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

248 Beech Hill Road • Wynnewood • PA • 19096 • (215) 625-3821 Phone • (484) 792-9495 Fax
www.FTAVANIASSOCIATES.com

23 September 2020

Jerry O'Connor
MLP Ventures, Inc.
201 King of Prussia Road, SU 501
Radnor, PA 19087

VIA EMAIL ONLY

RE: Traffic Engineering Investigations of Bishop Tube 92-unit Residential Site E. Whiteland Township, Chester County, PA

FTA Job #214-004

Dear Mr. O'Connor:

Per recent email conversations, F. Tavani and Associates, Inc. (FTA) has conducted traffic engineering investigations for the above-referenced project in Malvern.

GENERAL SITE DESCRIPTION

This study considers the traffic impact of a proposed attached housing community totaling 92 units. The housing is proposed to be for sale and will feature a mix of 3 and 4 bedrooms. The housing is proposed to be market-rate and not age-restricted. The process of entitlements, construction, and occupancy (sale) of the entire site is expected to take 3-5 years. The site is surrounded by other residential properties as well as a mix of retail buildings and two industrial users within a 1 mile radius of the site. Mass transit opportunities are also within approximately 1 ½ miles of the site.

The site is located on the east side of Malin Road, south of Lancaster Avenue (aka Route 30) and is known as the Bishop Tube site.

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

Note that technical appendices are provided following the figures. **Appendix A** includes project correspondence, including a review letter by McMahon Associates, Inc. (McM) on behalf of the Township. The review letter is dated 14 September 2020 and is based upon an earlier version of this report which was dated 27 March 2020. Photodocumentation of the study area / surrounding intersections is provided in **Appendix B**.

TRANSPORTATION FACILITIES DESCRIPTION

The site is proposed to take access to Malin Road – an existing, two-way, one-lane-per-direction, public roadway. Malin Road is posted 30 mph north of the site. An emergency access road is also proposed to

the east and connects with Village Way, an existing residential street. A short distance north of the site is Lancaster Avenue, a two-way, two-lane-per-direction arterial street. Lancaster Avenue is posted 45 mph east of the site. Neither Lancaster Avenue nor Malin Road features on-street public parking. There are limited sidewalk facilities in the study area, namely on the north side of Lancaster Avenue. The major intersection closest to the site is a signalized intersection (Lancaster Avenue and Malin Road) with only two painted crosswalks – on the east and north legs. There are existing SEPTA mass transit opportunities including SEPTA bus route (92) and a SEPTA regional rail station (Malvern) for the Paoli-Thorndale line, both of which are approximately a 20-25 minute walk from the site (about 1 ½ miles). More site roadway and surrounding intersection details can be seen in the photodocumentation log as provided in **Appendix B**.

The site has 92 units, all of which are proposed to take access to Malin Road via three proposed driveways as seen in **Figure 3**. The units will feature garage/driveway parking plus defined visitor street parking, as also shown in the figure. Sidewalks are also proposed as shown within the site, plus new sidewalk is proposed between the site and Route 30, to facilitate a walking path for residents between the site and an existing shopping center in the NW quadrant of the intersection of Route 30 and Malin Road.

There are no known planned roadway improvements in the vicinity of the site. Lancaster Avenue is an "SR" (state roadway) but Malin Road is not – instead it is a "G" roadway, meaning it is not an SR but is eligible for liquid fuels funding. PennDOT does maintain traffic count data both roadways, as seen in **Appendix C**. As shown there, the average daily traffic (ADT) along Malin Road is just under 5,000 vehicles per day (vpd). ADT along Lancaster Avenue is around 17,000 vpd west of Malin Road, and around 22,000 vpd east of Malin Road.

EXISTING TRAFFIC CONDITIONS

FTA conducted traffic counts at the intersection of Lancaster Avenue and Malin Road, as directed by the Township Traffic Engineer (TTE) in a phone call which took place in early March 2020. FTA contacted the TTE via email in February in response to item 1 in a recent review letter (see **Appendix A**).

The counts were conducted on Wednesday, 4 March 2020 from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. The counts were conducted during the school year, in fair weather, on a typical weekday, and before COVID-19 healthcare concerns affected work or school schedules[1]. Existing peak hours of 8:00 AM to 9:00 AM and 4:30 PM to 5:30 PM were selected for study based on a peak hour investigation. The corresponding existing peak hour traffic volumes are plotted and seen in **Figure 4**. Raw traffic volumes are attached in **Appendix D**.

With existing peak hour volumes established, present-day "levels of service" can be assessed. Level of service (or LOS) is a descriptive mechanism which is employed by traffic engineers to relate quality of traffic flow to both a letter grade and estimate of delay in seconds per vehicle. LOS results are assessed for traffic which must stop or yield to other traffic. Free-flowing traffic theoretically has no delay, and therefore no LOS rating. Existing levels of service were determined using *Synchro version 10* software, with HCS2010-format outputs selecting for performance reporting purposes. **LOS** and **Queue Comparison Matrices** were prepared and are attached to the end of this report. The matrices summarize AM and PM peak hour performance for existing and future (see next section) conditions for all intersections. As shown, <u>existing</u> levels of service are all LOS C and better, with all calculated delays

[1] The earliest that COVID-19 began to affect traffic data is generally accepted as Friday the 13th of March 2020, which was the day the Governor of Pennsylvania declared all schools in neighboring Montgomery County to be closed for 2 weeks, among other restrictions. This order very quickly had ripple effects in adjacent communities possibly lowering traffic counts.

being low (20 seconds or less in most cases – an acceptable condition). No congested turning movements (LOS E/F) are noted. Queues are not problematic.

TRANSPORTATION IMPACT OF THE DEVELOPMENT

Site traffic was estimated using the Institute of Transportation Engineers (ITE) publication, Trip Generation, 10th edition. ITE website trip generation outputs are attached and provided in **Appendix E**. Raw trip generation could have been modified to reflect how this site is located in a setting which is within a reasonable walk of several businesses, shopping opportunities, and mass transit modes (including a bus route and a regional rail train station) but no multimodal credits were taken. Instead, *all* site traffic was assigned (trip distributed) to the surrounding roadway network in accordance with existing traffic patterns as well as an understanding of existing road network connectivity, current traffic/congestion patterns, and relative locations of major highway interchanges (Routes 202 and 30). The assignments are summarized as follows:

- 60% to/from Route 202 (25% to/from south[2]; 35% to/from north);
- 20% to/from Business Route 30 (10% to/from west; 10% to/from east);
- 10% to/from Route 29 north;
- 5% to/from Route 401 west; and
- 5% to/from Malvern (local).

The trip distribution model for the community is shown in **Figure 6** and the resultant assignment of new, site-generated, vehicular peak hour traffic is shown in **Figure 7**. A site trip generation summary table follow below:

TABLE 1
PROJECTED VEHICULAR TRIP GENERATION – 92 UNITS

AM PEAK HOUR			PM PEAK HOUR		
IN	**OUT**	**TOTAL**	**IN**	**OUT**	**TOTAL**
10	34	44	35	20	55

Average daily site traffic was also calculated and determined to be approximately 673 trips for the proposed community. See **Appendix E** for more details.

ANALYSIS OF TRANSPORTATION IMPACT

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

As mentioned earlier, there are no other known approved land development projects in the vicinity of the site. Regarding background growth, the currently promulgated background growth rate for Chester County is 0.52% per year as reported by PennDOT. However, to be conservative, FTA increased traffic throughout the study area at a rate of 1.00% per year compounded for 5 years (see **Appendix E** for more details). The resultant projected future 'no build' (existing plus background growth only) peak hour

[2] The closest opportunities to get onto Rt 202 SB are: (a) traveling 1.6 mi to the north and east on Malin Rd and Swedesford Road; (b) traveling 1.8 mi to the north and west on Malin Rd and Route 401; or (c) traveling 2.4 mi to the west and south on Business Route 30. Some 202-SB-destined, site-exiting traffic was assumed to take each path as seen in **Figures 6** and **7**.

volumes are shown in **Figure 5**. The related projected levels of service are once again shown in **LOS Comparison Matrix**. As shown projected 'no build' levels of service remain essentially the same as they are today, and are all LOS C or better.

The projected future 'build' (no build plus site traffic) peak hour volumes are shown in **Figure 8**. The related projected levels of service are once shown in the **Comparison Matrices**. As shown projected 'build' levels of service once again remain essentially the same as they are today, and are all LOS C or better. The impact of site traffic is no added delay at most turning movements. In fact, the impact of site traffic never amounts to more than one added second of delay at any impacted turning movement, and this again is while taking no credits for multi-modalism and incorporating a higher-than-recommended background growth rate for 5 years. Even with all these conservative approaches, no congestion locations (LOS E/F) are noted. Queues remain not problematic.

No road improvements are necessary to offset the impact of added site traffic. The proposed site driveway will not feature traffic volumes which warrant the installation of a traffic signal. The acceptable operation of the site driveway (LOS A) in unsignalized state underscores this conclusion. Note that in the analysis and figures site traffic was treated as if it were distributed to Malin Road at one driveway, whereas three are proposed. This has the effect of producing more conservative level of service results.

The McMahon September 2020 review letter requested an optional analysis of future build conditions – namely one involving split phase operation at the intersection of Lancaster Avenue and Malin Road. This analysis was added as requested and the level of service comparison table was revised. Overall intersection delays are marginally longer with split phase operation, as shown in the table. Level of service worksheets are provided in **Appendix F**.

PEDESTRIAN CONNECTIVITY

The nearest shopping center is less than ½ mile from the site and is located in the NW quadrant of the intersection of Lancaster Avenue and Malin Road. This shopping center includes, among other things, a supermarket, several restaurants, and a hardware store. The applicant is committed to providing a complete sidewalk connection between the site and the shopping center. The resultant pedestrian path is expected to encourage residents to walk to the nearby shopping center, the net effect of which will be to reduce site vehicular activity (even though no such credits were taken in this effort, as explained previously). More details are provided in **Appendix G**, which includes a portion of a plan that was previously submitted to the township in 2019 which illustrates the path.

CONCLUSIONS

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

Other key conclusions are as follows:

- The study area is presently served by transit opportunities.
- There are no turning movements operating below LOS C under existing or future conditions.

- The site driveway is forecasted to operate at LOS A during both peak hours, and for all turning movements.
- The proposed pedestrian path is expected to encourage residents to walk to a nearby shopping center which features restaurants and a supermarket, the net effect of which will be to reduce site vehicular activity.
- The foregoing conclusions were reached:
    - taking no credits for walking or transit,
    - incorporating a higher-than-recommended background growth rate for 5 years, and
    - treating site traffic as if it were distributed to Malin Road at one driveway, whereas three are proposed.

  all of which combines to produce considerable conservative measure in the preceding analyses.

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

Thank you,
F. TAVANI AND ASSOCIATES, INC.

FRANK TAVANI, P.E., PTOE
Principal

attachments

cc: Mark Thompson, P.E.

LEVEL OF SERVICE AND EXPECTED DELAY FOR SIGNALIZED INTERSECTIONS*

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

* Transportation Research Board's Highway Capacity Manual

LEVEL OF SERVICE AND EXPECTED DELAY
FOR UNSIGNALIZED INTERSECTIONS*

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

* Transportation Research Board's Highway Capacity Manual

LEVEL OF SERVICE QUEUE COMPARISON TABLES

Lancaster Avenue & Malin Road

LEVELS OF SERVICE

Direction	Movement	AM Peak Hour				PM Peak Hour			
Lancaster Avenue		Existing (2020)	No Build (2025)	Build (2025)	Split Build (2025)	Existing (2020)	No Build (2025)	Build (2025)	Split Build (2025)
Eastbound	L	A 7	--	--	B 14	B 10	B 12	--	C 20
	TTR	A 5	A 6	--	B 11	A 5	A 6	--	A 10
Westbound	L	A 6	--	A 7	B 13	A 6	--	A 7	B 11
	TTR	A 4	--	--	A 9	A 7	--	A 8	B 13
Malin Road									
Northbound	LTR	B 20	--	C 20	D 40	B 19	--	--	D 35
Southbound	LT	C 20	--	--	C 23	C 21	--	--	C 22
	R	C 28	--	--	D 36	C 25	--	--	D 36
OVERALL:		A 8	--	A 9	B 14	A 10	B 10	--	B 16

Control Type: Signal

Lancaster Avenue & Malin Road

QUEUES

Direction	Movement	AM Peak Hour				PM Peak Hour			
Lancaster Avenue		Storage/Stacking	No Build (2025)	Build (2025)	Split Build (2025)	Storage/Stacking	No Build (2025)	Build (2025)	Split Build (2025)
Eastbound	L	150+	95	--	140	150+	60	--	80
	TTR	500+	148	150	273	500+	93	100	130
Westbound	L	150+	25	--	--	150+	25	--	--
	TTR	500+	68	--	100	500+	193	--	243
Malin Road									
Northbound	LTR	100+	25	33	50	100+	25	33	45
Southbound	LT	250	43	45	50	250	78	85	88
	R	100	133	--	158	100	175	--	208

Control Type: Signal

"available storage" is available storage if the movement in question is a turn lane with a dedicated bay, otherwise the distance to the next closest upstream intersection is shown.

-- indicates no change from the previous scenario

if a queue is < 1 vehicle it is rounded up to 25'

Figure 1

Site and Surrounding Area – Map View

Bishop Tube Site Campus Lot Site
East Whiteland Township,
Chester County, Pennsylvania

March 2020

F. Tavani and Associates, Inc.

Traffic Engineering and Planning

Figure 2

Site and Surrounding Area – Aerial View

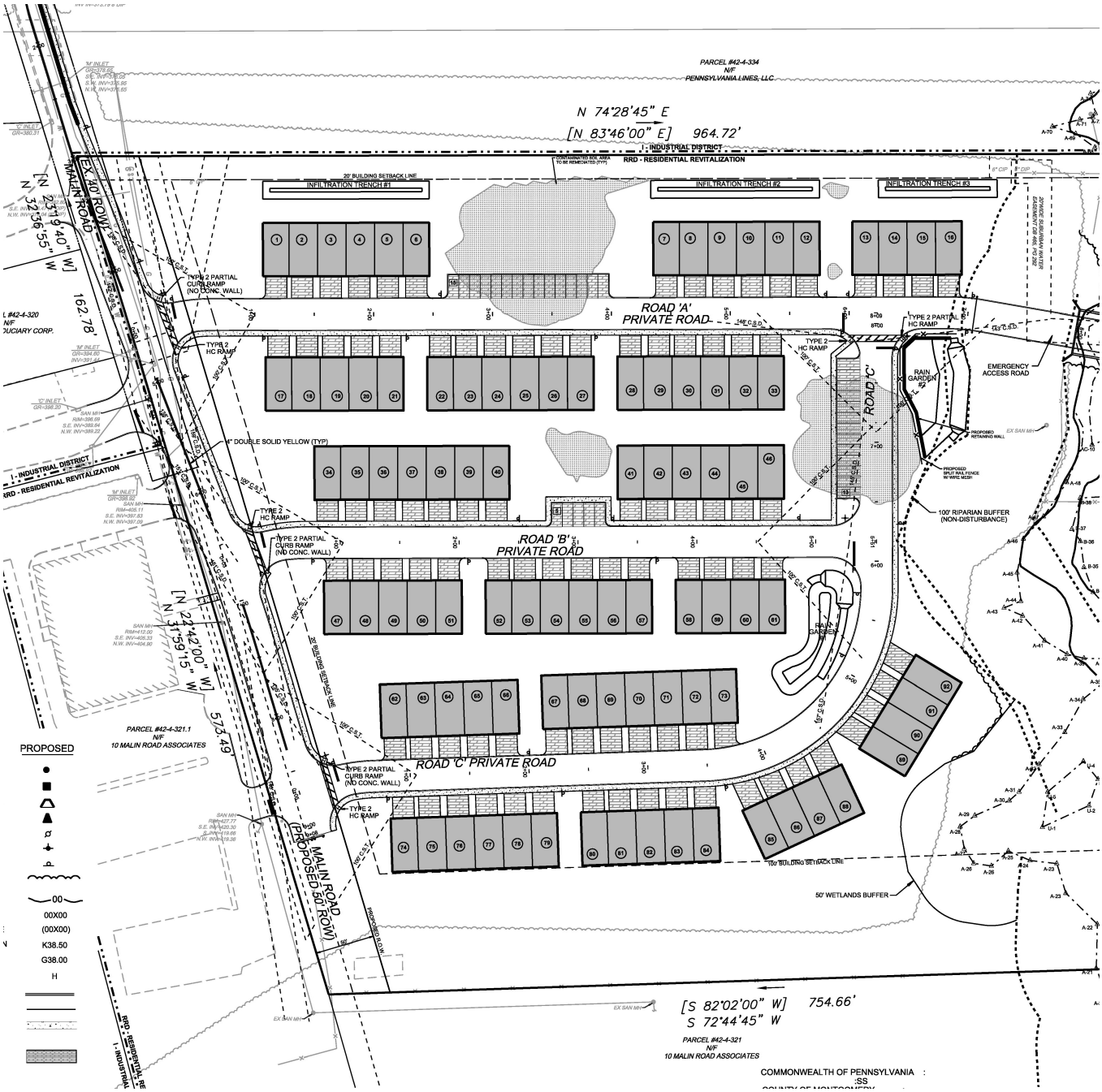
Bishop Tube Site Campus Lot Site
East Whiteland Township,
Chester County, Pennsylvania

March 2020

Site Plan Excerpt

Bishop Tube Site Campus Lot Site
East Whiteland Township,
Chester County, Pennsylvania

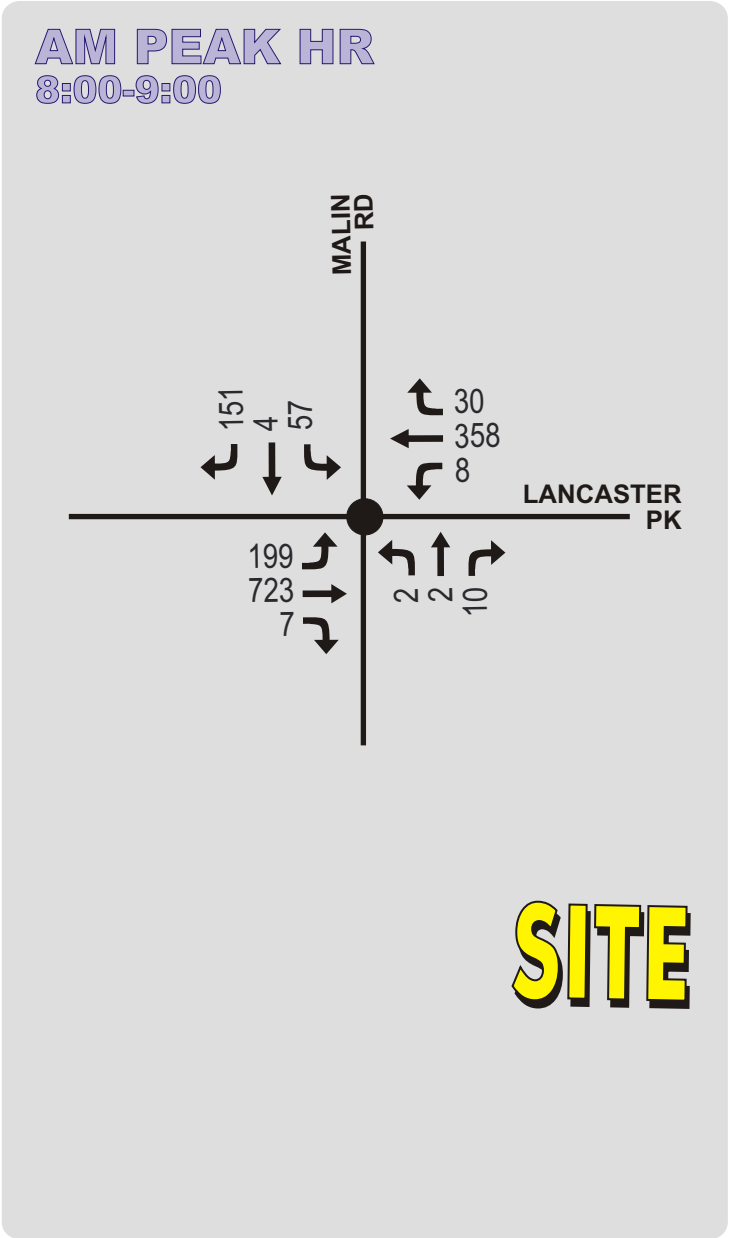
March 2020

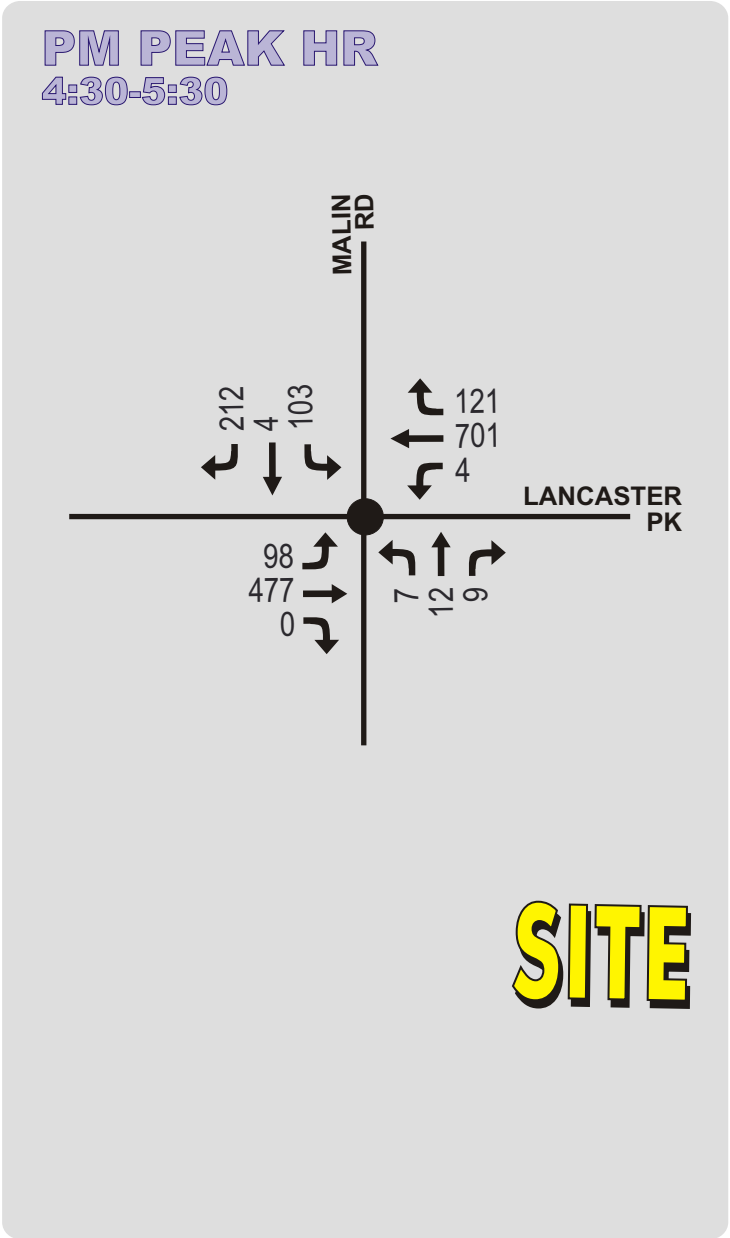


Existing (2020) Peak Hour Traffic Volumes

Bishop Tube Site Campus Lot Site
East Whiteland Township,
Chester County, Pennsylvania

March 2020



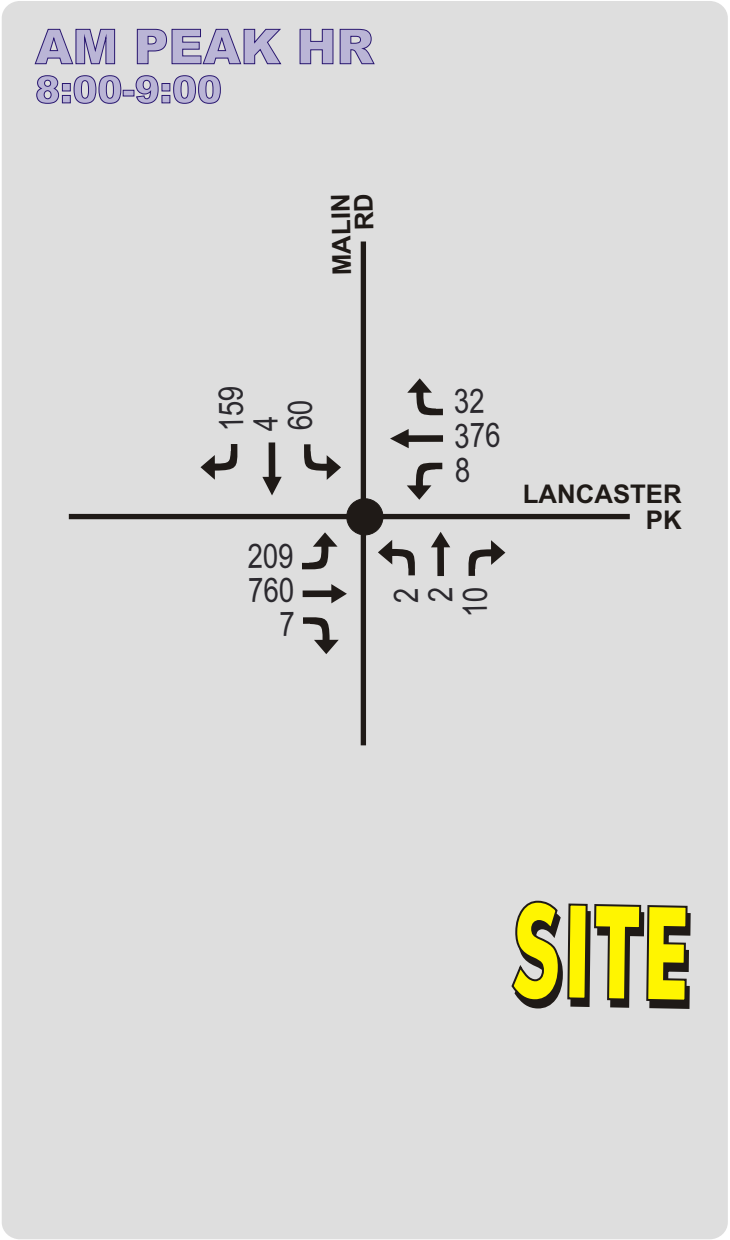


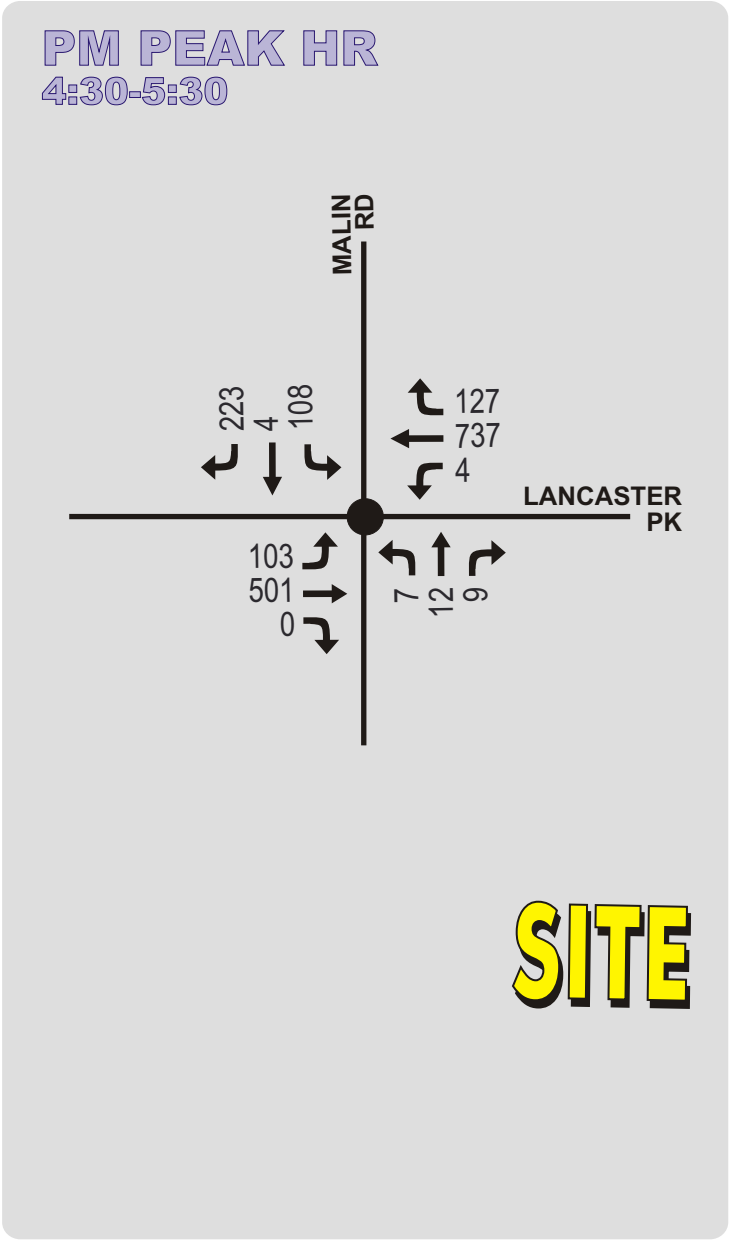
● Signalized Intersection

Future (2025) No Build Peak Hour Traffic Volumes

Bishop Tube Site Campus Lot Site
East Whiteland Township,
Chester County, Pennsylvania

March 2020



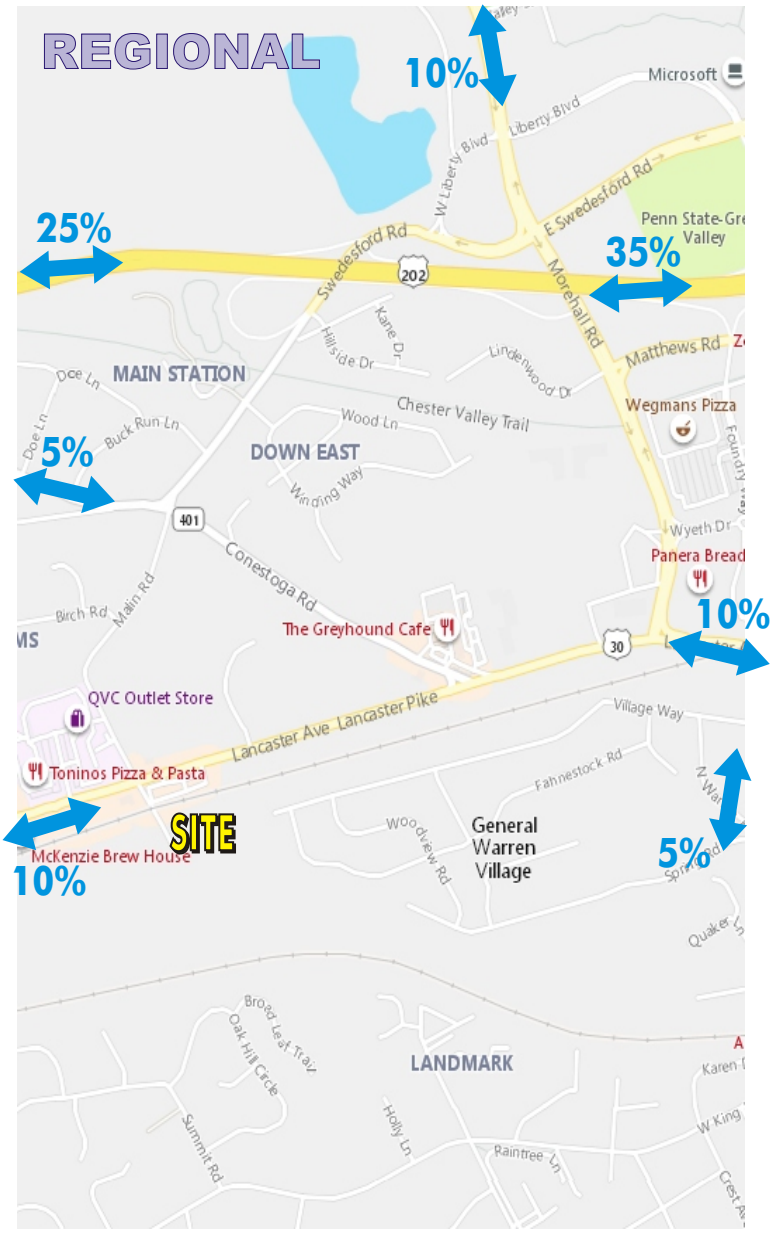


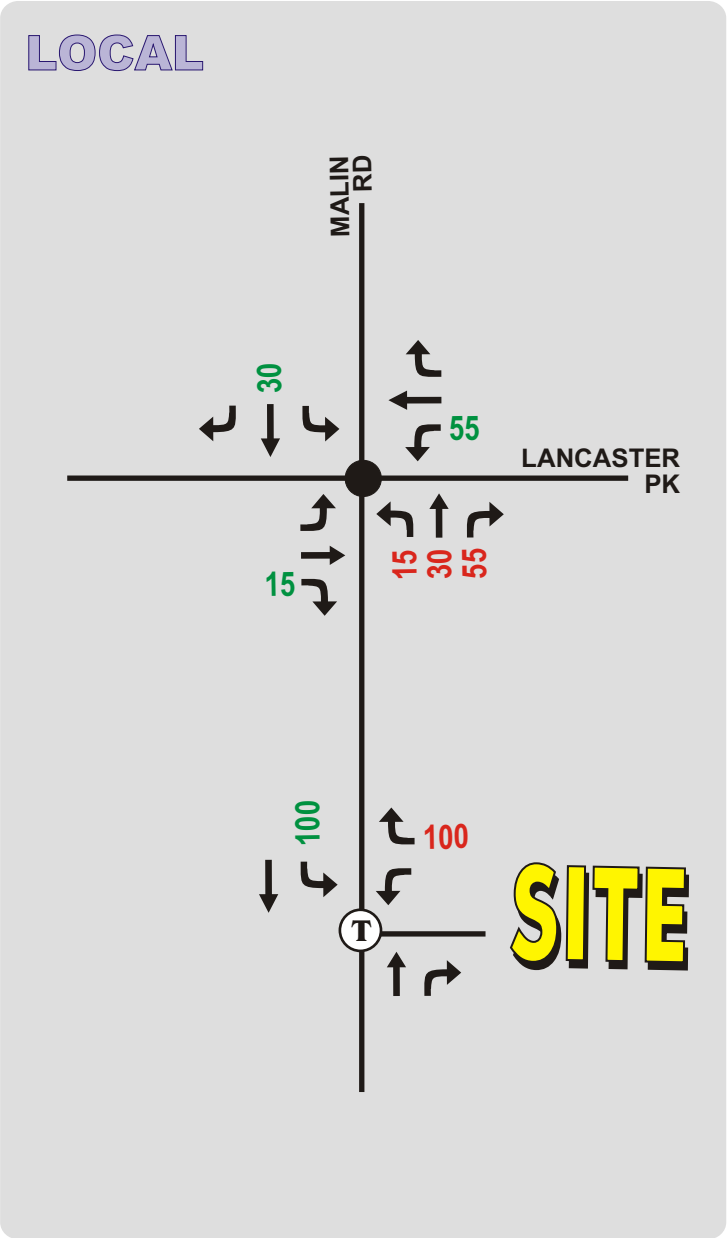
● Signalized Intersection

Site Peak Hour Traffic – Model

Bishop Tube Site Campus Lot Site
East Whiteland Township,
Chester County, Pennsylvania

March 2020





● Signalized Intersection

Ⓣ Unsignalized Intersection, Two-Way Stop Control (Side Street Only)

INBOUND

OUTBOUND

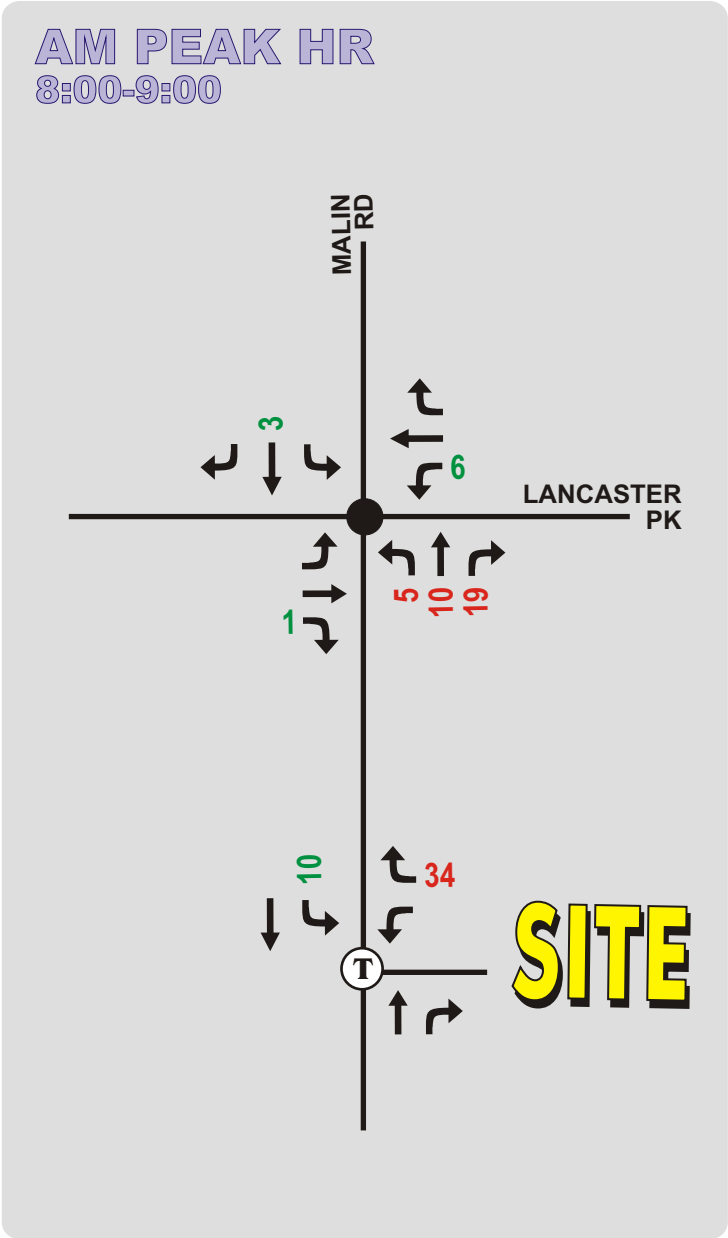
Site Peak Hour Traffic – Volumes

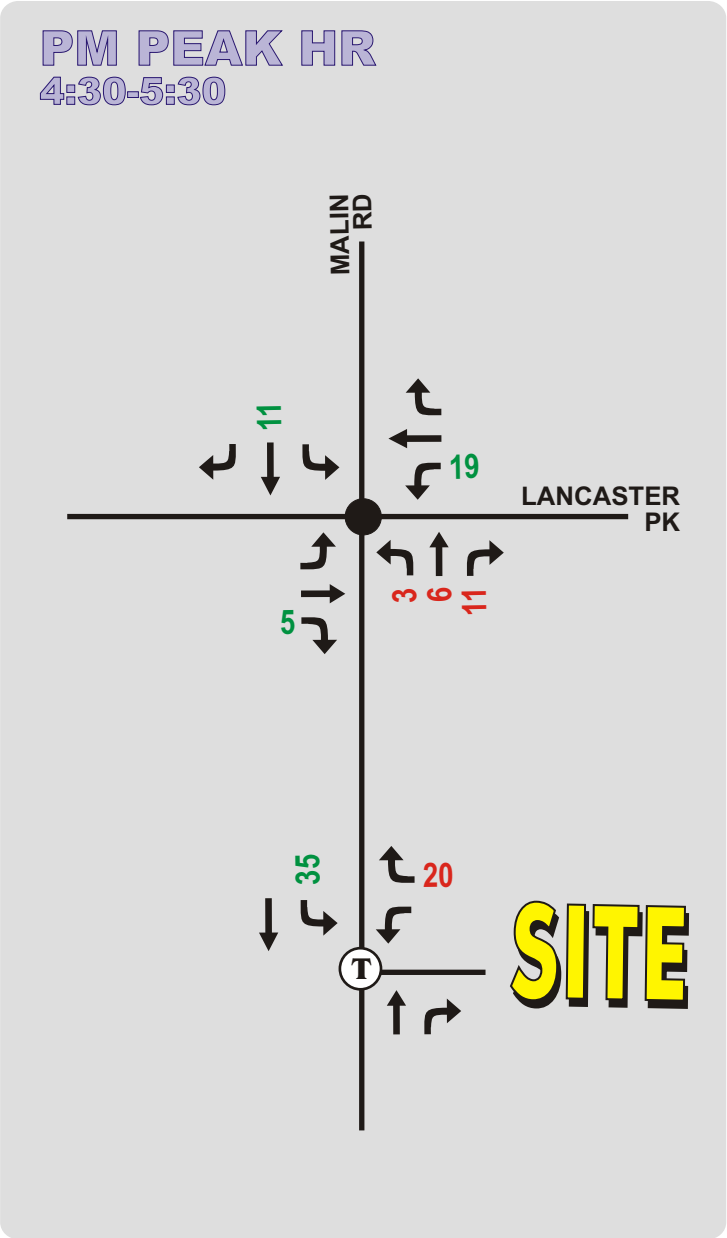
Bishop Tube Site Campus Lot Site
East Whiteland Township,
Chester County, Pennsylvania

March 2020

SITE TRAFFIC

TIME	IN	OUT
AM	10	34
PM	35	20



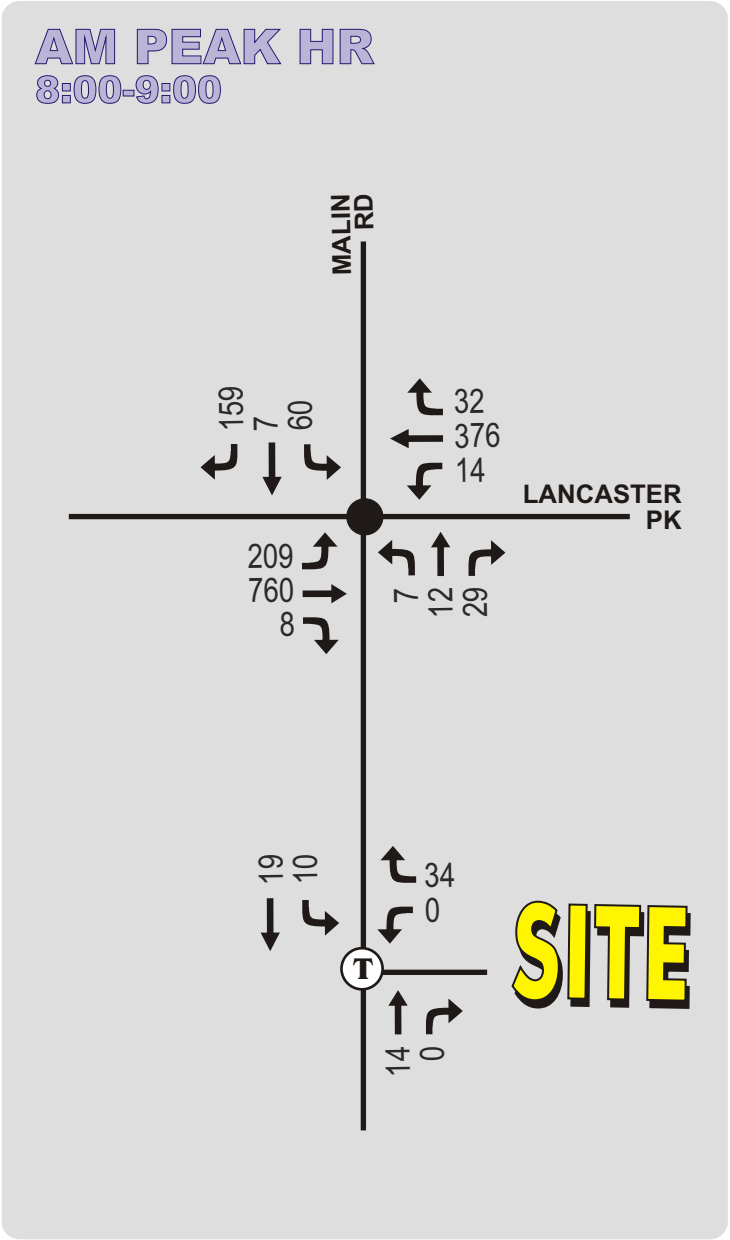


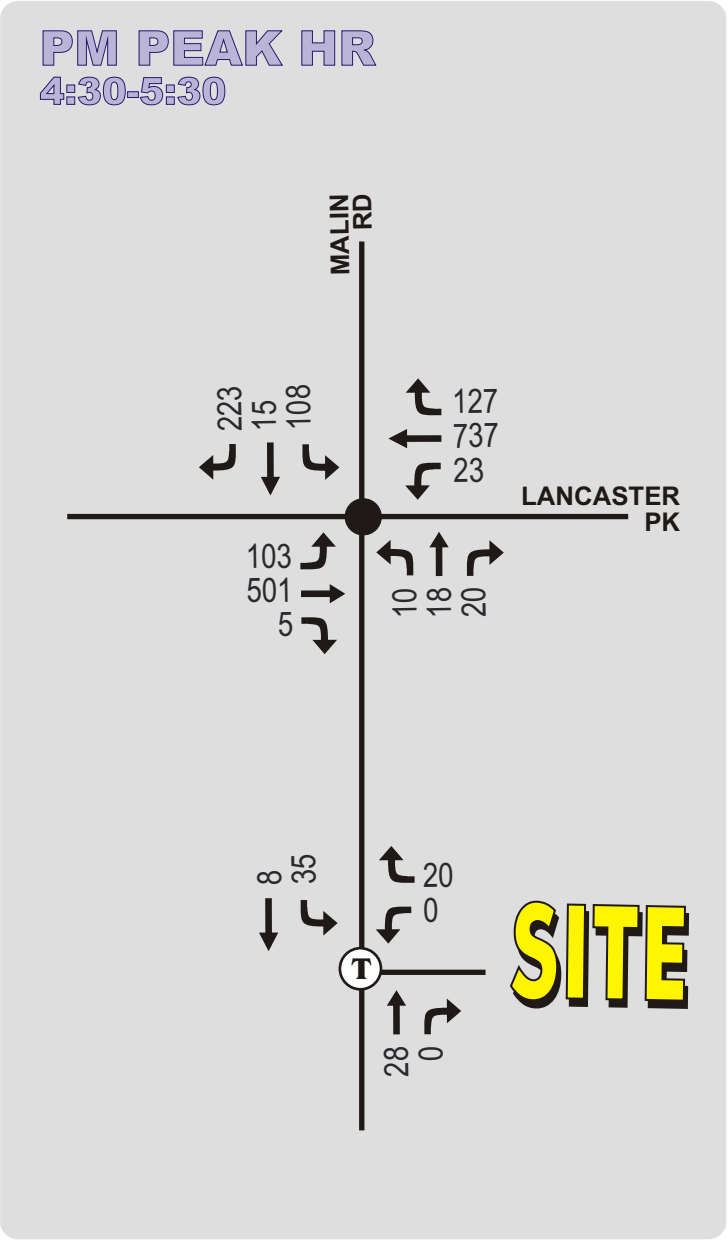
● Signalized Intersection (T) Unsignalized Intersection, Two-Way Stop Control (Side Street Only) INBOUND OUTBOUND

Future (2025) Build Peak Hour Traffic Volumes

Bishop Tube Site -- Route 30 & Malin Road
East Whiteland Township,
Chester County, Pennsylvania

March 2020





● Signalized Intersection

Ⓣ Unsignalized Intersection, Two-Way Stop Control (Side Street Only)

APPENDIX A

Correspondence

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

248 Beech Hill Road • Wynnewood • PA • 19096 • (215) 625-3821 Phone • (484) 792-9495 Fax
WWW.FTAVANIASSOCIATES.COM

21 September 2020

Jerry O'Connor
Constitution Drive Partners, LLC
201 King of Prussia Road, SU 501
Radnor, PA 19087

VIA EMAIL ONLY

RE: Traffic Engineering Investigations
Bishop Tube 92-unit Townhouse Site
E. Whiteland Township, Chester County

FTA Job #214-004

Dear Mr. O'Connor:

F. Tavani and Associates, Inc. (FTA) is in receipt of a letter from McMahon Associates, Inc. (McM) dated 14 September 2020 (copy attached) and offers the following responses to items 1 and 2 of said letter. The items are paraphrased / summarized in italics followed by FTA responses in standard print.

1) Split phasing should be investigated at the intersection of Lancaster Avenue and Malin Road …

The future traffic conditions section of the study has been revised as requested. The latest traffic study is now dated 23 September 2020.

2) Traffic signal equipment upgrades should be provided at the intersection of Lancaster Avenue and Malin Road in order to accommodate the Township's planned adaptive traffic signal system …

It is my understanding that you are agreeing to this request as further detailed in the McM letter.

I am happy to answer any questions you may have.

Thank you,
F. TAVANI AND ASSOCIATES, INC.

FRANK TAVANI, P.E., PTOE
Principal

attachment

McMAHON ASSOCIATES, INC.
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Dean A. Carr, P.E.
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Christopher K. Bauer, P.E., PTOE
Mark A. Roth, P.E.
John R. Wichner, P.E., PTOE

FOUNDER
Joseph W. McMahon, P.E.

September 14, 2020

Mr. Zachary Barner, AICP, Director of Planning and Development
East Whiteland Township
209 Conestoga Road
Frazer, PA 19355-1699

RE: Malin Road Residential Development
East Whiteland Township, Chester County
McMahon Project No. 814098.11

Dear Mr. Barner:

McMahon Associates, Inc. completed a traffic review of the proposed townhome development, consisting of 92 homes located along the east side of Malin Road, just south of Lancaster Avenue (S.R. 0030). Access to the homes is proposed via three unsignalized driveways along Malin Road. This review is based on the following documents.

1. *Traffic Engineering Investigations of Bishop Tube 92-Unit Residential Site,* prepared by F. Tavani and Associates, Inc., dated March 27, 2020.
2. *Malin Road Development Revised Preliminary Land Development Plan,* prepared by Taylor, Wiseman & Taylor, revised May 15, 2020.

Based on our review of the above documents, we offer the following comments for the consideration of the Township.

Traffic Study

1. As part of a previous application for this development, split traffic signal phasing was proposed at the Lancaster Avenue (S.R. 0030)/Malin Road intersection for the side street Malin Road approaches due to the existing off-set alignment of Malin Road across Lancaster Avenue. As such split phasing should be implemented in connection with this development also due to the increase in traffic along Malin Road from this residential community and due to the off-set alignment of Malin Road across Lancaster Avenue. The traffic study should evaluate this intersection with the split phase operation for the side-street Malin Road approaches.

2. Traffic signal equipment upgrades should be provided at the Lancaster Avenue (S.R. 0030)/Malin Road intersection in order to accommodate the Township's planned adaptive traffic signal system along S.R. 0030, as well as to comply with the Township's current traffic signal specifications. The applicant's engineer has indicated the applicant intends to implement traffic signal upgrades as part of this project. As

such, the applicant should coordinate with our office regarding the needed improvements. Furthermore, these improvements will require approval from PennDOT, and the applicant should copy the Township on all submissions to PennDOT.

Land Development Plans

3. SALDO Section 175-32.A and 175-33.I(1) – The available sight distances for left-turn entering traffic (looking ahead and behind) at each of the three site access intersections, as well as the three existing driveways on the west side of Malin Road should be labeled and dimensioned on the plans. In addition, the following note should be provided.

   "All sight distance obstructions (including but not limited to embankments and vegetation) shall be removed by the permittee to provide a minimum of XXX sight distance to the left and XXX sight distance to the right for a driver exiting the proposed driveways onto the through highway. The driver must be considered to be positioned ten feet from the near edge of the closest highway through travel lane (from the curbline if curbing is present) at an eye height of three feet six inches (3' 6") above the pavement surface located in the center of the closest highway travel lane designated for use by approaching traffic. This sight distance shall be maintained by the permittee."

4. SALDO Sections 170-310 and 175-37 - Provide capacity calculations for the 25-year storm for the existing drainage system on Malin Road downstream of the outfall pipe from Underground Basin #4.

5. Roads A, B, and C propose perpendicular parking. Perpendicular parking is not recommended on streets, and if feasible, parallel parking is preferred.

6. Zoning Section 200-69.E - Most of the individual residence driveways are only approximately 18 feet in length, which is not sufficient. It has been our experience that within residential communities, 18 feet long driveways are not sufficient to properly accommodate a parked vehicle without also overhanging the sidewalk, landscaping or curbing. In our experience, at least 20 feet is needed to allow room between the parked vehicle, the garage door, and the sidewalk or curb. It is important that the parked vehicles do not overhang the sidewalk or road edge. Also, the Township's recently updated SALDO (Section 175-39) requires private residence driveways to be a minimum of 20 feet long (as measured from the edge of the sidewalk or the edge of the adjacent roadway pavement if no sidewalk is proposed).

7. No Parking (R8-3a) signs should be placed on both sides of the Malin Road Extension.

8. We recommend providing sidewalk on both sides of Roads A, B, and C with a four-foot buffer between the curb and the sidewalk. This is also consistent with the Township's recently updated SALDO (Section 175-41.2).

9. Twenty-five miles per hour is generally the typical speed limit for a residential community. Please provide justification for the proposed speed limit of 20 miles per hour.

10. Please label the clear sight triangles on the landscape plans and verify whether the area within the clear sight triangles is clear of obstructions. Also, the on-street perpendicular parking should be relocated outside of the clear sight triangles.

11. The use of the sign R3-7-1R to direct all traffic to turn right at the intersection of Road A and Road C is not appropriate since it is necessary for the residents of units 13 through 16 to travel straight.

12. The following note should be added to the plan.

    "The finished elevation of the future pavement surface for the portion of Malin Road under the railroad overpass should not be increased as part of the mill and overlay of Malin Road, and the existing minimum roadway clearance between the future pavement surface and the bottom of the bridge shall not be reduced."

13. The Township's Department of Codes and Life Safety should review the access and internal site circulation with regard to emergency response and operations, including the proposed emergency access to Village Way.

14. The applicant and the applicant's engineer should ensure that all proposed pedestrian facilities along the extension of Malin Road, as well as Roads A, B, and C (including curb ramps and pedestrian access routes) are consistent with current ADA requirements.

15. Based on our review of the Underpass Walkway Plan (sheet 25), we offer the following comments:

    a. Previous designs for the Malin Road sidewalk extension included sidewalk on the east side of Malin Road north of the railroad underpass; however, the current design shows a three-foot wide sidewalk on the west side of Malin Road. The preferred sidewalk location in this area would be on the east side of Malin Road, since such a pedestrian route provides a direct connection to the existing pedestrian facilities on the southeast corner of the Route 30/Malin Road intersection, and it does not require a midblock pedestrian crossing of Malin Road immediately north of the bridge. As such, we recommend the proposed sidewalk should be relocated to the east side of Malin Road.
    b. The sidewalk is shown as varying in width between five feet, four feet and three feet. As much as possible, the sidewalk should be five feet wide, or four feet wide with ADA passing zones; however, we understand the proposed four-foot sidewalk under the railroad overpass.
    c. The northbound and southbound travel lanes under the railroad underpass should be revised to provide a consistent 10-foot lane width in both directions.
    d. The edges of the bridge should be marked with Right Clearance Markers (OM-3R) and Left Clearance Markers (OM-3L) on both the northbound and southbound Malin Road approaches to the underpass.
    e. Please provide white shoulder lines along Malin Road on the south side of the railroad overpass to account for the lane width transition between the widened/improved section of Malin Road and the section of Malin Road at the railroad overpass.
    f. The plans should dimension the height of the proposed wall luminaire above the surface of the proposed sidewalk. The luminaire should be a minimum of 80 inches above the sidewalk surface in order to meet ADA requirements.

g. Approval of the portion of the sidewalk under the Conrail bridge will require coordination and approval from Conrail. Please copy the Township on all correspondence with Conrail. In addition, the applicant should obtain the most recent bridge inspection report from Conrail for the existing bridge.
h. Please consider the use of a Yield sign for northbound truck and bus traffic on the approach to the railroad overpass using R1-2, R1-2AP, and R2-101.

16. The crosswalk markings for the pedestrian crossings of Roads A, B, and C at their intersections with Malin Road should be revised to two six-inch white lines. In addition, the crosswalk marking detail on sheet 24 should be revised.

17. Detailed designs of the curb ramps within the Malin Road right-of-way at Roads A, B, and C should be provided for review, including separate grading details, and all dimensions for construction, including widths, lengths, and all slopes to assist during construction for the proposed curb ramps.

18. Upon resubmission, the applicant's engineer should compose a response letter that describes how each comment has been addressed and where any plan and/or report revisions are located.

19. Additional comments regarding the traffic improvements and/or land development plans may follow upon receipt of future submissions.

If there are any questions or if additional clarification is required regarding any of the above comments, please do not hesitate to contact our office.

Sincerely,

Christopher J. Williams, P.E.
Vice President & Regional Manager – Mid-Atlantic

CJW/JDG/ab

cc: John Nagel, ICMA-CM, East Whiteland Township
Steve Brown, East Whiteland Township
Ted Locker, East Whiteland Township
John Neild, East Whiteland Township
John Kopacz, East Whiteland Township Police
Joseph J. McGrory, Jr., Hamburg, Rubin, Mullin, Maxwell & Lupin
Darrell Becker, P.E., ARRO Consulting
Mark M. Thompson, P.E., Taylor Wiseman & Taylor

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McMAHON ASSOCIATES, INC.
835 Springdale Drive, Suite 200
Exton, PA 19341
p 610-594-9995 | f 610-594-9565

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Joseph J. DeSantis, P.E., PTOE
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Christopher J. Williams, P.E.
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Matthew M. Kozsuch, P.E.
Maureen Chlebek, P.E., PTOE
Dean A. Carr, P.E.

FOUNDER
Joseph W. McMahon, P.E.

June 7, 2019

Mr. Zachary Barner, AICP, Director of Planning and Development
East Whiteland Township
209 Conestoga Road
Frazer, PA 19355-1699

RE: Malin Road Residential Development
East Whiteland Township, Chester County
McMahon Project No. 814098.11

Dear Mr. Barner:

McMahon Associates, Inc. completed a traffic review of the proposed townhome development, consisting of 93 homes located along the east side of Malin Road, just south of Lancaster Avenue (S.R. 0030). Access to the homes is proposed via three unsignalized driveways along Malin Road. This review is based on the following documents.

1. *Malin Road Development Revised Preliminary Land Development Plan,* prepared by Taylor, Wiseman & Taylor, dated April 5, 2019.

Based on our review of the above document, we offer the following observations or comments for the consideration of the Township.

1. SALDO Section 175-23.C(5) – The applicant's engineer has indicated a traffic study will be submitted prior to final plan approval. The traffic study should be submitted as soon as possible, in order to determine the traffic impact and traffic improvements associated with the development, and so the design of these improvements can be reviewed as part of the overall Township process. Please contact our office regarding the scope of the traffic impact study.

2. As part of a previous application for this development, split traffic signal phasing was proposed at the Lancaster Avenue (S.R. 0030)/Malin Road intersection for the side street Malin Road approaches. The traffic study should evaluate operational improvements at this intersection, including the potential for split phase operation for the side-street Malin Road approaches.

3. Traffic signal equipment upgrades should be provided at the Lancaster Avenue (S.R. 0030)/Malin Road intersection in order to accommodate the Township's planned adaptive traffic signal system along S.R. 0030, as well as to comply with the Township's current traffic signal specifications.

4. SALDO Section 175-31 – It is proposed to extend Malin Road and provide a 32-foot wide cartway along this extension, which meets the current ordinance roadway width requirements. However, the Township is currently updating the roadway width requirements, which would support a 28-foot wide curbed cartway (if there is no on-street parking). We could support a narrower cartway width for the extension of Malin Road. This new cartway width would require a waiver under the current ordinance requirements.

5. SALDO Section 175-31 – The applicant is requesting a waiver to allow Roads A, B, and C to be 26 feet wide, which does not meet the current ordinance standard of 32 feet for a minor roadway. However, we could support this waiver since the Township is currently updating the roadway width requirements, which would support a 26-foot wide curbed cartway with no on-street parking.

6. SALDO Section 175-32.F(1) – The applicant is requesting a waiver to allow a 10 percent grade along the proposed extension of Malin Road. The Township is currently updating the street design standards, which would allow a 10 percent grade for local roadways. As such, we could support a waiver of the current ordinance requirements to allow a 9.6 percent grade along the extension of Malin Road.

7. SALDO Section 175-33.C and 175-33.I(1) – The existing available sight distances for left-turn entering traffic (looking ahead and behind) at each of the three site access intersections, as well as the three existing driveways on the west side of Malin Road should be labeled and dimensioned on the plans. A PennDOT-style sight distance note should be added to the plans stating the required sight distances. In addition, please verify that the available sight distances shown on the driveways meet PenDOT's safe stopping sight distance criteria.

8. SALDO Section 175-34.D – The Typical Roadway Section on sheet 18 should be revised to remove the '5" Bit. Conc.' Label, and the location of the '5" Superpave asphalt mix WMA base course, PG 64-22, 3.0 to 10.0 million ESALs, 25.0 mm mix' leader arrow should be revised.

9. The applicant's engineer has indicated a roadway drainage report will be provided prior to final land development approval. These calculations should be submitted as soon as possible to determine the needed roadway drainage improvements, and so the design of these improvements can be reviewed as part of the overall Township process. The roadway drainage report should provide spread of flow calculations along the proposed eastern and western Malin Road curb lines.

10. Roads A, B, and C propose perpendicular parking. However, perpendicular parking is not encouraged on local roads, and if feasible, parallel parking would be preferred. However, since Roads A, B, and C are proposed to be private and the Township will not maintain these roads, our office does not have any objection to the perpendicular on-street parking in this case only.

11. The Township is currently updating the SALDO to require that private residence driveways should be a minimum of 20 feet long (as measured from the edge of the sidewalk or the edge of the adjacent roadway pavement if no sidewalk is proposed). However, most of the individual residence driveways are only approximately 18 feet in length. As such, we recommend that all individual residence driveways should be a minimum of 20 feet long, as measured from the back of curb or back of sidewalk, where sidewalk is shown. In our experience, 20 feet is more appropriate, as motorists do not park against their garage door, and a 20-foot driveway length helps to ensure the sidewalk and road is clear of any vehicle overhang.

12. The Township is currently updating the SALDO to include a provision for sidewalk on both sides of all new streets. As such, please provide sidewalk on both sides of Roads A, B, and C with a four-foot buffer between the curb and the sidewalk.

13. The Township's Department of Codes and Life Safety should review the access and internal site circulation with regard to emergency response and operations, including the proposed emergency access to Village Way.

14. The applicant and the applicant's engineer should ensure that all proposed pedestrian facilities along Roads A, B, and C (including curb ramps and pedestrian access routes) are consistent with current ADA requirements.

15. Based on our review of the Underpass Walkway Plan (sheet 25), we offer the following comments:

    a. Previous designs for the Malin Road sidewalk extension included sidewalk on the east side of Malin Road north of the railroad underpass; however, the current design shows three-foot wide sidewalk on the west side of Malin Road. The preferred sidewalk location in this area would be on the east side of Malin Road, since the pedestrian route provides a direct connection to the existing pedestrian facilities on the southeast corner of the Route 30/Malin Road intersection, and does not require a midblock pedestrian crossing of Malin Road. As such, we would recommend that the proposed sidewalk should be relocated to the east side of Malin Road. If it is not feasible to provide sidewalk on the east side of Malin Road, north of the railroad underpass, the applicant must provide justification for why sidewalk cannot be provided in this area.

b. We recommend (outside the section of sidewalk which crosses under the railroad bridge) the proposed sidewalk should be five feet wide, or four feet wide with ADA passing zones.
c. Please correct the variable width travel lanes along Malin Road under the railroad underpass. Also, the edges of the bridge should be marked with Right Clearance Markers (OM-3R) and Left Clearance Markers (OM-3L) on both the northbound and southbound Malin Road approaches to the underpass.
d. Please provide a shoulder line on the east side of Malin Road for the northbound Malin Road travel lane in the area of the transition between the widened Malin Road cartway to the existing carway width in the vicinity of the railroad underpass.
e. The plans should dimension the height of the proposed wall luminaire above the surface of the proposed sidewalk. The luminaire should be a minimum of 80 inches above the sidewalk surface in order to meet ADA requirements.
f. Approval of the portion of the sidewalk under the Conrail bridge will require coordination and approval from Conrail. Please copy the Township on all correspondence with Conrail.

16. The crosswalk markings for the pedestrian crossings of Roads A, B, and C at their intersections with Malin Road should be revised to two six-inch white lines. In addition, the crosswalk marking detail on sheet 24 should be revised to match the requested design.

17. Detailed designs of the curb ramps within the Malin Road right-of-way at Roads A, B, and C should be provided for review, including separate grading details, and all dimensions for construction, including widths, lengths, and all slopes to assist during construction for the proposed curb ramps.

18. This development is subject to the Township's Transportation Impact Fee. Based on the ITE publication *Trip Generation, 10th Edition*, the proposed 93 townhouses will generate approximately 55 trips during the weekday afternoon peak hour. The Township's current Transportation Impact Fee is $2,862 per weekday afternoon peak hour new trip, and therefore, the total Transportation Impact Fee for this development is **$157,410**. This Transportation Impact Fee can only be used to construct off-site roadway improvements listed in the Transportation Capital Improvements Plan, and cannot be used to construct site access improvements, maintain existing roadways, or mitigate existing roadway deficiencies.

19. Upon resubmission, the applicant's engineer should compose a response letter that describes how each comment has been addressed and where any plan and/or report revisions are located.

20. Additional comments regarding the traffic improvements and/or land development plans may follow upon receipt of future submissions.

If there are any questions or if additional clarification is required regarding any of the above comments, please do not hesitate to contact our office.

Sincerely,

Christopher J. Williams, P.E.
Vice President & Regional Manager – Mid-Atlantic

CJW/JDG/ab

cc: John Nagel, ICMA-CM, East Whiteland Township
William Steele, East Whiteland Township
Steve Brown, East Whiteland Township
Stephen Miller, East Whiteland Township
John Kopacz, East Whiteland Township Police
Joseph J. McGrory, Jr., Hamburg, Rubin, Mullin, Maxwell & Lupin
Darrell Becker, P.E., ARRO Consulting
Mark M. Thompson, P.E., Taylor Wiseman & Taylor

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APPENDIX B

Photodocumentation

Road name (# of pages)

1. Lancaster Avenue and Malin Road (5)
2. Malin Road south of Lancaster Avenue (5)

Aerial image of intersection

Photo # 1 - Description: Eastbound Lancaster Avenue approaching Malin Road (~ 50')

Photo # 2 - Description: Eastbound Lancaster Avenue approaching Malin Road (~200')

Photo # 3 - Description: Westbound Lancaster Avenue approaching Malin Road (~50')

Photo # 4 - Description: Westbound Lancaster Avenue approaching Malin Road (~200')

Photo # 5- Description: Northbound Malin Road approaching Lancaster Avenue (~50')

Photo # 6 - Description: Northbound Malin Road approaching Lancaster Avenue (~200')

Photo # 7- Description: Southbound Malin Road approaching Lancaster Avenue (~50')

Photo # 8 - Description: Southbound Malin Road approaching Lancaster Avenue (~200)

Aerial image of intersection

Photo # 1 - Description: Southbound Malin Road approaching Buckeye and Mack Services sites

Photo # 2 - Description: Northbound Malin Road approaching Lancaster Avenue

Photo # 3 - Description: Looking Westbound at Buckeye entrance from Malin Road

Photo # 4 - Description: Eastbound Buckeye entrance approaching Malin Road

Photo # 5 - Description: Looking Westbound at Buckeye exit to Malin Road

Photo # 6 - Description: Eastbound Buckeye exit approaching Malin Road

Photo # 7 - Description: Southbound Malin Road approaching Mack Services access

APPENDIX C

TIRe Data

Layer Information:

Sort Type: Alphabetic ▾ Show

AADT 1,001 - 5,000
Type: Line | **Result:** 1 of 1

Avg. Daily Traffic: 4687

Avg. Daily Truck Traffic: 94

Count Date: 20170822

Count Duration: 24

County: 15 - CHESTER

D Factor: 55

Daily Truck Vehicle Miles Traveled: 43

Daily Vehicle Miles Traveled: 2156

Direction: B - BOTH

District: 06

Jurisdiction: 5 - NON-STATE FEDERAL AID ROADS

K Factor: 10

Offset Begin: 0

Offset End: 2428

Route: G377

Segment Begin: 0010

Layer Information:

Sort Type: Alphabetic ▾ Show A

AADT 10,001 - 20,000

Type: Line | **Result:** 4 of 4

Avg. Daily Traffic: 11122

Avg. Daily Truck Traffic: 477

Count Date: 20190821

Count Duration: 24

County: 15 - CHESTER

D Factor: 57

Daily Truck Vehicle Miles Traveled: 409

Daily Vehicle Miles Traveled: 9532

Direction: E - EAST

District: 06

HAS_GEOMETRY: Y

Jurisdiction: 1 - STATE

K Factor: 9

OBJECTID: 631011

Offset Begin: 238

Offset End: 1585

Route: 0030

Layer Information:

Sort Type: Alphabetic ▾ Show

AADT 10,001 - 20,000

Type: Line | **Result:** 3 of 3

Avg. Daily Traffic: 11191

Avg. Daily Truck Traffic: 811

Count Date: 20190821

Count Duration: 24

County: 15 - CHESTER

D Factor: 57

Daily Truck Vehicle Miles Traveled: 702

Daily Vehicle Miles Traveled: 9680

Direction: W - WEST

District: 06

HAS_GEOMETRY: Y

Jurisdiction: 1 - STATE

K Factor: 9

OBJECTID: 631012

Offset Begin: 239

Offset End: 1628

Route 0030

Layer Information:

Sort Type: Alphabetic ▾ Show

AADT 10,001 - 20,000
Type: Line | **Result:** 2 of 2

Avg. Daily Traffic: 16703
Avg. Daily Truck Traffic: 669
Count Date: 20170822
Count Duration: 24
County: 15 - CHESTER
D Factor: 55
Daily Truck Vehicle Miles Traveled: 710
Daily Vehicle Miles Traveled: 17739
Direction: B - BOTH
District: 06
HAS_GEOMETRY: Y
Jurisdiction: 1 - STATE
K Factor: 10
OBJECTID: 25860
Offset Begin: 1855
Offset End: 0

INTERSTATE HIGHWAYS (1, 11)

OTHER FREEWAYS AND EXPRESSWAYS (12)

OTHER PRINCIPAL ARTERIAL HIGHWAYS (2, 14)

MINOR ARTERIALS (6, 16)

URBAN COLLECTOR OR
RURAL MAJOR COLLECTOR (7, 17)

RURAL MINOR COLLECTOR (8)

LOCAL ROADS (9, 19)

APPENDIX D

Data Collection

File Name : 214_004_Malin_756396_03-04-2020
Site Code : 214_004_Malin
Start Date : 3/4/2020
Page No : 1

Groups Printed- Lights - Buses - Trucks

	Malin Southbound					Rt 30 Westbound					Malin Northbound					Rt 30 Eastbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	4	1	22	0	27	2	58	6	0	66	3	1	2	0	6	26	113	2	0	141	240
07:15 AM	5	2	29	0	36	3	73	2	0	78	1	0	2	0	3	49	125	2	0	176	293
07:30 AM	24	2	38	0	64	2	96	0	0	98	2	1	4	0	7	43	155	1	0	199	368
07:45 AM	15	2	35	0	52	0	99	6	0	105	1	0	1	0	2	50	168	0	0	218	377
Total	48	7	124	0	179	7	326	14	0	347	7	2	9	0	18	168	561	5	0	734	1278
08:00 AM	8	0	47	0	55	1	86	6	0	93	0	1	2	0	3	43	165	3	0	211	362
08:15 AM	16	3	30	0	49	2	90	9	0	101	1	0	3	0	4	52	177	1	0	230	384
08:30 AM	15	1	38	0	54	2	70	7	0	79	0	0	3	0	3	53	186	2	0	241	377
08:45 AM	18	0	36	0	54	3	112	8	0	123	1	1	2	0	4	51	195	1	0	247	428
Total	57	4	151	0	212	8	358	30	0	396	2	2	10	0	14	199	723	7	0	929	1551
04:00 PM	17	0	48	0	65	3	210	14	0	227	4	1	1	0	6	19	127	0	1	147	445
04:15 PM	29	0	54	0	83	1	175	15	0	191	0	1	1	0	2	32	108	0	0	140	416
04:30 PM	16	1	45	0	62	1	166	22	0	189	0	4	1	0	5	28	128	0	0	156	412
04:45 PM	35	1	49	0	85	1	166	25	0	192	1	2	3	0	6	23	111	0	0	134	417
Total	97	2	196	0	295	6	717	76	0	799	5	8	6	0	19	102	474	0	1	577	1690
05:00 PM	24	1	63	0	88	1	187	27	0	215	4	4	3	0	11	26	120	0	0	146	460
05:15 PM	28	1	55	0	84	1	182	47	0	230	2	2	2	0	6	21	118	0	0	139	459
05:30 PM	22	0	51	0	73	4	156	19	0	179	1	1	2	0	4	24	131	1	0	156	412
05:45 PM	25	1	49	0	75	0	152	15	0	167	2	2	2	0	6	32	102	1	0	135	383
Total	99	3	218	0	320	6	677	108	0	791	9	9	9	0	27	103	471	2	0	576	1714
Grand Total	301	16	689	0	1006	27	2078	228	0	2333	23	21	34	0	78	572	2229	14	1	2816	6233
Apprch %	29.9	1.6	68.5	0		1.2	89.1	9.8	0		29.5	26.9	43.6	0		20.3	79.2	0.5	0		
Total %	4.8	0.3	11.1	0	16.1	0.4	33.3	3.7	0	37.4	0.4	0.3	0.5	0	1.3	9.2	35.8	0.2	0	45.2	
Lights	291	14	680	0	985	15	2030	218	0	2263	16	20	19	0	55	570	2181	8	1	2760	6063
% Lights	96.7	87.5	98.7	0	97.9	55.6	97.7	95.6	0	97	69.6	95.2	55.9	0	70.5	99.7	97.8	57.1	100	98	97.3
Buses	3	0	0	0	3	0	17	0	0	17	1	0	0	0	1	0	12	0	0	12	33
% Buses	1	0	0	0	0.3	0	0.8	0	0	0.7	4.3	0	0	0	1.3	0	0.5	0	0	0.4	0.5
Trucks	7	2	9	0	18	12	31	10	0	53	6	1	15	0	22	2	36	6	0	44	137
% Trucks	2.3	12.5	1.3	0	1.8	44.4	1.5	4.4	0	2.3	26.1	4.8	44.1	0	28.2	0.3	1.6	42.9	0	1.6	2.2

File Name : 214_004_Malin_756396_03-04-2020
Site Code : 214_004_Malin
Start Date : 3/4/2020
Page No : 2

	Malin Southbound					Rt 30 Westbound					Malin Northbound					Rt 30 Eastbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	**8**	**0**	**47**	**0**	**55**	1	86	6	0	93	0	**1**	2	0	3	43	165	**3**	0	211	362
08:15 AM	16	**3**	30	0	49	2	90	**9**	0	101	**1**		**3**		**4**	52	177	1	0	230	384
08:30 AM	15	1	38	0	54	2	70	7	0	79	0	0	3	0	3	**53**	186	2	0	241	377
08:45 AM	**18**					**3**	**112**			**123**							**195**			**247**	**428**
Total Volume	57	4	151	0	212	8	358	30	0	396	2	2	10	0	14	199	723	7	0	929	1551
% App. Total	26.9	1.9	71.2	0		2	90.4	7.6	0		14.3	14.3	71.4	0		21.4	77.8	0.8	0		
PHF	.792	.333	.803	.000	.964	.667	.799	.833	.000	.805	.500	.500	.833	.000	.875	.939	.927	.583	.000	.940	.906
Lights	55	4	147	0	206	2	346	28	0	376	1	2	4	0	7	198	701	3	0	902	1491
% Lights	96.5	100	97.4	0	97.2	25.0	96.6	93.3	0	94.9	50.0	100	40.0	0	50.0	99.5	97.0	42.9	0	97.1	96.1
Buses	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0	3	0	0	3	9
% Buses	0	0	0	0	0	0	1.7	0	0	1.5	0	0	0	0	0	0	0.4	0	0	0.3	0.6
Trucks	2	0	4	0	6	6	6	2	0	14	1	0	6	0	7	1	19	4	0	24	51
% Trucks	3.5	0	2.6	0	2.8	75.0	1.7	6.7	0	3.5	50.0	0	60.0	0	50.0	0.5	2.6	57.1	0	2.6	3.3

Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1
Peak Hour for Entire Intersection Begins at 04:30 PM

04:30 PM	16	**1**	45	0	62	**1**	166	22	0	189	0	**4**	1	0	5	**28**	**128**			**156**	
04:45 PM	**35**	**1**	**49**	**0**	**85**	**1**	**166**	**25**	**0**	**192**	**1**	**2**	**3**	**0**	**6**	**23**	**111**	**0**	**0**	**134**	**417**
05:00 PM	**24**	**1**	**63**	**0**	**88**	1	**187**	**27**	**0**	**215**	**4**	**4**	**3**	**0**	**11**	26	120	0	0	146	**460**
05:15 PM	**28**	**1**	**55**	**0**	**84**	**1**	**182**	**47**	0	**230**	**2**	**2**	**2**	**0**	**6**	**21**	**118**	**0**	**0**	**139**	**459**
Total Volume	103	4	212	0	319	4	701	121	0	826	7	12	9	0	28	98	477	0	0	575	1748
% App. Total	32.3	1.3	66.5	0		0.5	84.9	14.6	0		25	42.9	32.1	0		17	83	0	0		
PHF	.736	1.00	.841	.000	.906	1.00	.937	.644	.000	.898	.438	.750	.750	.000	.636	.875	.932	.000	.000	.921	.950
Lights	102	2	210	0	314	3	695	120	0	818	6	12	6	0	24	98	471	0	0	569	1725
% Lights	99.0	50.0	99.1	0	98.4	75.0	99.1	99.2	0	99.0	85.7	100	66.7	0	85.7	100	98.7	0	0	99.0	98.7
Buses	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	5
% Buses	1.0	0	0	0	0.3	0	0.1	0	0	0.1	0	0	0	0	0	0	0.6	0	0	0.5	0.3
Trucks	0	2	2	0	4	1	5	1	0	7	1	0	3	0	4	0	3	0	0	3	18
% Trucks	0	50.0	0.9	0	1.3	25.0	0.7	0.8	0	0.8	14.3	0	33.3	0	14.3	0	0.6	0	0	0.5	1.0

APPENDIX E

Trip Generation & Background Growth

Land Use: 220
Multifamily Housing (Low-Rise)

Description

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

Additional Data

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

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

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

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

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

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

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

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

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

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

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

Source Numbers

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

Multifamily Housing (Low-Rise)
(220)

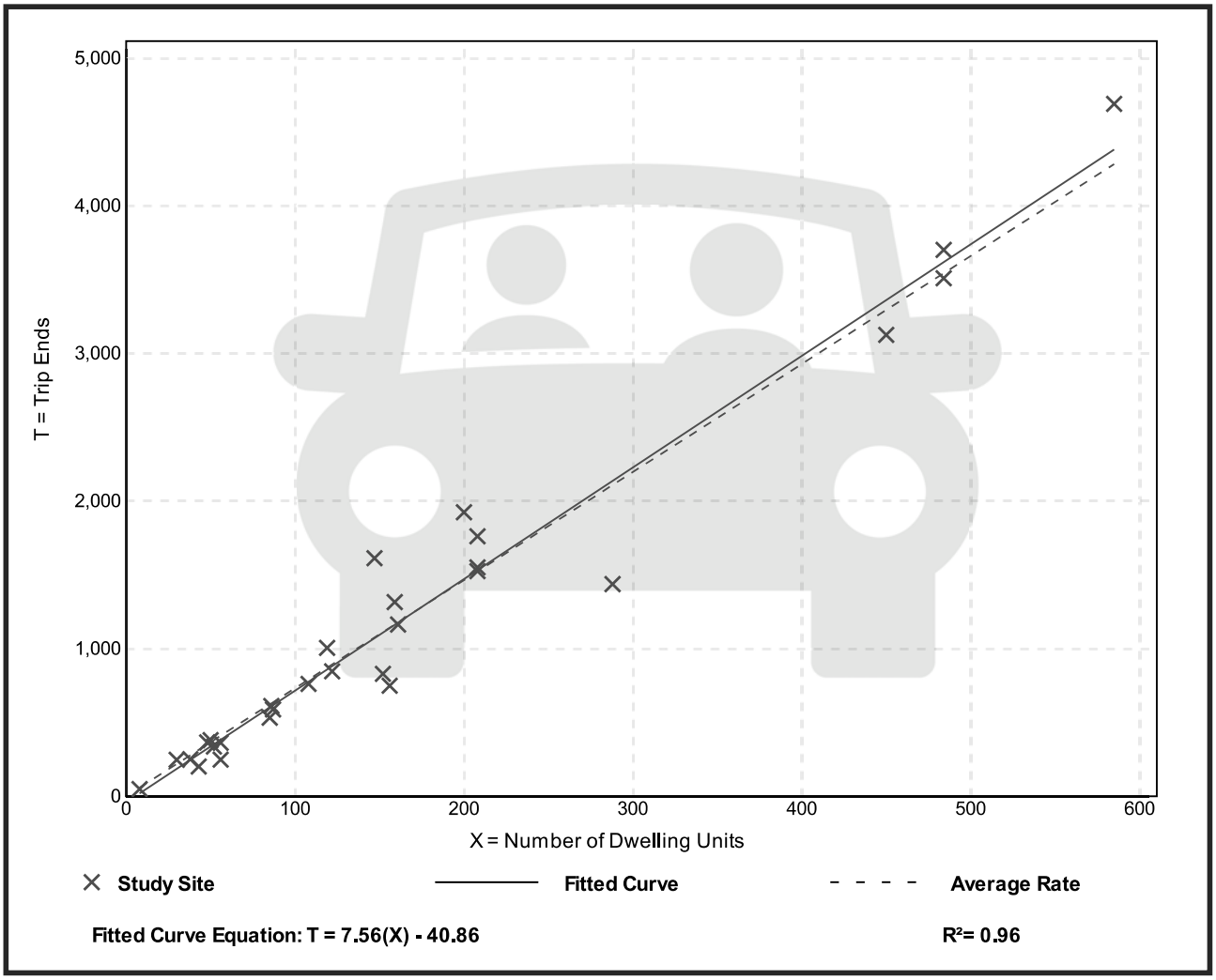
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

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

Vehicle Trip Generation per Dwelling Unit

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

Data Plot and Equation



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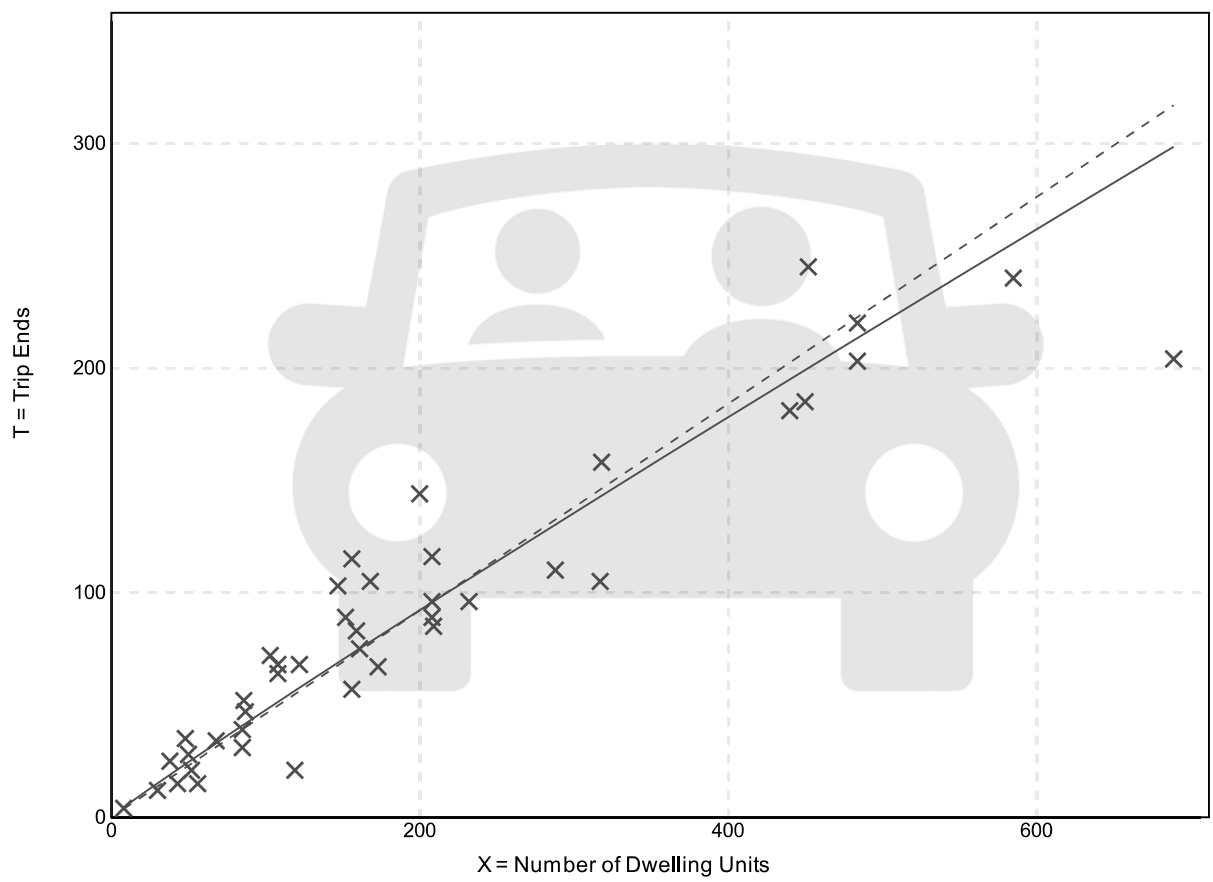
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	42
Avg. Num. of Dwelling Units:	199
Directional Distribution:	23% entering, 77% exiting

Vehicle Trip Generation per Dwelling Unit

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

Data Plot and Equation



Fitted Curve Equation: Ln(T) = 0.95 Ln(X) - 0.51 **R^2= 0.90**

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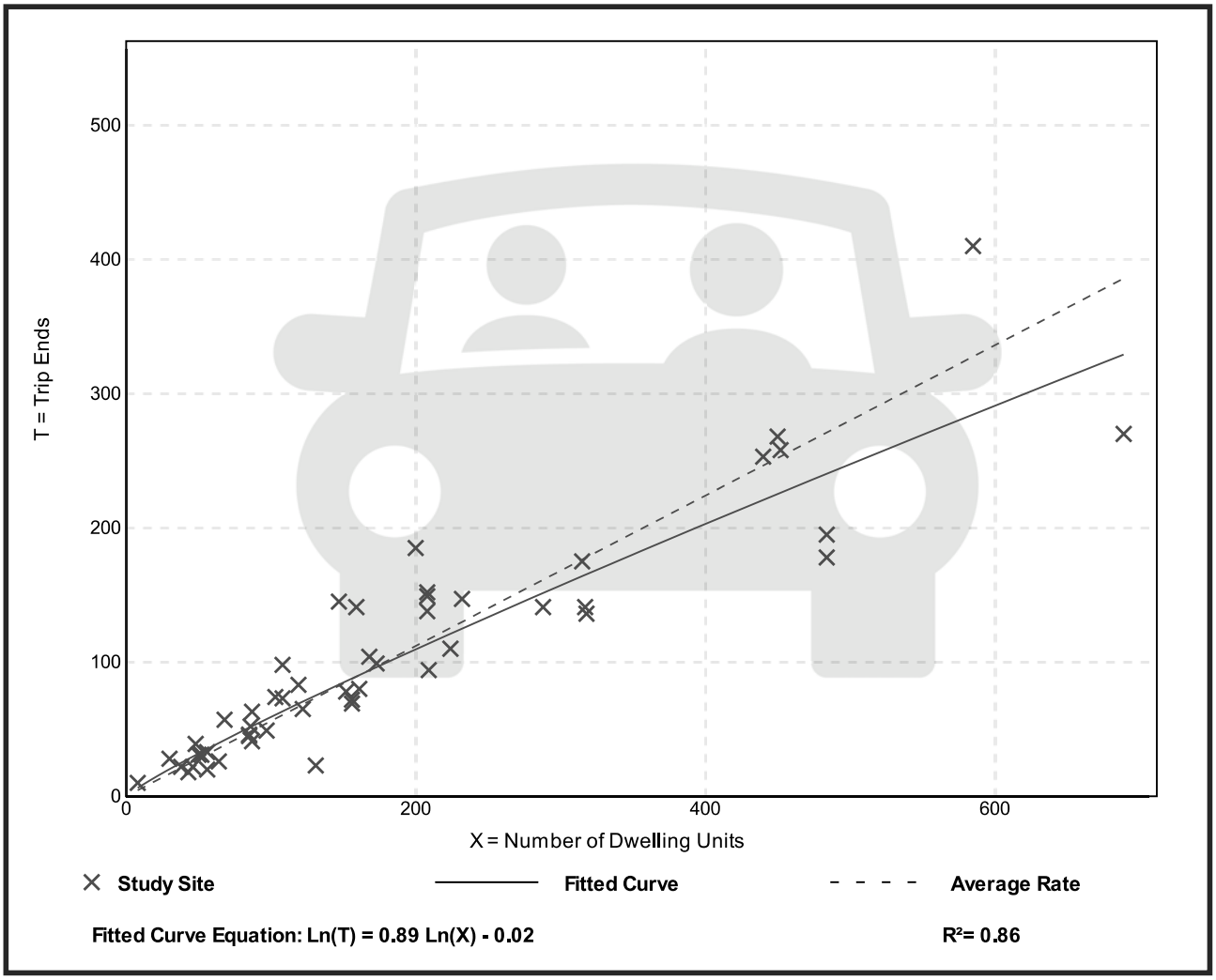
Multifamily Housing (Low-Rise)
(220)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	50
Avg. Num. of Dwelling Units:	187
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

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

Data Plot and Equation



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

* = Functional Class Doesn't Exist in County

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

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

pennsylvania
DEPARTMENT OF TRANSPORTATION

This spreadsheet calculates background growth for all through movements in the study area.

PennDOT recommended rate	*0.52%*
Utilized rate	*1.00%*
Assumed Years of Growth	*5*
Effective Growth Rate Incorporated in Study	*5.10%*

		1.00%			1.00%
		5			5
AM	151	**159**	***PM***	212	**223**
	4			4	
	57	**60**		103	**108**
	30	**32**		121	**127**
	358	**376**		701	**737**
401 / Malin	8			4	
	10			9	
	2			12	
	2			7	
	7			0	
	723	**760**		477	**501**
	199	**209**		98	**103**

214-004 Bishop Tube
23-Mar-20

APPENDIX F

Capacity Analyses

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	199	723	7	8	358	30	2	2	10	57	4	151
Future Volume (vph)	199	723	7	8	358	30	2	2	10	57	4	151
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	16	12	11	11	14	14	14	12	12	12
Grade (%)		-1%			1%			-2%			6%	
Storage Length (ft)	150		0	150		0	0		0	0		100
Storage Lanes	1		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.988			0.901				0.850
Flt Protected	0.950			0.950				0.993			0.955	
Satd. Flow (prot)	1702	3206	0	972	3146	0	0	1152	0	0	1607	1441
Flt Permitted	0.504			0.343				0.950			0.728	
Satd. Flow (perm)	903	3206	0	351	3146	0	0	1102	0	0	1225	1441
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			30			11				166
Link Speed (mph)		35			45			30			30	
Link Distance (ft)		1000			1458			537			972	
Travel Time (s)		19.5			22.1			12.2			22.1	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	1%	3%	57%	75%	3%	7%	50%	0%	60%	4%	0%	3%
Adj. Flow (vph)	219	795	8	9	393	33	2	2	11	63	4	166
Shared Lane Traffic (%)												
Lane Group Flow (vph)	219	803	0	9	426	0	0	15	0	0	67	166
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.11	0.90	1.08	1.13	1.13	0.97	0.97	0.97	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	22.0	22.0		22.0	22.0		16.0	16.0		16.0	16.0	16.0
Total Split (s)	39.0	39.0		39.0	39.0		16.0	16.0		16.0	16.0	16.0
Total Split (%)	70.9%	70.9%		70.9%	70.9%		29.1%	29.1%		29.1%	29.1%	29.1%
Maximum Green (s)	33.0	33.0		33.0	33.0		10.0	10.0		10.0	10.0	10.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	3.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		Max	Max		None	None		None	None	None
Act Effct Green (s)	39.2	39.2		39.2	39.2			9.1			9.1	9.1
Actuated g/C Ratio	0.71	0.71		0.71	0.71			0.17			0.17	0.17
v/c Ratio	0.34	0.35		0.04	0.19			0.08			0.33	0.44
Control Delay	6.6	4.9		4.5	3.9			13.1			24.3	8.1
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	6.6	4.9		4.5	3.9			13.1			24.3	8.1
LOS	A	A		A	A			B			C	A
Approach Delay		5.2			3.9			13.1			12.8	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	27	52		1	22			1			20	0
Queue Length 95th (ft)	67	86		5	40			14			48	40
Internal Link Dist (ft)		920			1378			457			892	
Turn Bay Length (ft)	150			150								100
Base Capacity (vph)	644	2287		250	2252			229			245	421
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.34	0.35		0.04	0.19			0.07			0.27	0.39

Intersection Summary

Area Type: Other
Cycle Length: 55
Actuated Cycle Length: 55
Offset: 22 (40%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.44
Intersection Signal Delay: 6.0 Intersection LOS: A
Intersection Capacity Utilization 47.4% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Site/Malin & Rt 30

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	199	723	7	8	358	30	2	2	10	57	4	151
Future Volume (veh/h)	199	723	7	8	358	30	2	2	10	57	4	151
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1791	1747	1881	1023	1734	1791	1891	1255	1891	1746	1683	1695
Adj Flow Rate, veh/h	219	795	8	9	393	33	2	2	11	63	4	166
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	3	3	75	3	3	0	0	0	0	0	3
Cap, veh/h	718	2205	22	346	2016	169	84	38	130	333	17	235
Arrive On Green	0.65	0.65	0.65	0.65	0.65	0.65	0.16	0.16	0.16	0.16	0.16	0.16
Sat Flow, veh/h	972	3367	34	391	3078	257	58	232	797	1263	104	1441
Grp Volume(v), veh/h	219	392	411	9	209	217	15	0	0	67	0	166
Grp Sat Flow(s),veh/h/ln	972	1660	1741	391	1647	1688	1087	0	0	1367	0	1441
Q Serve(g_s), s	6.3	5.9	5.9	0.6	2.8	2.8	0.0	0.0	0.0	1.6	0.0	6.0
Cycle Q Clear(g_c), s	9.1	5.9	5.9	6.5	2.8	2.8	0.6	0.0	0.0	2.3	0.0	6.0
Prop In Lane	1.00		0.02	1.00		0.15	0.13		0.73	0.94		1.00
Lane Grp Cap(c), veh/h	718	1087	1140	346	1079	1106	252	0	0	350	0	235
V/C Ratio(X)	0.30	0.36	0.36	0.03	0.19	0.20	0.06	0.00	0.00	0.19	0.00	0.71
Avail Cap(c_a), veh/h	718	1087	1140	346	1079	1106	290	0	0	400	0	288
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	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	5.6	4.3	4.3	5.7	3.8	3.8	19.5	0.0	0.0	20.2	0.0	21.8
Incr Delay (d2), s/veh	1.1	0.9	0.9	0.1	0.4	0.4	0.1	0.0	0.0	0.3	0.0	5.9
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	3.3	5.2	5.4	0.1	2.4	2.5	0.4	0.0	0.0	1.7	0.0	4.9
LnGrp Delay(d),s/veh	6.6	5.2	5.2	5.9	4.2	4.2	19.6	0.0	0.0	20.4	0.0	27.6
LnGrp LOS	A	A	A	A	A	A	B			C		C
Approach Vol, veh/h		1022			435			15			233	
Approach Delay, s/veh		5.5			4.2			19.6			25.6	
Approach LOS		A			A			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		41.0		14.0		41.0		14.0
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		33.0		10.0		33.0		10.0
Max Q Clear Time (g_c+I1), s		11.6		2.6		9.0		8.0
Green Ext Time (p_c), s		6.2		0.0		2.4		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	8.0
HCM 2010 LOS	A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	98	477	0	4	701	121	7	12	9	103	4	212
Future Volume (vph)	98	477	0	4	701	121	7	12	9	103	4	212
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	16	12	11	11	14	14	14	12	12	12
Grade (%)		-1%			1%			-2%			3%	
Storage Length (ft)	150		0	150		0	0		0	0		100
Storage Lanes	1		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.978			0.958				0.850
Flt Protected	0.950			0.950				0.988			0.954	
Satd. Flow (prot)	1719	3290	0	1361	3185	0	0	1615	0	0	1646	1492
Flt Permitted	0.307			0.468				0.920			0.712	
Satd. Flow (perm)	555	3290	0	671	3185	0	0	1504	0	0	1229	1492
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					48			9				167
Link Speed (mph)		35			45			30			30	
Link Distance (ft)		1000			1458			537			972	
Travel Time (s)		19.5			22.1			12.2			22.1	
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 (%)	0%	1%	0%	25%	1%	1%	14%	0%	33%	1%	50%	1%
Adj. Flow (vph)	103	502	0	4	738	127	7	13	9	108	4	223
Shared Lane Traffic (%)												
Lane Group Flow (vph)	103	502	0	4	865	0	0	29	0	0	112	223
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.11	0.90	1.08	1.13	1.13	0.97	0.97	0.97	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	22.0	22.0		22.0	22.0		16.0	16.0		16.0	16.0	16.0
Total Split (s)	36.0	36.0		36.0	36.0		24.0	24.0		24.0	24.0	24.0
Total Split (%)	60.0%	60.0%		60.0%	60.0%		40.0%	40.0%		40.0%	40.0%	40.0%
Maximum Green (s)	30.0	30.0		30.0	30.0		18.0	18.0		18.0	18.0	18.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	3.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		Max	Max		None	None		None	None	None
Act Effct Green (s)	38.1	38.1		38.1	38.1			11.9			11.9	11.9
Actuated g/C Ratio	0.64	0.64		0.64	0.64			0.20			0.20	0.20
v/c Ratio	0.29	0.24		0.01	0.42			0.10			0.46	0.52
Control Delay	9.2	5.7		5.8	6.6			14.4			26.3	10.8
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	9.2	5.7		5.8	6.6			14.4			26.3	10.8
LOS	A	A		A	A			B			C	B
Approach Delay		6.3			6.6			14.4			16.0	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	14	34		0	63			6			36	17
Queue Length 95th (ft)	50	71		4	127			21			69	60
Internal Link Dist (ft)		920			1378			457			892	
Turn Bay Length (ft)	150			150								100
Base Capacity (vph)	352	2091		426	2042			482			389	586
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.29	0.24		0.01	0.42			0.06			0.29	0.38

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 57 (95%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 8.3 Intersection LOS: A
Intersection Capacity Utilization 55.7% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: Site/Malin & Rt 30

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	98	477	0	4	701	121	7	12	9	103	4	212
Future Volume (veh/h)	98	477	0	4	701	121	7	12	9	103	4	212
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1809	1791	1881	1433	1773	1791	1891	1664	1891	1773	1726	1755
Adj Flow Rate, veh/h	103	502	0	4	738	127	7	13	9	108	4	223
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	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
Percent Heavy Veh, %	0	1	1	25	1	1	0	0	0	50	50	1
Cap, veh/h	442	2120	0	524	1791	308	117	172	96	397	12	314
Arrive On Green	0.62	0.62	0.00	0.62	0.62	0.62	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	653	3493	0	725	2876	495	200	818	458	1325	59	1492
Grp Volume(v), veh/h	103	502	0	4	432	433	29	0	0	112	0	223
Grp Sat Flow(s),veh/h/ln	653	1702	0	725	1685	1686	1476	0	0	1384	0	1492
Q Serve(g_s), s	5.7	3.9	0.0	0.1	7.8	7.8	0.0	0.0	0.0	3.1	0.0	8.3
Cycle Q Clear(g_c), s	13.5	3.9	0.0	4.1	7.8	7.8	0.9	0.0	0.0	4.0	0.0	8.3
Prop In Lane	1.00		0.00	1.00		0.29	0.24		0.31	0.96		1.00
Lane Grp Cap(c), veh/h	442	2120	0	524	1049	1050	385	0	0	409	0	314
V/C Ratio(X)	0.23	0.24	0.00	0.01	0.41	0.41	0.08	0.00	0.00	0.27	0.00	0.71
Avail Cap(c_a), veh/h	442	2120	0	524	1049	1050	534	0	0	554	0	473
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	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.2	5.0	0.0	5.9	5.7	5.7	19.1	0.0	0.0	20.2	0.0	22.0
Incr Delay (d2), s/veh	1.2	0.3	0.0	0.0	1.2	1.2	0.1	0.0	0.0	0.4	0.0	3.0
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	2.1	3.4	0.0	0.1	7.1	7.1	0.7	0.0	0.0	2.9	0.0	6.6
LnGrp Delay(d),s/veh	10.4	5.3	0.0	5.9	6.9	6.9	19.1	0.0	0.0	20.6	0.0	25.0
LnGrp LOS	B	A		A	A	A	B			C		C
Approach Vol, veh/h		605			869			29			335	
Approach Delay, s/veh		6.1			6.9			19.1			23.5	
Approach LOS		A			A			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		42.4		17.6		42.4		17.6
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		30.0		18.0		30.0		18.0
Max Q Clear Time (g_c+I1), s		16.0		2.9		10.3		10.8
Green Ext Time (p_c), s		3.5		0.1		5.0		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	9.9
HCM 2010 LOS	A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	209	760	7	8	376	32	2	2	10	60	4	159
Future Volume (vph)	209	760	7	8	376	32	2	2	10	60	4	159
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	16	12	11	11	14	14	14	12	12	12
Grade (%)		-1%			1%			-2%			6%	
Storage Length (ft)	150		0	150		0	0		0	0		100
Storage Lanes	1		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.988			0.901				0.850
Flt Protected	0.950			0.950				0.993			0.955	
Satd. Flow (prot)	1702	3207	0	972	3146	0	0	1152	0	0	1607	1441
Flt Permitted	0.493			0.326				0.950			0.727	
Satd. Flow (perm)	883	3207	0	334	3146	0	0	1102	0	0	1223	1441
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			30			11				175
Link Speed (mph)		35			45			30			30	
Link Distance (ft)		1000			1458			537			972	
Travel Time (s)		19.5			22.1			12.2			22.1	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	1%	3%	57%	75%	3%	7%	50%	0%	60%	4%	0%	3%
Adj. Flow (vph)	230	835	8	9	413	35	2	2	11	66	4	175
Shared Lane Traffic (%)												
Lane Group Flow (vph)	230	843	0	9	448	0	0	15	0	0	70	175
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.11	0.90	1.08	1.13	1.13	0.97	0.97	0.97	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	22.0	22.0		22.0	22.0		16.0	16.0		16.0	16.0	16.0
Total Split (s)	39.0	39.0		39.0	39.0		16.0	16.0		16.0	16.0	16.0
Total Split (%)	70.9%	70.9%		70.9%	70.9%		29.1%	29.1%		29.1%	29.1%	29.1%
Maximum Green (s)	33.0	33.0		33.0	33.0		10.0	10.0		10.0	10.0	10.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	3.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		Max	Max		None	None		None	None	None
Act Effct Green (s)	39.1	39.1		39.1	39.1			9.2			9.2	9.2
Actuated g/C Ratio	0.71	0.71		0.71	0.71			0.17			0.17	0.17
v/c Ratio	0.37	0.37		0.04	0.20			0.08			0.34	0.45
Control Delay	7.0	5.0		4.6	3.9			13.1			24.5	8.1
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	7.0	5.0		4.6	3.9			13.1			24.5	8.1
LOS	A	A		A	A			B			C	A
Approach Delay		5.4			3.9			13.1			12.8	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	29	55		1	23			1			20	0
Queue Length 95th (ft)	73	92		5	43			14			50	41
Internal Link Dist (ft)		920			1378			457			892	
Turn Bay Length (ft)	150			150								100
Base Capacity (vph)	628	2283		237	2247			229			244	428
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.37	0.37		0.04	0.20			0.07			0.29	0.41

Intersection Summary	
Area Type:	Other
Cycle Length: 55	
Actuated Cycle Length: 55	
Offset: 22 (40%), Referenced to phase 2:EBTL, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.45	
Intersection Signal Delay: 6.1	Intersection LOS: A
Intersection Capacity Utilization 48.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Site/Malin & Rt 30

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	209	760	7	8	376	32	2	2	10	60	4	159
Future Volume (veh/h)	209	760	7	8	376	32	2	2	10	60	4	159
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1791	1748	1881	1023	1734	1791	1891	1255	1891	1746	1683	1695
Adj Flow Rate, veh/h	230	835	8	9	413	35	2	2	11	66	4	175
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	3	3	75	3	3	0	0	0	0	0	3
Cap, veh/h	697	2186	21	332	1995	168	84	40	135	342	17	244
Arrive On Green	0.65	0.65	0.65	0.65	0.65	0.65	0.17	0.17	0.17	0.17	0.17	0.17
Sat Flow, veh/h	952	3370	32	377	3075	260	57	233	798	1266	99	1441
Grp Volume(v), veh/h	230	411	432	9	220	228	15	0	0	70	0	175
Grp Sat Flow(s),veh/h/ln	952	1660	1742	377	1647	1688	1088	0	0	1365	0	1441
Q Serve(g_s), s	7.1	6.4	6.4	0.6	3.0	3.0	0.0	0.0	0.0	1.7	0.0	6.3
Cycle Q Clear(g_c), s	10.1	6.4	6.4	7.0	3.0	3.0	0.6	0.0	0.0	2.4	0.0	6.3
Prop In Lane	1.00		0.02	1.00		0.15	0.13		0.73	0.94		1.00
Lane Grp Cap(c), veh/h	697	1077	1130	332	1069	1095	258	0	0	358	0	244
V/C Ratio(X)	0.33	0.38	0.38	0.03	0.21	0.21	0.06	0.00	0.00	0.20	0.00	0.72
Avail Cap(c_a), veh/h	697	1077	1130	332	1069	1095	291	0	0	400	0	288
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	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.0	4.5	4.5	6.1	3.9	3.9	19.2	0.0	0.0	19.9	0.0	21.6
Incr Delay (d2), s/veh	1.3	1.0	1.0	0.2	0.4	0.4	0.1	0.0	0.0	0.3	0.0	6.8
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	3.8	5.7	5.9	0.1	2.7	2.7	0.4	0.0	0.0	1.7	0.0	5.3
LnGrp Delay(d),s/veh	7.2	5.5	5.5	6.3	4.4	4.4	19.3	0.0	0.0	20.2	0.0	28.4
LnGrp LOS	A	A	A	A	A	A	B			C		C
Approach Vol, veh/h		1073			457			15			245	
Approach Delay, s/veh		5.9			4.4			19.3			26.1	
Approach LOS		A			A			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		40.7		14.3		40.7		14.3
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		33.0		10.0		33.0		10.0
Max Q Clear Time (g_c+I1), s		12.6		2.6		9.5		8.3
Green Ext Time (p_c), s		6.5		0.0		2.5		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	8.4
HCM 2010 LOS	A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	501	0	4	737	127	7	12	9	108	4	223
Future Volume (vph)	103	501	0	4	737	127	7	12	9	108	4	223
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	16	12	11	11	14	14	14	12	12	12
Grade (%)		-1%			1%			-2%			3%	
Storage Length (ft)	150		0	150		0	0		0	0		100
Storage Lanes	1		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.978			0.958				0.850
Flt Protected	0.950			0.950				0.988			0.954	
Satd. Flow (prot)	1719	3290	0	1361	3185	0	0	1615	0	0	1648	1492
Flt Permitted	0.288			0.456				0.919			0.712	
Satd. Flow (perm)	521	3290	0	653	3185	0	0	1503	0	0	1230	1492
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					48			9				151
Link Speed (mph)		35			45			30			30	
Link Distance (ft)		1000			1458			537			972	
Travel Time (s)		19.5			22.1			12.2			22.1	
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 (%)	0%	1%	0%	25%	1%	1%	14%	0%	33%	1%	50%	1%
Adj. Flow (vph)	108	527	0	4	776	134	7	13	9	114	4	235
Shared Lane Traffic (%)												
Lane Group Flow (vph)	108	527	0	4	910	0	0	29	0	0	118	235
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.11	0.90	1.08	1.13	1.13	0.97	0.97	0.97	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	22.0	22.0		22.0	22.0		16.0	16.0		16.0	16.0	16.0
Total Split (s)	36.0	36.0		36.0	36.0		24.0	24.0		24.0	24.0	24.0
Total Split (%)	60.0%	60.0%		60.0%	60.0%		40.0%	40.0%		40.0%	40.0%	40.0%
Maximum Green (s)	30.0	30.0		30.0	30.0		18.0	18.0		18.0	18.0	18.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	3.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		Max	Max		None	None		None	None	None
Act Effct Green (s)	37.9	37.9		37.9	37.9			12.1			12.1	12.1
Actuated g/C Ratio	0.63	0.63		0.63	0.63			0.20			0.20	0.20
v/c Ratio	0.33	0.25		0.01	0.45			0.09			0.48	0.56
Control Delay	10.3	6.0		6.0	7.0			14.1			26.3	13.1
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	10.3	6.0		6.0	7.0			14.1			26.3	13.1
LOS	B	A		A	A			B			C	B
Approach Delay		6.7			7.0			14.1			17.5	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	15	36		0	68			6			38	26
Queue Length 95th (ft)	56	75		4	138			21			71	72
Internal Link Dist (ft)		920			1378			457			892	
Turn Bay Length (ft)	150			150								100
Base Capacity (vph)	328	2075		412	2027			482			389	575
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.33	0.25		0.01	0.45			0.06			0.30	0.41

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 57 (95%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.56
Intersection Signal Delay: 8.9 Intersection LOS: A
Intersection Capacity Utilization 57.5% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: Site/Malin & Rt 30

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	103	501	0	4	737	127	7	12	9	108	4	223
Future Volume (veh/h)	103	501	0	4	737	127	7	12	9	108	4	223
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1809	1791	1881	1433	1773	1791	1891	1664	1891	1773	1727	1755
Adj Flow Rate, veh/h	108	527	0	4	776	134	7	13	9	114	4	235
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	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
Percent Heavy Veh, %	0	1	1	25	1	1	0	0	0	50	50	1
Cap, veh/h	416	2093	0	506	1768	305	119	177	100	408	12	326
Arrive On Green	0.62	0.62	0.00	0.62	0.62	0.62	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	626	3493	0	708	2874	496	202	813	457	1328	56	1492
Grp Volume(v), veh/h	108	527	0	4	455	455	29	0	0	118	0	235
Grp Sat Flow(s),veh/h/ln	626	1702	0	708	1685	1686	1472	0	0	1384	0	1492
Q Serve(g_s), s	6.6	4.2	0.0	0.2	8.5	8.5	0.0	0.0	0.0	3.4	0.0	8.8
Cycle Q Clear(g_c), s	15.1	4.2	0.0	4.4	8.5	8.5	0.9	0.0	0.0	4.2	0.0	8.8
Prop In Lane	1.00		0.00	1.00		0.29	0.24		0.31	0.97		1.00
Lane Grp Cap(c), veh/h	416	2093	0	506	1036	1037	396	0	0	420	0	326
V/C Ratio(X)	0.26	0.25	0.00	0.01	0.44	0.44	0.07	0.00	0.00	0.28	0.00	0.72
Avail Cap(c_a), veh/h	416	2093	0	506	1036	1037	533	0	0	554	0	473
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	0.00	1.00	1.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.1	5.3	0.0	6.3	6.1	6.1	18.7	0.0	0.0	19.9	0.0	21.8
Incr Delay (d2), s/veh	1.5	0.3	0.0	0.0	1.4	1.4	0.1	0.0	0.0	0.4	0.0	3.0
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	2.4	3.7	0.0	0.1	7.7	7.7	0.7	0.0	0.0	3.1	0.0	7.0
LnGrp Delay(d),s/veh	11.6	5.5	0.0	6.3	7.4	7.4	18.8	0.0	0.0	20.3	0.0	24.8
LnGrp LOS	B	A		A	A	A	B			C		C
Approach Vol, veh/h		635			914			29			353	
Approach Delay, s/veh		6.6			7.4			18.8			23.3	
Approach LOS		A			A			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		41.9		18.1		41.9		18.1
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		30.0		18.0		30.0		18.0
Max Q Clear Time (g_c+I1), s		17.6		2.9		11.0		11.3
Green Ext Time (p_c), s		3.5		0.1		5.2		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	10.2
HCM 2010 LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	209	760	8	14	376	32	7	12	29	60	7	159
Future Volume (vph)	209	760	8	14	376	32	7	12	29	60	7	159
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	16	12	11	11	14	14	14	12	12	12
Grade (%)		-1%			1%			-2%			6%	
Storage Length (ft)	150		0	150		0	0		0	0		100
Storage Lanes	1		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998			0.988			0.918				0.850
Flt Protected	0.950			0.950				0.993			0.957	
Satd. Flow (prot)	1702	3201	0	972	3146	0	0	1230	0	0	1613	1441
Flt Permitted	0.493			0.326				0.937			0.711	
Satd. Flow (perm)	883	3201	0	334	3146	0	0	1160	0	0	1199	1441
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			30			32				175
Link Speed (mph)		35			45			30			30	
Link Distance (ft)		1000			1458			408			972	
Travel Time (s)		19.5			22.1			9.3			22.1	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	1%	3%	57%	75%	3%	7%	50%	0%	60%	4%	0%	3%
Adj. Flow (vph)	230	835	9	15	413	35	8	13	32	66	8	175
Shared Lane Traffic (%)												
Lane Group Flow (vph)	230	844	0	15	448	0	0	53	0	0	74	175
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.11	0.90	1.08	1.13	1.13	0.97	0.97	0.97	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	22.0	22.0		22.0	22.0		16.0	16.0		16.0	16.0	16.0
Total Split (s)	39.0	39.0		39.0	39.0		16.0	16.0		16.0	16.0	16.0
Total Split (%)	70.9%	70.9%		70.9%	70.9%		29.1%	29.1%		29.1%	29.1%	29.1%
Maximum Green (s)	33.0	33.0		33.0	33.0		10.0	10.0		10.0	10.0	10.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	3.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		Max	Max		None	None		None	None	None
Act Effct Green (s)	39.0	39.0		39.0	39.0			9.3			9.3	9.3
Actuated g/C Ratio	0.71	0.71		0.71	0.71			0.17			0.17	0.17
v/c Ratio	0.37	0.37		0.06	0.20			0.24			0.37	0.45
Control Delay	7.1	5.1		5.0	4.0			13.7			25.1	8.0
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	7.1	5.1		5.0	4.0			13.7			25.1	8.0
LOS	A	A		A	A			B			C	A
Approach Delay		5.5			4.0			13.7			13.1	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	30	57		2	24			6			22	0
Queue Length 95th (ft)	73	92		8	43			30			52	41
Internal Link Dist (ft)		920			1378			328			892	
Turn Bay Length (ft)	150			150								100
Base Capacity (vph)	626	2273		237	2241			257			239	428
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.37	0.37		0.06	0.20			0.21			0.31	0.41

Intersection Summary

Area Type: Other
Cycle Length: 55
Actuated Cycle Length: 55
Offset: 22 (40%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.45
Intersection Signal Delay: 6.4 Intersection LOS: A
Intersection Capacity Utilization 48.8% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: Malin S/Malin & Rt 30

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	209	760	8	14	376	32	7	12	29	60	7	159
Future Volume (veh/h)	209	760	8	14	376	32	7	12	29	60	7	159
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1791	1747	1881	1023	1734	1791	1891	1315	1891	1746	1686	1695
Adj Flow Rate, veh/h	230	835	9	15	413	35	8	13	32	66	8	175
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	3	3	75	3	3	0	0	0	0	0	3
Cap, veh/h	696	2178	23	331	1991	168	90	63	119	330	32	246
Arrive On Green	0.65	0.65	0.65	0.65	0.65	0.65	0.17	0.17	0.17	0.17	0.17	0.17
Sat Flow, veh/h	952	3363	36	377	3075	260	85	372	696	1205	190	1441
Grp Volume(v), veh/h	230	412	432	15	220	228	53	0	0	74	0	175
Grp Sat Flow(s),veh/h/ln	952	1659	1740	377	1647	1688	1152	0	0	1395	0	1441
Q Serve(g_s), s	7.1	6.4	6.4	1.1	3.0	3.0	0.0	0.0	0.0	0.1	0.0	6.3
Cycle Q Clear(g_c), s	10.1	6.4	6.4	7.5	3.0	3.0	2.1	0.0	0.0	2.2	0.0	6.3
Prop In Lane	1.00		0.02	1.00		0.15	0.15		0.60	0.89		1.00
Lane Grp Cap(c), veh/h	696	1074	1127	331	1066	1093	272	0	0	362	0	246
V/C Ratio(X)	0.33	0.38	0.38	0.05	0.21	0.21	0.19	0.00	0.00	0.20	0.00	0.71
Avail Cap(c_a), veh/h	696	1074	1127	331	1066	1093	305	0	0	401	0	288
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	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	6.0	4.5	4.5	6.3	3.9	3.9	19.8	0.0	0.0	19.8	0.0	21.5
Incr Delay (d2), s/veh	1.3	1.0	1.0	0.3	0.4	0.4	0.3	0.0	0.0	0.3	0.0	6.6
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	3.8	5.7	6.0	0.2	2.7	2.7	1.3	0.0	0.0	1.8	0.0	5.3
LnGrp Delay(d),s/veh	7.3	5.6	5.5	6.6	4.4	4.4	20.1	0.0	0.0	20.1	0.0	28.1
LnGrp LOS	A	A	A	A	A	A	C			C		C
Approach Vol, veh/h		1074			463			53			249	
Approach Delay, s/veh		5.9			4.5			20.1			25.7	
Approach LOS		A			A			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		40.6		14.4		40.6		14.4
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		33.0		10.0		33.0		10.0
Max Q Clear Time (g_c+I1), s		12.6		4.1		10.0		8.3
Green Ext Time (p_c), s		6.5		0.1		2.6		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	8.6
HCM 2010 LOS	A

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	34	14	0	10	19
Future Volume (vph)	0	34	14	0	10	19
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Grade (%)	0%		-2%			0%
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.865					
Flt Protected						0.983
Satd. Flow (prot)	1557	0	1818	0	0	1769
Flt Permitted						0.983
Satd. Flow (perm)	1557	0	1818	0	0	1769
Link Speed (mph)	30		30			30
Link Distance (ft)	184		129			408
Travel Time (s)	4.2		2.9			9.3
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	0	37	15	0	11	21
Shared Lane Traffic (%)						
Lane Group Flow (vph)	37	0	15	0	0	32
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.07	1.07	1.06	1.06	1.07	1.07
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 18.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	4.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	34	14	0	10	19
Future Vol, veh/h	0	34	14	0	10	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	-2	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	37	15	0	11	21

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	58	15	0	0	15	0
Stage 1	15	-	-	-	-	-
Stage 2	43	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	954	1070	-	-	1616	-
Stage 1	1013	-	-	-	-	-
Stage 2	985	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	947	1070	-	-	1616	-
Mov Cap-2 Maneuver	947	-	-	-	-	-
Stage 1	1006	-	-	-	-	-
Stage 2	985	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.5	0	2.5
HCM LOS	A		

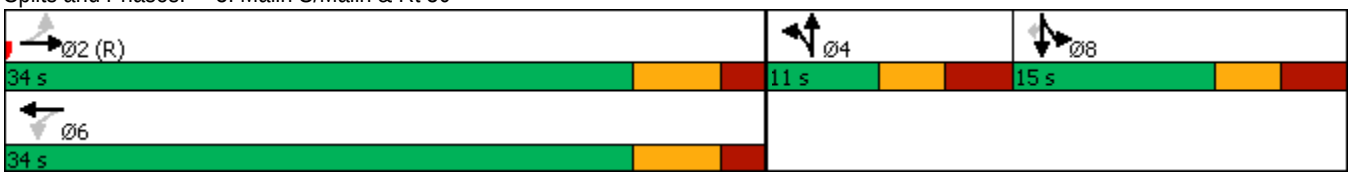
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1070	1616	-
HCM Lane V/C Ratio	-	-	0.035	0.007	-
HCM Control Delay (s)	-	-	8.5	7.2	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	209	760	8	14	376	32	7	12	29	60	7	159
Future Volume (vph)	209	760	8	14	376	32	7	12	29	60	7	159
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	16	12	11	11	14	14	14	12	12	12
Grade (%)		-1%			1%			-2%			6%	
Storage Length (ft)	150		0	150		0	0		0	0		100
Storage Lanes	1		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998			0.988			0.918				0.850
Flt Protected	0.950			0.950				0.993			0.957	
Satd. Flow (prot)	1702	3201	0	972	3146	0	0	1230	0	0	1613	1441
Flt Permitted	0.493			0.292				0.993			0.957	
Satd. Flow (perm)	883	3201	0	299	3146	0	0	1230	0	0	1613	1441
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			20			32				175
Link Speed (mph)		35			45			30			30	
Link Distance (ft)		1000			1458			408			972	
Travel Time (s)		19.5			22.1			9.3			22.1	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles (%)	1%	3%	57%	75%	3%	7%	50%	0%	60%	4%	0%	3%
Adj. Flow (vph)	230	835	9	15	413	35	8	13	32	66	8	175
Shared Lane Traffic (%)												
Lane Group Flow (vph)	230	844	0	15	448	0	0	53	0	0	74	175
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.11	0.90	1.08	1.13	1.13	0.97	0.97	0.97	1.11	1.11	1.11
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Split	NA		Split	NA	Perm
Protected Phases		2			6		4	4		8	8	
Permitted Phases	2			6								8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	22.0	22.0		22.0	22.0		16.0	16.0		16.0	16.0	16.0
Total Split (s)	34.0	34.0		34.0	34.0		11.0	11.0		15.0	15.0	15.0
Total Split (%)	56.7%	56.7%		56.7%	56.7%		18.3%	18.3%		25.0%	25.0%	25.0%
Maximum Green (s)	28.0	28.0		28.0	28.0		5.0	5.0		9.0	9.0	9.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	3.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		Max	Max		None	None		None	None	None
Act Effct Green (s)	34.7	34.7		34.7	34.7			6.0			8.7	8.7
Actuated g/C Ratio	0.58	0.58		0.58	0.58			0.10			0.14	0.14
v/c Ratio	0.45	0.46		0.09	0.25			0.35			0.32	0.49
Control Delay	13.2	9.7		10.2	7.7			21.3			26.4	9.5
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	13.2	9.7		10.2	7.7			21.3			26.4	9.5
LOS	B	A		B	A			C			C	A
Approach Delay		10.5			7.8			21.3			14.5	
Approach LOS		B			A			C			B	
Queue Length 50th (ft)	52	101		3	43			7			24	0
Queue Length 95th (ft)	117	151		13	71			36			57	46
Internal Link Dist (ft)		920			1378			328			892	
Turn Bay Length (ft)	150			150								100
Base Capacity (vph)	511	1853		173	1828			151			268	386
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.45	0.46		0.09	0.25			0.35			0.28	0.45

Intersection Summary	
Area Type:	Other
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 10.7	Intersection LOS: B
Intersection Capacity Utilization 48.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Malin S/Malin & Rt 30



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	209	760	8	14	376	32	7	12	29	60	7	159
Future Volume (veh/h)	209	760	8	14	376	32	7	12	29	60	7	159
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1791	1747	1881	1023	1734	1791	1891	1315	1891	1746	1686	1695
Adj Flow Rate, veh/h	230	835	9	15	413	35	8	13	32	66	8	175
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	3	3	75	3	3	0	0	0	0	0	3
Cap, veh/h	550	1764	19	258	1613	136	11	18	44	235	29	235
Arrive On Green	0.52	0.52	0.52	0.52	0.52	0.52	0.06	0.06	0.06	0.16	0.16	0.16
Sat Flow, veh/h	952	3363	36	377	3075	260	178	290	713	1439	174	1441
Grp Volume(v), veh/h	230	412	432	15	220	228	53	0	0	74	0	175
Grp Sat Flow(s),veh/h/ln	952	1659	1740	377	1647	1688	1180	0	0	1614	0	1441
Q Serve(g_s), s	10.5	9.4	9.4	1.6	4.4	4.4	2.6	0.0	0.0	2.4	0.0	6.9
Cycle Q Clear(g_c), s	14.9	9.4	9.4	11.0	4.4	4.4	2.6	0.0	0.0	2.4	0.0	6.9
Prop In Lane	1.00		0.02	1.00		0.15	0.15		0.60	0.89		1.00
Lane Grp Cap(c), veh/h	550	870	913	258	864	885	73	0	0	264	0	235
V/C Ratio(X)	0.42	0.47	0.47	0.06	0.26	0.26	0.72	0.00	0.00	0.28	0.00	0.74
Avail Cap(c_a), veh/h	550	870	913	258	864	885	118	0	0	269	0	240
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	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	11.9	9.0	9.0	12.5	7.8	7.8	27.6	0.0	0.0	22.0	0.0	23.9
Incr Delay (d2), s/veh	2.3	1.8	1.8	0.4	0.7	0.7	12.6	0.0	0.0	0.6	0.0	11.6
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	5.6	8.2	8.5	0.3	3.8	4.0	2.0	0.0	0.0	2.0	0.0	6.3
LnGrp Delay(d),s/veh	14.3	10.9	10.8	12.9	8.5	8.5	40.2	0.0	0.0	22.6	0.0	35.5
LnGrp LOS	B	B	B	B	A	A	D			C		D
Approach Vol, veh/h		1074			463			53			249	
Approach Delay, s/veh		11.6			8.7			40.2			31.6	
Approach LOS		B			A			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		36.5		8.7		36.5		14.8
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		28.0		5.0		28.0		9.0
Max Q Clear Time (g_c+I1), s		17.4		4.6		13.5		8.9
Green Ext Time (p_c), s		4.7		0.0		2.2		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	14.4
HCM 2010 LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	501	5	23	737	127	10	18	20	108	15	223
Future Volume (vph)	103	501	5	23	737	127	10	18	20	108	15	223
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	16	12	11	11	14	14	14	12	12	12
Grade (%)		-1%			1%			-2%			3%	
Storage Length (ft)	150		0	150		0	0		0	0		100
Storage Lanes	1		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.978			0.944				0.850
Flt Protected	0.950			0.950				0.989			0.958	
Satd. Flow (prot)	1719	3287	0	1361	3185	0	0	1553	0	0	1587	1492
Flt Permitted	0.285			0.454				0.923			0.716	
Satd. Flow (perm)	516	3287	0	650	3185	0	0	1449	0	0	1186	1492
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			48			21				151
Link Speed (mph)		35			45			30			30	
Link Distance (ft)		1000			1458			404			972	
Travel Time (s)		19.5			22.1			9.2			22.1	
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 (%)	0%	1%	0%	25%	1%	1%	14%	0%	33%	1%	50%	1%
Adj. Flow (vph)	108	527	5	24	776	134	11	19	21	114	16	235
Shared Lane Traffic (%)												
Lane Group Flow (vph)	108	532	0	24	910	0	0	51	0	0	130	235
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.11	0.90	1.08	1.13	1.13	0.97	0.97	0.97	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
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)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	22.0	22.0		22.0	22.0		16.0	16.0		16.0	16.0	16.0
Total Split (s)	36.0	36.0		36.0	36.0		24.0	24.0		24.0	24.0	24.0
Total Split (%)	60.0%	60.0%		60.0%	60.0%		40.0%	40.0%		40.0%	40.0%	40.0%
Maximum Green (s)	30.0	30.0		30.0	30.0		18.0	18.0		18.0	18.0	18.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	3.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		Max	Max		None	None		None	None	None
Act Effct Green (s)	36.9	36.9		36.9	36.9			13.1			13.1	13.1
Actuated g/C Ratio	0.62	0.62		0.62	0.62			0.22			0.22	0.22
v/c Ratio	0.34	0.26		0.06	0.46			0.15			0.50	0.53
Control Delay	11.3	6.5		6.9	7.6			12.3			26.2	12.0
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	11.3	6.5		6.9	7.6			12.3			26.2	12.0
LOS	B	A		A	A			B			C	B
Approach Delay		7.3			7.6			12.3			17.1	
Approach LOS		A			A			B			B	
Queue Length 50th (ft)	16	38		3	72			9			42	26
Queue Length 95th (ft)	59	80		14	145			28			76	69
Internal Link Dist (ft)		920			1378			324			892	
Turn Bay Length (ft)	150			150								100
Base Capacity (vph)	317	2023		399	1978			473			375	575
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.34	0.26		0.06	0.46			0.11			0.35	0.41

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 57 (95%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle: 40
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.53
Intersection Signal Delay: 9.4 Intersection LOS: A
Intersection Capacity Utilization 58.1% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 3: Malin S/Malin & Rt 30

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	103	501	5	23	737	127	10	18	20	108	15	223
Future Volume (veh/h)	103	501	5	23	737	127	10	18	20	108	15	223
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1809	1791	1881	1433	1773	1791	1891	1621	1891	1773	1657	1755
Adj Flow Rate, veh/h	108	527	5	24	776	134	11	19	21	114	16	235
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	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
Percent Heavy Veh, %	0	1	1	25	1	1	0	0	0	50	50	1
Cap, veh/h	415	2122	20	504	1765	305	109	148	129	365	43	327
Arrive On Green	0.61	0.61	0.61	0.61	0.61	0.61	0.22	0.22	0.22	0.22	0.22	0.22
Sat Flow, veh/h	626	3454	33	705	2874	496	163	675	587	1153	197	1492
Grp Volume(v), veh/h	108	260	272	24	455	455	51	0	0	130	0	235
Grp Sat Flow(s),veh/h/ln	626	1702	1785	705	1685	1686	1425	0	0	1350	0	1492
Q Serve(g_s), s	6.6	4.2	4.2	1.0	8.6	8.6	0.0	0.0	0.0	3.1	0.0	8.8
Cycle Q Clear(g_c), s	15.2	4.2	4.2	5.1	8.6	8.6	1.6	0.0	0.0	4.7	0.0	8.8
Prop In Lane	1.00		0.02	1.00		0.29	0.22		0.41	0.88		1.00
Lane Grp Cap(c), veh/h	415	1045	1097	504	1035	1035	385	0	0	408	0	327
V/C Ratio(X)	0.26	0.25	0.25	0.05	0.44	0.44	0.13	0.00	0.00	0.32	0.00	0.72
Avail Cap(c_a), veh/h	415	1045	1097	504	1035	1035	517	0	0	537	0	473
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	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.1	5.3	5.3	6.4	6.1	6.1	18.9	0.0	0.0	20.1	0.0	21.7
Incr Delay (d2), s/veh	1.5	0.6	0.5	0.2	1.4	1.4	0.2	0.0	0.0	0.4	0.0	3.0
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	2.4	3.8	4.0	0.4	7.7	7.7	1.3	0.0	0.0	3.4	0.0	6.9
LnGrp Delay(d),s/veh	11.6	5.8	5.8	6.6	7.5	7.5	19.1	0.0	0.0	20.5	0.0	24.7
LnGrp LOS	B	A	A	A	A	A	B			C		C
Approach Vol, veh/h		640			934			51			365	
Approach Delay, s/veh		6.8			7.4			19.1			23.2	
Approach LOS		A			A			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		41.9		18.1		41.9		18.1
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		30.0		18.0		30.0		18.0
Max Q Clear Time (g_c+I1), s		17.7		3.6		11.1		11.3
Green Ext Time (p_c), s		3.3		0.1		5.4		0.9

Intersection Summary	
HCM 2010 Ctrl Delay	10.4
HCM 2010 LOS	B

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	20	28	0	35	8
Future Volume (vph)	0	20	28	0	35	8
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Grade (%)	0%		-2%			0%
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.865					
Flt Protected						0.961
Satd. Flow (prot)	1557	0	1818	0	0	1730
Flt Permitted						0.961
Satd. Flow (perm)	1557	0	1818	0	0	1730
Link Speed (mph)	30		30			30
Link Distance (ft)	206		133			404
Travel Time (s)	4.7		3.0			9.2
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	21	29	0	37	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	21	0	29	0	0	45
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.07	1.07	1.06	1.06	1.07	1.07
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 19.2%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	4.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	20	28	0	35	8
Future Vol, veh/h	0	20	28	0	35	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	-2	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	0	21	29	0	37	8

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	111	29	0	0	29	0
Stage 1	29	-	-	-	-	-
Stage 2	82	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.3	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3	3.1	-	-	3	-
Pot Cap-1 Maneuver	1031	1119	-	-	1173	-
Stage 1	1163	-	-	-	-	-
Stage 2	1098	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	998	1119	-	-	1173	-
Mov Cap-2 Maneuver	998	-	-	-	-	-
Stage 1	1126	-	-	-	-	-
Stage 2	1098	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.3	0	6.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1119	1173	-
HCM Lane V/C Ratio	-	-	0.019	0.031	-
HCM Control Delay (s)	-	-	8.3	8.2	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	501	5	23	737	127	10	18	20	108	15	223
Future Volume (vph)	103	501	5	23	737	127	10	18	20	108	15	223
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width (ft)	12	11	16	12	11	11	14	14	14	12	12	12
Grade (%)		-1%			1%			-2%			3%	
Storage Length (ft)	150		0	150		0	0		0	0		100
Storage Lanes	1		0	1		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.978			0.944				0.850
Flt Protected	0.950			0.950				0.989			0.958	
Satd. Flow (prot)	1719	3287	0	1361	3185	0	0	1553	0	0	1587	1492
Flt Permitted	0.256			0.448				0.989			0.958	
Satd. Flow (perm)	463	3287	0	642	3185	0	0	1553	0	0	1587	1492
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			42			21				235
Link Speed (mph)		35			45			30			30	
Link Distance (ft)		1000			1458			404			972	
Travel Time (s)		19.5			22.1			9.2			22.1	
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 (%)	0%	1%	0%	25%	1%	1%	14%	0%	33%	1%	50%	1%
Adj. Flow (vph)	108	527	5	24	776	134	11	19	21	114	16	235
Shared Lane Traffic (%)												
Lane Group Flow (vph)	108	532	0	24	910	0	0	51	0	0	130	235
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.07	1.11	0.90	1.08	1.13	1.13	0.97	0.97	0.97	1.09	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	1
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100		20	100		20	100		20	100	20
Trailing Detector (ft)	0	0		0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Turn Type	Perm	NA		Perm	NA		Split	NA		Split	NA	Perm
Protected Phases		2			6		4	4		8	8	
Permitted Phases	2			6								8
Detector Phase	2	2		6	6		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	22.0	22.0		22.0	22.0		16.0	16.0		16.0	16.0	16.0
Total Split (s)	32.0	32.0		32.0	32.0		11.0	11.0		17.0	17.0	17.0
Total Split (%)	53.3%	53.3%		53.3%	53.3%		18.3%	18.3%		28.3%	28.3%	28.3%
Maximum Green (s)	26.0	26.0		26.0	26.0		5.0	5.0		11.0	11.0	11.0
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	3.0		3.0	3.0	3.0
All-Red Time (s)	2.0	2.0		2.0	2.0		3.0	3.0		3.0	3.0	3.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0			-1.0			-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0			5.0			5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	C-Max	C-Max		Max	Max		None	None		None	None	None
Act Effct Green (s)	33.1	33.1		33.1	33.1			6.0			10.3	10.3
Actuated g/C Ratio	0.55	0.55		0.55	0.55			0.10			0.17	0.17
v/c Ratio	0.42	0.29		0.07	0.51			0.29			0.48	0.52
Control Delay	18.2	9.3		10.0	11.0			22.0			28.0	8.1
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0	0.0
Total Delay	18.2	9.3		10.0	11.0			22.0			28.0	8.1
LOS	B	A		B	B			C			C	A
Approach Delay		10.8			10.9			22.0			15.2	
Approach LOS		B			B			C			B	
Queue Length 50th (ft)	26	60		5	114			10			42	0
Queue Length 95th (ft)	#81	94		16	173			38			86	50
Internal Link Dist (ft)		920			1378			324			892	
Turn Bay Length (ft)	150			150								100
Base Capacity (vph)	255	1812		353	1773			174			317	486
Starvation Cap Reductn	0	0		0	0			0			0	0
Spillback Cap Reductn	0	0		0	0			0			0	0
Storage Cap Reductn	0	0		0	0			0			0	0
Reduced v/c Ratio	0.42	0.29		0.07	0.51			0.29			0.41	0.48

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.52
Intersection Signal Delay: 12.0 Intersection LOS: B
Intersection Capacity Utilization 58.1% ICU Level of Service B
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: Malin S/Malin & Rt 30

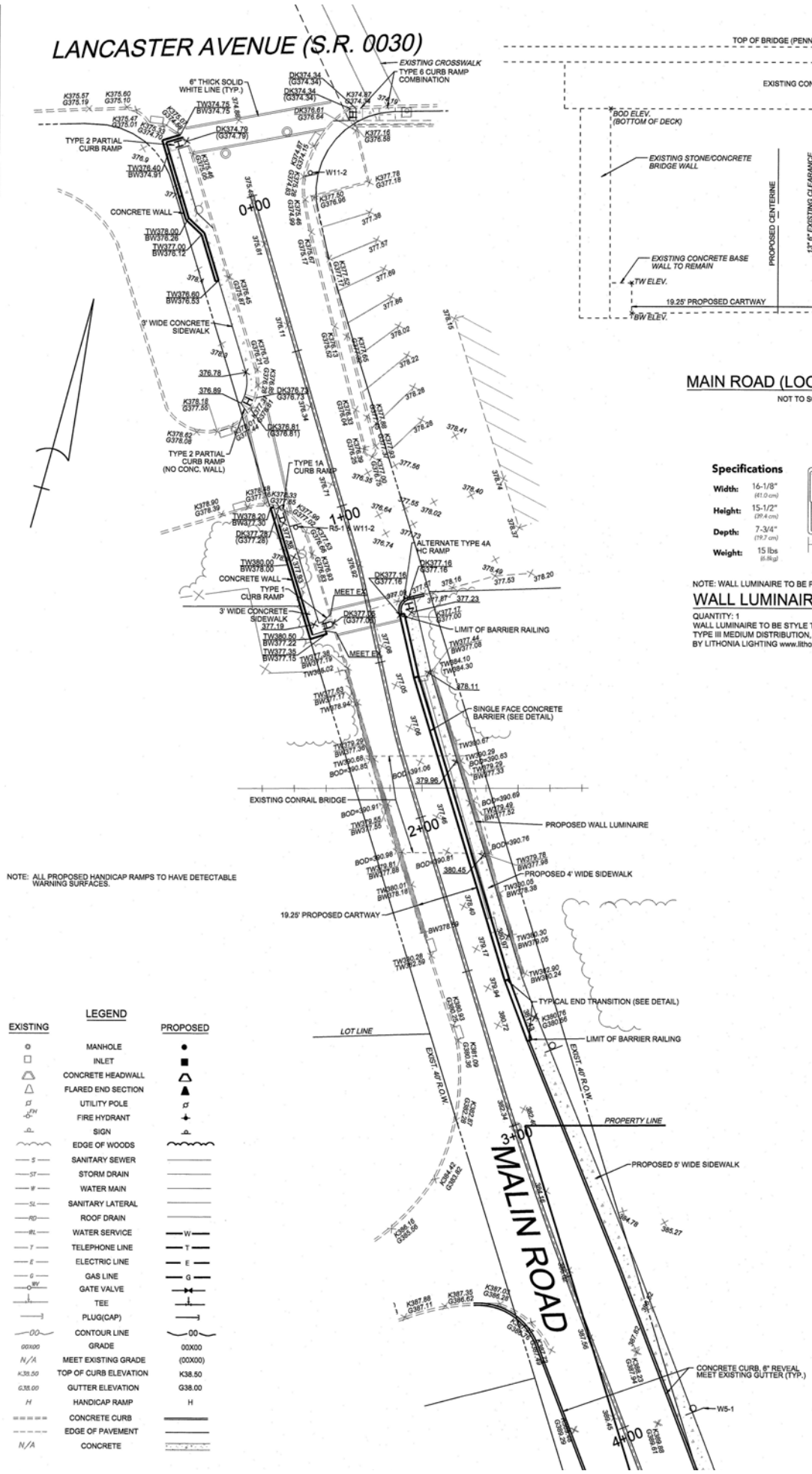
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	103	501	5	23	737	127	10	18	20	108	15	223
Future Volume (veh/h)	103	501	5	23	737	127	10	18	20	108	15	223
Number	5	2	12	1	6	16	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1809	1791	1881	1433	1773	1791	1891	1621	1891	1773	1657	1755
Adj Flow Rate, veh/h	108	527	5	24	776	134	11	19	21	114	16	235
Adj No. of Lanes	1	2	0	1	2	0	0	1	0	0	1	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
Percent Heavy Veh, %	0	1	1	25	1	1	0	0	0	50	50	1
Cap, veh/h	313	1710	16	405	1423	246	18	31	34	278	39	298
Arrive On Green	0.50	0.50	0.50	0.50	0.50	0.50	0.05	0.05	0.05	0.20	0.20	0.20
Sat Flow, veh/h	626	3454	33	705	2874	496	323	558	616	1392	195	1492
Grp Volume(v), veh/h	108	260	272	24	455	455	51	0	0	130	0	235
Grp Sat Flow(s),veh/h/ln	626	1702	1785	705	1685	1686	1497	0	0	1587	0	1492
Q Serve(g_s), s	8.7	5.5	5.5	1.3	11.2	11.2	2.0	0.0	0.0	4.3	0.0	9.0
Cycle Q Clear(g_c), s	19.9	5.5	5.5	6.7	11.2	11.2	2.0	0.0	0.0	4.3	0.0	9.0
Prop In Lane	1.00		0.02	1.00		0.29	0.22		0.41	0.88		1.00
Lane Grp Cap(c), veh/h	313	842	884	405	834	834	82	0	0	317	0	298
V/C Ratio(X)	0.35	0.31	0.31	0.06	0.55	0.55	0.62	0.00	0.00	0.41	0.00	0.79
Avail Cap(c_a), veh/h	313	842	884	405	834	834	150	0	0	317	0	298
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	1.00	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.3	9.0	9.0	11.0	10.5	10.5	27.7	0.0	0.0	20.9	0.0	22.8
Incr Delay (d2), s/veh	3.0	0.9	0.9	0.3	2.6	2.6	7.4	0.0	0.0	0.8	0.0	13.1
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	3.2	4.9	5.2	0.5	9.7	9.7	1.8	0.0	0.0	3.5	0.0	8.3
LnGrp Delay(d),s/veh	20.3	10.0	9.9	11.3	13.0	13.0	35.1	0.0	0.0	21.8	0.0	35.9
LnGrp LOS	C	A	A	B	B	B	D			C		D
Approach Vol, veh/h		640			934			51			365	
Approach Delay, s/veh		11.7			13.0			35.1			30.9	
Approach LOS		B			B			D			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		34.7		8.3		34.7		17.0
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		26.0		5.0		26.0		11.0
Max Q Clear Time (g_c+I1), s		22.4		4.0		13.7		11.5
Green Ext Time (p_c), s		1.4		0.0		4.4		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	16.4
HCM 2010 LOS	B

APPENDIX G

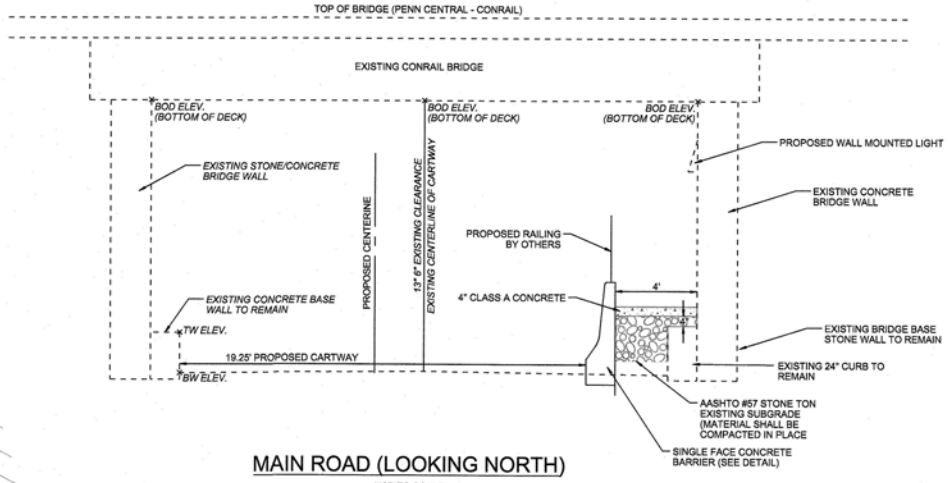
Misc



NOTE: ALL PROPOSED HANDICAP RAMPS TO HAVE DETECTABLE WARNING SURFACES.

LEGEND

EXISTING		PROPOSED
	MANHOLE	
	INLET	
	CONCRETE HEADWALL	
	FLARED END SECTION	
	UTILITY POLE	
FH	FIRE HYDRANT	
	SIGN	
	EDGE OF WOODS	
S	SANITARY SEWER	
ST	STORM DRAIN	
W	WATER MAIN	
SL	SANITARY LATERAL	
RD	ROOF DRAIN	
WL	WATER SERVICE	W
T	TELEPHONE LINE	T
E	ELECTRIC LINE	E
G	GAS LINE	G
BV	GATE VALVE	
	TEE	
	PLUG(CAP)	
00	CONTOUR LINE	00
00X00	GRADE	00X00
N/A	MEET EXISTING GRADE	(00X00)
K38.50	TOP OF CURB ELEVATION	K38.50
G38.00	GUTTER ELEVATION	G38.00
H	HANDICAP RAMP	H
	CONCRETE CURB	
	EDGE OF PAVEMENT	
N/A	CONCRETE	

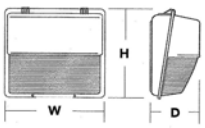


MAIN ROAD (LOOKING NORTH)

NOT TO SCALE

Specifications

Width:	16-1/8" (41.0 cm)
Height:	15-1/2" (39.4 cm)
Depth:	7-3/4" (19.7 cm)
Weight:	15 lbs (6.8kg)



NOTE: WALL LUMINAIRE TO BE PLACED UNDER RAILROAD OVERPASS.

WALL LUMINAIRE DETAIL

QUANTITY: 1 SCALE: 1" = 20'

WALL LUMINAIRE TO BE STYLE TWP LED, ALO POWER PACKAGE, 4000K, TYPE III MEDIUM DISTRIBUTION, MVOLT, COLOR BLACK, AS MANUFACTURED BY LITHONIA LIGHTING www.lithonia.com (800) 279-8041 OR APPROVED EQUAL

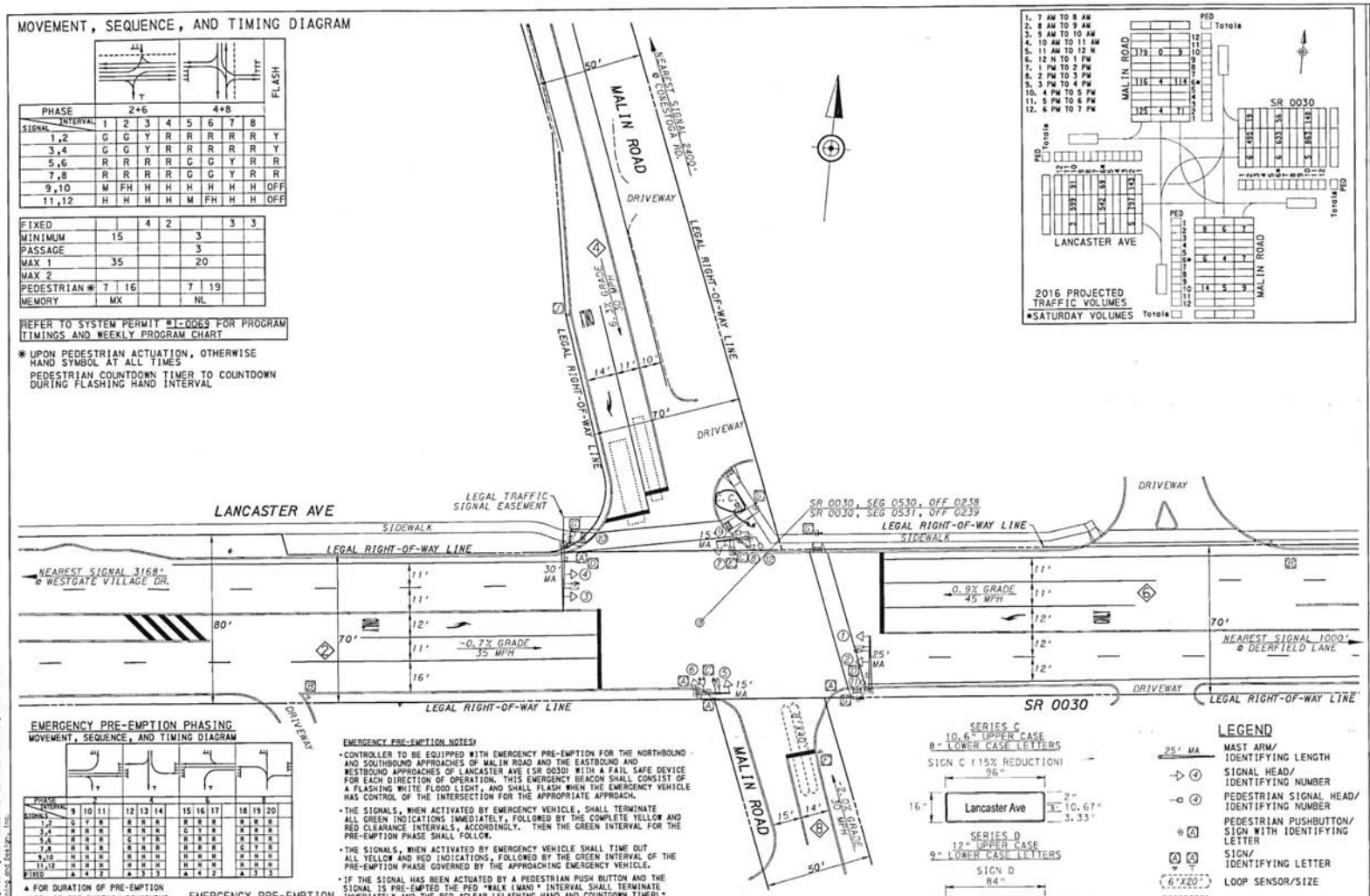
MOVEMENT, SEQUENCE, AND TIMING DIAGRAM

PHASE	2+6				4+8				FLASH
INTERVAL / SIGNAL	1	2	3	4	5	6	7	8	
1,2	G	G	Y	R	R	R	R	R	Y
3,4	G	G	Y	R	R	R	R	R	Y
5,6	R	R	R	R	G	G	Y	R	R
7,8	R	R	R	R	G	G	Y	R	R
9,10	W	FH	H	H	H	H	H	H	OFF
11,12	H	H	H	H	W	FH	H	H	OFF

FIXED			4	2			3	3
MINIMUM	15				3			
PASSAGE					3			
MAX 1	35				20			
MAX 2								
PEDESTRIAN *	7	16			7	19		
MEMORY	MX				NL			

REFER TO SYSTEM PERMIT #I-0069 FOR PROGRAM TIMINGS AND WEEKLY PROGRAM CHART

* UPON PEDESTRIAN ACTUATION, OTHERWISE HAND SYMBOL AT ALL TIMES
PEDESTRIAN COUNTDOWN TIMER TO COUNTDOWN DURING FLASHING HAND INTERVAL



GENERAL NOTES

NO MODIFICATIONS OF THIS INSTALLATION ARE PERMITTED UNLESS PRIOR APPROVAL IS GRANTED IN WRITING BY A REPRESENTATIVE OF THE DEPARTMENT OF TRANSPORTATION.

ALL MAINTENANCE WORK INCLUDING TRIMMING OF TREES, NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS 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 IN ACCORDANCE WITH PUBLICATION NO. 212.

POST MOUNTED SIGNALS SHALL BE INSTALLED WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF CURB OR THE EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS SHALL ALSO HAVE A MINIMUM CLEARANCE HORIZONTALLY OF 2 FEET.

SIGNALS ERECTED OVER THE ROADWAY SHALL HAVE A MINIMUM VERTICAL CLEARANCE OF 16 FT. ABOVE THE ROADWAY. POST MOUNTED SIGNALS SHALL BE A MINIMUM OF 8 FT. ABOVE THE SIDEWALK OR PAVEMENT.

ALL OVERHEAD SIGNALS MUST BE RIGIDLY MOUNTED, TOP AND BOTTOM, AND EQUIPPED WITH BACKPLATES.

THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNALS MEASURED AT RIGHT ANGLES TO THE APPROACH SHALL BE 8 FEET.

EXACT LOCATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PENNDOT.

CURBING TO BE INSTALLED BY MUNICIPALITY AND WHERE NOTED, SHALL BE PLAIN CEMENT CONCRETE CURB OR GRANITE CURB, INSTALLED IN ACCORDANCE WITH DEPARTMENT SPECIFICATIONS FORM 408.

PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF THE LATEST AMENDMENT TO ACT 287, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES, DATED 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-8800 SERIES.

SYSTEM PERMIT # I-0069

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 6-0

COUNTY: CHESTER
MUNICIPALITY: EAST WHITELAND TOWNSHIP
INTERSECTION: LANCASTER AVE (SR 0030) & MALIN ROAD

REVIEWED:
Willia Holmes — DATE 8/10/16
MUNICIPAL OFFICIAL — DATE

RECOMMENDED:
STEPHEN B. LESTER — 11/24/75
DISTRICT TRAFFIC ENGINEER — DATE

NO	REVISION	DES/REVW	DATE	REVW	DATE	RECOM	DATE
1	FIBER INTERCONNECTION	NV	10/00	MLK	10/00	LRB	10/00
2	ADD PRE-EMPTION	MCM	4/18/02	MLK	4/18/02	LRB	4/19/02
3	REV. EB CORE AREA	MCM / SHG	5/12/03	MLK	5/13/03	LRB	5/14/03
4	ADD PEDS, REVISE TIMINGS, CHANGE SR #6 & 8 TO 12" HEADS	TPD / KMS	9/14/05	MLK	9/19/05	LRB	10/3/05
5	ADD SIGNS UNDER ST. REVISE TIMING DURING AMLE PROJECT	MCM	2/22/16	LUTZ	2/29/16	ABP	3/25/16
6	ADD SR RT LANES, REPLACE MPC, NA & ALL OSHA; NEW C.C.; ADD UPS	TPD	10/25/16	[illegible]	10/25/16	[illegible]	11/2/16
7							
8							

SHEET 2 OF 2 — PERMIT # 62-1936 — FILE # 1936

EMERGENCY PRE-EMPTION PHASING

MOVEMENT, SEQUENCE, AND TIMING DIAGRAM

PHASE / INTERVAL / SIGNAL	9	10	11	12	13	14	15	16	17	18	19	20
1,2	G	Y	R	R	R	R	R	R	R	R	R	R
3,4	R	R	R	R	R	R	G	Y	R	R	R	R
5,6	R	R	R	G	Y	R	R	R	R	R	R	R
7,8	R	R	R	R	R	R	R	R	R	G	Y	R
9,10	H	H	H	H	H	H	H	H	H	H	H	H
11,12	H	H	H	H	H	H	H	H	H	H	H	H
FIXED		4	2		3	3		4	2		3	3

▲ FOR DURATION OF PRE-EMPTION

NOTE: IF PRE-EMPTION EQUIPMENT HAS ENCODING CAPABILITIES FOR VEHICLE IDENTIFICATION, IT IS RECOMMENDED TO HAVE THE ZERO "00" FEATURE ON, TO GIVE UNCODED EMITTERS THE ABILITY TO ACTIVATE THE EMERGENCY PRE-EMPTION.

EMERGENCY PRE-EMPTION OPERATION NOTES

ⓐ SIGNAL TO INDICATE G WHEN RETURNING TO NORMAL OPERATION

EMERGENCY PRE-EMPTION NOTES:

- CONTROLLER TO BE EQUIPPED WITH EMERGENCY PRE-EMPTION FOR THE NORTHBOUND AND SOUTHBOUND APPROACHES OF MALIN ROAD AND THE EASTBOUND AND WESTBOUND APPROACHES OF LANCASTER AVE (SR 0030) WITH A FAIL SAFE DEVICE FOR EACH DIRECTION OF OPERATION. THIS EMERGENCY BEACON 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 SIGNALS, WHEN ACTIVATED BY EMERGENCY VEHICLE, SHALL TERMINATE ALL GREEN INDICATIONS IMMEDIATELY, FOLLOWED BY THE COMPLETE YELLOW AND RED CLEARANCE INTERVALS, ACCORDINGLY. THEN THE GREEN INTERVAL FOR THE PRE-EMPTION PHASE SHALL FOLLOW.
- THE SIGNALS, WHEN ACTIVATED BY EMERGENCY VEHICLE SHALL TIME OUT ALL YELLOW AND RED INDICATIONS, FOLLOWED BY THE GREEN INTERVAL OF THE PRE-EMPTION PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE.
- IF THE SIGNAL HAS BEEN ACTUATED BY A PEDESTRIAN PUSH BUTTON AND THE SIGNAL IS PRE-EMPTED THE PED "WALK (MAN)" INTERVAL SHALL TERMINATE IMMEDIATELY AND THE PED "CLEAR (FLASHING HAND AND COUNTDOWN TIMER)" INTERVAL SHALL TIME OUT THIS INTERVAL 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.
- IF ADDITIONAL PRE-EMPTION PHASES ARE ACTIVATED WHILE IN PRE-EMPTION, THE ORIGINAL PRE-EMPTION PHASE SHALL TIME OUT BEFORE PROCEEDING TO THE NEXT PRE-EMPTION PHASE.
- UPON COMPLETION OF PRE-EMPTION PHASE 2,4,6 OR 8 IN RETURNING TO NORMAL OPERATION, PHASE 2+6 INTERVAL 1 SHALL FOLLOW.
- IN EMERGENCY PRE-EMPTION, NO PRIORITY SHALL BE ESTABLISHED, PRE-EMPTION SHALL BE A "FIRST COME, FIRST SERVE" OPERATION.
- LOCATION OF EMERGENCY VEHICLE DETECTORS ARE TO BE FIELD ADJUSTED TO ACHIEVE MAXIMUM OPERATION.

SIGN TABULATION

PLAN SYMBOL	SERIES	SIZE	DESCRIPTION
A	R9-3	18"x18"	NO PEDESTRIAN CROSSING
B	R3-7L	30"x30"	LEFT LANE MUST TURN LEFT
C	D3-4	96"x16"	STREET SIGN "Lancaster Ave"
D	D3-4	78"x16"	STREET SIGN "Malin Rd"
E	R10-11	30"x36"	NO TURN ON RED
F	R10-6AL	24"x30"	STOP HERE ON RED
G	R10-3E	9"x15"	EDUCATIONAL PUSH BUTTON SIGN ←OR→
H	R3-7R	30"x30"	RIGHT LANE MUST TURN RIGHT

SERIES C
10.6" UPPER CASE
8" LOWER CASE LETTERS
SIGN C (15% REDUCTION)
96"
16" — Lancaster Ave — 2" — 10.67" — 3.33"

SERIES D
12" UPPER CASE
9" LOWER CASE LETTERS
SIGN D
84"
24" — Malin Rd — 4.4" — 12" — 7.6"

NOTE:
STREET NAME SIGNS TO BE INTERNALLY ILLUMINATED

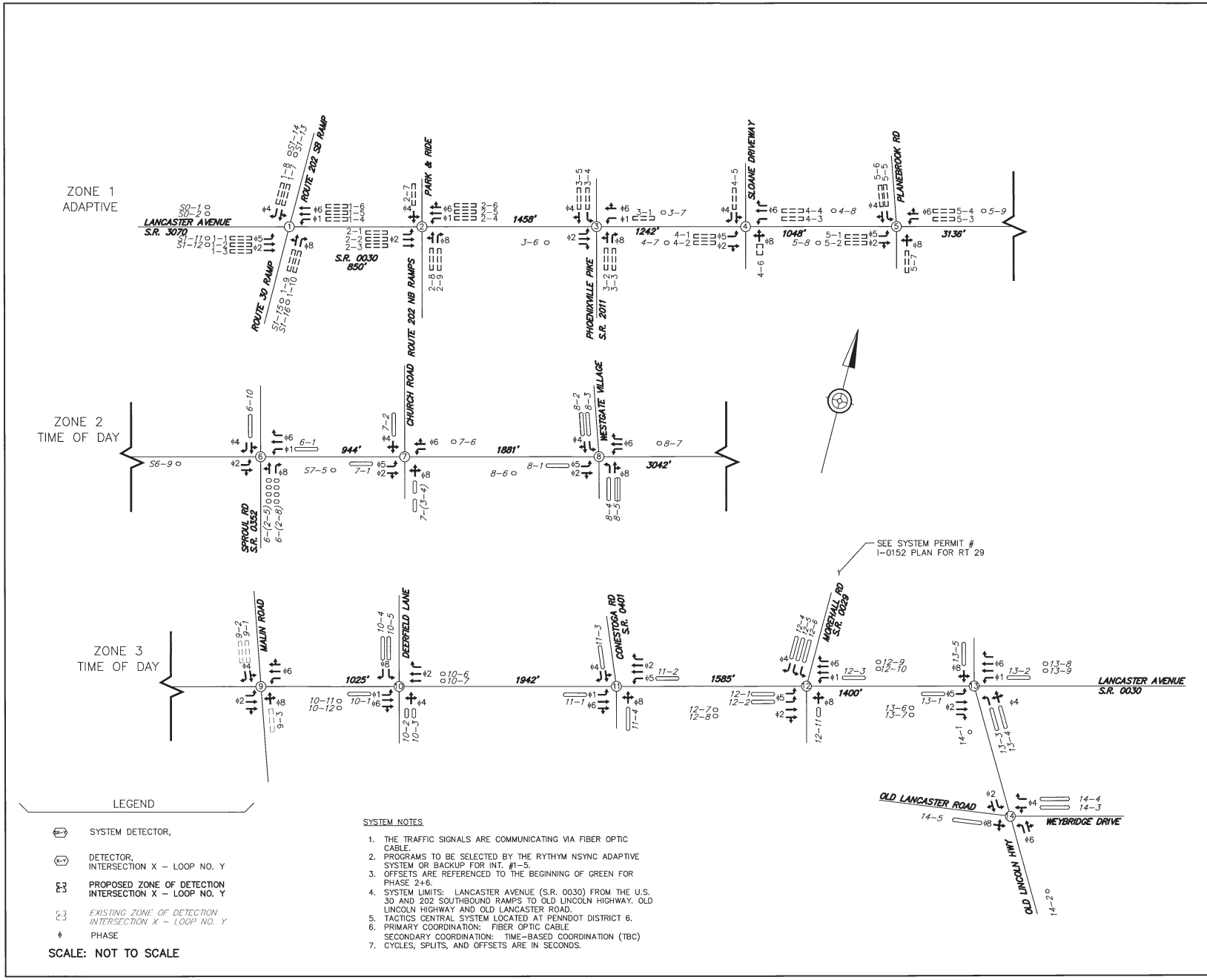
SIGNAL INDICATIONS

12" LENS — 1,2,3,4, 5,6,7,8
16"X18" COUNTDOWN — 18 — 9,10, 11,12

LEGEND

- 25' MA — MAST ARM/ IDENTIFYING LENGTH
- SIGNAL HEAD/ IDENTIFYING NUMBER
- PEDESTRIAN SIGNAL HEAD/ IDENTIFYING NUMBER
- PEDESTRIAN PUSHBUTTON/ SIGN WITH IDENTIFYING LETTER
- SIGN/ IDENTIFYING LETTER
- 6'X20' — LOOP SENSOR/SIZE
- ZONE OF DETECTION
- DETECTABLE WARNING SURFACE
- EMERGENCY PRE-EMPTION DETECTOR
- EMERGENCY PRE-EMPTION FLASHING BEACON
- CONTROLLER CABINET
- PHASE NUMBER
- UTILITY POLE
- VIDEO DETECTOR
- 15' LA — LUMINAIRE/ IDENTIFYING LENGTH

0 25 50 FEET



LEGEND

- SYSTEM DETECTOR,
- DETECTOR, INTERSECTION X – LOOP NO. Y
- PROPOSED ZONE OF DETECTION INTERSECTION X – LOOP NO. Y
- *EXISTING ZONE OF DETECTION INTERSECTION X – LOOP NO. Y*
- PHASE

SCALE: NOT TO SCALE

SYSTEM NOTES

1. THE TRAFFIC SIGNALS ARE COMMUNICATING VIA FIBER OPTIC CABLE.
2. PROGRAMS TO BE SELECTED BY THE RYTHYM NSYNC ADAPTIVE SYSTEM OR BACKUP FOR INT. #1–5.
3. OFFSETS ARE REFERENCED TO THE BEGINNING OF GREEN FOR PHASE 2+6.
4. SYSTEM LIMITS: LANCASTER AVENUE (S.R. 0030) FROM THE U.S. 30 AND 202 SOUTHBOUND RAMPS TO OLD LINCOLN HIGHWAY. OLD LINCOLN HIGHWAY AND OLD LANCASTER ROAD.
5. TACTICS CENTRAL SYSTEM LOCATED AT PENNDOT DISTRICT 6.
6. PRIMARY COORDINATION: FIBER OPTIC CABLE
   SECONDARY COORDINATION: TIME–BASED COORDINATION (TBC)
7. CYCLES, SPLITS, AND OFFSETS ARE IN SECONDS.

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.

SET UP PENNDOT DISTRICT 6–0 COMPUTER WITH THE SYSTEM DATABASE AND GRAPHICS. MODIFY THE DATABASE AND GRAPHICS FOR SYSTEMS REVISIONS.

ASSIGN LOOP DETECTORS AND PROGRAM THE CONTROLLERS TO GATHER TRAFFIC VOLUMES IN 15 MINUTE INTERVAL, WHERE APPLICABLE.

EXACT LOCATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PENNDOT.

OBTAIN POLE ATTACHMENT PERMIT FOR AERIAL FIBER OPTIC INSTALLATION.

MAINTAIN MASTER CONTROLLER COMMUNICATION SUCH AS PHONE DROPS.

PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF THE LATEST AMENDMENT TO ACT 287, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES, DATED DECEMBER 20, 1974.

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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.

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 6–0

COUNTY: CHESTER
MUNICIPALITY: EAST WHITELAND TOWNSHIP
INTERSECTION: LANCASTER AVENUE (S.R. 0030)
TRAFFIC SIGNAL SYSTEM

REVIEWED: 7/9/19
MUNICIPAL OFFICIAL — DATE

RECOMMENDED:
AB PATEL — 10/02/03
LR BELMONTE — 10/08/03
DISTRICT TRAFFIC ENGINEER — DATE

NO.	REVISION	DES./REVW.	DATE	REVW.	DATE	RECOM.	DATE
1	REVISE TIMINGS & OFFSETS	TPD/KMS	9|14|05	ABP	10|2|05	LRB	10|2|05
2	ADD SIGNALS, REV. TIMIINGS	McM	2|20|14				
3	ADD DRIVEWAY INT.#6	H&K	3|10|15	LUTZ	7|7|15	ABP	7|7|15
4	ADAPTIVE INSTALLATION INT. #1–5	McM	8|21|18	LUTZ	8|27|18	ABP	8|28|18
5	ADAPTIVE INSTALLATION AS–BUILT	McM	6|18|19	LUTZ	7|10|19	ABP	7|11|19
6							
7							
8							

SYSTEM PERMIT #I–0069 — SHEET 1 OF 2

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CYCLE/SPLIT/OFFSET

	Program 1 = AM PEAK			Phase								Cycle	Offset
	Intersections	File #	Master	1	2	3	4	5	6	7	8		
1	LANCASTER AVE & ROUTE 202 SOUTHBOUND RAMPS	2086		23 (LEAD)	22		45	16 (LEAD)	29		45	90	0
2	LANCASTER AVE & ROUTE 202 NORTHBOUND RAMPS	2870		13 (LEAD)	37		40		50		40	90	88
3	LANCASTER AVE & PHOENIXVILLE PIKE	2974		14 (LEAD)	48		28		62		28	90	20
4	LANCASTER AVE & DEALERSHIP DRIVEWAY	2885			78		12	11 (LEAD)	67		12	90	17
5	LANCASTER AVE & PLANEBROOK ROAD	1458			58		20 (SPLIT)	19 (LEAD)	39		12 (SPLIT)	90	2
6	LANCASTER AVE & SPROUL ROAD	0261		27 (LEAD)	63		30		90		30	120	7
7	LANCASTER AVE & CHURCH ROAD	3436			87		33	12 (LEAD)	75		33	120	2
8	LANCASTER AVE & WESTGATE VILLAGE DRIVE	2635			88		32	12 (LEAD)	76		32	120	59
9	LANCASTER AVE & MALIN ROAD	1936			39		16		39		16	55	22
10	LANCASTER AVE & DEERFIELD LANE	3236		12 (LEAD)	31		12		43		12	55	54
11	LANCASTER AVE & CONESTOGA ROAD	0348		13 (LEAD)	25		58 (SPLIT)	13 (LEAD)	25		14 (SPLIT)	110	80
12	LANCASTER AVE & MOREHALL ROAD	0525		12 (LEAD)	57		28 (SPLIT)	46 (LAG)	23		13 (SPLIT)	110	47
13	LANCASTER AVE & OLD LINCOLN HIGHWAY	1581		13 (LEAD)	33		52 (SPLIT)	13 (LEAD)	33		12 (SPLIT)	110	29
14	OLD LINCOLN HIGHWAY & OLD LANCASTER ROAD	3728										MAX 1	FREE

	Program 2 = MIDDAY			Phase								Cycle	Offset
	Intersections	File #	Master	1	2	3	4	5	6	7	8		
1	LANCASTER AVE & ROUTE 202 SOUTHBOUND RAMPS	2086		32 (LEAD)	25		33	23 (LEAD)	34		33	90	12
2	LANCASTER AVE & ROUTE 202 NORTHBOUND RAMPS	2870		13 (LEAD)	47		30		60		30	90	3
3	LANCASTER AVE & PHOENIXVILLE PIKE	2974		16 (LEAD)	47		27		63		27	90	11
4	LANCASTER AVE & DEALERSHIP DRIVEWAY	2885			74		16	11 (LEAD)	63		16	90	3
5	LANCASTER AVE & PLANEBROOK ROAD	1458			53		25 (SPLIT)	13 (LEAD)	40		12 (SPLIT)	90	79
6	LANCASTER AVE & SPROUL ROAD	0261		16 (LEAD)	54		20		70		20	90	26
7	LANCASTER AVE & CHURCH ROAD	3436			70		20	12 (LEAD)	58		20	90	22
8	LANCASTER AVE & WESTGATE VILLAGE DRIVE	2635			74		16	12 (LEAD)	62		16	90	73
9	LANCASTER AVE & MALIN ROAD	1936			56		34		56		34	90	27
10	LANCASTER AVE & DEERFIELD LANE	3236		12 (LEAD)	54		24		66		24	90	27
11	LANCASTER AVE & CONESTOGA ROAD	0348		13 (LEAD)	37		27 (SPLIT)	13 (LEAD)	37		13 (SPLIT)	90	81
12	LANCASTER AVE & MOREHALL ROAD	0525		12 (LEAD)	40		24 (SPLIT)	30 (LAG)	22		14 (SPLIT)	90	51
13	LANCASTER AVE & OLD LINCOLN HIGHWAY	1581		13 (LEAD)	30		35 (SPLIT)	13 (LEAD)	30		12 (SPLIT)	90	35
14	OLD LINCOLN HIGHWAY & OLD LANCASTER ROAD	3728										MAX 1	FREE

	Program 3 = PM PEAK			Phase								Cycle	Offset
	Intersections	File #	Master	1	2	3	4	5	6	7	8		
1	LANCASTER AVE & ROUTE 202 SOUTHBOUND RAMPS	2086		45 (LEAD)	30		25	24 (LEAD)	51		25	100	93
2	LANCASTER AVE & ROUTE 202 NORTHBOUND RAMPS	2870		13 (LEAD)	31		56		44		56	100	0
3	LANCASTER AVE & PHOENIXVILLE PIKE	2974		19 (LEAD)	53		48		72		48	120	112
4	LANCASTER AVE & DEALERSHIP DRIVEWAY	2885			96		24	11 (LEAD)	85		24	120	87
5	LANCASTER AVE & PLANEBROOK ROAD	1458			78		30 (SPLIT)	16 (LEAD)	62		12 (SPLIT)	120	92
6	LANCASTER AVE & SPROUL ROAD	0261		23 (LEAD)	45		22		68		22	90	25
7	LANCASTER AVE & CHURCH ROAD	3436			67		23	12 (LEAD)	55		23	90	26
8	LANCASTER AVE & WESTGATE VILLAGE DRIVE	2635			72		18	12 (LEAD)	60		18	90	78
9	LANCASTER AVE & MALIN ROAD	1936			36		24		36		24	60	57
10	LANCASTER AVE & DEERFIELD LANE	3236		12 (LEAD)	28		20		40		20	60	1
11	LANCASTER AVE & CONESTOGA ROAD	0348		13 (LEAD)	33		31 (SPLIT)	13 (LEAD)	33		13 (SPLIT)	90	62
12	LANCASTER AVE & MOREHALL ROAD	0525		12 (LEAD)	30		35 (SPLIT)	20 (LAG)	22		13 (SPLIT)	90	28
13	LANCASTER AVE & OLD LINCOLN HIGHWAY	1581		13 (LEAD)	61		34 (SPLIT)	13 (LEAD)	61		12 (SPLIT)	120	94
14	OLD LINCOLN HIGHWAY & OLD LANCASTER ROAD	3728										MAX 1	FREE

	Program 4 = WEEKEND			Phase								Cycle	Offset
	Intersections	File #	Master	1	2	3	4	5	6	7	8		
1	LANCASTER AVE & ROUTE 202 SOUTHBOUND RAMPS	2086		33 (LEAD)	33		24	12 (LEAD)	54		24	90	37
2	LANCASTER AVE & ROUTE 202 NORTHBOUND RAMPS	2870		13 (LEAD)	50		27		63		27	90	33
3	LANCASTER AVE & PHOENIXVILLE PIKE	2974										MAX 1	–
4	LANCASTER AVE & DEALERSHIP DRIVEWAY	2885										MAX 1	–
5	LANCASTER AVE & PLANEBROOK ROAD	1458										MAX 1	–
6	LANCASTER AVE & SPROUL ROAD	0261										MAX 1	–
7	LANCASTER AVE & CHURCH ROAD	3436										MAX 1	–
8	LANCASTER AVE & WESTGATE VILLAGE DRIVE	2635										MAX 1	–
9	LANCASTER AVE & MALIN ROAD	1936			36		24		36		24	60	39
10	LANCASTER AVE & DEERFIELD LANE	3236		12 (LEAD)	30		18		42		18	60	43
11	LANCASTER AVE & CONESTOGA ROAD	0348		13 (LEAD)	31		33 (SPLIT)	13 (LEAD)	31		13 (SPLIT)	90	13
12	LANCASTER AVE & MOREHALL ROAD	0525		12 (LEAD)	34		31 (SPLIT)	20 (LAG)	26		13 (SPLIT)	90	68
13	LANCASTER AVE & OLD LINCOLN HIGHWAY	1581										MAX 1	FREE
14	OLD LINCOLN HIGHWAY & OLD LANCASTER ROAD	3728										MAX 1	FREE

BACKUP WEEKLY PROGRAM CHART INTERSECTIONS 1 TO 5

EVENT	DAY	TIME	PROGRAM	REMARKS
1	1–7	00:00	FREE	
2	2–6	06:30	1	AM PEAK
3	2–6	08:30	2	MIDDAY
4	2–6	13:30	3	PM PEAK
5	2–6	20:00	FREE	WEEKDAY EVENING
6	7	08:00	4*	SATURDAY
7	7	21:30	FREE	SATURDAY EVE.
8	1	09:30	4*	SUNDAY
9	1	20:00	FREE	SUNDAY EVENING

SUNDAY = DAY 1
* INT. 3 TO 5 TO RUN FREE

WEEKLY PROGRAM CHART INTERSECTIONS 6 TO 8

EVENT	DAY	TIME	PROGRAM	REMARKS
1	1–7	00:00	FREE	
2	2–6	06:30	1	AM PEAK
3	2–6	09:30	2	MIDDAY
4	2–6	13:00	3	PM PEAK
5	2–6	20:30	FREE	WEEKDAY EVENING

SUNDAY = DAY 1

WEEKLY PROGRAM CHART INTERSECTIONS 9 TO 13

EVENT	DAY	TIME	PROGRAM	REMARKS
1	1–7	00:00	FREE	
2	2–6	06:30	1	AM PEAK
3	2–6	09:00	2	MIDDAY
4	2–6	13:30	3	PM PEAK
5	2–6	21:00	FREE	WEEKDAY EVENING
6	7	08:30	4*	SATURDAY
7	7	20:00	FREE	SATURDAY EVE.
8	1	10:00	4*	SUNDAY
9	1	17:00	FREE	SUNDAY EVENING

SUNDAY = DAY 1
* INT. 13 AND 14 TO RUN FREE
NOTE: INT. 14 TO RUN FREE AT ALL TIMES

ADAPTIVE PROGRAM CHART INTERSECTIONS 1 TO 5

EVENT	DAY	TIME	PERIOD	PROGRAM	REMARKS
1	1–7	00:00	N/A	TUNNELLESS	ADAPTIVE
2	2–6	06:15	100–110	AM	ADAPTIVE
3	7	08:00	82	OFF PEAK	ADAPTIVE
4	1–6	09:00	100	MIDDAY	ADAPTIVE
5	7	09:30	100	MIDDAY	ADAPTIVE
6	2–6	11:30	110–120	PM	ADAPTIVE
7	1,7	17:30	82	OFF PEAK	ADAPTIVE
8	2–6	18:30	82	OFF PEAK	ADAPTIVE
9	1–7	20:00	N/A	TUNNELLESS	ADAPTIVE

SUNDAY = DAY 1

CYCLE / SPLIT / OFFSET
ADAPTIVE SETTINGS

	PROGRAM: 100–110		PHASE/TUNNEL PHASE DURATION								CYCLE/PERIOD	OFFSET	REMARKS	GLOBAL OFFSET AT FACILITATOR (SEC)				LOCAL OFFSET				TRAVEL TIME TO NEXT INTERSECTION			
	INTERSECTIONS	FILE #	1	2	3	4	5	6	7	8			TRAFFIC ADAPTIVE	PHASE 2	PHASE 4	PHASE 6	PHASE 8	WB	SB	EB	NB	WB	SB	EB	NB
▲ 1	LANCASTER AVE & ROUTE 202 SOUTHBOUND RAMPS	2086		25				30			100–110		TRAFFIC ADAPTIVE					ϕ2=20		ϕ6=−5		ϕ2=n/a		ϕ6=12	
▲ 2	LANCASTER AVE & ROUTE 202 NORTHBOUND RAMPS	2870		30				25			100–110		TRAFFIC ADAPTIVE					ϕ2=10		ϕ6=0		ϕ2=12		ϕ6=25	
▲ 3	LANCASTER AVE & PHOENIXVILLE PIKE	2974		40				25			100–110		TRAFFIC ADAPTIVE	ϕ2=0		ϕ6=84		ϕ2=0		ϕ6=0		ϕ2=25		ϕ6=23	
▲ 4	LANCASTER AVE & DEALERSHIP DRIVEWAY	2885		47				25			100–110		TRAFFIC ADAPTIVE					ϕ2=−7		ϕ6=0		ϕ2=23		ϕ6=19	
▲ 5	LANCASTER AVE & PLANEBROOK ROAD	1458		45				25			100–110		TRAFFIC ADAPTIVE					ϕ2=0		ϕ6=0		ϕ2=19		ϕ6=n/a	
	PROGRAM: 100		PHASE/TUNNEL PHASE DURATION								CYCLE/PERIOD	OFFSET	REMARKS	GLOBAL OFFSET AT FACILITATOR (SEC)				LOCAL OFFSET				TRAVEL TIME TO NEXT INTERSECTION			
	INTERSECTIONS	FILE #	1	2	3	4	5	6	7	8			TRAFFIC ADAPTIVE	PHASE 2	PHASE 4	PHASE 6	PHASE 8	WB	SB	EB	NB	WB	SB	EB	NB
▲ 1	LANCASTER AVE & ROUTE 202 SOUTHBOUND RAMPS	2086		25				33			100		TRAFFIC ADAPTIVE					ϕ2=0		ϕ6=−8		ϕ2=n/a		ϕ6=12	
▲ 2	LANCASTER AVE & ROUTE 202 NORTHBOUND RAMPS	2870		25				25			100		TRAFFIC ADAPTIVE					ϕ2=0		ϕ6=0		ϕ2=12		ϕ6=25	
▲ 3	LANCASTER AVE & PHOENIXVILLE PIKE	2974		25				33			100		TRAFFIC ADAPTIVE	ϕ2=33		ϕ6=0		ϕ2=0		ϕ6=0		ϕ2=25		ϕ6=23	
▲ 4	LANCASTER AVE & DEALERSHIP DRIVEWAY	2885		25				25			100		TRAFFIC ADAPTIVE					ϕ2=0		ϕ6=0		ϕ2=23		ϕ6=19	
▲ 5	LANCASTER AVE & PLANEBROOK ROAD	1458		25				25			100		TRAFFIC ADAPTIVE					ϕ2=0		ϕ6=0		ϕ2=19		ϕ6=n/a	
	PROGRAM: 110–120		PHASE/TUNNEL PHASE DURATION								CYCLE/PERIOD	OFFSET	REMARKS	GLOBAL OFFSET AT FACILITATOR (SEC)				LOCAL OFFSET				TRAVEL TIME TO NEXT INTERSECTION			
	INTERSECTIONS	FILE #	1	2	3	4	5	6	7	8			TRAFFIC ADAPTIVE	PHASE 2	PHASE 4	PHASE 6	PHASE 8	WB	SB	EB	NB	WB	SB	EB	NB
▲ 1	LANCASTER AVE & ROUTE 202 SOUTHBOUND RAMPS	2086		30				35			110–120		TRAFFIC ADAPTIVE					ϕ2=3		ϕ6=0		ϕ2=n/a		ϕ6=12	
▲ 2	LANCASTER AVE & ROUTE 202 NORTHBOUND RAMPS	2870		35				35			110–120		TRAFFIC ADAPTIVE					ϕ2=0		ϕ6=0		ϕ2=12		ϕ6=25	
▲ 3	LANCASTER AVE & PHOENIXVILLE PIKE	2974		35				39			110–120		TRAFFIC ADAPTIVE	ϕ2=0		ϕ6=84		ϕ2=0		ϕ6=0		ϕ2=25		ϕ6=23	
▲ 4	LANCASTER AVE & DEALERSHIP DRIVEWAY	2885		45				35			110–120		TRAFFIC ADAPTIVE					ϕ2=−5		ϕ6=0		ϕ2=23		ϕ6=19	
▲ 5	LANCASTER AVE & PLANEBROOK ROAD	1458		40				35			110–120		TRAFFIC ADAPTIVE					ϕ2=−5		ϕ6=0		ϕ2=19		ϕ6=n/a	
	PROGRAM: 82		PHASE/TUNNEL PHASE DURATION								CYCLE/PERIOD	OFFSET	REMARKS	GLOBAL OFFSET AT FACILITATOR (SEC)				LOCAL OFFSET				TRAVEL TIME TO NEXT INTERSECTION			
	INTERSECTIONS	FILE #	1	2	3	4	5	6	7	8			TRAFFIC ADAPTIVE	PHASE 2	PHASE 4	PHASE 6	PHASE 8	WB	SB	EB	NB	WB	SB	EB	NB
▲ 1	LANCASTER AVE & ROUTE 202 SOUTHBOUND RAMPS	2086		20				20			82		TRAFFIC ADAPTIVE					ϕ2=3		ϕ6=0		ϕ2=n/a		ϕ6=12	
▲ 2	LANCASTER AVE & ROUTE 202 NORTHBOUND RAMPS	2870		20				32			82		TRAFFIC ADAPTIVE					ϕ2=0		ϕ6=0		ϕ2=12		ϕ6=25	
▲ 3	LANCASTER AVE & PHOENIXVILLE PIKE	2974		20				20			82		TRAFFIC ADAPTIVE	ϕ2=0		ϕ6=84		ϕ2=0		ϕ6=0		ϕ2=25		ϕ6=23	
▲ 4	LANCASTER AVE & DEALERSHIP DRIVEWAY	2885		39				20			82		TRAFFIC ADAPTIVE					ϕ2=−5		ϕ6=0		ϕ2=23		ϕ6=19	
▲ 5	LANCASTER AVE & PLANEBROOK ROAD	1458		20				20			82		TRAFFIC ADAPTIVE					ϕ2=−5		ϕ6=0		ϕ2=19		ϕ6=n/a	

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.

SET UP PENNDOT DISTRICT 6–0 COMPUTER WITH THE SYSTEM DATABASE AND GRAPHICS. MODIFY THE DATABASE AND GRAPHICS FOR SYSTEMS REVISIONS.

ASSIGN LOOP DETECTORS AND PROGRAM THE CONTROLLERS TO GATHER TRAFFIC VOLUMES IN 15 MINUTE INTERVAL, WHERE APPLICABLE.

EXACT LOCATION OF DETECTORS SHALL BE DETERMINED PRIOR TO INSTALLATION BY A REPRESENTATIVE OF PENNDOT.

OBTAIN POLE ATTACHMENT PERMIT FOR AERIAL FIBER OPTIC INSTALLATION.

MAINTAIN MASTER CONTROLLER COMMUNICATION SUCH AS PHONE DROPS.

PRIOR TO INSTALLATION THE CONTRACTOR SHALL CONSULT WITH THE LOCAL OFFICIALS AND UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF THE LATEST AMENDMENT TO ACT 287, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES, DATED 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–8800 SERIES.

PENNSYLVANIA DEPARTMENT OF TRANSPORTATION
ENGINEERING DISTRICT 6–0

COUNTY: CHESTER
MUNICIPALITY: EAST WHITELAND TOWNSHIP
INTERSECTION: LANCASTER AVENUE (S.R. 0030)
TRAFFIC SIGNAL SYSTEM

REVIEWED: 7/9/19
MUNICIPAL OFFICIAL — DATE

RECOMMENDED:
AB PATEL 10/02/03
LR BELMONTE 10/08/03
DISTRICT TRAFFIC ENGINEER — DATE

NO.	REVISION	DES./REVW.	DATE	REVW.	DATE	RECOM.	DATE
1	REVISE TIMINGS & OFFSETS	TPD/KMS	9/14/05	ABP	10/2/05	LRB	10/2/05
2	ADD SIGNALS, REV. TIMIINGS	McM	2/20/14				
3	ADD DRIVEWAY INT.#6	H&K	3/10/15	LUTZ	7/7/15	ABP	7/7/15
4	ADAPTIVE INSTALLATION INT. #1–5	McM	8/21/18	LUTZ	8/27/18	ABP	8/28/18
5	ADAPTIVE INSTALLATION AS–BUILT	McM	6/18/19	Lutz	7/10/19	[illegible]	7/11/19
6							
7							
8							

SYSTEM PERMIT #I–0069 — SHEET 2 OF 2

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