	519	449	433	485	547	484	470	167	223	237
Average Queue (ft)	220	291	323	288	32	176	344	339	295	38	111	153
95th Queue (ft)	374	422	447	408	160	332	488	466	434	97	185	217
Link Distance (ft)		1836	1836	1836			1923	1923	1923			594
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	3	13		2			4		1			
Queuing Penalty (veh)	13	33		3			7		2			

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	SB	SB	SB	SB
Directions Served	T	L	LT	T	R
Maximum Queue (ft)	208	374	412	298	228
Average Queue (ft)	102	246	268	197	13
95th Queue (ft)	178	356	375	287	94
Link Distance (ft)	594		1655	1655	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		400		320	
Storage Blk Time (%)	0		0		
Queuing Penalty (veh)	0		1		

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	69	92	39
Average Queue (ft)	35	39	1
95th Queue (ft)	63	72	13
Link Distance (ft)	124		1065
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	356	386	212	437	386	300
Average Queue (ft)	136	143	107	92	150	29
95th Queue (ft)	243	286	184	232	285	151
Link Distance (ft)		2570	1481	1132	2917	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)	1				7	
Queuing Penalty (veh)	2				14	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2019	85	270	415	375
Average Queue (ft)	1460	61	144	39	150
95th Queue (ft)	2181	104	247	160	283
Link Distance (ft)	3135		226	623	
Upstream Blk Time (%)			2		
Queuing Penalty (veh)			7		
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		17	15		4
Queuing Penalty (veh)		47	16		2

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	251	456	235
Average Queue (ft)	74	140	198	136
95th Queue (ft)	101	299	354	229
Link Distance (ft)		226	810	827
Upstream Blk Time (%)		4		
Queuing Penalty (veh)		26		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	33	5		
Queuing Penalty (veh)	44	22		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	349	567	398	364	74	480	545	488	429	110	204	255
Average Queue (ft)	233	317	301	276	18	171	362	367	310	33	120	161
95th Queue (ft)	354	434	371	360	52	327	466	469	416	86	178	223
Link Distance (ft)		1836	1836	1836			1923	1923	1923			594
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	2	14		0			3		0			
Queuing Penalty (veh)	10	35		0			6		0			

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	SB	SB	SB	SB
Directions Served	T	L	LT	T	R
Maximum Queue (ft)	187	475	642	528	407
Average Queue (ft)	104	343	375	304	14
95th Queue (ft)	182	523	596	491	134
Link Distance (ft)	594		1655	1655	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		400			320
Storage Blk Time (%)	1	15	21	5	
Queuing Penalty (veh)	0	59	52	11	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	95	64	22
Average Queue (ft)	39	29	1
95th Queue (ft)	76	56	10
Link Distance (ft)	124		1065
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 552

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	209	251	218	190	258	289
Average Queue (ft)	122	105	121	92	137	22
95th Queue (ft)	198	187	211	161	230	111
Link Distance (ft)		2570	1481	1132	2917	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					6	
Queuing Penalty (veh)					13	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	1997	84	261	46	242
Average Queue (ft)	1624	54	108	20	122
95th Queue (ft)	2358	97	234	45	223
Link Distance (ft)	3135		226	623	
Upstream Blk Time (%)			3		
Queuing Penalty (veh)			12		
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		19	10		
Queuing Penalty (veh)		52	11		

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	256	407	258
Average Queue (ft)	76	182	186	133
95th Queue (ft)	96	319	319	218
Link Distance (ft)		226	810	827
Upstream Blk Time (%)		10		
Queuing Penalty (veh)		59		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	38	3		
Queuing Penalty (veh)	51	16		



Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	457	414	364	82	485	596	592	559	485	257	270
Average Queue (ft)	218	304	296	267	15	298	404	383	337	90	99	154
95th Queue (ft)	352	416	389	348	49	506	567	549	522	348	200	224
Link Distance (ft)		1836	1836	1836			1923	1923	1923			594
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	3	14		0		5	10		4			
Queuing Penalty (veh)	12	36		0		21	17		15			

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	SB	SB	SB	SB
Directions Served	T	L	LT	T	R
Maximum Queue (ft)	179	338	349	308	198
Average Queue (ft)	88	231	245	187	7
95th Queue (ft)	162	338	350	293	65
Link Distance (ft)	594		1655	1655	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		400		320	
Storage Blk Time (%)	0			0	
Queuing Penalty (veh)	0			0	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	89	134
Average Queue (ft)	43	38
95th Queue (ft)	70	86
Link Distance (ft)	124	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 453

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	209	251	218	190	258	289
Average Queue (ft)	122	105	121	92	137	22
95th Queue (ft)	198	187	211	161	230	111
Link Distance (ft)		2570	1481	1132	2917	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					6	
Queuing Penalty (veh)					13	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	1997	84	261	46	242
Average Queue (ft)	1624	54	108	20	122
95th Queue (ft)	2358	97	234	45	223
Link Distance (ft)	3135		226	623	
Upstream Blk Time (%)			3		
Queuing Penalty (veh)			12		
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		19	10		
Queuing Penalty (veh)		52	11		

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	256	407	258
Average Queue (ft)	76	182	186	133
95th Queue (ft)	96	319	319	218
Link Distance (ft)		226	810	827
Upstream Blk Time (%)		10		
Queuing Penalty (veh)		59		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	38	3		
Queuing Penalty (veh)	51	16		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	457	414	364	82	485	596	592	559	485	257	270
Average Queue (ft)	218	304	296	267	15	298	404	383	337	90	99	154
95th Queue (ft)	352	416	389	348	49	506	567	549	522	348	200	224
Link Distance (ft)		1836	1836	1836			1923	1923	1923			594
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	3	14		0		5	10		4			
Queuing Penalty (veh)	12	36		0		21	17		15			

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	SB	SB	SB	SB
Directions Served	T	L	LT	T	R
Maximum Queue (ft)	179	338	349	308	198
Average Queue (ft)	88	231	245	187	7
95th Queue (ft)	162	338	350	293	65
Link Distance (ft)	594		1655	1655	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		400		320	
Storage Blk Time (%)	0			0	
Queuing Penalty (veh)	0			0	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	89	134
Average Queue (ft)	43	38
95th Queue (ft)	70	86
Link Distance (ft)	124	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 453

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	375	477	867	1148	688	300
Average Queue (ft)	207	113	374	825	146	70
95th Queue (ft)	405	331	680	1367	374	200
Link Distance (ft)		2564	1473	1133	2912	
Upstream Blk Time (%)				11		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)	8				12	1
Queuing Penalty (veh)	16				39	2

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2486	84	240	686	375
Average Queue (ft)	1435	46	84	459	348
95th Queue (ft)	2603	85	203	907	424
Link Distance (ft)	3126		226	623	
Upstream Blk Time (%)			1	49	
Queuing Penalty (veh)			2	0	
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		11	7	0	72
Queuing Penalty (veh)		34	7	0	43

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	259	305	500
Average Queue (ft)	76	185	160	194
95th Queue (ft)	105	314	260	366
Link Distance (ft)		226	805	827
Upstream Blk Time (%)		11		
Queuing Penalty (veh)		77		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	41	13		
Queuing Penalty (veh)	81	65		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	620	611	602	445	485	1318	1300	1381	485	387	483
Average Queue (ft)	266	416	398	365	71	322	887	876	888	446	203	265
95th Queue (ft)	411	567	547	507	314	637	1244	1267	1344	611	300	367
Link Distance (ft)		1831	1831	1831			1921	1921	1921			559
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	6	26		7			51		44	2		
Queuing Penalty (veh)	35	60		16			60		267	15		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	LT	T	R
Maximum Queue (ft)	446	225	472	477	440	193
Average Queue (ft)	216	35	245	262	198	17
95th Queue (ft)	329	167	390	392	341	100
Link Distance (ft)	559			1640	1640	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		150	400			320
Storage Blk Time (%)	24	0	3	2	0	
Queuing Penalty (veh)	29	0	9	5	0	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	165	64	20
Average Queue (ft)	65	17	1
95th Queue (ft)	111	54	7
Link Distance (ft)	156		874
Upstream Blk Time (%)	0		
Queuing Penalty (veh)	0		
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 1829

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	326	149	558	352	275	134
Average Queue (ft)	127	73	365	187	121	32
95th Queue (ft)	261	137	511	277	240	87
Link Distance (ft)		2564	1473	1133	2912	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					9	
Queuing Penalty (veh)					30	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2217	84	247	686	375
Average Queue (ft)	1424	41	92	521	343
95th Queue (ft)	2363	85	207	919	477
Link Distance (ft)	3126		226	623	
Upstream Blk Time (%)			2	57	
Queuing Penalty (veh)			7	0	
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		10	11		80
Queuing Penalty (veh)		33	10		48

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	258	275	344
Average Queue (ft)	78	204	131	165
95th Queue (ft)	99	299	218	271
Link Distance (ft)		226	805	827
Upstream Blk Time (%)		12		
Queuing Penalty (veh)		85		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	36	10		
Queuing Penalty (veh)	73	47		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	812	781	525	445	485	1973	1984	1960	485	336	392
Average Queue (ft)	348	592	568	370	71	243	1614	1599	1625	485	200	255
95th Queue (ft)	352	796	775	526	313	593	2386	2401	2388	485	299	356
Link Distance (ft)		1831	1831	1831			1921	1921	1921			559
Upstream Blk Time (%)							22	24	51			
Queuing Penalty (veh)							0	0	0			
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	72	11		7			62		60	2		
Queuing Penalty (veh)	414	25		17			72		360	10		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	LT	T	R
Maximum Queue (ft)	414	225	358	396	329	207
Average Queue (ft)	198	45	244	275	193	7
95th Queue (ft)	299	192	371	395	311	68
Link Distance (ft)	559			1640	1640	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		150	400			320
Storage Blk Time (%)	18			0	0	
Queuing Penalty (veh)	22			0	0	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	116	76
Average Queue (ft)	74	19
95th Queue (ft)	113	60
Link Distance (ft)	156	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1963

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	375	771	583	1185	364	300
Average Queue (ft)	232	159	384	990	136	52
95th Queue (ft)	457	523	523	1492	270	173
Link Distance (ft)		2564	1473	1133	2912	
Upstream Blk Time (%)				63		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)	14	0			11	
Queuing Penalty (veh)	26	0			36	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2167	84	238	686	375
Average Queue (ft)	1293	45	84	370	307
95th Queue (ft)	2219	85	184	854	450
Link Distance (ft)	3126		226	623	
Upstream Blk Time (%)			0	38	
Queuing Penalty (veh)			1	0	
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		9	9		56
Queuing Penalty (veh)		29	9		34

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	255	179	365
Average Queue (ft)	80	201	118	149
95th Queue (ft)	94	306	185	277
Link Distance (ft)		226	805	827
Upstream Blk Time (%)		12		
Queuing Penalty (veh)		81		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	42	10		
Queuing Penalty (veh)	84	50		



Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	662	546	524	445	485	1955	1972	1955	485	331	356
Average Queue (ft)	263	417	399	367	85	285	1520	1518	1527	465	207	274
95th Queue (ft)	421	567	538	514	350	600	2285	2281	2283	584	325	351
Link Distance (ft)		1831	1831	1831			1921	1921	1921			559
Upstream Blk Time (%)							8	4	14			
Queuing Penalty (veh)							0	0	0			
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	3	25		8			58		57	1		
Queuing Penalty (veh)	17	59		20			67		343	6		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	LT	T	R
Maximum Queue (ft)	326	225	361	369	306	260
Average Queue (ft)	207	22	241	265	195	33
95th Queue (ft)	279	134	355	373	294	155
Link Distance (ft)	559			1640	1640	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		150	400			320
Storage Blk Time (%)	17				0	
Queuing Penalty (veh)	21				0	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	139	90
Average Queue (ft)	65	16
95th Queue (ft)	102	58
Link Distance (ft)	156	
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1695

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	362	108	564	1182	1534	300
Average Queue (ft)	162	42	393	712	238	71
95th Queue (ft)	308	83	542	1370	790	216
Link Distance (ft)		2564	1473	1133	2912	
Upstream Blk Time (%)				17		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)	0				16	0
Queuing Penalty (veh)	1				51	0

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2263	84	198	686	375
Average Queue (ft)	1318	48	69	467	321
95th Queue (ft)	2474	93	143	914	482
Link Distance (ft)	3126		226	623	
Upstream Blk Time (%)				44	
Queuing Penalty (veh)				0	
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		13	7		70
Queuing Penalty (veh)		39	7		42

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	255	318	298
Average Queue (ft)	75	162	141	163
95th Queue (ft)	107	310	260	283
Link Distance (ft)		226	805	827
Upstream Blk Time (%)		9		
Queuing Penalty (veh)		59		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	40	11		
Queuing Penalty (veh)	80	55		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	593	567	494	444	485	1440	1463	1446	485	354	381
Average Queue (ft)	316	406	397	350	34	337	886	879	846	387	211	266
95th Queue (ft)	398	551	508	445	164	622	1463	1450	1436	657	306	374
Link Distance (ft)		1831	1831	1831			1921	1921	1921			559
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	28	22		3			47		40	1		
Queuing Penalty (veh)	161	51		7			54		244	5		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	LT	T	R
Maximum Queue (ft)	381	225	348	335	254	230
Average Queue (ft)	220	30	218	237	156	8
95th Queue (ft)	353	156	326	338	267	76
Link Distance (ft)	559			1640	1640	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		150	400		320	
Storage Blk Time (%)	20					
Queuing Penalty (veh)	25					

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	161	66
Average Queue (ft)	71	20
95th Queue (ft)	122	60
Link Distance (ft)	156	
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1389

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	293	113	581	1148	793	300
Average Queue (ft)	140	51	392	392	173	59
95th Queue (ft)	257	104	610	821	478	204
Link Distance (ft)		2564	1473	1133	2912	
Upstream Blk Time (%)				4		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					14	0
Queuing Penalty (veh)					46	1

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2192	84	248	686	375
Average Queue (ft)	1556	43	92	589	360
95th Queue (ft)	2381	84	195	901	451
Link Distance (ft)	3126		226	623	
Upstream Blk Time (%)			0	72	
Queuing Penalty (veh)			1	0	
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		9	8		90
Queuing Penalty (veh)		27	8		54

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	258	544	483
Average Queue (ft)	78	203	174	202
95th Queue (ft)	103	310	340	376
Link Distance (ft)		226	805	827
Upstream Blk Time (%)		12		
Queuing Penalty (veh)		84		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	45	11		
Queuing Penalty (veh)	90	50		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	625	592	550	445	485	1963	1960	1973	485	284	380
Average Queue (ft)	319	434	428	358	42	239	1444	1434	1454	464	192	264
95th Queue (ft)	405	611	590	505	221	574	2347	2294	2291	596	281	364
Link Distance (ft)		1831	1831	1831			1921	1921	1921			559
Upstream Blk Time (%)							8	9	19			
Queuing Penalty (veh)							0	0	0			
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	27	20		6			56		54	1		
Queuing Penalty (veh)	155	46		13			65		326	4		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	LT	T	R
Maximum Queue (ft)	373	225	334	393	328	264
Average Queue (ft)	211	52	229	266	203	26
95th Queue (ft)	316	209	347	388	339	136
Link Distance (ft)	559			1640	1640	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		150	400			320
Storage Blk Time (%)	21			0	0	
Queuing Penalty (veh)	25			0	0	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB	SB
Directions Served	LR	L	TR
Maximum Queue (ft)	114	88	22
Average Queue (ft)	62	16	1
95th Queue (ft)	90	56	7
Link Distance (ft)	156		874
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 1747

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	371	148	834	1172	2052	300
Average Queue (ft)	192	54	441	674	418	94
95th Queue (ft)	368	122	691	1299	1378	286
Link Distance (ft)		2564	1473	1133	2912	
Upstream Blk Time (%)				14		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)	0				27	1
Queuing Penalty (veh)	1				85	3

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2802	84	189	675	375
Average Queue (ft)	1587	44	58	300	318
95th Queue (ft)	2760	87	137	765	443
Link Distance (ft)	3126		226	623	
Upstream Blk Time (%)				19	
Queuing Penalty (veh)				0	
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		10	6	0	55
Queuing Penalty (veh)		29	6	1	33

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	254	286	338
Average Queue (ft)	82	202	131	156
95th Queue (ft)	90	296	236	288
Link Distance (ft)		226	805	827
Upstream Blk Time (%)		14		
Queuing Penalty (veh)		97		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	44	13		
Queuing Penalty (veh)	88	63		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	685	671	600	445	485	1973	1955	1960	485	404	505
Average Queue (ft)	280	412	407	383	97	275	1369	1381	1397	443	244	309
95th Queue (ft)	421	615	598	560	384	586	2171	2195	2245	649	390	455
Link Distance (ft)		1831	1831	1831			1921	1921	1921			559
Upstream Blk Time (%)							4	3	13			
Queuing Penalty (veh)							0	0	0			
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	3	27		9			53		50	5		
Queuing Penalty (veh)	17	63		21			62		304	31		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	LT	T	R
Maximum Queue (ft)	471	225	452	470	428	209
Average Queue (ft)	249	67	283	307	232	19
95th Queue (ft)	404	236	485	479	412	111
Link Distance (ft)	559			1640	1640	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		150	400			320
Storage Blk Time (%)	31		5	6	1	
Queuing Penalty (veh)	37		18	13	3	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	171	89
Average Queue (ft)	74	29
95th Queue (ft)	128	76
Link Distance (ft)	156	
Upstream Blk Time (%)	1	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1878

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	324	177	825	905	388	300
Average Queue (ft)	125	56	486	448	106	54
95th Queue (ft)	251	124	782	896	237	166
Link Distance (ft)		2564	1473	1133	2912	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					8	1
Queuing Penalty (veh)					27	2

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2288	82	224	662	375
Average Queue (ft)	1270	42	72	304	282
95th Queue (ft)	2342	83	172	720	472
Link Distance (ft)	3126		226	623	
Upstream Blk Time (%)			0	6	
Queuing Penalty (veh)			0	0	
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		9	8	0	51
Queuing Penalty (veh)		28	8	1	31

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	256	309	270
Average Queue (ft)	74	187	132	126
95th Queue (ft)	103	315	234	223
Link Distance (ft)		226	805	827
Upstream Blk Time (%)		13		
Queuing Penalty (veh)		87		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	36	17		
Queuing Penalty (veh)	72	83		



Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	895	866	752	444	485	1421	1589	1626	485	387	392
Average Queue (ft)	339	621	577	373	31	243	955	965	982	437	235	290
95th Queue (ft)	404	873	831	599	161	557	1401	1478	1551	639	344	402
Link Distance (ft)		1831	1831	1831			1921	1921	1921			559
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	70	10		3			52		48	1		
Queuing Penalty (veh)	404	24		6			60		292	4		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	NB	SB	SB	SB
Directions Served	T	R	L	LT	T
Maximum Queue (ft)	358	225	444	460	379
Average Queue (ft)	238	102	283	302	227
95th Queue (ft)	353	284	433	458	395
Link Distance (ft)	559			1640	1640
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		150	400		
Storage Blk Time (%)	33	0	0	2	2
Queuing Penalty (veh)	40	1	1	4	4

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	135	76
Average Queue (ft)	66	19
95th Queue (ft)	109	58
Link Distance (ft)	156	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 2015

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	322	134	642	1167	548	300
Average Queue (ft)	136	48	412	618	166	67
95th Queue (ft)	266	107	600	1242	385	225
Link Distance (ft)		2564	1473	1133	2912	
Upstream Blk Time (%)				14		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					14	0
Queuing Penalty (veh)					45	0

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2515	84	265	686	375
Average Queue (ft)	1572	46	97	590	363
95th Queue (ft)	2551	90	200	875	444
Link Distance (ft)	3126		226	623	
Upstream Blk Time (%)			2	76	
Queuing Penalty (veh)			8	0	
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		10	9		92
Queuing Penalty (veh)		32	9		55

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	254	220	387
Average Queue (ft)	74	209	138	179
95th Queue (ft)	105	319	224	326
Link Distance (ft)		226	805	827
Upstream Blk Time (%)		19		
Queuing Penalty (veh)		129		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	43	12		
Queuing Penalty (veh)	87	55		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	542	541	506	127	485	1744	1748	1754	485	300	366
Average Queue (ft)	244	390	371	357	25	278	1222	1223	1238	411	213	281
95th Queue (ft)	418	520	504	478	74	572	1910	1915	1963	662	288	359
Link Distance (ft)		1831	1831	1831			1921	1921	1921			559
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	11	25		5			50		48	2		
Queuing Penalty (veh)	61	59		11			58		287	10		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	LT	T	R
Maximum Queue (ft)	306	225	475	1050	863	415
Average Queue (ft)	221	37	322	455	349	129
95th Queue (ft)	301	175	563	929	753	427
Link Distance (ft)	559			1640	1640	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		150	400			320
Storage Blk Time (%)	19		32	39	25	
Queuing Penalty (veh)	23		103	82	58	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	142	77
Average Queue (ft)	71	15
95th Queue (ft)	119	52
Link Distance (ft)	156	
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1566

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	300	156	664	769	176	132
Average Queue (ft)	164	63	372	331	91	52
95th Queue (ft)	295	135	584	630	182	113
Link Distance (ft)		2564	1473	1133	2912	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					3	
Queuing Penalty (veh)					8	

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2336	84	232	686	375
Average Queue (ft)	1429	54	115	607	358
95th Queue (ft)	2506	101	234	902	465
Link Distance (ft)	3126		226	623	
Upstream Blk Time (%)			0	87	
Queuing Penalty (veh)			1	0	
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		14	9		89
Queuing Penalty (veh)		42	9		54

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	259	332	445
Average Queue (ft)	77	182	152	200
95th Queue (ft)	94	339	281	354
Link Distance (ft)		226	805	827
Upstream Blk Time (%)		14		
Queuing Penalty (veh)		97		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	41	7		
Queuing Penalty (veh)	83	35		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	349	570	543	518	445	485	1665	1687	1633	485	411	472
Average Queue (ft)	292	423	392	348	57	274	904	892	912	474	269	337
95th Queue (ft)	406	588	542	485	270	596	1320	1322	1372	566	384	441
Link Distance (ft)		1831	1831	1831			1921	1921	1921			559
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	31	19		4		0	54		49	2		
Queuing Penalty (veh)	178	44		10		0	63		295	15		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	LT	T	R
Maximum Queue (ft)	434	225	378	426	402	205
Average Queue (ft)	268	64	248	275	190	18
95th Queue (ft)	400	227	350	384	302	109
Link Distance (ft)	559			1640	1640	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		150	400			320
Storage Blk Time (%)	38	0		0	0	
Queuing Penalty (veh)	46	0		1	0	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	136	95
Average Queue (ft)	75	20
95th Queue (ft)	117	66
Link Distance (ft)	156	
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1966

Intersection: 4: Susquehanna Trail & Canal Rd

Movement	EB	EB	WB	NB	SB	SB
Directions Served	L	TR	LTR	LTR	LT	R
Maximum Queue (ft)	292	232	698	1185	578	300
Average Queue (ft)	127	58	419	834	197	94
95th Queue (ft)	255	138	632	1447	443	295
Link Distance (ft)		2564	1473	1133	2912	
Upstream Blk Time (%)				44		
Queuing Penalty (veh)				0		
Storage Bay Dist (ft)	350					160
Storage Blk Time (%)					26	0
Queuing Penalty (veh)					82	1

Intersection: 5: I-83 SB Ramps & Susquehanna Trail

Movement	EB	WB	WB	SB	SB
Directions Served	TR	L	T	LT	R
Maximum Queue (ft)	2198	84	262	686	375
Average Queue (ft)	1161	40	81	449	339
95th Queue (ft)	2199	83	184	934	457
Link Distance (ft)	3126		226	623	
Upstream Blk Time (%)			0	59	
Queuing Penalty (veh)			2	0	
Storage Bay Dist (ft)		50			275
Storage Blk Time (%)		10	11		69
Queuing Penalty (veh)		32	10		41

Intersection: 6: I-83 NB Ramps & Susquehanna Trail

Movement	EB	EB	WB	NB
Directions Served	L	T	TR	LTR
Maximum Queue (ft)	85	256	218	509
Average Queue (ft)	75	173	125	197
95th Queue (ft)	104	316	213	404
Link Distance (ft)		226	805	827
Upstream Blk Time (%)		12		
Queuing Penalty (veh)		79		
Storage Bay Dist (ft)	50			
Storage Blk Time (%)	39	15		
Queuing Penalty (veh)	78	74		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	T	T	T	R	L	T	T	T	R	L	LT
Maximum Queue (ft)	350	575	530	531	445	485	1973	1973	1973	485	355	393
Average Queue (ft)	280	378	372	340	72	277	1462	1488	1500	447	219	277
95th Queue (ft)	388	533	500	476	313	624	2309	2331	2380	631	325	379
Link Distance (ft)		1831	1831	1831			1921	1921	1921			559
Upstream Blk Time (%)							9	12	26			
Queuing Penalty (veh)							0	0	0			
Storage Bay Dist (ft)	270				370	410				410	530	
Storage Blk Time (%)	12	22		5			55		52	0		
Queuing Penalty (veh)	71	51		12			64		315	1		

Intersection: 9: Roosevelt Ave & Loucks Road

Movement	NB	NB	SB	SB	SB	SB
Directions Served	T	R	L	LT	T	R
Maximum Queue (ft)	336	225	350	361	304	237
Average Queue (ft)	209	22	223	247	184	34
95th Queue (ft)	298	133	349	355	300	160
Link Distance (ft)	559			1640	1640	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		150	400			320
Storage Blk Time (%)	18				0	
Queuing Penalty (veh)	22				0	

Intersection: 10: Bull Road & Site Drive

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	155	112
Average Queue (ft)	72	20
95th Queue (ft)	120	61
Link Distance (ft)	156	
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		250
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1641

## Briana Pampuch

---

**From:** Samuel Scalzo  
**Sent:** Tuesday, August 29, 2023 10:35 AM  
**To:** 'Robert J. Leonard'  
**Cc:** AnnMarie Vigilante; Briana Pampuch; Tom.Hilley@hines.com; Sterling R. Feeser; Zimmermann, Whitney; Mitman, Eric; Griggs, Thomas; Richard Munns  
**Subject:** RE: Canal Road Betterment HOP  
**Attachments:** Conceptual Roadway Improvement Plans - Sheet 5-6.pdf

Bob,

See attached for our plans, which were just submitted to PennDOT as part of a TIS package on 8/24/2023.

Sam

**Samuel M. Scalzo, PE**  
Project Engineer

**LANGAN**

Direct: 215.491.6543  
Mobile: 267.229.1725  
[File Sharing Link](#)  
[www.langan.com](http://www.langan.com)

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ATHENS CALGARY DUBAI LONDON PANAMA



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**From:** Robert J. Leonard <LeonardRJ@erdmananthony.com>  
**Sent:** Monday, August 28, 2023 8:48 AM  
**To:** Samuel Scalzo <sscalzo@Langan.com>  
**Cc:** AnnMarie Vigilante <avigilante@Langan.com>; Briana Pampuch <bpampuch@Langan.com>; Tom.Hilley@hines.com; Sterling R. Feeser <FeeserS@erdmananthony.com>; Zimmermann, Whitney <Whitney.Zimmermann@hines.com>; Mitman, Eric <Eric.Mitman@hines.com>; Griggs, Thomas <Thomas.Griggs@hines.com>; Richard Munns <rmunns@Langan.com>  
**Subject:** [External] RE: Canal Road Betterment HOP

Sam...lets do Thursday. If you have a sketch of the widening you are suggesting, please forward when you can. If we can accommodate the widening to the east side of the intersection, we will need to make that change quickly as our HOP plan submission is anticipated in mid-Sept.

Thanks,  
Bob



---

**From:** Samuel Scalzo <[sscalzo@Langan.com](mailto:sscalzo@Langan.com)>  
**Sent:** Saturday, August 26, 2023 11:01 AM  
**To:** Robert J. Leonard <[LeonardRJ@erdmananthony.com](mailto:LeonardRJ@erdmananthony.com)>  
**Cc:** AnnMarie Vigilante <[avigilante@Langan.com](mailto:avigilante@Langan.com)>; Briana Pampuch <[bpampuch@Langan.com](mailto:bpampuch@Langan.com)>; [Tom.Hilley@hines.com](mailto:Tom.Hilley@hines.com);  
Sterling R. Feeser <[FeeserS@erdmananthony.com](mailto:FeeserS@erdmananthony.com)>; Zimmermann, Whitney <[Whitney.Zimmermann@hines.com](mailto:Whitney.Zimmermann@hines.com)>;  
Mitman, Eric <[Eric.Mitman@hines.com](mailto:Eric.Mitman@hines.com)>; Griggs, Thomas <[Thomas.Griggs@hines.com](mailto:Thomas.Griggs@hines.com)>; Richard Munns  
<[rmunns@Langan.com](mailto:rmunns@Langan.com)>  
**Subject:** RE: Canal Road Betterment HOP

Hi Bob,

We can offer Monday (8/28) from 2-3 or Thursday (8/31) from 2-3, let us know what works for you and I'll send a MS Teams invite.

We are widening Canal Rd (SR 0921) to provide a 350' NB Left Turn Lane from Canal RD to N Susquehanna Trail. As part of the widening we are providing leading and trailing 480' lane shift tapers to accommodate the addition of the left turn lane. This trailing taper travels across the intersection to Canal Rd on the eastern side of the intersection and requires widening along the northern side to tie into existing at the conclusion of our lane shift taper. All widening has been pushed to the northern side of Canal Rd to minimized impact to residential parcels on the southern side as well as the existing electrical lines running parallel to Canal Rd on the southern side.

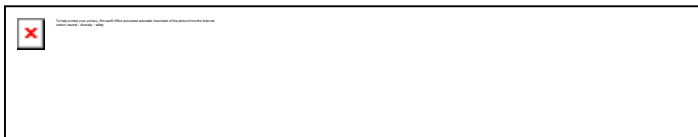
Sam

**Samuel M. Scalzo, PE**  
Project Engineer

**LANGAN**

Direct: 215.491.6543  
Mobile: 267.229.1725  
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ATHENS CALGARY DUBAI LONDON PANAMA



---

**From:** Robert J. Leonard <[LeonardRJ@erdmananthony.com](mailto:LeonardRJ@erdmananthony.com)>  
**Sent:** Tuesday, August 22, 2023 11:51 AM  
**To:** Samuel Scalzo <[sscalzo@Langan.com](mailto:sscalzo@Langan.com)>  
**Cc:** AnnMarie Vigilante <[avigilante@Langan.com](mailto:avigilante@Langan.com)>; Briana Pampuch <[bpampuch@Langan.com](mailto:bpampuch@Langan.com)>; [Tom.Hilley@hines.com](mailto:Tom.Hilley@hines.com);  
Sterling R. Feeser <[FeeserS@erdmananthony.com](mailto:FeeserS@erdmananthony.com)>  
**Subject:** [External] RE: Canal Road Betterment HOP

Hi Sam,

Initial thoughts....sure, I can share our current plan files for the intersection. We are working toward an HOP resubmission the week after Labor Day so if its OK to delay til then, I will add you to the distribution list. Not a lot has changed since the Oct '22 set but you will have our latest grading and such. We are adding a lane on the SB Susq Trail

approach so that there will be an exclusive left, exclusive thru and exclusive Right turn lane. The widening is occurring on the east side of the intersection. We are not changing the lane configuration on the other 3 approaches, except that we have a large channelized right turn lane from Canal to northbound Susq Trail. We are NOT impacting existing signal mast arms so we likely will maintain the existing system.

My other thought is that a Teams meeting would definitely be of value. I'm available this Thursday morning, most of the day Friday. Monday 8/28, Wed 8/30 and Thursday 8/31 in the afternoon are also available.

As for our schedule, we are striving to commence construction in the Spring of 2024 (at least with our new bridge carrying Canal over the Little Conawago Creek) and completing all roadwork by Nov 2025.

What improvements are you being asked to make? What is your timeline for the improvements?

Thanks,  
Bob

**Robert J. Leonard, PE**  
Principal Associate

[T] 717.766.1741 ext. 5006  
[C] 717.579.9366  
100 Sterling Parkway, Suite 212  
Mechanicsburg, PA 17050  
[www.erdmananthony.com](http://www.erdmananthony.com)



---

**From:** Samuel Scalzo <[sscalzo@Langan.com](mailto:sscalzo@Langan.com)>  
**Sent:** Tuesday, August 22, 2023 10:50 AM  
**To:** Robert J. Leonard <[LeonardRJ@erdmananthony.com](mailto:LeonardRJ@erdmananthony.com)>  
**Cc:** AnnMarie Vigilante <[avigilante@Langan.com](mailto:avigilante@Langan.com)>; Briana Pampuch <[bpampuch@Langan.com](mailto:bpampuch@Langan.com)>; [Tom.Hilley@hines.com](mailto:Tom.Hilley@hines.com)  
**Subject:** Canal Road Betterment HOP

\*\*\* External Email - Please exercise caution before viewing attachments, clicking links or responding to this external email. \*\*\*

Hi Bob,

I'm reaching out to you in regards to the Canal Road Betterment HOP project your company is working on. We had a meeting with Terry Myers at C.S. Davidson last week and he forwarded us your plan set from 10/28/2022. Our client is proposing a development in Dover Township and PennDOT is requiring us to design roadway improvements at the intersection of Canal Road and N. Susquehanna Trail as well.

I was wondering if you could share with us any design information that may have changed since the 10/28/2022 plan submission that was made to Terry? He mentioned something about a stormwater basin on TMP 23-000-MH-0085 that I'm not seeing on the plan set he shared with us. Could you also share with us timing of your improvements? We can also make ourselves available for a MS Teams call if you would like.

Thanks in advance,

Sam

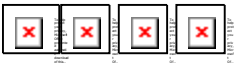
**Samuel M. Scalzo, PE**  
**Project Engineer**

**LANGAN**

Direct: 215.491.6543  
Mobile: 267.229.1725  
[File Sharing Link](#)

Phone: 215.491.6500 Fax: 215.491.6501  
2700 Kelly Road  
Suite 200  
Warrington, PA 18976-3653  
[www.langan.com](http://www.langan.com)

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2700 Kelly Road, Suite 200 Warrington, PA 18976 T: 215.491.6500 F: 215.491.6501

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**Meeting:** Hines | Glen-Gery Site | Dover, PA  
Dover Township/Conewago Township, PA  
Langan Project No.: 200164402

**Date / Location:** Meeting Date: August 17, 2023  
Virtual – Microsoft Teams

**Attendees:** Tom Hilley / Hines  
Terry Myers, Cory McCoy/ CS Davidson  
AnnMarie Vigilante, Sam Scalzo/ Langan

**Prepared By:** Sam Scalzo

**Date Prepared:** 8/18/2023, revised 9/19/23

---

Sam Scalzo called the meeting to order at approximately 2pm on Thursday August 17, 2023. The meeting was held virtually between CS Davidson (Dover Township/Conewago Township engineers), Langan (Traffic & Site/Civil engineer), and Hines (project owner). The purpose of the meeting was to share with CS Davidson the more detailed roadway concept plans and the associated stormwater implications.

## Site Frontage

- Stormwater rate, volume, and water quality for frontage improvements will be accounted for with on-site stormwater BMP's
- Earth Disturbance will be accounted for under the site's NPDES permit.

## Bull Road (SR 4001) & E. Canal Road (SR 0921)

- Langan discussed improvements and characteristics.
  - Approximate impervious area at intersection is 590-SF (0.014-acre).
  - Intersection is >1,200-ft from site, therefore is not a "Common Plan of Development" with site. Non-NPDES E&S plan review will be pursued with County Conservation District (CCD).
- CS Davidson explained this would likely be exempt from stormwater because it's under the Conewago Township threshold of 2,000-SF

## Bull Road (SR 4001) & Hilton Avenue (T-830)

- Langan discussed improvements and characteristics.

- Approximate impervious area at intersection is 17,256-SF (0.40-acre).
- Intersection is >1,200-ft from site, therefore is not a “Common Plan of Development” with site. Non-NPDES E&S plan review will be pursued with County Conservation District (CCD). Pre-application will be held to confirm.
- CS Davidson input:
  - Stormwater threshold of exemption is exceeded.
  - If improvements are under 0.50-acre (including grading) project could pursue CG-2 methodology.
  - Will follow up with Dover Township’s preferred BMPs since they will ultimately be responsible for maintenance.
  - Recent improvements nearby at Poplar would be a good project to reference, will follow up with email to Langan. This was a reference to a PennDOT project which re-aligned a roadway and roadside swales/BMP’s were utilized – CSD had no involvement with design or review.

## **E Canal Road & N Susquehanna Trail**

- Langan discussed improvements and characteristics.
  - Approximate impervious area at intersection is 14,374-SF (0.33-acre).
  - Intersection is >1,200-ft from site, therefore is not a “Common Plan of Development” with site. Non-NPDES E&S plan review will be pursued with County Conservation District (CCD). Pre-application will be held to confirm.
- CS Davidson explained this intersection is in Conewago Township. The current engineer is Terry Myers, but will be Derick Ronaldo at the end of the year when Terry retires.
  - Stormwater threshold of exemption is exceeded.
  - If improvements are under 0.50-acre (including grading) project could pursue CG-2 methodology.
  - Notified Langan and Hines of HOP project proposed at the NE corner of E Canal Road and N. Susquehanna Trail (Canal Road Betterment HOP, designed by Erdman Anthony).
    - Project was submitted late 2022 and there will be a revised submission shortly. Project involves the addition of a sliplane and “pork chip” for westbound traffic on E. Canal Rd. to turn northbound on N. Susquehanna Trail. The project was planned to start construction in 2024 and be completed by 2025.

- The maintenance concerns are potentially a problem for Conewago Township because they aren't receiving tax dollars from the Hines development and CS Davidson proposed there could be a potential cost sharing if Hines expanded the basin the other Hop project is proposing.
- CS Davidson will share the previous submission with Langan/Hines.

## Open Discussion

- CS Davidson
  - Concern brought up about eastbound truck traffic on Bull Road tracking across property on curves with narrow shoulder. Asked if PennDOT is requiring improvements at the curve locations.
- Langan
  - The concern about narrow shoulders and truck traffic at the curves has not been brought up by PennDOT and is not under the current scope of the project. The project is already funding three offsite major intersection improvements to mitigate the proposed site traffic.

---

2700 Kelly Road, Suite 200 Warrington, PA 18976 T: 215.491.6500 F: 215.491.6501

---

**Meeting:** Hines-York Warehouse Development HOP Application #291441  
Dover, PA  
Langan Project No.: 200164401

**Date / Location:** Meeting Date: August 10, 2023  
Location: Microsoft Teams

**Attendees:** AnnMarie Vigilante, Ryan Lothian, Richard Munns, Keith Ottles, Shaun Haas - Langan  
Eric Mitman – Hines  
Michael Musser  
Eric Kinard, Dan Whalen - PennDOT

**Prepared By:** Richard Munns

**Date Prepared:** August 11, 2023

---

The following is a summary of matters discussed at the Hines Warehouse Development TIS Review Letter meeting:

- E. Kinard began the meeting summarizing the agenda for the call which included the following:
  - Queuing at the I-83 and Susquehanna Trail (SR 0297) Interchange
  - Queuing of the SB Left Turn Lane at US-30 (Loucks Ave) and Roosevelt Boulevard (SR 4001)
  - Original Comment for reference:
    - Where with development queues are greater than without development queues and exceed existing/proposed storage lengths provide mitigating measures. As noted in Publication 282, Appendix A, Step 1, ITE's Transportation Impact Analyses for Site Development, Chapter 2 is a guiding document, and the limits provided in Table 2-3 of that document are suggestions. The study area for this development was expanded beyond those suggestions to encompass truck routing to the nearest interchange. This is typical practice for the District for industrial developments to ensure that the roadway network can accommodate the expected increase in truck traffic to the nearest limited access highway. Specific approaches of concern are noted below, at which vehicle queues are anticipated to increase as a result of development and exceed storage in existing or build conditions:
      - a) Eastbound through/right approach at Susquehanna Trail (S.R. 0297) and I-83 Southbound Ramps.

- b) Eastbound left approach at Susquehanna Trail (S.R. 0297) and I-83 Northbound Ramps.
- c) Southbound left approach at Roosevelt Avenue (S.R. 4001) and Loucks Road (S.R. 0030).

In regard to the queuing concerns at SR 0297 and I-83, the following was discussed:

- A. Vigilante discussed the locations of these intersections with proximity to the site, the minimal additions to the queue that the development is creating, and the limited space available to provided mitigating measures.
- E. Kinard acknowledged that there is an HOP currently in review that is providing improvements including a southbound 83 Off-Ramp right turn lane but reminded the team that improvements by others cannot be used unless in place prior to proposed development.
- E. Kinard acknowledged that this location is an existing deficiency pre-development but since the development traffic utilizes this route that the applicant needs to attempt to minimize impacts to existing deficiencies.
- R. Lothian stated that signal timings were optimized as part of no build and agreed to look further into build scenario signal timings with the goal of getting the development queues to under one car length which PennDOT (E. Kinard) mentioned will be acceptable.
- R. Lothian suggested the addition of Do Not Block the Box Signage at the Cloverleaf intersection as a mitigation effort for queuing traffic which E. Kinard agreed was a reasonable mitigation.
- E. Kinard concluded the discussion at this location with the suggestion that simulations be modeled in Synchro at these intersections to see if the development queues are shorten from the original analysis and if so the analysis be updated.

In regard to the queuing concerns at the US 30 (Loucks Ave) and Roosevelt Blvd (SR 4001) intersection, the following was discussed:

- R. Lothian mentioned that for the existing 400' southbound left turn lane, and additional 15' was added to the AM with development queue and 40' added during the PM.
- R. Lothian also stated that the queuing based on HCM falls below 400' and that the Synchro model is projecting over 400' of queuing.
- E. Kinard stated again for this intersection as well that an additional 10 simulations be modeled in Synchro with the average queues analyzed to justify the difference in HCM/Synchro values and the queues with development values reduced.

The call concluded with a summary by E. Kinard that these intersections are problem intersections with existing deficiencies and that PennDOT is requesting that the development makes a reasonable effort to analyze and mitigate impacts to the greatest extent possible given the existing constraints at each location.





August 7, 2023

Dover Township Board of Supervisors  
2480 West Canal Road  
Dover, PA 17315

Re: York Industrial Development (Hines Warehouse)  
Preliminary Land Development Plan  
Dover Township, York County  
Engineer's Project No. 1619.3.08.30

Dear Supervisors:

The above referenced preliminary land development plan, dated June 7, 2023 prepared by Langan Engineering proposes 3 separate warehouse buildings on 1 proposed lot. The site encompasses a total of 197.93 acres and is will access Bull Road and Fox Run Road.

We have reviewed the aforementioned plans and offer the following comments:

#### **Waiver Requests**

- §19-306.11 – Maximum Depth of Basins
- §19-306.18.A.1 & §22-1003.3 – Interior Slopes of Detention Basins
- §22-709.7 – Maximum Access Driveway Width

#### **Subdivision and Land Development Ordinance**

1. Show the future growth and designated growth area boundaries on the plans (§22-501.2.K).
2. Show and label the existing and proposed right-of-way and cartway widths of Fox Run Road on the plans. Additionally, update the maps on the cover sheet to include the connection to Fox Run Road. (§22-601.2.C)
3. The following comments are related to the easement plans:
  - a. Set the plan scale to no smaller than 1"=100' and provide a key map and match lines similar to the site plan views. (§22-601.2.A)
  - b. List any deed restrictions on the easement plans.
4. The following comments are related to the Zoning Data Table (§22-502.2.N):
  - a. Provide the Existing Use of the lots
  - b. Provide the existing and proposed net and gross areas for each lot in the area tables.
  - c. Change the proposed use to "Heavy Industrial (Warehouse)"
  - d. Change "Min. Buffer Yard Along Residential Use or District" to "Min. Buffer Yard for Heavy Industrial Use (Warehouse) Along Residential Use or District".
5. The following comments are related to the Lot Consolidation plans:
  - a. The Lot Consolidation plans will be recorded as a standalone plan and shall have the Zoning Data Table and Lot area table provided with it.
  - b. Identify lot and dimension ultimate right-of-way and cartway widths on the plans (§22-601.2.C).
6. Provide a note on the plans stating "If at any time level 3 screening is not being met, the owner shall be responsible for providing adequate screening as required by §27-664.2."



## C.S. DAVIDSON, INC.

7. Level 3 screening is required along residential uses and districts, the following properties shall be screened from the site:
  - a. 4000 Bull Rd.
  - b. 1501 E. Canal Rd.
  - c. Bull Rd. Across from Airport (40.018229, -76.821439)
8. Provide the proposed and existing gross and net areas for each lot in the lot area table. (§22-601.2.C)
9. Provide and label a profile of the proposed water line. (§22-601.2.G)
10. The site is within wellhead protection zone 3, the Zone 3 Protection Area prohibitions listed in Section 26-213.1 shall be listed on the plans.
11. Provide a detail for buffer strip level 3. (§22-1103.11.B)
12. Name, address, seal, signature, and date of the Professional Engineer/Surveyor shall be added to the plan, certifying the accuracy. (§22-501.2.F)
13. The legal and/or equitable Owner's notarized signatures must be added to the plan certifying concurrence with the plan. (§22-501.2.H)
14. SWM plan approval needs to be obtained from the Township Engineer. (§22-602.3)
15. Verification shall be provided indicating that the Erosion and Sedimentation control plan was approved by the York County Conservation District. (§22-602.4)
16. Where a subdivision abuts or contains an existing street of inadequate width, the developer shall provide sufficient additional right-of-way and cartway widths to meet the following standards. (§22-704.B)

Street	Classification	Required R/W	Required Cartway
Bull Road (SR 4001)	Urban Minor Arterial	80'	40' (including shoulder) curb & sidewalk required
Fox Run Road	Urban Collector	60'	33' (including shoulder) curb & sidewalk required.

### General Comments

1. Township Public Works comments shall be addressed prior to final plan approval.
2. Remove Terry Myers' name from the contact information for C.S. Davidson.
3. In the lot consolidation plans, provide an exhibit for the connection to Bull Road and label the right-of-way dedication.
4. The proposed lot 1 area in the lot table doesn't match the area labeled for proposed lot 1 on the plans.



## **C.S. DAVIDSON, INC.**

5. Provide crosswalks at the intersections to allow for crossings along the main drive.
6. The sidewalk detail is inconsistent with the plans. Provide, label, and dimension a typical cross section for the access drive.
7. Reference the handicap parking detail on the site plans.
8. Add "and Lot Consolidation" to the title of the plans.
9. Reference the Wetlands Report on sheet CB-100.

### **Stormwater Management Ordinance Comments**

1. The following comments pertain to volume control:
  - a. For the proposed infiltration basins, provide infiltration testing at the depth and location of the bottom of the proposed facilities and label the test pits on the plans. (§19-303.A.1)
  - b. For the proposed infiltration facilities, provide de-watering calculations based off field infiltration rates to show volume and rate control will de-water less than 72 hours after the end of the design storm. (§19-301.11)
  - c. Provide further justification for the riparian forest buffer volume control credit taken in DP-002.
2. Provide the following additional points of analysis to assure runoff rate to the stream has not been increased (§19-304.2):
  - a. At the stream crossing closest to Bull Road (including all bypass runoff and Bains 1 and 2 discharge).
  - b. After the discharge points of Bains 4 & 7 (including all bypass runoff and Basins 4, 5, 6a, 6b, and 7 discharge).
3. Provide and label a profile for all culverts, swales, and the stream repair. (§19-401.5.N)
4. A notarized signature for the owner of the parcel for which the SWM site plan is proposed indicating that they are aware of and will be responsible for operation and maintenance of the facilities (§19-401.E.11).
5. The signature and seal of the professional Engineer and Surveyor shall be included on the plan (§19-401.E.19).
6. The developer shall be responsible for providing as-built plans of all SWM BMPs included in the approved SWM Site Plan. The as-built plans and an explanation of any discrepancies with the construction plans shall be submitted to the Township upon completion. The as-built submission shall include a certification of completion signed by a qualified person verifying that all permanent SWM BMPs have been constructed and will function according to the approved plans and specifications. (§19-407.1&2).
7. Prior to final approval of the SWM site plan, the property owner shall sign and record an operation and maintenance (O&M) agreement covering all stormwater control facilities which are to be privately owned (§19-602.1).
8. Municipal Stormwater Maintenance Fund amount shall be paid prior to final plan approval (§ 19-604). Amount will be provided once all technical stormwater management comments have been addressed.



## C.S. DAVIDSON, INC.

### General Stormwater Management Comment

1. The following discrepancies shall be resolved accordingly:
  - a. Infiltration Basin 1: 6" x 22" Orifice elevation. Detail: 475.50'. PCSM report: 454.00'.
  - b. Infiltration Basin 3A: Outlet control structure crest length. PCSM report: 24'. Dimension the crest length of the outlet control structure or revise.
  - c. Detention Basin 7: Orifice size. Plan view: 6"x14". Detail and PCSM Report: 6"x12".
  - d. Detention Basin 8: Orifice size. Plan view: 6"x14". Detail and PCSM Report: 6"x24".
2. Provide a detail of the proposed swale.
3. Provide a detail of the proposed stream repair.

Should you have any questions regarding this review, please contact me at the York office number above.

Respectfully,

Cory A. McCoy, P.E.

CAM/AJS/ems

Copy: Shaun Haas - Langan Engineering via email (shaas@langan.com)  
File

K:\161930830\Correspondence\Letters-Reports\2023-08-07 Hines Warehouse Inhouse Letter.docx

## Briana Pampuch

---

**From:** Briana Pampuch  
**Sent:** Thursday, October 12, 2023 4:45 PM  
**To:** Briana Pampuch  
**Subject:** FW: York Industrial Development

---

**From:** Heather Bitner <[hbitner@ycpc.org](mailto:hbitner@ycpc.org)>  
**Sent:** Tuesday, August 29, 2023 10:21 AM  
**To:** AnnMarie Vigilante <[avigilante@Langan.com](mailto:avigilante@Langan.com)>  
**Subject:** [External] York Industrial Development

The York County Planning Commission has reviewed the most recent update of the TIS for York Industrial Development. From a planning perspective, the TIS is acceptable.

Sincerely,

*Heather A. Bitner*  
*Senior Planner*



28 East Market Street | York, PA 17401-1580  
Phone 717.771.9870 x1728 | Fax 717.771.9511  
[www.ycpc.org](http://www.ycpc.org) | [hbitner@ycpc.org](mailto:hbitner@ycpc.org)



The York County Planning Commission is open to the public during our regular business hours Monday-Friday 8:00 AM-4:30 PM. To ensure the appropriate person is in the office, we recommend making an appointment when meeting with Planning Commission Staff. Appointments can be made by phone, website, or by contacting a staff person directly.



**pennsylvania**  
DEPARTMENT OF TRANSPORTATION

**Date:** 04/21/2023  
**Subject:** Highway Occupancy Permit Application No. 291441, Cycle No.2 - Returned For Revisions  
**To:** Bull Canal Dover Owner, LLC  
345 Hudson Street  
12th Floor  
New York, NY 10014  
**From:** PennDOT Engineering District 8-0  
2140 Herr Street  
Harrisburg, PA 17103-1699

Dear Applicant,

PennDOT has reviewed your application for completeness, consistency and compliance with applicable Department Regulations. This review has identified issues that must be addressed in order for our review to continue.

The Department's review comments are attached.

Once the comments have been addressed, please resubmit the application and associated material for further review.

Upon resubmission, the applicant's engineer should put together a letter that describes how each comment has been addressed and where each can be found. This will help expedite the review. For guidance on HOP applications refer to 67 PA Code, Chapter 441, Chapter 459 and PennDOT Publication 282, "Highway Occupancy Permit Guidelines". Additional comments may follow upon review of the resubmitted application.

If you have any questions regarding this matter, you may contact William Warden, District Permit Manager, at (717) 705-0925.

## Ryan Lothian

---

**From:** Noles, Dean T <dnoles@pa.gov>  
**Sent:** Monday, August 15, 2022 10:42 AM  
**To:** Ryan Lothian; Kinard, Eric W  
**Cc:** Flad, Christopher; Jones, Nicholas; Warden, William J; 'Laurel Oswald'; 'Myers, Terry A.'; John T. McLucas; hbitner@ycoc.org; Zimmermann, Whitney; Griggs, Thomas; Mitman, Eric; AnnMarie Vigilante; Keith Ottes; Shaun Haas  
**Subject:** [External] RE: Hines-York Meeting Minutes

Ryan,

The Traffic Unit has reviewed the draft meeting minutes and we have no comments.

Thank you,

**Dean Noles** | Traffic Control Specialist  
PA Department of Transportation | PennDOT Engineering District 8-0  
2140 Herr Street | Harrisburg PA 17103-1699  
Phone: 717.772.0976 | Fax: 717.705.0375  
[www.PennDOT.pa.gov](http://www.PennDOT.pa.gov)

---

**From:** Ryan Lothian <rlothian@Langan.com>  
**Sent:** Tuesday, August 9, 2022 9:25 AM  
**To:** Kinard, Eric W <ekinard@pa.gov>  
**Cc:** Noles, Dean T <dnoles@pa.gov>; Flad, Christopher <cflad@pa.gov>; Jones, Nicholas <nichojones@pa.gov>; Warden, William J <wilwarden@pa.gov>; 'Laurel Oswald' <laoswalt@dovertownship.org>; 'Myers, Terry A.' <tam@csdavidson.com>; John T. McLucas <jmclucas@dovertownship.org>; hbitner@ycoc.org; Zimmermann, Whitney <Whitney.Zimmermann@hines.com>; Griggs, Thomas <Thomas.Griggs@hines.com>; Mitman, Eric <Eric.Mitman@hines.com>; AnnMarie Vigilante <avigilante@Langan.com>; Keith Ottes <kottes@langan.com>; Shaun Haas <SHAas@Langan.com>  
**Subject:** [External] Hines-York Meeting Minutes

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Hello Eric,

Hope you had a nice weekend. Please see the attached meeting minutes from the July 18, 2022 scoping meeting for the Hines-York project in Dover Township. Please advise if you or any of the other attendees has any comments or revisions. We ask that everyone please try to respond with comments within 5 business days and then we can send out a copy of the final minutes.

Thanks!  
Ryan

**Ryan Lothian, PE**  
Project Engineer

# LANGAN

Direct: 215.491.6583

[File Sharing Link](#)

Phone: 215.491.6500 Fax: 215.491.6501

2700 Kelly Road, Suite 200

Warrington, PA 18976-3653

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## **Response Comments**

**Date:** 04/21/2023

**Application Number:** 291441, Cycle No.2

## **Form Letter Notes**

- (1) \* Upon resubmission, the applicant's engineer should put together a letter that describes how each comment has been addressed and where each can be found in the plan set. A copy of these comments and any previously submitted plans should also be provided.

\* For guidance on Highway Occupancy Permit applications refer to PA Code Title 67, Chapter 441, Chapter 459 and PennDOT Publication 282. This will help expedite the review.

## **Transportation Impact Study/Transportation Impact Assessment**

- (1) Provide review documentation and/or acceptance from the municipalities and the MPO for the traffic study. Address all comments to their satisfaction.
- (2) Based on the significant LOS/delay degradation along the eastbound approach and the drops in intersection overall level of service at the intersection of Hilton Avenue and Bull Road (S.R. 4001), mitigation is required as outlined in Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits, Step 10. Provide additional documentation regarding the potential realignment of Hilton Avenue. Given that the project has not been programmed, sufficient documentation that the project will proceed is required or full mitigation in conjunction with this project will be necessary. Please note that the Department does not accept fair share contributions, and therefore installation of improvements for full mitigation for this development should be included in the report recommendations.
- (3) Any references to meetings with Department personnel will not be considered in the review unless documentation in the form of meeting minutes previously approved by the Department personnel with whom the applicant/engineer met has been provided with the TIS application package. Provide documentation of approval of the meeting minutes related to the project in the TIS correspondence appendix.
- (4) Based on the significant LOS/delay degradation on all approaches and for the overall intersection level of service at the intersection of Bull Road (S.R. 4001) and Canal Road (S.R. 0921), mitigation is required as outlined in Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits, Step 10. As signalization is the recommended mitigation, a full traffic signal warrant analysis based on 12-hour manual turning movement counts will be required along with an Intersection Control Evaluation (ICE). If signal warrants are not met in existing

conditions, projection of the 12 hour manual turning movement counts and incorporation of site traffic utilizing ITEs time of day tables will be required.

- (5) As previously noted, significant delay degradation occurs along the southbound approach, as well as for the eastbound left movements, at the intersection of Roosevelt Avenue (SR 4001) and Loucks Road (SR 0030) during the afternoon peak hour, and northbound left movement during the morning peak hour. Delays for this movement at this intersection increase by up to 29 seconds. The 10-seconds of additional delay increase requirement is applicable to the overall intersection delay when comparing with to without development scenarios, but additionally the Department may require mitigation to impacted approaches/lane groups with significant drops in LOS or delay. Necessary improvements must be identified to mitigate the development traffic impact within the study area.
- (6) Where with development queues are greater than without development queues and exceed existing/proposed storage lengths, provide mitigating measures. This condition occurs at multiple study intersections. Furthermore, verify the noted queue storage lengths at all study intersections. Queue storage lengths should be considered as the distance to the nearest intersection in absence of a turning lane.
- (7) Provide left turn conflict factor analysis in conjunction with installation of a dedicated eastbound left turn lane at the intersection of Canal Road (S.R. 0921) and Susquehanna Trail (S.R. 0297). Furthermore, provide turn lane warrant and length analysis for this proposed turn lane. Based on the queue analysis, the eastbound left turn 95th percentile queue is expected to extend beyond the proposed 200 storage for the eastbound left turn lane. Revise the proposed turn lane to contain the entire 95th percentile queue or the entire warranted length, whichever is greater.
- (8) It appears that the previously provided volume development spreadsheet that clearly indicated the existing volumes, baseline traffic growth volumes, traffic generated by planned or approved projects in the study area, and proposed site volumes was omitted this cycle. Please revise.
- (9) Verify passenger car traffic from Manchester Commerce Center for consistency between that TIS and its figures, Figure D2 of this study, and the analysis at the intersection of Canal Road (S.R. 0921) and Susquehanna Trail (S.R. 0297).
- (10) Pending verification of the traffic volume projections, the future traffic analysis has not been reviewed in detail at this time, and additional comments may follow upon review of the updated TIS and Crash Analysis. That being said, please verify the LOS/delay tables for consistency with the analysis as inconsistencies were again noted this cycle.
- (11) Revise the footnotes on the LOS and queue tables to note in which scenarios the improvements from Freedom Square Phase 1 are accounted for within the traffic analysis. Furthermore, provide

the length of the proposed eastbound left turn lane at the intersection of Canal Road (S.R. 0921) and Susquehanna Trail (S.R. 0297) in the footnotes.

- (12) Verify minimum green times at all signalized study intersections. Furthermore, verify the detector settings at the intersections of Bull Road (S.R. 4001)/ Church Road (S.R. 0238) and Susquehanna Trail (S.R. 0297) / I-83 Ramps. Lastly, verify the vehicle extension settings at the intersection of Susquehanna Trail and the I-83 Ramps.
- (13) Provide Chapter 441 desirable sight distances in the sight distance table and on the M-950S forms. Revise the sight distance table to verify the movements for which sight distance information is being provided. For instance, the driveway appears to be an eastbound approach that requires sight distance to the left and to the right. Additionally, the available sight distance for left turns entering the driveway from the rear should be included.
- (14) As combination truck traffic is anticipated to exceed 5.0% of the total traffic using the proposed driveway, provide a sight distance evaluation for combination trucks in addition to passenger cars based on the guidance provided in Chapter 441.
- (15) The provided concept plans depicting proposed roadway improvements do not contain sufficient detail to illustrate their feasibility. Furthermore, concept plans should be provided for improvements at the site access in addition to off-site improvements. Development of construction cost estimates is required along with noting any proposed design exception(s). The plans must also show right-of-way lines. The plan scale should be 50-scale unless otherwise agreed to at the scoping meeting. Ensure that the travel lane and shoulder widths are in accordance with PennDOT's Resurfacing, Restoration and Rehabilitation (3-R) Design Criteria found in PennDOT Publication 13M, Design Manual Part 2. (Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits, Step 9) We note that the concept for the EB left turn lane on Canal Road at Susquehanna Trail should evaluate the potential for an opposing left turn lane across the intersection. Also, symmetrical widening must be assumed for all improvements, unless clearly documented to be infeasible. Please note that the standard AASHTO WB-67 is not legal in PA, and therefore the truck turning templates should be modified for WB-62, which sufficiently models turning movements for the PA legal modified WB-67.
- (16) As previously noted, this application is expected to include the creation of a medium-volume or high-volume access. As such, the applicant shall comply with PennDOT's Intersection Control Evaluation (ICE) Policy. Please refer to Appendix AI of Publication 10X (DM-1X) and the ICE portion of PennDOT's Traffic Signal Portal for additional information, guidance, and standard forms. As the purpose of the ICE is to determine final intersection control, the ICE process should be completed during the traffic study phase and prior to commencement of full access design.

Provide ICE Stage 1 documentation with the resubmission.

(17) The following comments pertain to the crash analysis:

a) Provide a summary of all mid-block crashes along the site frontage

b) Include crash rate calculations in the crash data analysis

c) It appears that some of the pages in the crash resume were repeated, corrupted and are mostly blank (pages 10, 23, and 55 of the provided PDF). Remove these extra pages.

(18) As previously requested, and per Pub. 282, contact the local police department for non-reportable crashes. Although non-reportable crashes are less severe than reportable crashes, they are an important indicator of overall safety.

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2700 Kelly Road, Suite 200 Warrington, PA 18976 T: 215.491.6500 F: 215.491.6501

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- Meeting:** Hines-York Warehouse Development HOP Application #291441  
Dover, PA  
Langan Project No.: 200164401
- Date / Location:** Meeting Date: January 27, 2023  
Location: Microsoft Teams
- Attendees:** AnnMarie Vigilante, Ryan Lothian, Richard Munns, Keith Ottles, Shaun Haas - Langan  
Jodie Evans – McMahon Associates  
Heather Bitner – York County Planning Department  
Thomas Griggs, Tom Hilley, Eric Mitman, Whitney Zimmerman - Hines  
John McLucas, Laurel Oswald – Dover Township  
Nicholas Jones, Eric Kinard, Kyle Kreiser, Dean Noles, William Warden - PennDOT
- Prepared By:** Richard Munns
- Date Prepared:** January 27, 2023
- 

The following is a summary of matters discussed at the Hines Warehouse Development TIS Review Letter meeting:

- A. Vigilante began the meeting mentioning the recently issued PennDOT TIS Comment Letter dated 11/30/22.
  - Three off-site intersections were brought up for and action items moving forward. This intersections include Bull Rd (SR 4001) & E Canal Rd (SR 0921), Bull Rd (SR 4001) & Hilton Ave, and E Canal Rd (SR 0921) & N Susquehanna Trail (SR 0297).
- Bull Rd (SR 4001) and E Canal Rd (SR 0921)
  - A. Vigilante asked for a brief overview on the current status of the Department's planned project at the intersection.
    - K. Kreiser stated that the Department project is in preliminary stages.
      - Anticipated let date of early 2026.
      - Provided clarification that let date is not concrete, will soon be updated to probably February/March 2026 with the potential for construction early summer 2026
  - A. Vigilante stated that the anticipated open date for the Hines Warehouse Development project is early 2024.
  - E. Kinard stated that due to the 2+ year gap in project schedules that the applicant should not assume any of the Department's potential improvements in their analysis.

- Applicant's TIS needs to specify what improvements are needed at the intersection separate of the Department Project and commit to those improvements for the opening date in 2024.
- A. Vigilante and T. Hilley raises a concern about if the Department's 2026 project still requires additional improvements to the intersection that access to the site will be hindered during construction.
  - Introduced the possibility of merging the Department project and developer project improvements at the intersection to streamline construction and limit impact to site in 2026.
- E. Kinard asks if the private development improvements will reduce/eliminate the scope of the DOT project.
  - Difference between the developer project and the Department project is that the developer project provides an analysis with a 5-year post build condition whereas the Department project is utilizing a 20 year condition.
  - R. Lothian states that the intersection maybe able to operate at a satisfactory level of service with the installation of a signal, without the addition of turning lanes to satisfy the 2024 opening year conditions until the Department's 2026 project is implemented.
    - E. Kinard states that the TIS will need to be updated to evaluate all of the scenarios discussed to properly evaluate what build conditions are required and that an "interim condition" is not on the table.
    - Need to evaluate the private developers project entirely and implement the required improvements and then the Department/county can evaluate after implementation to see what if any improvements are still required for their Department project.
- T. Hilley acknowledges the Department's feedback and asks for further clarification on when they may be able to determine the need for the separate Department project. Again he mentions the concern that access will be impacted in 2026 during the Department project construction.
  - E. Kinard notes that to answer that question, the applicant would need to account for the Departments 20 year condition in their analysis versus a 5 year condition to better understand the difference in required improvements at the intersection.
    - Timing is brought up again and that if the applicant is set on a 2024 opening that they will need to prepare their TIS separate from the Department project and commit to improvements required for the opening year.
    - Secondary option of delaying until the Department project comes along in 2026 but all parties acknowledge that a 2026 build is not a guarantee and that the private development is not likely to want to wait until that timeframe.
    - Further elaboration that the gap of 2+ years with the Department project still being in early phases is going to prohibit these projects from being completed in tandem.

- T. Hilley then raises the scenario that if Hines were to commit to and implement the improvements required as part of a 20 year scenario if any type of funding/fair share contribution would be possible.
  - A. Vigilante elaborates on this scenario mentioning that the pursuit of right-of-way from outside parties is sometimes a hindrance for these projects and asks if a joint effort to obtain right-of-way with the Department is possible as part of this scenario.
  - E. Kinard inquires to the others from the Department about this potential partnership on the improvements.
    - K. Kreiser mentioned that the Department project is 100% federally funded and that they are required to follow a specific process throughout the project.
    - Right-of-way acquisition in particular needs to follow a specific timeline and cannot be pursued until the design of improvements is completed.
      - J. McLucas states that Dover Township is not likely to condemn if applicant is unable to obtain the necessary right-of-way and mentions that a large majority of the necessary takings actually fall in Conewago Township who was invited but not present in the meeting.
- A. Vigilante wraps up the discussion at this intersection that given all the different parameters in play that the current path forward is for Langan to update the TIS based on private development build scenario solely and then reconvene for a follow up discussion on the path for the project prior to a formal resubmission of the TIS.
- Bull Rd (SR 4001) and Hilton Ave
  - A. Vigilante then moved the conversation to the comments pertaining to the necessary improvements required at the intersection of Bull Rd (SR 4001) & Hilton Avenue.
  - E. Kinard and H. Bitner first mentioned that the Dover Mixed Use Development was pulled and does not need to be accounted for in the analysis of this intersection.
    - The County and Department stated that they are however currently looking at a realignment of Hilton Avenue as it intersects with Bull Rd due to the existing sight distance concerns.
  - A. Vigilante asks for clarification on re-aligning Bull/Hilton and the impacts that it would have to the improvements proposed under the developer's application.
    - Current analysis shows that a westbound left turn lane from Bull onto Hilton and signalization of the intersection are required as part of the developer's project.
    - Raises the concern that a signal would be installed and then potentially removed shortly thereafter as part of the re-alignment project.
    - Fair share contribution in place of improvements at this intersection was discussed as a potential option.
  - Discussion of impacts at Bull and Hilton concludes that Langan to revise TIS based on the items discussed in the meeting and that if a signal is warranted, further

conversation about contribution in place of improvements can be discussed with the Department.

- E Canal Rd (SR 0921) and N Susquehanna Trail (SR 0297)
  - E. Kinard begins the discussion about the analysis at this intersection by mentioning that there is another development at this location (Freedom Square) that is proposing improvements to the intersection. TPD is the traffic engineer preparing the TIS associated with the Freedom Square development.
    - Freedom Square development is split into a Phase 1 and Phase 2.
    - Phase 2 improvements contain improvements at this intersection that would encompass/replace the improvements required as part of the Hines Warehouse project.
    - Phase 2 of Freedom Square is currently anticipated to have a 2027 build year.
    - R. Lothian stated that the analysis for this development included the Freedom Square improvements in 5 year buildout.
  - E. Kinard suggests revising the TIS to not include Freedom Square Phase 2.
    - J. Evans agrees with Erik's suggestion, stating that there is the potential that improvements at this intersection for the warehouse development go away if Freedom Square Phase 2 is not included.
    - Will allow everyone to better understand what's really needed for Hines warehouse development vs Freedom Square Phase 2.
  - A. Vigilante made the suggestion again of a fair share contribution in lieu of improvements in the case that Freedom Square Phase 2 doesn't move forward.

Langan to revise TIS and evaluate need for another meeting prior to submission.

## Action Items:

- Langan to revise the TIS based on the comments received in the November 30<sup>th</sup>, 2022 letter as well as per the discussions held during the meeting.
  - Analysis at Bull/Canal intersection to include 2024 build condition without the assumption of the Department Project as well as an analysis in the 5 year buildout scenarios to better evaluate the need for improvements under the warehouse project and separate Department Project.
  - Analysis at Bull/Hilton to remove the Dover Mixed Use Development and determine the improvements required solely for the Warehouse development. Further discussion to be had in conjunction with Department re-alignment project following revisions.
  - Analysis at Canal/Susquehanna Trail to remove Freedom Square Phase 2 to better understand the improvements associated with each project. Further discussion on required improvements/contributions to be held following revisions.
- Langan to coordinate an additional meeting with PennDOT, Townships, and County if necessary prior to formal resubmission of the TIS.





**pennsylvania**  
DEPARTMENT OF TRANSPORTATION

**Date:** 11/30/2022  
**Subject:** Highway Occupancy Permit Application No. 291441, Cycle No.1 - Returned For Revisions  
**To:** Bull Canal Dover Owner, LLC  
345 Hudson Street  
12th Floor  
New York, NY 10014  
**From:** PennDOT Engineering District 8-0  
2140 Herr Street  
Harrisburg, PA 17103-1699

Dear Applicant,

PennDOT has reviewed your application for completeness, consistency and compliance with applicable Department Regulations. This review has identified issues that must be addressed in order for our review to continue.

The Department's review comments are attached.

Once the comments have been addressed, please resubmit the application and associated material for further review.

Upon resubmission, the applicant's engineer should put together a letter that describes how each comment has been addressed and where each can be found. This will help expedite the review. For guidance on HOP applications refer to 67 PA Code, Chapter 441, Chapter 459 and PennDOT Publication 282, "Highway Occupancy Permit Guidelines". Additional comments may follow upon review of the resubmitted application.

If you have any questions regarding this matter, you may contact William Warden, District Permit Manager, at (717) 705-0925.

## **Response Comments**

**Date:** 11/30/2022

**Application Number:** 291441, Cycle No.1

## **Form Letter Notes**

(1) \* Upon resubmission, the applicants engineer should put together a response letter that includes each comment, describes how each comment has been addressed, and where each can be found in the report. A copy of these comments and any previously submitted reports should also be provided. This will help expedite the review.

\* Additional comments may follow upon subsequent review of the revised Transportation Impact Study (TIS). If you have any questions pertaining to the technical aspects of this review, please contact Mr. Eric Kinard of the District 8-0 Traffic Unit at (717) 787-9237.

## **Transportation Impact Study/Transportation Impact Assessment**

- (1) Provide review documentation and/or acceptance from the municipalities and the MPO for the traffic study. Address all comments to their satisfaction. Furthermore, continue to update the correspondence appendix with subsequent cycles. As previously requested, provide documentation of the Department's review and approval of the scoping meeting minutes in the correspondence appendix. Also, the Langan response to Cycle 2 Scope comments letter in the correspondence appendix appears to have omitted pages beyond page 1, and the full response letter must be included. Ensure that all comments are fully addressed in the TIS, including recommendations for outstanding items to be addressed with the HOP submission. (Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits, Step 1)
- (2) As the intersection improvements to be implemented by the Department as part of the congestion reduction project in development at the intersection of Bull Road (SR 4001) and Canal Road (SR 0921) are not improvements that will be recommended or constructed by the developer, they should be incorporated into no-build and build scenarios in addition to build with improvements scenarios, as applicable once the Department recommendations are finalized and a timeline determined. Provide the MPMS number and clearly indicate Kyle Kreiser's role in the Department project located at the intersection of Bull Road (SR 4001) and Canal Road (SR 0921). Additionally, provide copies of all correspondence with Department staff regarding the project in the correspondence appendix, and update with subsequent cycles.
- (3) Based on the significant LOS/delay degradation along the eastbound approach and the drops in intersection overall level of service at the intersection of Hilton Avenue and Bull Road (SR 4001),

mitigation is required as outlined in Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits, Step 10. Necessary improvements to mitigate the impact of the development will be required, regardless of further development in the area and may be the sole responsibility of this applicant. Revise the language of the study recommendations accordingly. Furthermore, as signalization of the intersection is the recommended mitigation, a full traffic signal warrant analysis based on 12-hour manual turning movement counts will be required along with an Intersection Control Evaluation (ICE).

- (4) Verify the recall mode used for the major street through phases at the intersection of Canal Road (SR 0921) and Main Street (SR 0074) for consistency between the traffic signal permit plans and the analysis.
- (5) Significant LOS/delay degradation occurs along the northbound approach at the intersection of Canal Road (SR 0921) and Susquehanna Trail (SR 0297) during the afternoon peak hour prior to the implementation of the Phase 2 improvements associated with Freedom Square Phase 2 and for the eastbound left turn once Phase 2 improvements are implemented (2029). The 10-seconds of additional delay increase requirement is applicable to the overall intersection delay when comparing with to without development scenarios, but additionally the Department may require mitigation to impacted approaches/lane groups with significant drops in LOS or delay. Necessary improvements must be identified to mitigate the development traffic impact within the study area. A developers agreement will be required, noting the applicants responsibility for mitigation should Freedom Square Phase 2 proceed on a slower timeline than this development.
- (6) Significant LOS/delay degradation occurs along the southbound approach at the intersection of Roosevelt Avenue (SR 4001) and Loucks Road (SR 0030) during the afternoon peak hour. The 10-seconds of additional delay increase requirement is applicable to the overall intersection delay when comparing with to without development scenarios, but additionally the Department may require mitigation to impacted approaches/lane groups with significant drops in LOS or delay. Necessary improvements must be identified to mitigate the development traffic impact within the study area.
- (7) Where with development queues are greater than without development queues and exceed existing/proposed storage lengths, provide mitigating measures. Provide storage lengths for all movements noted on the queue tables, including through movements.
- (8) Pending verification of the traffic volume projections, the future traffic analysis has not been reviewed in detail at this time, and additional comments may follow upon review of the updated TIS and Crash Analysis. That being said, please verify the LOS/delay tables for consistency with the analysis.

- (9) Provide footnotes on the LOS and queue tables to clearly indicate what improvements are proposed by others, where those improvements are proposed, and in what scenarios they are included. Furthermore, clearly indicate in the footnotes what improvements are proposed by the applicant in with improvements scenarios.
- (10) Provide excerpts from the approved traffic studies for the Freedom Square Development and Manchester Commerce Center (Northpoint) which include information regarding site trip generation, distribution, and any recommended improvements which impact this study area. Ensure that trip distribution and proposed improvements are consistent with these studies.
- (11) Based on the truck trip distribution shown on Figure 10, no truck traffic has been assigned to/from the west along U.S. 30, which may not be appropriate given destinations to the west. Verify and revise accordingly.
- (12) The following comments pertain to the gravity model:
  - a) Given the population distribution of Cumberland County and ease of access to I-83 from the eastern third of the county, trips to/from the county should be split between Bull Road (SR 4001) and I-83.
  - b) It is extremely unlikely that any traffic to/from Dover Township will enter the study area from the south via Roosevelt Avenue (SR 4001) as this route would be very circuitous. Revise the distribution for the Township accordingly.
  - c) Given the population distribution of Conewago Township, trips to/from the township should be split between Bull Road (SR 4001) and Susquehanna Trail (SR 0297).
  - d) The trip distribution percentages noted on Figure 8 do not match the distribution documentation provided in Appendix E. Clarify and revise accordingly.
- (13) Please include bookmarks for at a minimum each Appendix in the report PDF to ease the review.
- (14) Link the scoping # in EPS.
- (15) Provide photographs of all study intersections and proposed access driveway in accordance with Publication 282 Appendix A Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits, which specifies photos are to be taken approximately 50' and 200' upstream of the intersection. Furthermore, photos should be provided at a higher resolution and larger size for clarity.
- (16) Provide a copy of the most recent traffic signal permit plan for the intersections of Bull Road (SR 4001)/Church Road (SR 0238) and Canal Road (SR 0921)/Main Street (SR 0074) within the study. Permit plans for these intersections were not included in the appendix.
- (17) Verify the length of the westbound right turn lane and all northbound storage lanes at the

intersection of Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001) and the speed limit for the southbound approach at the intersection of Bull Road (SR 4001) and Church Road (SR 0238) for consistency between the traffic signal permit plans and the analysis. Furthermore, verify the lane widths at the intersection of Canal Road (SR 0921) and Main Street (SR 0074) for consistency between the intersection sketches and the analysis.

- (18) Verify the posted speed limits for all approach legs at the intersection of Bull Road (SR 4001) and Church Road (SR 0238) for consistency between the traffic signal permit plans and the analysis.
- (19) Provide a brief narrative in the TIS report that describes your approach to determining and incorporating the adaptive signal timings in your analyses. Verify the cycle lengths and offsets at the intersection of Loucks Road (SR 0030) and Roosevelt Avenue (SR 4001) for consistency between the traffic signal and system permit plans and the analysis.
- (20) Verify all traffic signal timing settings, including yellow change and red clearance intervals, minimum green times, passage times, and detector settings for consistency between the traffic signal permit plans and the analysis at all signalized study intersections.
- (21) Signal Timings should be optimized for without development and then applied in the with development conditions in opening and design years at all study intersections.
- (22) As Church Road (SR 0238) is state owned, provide the state route number on the figures.
- (23) Provide available and Chapter 441 desirable sight distances on the M-950S form. Furthermore, provide a summary and discussion of the results of the sight distance analysis in the traffic study text.
- (24) Verify the grades at the site access for consistency between the capacity analysis and sight distance analysis.
- (25) Please revise the turn lane warrant and length analyses if grades are less than 2%, as these are considered level terrain.
- (26) Concept plans of proposed roadway improvements shall be prepared with sufficient detail to illustrate their feasibility. Development of construction cost estimates is required along with noting any proposed design exception(s). The plans must also show right-of-way lines. The plan scale should be 50-scale unless otherwise agreed to at the scoping meeting. Ensure that the travel lane and shoulder widths are in accordance with PennDOT's Resurfacing, Restoration and Rehabilitation (3-R) Design Criteria found in PennDOT Publication 13M, Design Manual Part 2. (Policies and Procedures for Transportation Impact Studies Related to Highway Occupancy Permits, Step 9)
- (27) As previously noted, this application is expected to include the creation of a medium-volume or high-volume access. As such, the applicant shall comply with PennDOT's Intersection Control

Evaluation (ICE) Policy. Please refer to Appendix AI of Publication 10X (DM-1X) and the ICE portion of PennDOT's Traffic Signal Portal for additional information, guidance, and standard forms.

- (28) As outlined in the approved scope, provide a crash analysis under separate cover from the TIS. The TIS notes a crash analysis was uploaded to EPS but cannot be located. Ensure that documentation is included that the applicant also contacted the local police department for non-reportable crashes.
- (29) For future studies, consider utilizing the scenario manager within Synchro 11 to combine peak hours and analysis years in order to reduce the number of Synchro files.
- (30) Incorporate the eastbound US 30 right-turn overlap phase into the analysis at the intersection of Loucks Road (SR 0030) / Roosevelt Avenue (SR 4001).
- (31) Provide left turn conflict factor analysis at the proposed signal to be installed at Hilton Avenue and Bull Road (SR 4001). Consider providing left-turn phases if warranted and justified.



December 5, 2022

Terry Myers, P.E.  
C.S. Davidson, Inc.  
38 North Duke Street  
York, PA 17401

Re: Traffic Review Letter #1  
Hines Warehouses Transportation Impact Study (CSD#1619.3.08.30)  
Dover Township, York County

Dear Terry:

ELA Group has reviewed the York Industrial Development Transportation Impact Study, dated October 19, 2022. We offer the following comments:

1. The approved scoping application should be included in one of the appendices. The meeting minutes reference intersections by number, with no way to correlate the numbers to a specific intersection.
2. Measured sight distances must be included in the TIS to demonstrate that access is feasible at the proposed location.
3. A crash analysis in accordance with sections 22-719.5.B(3)(e) and (4)(h) should be submitted to Dover Township for review. This shall be submitted under separate cover.
4. As currently presented, the TIS appears to credit this developer for improvements made by others. Any improvements by other agencies that have committed funding or that a developer is required to make prior to the analysis year should be included in the No-Build scenario so that the impact of this development is evaluated. If no construction money is committed for a specific improvement, then it is generally accepted practice that no improvement should be assumed. An exception to this practice may be appropriate at the Bull Road and Canal Road intersection, where some type of improvement by the York Area MPO is likely, but a specific preferred alternative has not yet been identified.
5. The Executive Summary references a potential improvement at the intersection of Bull Road and Hilton Avenue, and a potential development that may impact that intersection. It also references improvements at the intersection of Canal Road and Susquehanna Trail, and an impact to that intersection by Phase 2 of Freedom Square. It is suggested that this developer will coordinate with the other developers for improvements to these intersections, but not specific measurable actions are proposed. It is generally accepted practice that in these cases, if the affected developers cannot reach an agreement, the developer receiving the first plan approval is the responsible party.

6. We have concerns regarding the trip generation calculation. Based on the projected employee count on the October 22, 2022 Sketch Plan (649 employees on each of the 2 largest shifts) and the total size of the 3 buildings, the employee per sf ratio is not consistent with that ratio for the ITE Warehousing land use. Although the ITE data is not sufficient for determining an exact ratio, the ratio for this site (1 employee per 1,400 sf) is more than 5 times higher than the approximate ITE ratio (1 employee per 7,700 sf). It is our opinion that with such a large discrepancy that either the trip generation should be based on the projected employee count or that adequate justification for the discrepancy be provided by the developer.

Please contact me at (717) 626-7271 or [mlhenise@elagroup.com](mailto:mlhenise@elagroup.com) if you have any questions.

Sincerely:

**ELA Group, Inc.**

Handwritten signature of Mark L. Henise in black ink, followed by a plus sign.

Mark L. Henise, P.E., PTOE  
Director of Transportation Engineering

c:\users\mlhenise\accdocs\ela group\241-057 hines warehouses - bull road (csd #1619.3.08.30)\project files\project documents\review comments\traffic review #1.docx



**YCPC Transportation Comments  
Transportation Impact Study  
York Industrial Development  
Bull Road (SR4001)  
Dover Township, York County, PA  
December 2022**

General Comments:

1. The YCPC has concerns about the Canal/Bull Road intersection. The improvement of a signal or roundabout programmed on the 2023 Transportation Improvement Program (TIP) is still in the early stages of development, and construction is not anticipated to start until 2027. The proposed build for this development is in 2024. This is where the concern is, this intersection was selected for the TIP due to being one of the most congested intersections in York County. How will this intersection operate until the TIP project is complete?
2. The intersection of Bull/Hilton Road intersection requires improvements and is contingent on another development, which is in the TIS Scoping Application process (#S0820220166). What happens to the required improvements if this project does not materialize?

25 August 2022

Eric Kinard  
Pennsylvania Department of Transportation  
Engineering District 8-0  
2140 Herr Street  
Harrisburg, PA 17103

**Re: Request for Preliminary Review and Scoping Meeting  
Hines - York  
Dover Township, York County, Pennsylvania  
Langan Project No.: 200164401**

Dear Eric,

Hines is proposing a warehouse development located along Bull Road (SR 4001) in Dover Township, York County, Pennsylvania. The site will be developed to provide three warehouse buildings totaling 1,768,275 square feet and associated trailer and car parking. Warehouse 1 will be 276,025 square feet, Warehouse 2 will be 956,000 square feet and Warehouse 3 will be 536,250 square feet.

The attached concept plan shows that site access will be provided via one full-access unsignalized driveway located along Bull Road (SR 4001).

As part of this revised scoping meeting application, we addressed comments from PennDOT's initial scoping review. In addition, we included anticipated trip distribution percentages for PennDOT review prior to beginning the formal analysis.

We received your review comments via EPS. Below are responses to those comments.

### **PennDOT Scoping Review Comments**

1. Please verify the segment/offset noted for S.R. 4001, as it appears to be inconsistent with the Straight-Line Diagram.

**Response: Once the location of the driveway is finalized, the correct segment and offset information will be shown on the applicable HOP plans.**

2. For high volume driveways, a 150' median must be provided. Internal site driveways should not be located within these areas.

**Response: Comment noted. We will work with PennDOT to determine the applicable design requirements for the proposed driveway.**

3. Include the site access at S.R. 4001 in the study intersections.

**Response: Comment noted. The intersection has been added to the list.**

4. There are some inconsistencies in the separate attachment scoping meeting application. Ensure that the peak periods are noted to include 6-9 AM and 3-6 PM throughout.

**Response: Comment noted. The scoping meeting with application pdf has been modified.**

5. Review documentation and acceptance from Dover Township, Conewago Township and the MPO, as necessary, for the scope should be provided. Confirm with the municipalities if there are any adjacent developments within the study area that should be added to the base traffic. Include documentation of correspondence within the study.

**Response: Comment noted. There was discussion about the approved developments to be included during the scoping meeting. It was determined that the projects to include as part of the background traffic should be Freedom Square, Northpoint and 570 Locust Point Road Warehouse.**

6. Provide trip distribution and assignment information including calculations and backup data to support the trip distribution percentages. The Department concurs with the use of a gravity model for distribution and assignment of the development traffic. A review of the backup data and methodologies will be required prior to the Department accepting the trip distribution. Consider submitting this for approval prior to submitting the TIS.

**Response: A copy of the anticipated distribution percentages have been included within this revised scoping submission. The employee passenger car distributions have been created utilizing a journey to work census model.**

7. Considering the potential impacts of the truck routes from the site trip distribution, truck turning templates may be requested for critical intersections to document that the largest anticipated vehicle for this development can safely maneuver turn movements.

**Response: Comment noted. This information will be provided within the Transportation Impact Study, as applicable.**

8. At locations where traffic signal warrant analysis is anticipated, 12-hour manual turning movement counts are recommended in accordance with PennDOT Publication 46 (i.e., Bull Road (S.R. 4001) and East Canal Road (S.R. 0921)).

**Response: Comment noted.**

9. Provide calibrated Synchro 11 analyses (in electronic format) with each submission. Synchro 10 is no longer accepted by the Department, so please revise for Synchro 11 throughout.

**Response: Synchro 11 will be used for all analysis.**

10. Include the site access at S.R. 4001 in the list of study intersections.

**Response: The site driveway intersection will be analyzed as part of the study area intersections.**

11. As noted in the scoping application, per PennDOT One Map, a congestion reduction project is planned for the intersection of S.R. 4001 (Bull Road) and S.R. 0921 (East Canal Road). Coordination with the PennDOT project manager, Kyle Kreiser (kykreiser@pa.gov) will be necessary considering that this project is anticipated to be completed in 2027, which is between the opening year and design year of this project.

**Response: Comment noted. We will coordinate with Kyle Kreiser accordingly.**

12. The sight distance evaluation should be completed for passenger cars and combination trucks if combination truck traffic exceeds 5.0% of the total traffic using the proposed driveway.

**Response: The sight distance calculations will include both passenger cars and combination trucks.**

13. Please add the 95th and 50th percentile queues from Synchro for the signalized intersection queue analyses, in addition to the 95th from HCM 6th methodology results.

**Response: The TIS will include the 50<sup>th</sup> and 95<sup>th</sup> percentile queues from the Synchro percentile delay methodology.**

14. Please clarify the crash data and analysis will include study area roadway segments in addition to study intersections, and crash analysis to include mitigation options if crash trends are present at an intersection or along a corridor. The applicant should also contact the municipality for input regarding non-reportable crashes.

**Response: The crash data analysis will include the study area roadway segments in addition to the study intersections.**

15. Please revise gap studies from N/A to as applicable. If the unsignalized capacity analyses shows that a movement is projected to operate at an unacceptable level of service, a gap study will be required to identify if a sufficient number of gaps exist.

**Response: Comment noted.**

16. Please note that an Intersection Control Evaluation (ICE) may be required for this project, since this project appears to include a proposed medium or high-volume access, a proposed 4th leg to an existing intersection, or change in traffic control or lane configurations at an existing intersection. Refer to Appendix AI of Publication 10X (DM-1X) for guidance on when an ICE is required. This will be further considered with the additional information to be provided in the TIS and/or HOP submission.

**Response: Comment noted.**

Enclosed please find a copy of the revised Scoping Meeting Application.

Sincerely,

**Langan Engineering and Environmental Services, Inc.**



Ann Marie Vigilante, P.E.

Senior Associate/ Vice President

cc: Laurel Oswalt, Dover Township Manager  
Terry Myers, Township Engineer  
Hines Team  
Langan Team

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2700 Kelly Road, Suite 200 Warrington, PA 18976 T: 215.491.6500 F: 215.491.6501  
Mailing Address: P.O. Box 1569 Doylestown, PA 18901

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**Meeting:** Hines - York  
PennDOT TIS Scoping Meeting  
Langan Project No.: 200164401

**Date / Location:** Meeting Date: July 18, 2022  
Virtual Conference Call

**Attendees:** Eric Kinard (PennDOT District 8-0)  
Bill Warden (PennDOT District 8-0)  
Dean Noles (PennDOT District 8-0)  
Chris Flad (PennDOT District 8-0)  
Laurel Oswalt (Dover Township Manager)  
Heather Bitner (York County MPO)  
Terry Myers (Dover Township and Conewago Township Engineer)  
John McLucas (Dover Township Planning)  
Whitney Zimmermann (Hines)  
Thomas Griggs (Hines)  
Eric Mitman (Hines)  
AnnMarie Vigilante (Langan)  
Keith Ottles (Langan)  
Ryan Lothian (Langan)  
Shaun Haas (Langan)

**Prepared By:** AnnMarie Vigilante / Ryan Lothian

**Date Prepared:** August 1, 2022

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Following introductions, Whitney Zimmermann introduced the project and the Hines team. Whitney noted that the project team recently closed on the property and are now the landowners. The development will consist of approximately 1.8 million square feet of as-of-right industrial. Eric Kinard wanted to confirm that the project is proposing warehousing, and the Hines team confirmed that is the case. AnnMarie Vigilante stated that Langan will utilize LUC 150 "Warehousing" for the trip generation calculations.

AnnMarie gave a brief overview of the anticipated operations and stated that the development is proposing one full-access driveway along Bull Road (SR 4001) and that even though the anticipated daily trips are slightly above 3,000, the driveway would not necessarily be a true high-volume driveway design because the majority of trips will be coming from the south of the site access. In addition, site tractor-trailer trucks are assumed to travel along Bull Road to the south and Canal Road to the east.

AnnMarie stated that a journey to work analysis will be prepared to determine the trip distribution percentages for the employees.

# Meeting Minutes

Terry Myers and John McLucas described how there are trucks in the existing conditions heading towards downtown Dover towards the west. Whitney stated that the Hines team anticipates that most, if not all, of the trucks for this project are anticipated to go east towards I-83. There was discussion about signage and design elements to help send the trucks in the correct directions. Whitney said that because Hines will own and maintain the site, they want to encourage their drivers to use the right truck routes.

AnnMarie asked about the new interchange that is being proposed along I-83. Heather Bitner stated that there is no funding for this new interchange and that it would be many years out before anything is done at this location. Eric agreed and stated that this project should not anticipate an Interchange at I-83 and SR 0921 for analysis purposes. Langan will not assume that a new interchange is constructed as part of this study.

There was discussion about the improvement project located at the intersection of Bull Road (SR 4001) and Canal Road (SR 0921). Heather stated that is an MPO project and is on the transportation improvement program. Eric said that it will be a department project. A traffic signal and a roundabout are being considered and Heather said at this time it is looking more likely that a roundabout will be constructed. Terry asked whether a design contract has been awarded, as he understood they recently took proposals. AnnMarie stated that Langan will coordinate with the PennDOT project manager to make sure that the Hines development is being considered when designing the improvements at this intersection.

At this time, the specific scoping application comments (see attached) issued by PennDOT were discussed. The additional discussion on the conference call regarding these comments are summarized as follows:

Scoping Application Comment #1 – Eric stated that this is a minor change and Langan will revise the segment/offset, as needed.

Scoping Application Comment #2 –Langan explained that the ADT is just over the high-volume threshold of 3,000, and that mostly all of the traffic will be coming to/from the south, therefore, a typical high-volume driveway design may not make sense. Eric explained that once the project moves forward towards the HOP design, the layout of the proposed driveway along Bull Road will be discussed. At this time, it is recommended to install a median for 150 feet, and that no internal driveways should be constructed within that 150 foot span.

AnnMarie explained that there are options for the driveway design that can be implemented to deter trucks from turning left onto Bull Road. Eric agreed that PennDOT would not want trucks going north along Bull Road. Terry mentioned that the Locust Point Project where driveways were designed to restrict left-turning trucks, in addition to a similar design for project on Mount Zion for DHL. These were identified as two local examples that we should pattern the design after. PennDOT/Terry mentioned that they would send examples to Langan.

Scoping Application Comment #3 – Ryan Lothian explained that the study area will include site access driveway along SR 4001.

Scoping Application Comment #4 – Comment noted. Ryan stated that the scoping application resubmission will be revised to show the same 6-9AM and 3-6PM peak periods throughout the application.

Scoping Application Comment #5 – There was discussion about projects within the nearby area that would need to be included as part of the base traffic. Eric and Terry noted that there is a significant mixed-use project located along SR 0921 that will consist of residential, commercial, hotels, restaurants, etc. In addition, Terry noted the Northpoint project which is an industrial project on the south side of SR 0921. It was determined that the projects to include as part of the background traffic should be Freedom Square, Northpoint and 570 Locust Point Road Warehouse. John McLucas asked about a development at Bull Road and Hilton Road, however, Terry noted that he was not aware of a TIS for that project as of yet. Eric noted that the department only requires that you include studies that will beat your project to the finish line. Langan will coordinate with Dover, Conewago and PennDOT to get the necessary information from the traffic studies for the developments to be included as part of the background traffic.

Scoping Application Comment #6 and #7 – Eric suggested submitting the trip distribution percentages prior to submitting the study. In addition, PennDOT would like to see a truck routing map with some truck turns at critical intersections. AnnMarie stated that the truck turns and routing map will be included with future submissions. The truck turns will be roughly outlined over available google earth aerial imagery.

Scoping Application Comment #8 – Comment noted. As previously discussed, the intersection of Bull Road (SR 4001) and East Canal Road (SR 0921) is currently being evaluated and studied for a potential signal or roundabout. The applicable 12 hour count would have been completed for that PennDOT project. Langan will incorporate that information, as needed.

Scoping Application Comment #9 and #10 – Ryan stated that the Synchro analysis will be prepared using Synchro 11. In addition, as previously stated, any site driveway(s) will be included as part of the study area.

Scoping Application Comment #11 – Eric stated that Langan should coordinate with Kyle Kreiser regarding the planned improvement project at the intersection of Bull Road (SR 4001) and East Canal Road (SR 0921). Langan will incorporate these improvements, and any other improvements identified for the nearby approved developments, within the background no-build analysis (as applicable). In addition, Ryan stated that Langan will include improvements by others as part of the no-build conditions, as applicable, based on timing and phasing of the other developments.

Scoping Application Comment #12 – Eric suggested looking at the desirable rates for trucks on SR 4001 because it is assumed that the trucks will account for more than 5%



of the trips. AnnMarie agreed that we will utilize the more conservative calculations when going through the HOP design.

Scoping Application Comment #13 – Eric requested that Langan provide the 50<sup>th</sup> and 95<sup>th</sup> percentile queues from Synchro printouts, in addition to the 95<sup>th</sup> percentile queues from HCM 6<sup>th</sup> Edition results. Ryan stated that the requested queues will be included in the TIS.

Scoping Application Comment #14 – Eric asked that the crash data analysis include segments, in addition to the specific intersections. Ryan said that the crash data will include the applicable segments.

Scoping Application Comment #15 – Eric stated that it is possible a gap study could be required, and that the scoping application should be revised as such.

Scoping Application Comment #16 – Eric said that an ICE form will be needed for the project for the high-volume driveway design.

Eric identified current issues at the study intersections. Specifically, the eastbound left-turn at intersection 9 and the southbound approach at intersection 5.

Eric asked if there were any additional concerns from the municipalities. John McLucas said that there are concerns if trucks head west. There was additional discussion about the site trucks, and it was determined that the majority of trucks will be going to the east towards I-83. Based on the anticipated operations of the building, the Hines team explained that it does not appear that many trucks will be heading towards the west, as many of the tenants would be focused on regional distribution and not local deliveries.

Dean Noles asked Langan to provide meeting minutes and also to link the scoping application to the TIA when we submit on EPS. In addition, the TIS submission on EPS should include bookmark tabs for ease of review.

## Action Items

- Langan will coordinate with PennDOT Project Manager Kyle Kreiser regarding the SR 4001 and SR 0921 project.
- Langan will submit the proposed trip distribution percentages to PennDOT for review and approval prior to starting analysis.
- PennDOT/Terry Myers will send examples of recently approved/constructed driveways that utilized truck restriction designs.
- Langan will coordinate with the applicable contacts provided by Terry Myers to get copies of the traffic studies for the adjacent developments to be used as background traffic. If there are any issues, Langan will ask for PennDOT's help in reaching out.
- Langan will continue to coordinate with the adjacent municipalities moving forward.

**Draft Scope Application Cycle 1 Comment Sheet**

COUNTY:	York	MUNICIPALITY:	Dover Township
JOB NAME:	Hines-York Warehouse	PREPARED BY:	Langan Engineering & Envir. Services
APPLICANT:	Hines	REVIEW BY:	PennDOT/McM

**Please incorporate these comments into the revised Scope Application and resubmit:**

**Scope Application Comments:**

- (1) LOCATION OF PROPOSED DEVELOPMENT:**
  - 1. Please verify the segment/offset noted for S.R. 4001, as it appears to be inconsistent with the Straight-Line Diagram.
  
- (2) DESCRIPTION OF PROPOSED DEVELOPMENT:**
  - 2. For high volume driveways, a 150' median must be provided. Internal site driveways should not be located within these areas.
  
- (3) DEVELOPMENT SCHEDULE AND STAGING:** No comments.
  
- (4) TRIP GENERATION:** No comments.
  
- (5) TRANSPORTATION IMPACT STUDY REQUIRED?** No comments.
  
- (6) TRAFFIC IMPACT ASSESSMENT REQUIRED?** No comments.
  
- (7) STUDY AREA:**
  - 3. Include the site access at S.R. 4001 in the study intersections.
  
- (8) STUDY AREA TYPE:** No comments.
  
- (9) TIS ANALYSIS PERIODS AND TIMES:**
  - 4. There are some inconsistencies in the separate attachment scoping meeting application. Ensure that the peak periods are noted to include 6-9 AM and 3-6 PM throughout.
  
- (10) TRAFFIC ADJUSTMENT FACTORS:** No comments.
  
- (11) OTHER PROJECTS WITHIN STUDY AREA TO BE ADDED TO BASE TRAFFIC:**
  - 5. Review documentation and acceptance from Dover Township, Conewago Township and the MPO, as necessary, for the scope should be provided. Confirm with the municipalities if there are any adjacent developments within the study area that should be added to the base traffic. Include documentation of correspondence within the study.
  
- (12) TRIP DISTRIBUTION AND ASSIGNMENT:**
  - 6. Provide trip distribution and assignment information including calculations and backup data to support the trip distribution percentages. The Department concurs with the use of a gravity model for distribution and assignment of the development traffic. A review of the backup data and methodologies will be required prior to the Department accepting the trip distribution. Consider submitting this for approval prior to submitting the TIS.
  - 7. Considering the potential impacts of the truck routes from the site trip distribution, truck turning templates may be requested for critical intersections to document that the largest anticipated vehicle for this development can safely maneuver turn movements.

**(13) APPROVAL OF DATA COLLECTION ELEMENTS AND METHODOLOGIES:**

8. At locations where traffic signal warrant analysis is anticipated, 12-hour manual turning movement counts are recommended in accordance with PennDOT Publication 46 (i.e., Bull Road (S.R. 4001) and East Canal Road (S.R. 0921)).

**(14) CAPACITY/LOS ANALYSIS:**

9. Provide calibrated Synchro 11 analyses (in electronic format) with each submission. Synchro 10 is no longer accepted by the Department, so please revise for Synchro 11 throughout.
10. Include the site access at S.R. 4001 in the list of study intersections.

**(15) ROADWAY IMPROVEMENTS/MODIFICATIONS BY OTHERS TO BE INCLUDED:**

11. As noted in the scoping application, per PennDOT One Map, a congestion reduction project is planned for the intersection of S.R. 4001 (Bull Road) and S.R. 0921 (East Canal Road). Coordination with the PennDOT project manager, Kyle Kreiser (kykreiser@pa.gov) will be necessary considering that this project is anticipated to be completed in 2027, which is between the opening year and design year of this project.

**(16) OTHER NEEDED ANALYSES:**

12. The sight distance evaluation should be completed for passenger cars and combination trucks if combination truck traffic exceeds 5.0% of the total traffic using the proposed driveway.
13. Please add the 95<sup>th</sup> and 50<sup>th</sup> percentile queues from Synchro for the signalized intersection queue analyses, in addition to the 95<sup>th</sup> from HCM 6<sup>th</sup> methodology results.
14. Please clarify the crash data and analysis will include study area roadways segments in addition to study intersections, and crash analysis to include mitigation options if crash trends are present at an intersection or along a corridor. The applicant should also contact the municipality for input regarding non-reportable crashes.
15. Please revise gap studies from N/A to as applicable. If the unsignalized capacity analyses shows that a movement is projected to operate at an unacceptable level of service, a gap study will be required to identify if a sufficient number of gaps exist.
16. Please note that an Intersection Control Evaluation (ICE) may be required for this project, since this project appears to include a proposed medium or high-volume access, a proposed 4<sup>th</sup> leg to an existing intersection, or change in traffic control or lane configurations at an existing intersection. Refer to Appendix AI of Publication 10X (DM-1X) for guidance on when an ICE is required. This will be further considered with the additional information to be provided in the TIS and/or HOP submission.

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**TRANSPORTATION IMPACT STUDY (TIS)  
SCOPING MEETING APPLICATION**

Scoping Meeting Date: July 18, 2022

Applicant: Hines

Business Partner ID: The applicant will apply for for a BPID

Applicant's Consultant: Langan Engineering & Environmental Services

Applicant's Primary Contact: Whitney Zimmermann and Eric Mitman

*(Attach a list of meeting attendees along with phone numbers and email addresses)*

(1) LOCATION OF PROPOSED DEVELOPMENT: (Attach location map if available)

PennDOT Engineering Dist.: 8 - 0 County: York

Municipality: Dover Township

State Route(s) (SR): SR 4001 (Bull Road)

Segment(s): Segment 0240 Offset(s): 332

Are 102" wide combinations (w/ trailer lengths greater than 28') allowed access to SR

in accordance with 75 PA. C.S. §4908: Yes

(2) DESCRIPTION OF PROPOSED DEVELOPMENT: (Attach site plan if available)

A warehouse development is proposed to be constructed along SR 4001 (Bull Road) in Dover Township, York County, Pennsylvania. The site will be developed to provide three warehouse buildings totaling 1,768,275 sf and associated trailer and car parking. Warehouse 1 will be 276,025 sf, Warehouse 2 will be 956,000 sf and Warehouse 3 will be 536,250 sf. Site access will be provided via one full-access unsignalized driveway along SR 4001 (Bull Run Road). A copy of the concept plan is included as an attachment.

Proposed site access: One full-access unsignalized driveway along SR 4001 (Bull Road)

Proposed land uses: Warehouse

Community linkages (*access to neighboring properties, cross easements, pedestrian and*

*transit accommodations*): To be determined. Pedestrian and transit accommodations

will be provided, as necessary, to meet the design requirements.

(3) DEVELOPMENT SCHEDULE AND STAGING:

Anticipated Opening Date: 2024

Full Buildout Date: 2024

Describe Proposed Development Schedule/Staging:

Construction is anticipated to begin once approvals have been obtained. For purposes of this traffic projection, we have assumed that the development will be constructed by the end of 2024.

- (4) TRIP GENERATION: (Use the most recent edition of "Institute of Transportation Engineers (ITE) *Trip Generation*," unless the Department approves another source. Non-ITE methods must be fully justified based on surveys of multiple sites of the same land use type and size.)

Trip generation for the proposed development will be based on:

ITE *Trip Generation Manual*.  
(List proposed development land uses and associated ITE Land Use Codes)

Other independent surveys.  
(Attach justification for non-ITE methods)

List land development and trip generation information, as appropriate. If necessary, attach additional sheets to indicate additional land uses or development phases.

Land Use	Size	Daily Trips	Peak Hour Trips		TOTAL
			Inbound	Outbound	
(1) LUC 150 - Warehousing	276,025 SF	474 (308 cars, 166 trucks)	AM = 44 PM = 17	AM = 13 PM = 43	AM = 57 PM = 60
(2) LUC 150 - Warehousing	956,000 SF	1635 (1068cars, 574 trucks)	AM = 125 PM = 48	AM = 38 PM = 124	AM = 163 PM = 172
(3) LUC 150 - Warehousing	536,250 SF	917 (595 cars, 322 trucks)	AM = 70 PM = 27	AM = 21 PM = 70	AM = 91 PM = 97
(4)					
(5)					
(6)					
<b>Totals</b>		3,026 (1,964 cars, 1,062 trucks)	AM = 239 PM = 92	AM=72 PM=237	AM = 311 PM = 329

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(5) ESTIMATED DAILY TRIP GENERATION/DRIVEWAY CLASSIFICATION:

(a) Estimated Daily Trip Generation of Proposed Development -- Assuming One Access Point and Full Build out/Occupancy of Entire Tract: trips/day  
Based on Average Weekday: 3,026 trips/day = 1,513 vehicles/day

(b) Driveway Classification Based on Trip Generation and One Access Point:

Low Volume: \_\_\_\_\_

Medium Volume: \_\_\_\_\_

High Volume: \_\_\_\_\_ X \_\_\_\_\_

(6) TRANSPORTATION IMPACT STUDY REQUIRED?

\_\_\_\_ No

X Yes, based on: X 3,000 or more vehicle trips/day generated

X During any one-hour time period, 100 or more new (added) vehicle trips generated entering or 100 or more new (added) vehicle trips generated exiting development

\_\_\_\_ Other considerations as described below:

(7) TRANSPORTATION IMPACT ASSESSMENT REQUIRED? X No \_\_\_\_ Yes

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(If a TIS is required, the following sections of this checklist will be discussed at the TIS Scoping Meeting. The applicant may provide preliminary information.)

(8) STUDY AREA: (Describe; attach map and/or diagram)

Roadway and Study Intersections

A copy of the anticipated Study Area Map has been included as an attachment with this submission. Land use context (Refer to PennDOT Design Manual, Part 1X, Appendix B)

Urban

Known Congestion Areas

To be determined.

Known Safety Concerns

No Known safety concerns

Known Environmental Constraints

To be determined.

Pedestrian/Bike Review (Community Centers, Parks, Schools, etc.)

Pedestrian/Bike review will be prepared in conjunction with the TIS.

Transit Review (Current routes/stops)

Transit review will be prepared in conjunction with the TIS.

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(9) STUDY AREA TYPE: Urban   X   Rural           

(10) TIS ANALYSIS PERIODS AND TIMES:

(List periods and times. Normal analysis periods are existing conditions, 5 years in the future without development, and 5 years in the future with development. Normal analysis times for each period are the AM peak hour, the PM peak hour, and the peak hour of site-generated traffic.)

We assumed that the TIS analysis periods will be the weekday morning (6-9 AM) and weekday evening (3-6 PM) peak hours, as these hours coincide with the typical peak time periods of the proposed land use and adjacent street traffic. These time periods will be analyzed for the existing conditions, the opening year no-build and build conditions and the five year build out no-build and build conditions.

(11) TRAFFIC ADJUSTMENT FACTORS:

(a) Seasonal Adjustment: (Identify counts requiring adjustment and methodology)

N/A

(b) Annual Base Traffic Growth:   0.54   %/yr. Source:   PennDOT BP&R  

(c) Pass-By Trips: (Attach justification where required)

<u>Land Use</u>	<u>%</u>	<u>Source</u>
N/A		

(d) Captured Trips for Multi-Use Sites:

(List % and manner of application. Attach justification where required.)

N/A

(e) Modal Split Reductions

To be conservative in the analysis, we will assume that all employees will utilize their own vehicle to access the site.

(f) Other Reductions

N/A

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(12) OTHER PROJECTS WITHIN STUDY AREA TO BE ADDED TO BASE TRAFFIC:

(Identify proposed developments with issued permits that need to be included.)

Based on the scoping meeting discussions, it was determined that the projects to include as part of the background traffic should be Freedom Square, Northpoint and 570 Locust Point Road Warehouse.

(13) TRIP DISTRIBUTION AND ASSIGNMENT:

(Describe; explain/justify; attach diagram and related information.)

The proposed trip distribution of site generated traffic will be based on a combination of manual turning movement counts and knowledge of surrounding roadways, including access to major arterials. We will prepare a journey to work gravity model for the passenger car trip distribution and compare to the existing traffic counts. Truck trip distribution will be determined based on approved truck routes.

(14) Approval of Data Collection Elements and Methodologies :

Location

Period

Type

Data collection elements and methodologies will be based on PennDOT's TIS guidelines. We will perform turning movement traffic counts at the study area intersections during the 6-9 AM and 3-6 PM peak periods utilizing video (MioVision).

(15) CAPACITY/LOS ANALYSIS:

Location

Period

Type

Level of Service (LOS) capacity analyses will be conducted for the intersections within the study area using Synchro Version 10. The Synchro analysis printouts will be HCM 6th Edition. PennDOT default values will be utilized based on Publication 46, Chapter 10, Exhibits 10-9 through 10-12 (As applicable.)

(16) ROADWAY IMPROVEMENTS/MODIFICATIONS BY OTHERS TO BE INCLUDED:

(Projects programmed for construction or other developments with issued permits.)

To be determined after review of the approved traffic studies for the background developments.



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(17) OTHER NEEDED ANALYSES:

(a) Sight Distance Analysis:

(Required for all site access driveways; identify other locations)

Sight distance calculations will be prepared, as necessary, and will be included in the Transportation Impact Study. All proposed access points will be designed to meet PennDOT and Dover Township sight distance criteria. Sight distance calculations will be provided for passenger cars and combination trucks.

(b) Signal Warrant Analysis:

(Identify locations)

A signal warrant analysis will be prepared in conjunction with the Transportation Impact Study, as necessary.

(c) Required Signal Phasing/Timing Modifications:

(Determine for all signalized intersections; specify methodology.)

Based upon the results of the capacity analyses, signal phasing/timing modifications may be required. Revised traffic signal permit plans will be provided, where applicable.

(d) Traffic Signal Corridor/Network Analysis:

(Identify locations/methodology)

Coordinated intersections will be analyzed using Synchro 11 software.

(e) Analysis of the Need for Turning Lanes:

(Identify locations/methodology)

Turning lane warrant analysis will be prepared in accordance with Publication 46.

(f) Turning Lane Lengths:

(Identify methodology to be used)

Turning lane storage lengths will be determined, as necessary, based on a combination of Publication 46 and the 95th percentile queue lengths as determined by Synchro.

- 
- (g) Left Turn Signal Phasing Analysis:  
(Identify locations/methodology)

Left-turn signal phasing warrant analysis will be prepared and included in the Transportation Impact Assessment as needed.

- (h) Queuing Analysis:  
(Identify locations/methodology)

A queue table will be provided summarizing HCM 6th Edition 95th percentile queues at the study intersections for all study years and scenarios. Storage lengths or distances from the stop bar to adjacent intersections will be listed in the table. The queue table will also include the 50th and 95th percentile queues from the Synchro percentile delay methodology.

- (i) Gap Studies:  
(Identify locations/methodology)

As applicable.

- (j) Crash Analysis:  
(Identify locations)

The most recent 5 years of crash history will be requested for the study area intersections. A separate Crash Data Report will be included with the TIS submission. The crash analysis will include roadway segments in addition to the study area intersections.

- (k) Weaving Analysis:  
(Identify locations)

N/A

- (l) Other Required Studies:  
(Specify locations/methodology)

N/A

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(18) ADDITIONAL COMMENTS OR RECOMMENDATIONS RELATIVE TO THE SCOPE OF THE TIS:

We anticipate that a Transportation Impact Study will be required for this project. We have included a figure as an attachment showing the "Anticipated Study Area Intersections" that we are assuming will be required to be studied. These intersections include:

1. E Canal Road (SR 921) and Main Street (SR 0074) - signalized
2. Bull Road (SR 4001) and E Canal Road (SR 921) - unsignalized
3. E Canal Road (SR 921) and Greenbriar Road - unsignalized
4. E Canal Road (SR 921) and Susquehana Trail (SR 297) - signalized
5. I-83 SB and SR 297 - signalized
6. I-83 NB and SR 297 - signalized
7. Bull Road (SR 4001) and Hilton Avenue - unsignalized
8. Roosevelt Ave (SR 4001) and Church Road (SR 238) - signalized
9. Route 30 and Roosevelt Ave (SR 4001) - signalized
10. Bull Road (SR 4001) and Site Driveway

\_\_\_\_\_ Date: \_\_\_\_\_  
Signature of Applicant's Engineer

\_\_\_\_\_ Date: \_\_\_\_\_  
Signature of District Traffic PennDOT Representative

\_\_\_\_\_ Date: \_\_\_\_\_  
Signature of District Permit PennDOT Representative (if present)

\_\_\_\_\_ Date: \_\_\_\_\_  
Signature of Municipal Traffic Representative

# **ATTACHMENTS**

# **SITE PLAN**

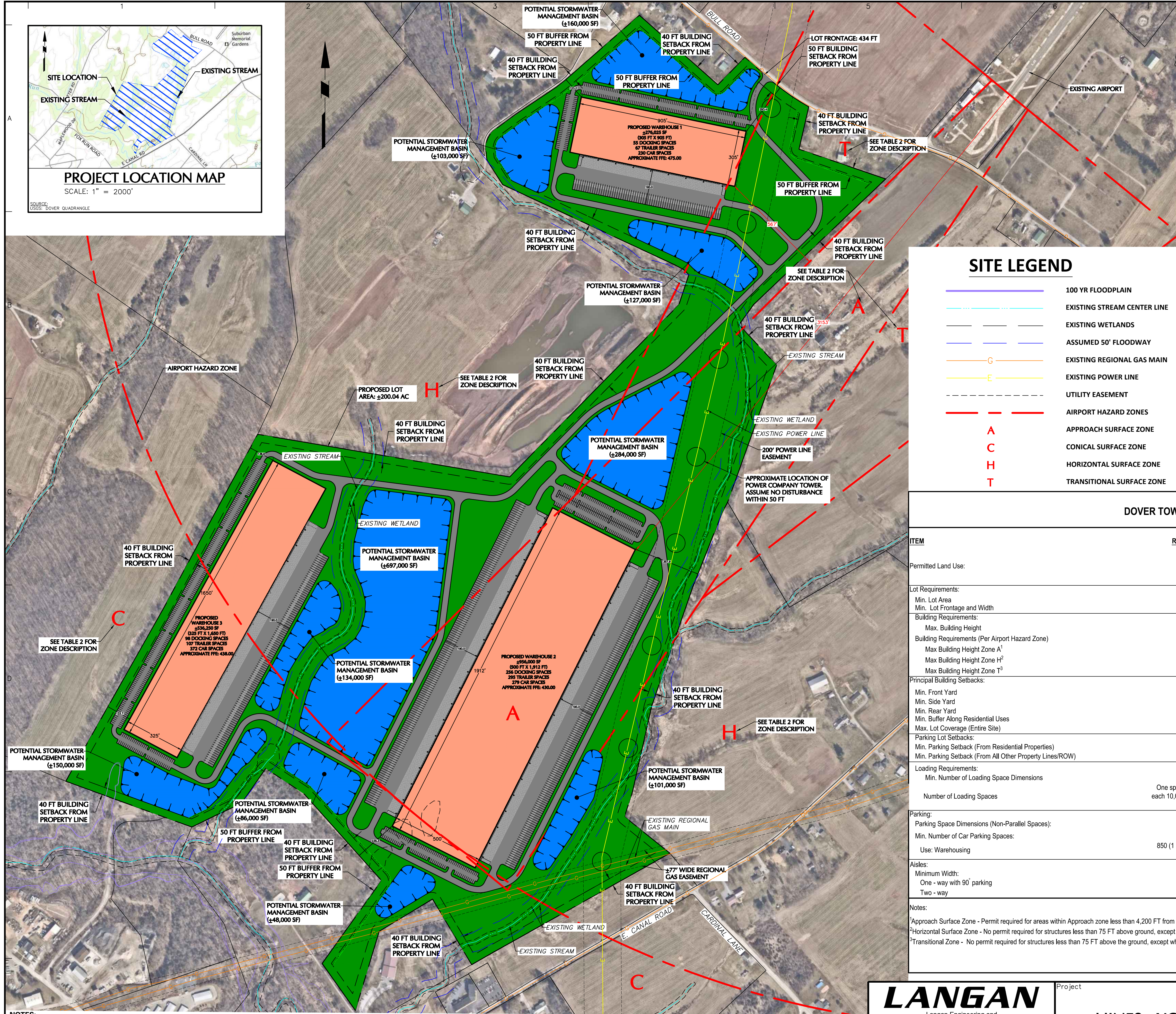
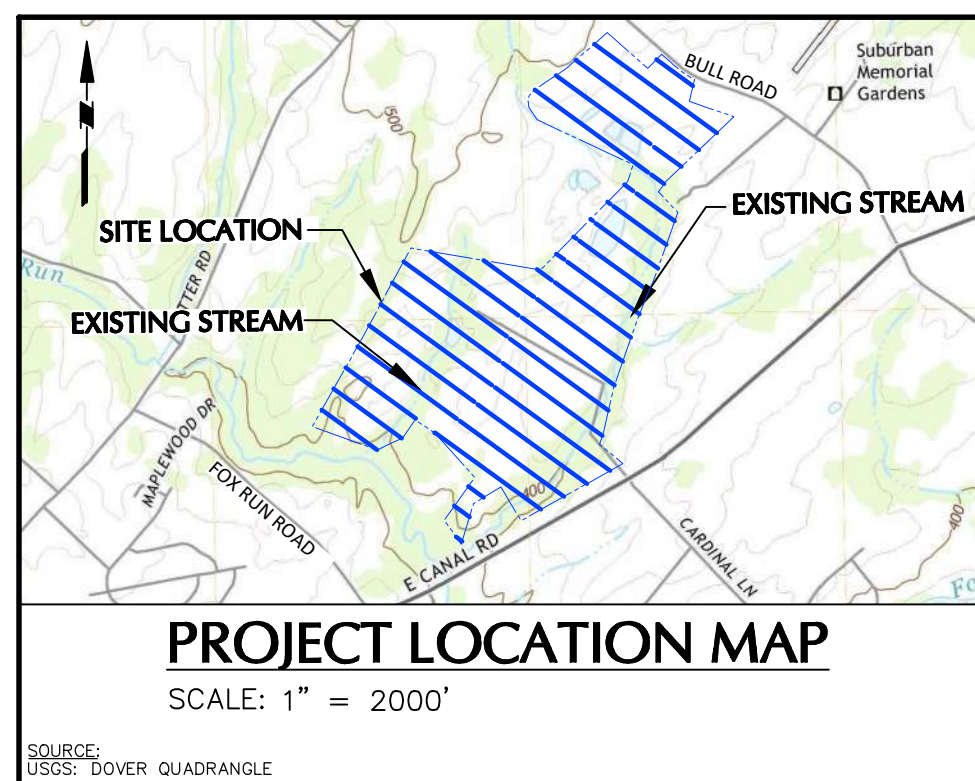


TABLE 2

*ELEVATION AT AIRPORT RUNWAY: 476.00	WAREHOUSE 1	WAREHOUSE 2	WAREHOUSE 3
ZONE	T <sup>1</sup>	A <sup>2</sup>	H <sup>3</sup>
ELEVATION (FT): E	475.00	430.00	438.00
DISTANCE (FT): D	563	3153	N/A
ALLOWABLE BUILDING HEIGHT FORMULA	(ELEV. OF APPROACH SURFACE CENTERLINE PERPENDICULAR TO LOCATION) + (D/7) - E	(RUNWAY ELEV.) + ((D-200)/20) - E	(RUNWAY ELEV.) + 150 - E
ALLOWABLE HEIGHT (FT)	63.00 <sup>4</sup>	148.50 <sup>4</sup>	188.00 <sup>4</sup>
MAXIMUM BUILDING ROOF ELEVATION (FT)	538.00	578.50	626.00

- NOTES:
- TRANSITIONAL SURFACE ZONE - SLOPES SEVEN FEET OUTWARD FOR EACH FOOT UPWARD BEGINNING AT THE SIDES OF AND AT THE SAME ELEVATION AS THE PRIMARY SURFACE AND APPROACH SURFACE, AND EXTENDING TO A HEIGHT OF 150 FEET ABOVE AIRPORT ELEVATION.
  - APPROACH SURFACE ZONE - ESTABLISHED BENEATH THE VISUAL APPROACH SURFACE. THE INNER EDGE IF THIS ZONE COINCIDED WITH THE WIDTH OF THE PRIMARY SURFACE AND IS 250 FEET WIDE. THE ZONE EXPANDS OUTWARD UNIFORMLY TO A WIDTH OF 1,250 FEET AT A HORIZONTAL DISTANCE OF 5,000 FEET FROM THE PRIMARY SURFACE. ITS CENTERLINE IS THE CONTINUATION OF THE CENTERLINE OF THE RUNWAY.
  - HORIZONTAL SURFACE ZONE - ESTABLISHED BENEATH THE HORIZONTAL SURFACE, 150 FEET ABOVE THE ESTABLISHED AIRPORT ELEVATION, THE PERIMETER OF WHICH IS CONSTRUCTED BY SWINGING ARCS OF 5,000 FEET RADII FROM THE CENTER OF EACH END OF THE PRIMARY SURFACE OF EACH RUNWAY AND CONNECTING THE ADJACENT ARCS BY DRAWING LINES TANGENT TO THOSE ARCS. THE HORIZONTAL SURFACE ZONE DOES NOT INCLUDE THE APPROACH SURFACE AND TRANSITIONAL SURFACE ZONES.
  - ALLOWABLE HEIGHT CALCULATIONS ARE ROUNDED DOWN TO THE NEAREST HALF FOOT.

**SITE LEGEND**

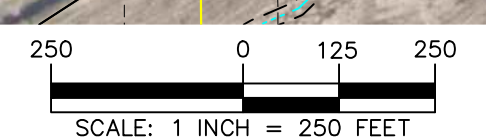
- 100 YR FLOODPLAIN
  - EXISTING STREAM CENTER LINE
  - EXISTING WETLANDS
  - ASSUMED 50' FLOODWAY
  - EXISTING REGIONAL GAS MAIN
  - EXISTING POWER LINE
  - UTILITY EASEMENT
  - AIRPORT HAZARD ZONES
  - APPROACH SURFACE ZONE
  - CONICAL SURFACE ZONE
  - HORIZONTAL SURFACE ZONE
  - TRANSITIONAL SURFACE ZONE
- A  
C  
H  
T

**DOVER TOWNSHIP ZONING TABLE - FOR DRAWING "CS-101"**  
ZONING DISTRICT: I - INDUSTRIAL DISTRICT

ITEM	REQUIRED/PERMITTED PER DISTRICT	PROPOSED SITE	ORDINANCE SECTION	COMPLIANCE
Permitted Land Use:	Warehousing	Warehousing	Part 4, § 27-409.2	YES
Lot Requirements:				
Min. Lot Area	20,000 SF	8,713,840 SF (200.04 AC)	Part 4, § 27-409.5.A	YES
Min. Lot Frontage and Width	100 FT	434 FT	Part 4, § 27-409.5.B	YES
Building Requirements:				
Max. Building Height	45 FT	<45 FT	Part 4, § 27-409.5.E	YES
Building Requirements (Per Airport Hazard Zone)				
Max Building Height Zone A <sup>1</sup>	148.50 FT	<45 FT	Part 4, § 27-411.4.A	YES
Max Building Height Zone H <sup>2</sup>	188.00 FT	<45 FT	Part 4, § 27-411.4.A	YES
Max Building Height Zone T <sup>3</sup>	63.00 FT	<45 FT	Part 4, § 27-411.4.A	YES
Principal Building Setbacks:				
Min. Front Yard	50 FT	293 FT	Part 4, § 27-409.5.C(1)	YES
Min. Side Yard	40 FT	123 FT	Part 4, § 27-409.5.C(2)	YES
Min. Rear Yard	40 FT	235 FT	Part 4, § 27-409.5.C(3)	YES
Min. Buffer Along Residential Uses	50 FT	50 FT	Part 4, § 27-409.5.E	YES
Max. Lot Coverage (Entire Site)	75%	43%	Part 4, § 27-409.5.D	YES
Parking Lot Setbacks:				
Min. Parking Setback (From Residential Properties)	15 FT	50 FT	Part 7, § 27-708	YES
Min. Parking Setback (From All Other Property Lines/ROW)	10 FT	50 FT	Part 7, § 27-708	YES
Loading Requirements:				
Min. Number of Loading Space Dimensions	12 FT x 60 FT	12 FT x 60 FT	Part 7, § 27-711.1.A	YES
Number of Loading Spaces	One space for a gross floor area of 5,000 to 25,000 SF each 10,000 SF of gross floor area in excess of 25,000 SF (184 Spaces)	469	Part 7, § 27-711.1.C	YES
Parking:				
Parking Space Dimensions (Non-Parallel Spaces):	10 FT x 20 FT	10 FT x 20 FT	Part 7, § 27-702.1	YES
Min. Number of Car Parking Spaces:				
Use: Warehousing	850 (1 space/1 employee on 2 largest shifts (Assumed largest shift: 425 employees))	881	Part 7, § 27-703	YES
Aisles:				
Minimum Width:				
One - way with 90° parking	24 FT	24 FT	SALDO Part 7, §22-707.H	YES
Two - way	24 FT	24 FT	SALDO Part 7, §22-707.H	YES

Notes:  
<sup>1</sup>Approach Surface Zone - Permit required for areas within Approach zone less than 4,200 FT from runway  
<sup>2</sup>Horizontal Surface Zone - No permit required for structures less than 75 FT above ground, except where topographic features would extend structures above the height limits  
<sup>3</sup>Transitional Zone - No permit required for structures less than 75 FT above the ground, except where topographic features would extend structures above the height limit

- NOTES:
- WORLD AERIAL IMAGERY BASEMAP IS PROVIDED THROUGH LANGAN'S ESRI ARCGIS SOFTWARE LICENSING AND ARCGIS ONLINE. SOURCE OF AERIAL IMAGERY IS MICROSOFT FROM 2011. CREDITS: EDRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA, USGS, AEX, GETMAPPING, AEROGRIID, IGN, IGP, AND THE GIS USER COMMUNITY.
  - LIDAR, PARCEL LINES, AND WATERWAYS PROVIDED THROUGH LANGAN'S ESRI ARCGIS SOFTWARE LICENSING AND ARCGIS ONLINE.
  - UTILITIES AND RIGHT-OF-WAY INFORMATION ARE APPROXIMATE AND NOT PER ALTA OR FIELD SURVEY. IF UTILITY RELOCATION IS NECESSARY, COORDINATION WITH THE UTILITY PROVIDER WILL BE REQUIRED.



Date	Description	No.
	Revisions	

**LANGAN**  
 Langan Engineering and Environmental Services, Inc.  
 Stone Manor Corporate Center, 2700 Kelly Road, Suite 200  
 Warrington, PA 18976  
 T: 215.491.6500 F: 215.491.6501 www.langan.com

Project  
**HINES - YORK**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title  
**CONCEPT PLAN**

Project No.  
**200164401**  
 Date  
**3-3-2022**  
 Drawn By  
**BGD**  
 Checked By  
**KSO**

Drawing No.  
**CS-101**  
 Sheet 1 of 1

## **TRIP GENERATION PRINTOUTS**

# Warehousing (150)

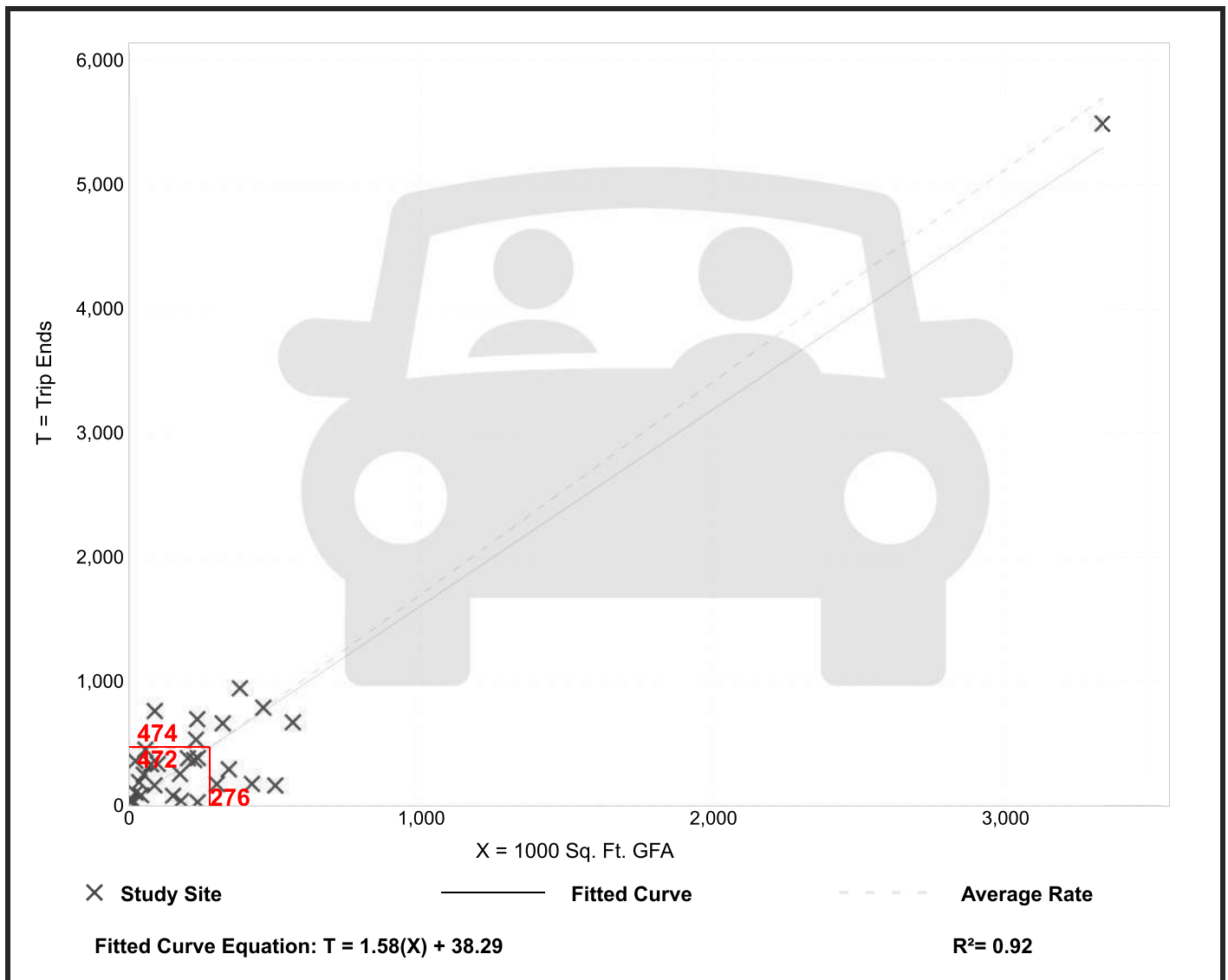
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA  
On a: Weekday

Setting/Location: General Urban/Suburban  
Number of Studies: 31  
Avg. 1000 Sq. Ft. GFA: 292  
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.71	0.15 - 16.93	1.48

## Data Plot and Equation





# Warehousing (150)

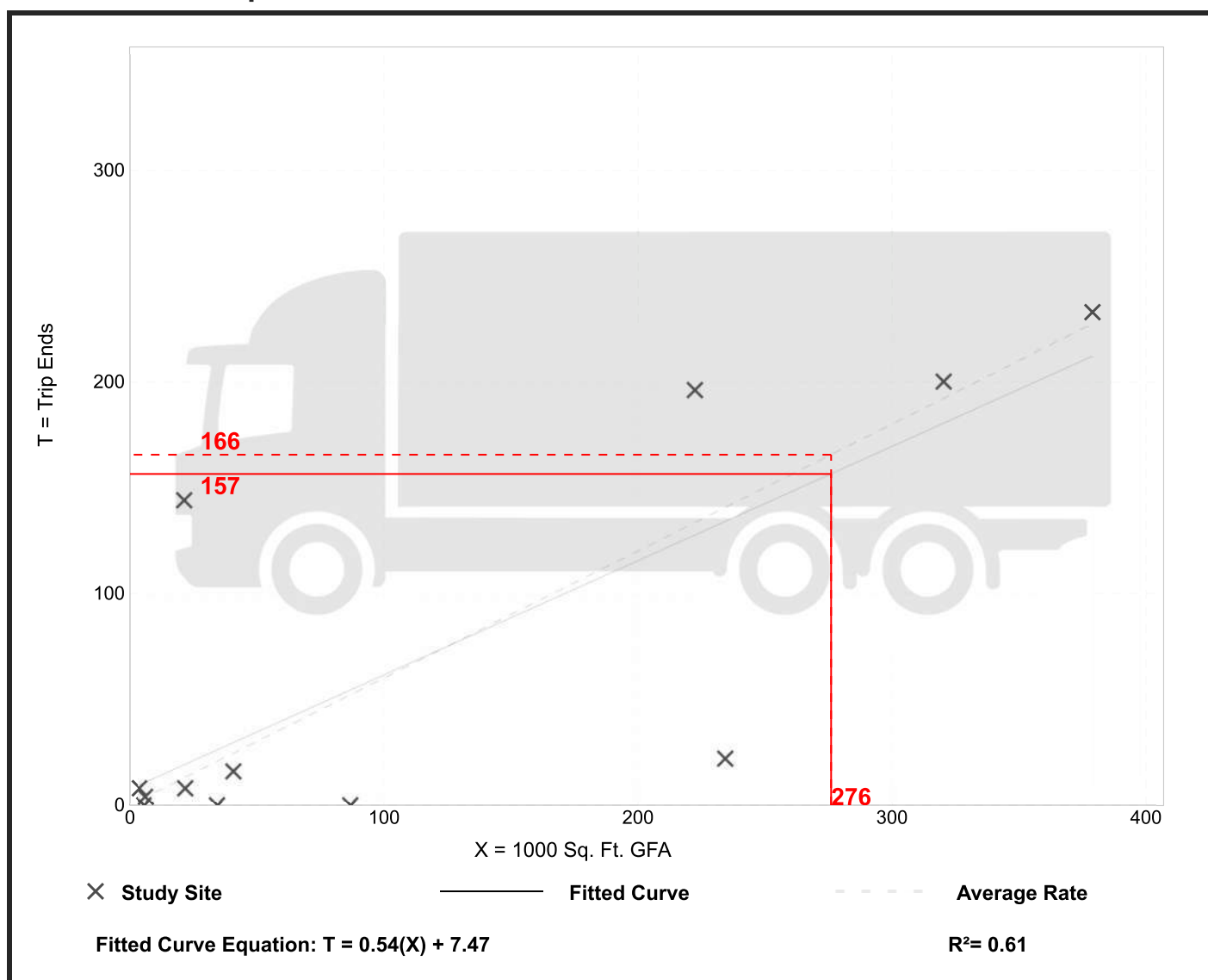
Truck Trip Ends vs: 1000 Sq. Ft. GFA  
On a: Weekday

Setting/Location: General Urban/Suburban  
Number of Studies: 12  
Avg. 1000 Sq. Ft. GFA: 115  
Directional Distribution: 50% entering, 50% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.60	0.00 - 6.66	0.86

## Data Plot and Equation



# Warehousing (150)

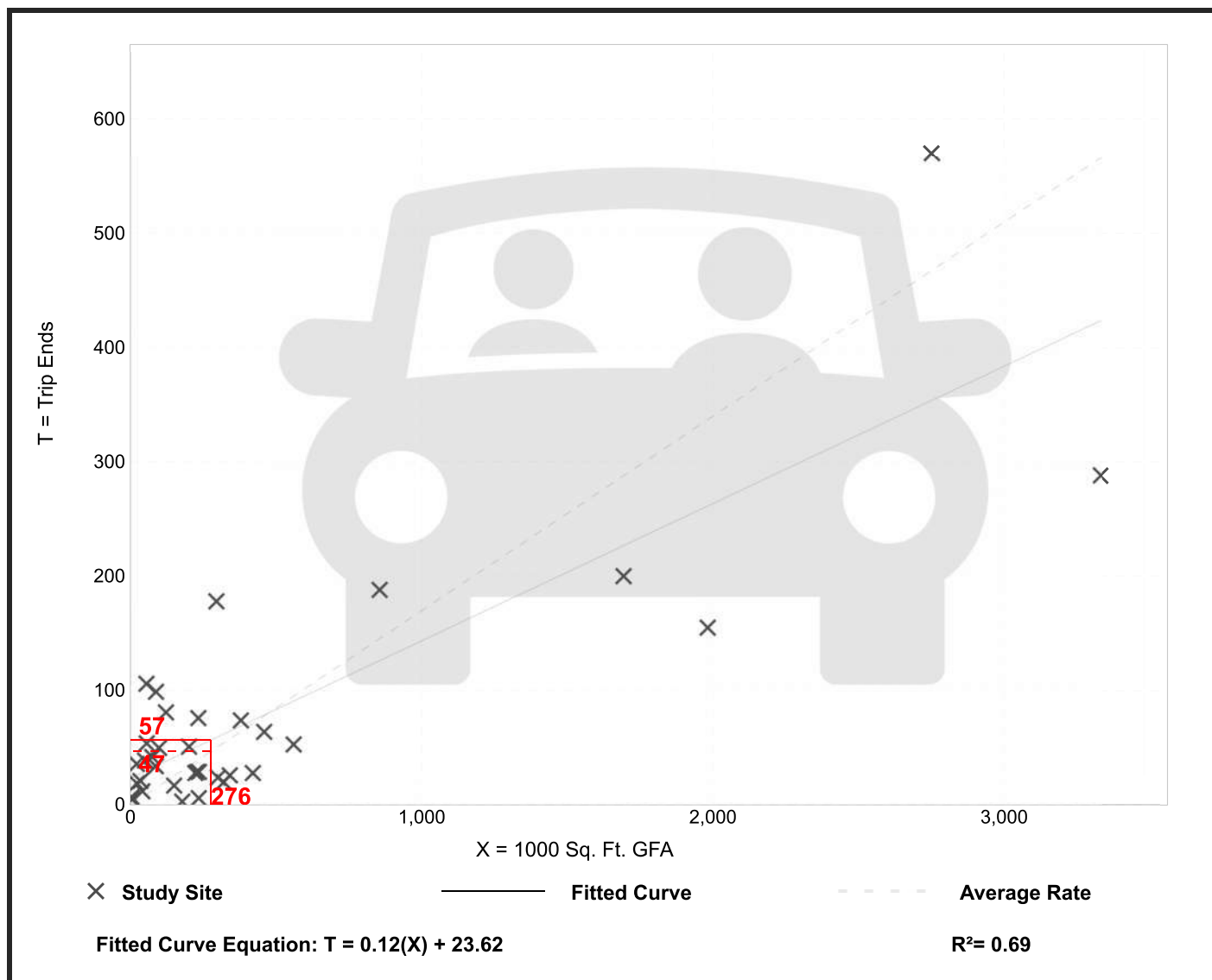
**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**

**Setting/Location: General Urban/Suburban**  
 Number of Studies: 36  
 Avg. 1000 Sq. Ft. GFA: 448  
 Directional Distribution: 77% entering, 23% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.17	0.02 - 1.93	0.19

## Data Plot and Equation



# Warehousing (150)

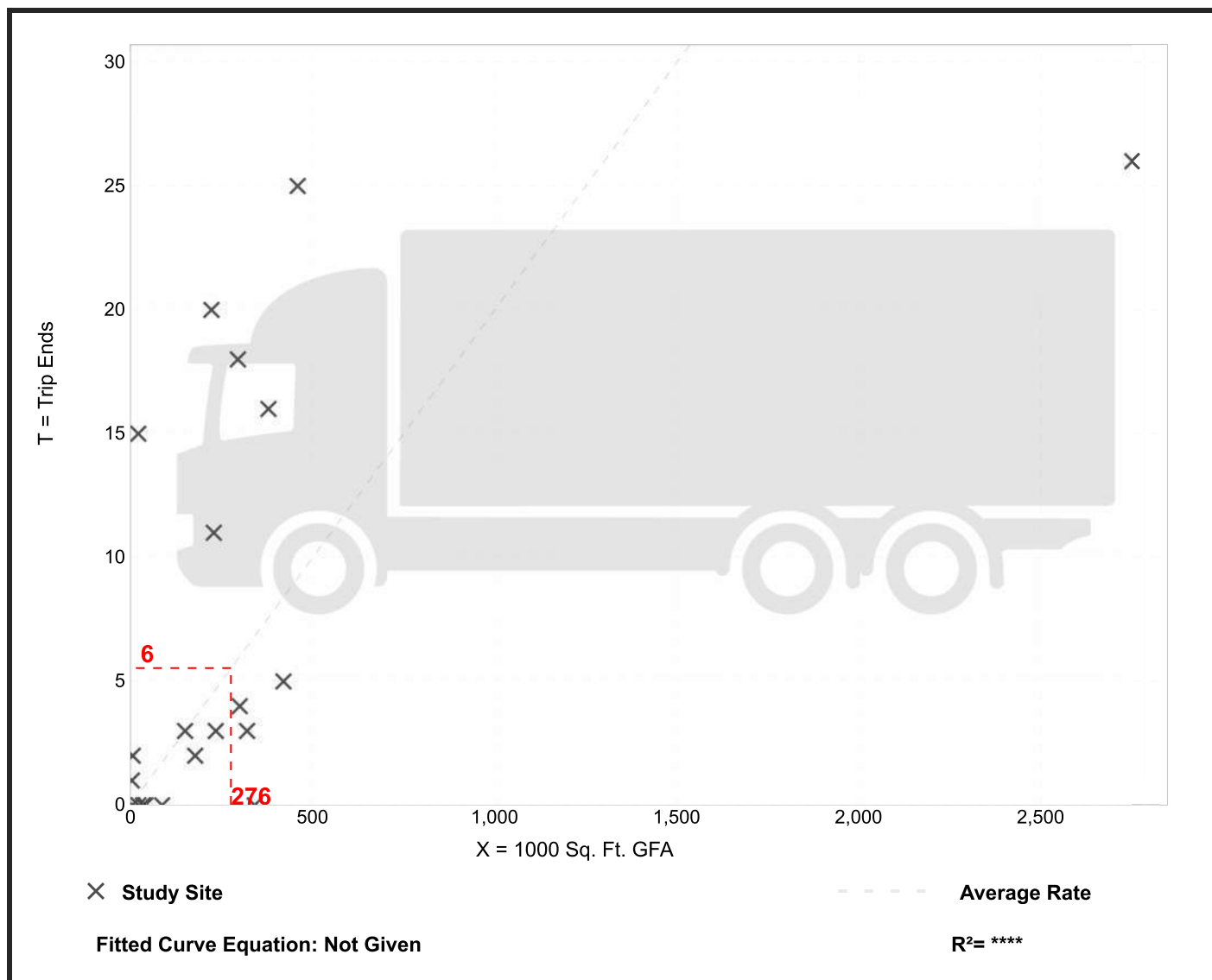
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**Setting/Location: General Urban/Suburban**  
 Number of Studies: 21  
 Avg. 1000 Sq. Ft. GFA: 309  
 Directional Distribution: 52% entering, 48% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.02	0.00 - 0.69	0.05

## Data Plot and Equation



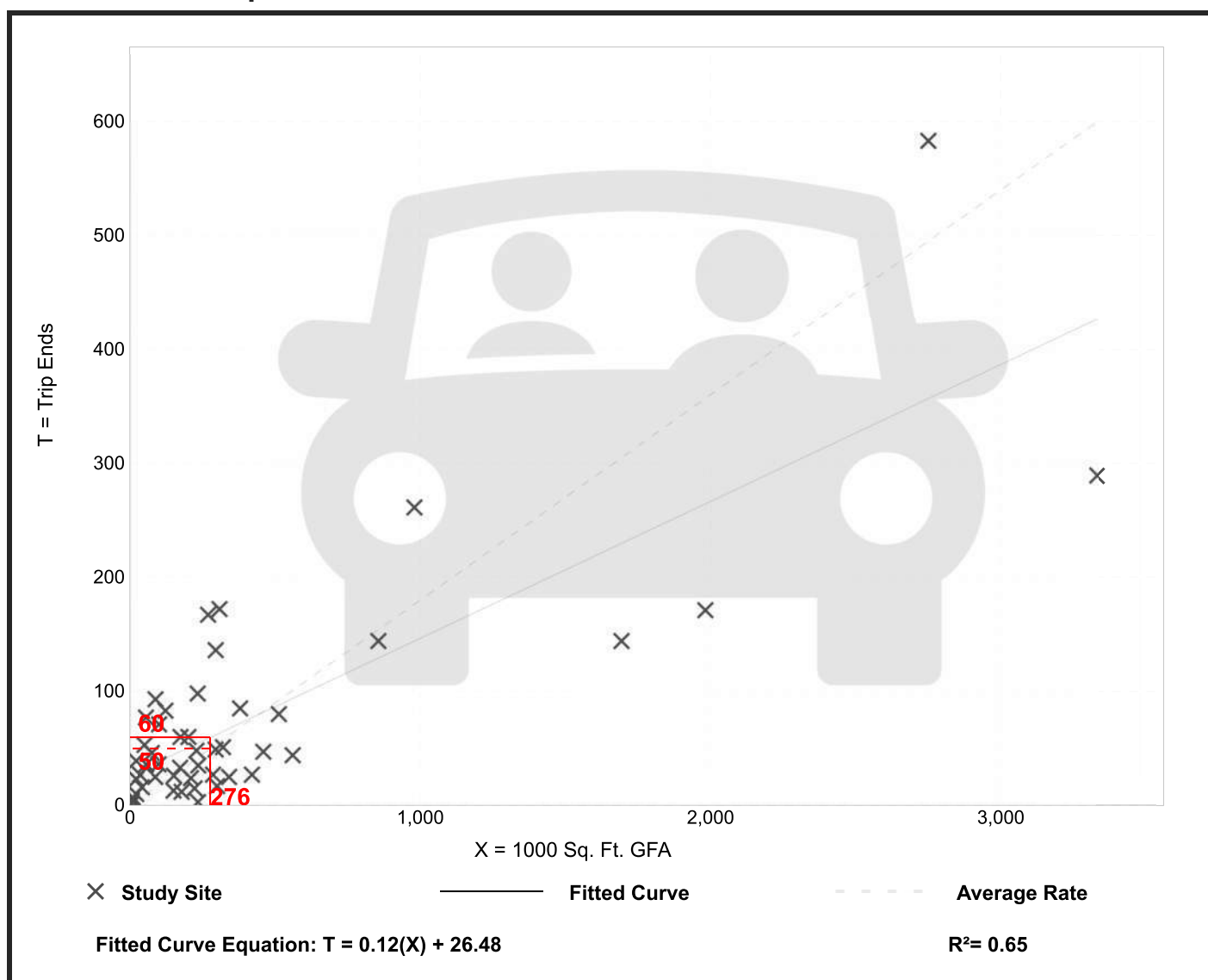
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**Setting/Location: General Urban/Suburban**  
 Number of Studies: 49  
 Avg. 1000 Sq. Ft. GFA: 400  
 Directional Distribution: 28% entering, 72% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.18	0.01 - 1.80	0.18

## Data Plot and Equation



# Warehousing (150)

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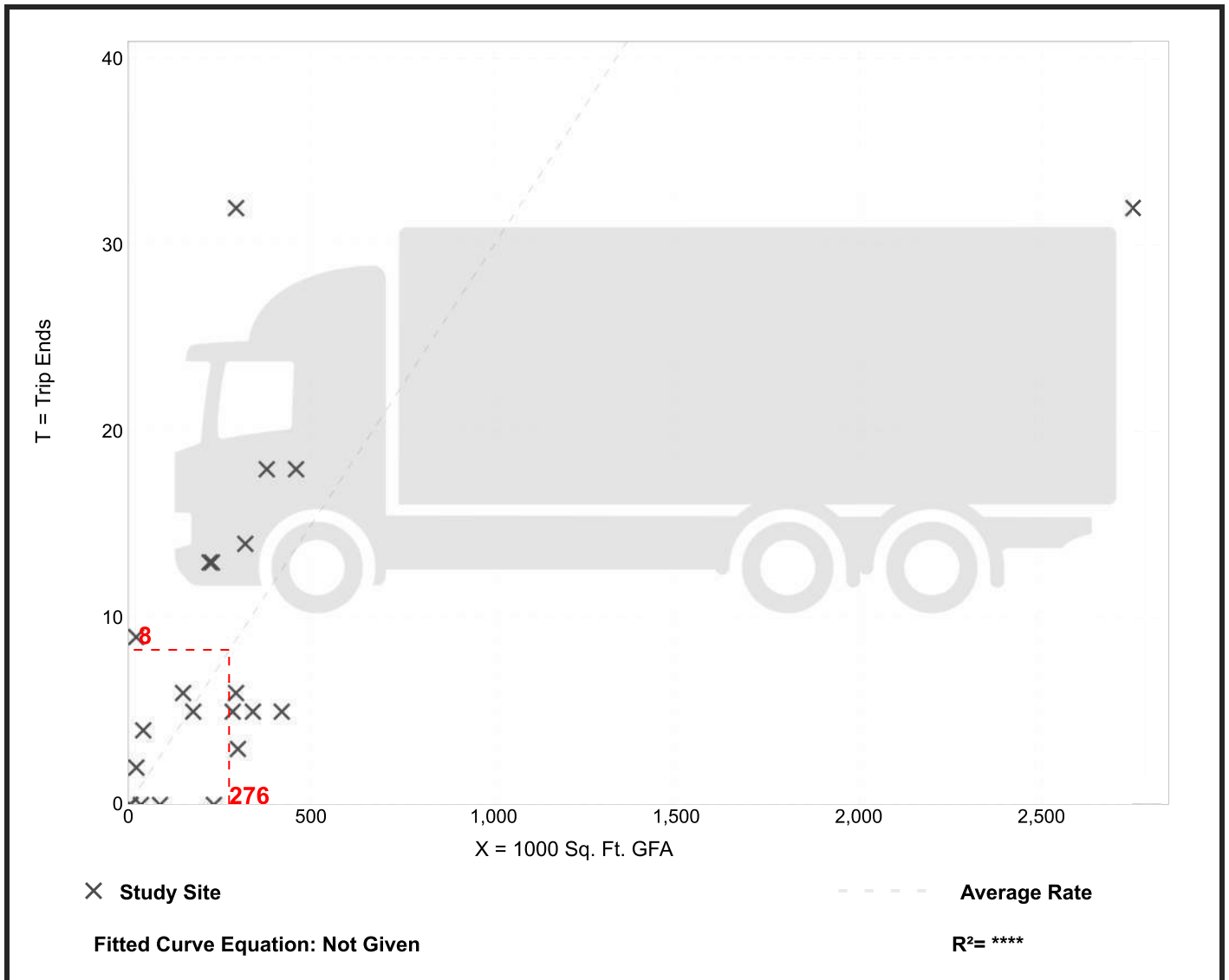
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Number of Studies: 23  
 Avg. 1000 Sq. Ft. GFA: 308  
 Directional Distribution: 52% entering, 48% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.03	0.00 - 0.42	0.03

## Data Plot and Equation



# Warehousing (150)

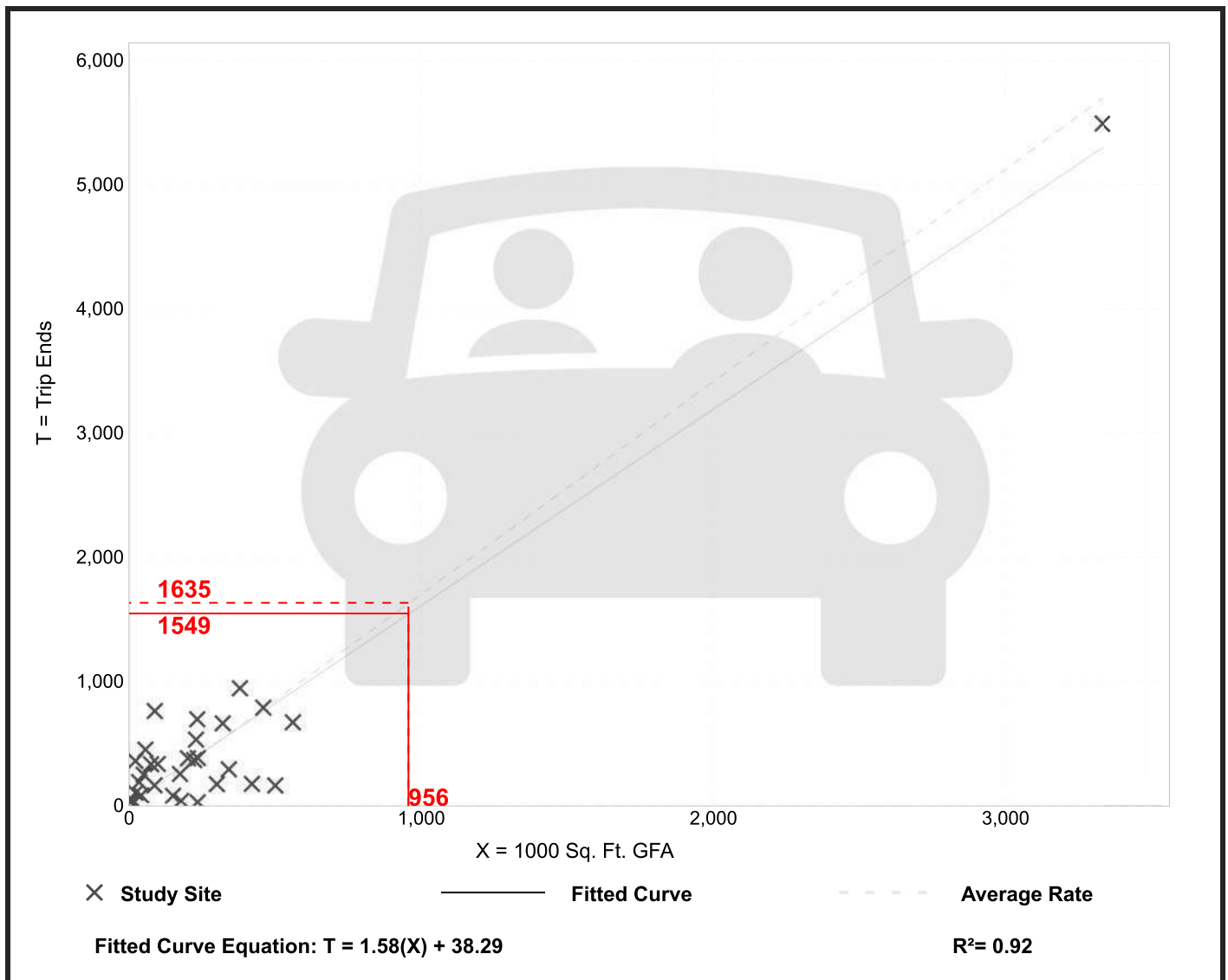
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Avg. 1000 Sq. Ft. GFA: 292  
Directional Distribution: 50% entering, 50% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.71	0.15 - 16.93	1.48

## Data Plot and Equation



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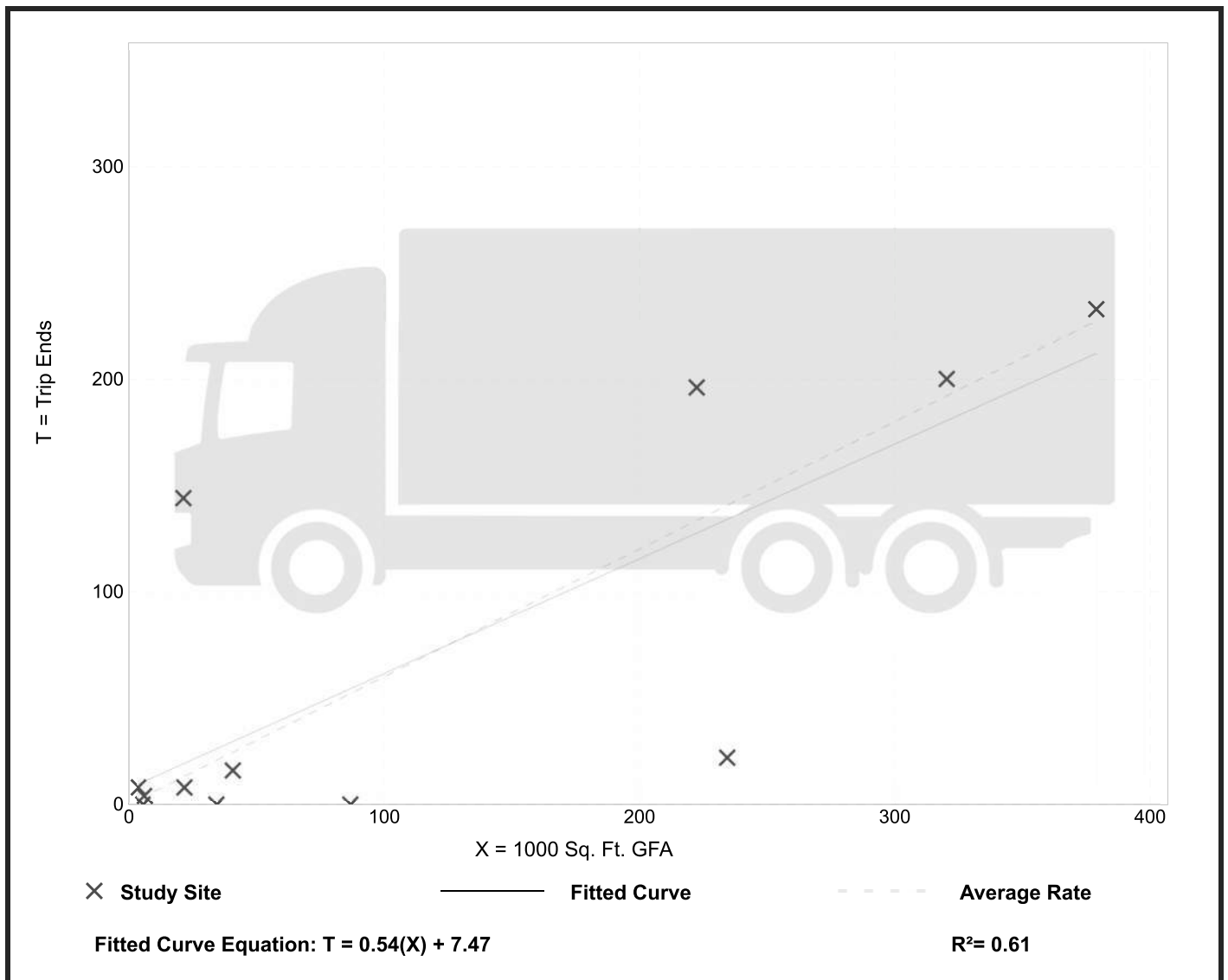
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 Directional Distribution: 50% entering, 50% exiting

## Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
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## Data Plot and Equation



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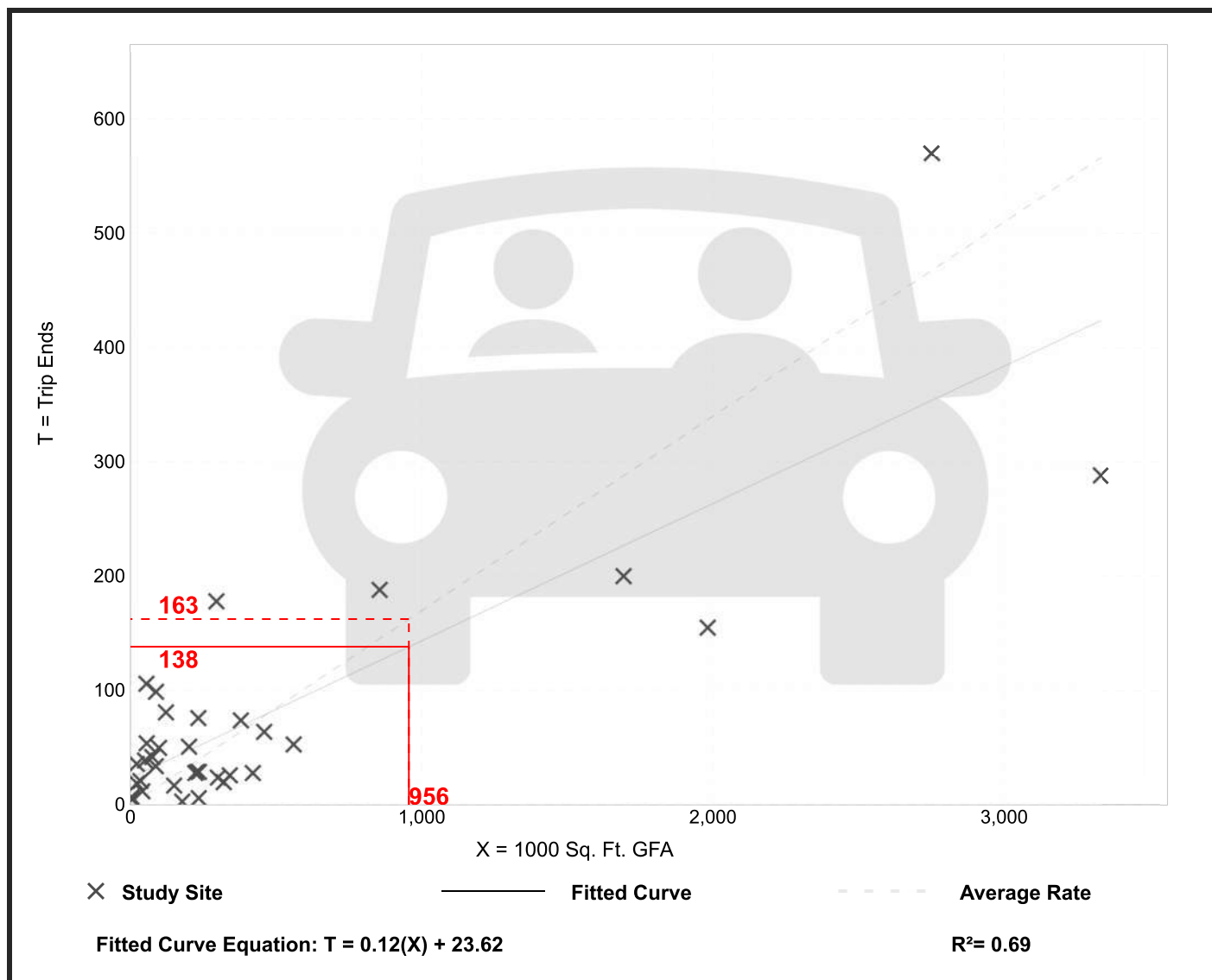
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## Data Plot and Equation





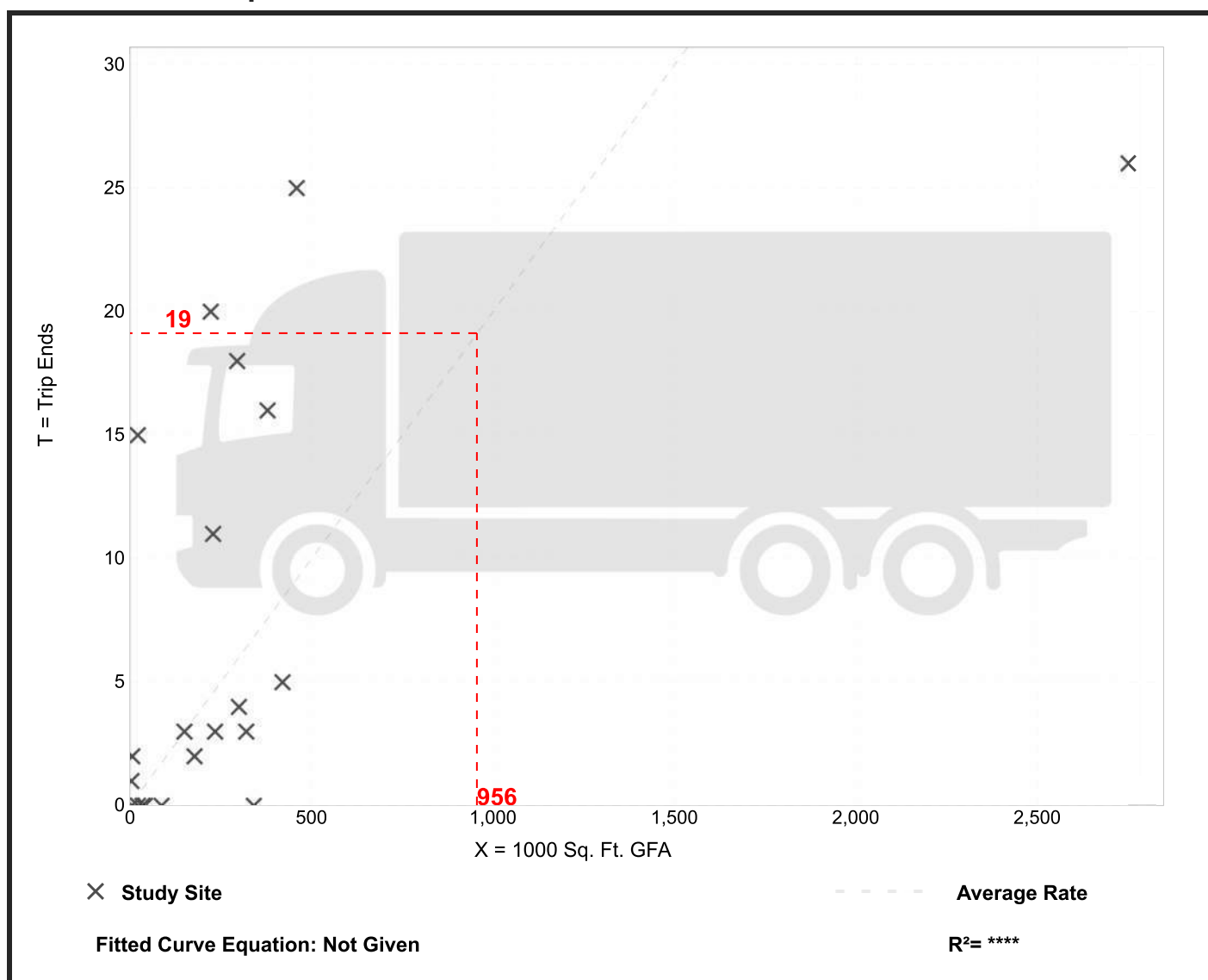
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## Data Plot and Equation



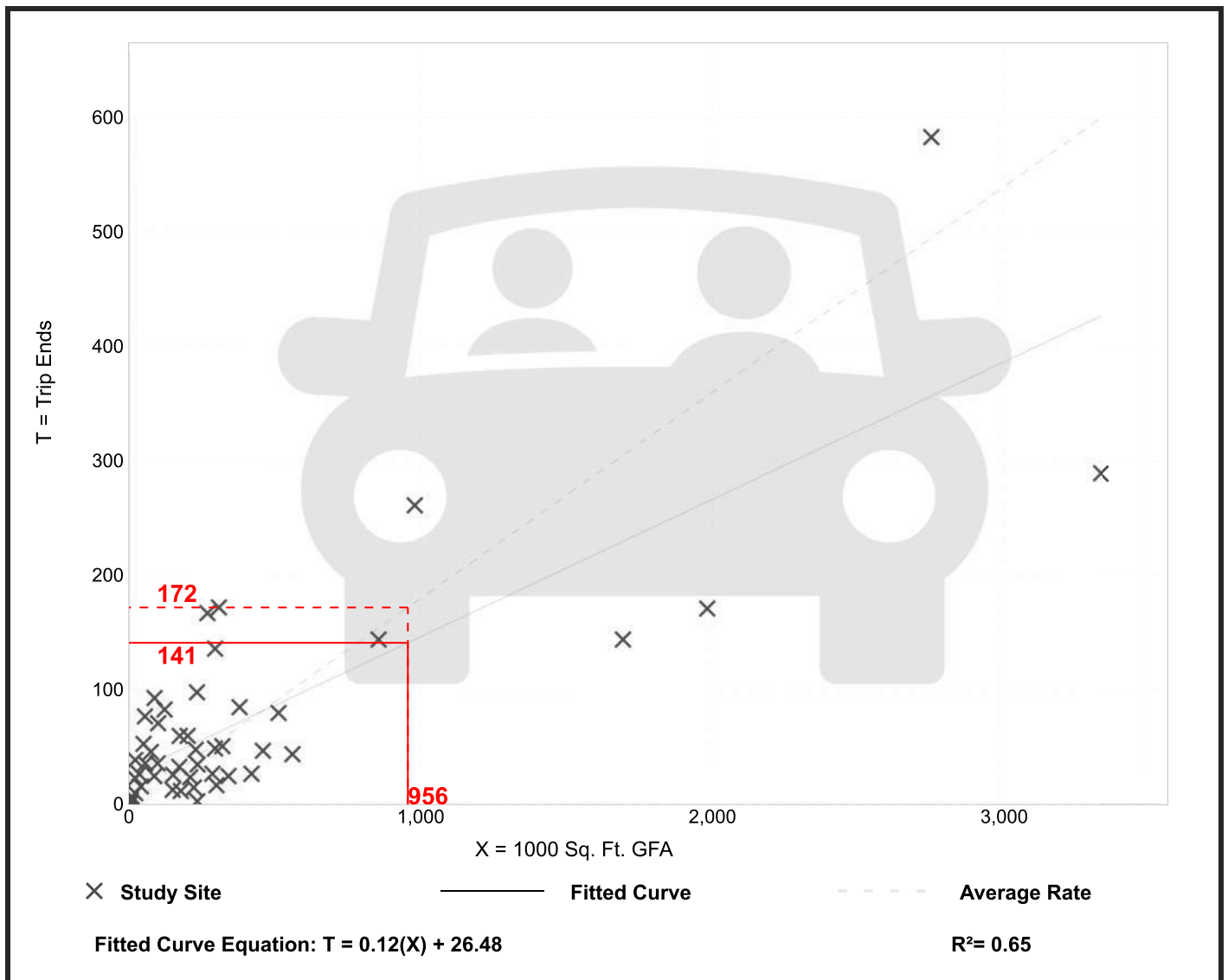
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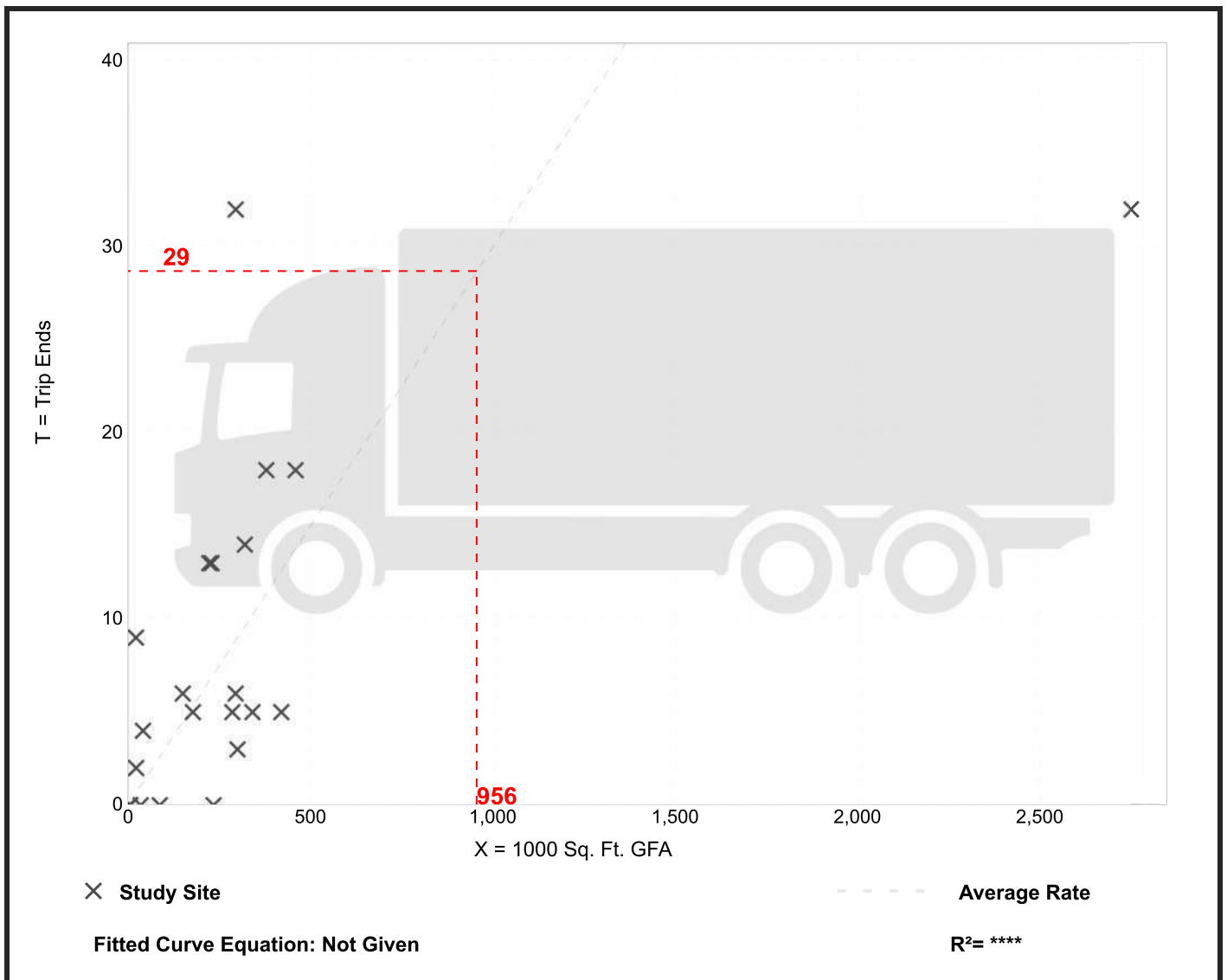
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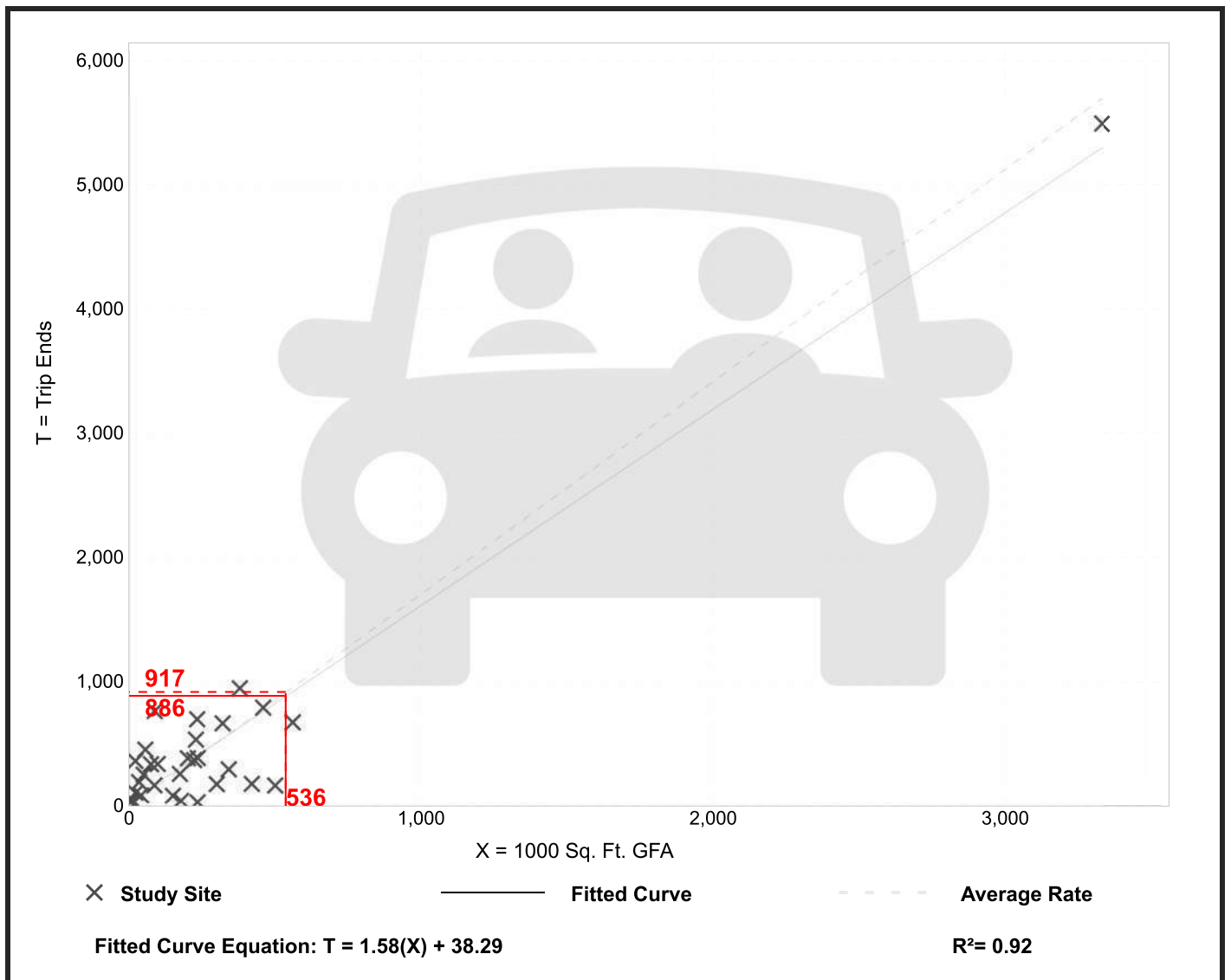
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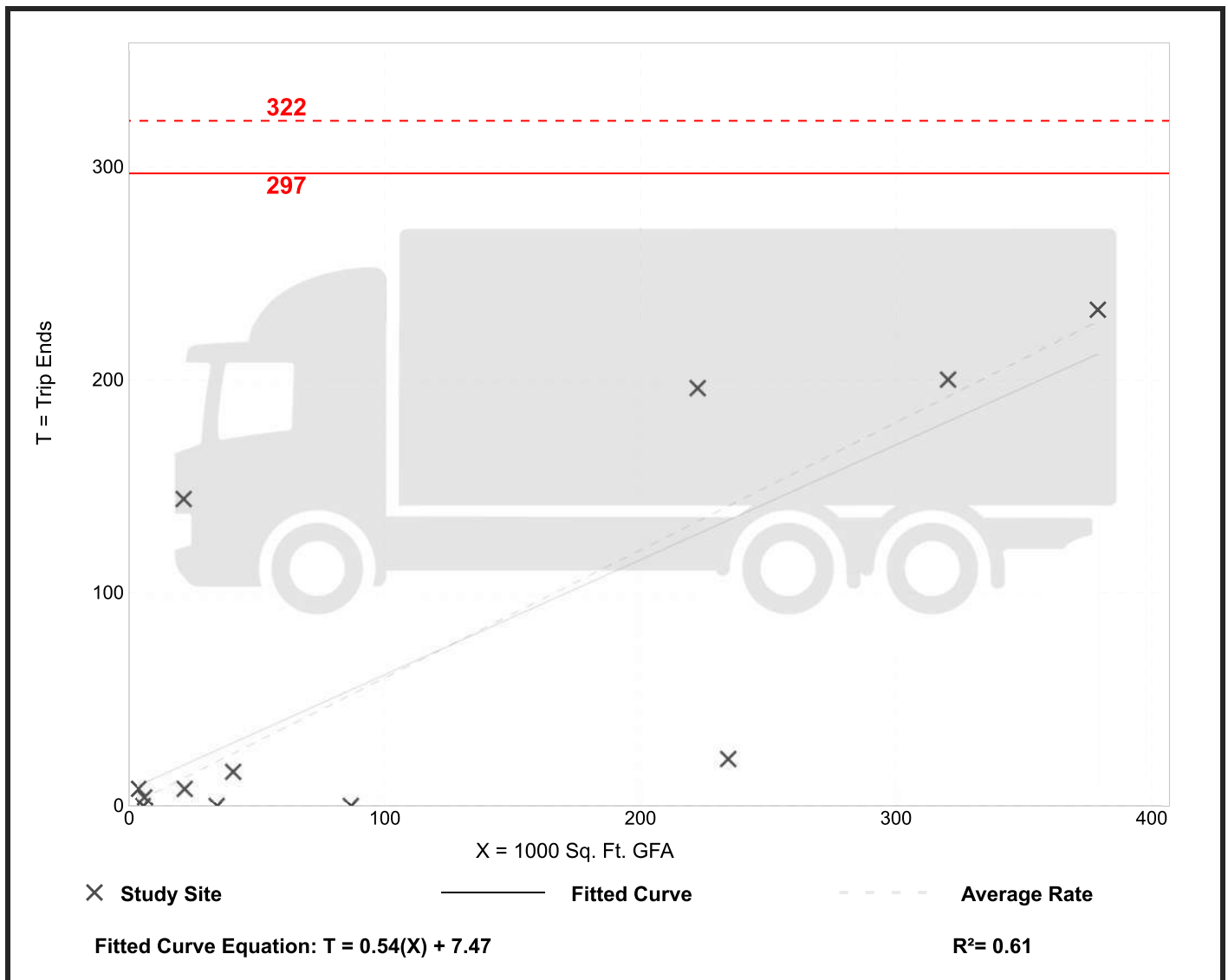
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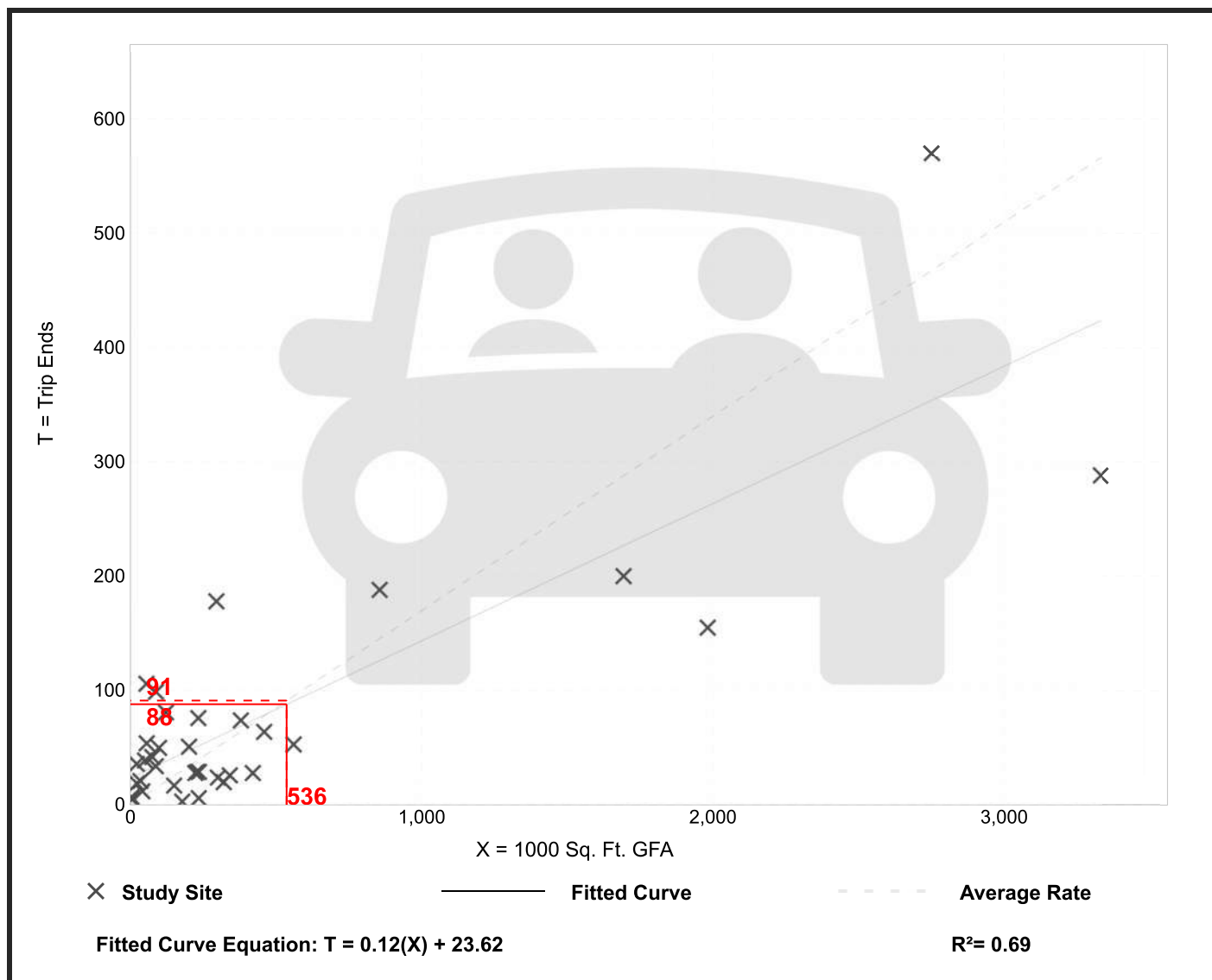
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Setting/Location: General Urban/Suburban

Number of Studies: 21

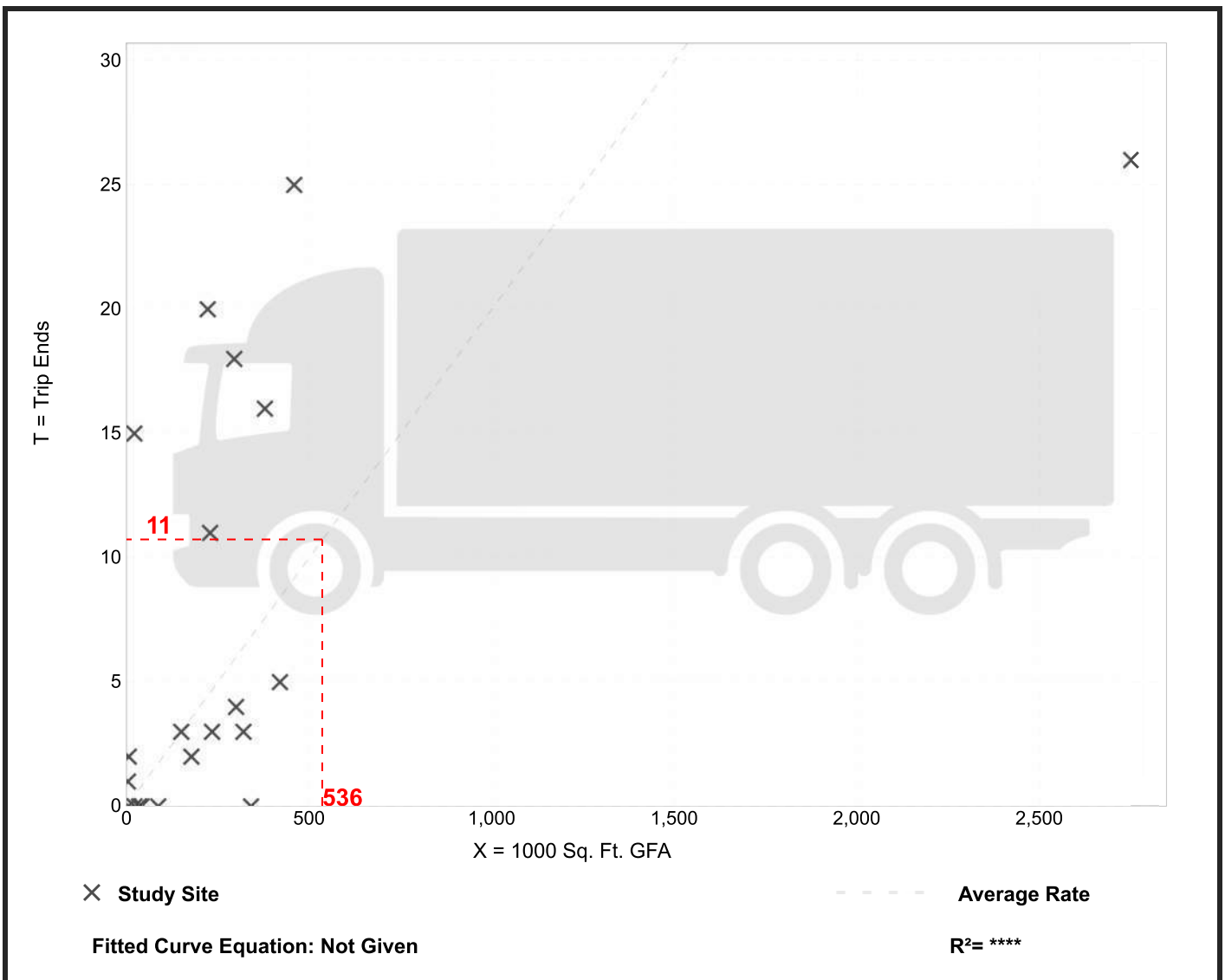
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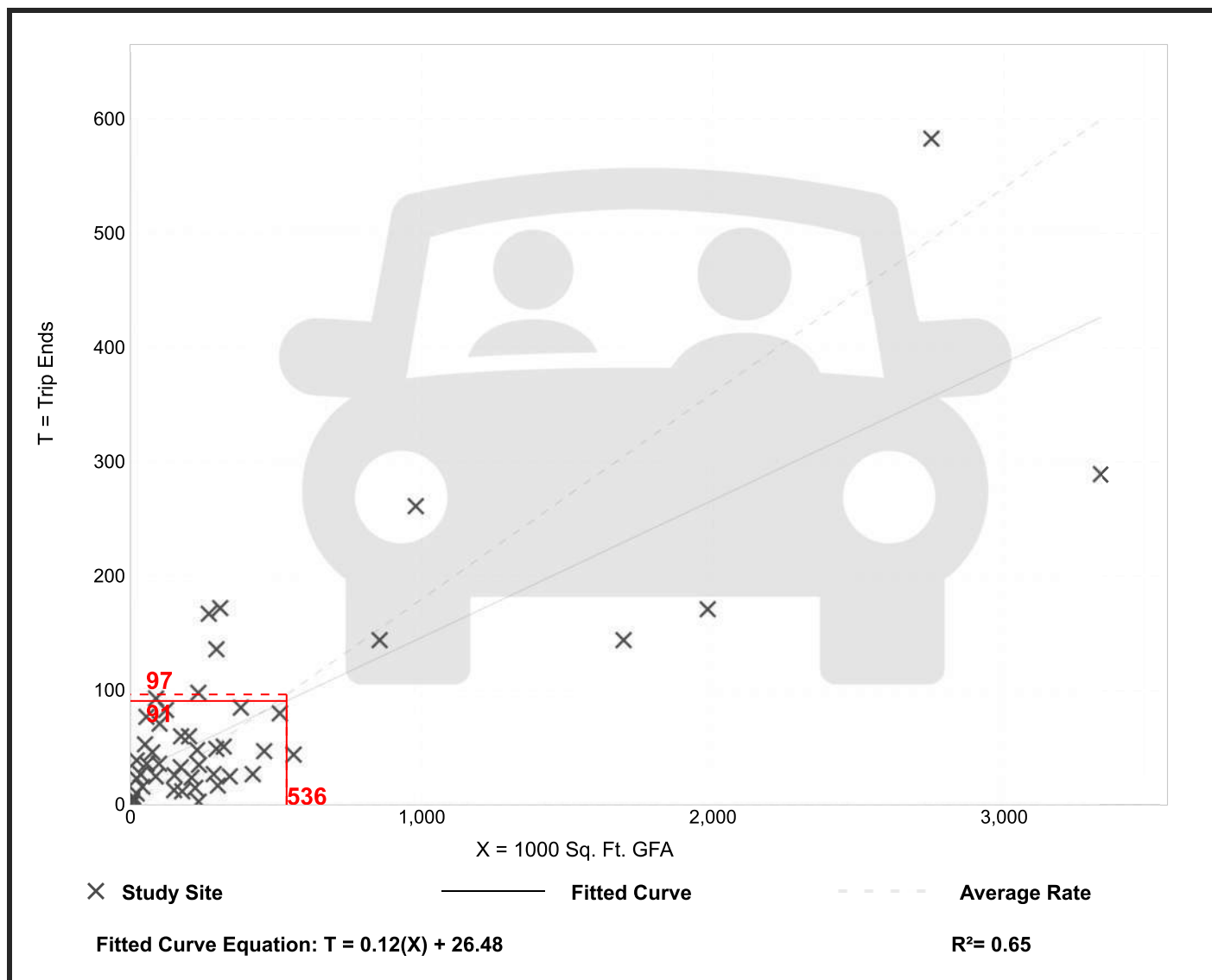
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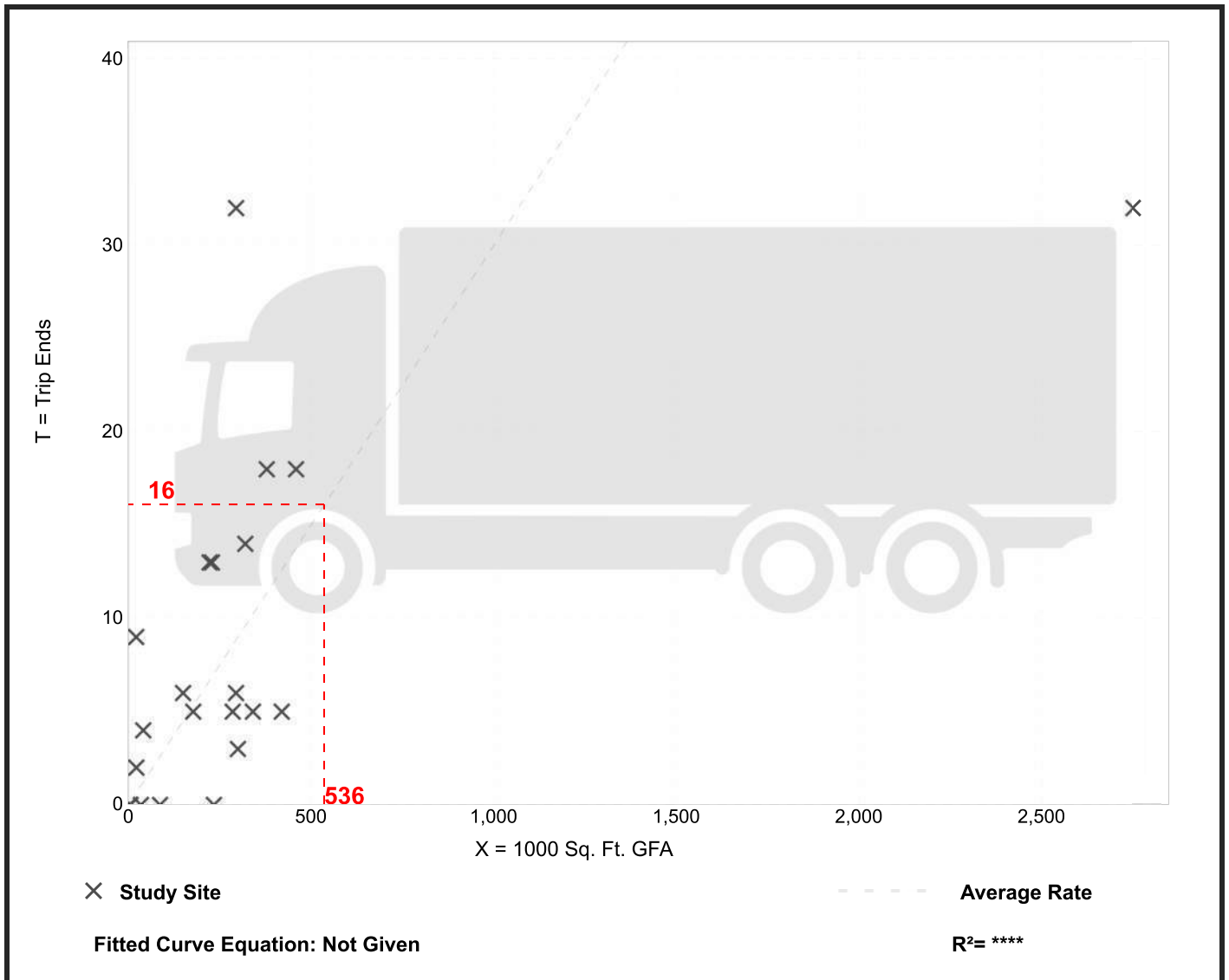
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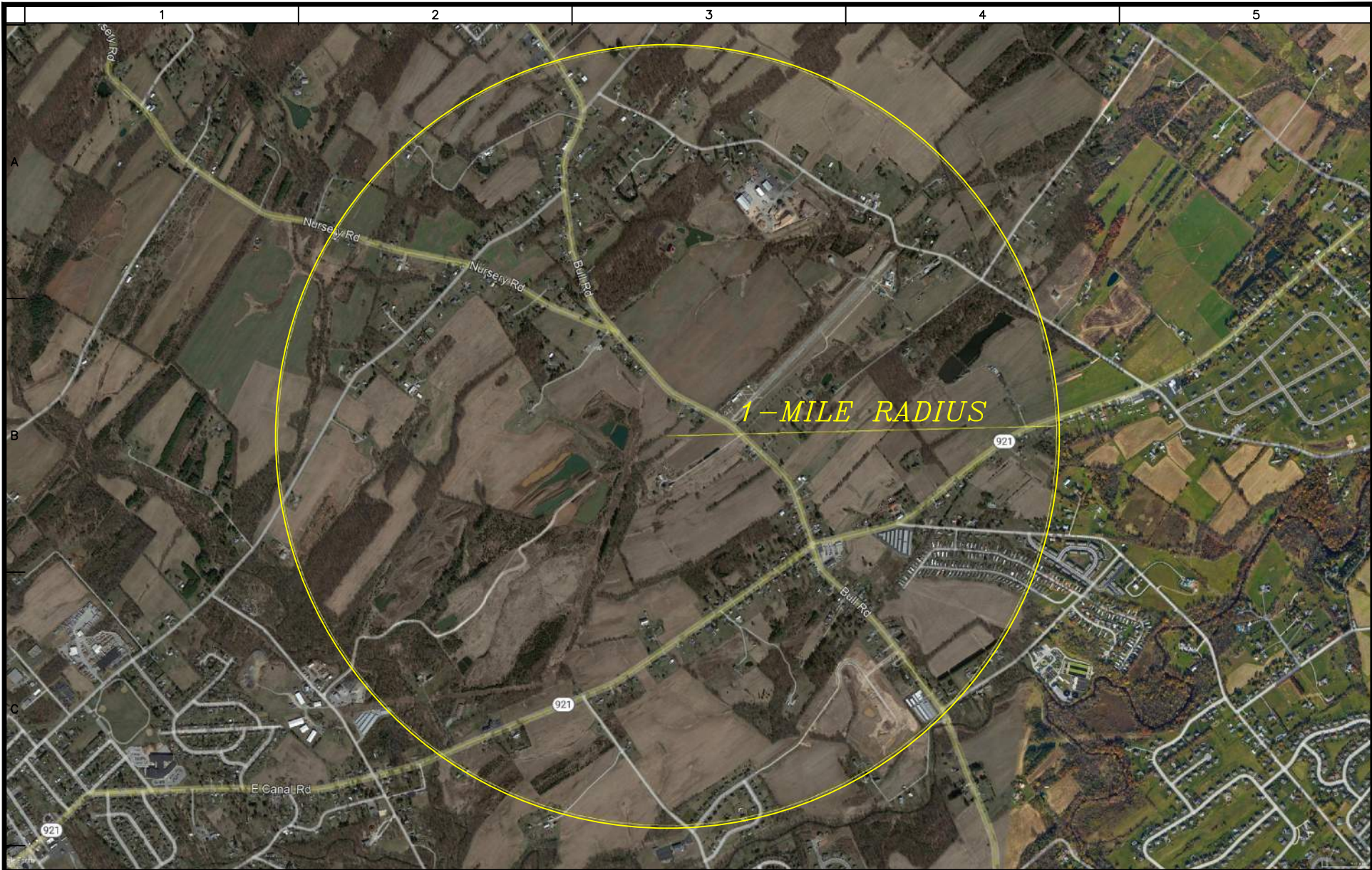
## Truck Trip Generation per 1000 Sq. Ft. GFA

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## Data Plot and Equation



## **RADIUS MAPS**



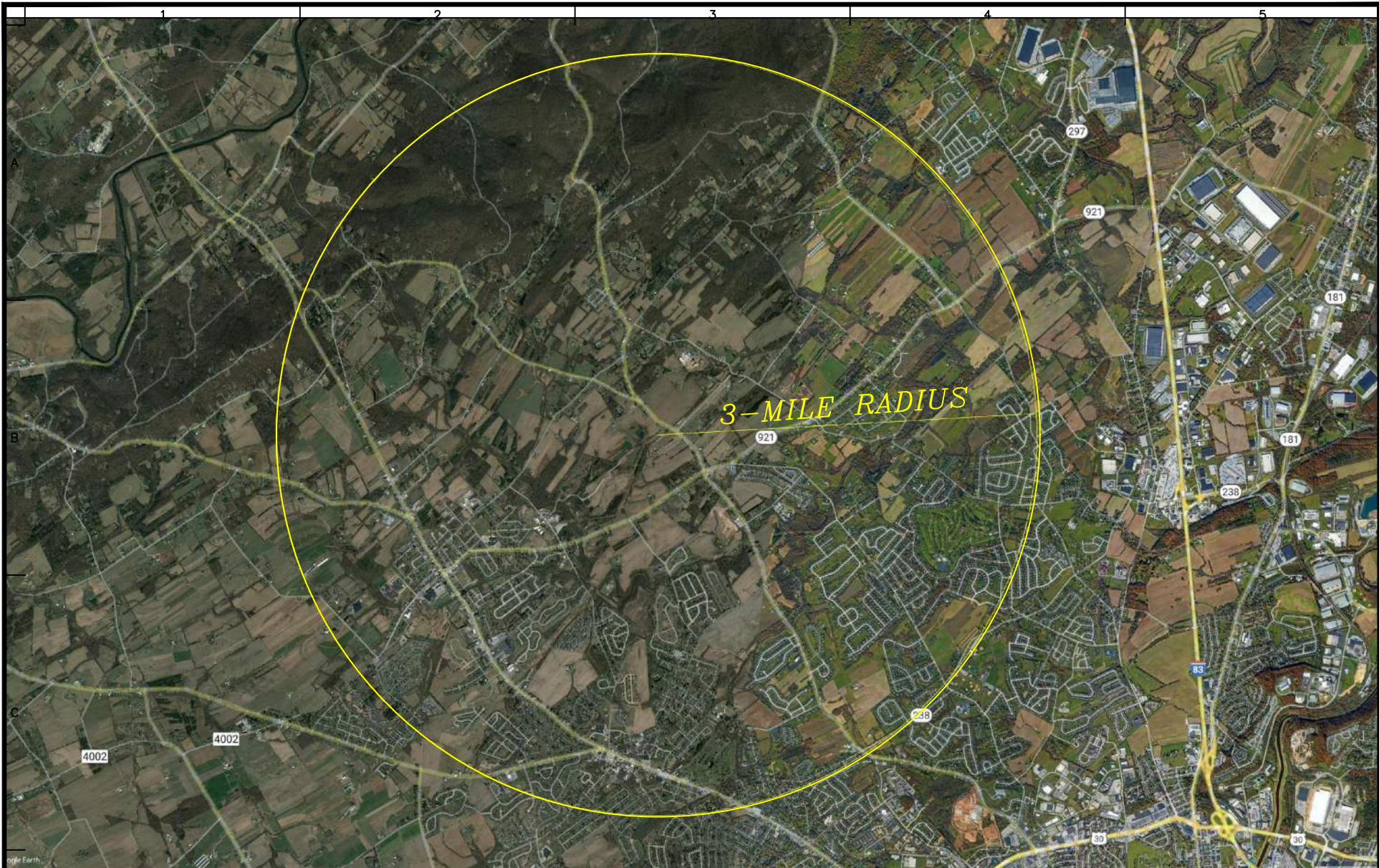
**LANGAN**  
 Langan Engineering and  
 Environmental Services, Inc.  
 Stone Manor Corporate Center, 2700 Kelly Road, Suite 200  
 Warrington, PA 18976  
 T: 215.491.6500 F: 215.491.6501 www.langan.com


Project  
**HINES - YORK**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

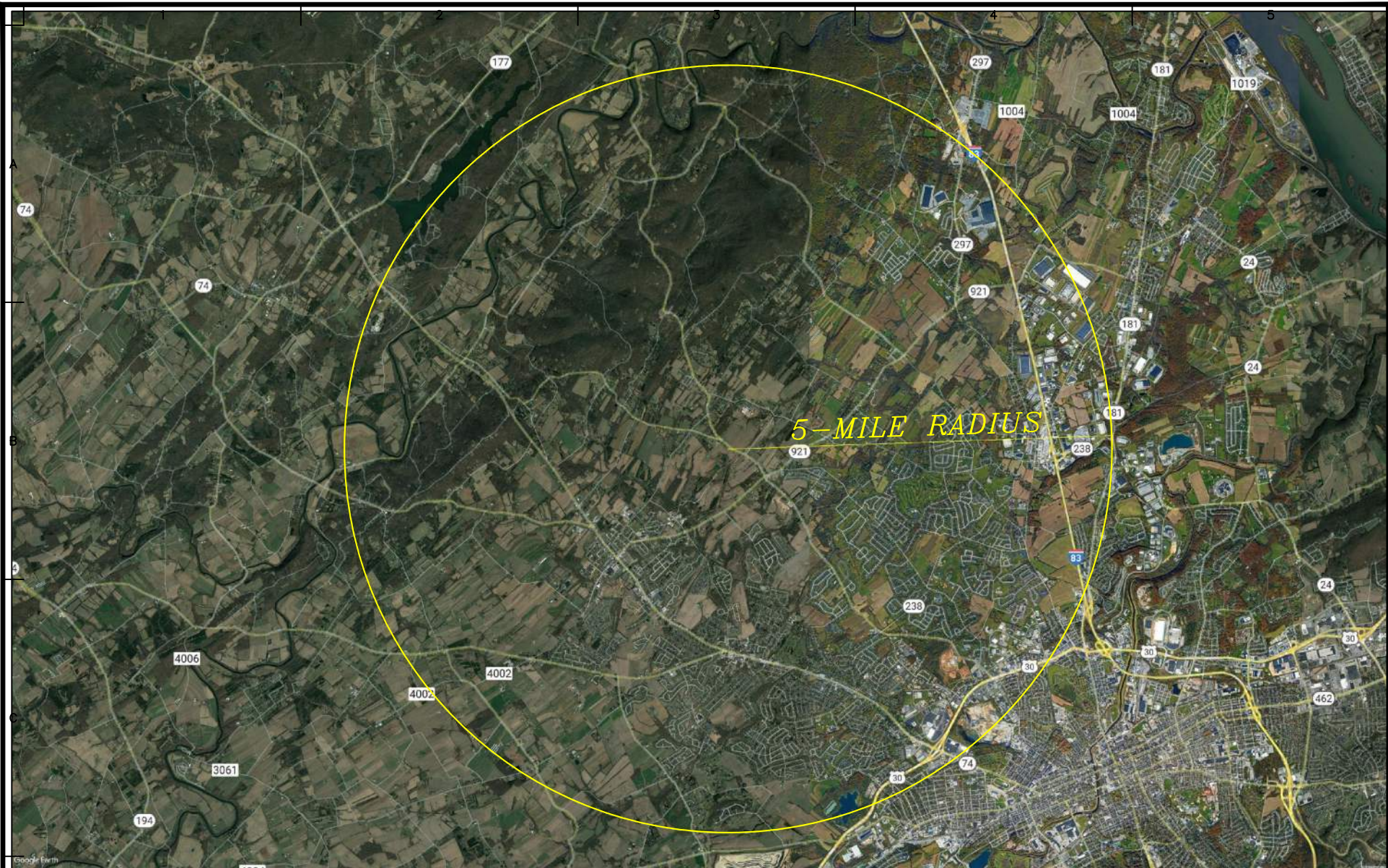
Drawing Title  
**RADIUS MAP  
 1 MILE**

Project No.  
 200164401  
 Date  
 4/27/22  
 Drawn By  
 KLP  
 Checked By  
 RJL

Drawing No.

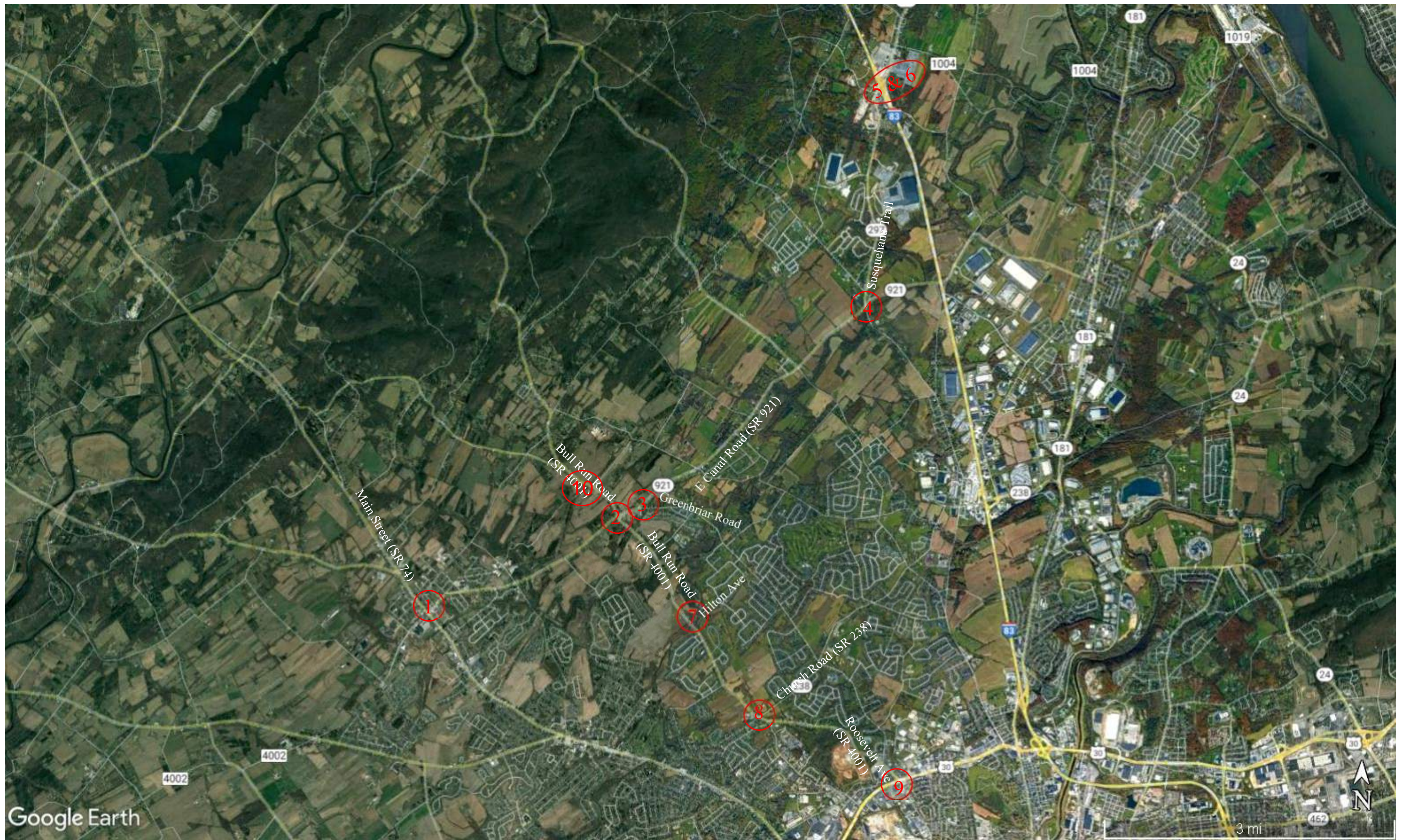


<b>D</b>	 Langan Engineering and Environmental Services, Inc. Stone Manor Corporate Center, 2700 Kelly Road, Suite 200 Warrington, PA 18976 T: 215.491.6500 F: 215.491.6501 www.langan.com	Project	Drawing Title	Project No.	Drawing No.		
		<b>HINES - YORK</b>		<b>RADIUS MAP 3 MILES</b>		200164401	
		DOVER TOWNSHIP YORK COUNTY PENNSYLVANIA				Date 4/27/22	
						Drawn By KLP Checked By RJL	



<p><b>LANGAN</b>          Langan Engineering and          Environmental Services, Inc.          Stone Manor Corporate Center, 2700 Kelly Road, Suite 200          Warrington, PA 18976          T: 215.491.6500 F: 215.491.6501 www.langan.com</p>	Project	Drawing Title	Project No.	Drawing No.
	<b>HINES - YORK</b>	<b>RADIUS MAP 5 MILES</b>	200164401	
	DOVER TOWNSHIP YORK COUNTY PENNSYLVANIA		Date 4/27/22	
			Drawn By KLP	
			Checked By RJL	

## **ANTICIPATED STUDY AREA INTERSECTIONS**



**Assumed Study Area Intersections**

- 1. E Canal Road (SR 921) and Main Street (SR 0074) - signalized
- 2. Bull Road (SR 4001) and E Canal Road (SR 921) - unsignalized
- 3. E Canal Road (SR 921) and Greenbriar Road - unsignalized
- 4. E Canal Road (SR 921) and Susquehanna Trail – signalized
- 5. I-83 SB and SR 297 – signalized

- 6. I-83 NB and SR 297 – signalized
- 7. Bull Road (SR 4001) and Hilton Ave - unsignalized
- 8. Roosevelt Ave (SR 4001) and Church Road (SR 238) – signalized
- 9. Route 30 and Roosevelt Ave (SR 4001) – signalized
- 10. Bull Road (SR 4001) and Site Driveway





# **ANTICIPATED TRUCK ACCESS ROUTE**



D

LEGEND	
	INBOUND
	OUTBOUND

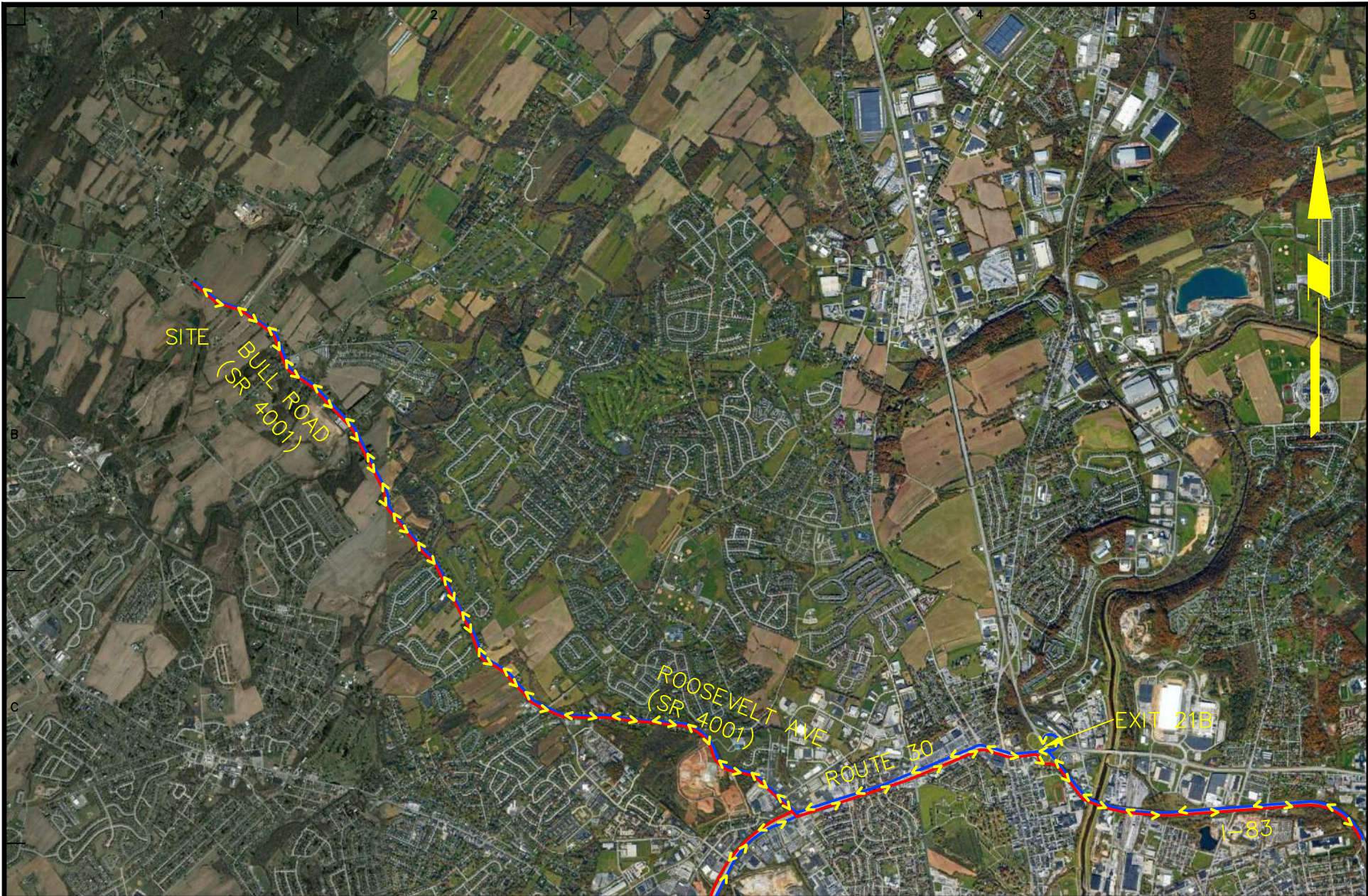
**LANGAN**  
 Langan Engineering and Environmental Services, Inc.  
 Stone Manor Corporate Center, 2700 Kelly Road, Suite 200  
 Warrington, PA 18976  
 T: 215.491.6500 F: 215.491.6501 www.langan.com

Project  
**HINES - YORK**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title  
**TRUCK ROUTE TO/FROM I-83 NORTH**

Project No. 200164401
Date 4/27/22
Drawn By KLP
Checked By RJL

Drawing No.



D

LEGEND	
	INBOUND
	OUTBOUND

**LANGAN**  
 Langan Engineering and Environmental Services, Inc.  
 Stone Manor Corporate Center, 2700 Kelly Road, Suite 200  
 Warrington, PA 18976  
 T: 215.491.6500 F: 215.491.6501 www.langan.com

Project  
**HINES - YORK**  
 DOVER TOWNSHIP  
 YORK COUNTY PENNSYLVANIA

Drawing Title  
**TRUCK ROUTE TO/FROM I-83 SOUTH & ROUTE 30**

Project No. 200164401
Date 4/27/22
Drawn By KLP
Checked By RUL

Drawing No.
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## **APPENDIX J**

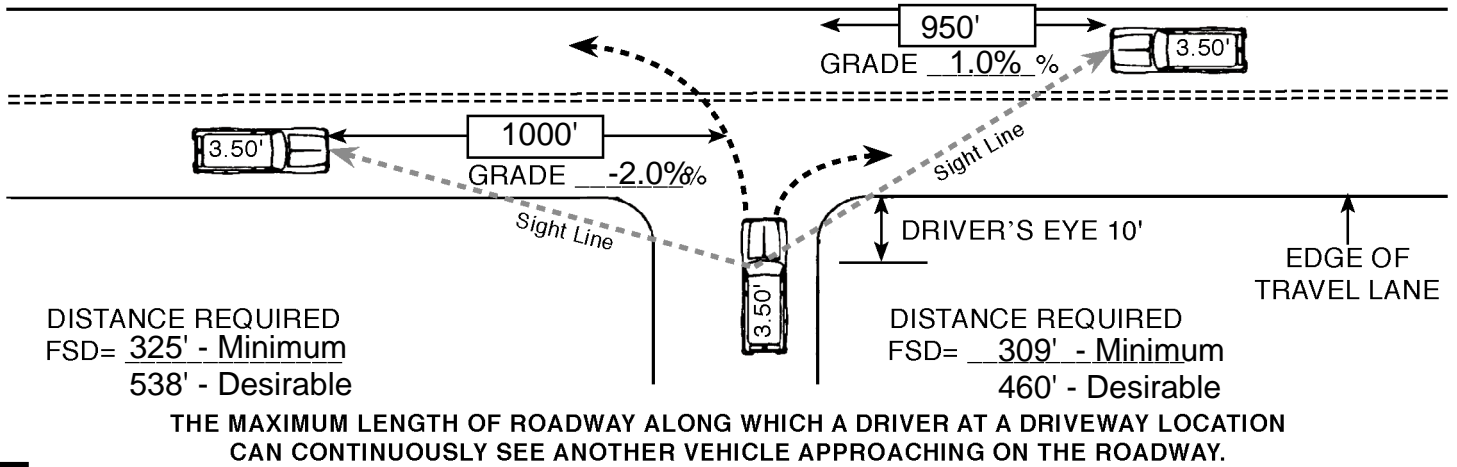
# **PENNDOT M-950S FORM/SIGHT DISTANCE INFORMATION**

# DRIVEWAY SIGHT DISTANCE MEASUREMENTS

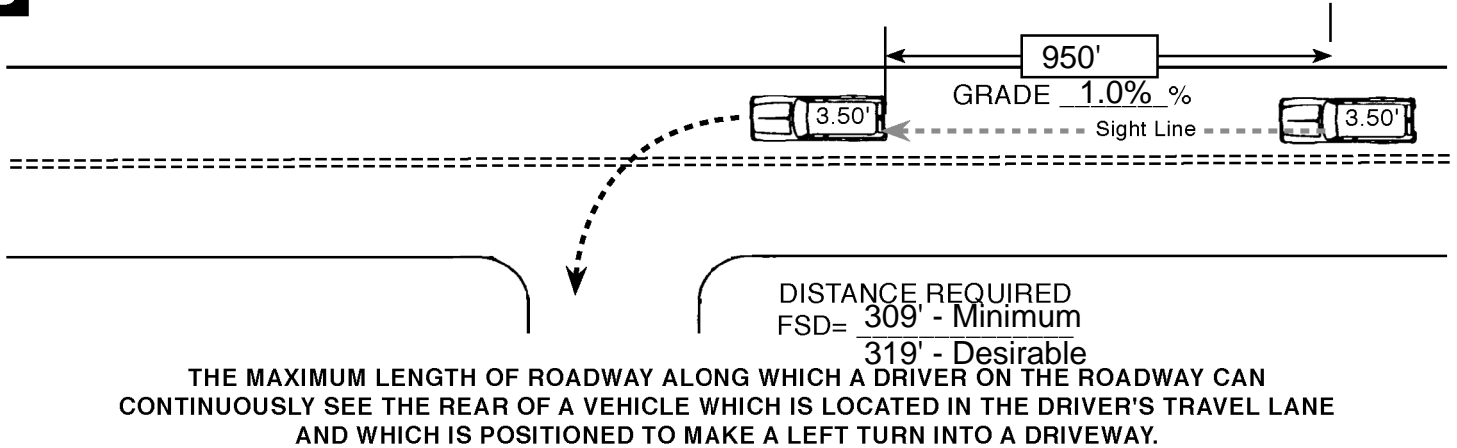
(FOR LOCAL ROADS, USE PENNDOT PUB 70)

APPLICANT Bull Canal Dover Owner, LLC APPLICATION NO. 291441  
 S.R. SR 4001 SEG. 0230 OFFSET 2976 LEGAL SPEED LIMIT 40 mph  
 MEASURED BY \_\_\_\_\_ DATE 10/18/22, REVISED 1/12/24  
 FOR DEPARTMENT USE ONLY: Safe-Running Speed \_\_\_\_\_ 85th Percentile Speed \_\_\_\_\_

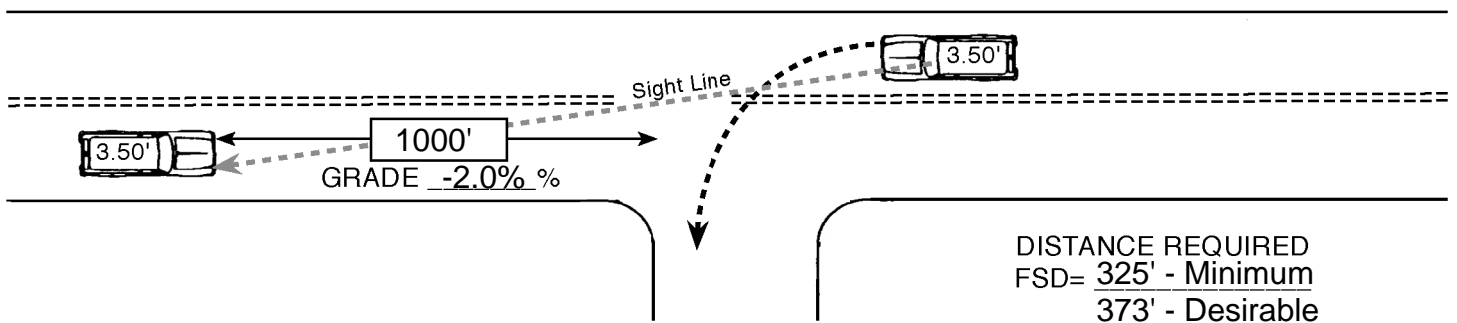
## A



## B



## C

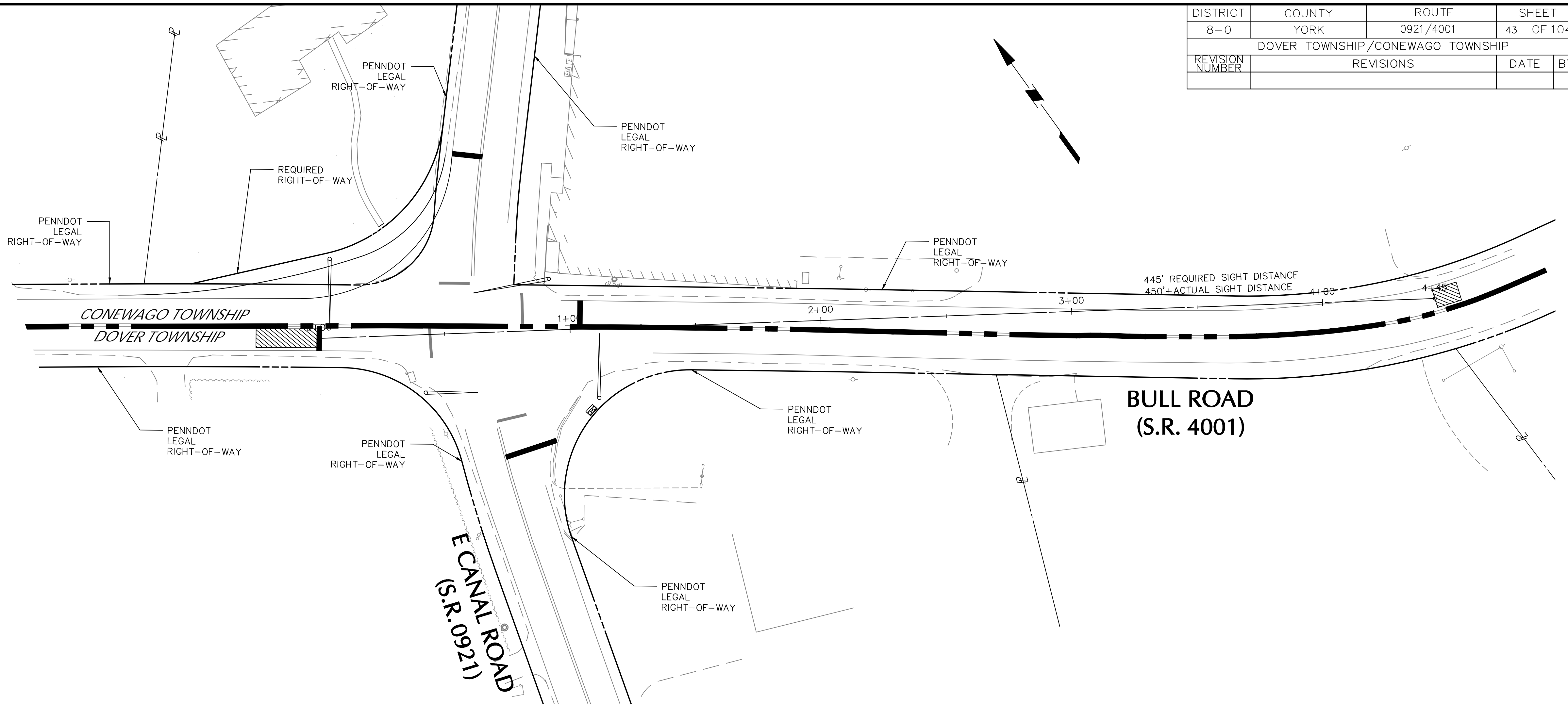


THE MAXIMUM LENGTH OF ROADWAY ALONG WHICH A DRIVER OF A VEHICLE INTENDING TO MAKE A LEFT TURN  
 INTO A DRIVEWAY CAN CONTINUOUSLY SEE A VEHICLE APPROACHING FROM THE OPPOSITE DIRECTION.

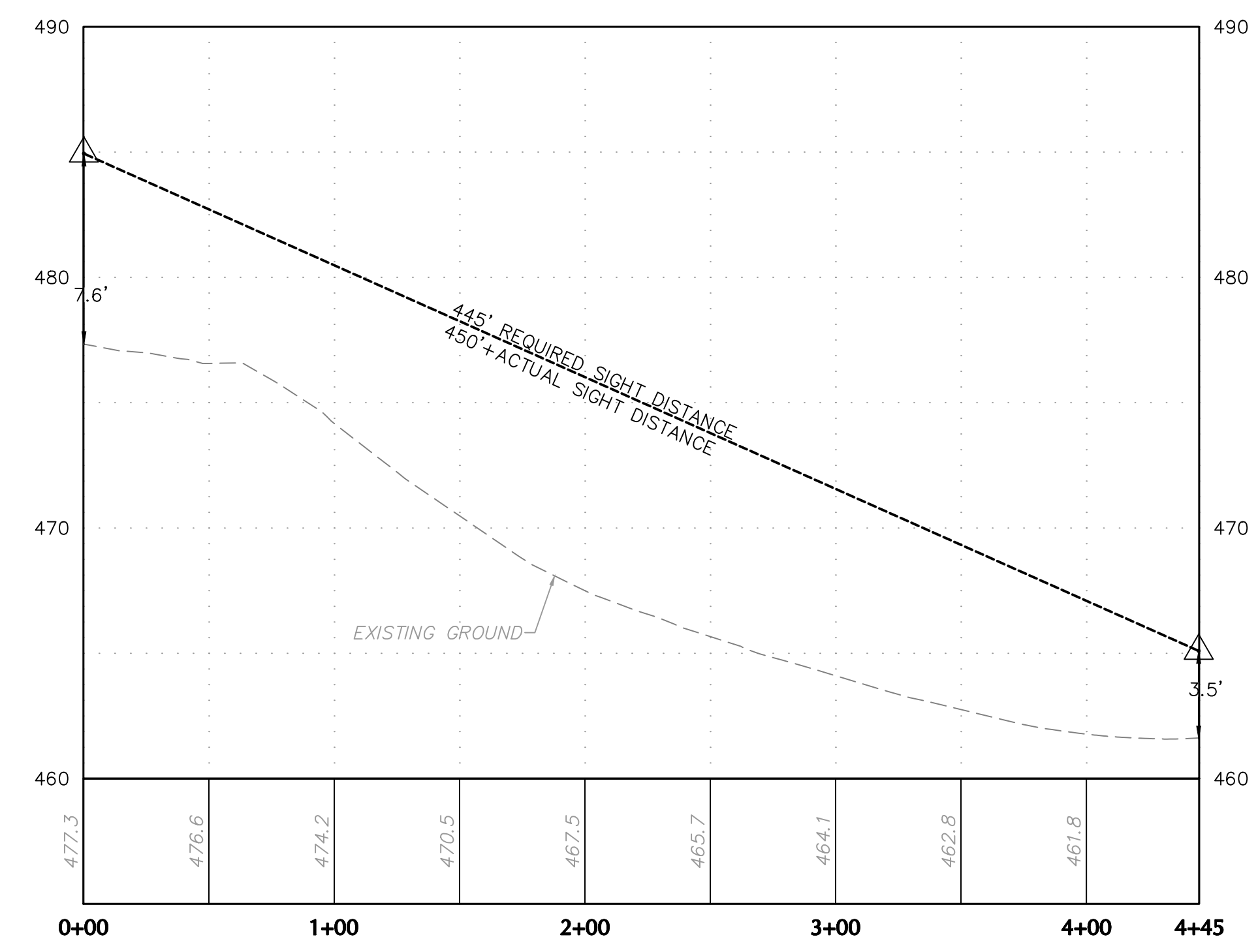
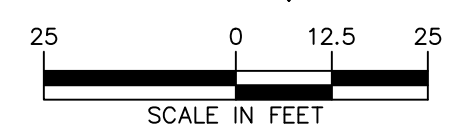
# FORMULA SIGHT DISTANCE TABLE

Speed (V) (Miles Per Hour)	Average Grade (G) (Percent)										
	Use plus grades when approaching vehicle is travelling upgrade.										
	0.0	+1.0	+2.0	+3.0	+4.0	+5.0	+6.0	+7.0	+8.0	+9.0	+10.0
25	147	145	144	143	142	140	139	138	137	136	135
30	196	194	191	189	187	185	183	182	180	178	177
35	249	245	242	239	236	233	231	228	226	224	221
40	314	<sup>A</sup> 309 <sub>B</sub>	304	299	295	291	287	284	280	277	274
45	383	376	370	364	358	353	348	343	339	334	330
50	462	453	444	436	429	422	415	409	403	397	392
55	538	527	517	508	499	490	482	475	468	461	454
Use negative grades when approaching vehicle is travelling downgrade.											
	0.0	-1.0	-2.0	-3.0	-4.0	-5.0	-6.0	-7.0	-8.0	-9.0	-10.0
25	147	148	150	151	153	155	157	159	161	164	166
30	196	199	201	204	207	210	214	217	221	226	230
35	249	252	256	260	265	269	275	280	286	292	299
40	314	319	<sup>A</sup> 325 <sub>C</sub>	331	338	345	352	360	369	379	389
45	383	390	398	406	415	425	435	447	459	472	487
50	462	471	481	492	504	517	531	546	563	581	600
55	538	550	562	576	590	606	622	641	661	682	706

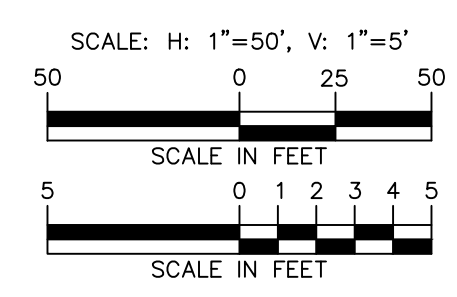
DISTRICT	COUNTY	ROUTE	SHEET
8-0	YORK	0921/4001	43 OF 104
DOVER TOWNSHIP / CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY



**COMBINATION TRUCK SIGHT DISTANCE PLAN  
INTERSECTION OF E CANAL ROAD (S.R. 0921) &  
BULL ROAD (S.R.4001)**



**COMBINATION TRUCK  
SIGHT DISTANCE PROFILE  
LEFT TURN ONTO E CANAL ROAD (S.R. 0921)  
FROM SOUTHBOUND BULL ROAD (S.R.4001)**



REQUIRED SIGHT DISTANCE OBTAINED FROM THE 2011 AASHTO GREEN BOOK "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS," CHAPTER 9 SECTION 9.5. CASE F, LEFT TURN FROM MAJOR ROAD COMBINATION TRUCK SPEED LIMIT = 40 MPH

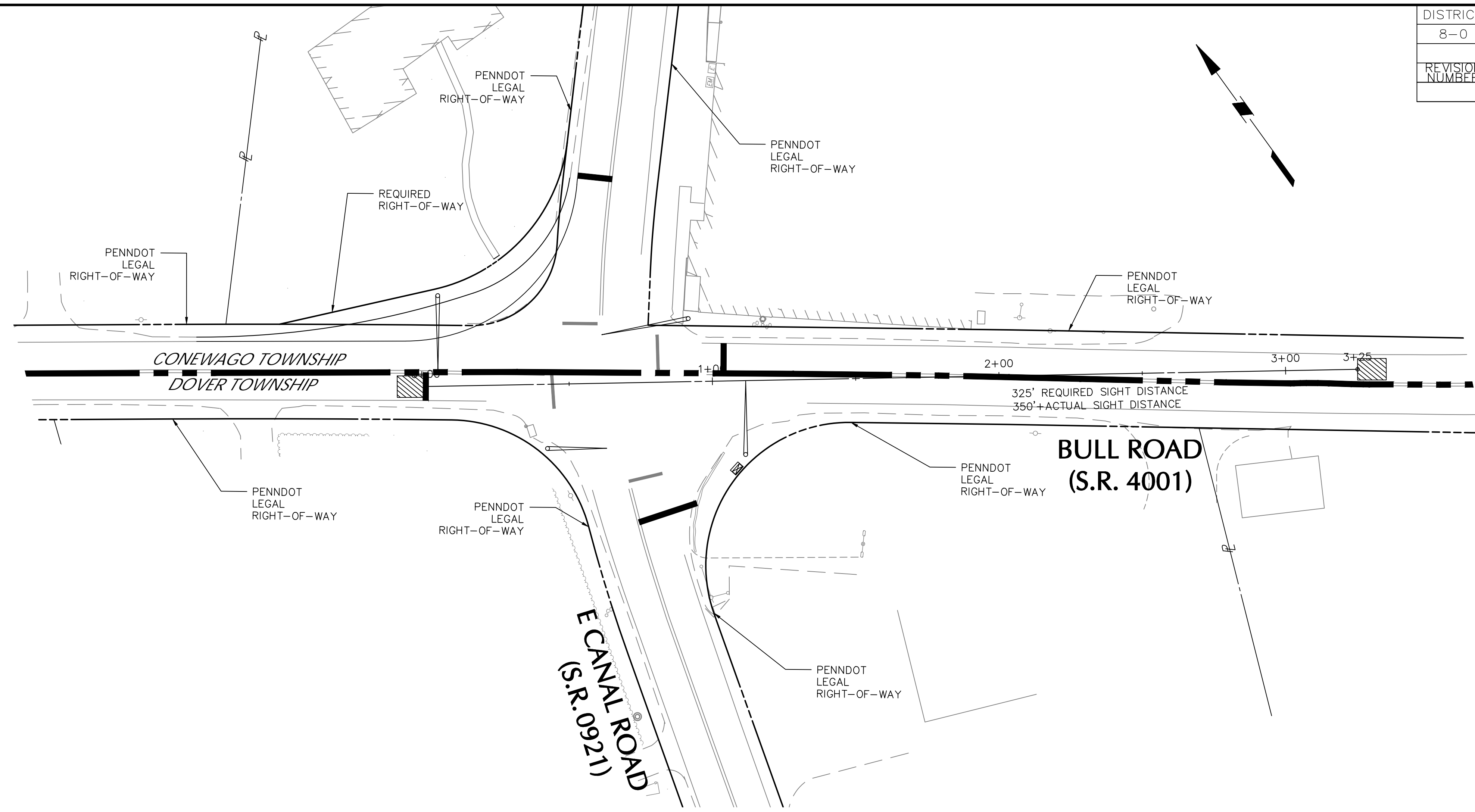
DATE: JANUARY 15, 2024

**LANGAN**  
2700 KELLY ROAD, SUITE 200  
WARRINGTON, PA 18976  
E-MAIL: AVIGILANTE@LANGAN.COM  
PHONE: 215-491-6500

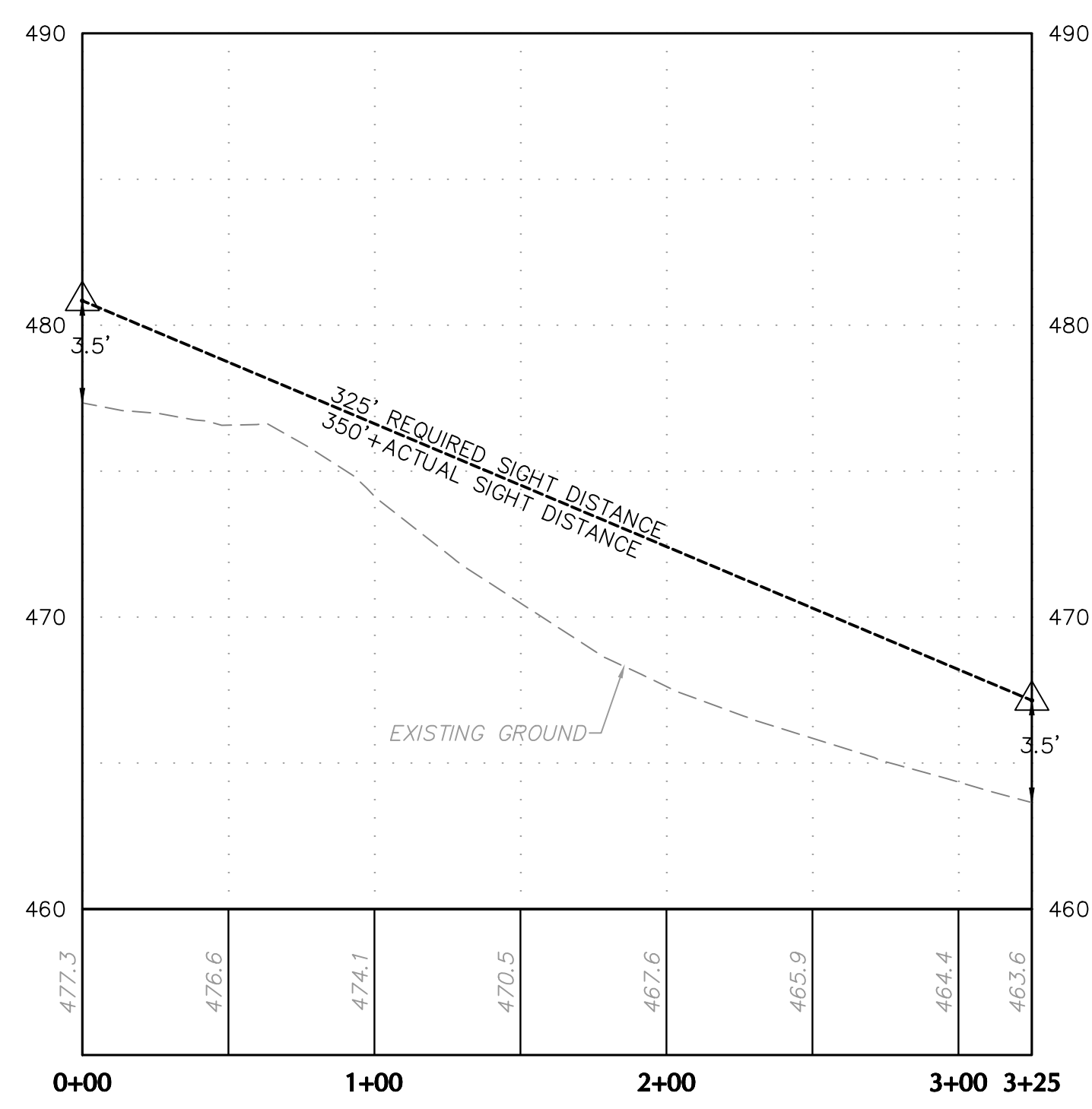
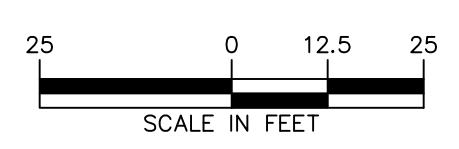
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LANGAN PROJECT No. 200164401 © 2024 Langan

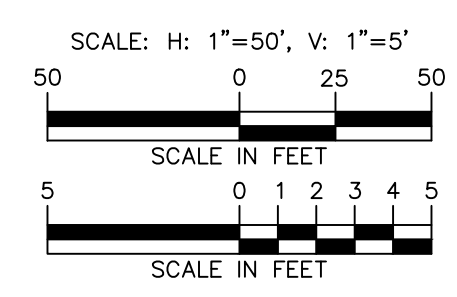
DISTRICT	COUNTY	ROUTE	SHEET
8-0	YORK	0921/4001	44 OF 104
DOVER TOWNSHIP / CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY



**SIGHT DISTANCE PLAN  
INTERSECTION OF E CANAL ROAD (S.R. 0921) &  
BULL ROAD (S.R. 4001)**



**CAR  
SIGHT DISTANCE PROFILE  
LEFT TURN ONTO E CANAL ROAD (S.R. 0921)  
FROM SOUTHBOUND BULL ROAD (S.R. 4001)**



REQUIRED SIGHT DISTANCE OBTAINED FROM THE 2011 AASHTO GREEN BOOK "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS," CHAPTER 9 SECTION 9.5. CASE F, LEFT TURN FROM MAJOR ROAD PASSENGER CAR SPEED LIMIT = 40 MPH



DATE: JANUARY 15, 2024

**LANGAN**

2700 KELLY ROAD, SUITE 200  
WARRINGTON, PA 18976  
E-MAIL: AVIGILANTE@LANGAN.COM  
PHONE: 215-491-6500

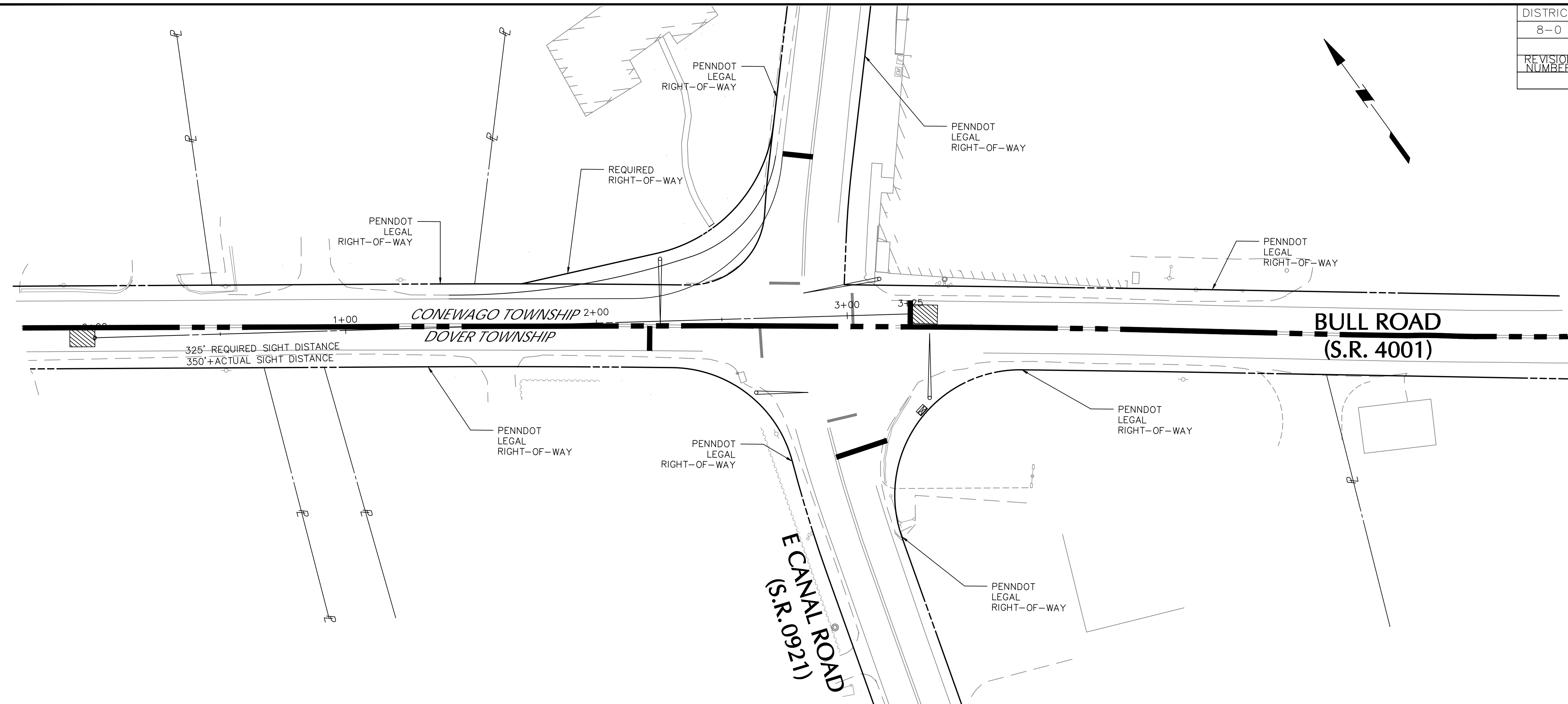
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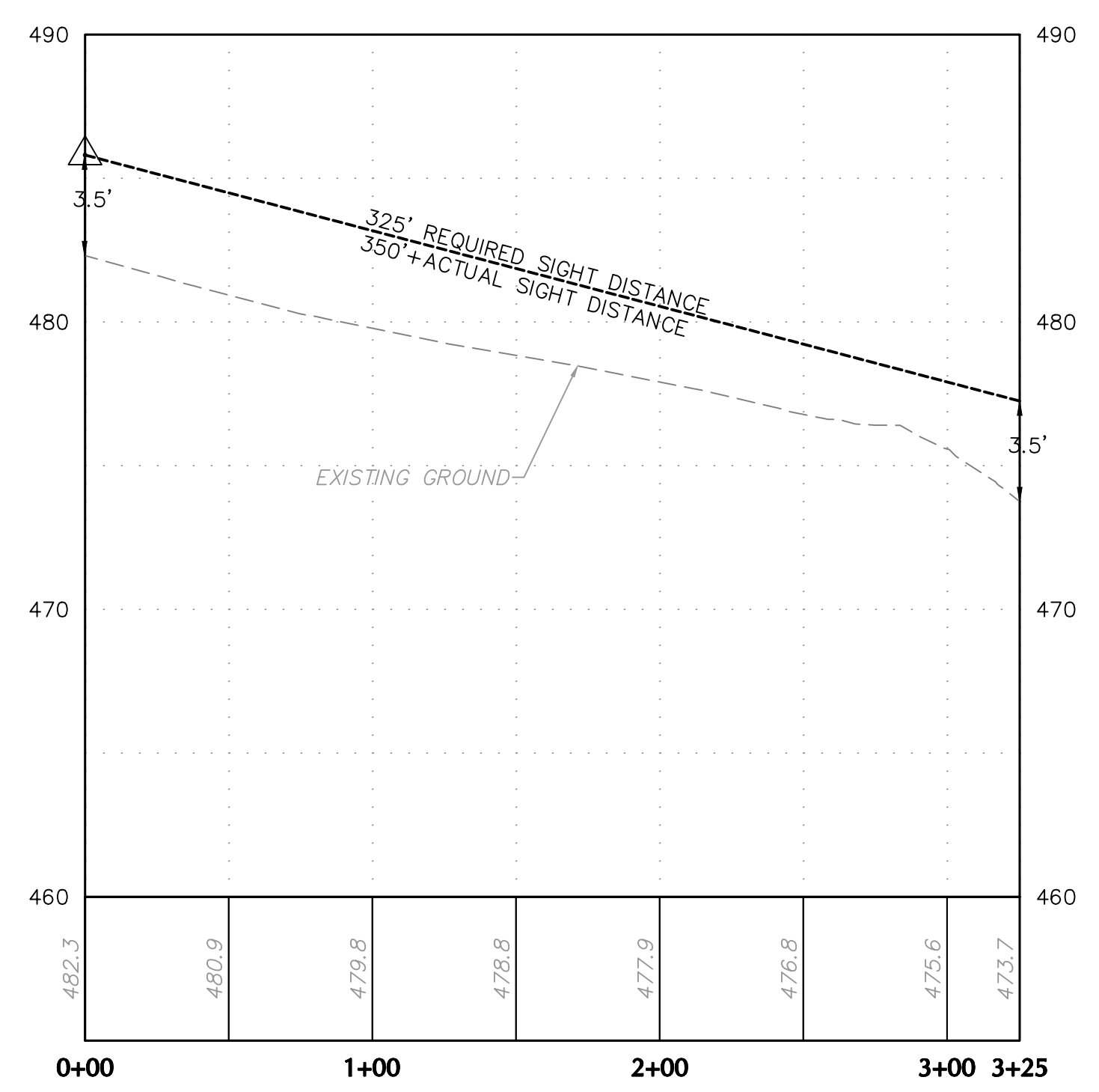
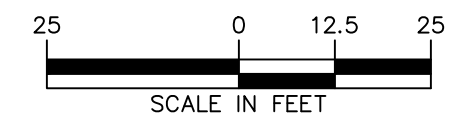


DISTRICT	COUNTY	ROUTE	SHEET
8-0	YORK	0921/4001	45 OF 104
DOVER TOWNSHIP / CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY

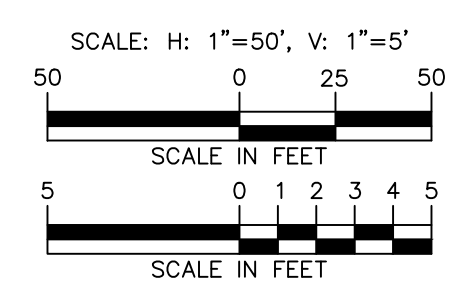
LANGAN PROJECT No. 200164401 © 2024 Langan



**SIGHT DISTANCE PLAN  
INTERSECTION OF E CANAL ROAD (S.R. 0921) &  
BULL ROAD (S.R. 4001)**



**CAR  
SIGHT DISTANCE PROFILE  
LEFT TURN ONTO E CANAL ROAD (S.R. 0921)  
FROM NORTHBOUND BULL ROAD (S.R. 4001)**



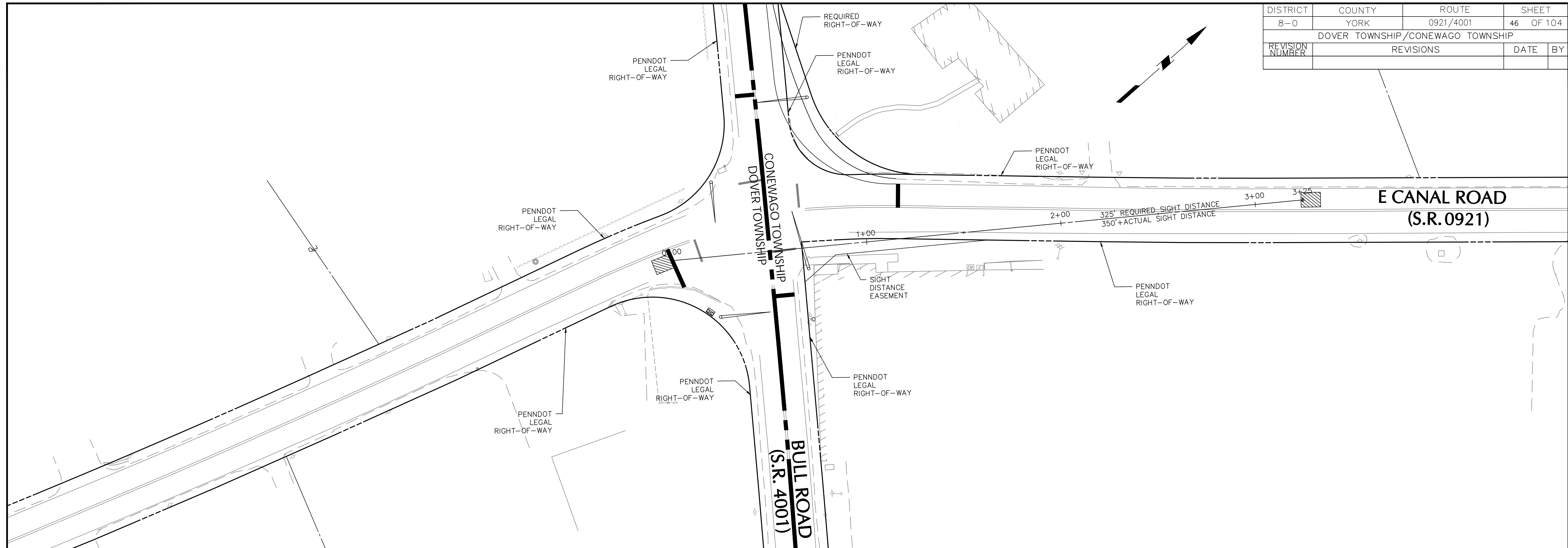
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DATE: JANUARY 15, 2024

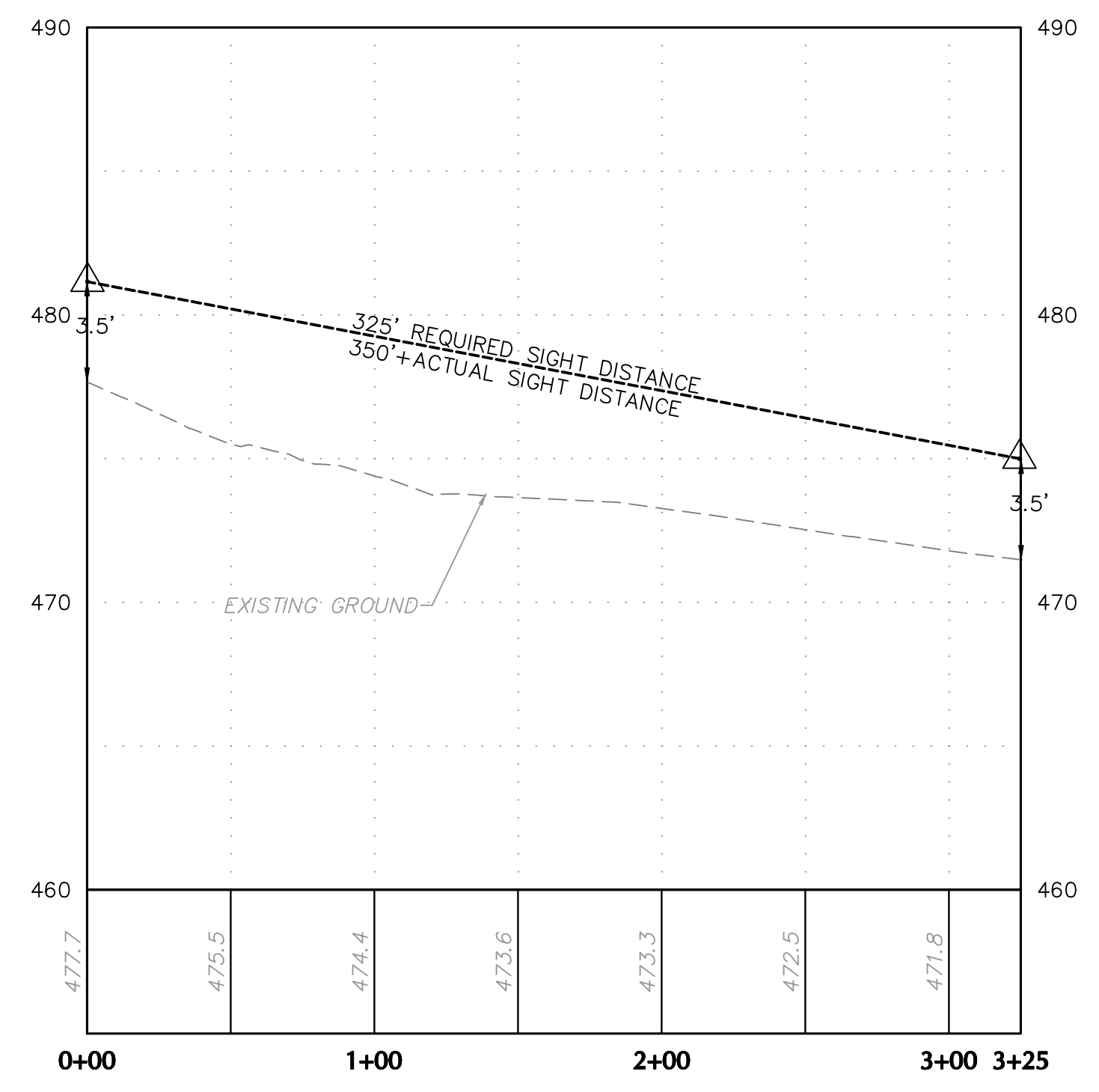
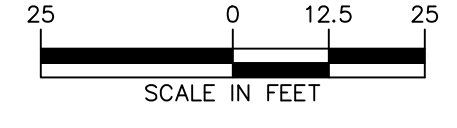
**LANGAN**  
2700 KELLY ROAD, SUITE 200  
WARRINGTON, PA 18976  
E-MAIL: AVIGILANTE@LANGAN.COM  
PHONE: 215-491-6500

DATE: 01/15/2024	HOP APP. #: 291441	PROJECT NO. 200164401
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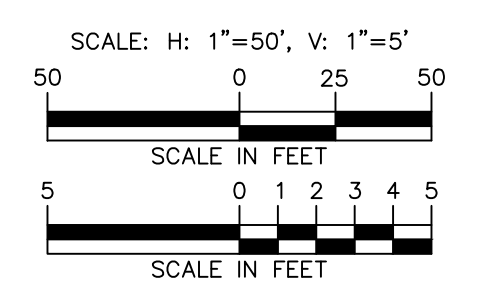
DISTRICT	COUNTY	ROUTE	SHEET
8-0	YORK	0921/4001	46 OF 104
DOVER TOWNSHIP / CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY



**SIGHT DISTANCE PLAN  
INTERSECTION OF E CANAL ROAD (S.R. 0921) &  
BULL ROAD (S.R. 4001)**



**CAR  
SIGHT DISTANCE PROFILE  
LEFT TURN ONTO NORTHBOUND BULL ROAD (S.R. 4001)  
FROM EASTBOUND E CANAL ROAD (S.R. 0921)**



REQUIRED SIGHT DISTANCE OBTAINED FROM THE 2011 AASHTO GREEN BOOK "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS," CHAPTER 9 SECTION 9.5. CASE F, LEFT TURN FROM MAJOR ROAD PASSENGER CAR SPEED LIMIT = 40 MPH



DATE: JANUARY 15, 2024

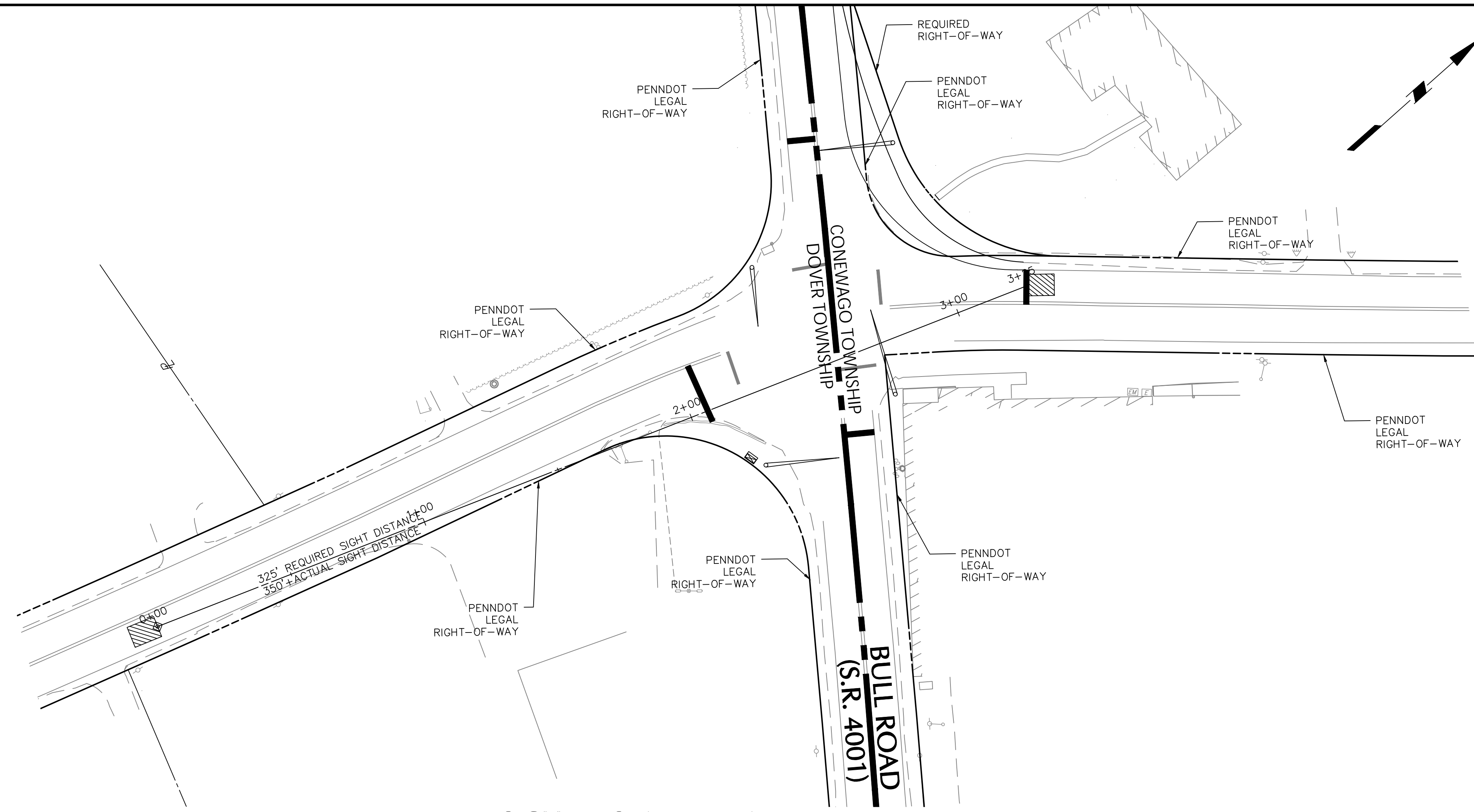
**LANGAN**

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WARRINGTON, PA 18976  
E-MAIL: AVIGILANTE@LANGAN.COM  
PHONE: 215-491-6500

DATE: 01/15/2024	HOP APP. #: 291441	PROJECT NO. 200164401
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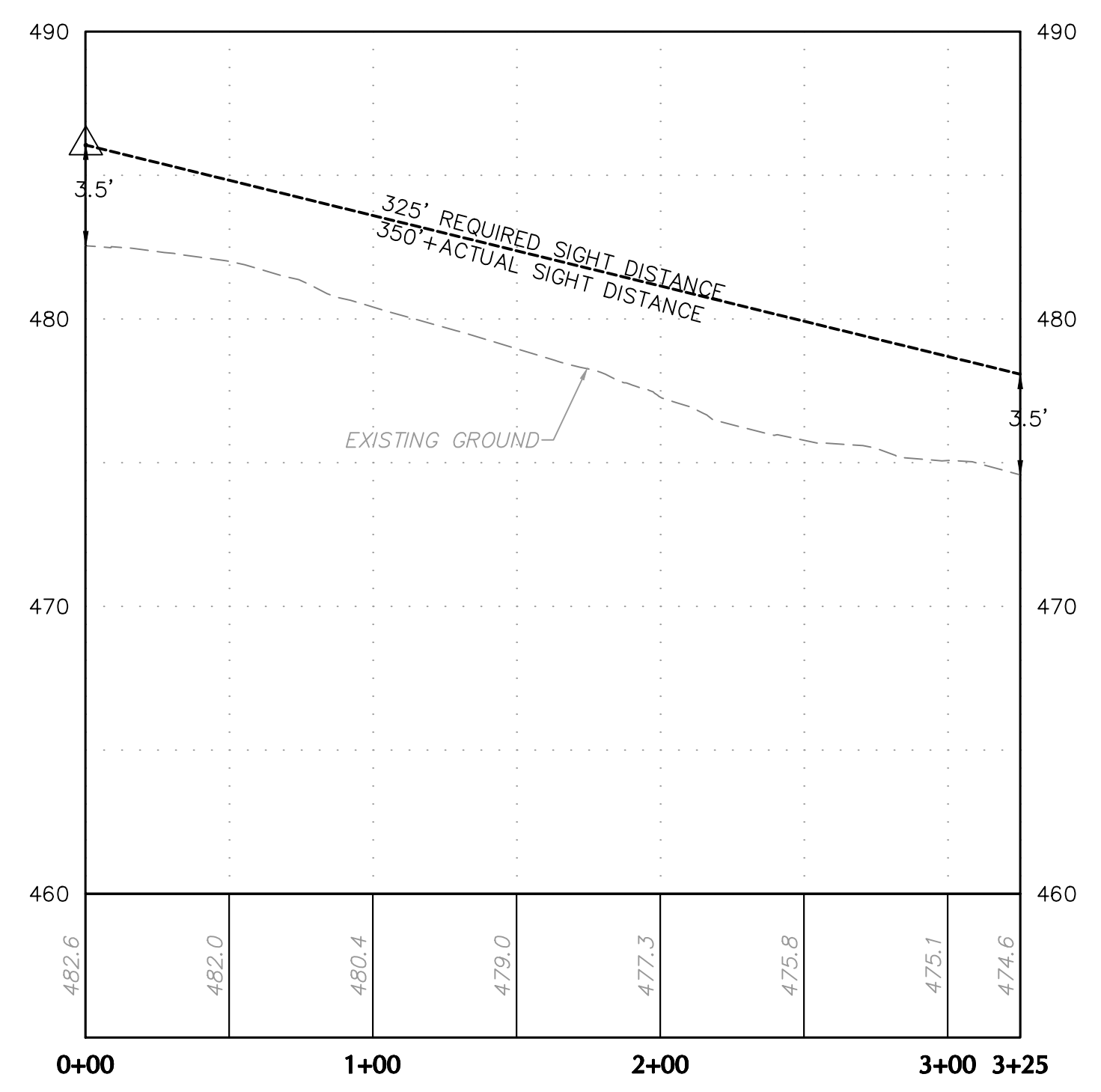
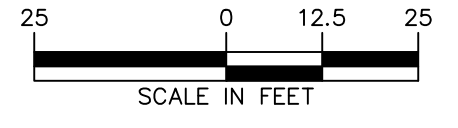
LANGAN PROJECT No. 200164401 © 2024 Langan

DISTRICT	COUNTY	ROUTE	SHEET
8-0	YORK	0921/4001	47 OF 104
DOVER TOWNSHIP / CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY

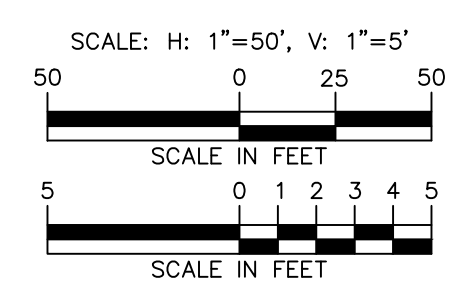


**E CANAL ROAD  
(S.R. 0921)**

**SIGHT DISTANCE PLAN  
INTERSECTION OF E CANAL ROAD (S.R. 0921) &  
BULL ROAD (S.R. 4001)**



**CAR  
SIGHT DISTANCE PROFILE  
LEFT TURN ONTO SOUTHBOUND BULL ROAD (S.R. 4001)  
FROM WESTBOUND E CANAL ROAD**



REQUIRED SIGHT DISTANCE OBTAINED FROM THE 2011 AASHTO GREEN BOOK "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS," CHAPTER 9 SECTION 9.5. CASE F, LEFT TURN FROM MAJOR ROAD PASSENGER CAR SPEED LIMIT = 40 MPH



DATE: JANUARY 15, 2024

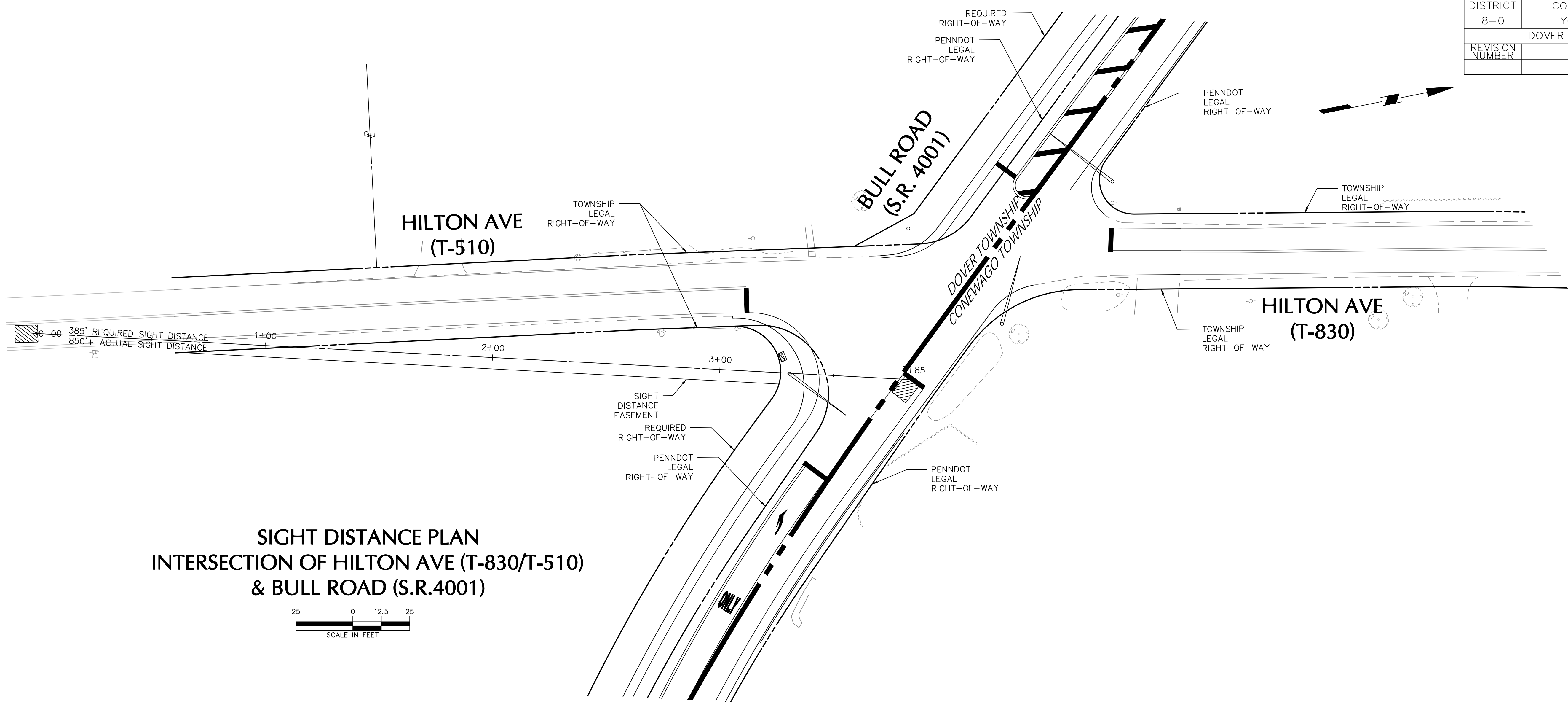
**LANGAN**

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WARRINGTON, PA 18976  
E-MAIL: AVIGILANTE@LANGAN.COM  
PHONE: 215-491-6500

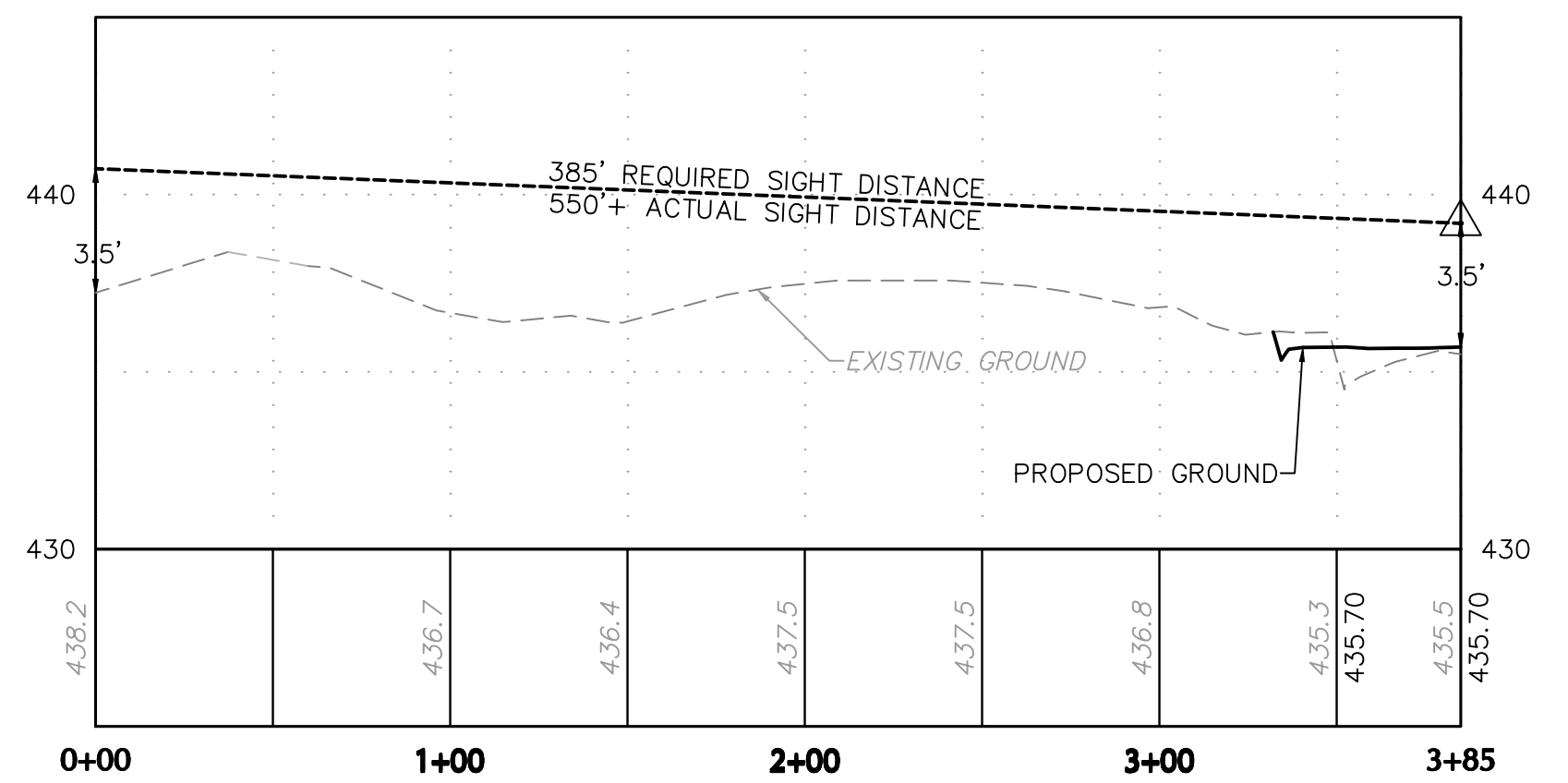
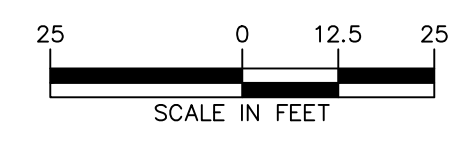
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DRAWN BY: EL/RC		CHECKED BY: BP/RM
PLAN TITLE <b>SIGHT DISTANCE PROFILE</b>		DRAWING NO. <b>KT502-0106</b>



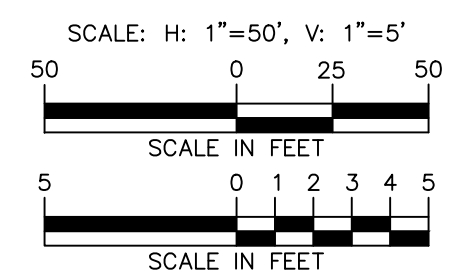
DISTRICT	COUNTY	ROUTE	SHEET
8-0	YORK	0921/4001	49 OF 104
DOVER TOWNSHIP/ CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY



**SIGHT DISTANCE PLAN  
INTERSECTION OF HILTON AVE (T-830/T-510)  
& BULL ROAD (S.R.4001)**



**CAR  
SIGHT DISTANCE PROFILE  
RIGHT TURN ONTO HILTON AVE (T-830)  
FROM NORTHBOUND BULL ROAD (S.R.4001)**



REQUIRED SIGHT DISTANCE OBTAINED FROM THE 2011 AASHTO GREEN BOOK "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS," CHAPTER 9 SECTION 9.5. CASE B2, RIGHT TURNS FROM THE MINOR ROAD PASSENGER CAR SPEED LIMIT = 40 MPH



DATE: JANUARY 15, 2024

**LANGAN**  
2700 KELLY ROAD, SUITE 200  
WARRINGTON, PA 18976  
E-MAIL: AVIGILANTE@LANGAN.COM  
PHONE: 215-491-6500

DATE: 01/15/2024	HOP APP. #: 291441	PROJECT NO. 200164401
DRAWN BY: EL/RC		CHECKED BY: BP/RM
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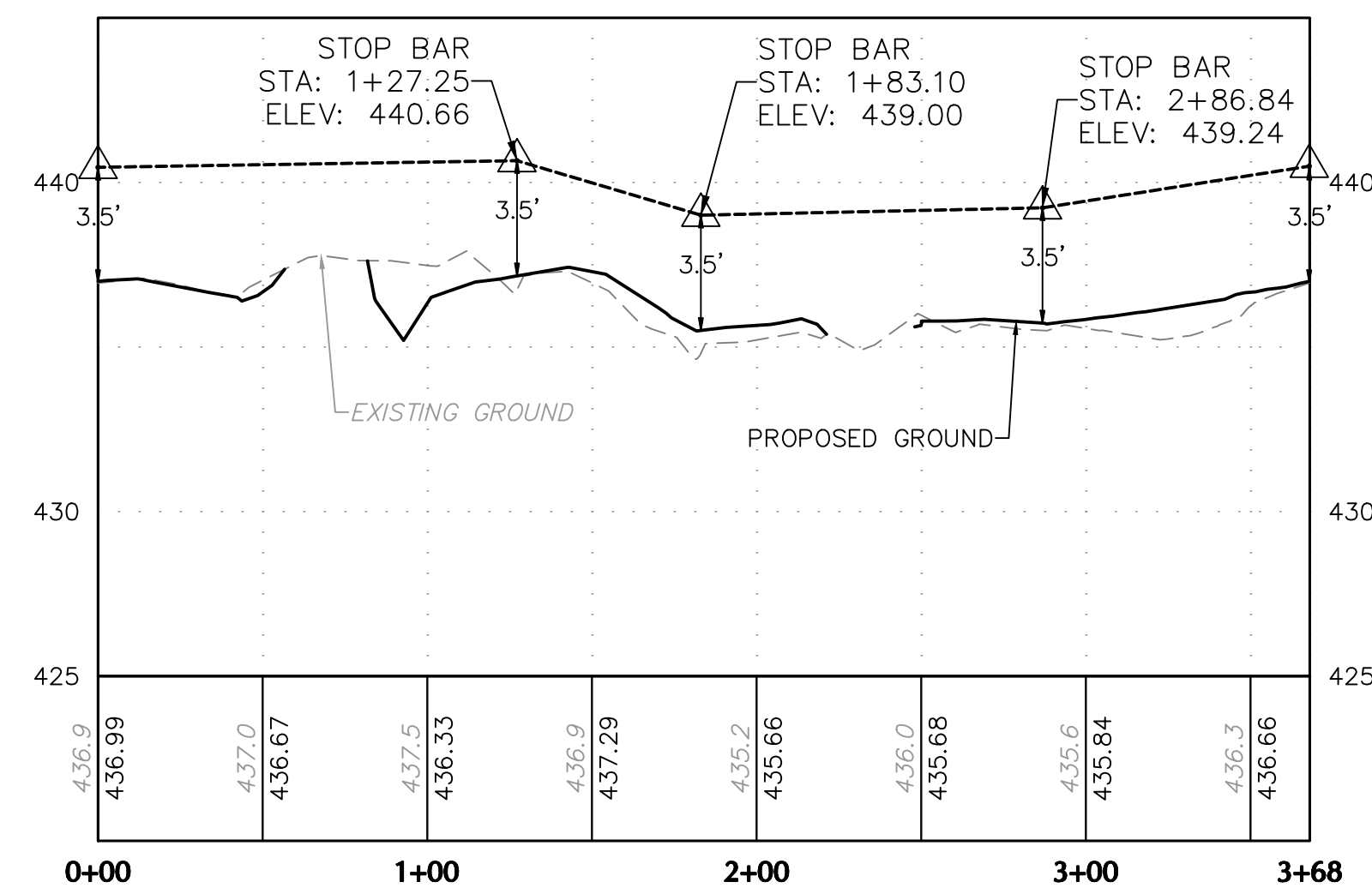
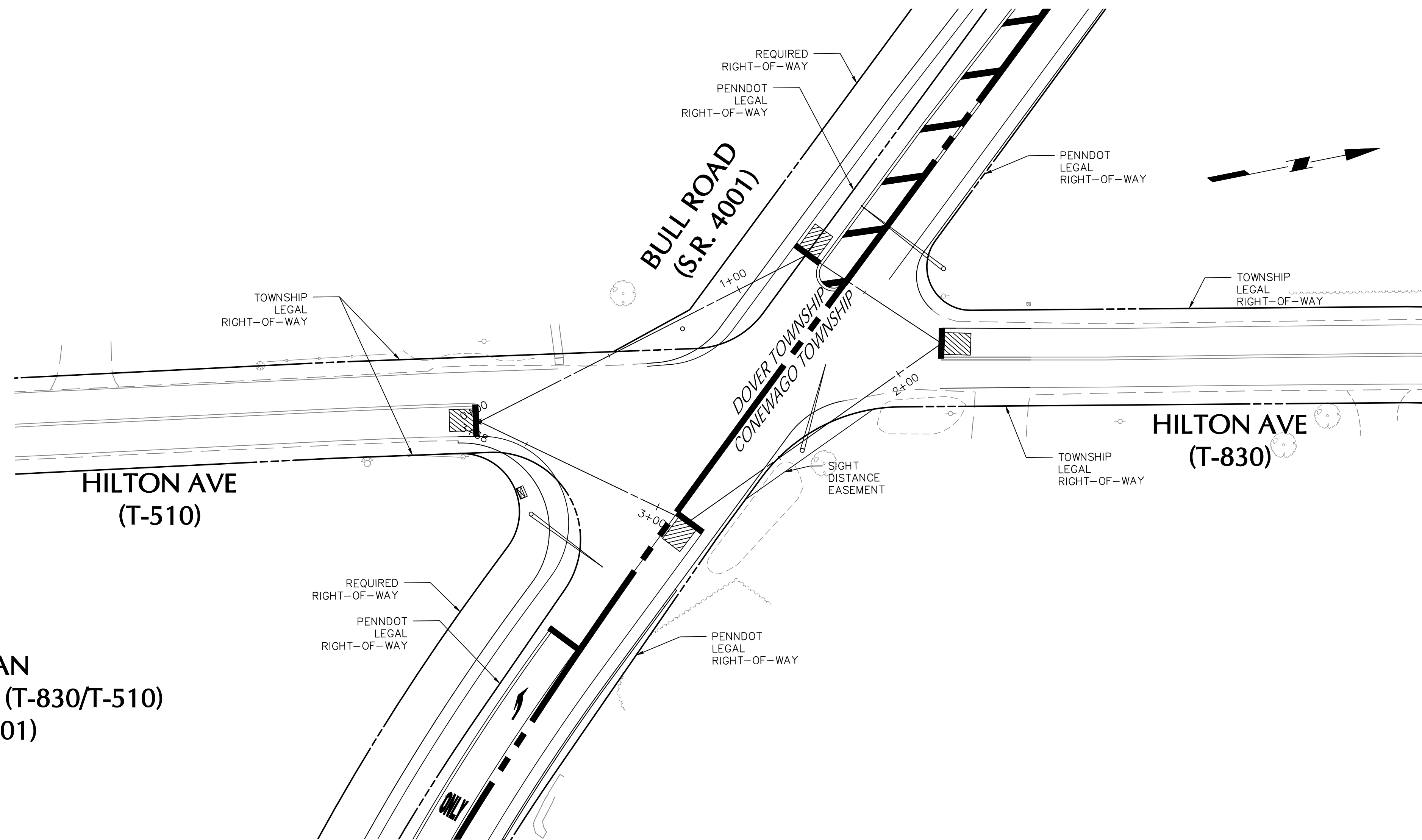
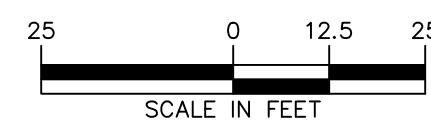
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DISTRICT	COUNTY	ROUTE	SHEET
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DOVER TOWNSHIP / CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY

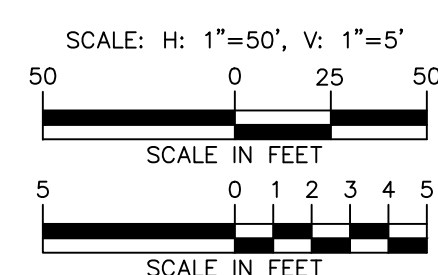
LANGAN

PROJECT No. 200164401

**SIGHT DISTANCE PLAN  
INTERSECTION OF HILTON AVE (T-830/T-510)  
& BULL ROAD (S.R.4001)**



**CAR  
SIGHT DISTANCE PROFILE  
CONNECT ALL FOUR STOP BARS**



REQUIRED SIGHT DISTANCE OBTAINED FROM THE 2011 AASHTO GREEN BOOK "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS," CHAPTER 9 SECTION 9.5. CASE D, INTERSECTIONS WITH TRAFFIC SIGNAL CONTROL. PASSENGER CAR. SPEED LIMIT = 40 MPH

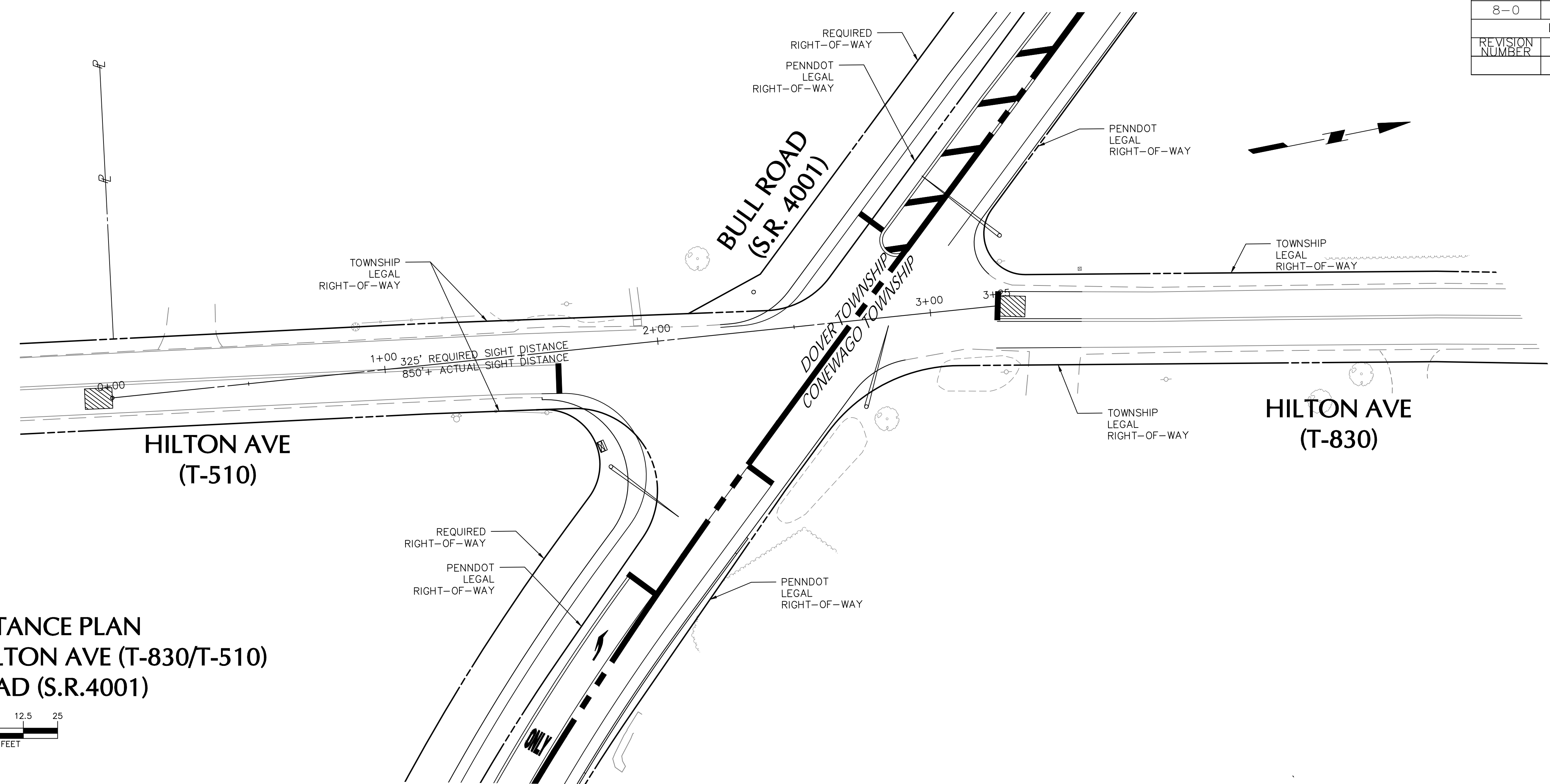
DATE: JANUARY 15, 2024

**LANGAN**  
2700 KELLY ROAD, SUITE 200  
WARRINGTON, PA 18976  
E-MAIL: AVIGILANTE@LANGAN.COM  
PHONE: 215-491-6500

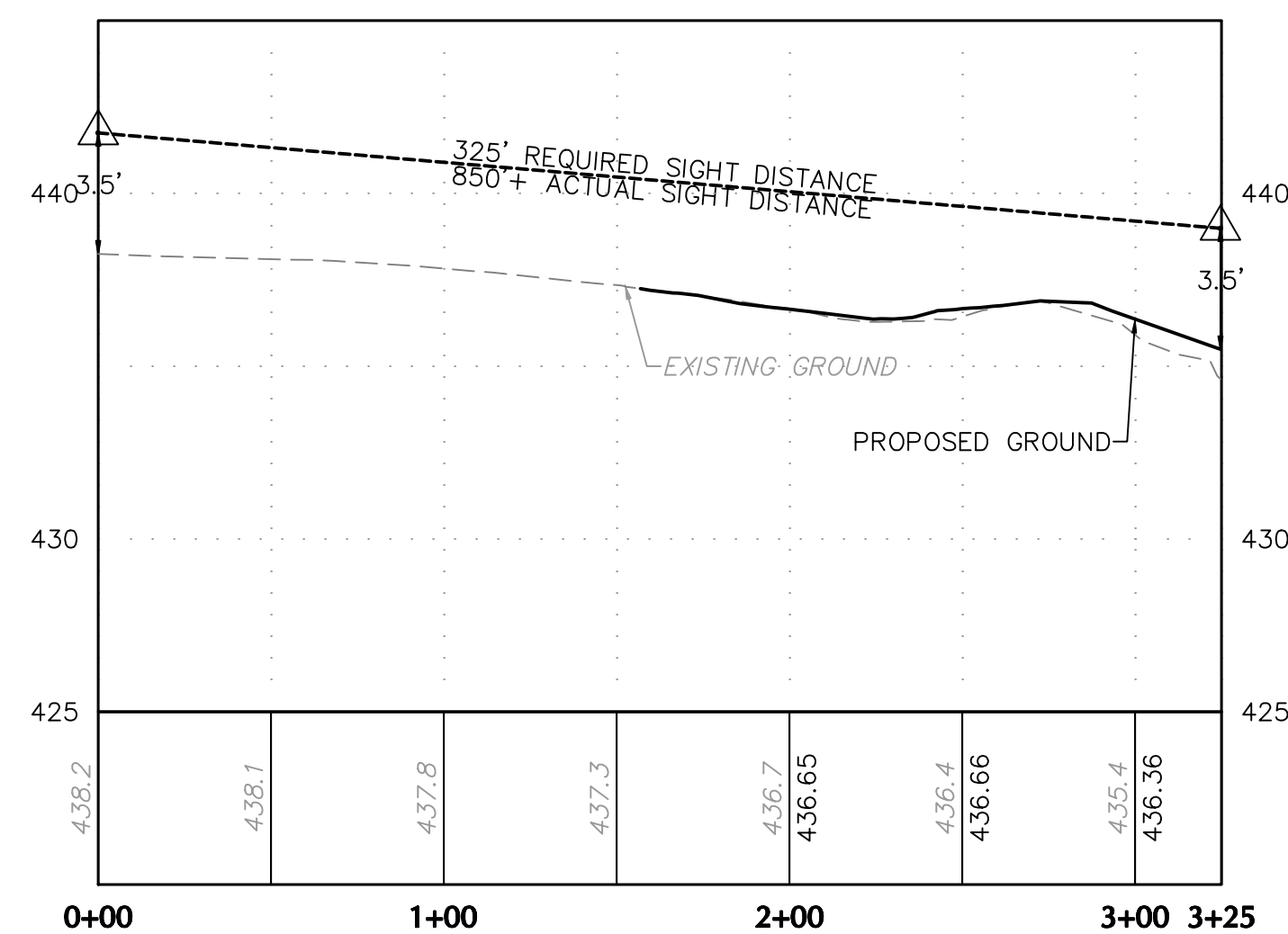
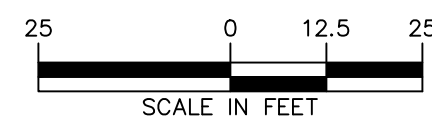
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PLAN TITLE: <b>SIGHT DISTANCE PROFILE</b>		DRAWING NO.: <b>KT502-0109</b>

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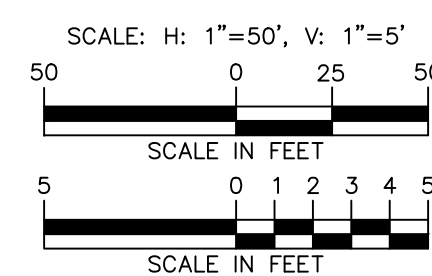
DISTRICT	COUNTY	ROUTE	SHEET
8-0	YORK	0921/4001	51 OF 104
DOVER TOWNSHIP/ CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY



**SIGHT DISTANCE PLAN  
INTERSECTION OF HILTON AVE (T-830/T-510)  
& BULL ROAD (S.R.4001)**



**CAR  
SIGHT DISTANCE PROFILE  
LEFT TURN ONTO BULL ROAD (S.R.4001)  
FROM WESTBOUND HILTON AVE (T-830)**



REQUIRED SIGHT DISTANCE OBTAINED FROM THE 2011 AASHTO GREEN BOOK "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS," CHAPTER 9 SECTION 9.5. CASE F, LEFT TURN FROM MAJOR ROAD PASSENGER CAR SPEED LIMIT = 40 MPH

DATE: JANUARY 15, 2024

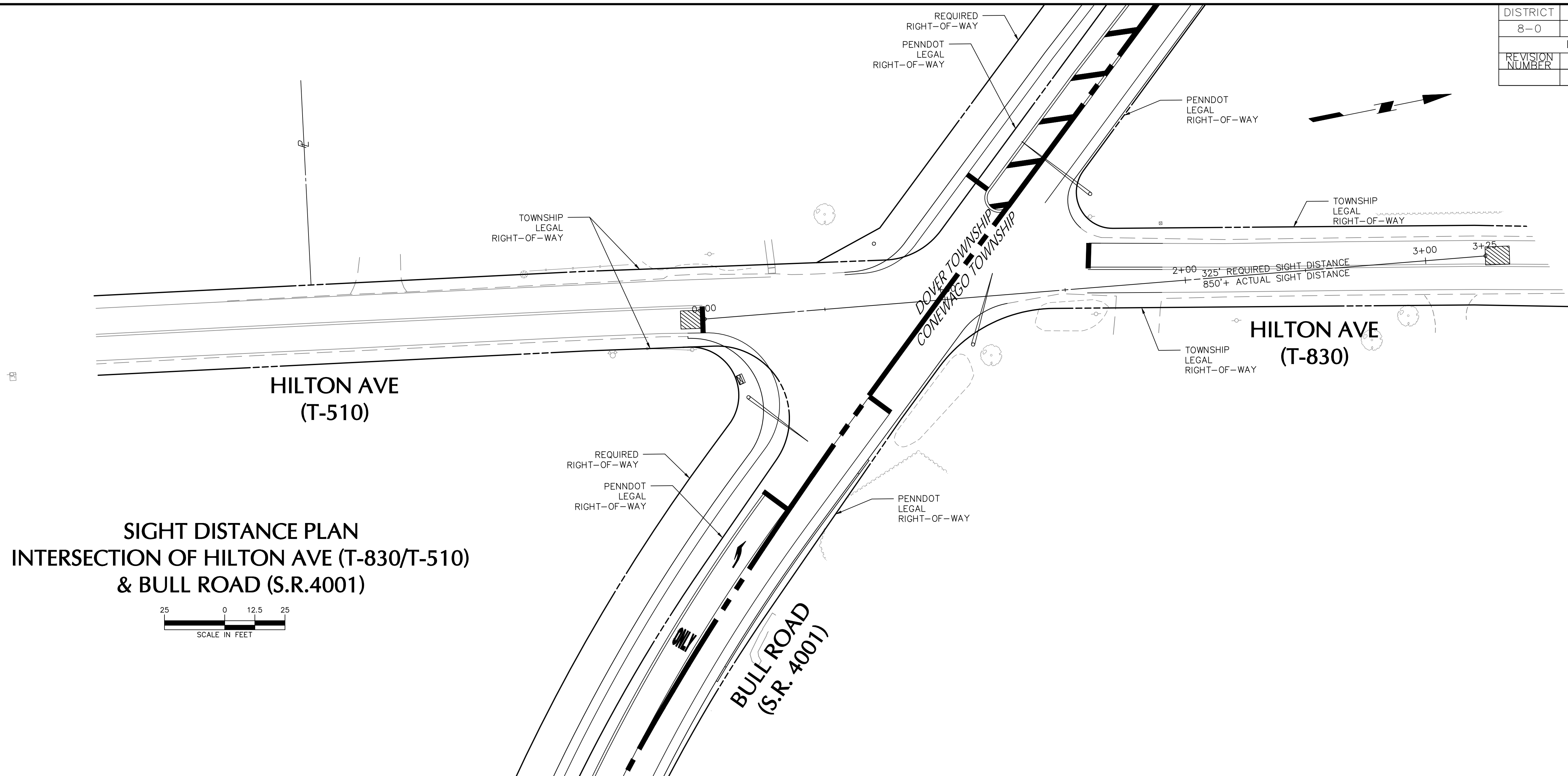
**LANGAN**  
2700 KELLY ROAD, SUITE 200  
WARRINGTON, PA 18976  
E-MAIL: AVIGILANTE@LANGAN.COM  
PHONE: 215-491-6500

DATE: 01/15/2024	HOP APP. #: 291441	PROJECT NO. 200164401
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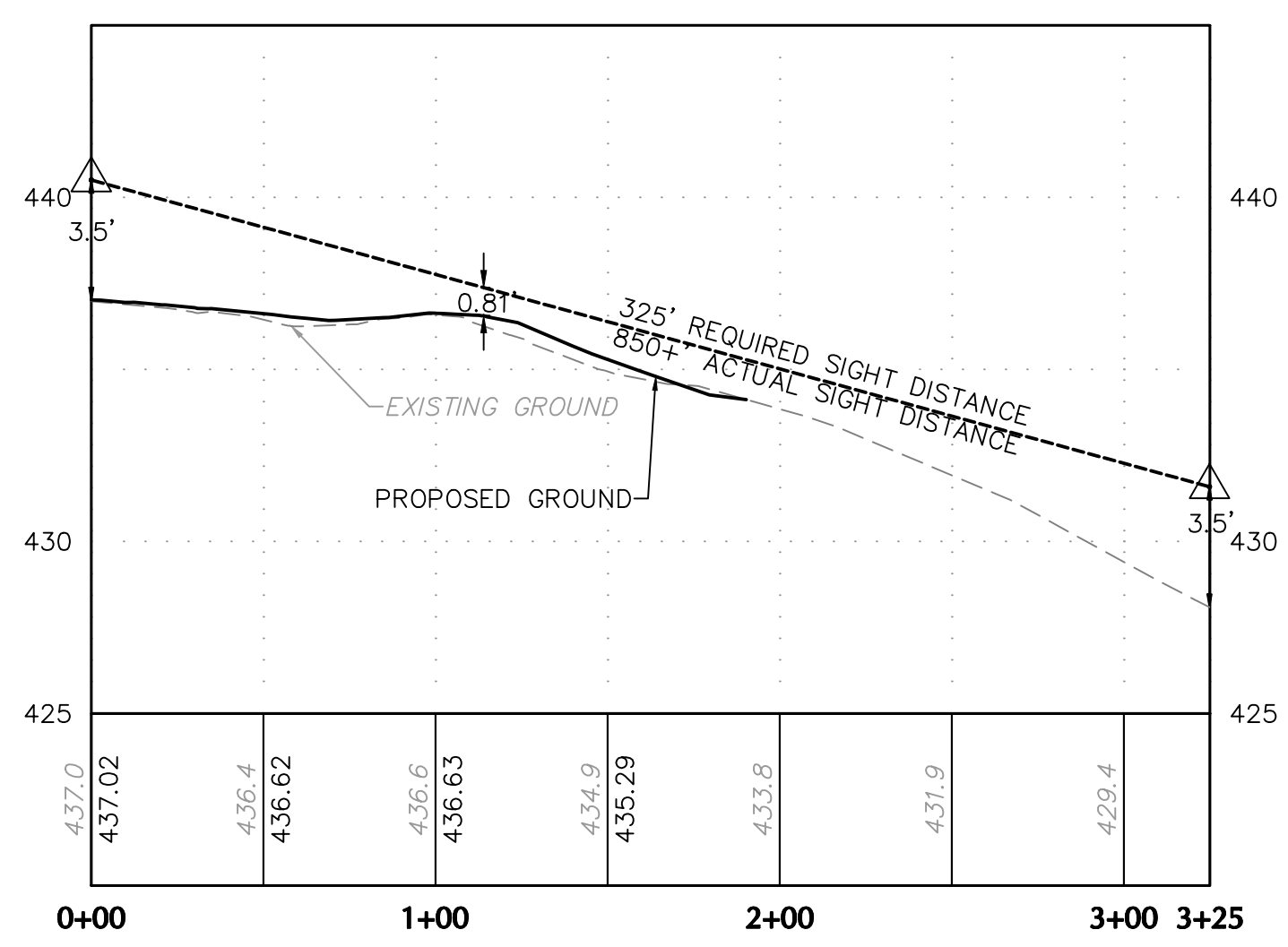
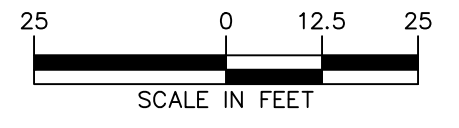
LANGAN PROJECT No. 200164401 © 2024 Langan

DISTRICT	COUNTY	ROUTE	SHEET
8-0	YORK	0921/4001	52 OF 104
DOVER TOWNSHIP/ CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY

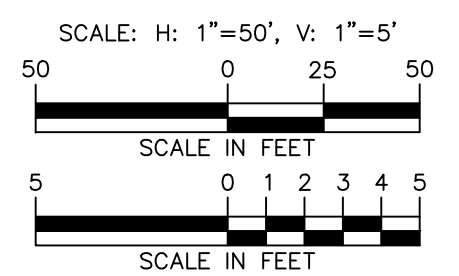
LANGAN PROJECT No. 200164401 © 2024 Langan



**SIGHT DISTANCE PLAN  
INTERSECTION OF HILTON AVE (T-830/T-510)  
& BULL ROAD (S.R.4001)**



**CAR  
SIGHT DISTANCE PROFILE  
LEFT TURN ONTO BULL ROAD (S.R.4001)  
FROM EASTBOUND HILTON AVE (T-510)**



REQUIRED SIGHT DISTANCE OBTAINED FROM THE 2011 AASHTO GREEN BOOK "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS," CHAPTER 9 SECTION 9.5. CASE F, LEFT TURN FROM MAJOR ROAD PASSENGER CAR SPEED LIMIT = 40 MPH

DATE: JANUARY 15, 2024

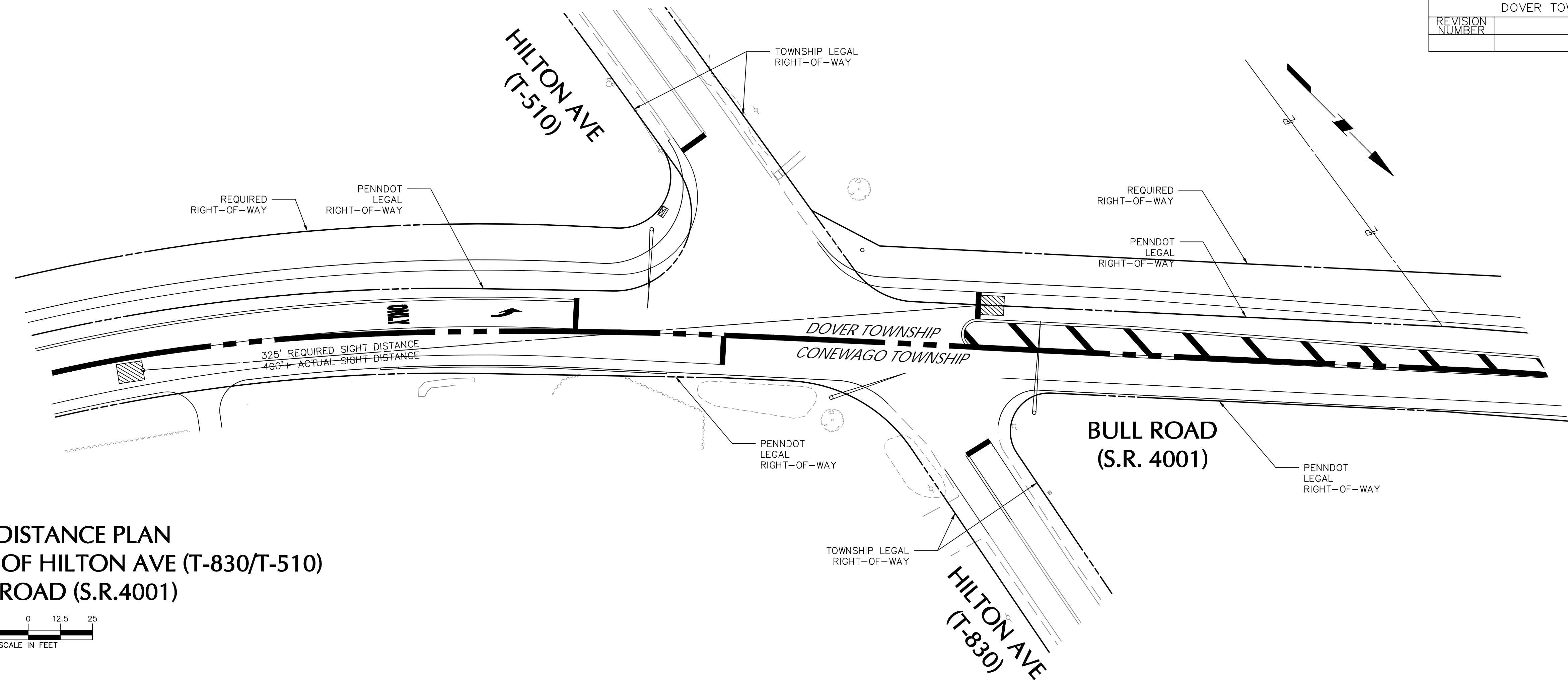
**LANGAN**  
2700 KELLY ROAD, SUITE 200  
WARRINGTON, PA 18976  
E-MAIL: AVIGILANTE@LANGAN.COM  
PHONE: 215-491-6500

DATE: 01/15/2024	HOP APP. #: 291441	PROJECT NO. 200164401
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PLAN TITLE <b>SIGHT DISTANCE PROFILE</b>		DRAWING NO. <b>KT502-0111</b>

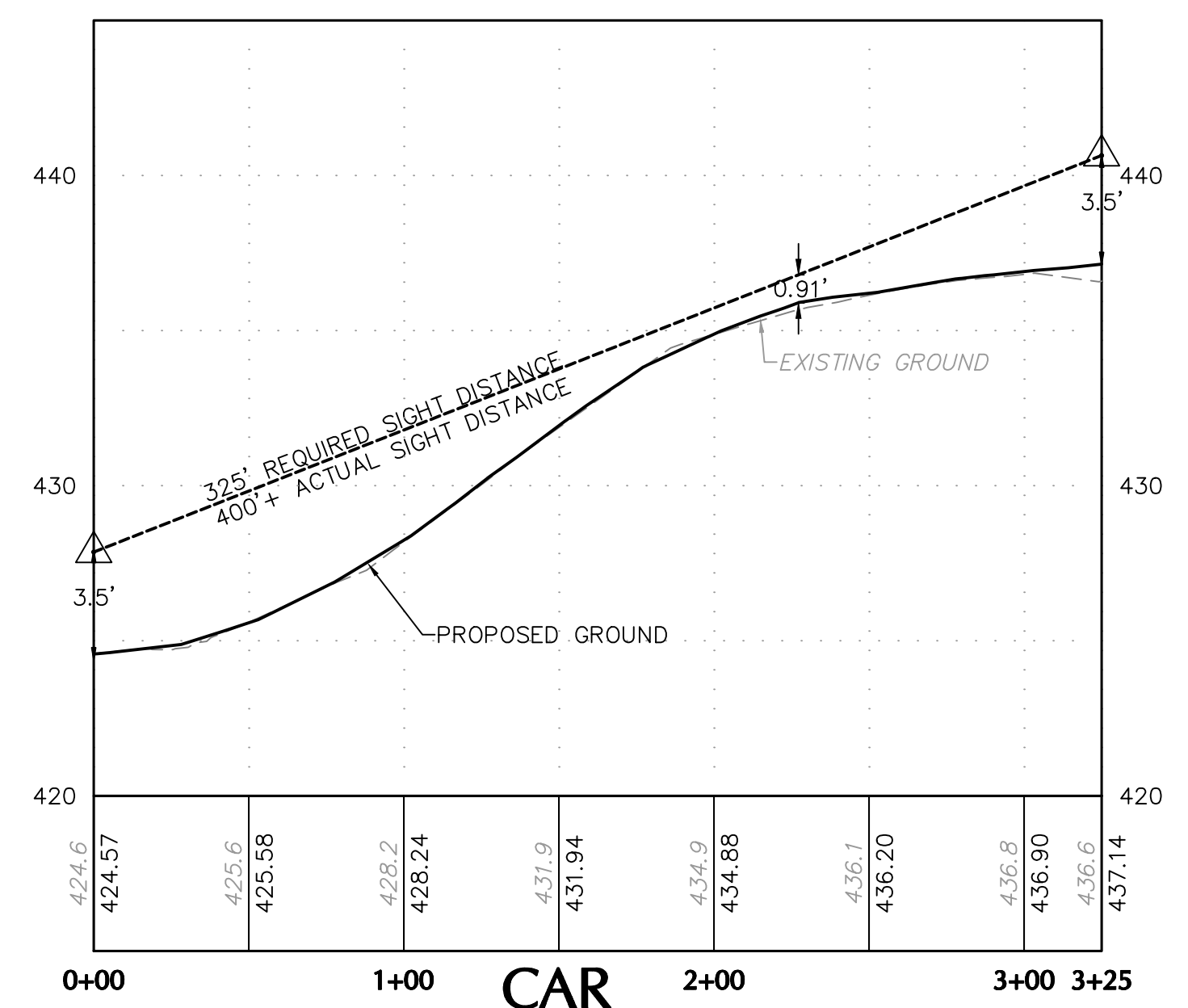
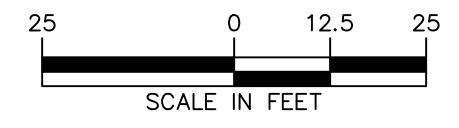


DISTRICT	COUNTY	ROUTE	SHEET
8-0	YORK	0921/4001	53 OF 104
DOVER TOWNSHIP/ CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY

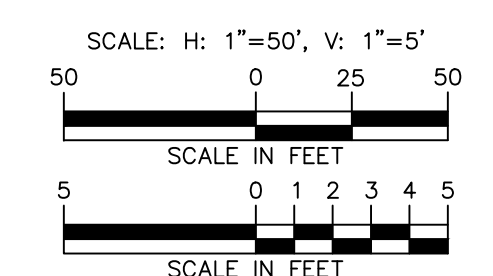
LANGAN



**SIGHT DISTANCE PLAN  
INTERSECTION OF HILTON AVE (T-830/T-510)  
& BULL ROAD (S.R.4001)**



**SIGHT DISTANCE PROFILE  
LEFT TURN ONTO EASTBOUND HILTON AVE (T-830)  
FROM SOUTHBOUND BULL ROAD (S.R. 4001)**



REQUIRED SIGHT DISTANCE OBTAINED FROM THE 2011 AASHTO GREEN BOOK "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS," CHAPTER 9 SECTION 9.5. CASE F, LEFT TURN FROM MAJOR ROAD PASSENGER CAR SPEED LIMIT = 40 MPH



DATE: JANUARY 15, 2024

**LANGAN**

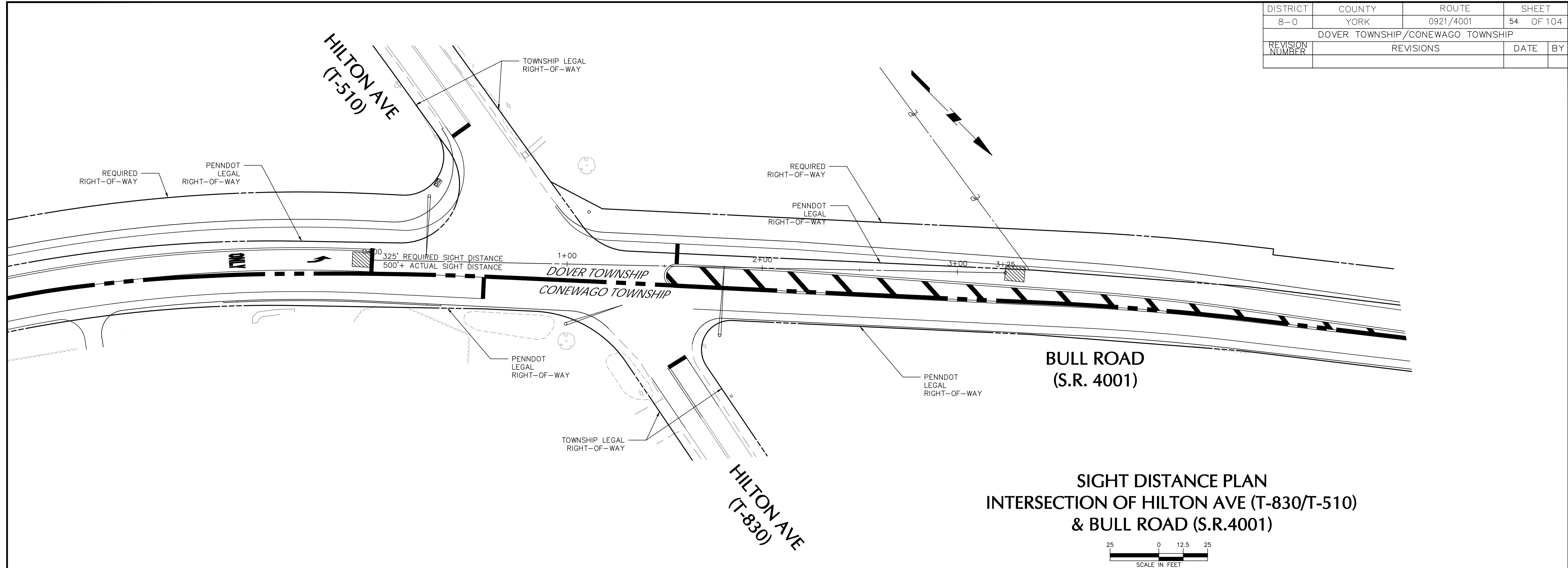
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WARRINGTON, PA 18976  
E-MAIL: AVIGILANTE@LANGAN.COM  
PHONE: 215-491-6500

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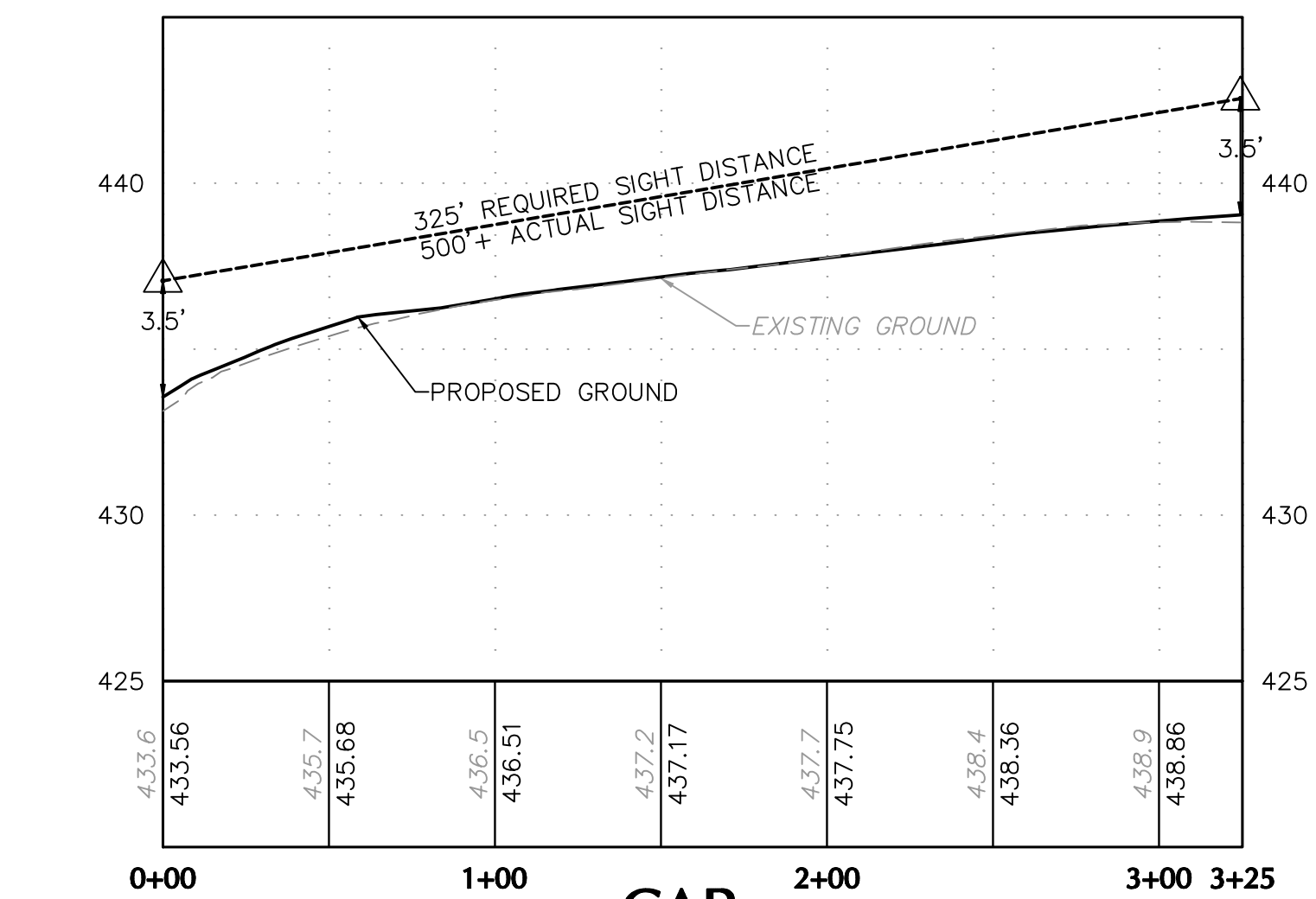
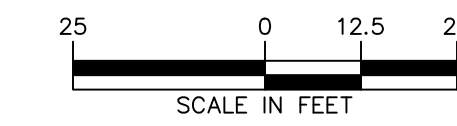
PROJECT No. 200164401

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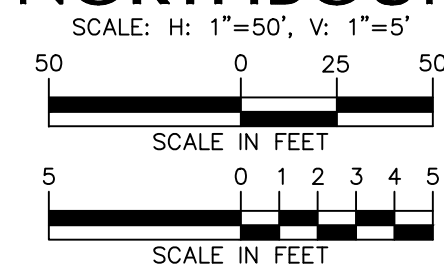
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8-0	YORK	0921/4001	54 OF 104
DOVER TOWNSHIP/ CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY



**SIGHT DISTANCE PLAN  
INTERSECTION OF HILTON AVE (T-830/T-510)  
& BULL ROAD (S.R.4001)**



**CAR  
SIGHT DISTANCE PROFILE  
LEFT TURN ONTO HILTON AVE (T-510)  
FROM NORTHBOUND BULL ROAD (S.R. 4001)**



REQUIRED SIGHT DISTANCE OBTAINED FROM THE 2011 AASHTO GREEN BOOK "A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS," CHAPTER 9 SECTION 9.5. CASE F, LEFT TURN FROM MAJOR ROAD PASSENGER CAR SPEED LIMIT = 40 MPH



DATE: JANUARY 15, 2024

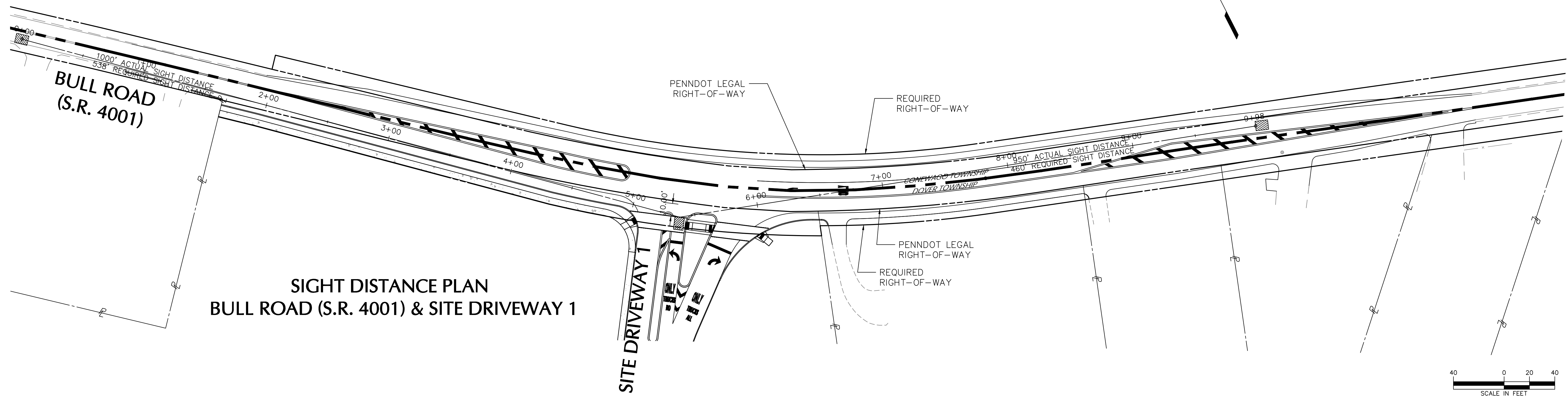
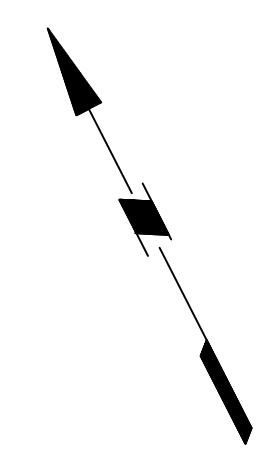
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PHONE: 215-491-6500

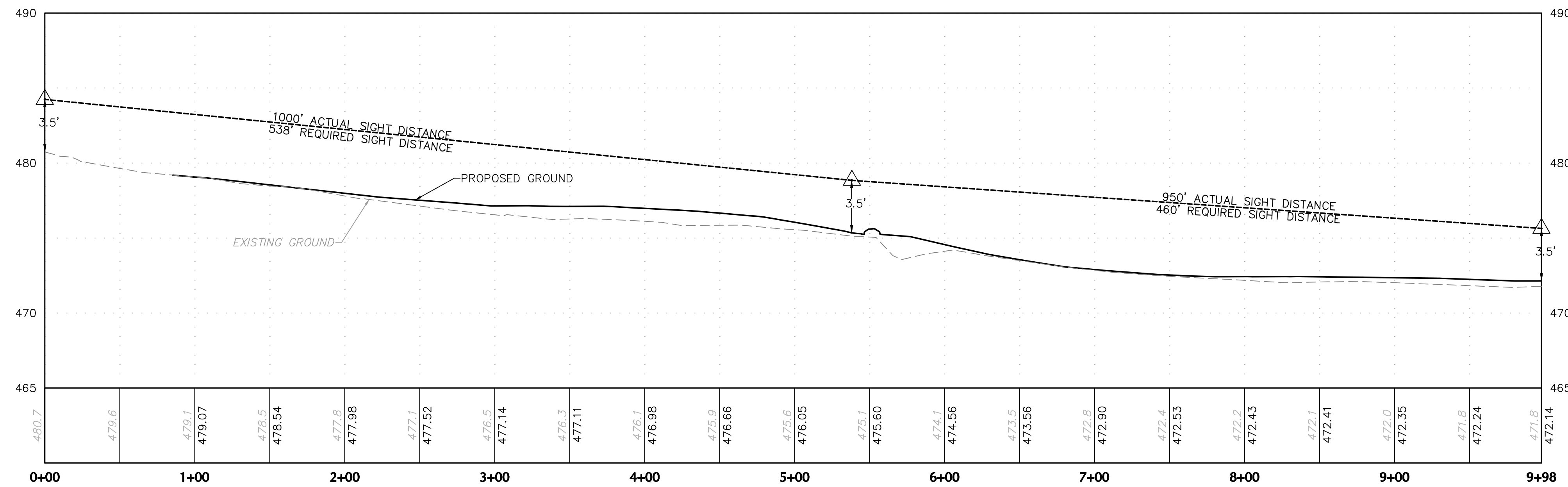
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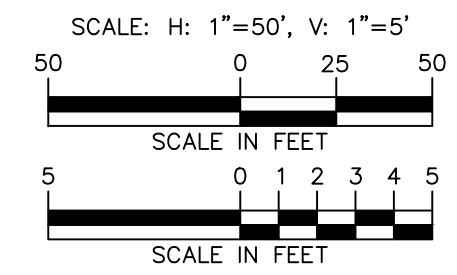
DISTRICT	COUNTY	ROUTE	SHEET
8-0	YORK	0921/4001	55 OF 114
DOVER TOWNSHIP / CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY



**SIGHT DISTANCE PLAN**  
**BULL ROAD (S.R. 4001) & SITE DRIVEWAY 1**



**PASSENGER CAR**  
**SIGHT DISTANCE PROFILE**  
**LEFT TURN ONTO BULL ROAD (S.R.4001)**  
**FROM SITE DRIVEWAY 1**



REQUIRED SIGHT DISTANCE OBTAINED FROM  
PA CODE TITLE 67 CHAPTER 441.8. DRIVEWAY  
DESIGN REQUIREMENT, TABLE 1,  
SPEED LIMIT = 40 MPH



DATE: JANUARY 15, 2024

**LANGAN**

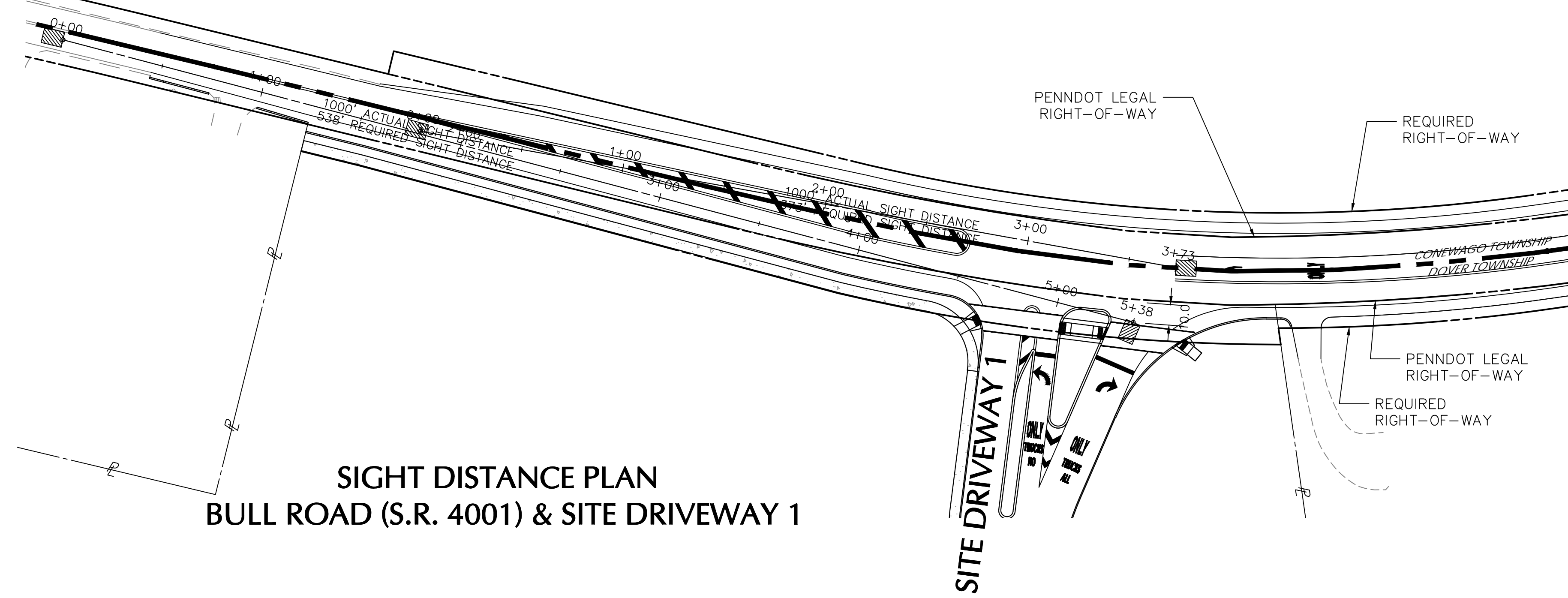
2700 KELLY ROAD, SUITE 200  
WARRINGTON, PA 18976  
E-MAIL: AVIGILANTE@LANGAN.COM  
PHONE: 215-491-6500

DATE: 01/15/2024	HOP APP. #: 291441	PROJECT NO. 200164401
DRAWN BY: EL/RC		CHECKED BY: BP/RM
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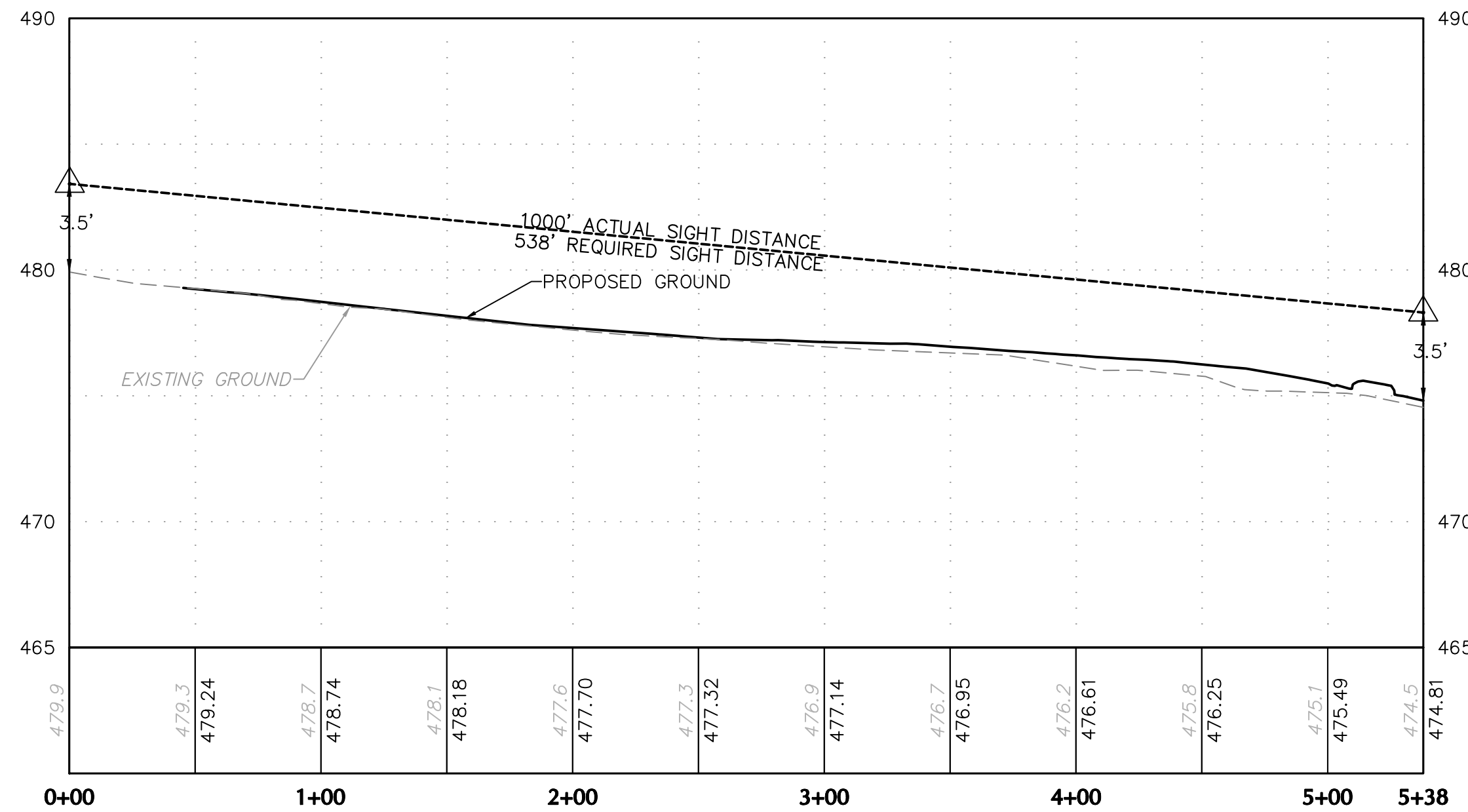
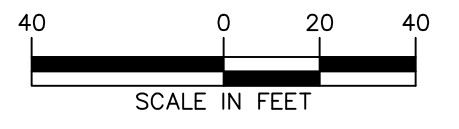
PROJECT No. 200164401  
LANGAN

DISTRICT	COUNTY	ROUTE	SHEET
8-0	YORK	0921/4001	56 OF 114
DOVER TOWNSHIP / CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY

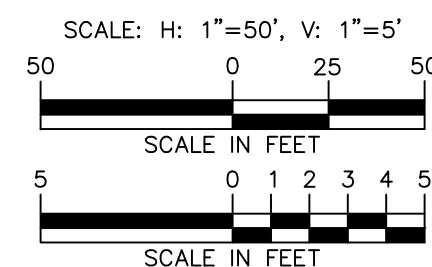
**BULL ROAD  
(S.R. 4001)**



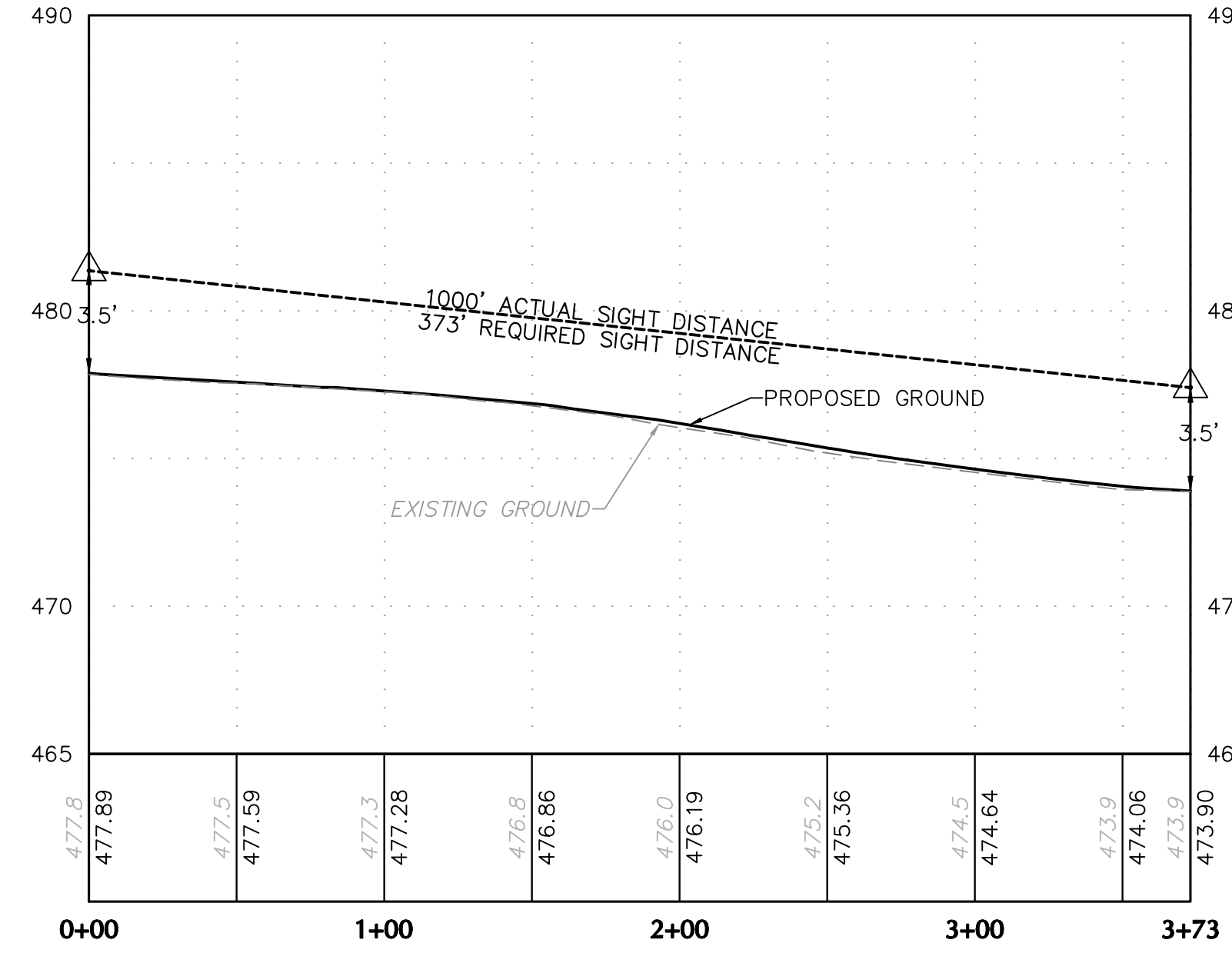
**SIGHT DISTANCE PLAN  
BULL ROAD (S.R. 4001) & SITE DRIVEWAY 1**



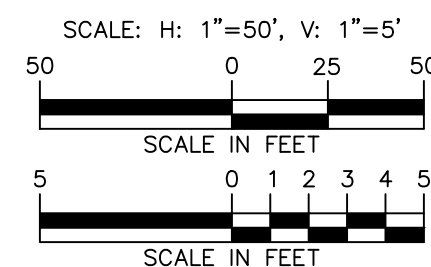
**PASSENGER CAR  
SIGHT DISTANCE PROFILE  
RIGHT TURN ONTO SOUTHBOUND BULL ROAD (S.R.4001)  
FROM SITE DRIVEWAY 1**



REQUIRED SIGHT DISTANCE OBTAINED FROM PA CODE TITLE 67 CHAPTER 441.8. DRIVEWAY DESIGN REQUIREMENT, TABLE 1, SPEED LIMIT = 40 MPH



**PASSENGER CAR  
SIGHT DISTANCE PROFILE  
LEFT TURN INTO SITE DRIVEWAY 1  
FROM BULL ROAD (S.R. 4001)**



REQUIRED SIGHT DISTANCE OBTAINED FROM PA CODE TITLE 67 CHAPTER 441.8. DRIVEWAY DESIGN REQUIREMENT, TABLE 5, SPEED LIMIT = 40 MPH

DATE: JANUARY 15, 2024



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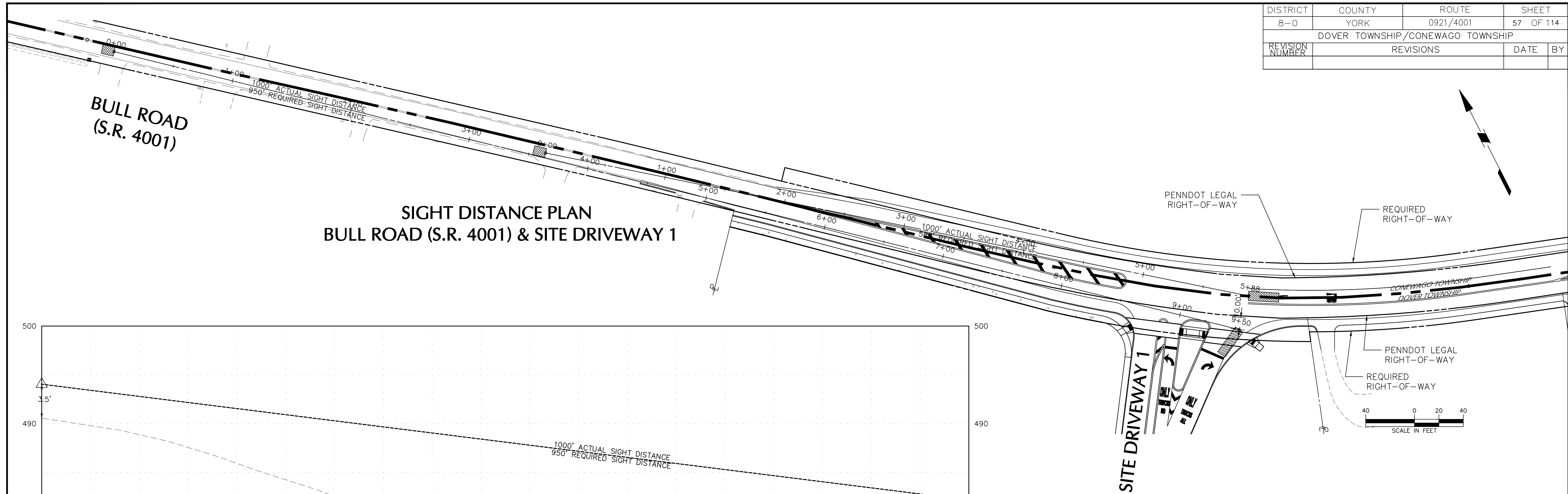
PHONE: 215-491-6500

DATE: 01/15/2024 HOP APP. #: 291441 PROJECT NO. 200164401

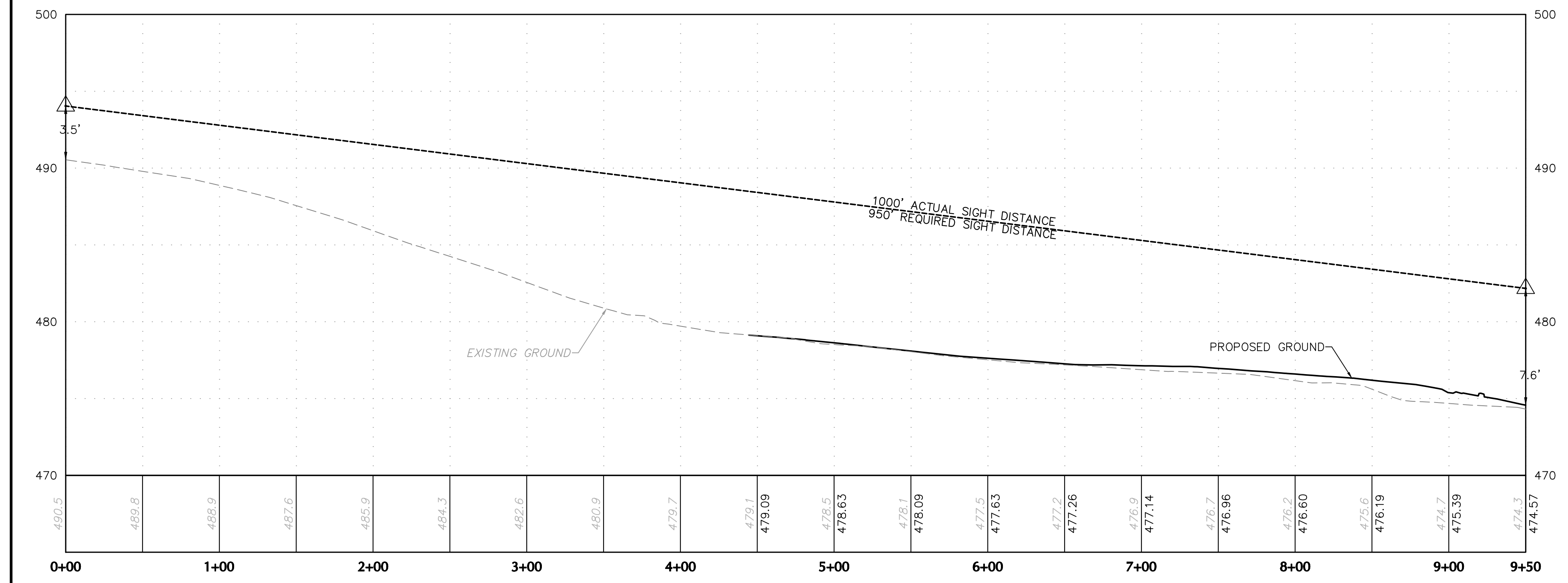
DRAWN BY: EL/RC CHECKED BY: BP/RM  
PLAN TITLE: **SIGHT DISTANCE PROFILE** DRAWING NO.: **KT502-0115**

DISTRICT	COUNTY	ROUTE	SHEET
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DOVER TOWNSHIP / CONEWAGO TOWNSHIP			
REVISION NUMBER	REVISIONS	DATE	BY

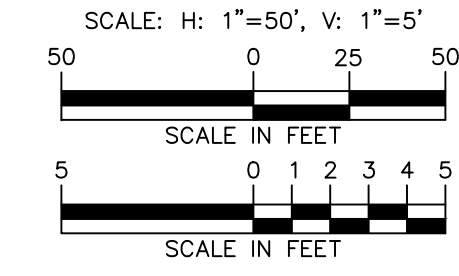
LANGAN PROJECT No. 200164401 © 2024 Langan



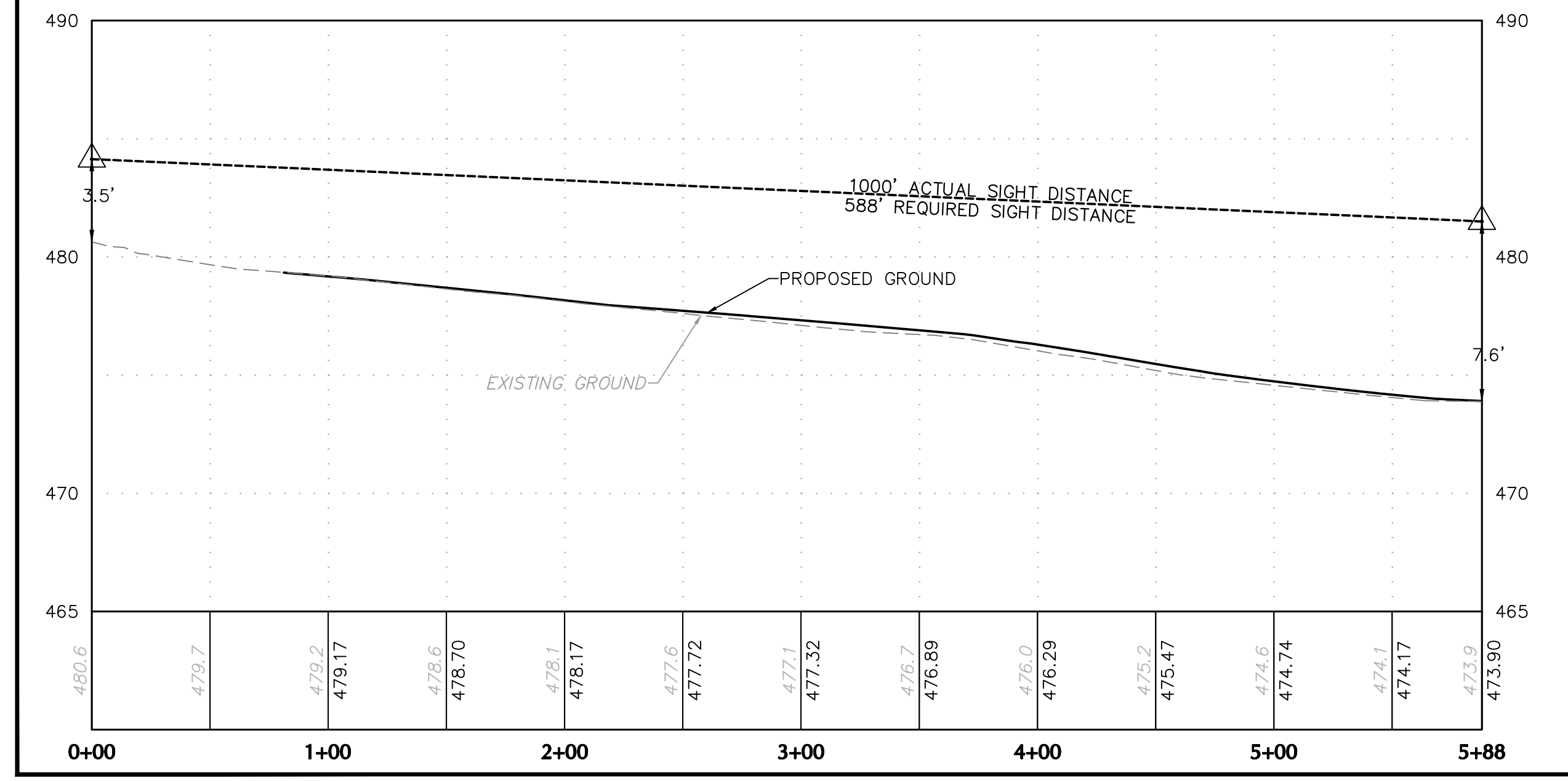
**SIGHT DISTANCE PLAN  
BULL ROAD (S.R. 4001) & SITE DRIVEWAY 1**



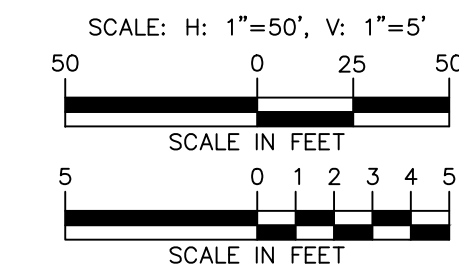
**COMBINATION TRUCK  
SIGHT DISTANCE PROFILE  
RIGHT TURN ONTO SOUTHBOUND BULL ROAD (S.R.4001)  
FROM SITE DRIVEWAY 1**



REQUIRED SIGHT DISTANCE OBTAINED FROM  
PA CODE TITLE 67 CHAPTER 441.8. DRIVEWAY  
DESIGN REQUIREMENT, TABLE 6,  
SPEED LIMIT = 40 MPH



**COMBINATION TRUCK  
SIGHT DISTANCE PROFILE  
LEFT TURN INTO SITE DRIVEWAY 1  
FROM BULL ROAD (S.R.4001)**



REQUIRED SIGHT DISTANCE OBTAINED FROM  
PA CODE TITLE 67 CHAPTER 441.8. DRIVEWAY  
DESIGN REQUIREMENT, TABLE 2,  
SPEED LIMIT = 40 MPH



DATE: JANUARY 15, 2024

**LANGAN**

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WARRINGTON, PA 18976

E-MAIL: AVIGILANTE@LANGAN.COM

PHONE: 215-491-6500

DATE: 01/15/2024 HOP APP. #: 291441 PROJECT NO. 200164401

DRAWN BY: EL/RC CHECKED BY: BP/RM

PLAN TITLE: SIGHT DISTANCE PROFILE DRAWING NO.: KT502-0116