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Appendix H

Traffic Impact Study

AECOM

Solar Glass Manufacturing Facility - Traffic Impact Study

Canadian Premium Sand Inc.

Project number: 60663147.15

August 11, 2022

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Calgary, AB T2P 2X6

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August 11, 2022

Project Number:
60663147.15

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Attention: Mr. Alasdair Knox
VP Project Engineering

Canadian Premium Sand Inc.
Traffic Impact Study for a Solar Glass Manufacturing Facility – Final Report

Dear Mr. Knox,

Manitoba Transportation and Infrastructure (MTI) has completed their review of the Traffic Impact Study (TIS) submitted by AECOM for the proposed Canadian Premium Sand Inc. Solar Glass Manufacturing Facility located in Selkirk, Manitoba. The TIS has been revised based on the review comments received from MTI. A final copy of the TIS report is attached which includes a comment response letter in Appendix D.

Please feel free to contact me at 204-955-2461 or brad.cook@aecom.com with any questions regarding the TIS revisions or the final TIS report.

Yours sincerely,

S. Brad Cook, P.Eng.
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enclosures: CPS Glass Manufacturing Facility – Traffic Impact Study (Final)

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AECOM: 2015-04-13

Quality information

Prepared by	Checked by	Verified by	Approved by
S. Brad Cook, P.Eng. Senior Transportation Engineer			

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	12/21/21	Draft Report		S. Brad Cook	Project Manager
2	05/27/22	Final Report		S. Brad Cook	Project Manager
3	08/11/22	revised Final Report		S. Brad Cook	Project Manager

Distribution List

# Hard Copies	PDF Required	Association / Company Name
1	1	Canadian Premium Sand Inc.

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1. Introduction

1.1 Solar Glass Manufacturing Facility

Canadian Premium Sand Inc. (CPS) proposes to develop a Solar Glass Manufacturing Facility in the northwest portion of the City of Selkirk. The development is located on the northeast corner of the junction between Easton Dr (PTH 9A) and PTH 4. AECOM Canada Ltd. (AECOM) has been retained by CPS to complete a Traffic Impact Study (TIS) for the proposed development as required by Manitoba Transportation and Infrastructure (MTI) and the City of Selkirk (City).

1.1.1 Development Site Plan

The proposed CPS Solar Glass Manufacturing Facility (GMF) is approximately 85-acres in size and located in the northeast quadrant of the Easton Dr (PTH 9A) at PTH 4 intersection. The site is bounded to the south by the Easton Dr (PTH 9A), to the west by PTH 4, to the north by Walker Ave, and to the east by undeveloped land. The CP Rail Winnipeg Beach subdivision is located along the south side of the development site.

The location of the GMF development is illustrated in Figure 1.

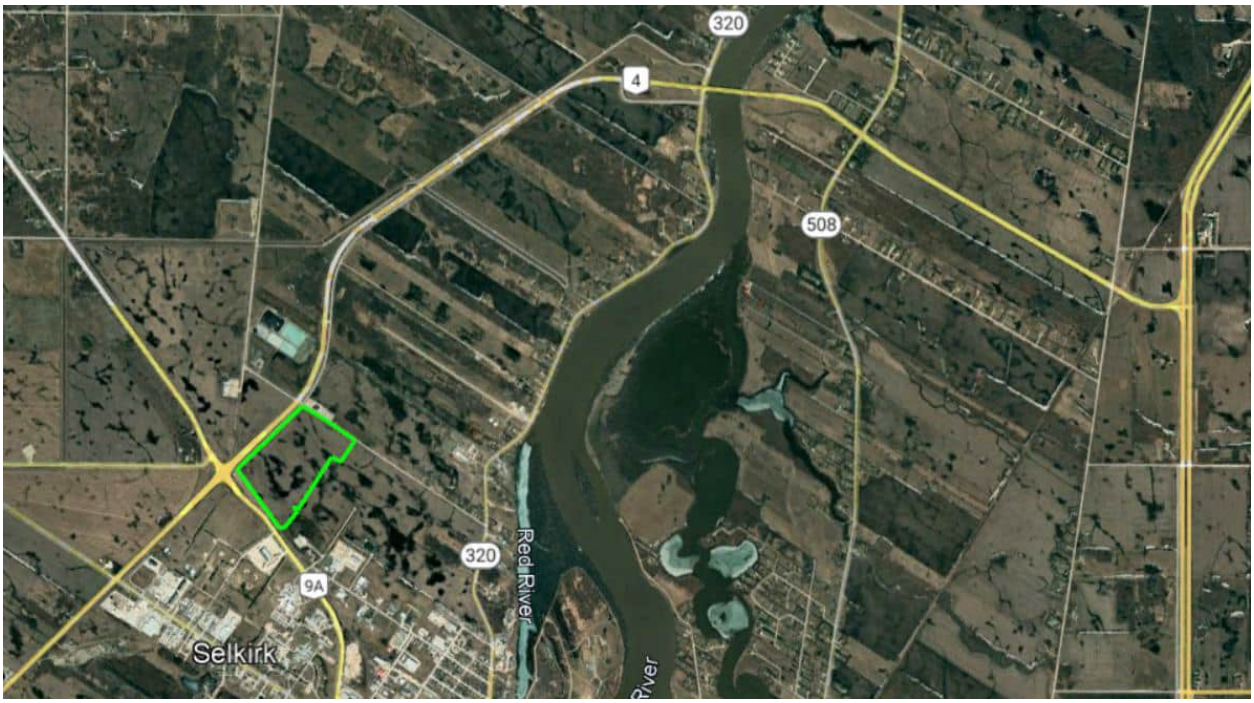


Figure 1: Glass Manufacturing Facility Location Plan

As currently proposed, the GMF development will include the following land uses:

- 1,048,000 ft^2 heavy industrial manufacturing facility,
- 30,000 ft^2 office building.

The site plan for the proposed development is illustrated in Figure 2. As shown, the GMF is located on the west side of the property.

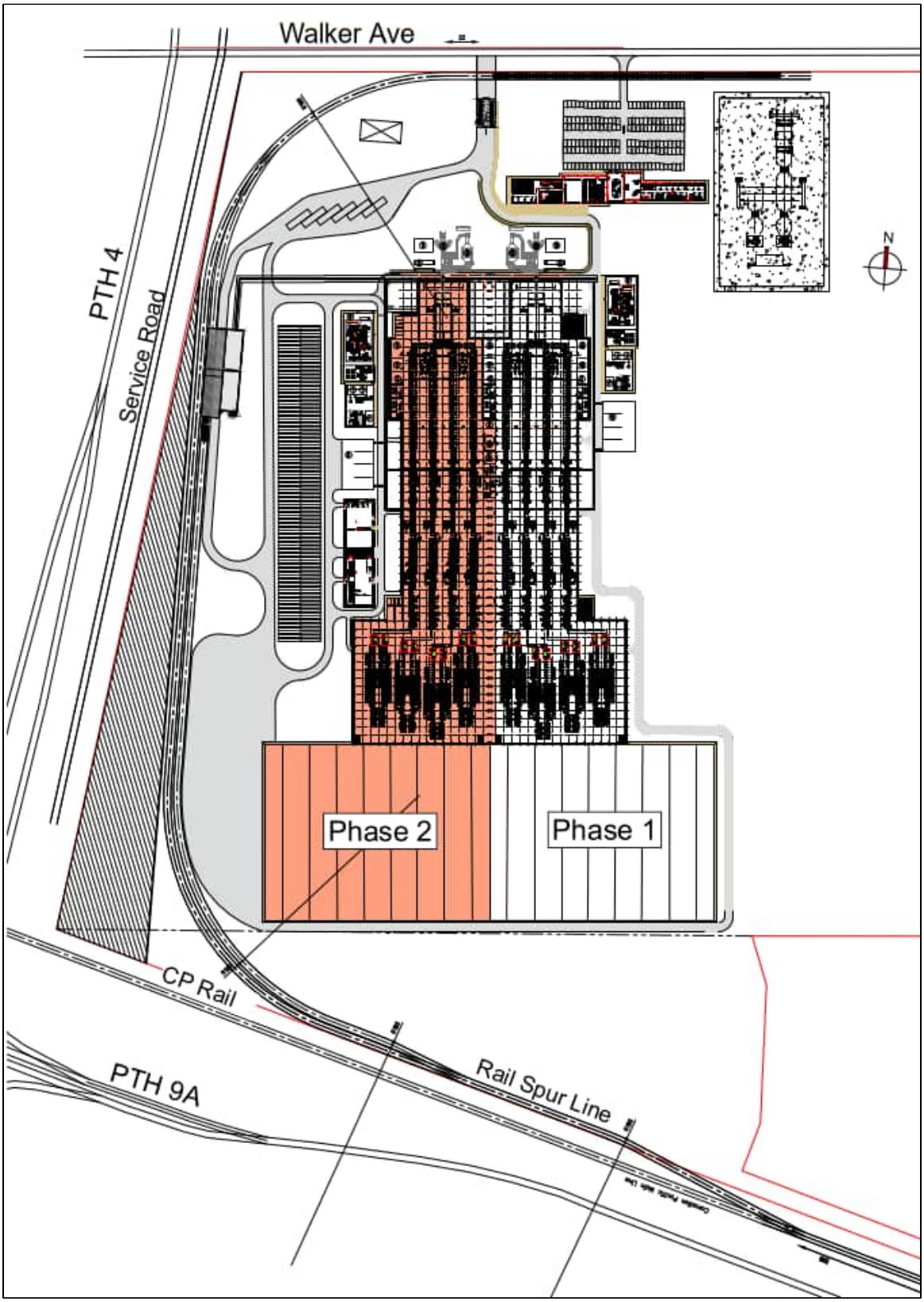


Figure 2: Glass Manufacturing Facility Site Plan

1.1.2 Proposed Development Access

As currently proposed, the GMF development will have the following access:

- All access to the facility will be from PTH 4 via Walker Ave,
- A truck access is located on the south side of Walker Ave approx. 230 m east of PTH 4,
- A separate access to the office building and staff parking area is located on the south side of Walker Ave approx. 330 m east of PTH 4.
- As part of the development, CPS proposed to pave Walker Ave in asphalt from PTH 4 330 m east to the staff parking access.

1.1.3 Development Phasing

Development of the site will occur in two separate phases:

- Phase 1 will include a 524,000 ft^2 manufacturing facility capable of producing 650 tons of finished product per day along with a 30,000 ft^2 office building,
- Phase 2 involves expanding the GMF development by constructing a second 524,000 ft^2 manufacturing facility to double production capacity to 1,300 tons of finished product per day.

Construction of Phase 1 is expected to begin in 2022 with glass production beginning in 2024. The timing of Phase 2 of the development is unknown at this time and will depend on market demand for the glass product. However, to simplify the TIS analysis it was assumed Phase 1 and 2 would be developed at the same time with full build-out of the GMF development by 2024 with no interim phases.

1.2 Purpose and Methodology

The purpose of the TIS is to estimate the type and quantity of traffic generated by the development and identify potential impacts from this traffic on adjoining public roadways. The study must identify the type of roadway, intersection, and/or traffic control improvements needed to mitigate any unacceptable impacts. The study must also confirm the location and suitability of proposed access points and geometry.

1.2.1 Analysis Scope

AECOM has had preliminary discussions with MTI and the City to identify the scope of the TIS and ensure that all parties have general agreement on the study methodology. MTI has identified the following intersections to be included as part of this study:

- Easton Dr (PTH 9A) at Wersch St (existing traffic control: 2-way stop),
- Easton Dr (PTH 9A) at PTH 9/PTH 4 (existing traffic control: traffic signal),
- PTH 4 at Walker Ave (existing traffic control: 2-way stop),
- Site accesses from Walker Ave (proposed traffic control: 2-way stop).

AECOM is not aware of any other area developments that are expected to generate significant amounts of traffic that will travel through the study intersections.

The TIS includes analysis of five separate traffic scenarios:

- 2021 Background traffic conditions,
- 2024 Pre-Development traffic conditions,
- 2024 Post-Development traffic conditions including traffic generated by the development,
- 2034 Pre-Development traffic conditions,
- 2034 Post-Development traffic conditions including traffic generated by the development.

The selected design years allow analysis at full build-out of the development and ten (10) years after full build-out is reached. The analysis will determine if roadway and/or traffic control improvements are required due to pre-development conditions (background traffic growth only) or due to traffic generated by the GMF development.

1.2.2 TIS Objectives and Methodology

Specific objectives of the TIS and the methodology used for the study are listed as follows:

- Review background data supplied by MTI, the City and CPS to collect relevant information including design years, background traffic growth rates, and to confirm pre-development conditions,
- Review available traffic data to determine peak periods and current distribution during the weekday AM and PM peak hour periods,
- If required, conduct additional intersection turning movement counts to collect data on existing traffic conditions,
- Hold discussions with MTI to ensure agreement on TIS parameters, including background traffic growth rates, road geometries, traffic distribution, etc.,
- Using background traffic growth rates, project existing traffic to 2024 and to 2034 to determine Pre-Development traffic conditions,
- Using information supplied by CPS based on similar manufacturing facilities, estimate the quantity and type of traffic generated by the proposed GMF development,
- Combine traffic generated by the GMF development with Pre-Development traffic to determine Post-Development traffic conditions for the 2024 and 2034 design years,
- Utilize Synchro traffic analysis software to analyze AM and PM peak hour Pre and Post-Development traffic conditions for the 2021, 2024 and 2034 design years,
- Evaluate the projected change in traffic operations at study intersections in terms of delay, level of service, and queuing,
- Identify and recommend appropriate infrastructure and traffic control improvements necessary to accommodate Pre-Development and/or Post-Development traffic volume increases as per MTI standards,
- If necessary, conduct traffic signal warrant analyses at study intersections to determine the need for traffic signal control,
- If necessary, conduct warrant analyses for two-lane rural highway intersection improvements,
- Detail the study assumptions, findings and recommendations in a draft report and provide a copy to CPS for review,
- Following review and implementation of necessary changes, AECOM will provide draft copies of the TIS to MTI and the City for distribution, review, and comment,
- If required, prepare one set of report revisions/supplements to address MTI / City review comments,
- Provide two (2) copies of the Final Report including supplements to CPS and two (2) copies to MTI and the City for filing and records.

2. Transportation Network

2.1 Area Context

Located in the northwest portion of the City of Selkirk, the proposed GMF site is in an area with primarily industrial and institutional land uses. East of PTH 9 on the south side of Easton Dr (PTH 9A) the institutional land uses include the Selkirk Regional Health Centre, the Selkirk & District General Hospital, and the Selkirk Recreation Complex. On the north side of Easton Dr there is a large (17-acre) Manitoba Hydro facility and many 2.0 - 6.0-acre industrial developments along Greenwood Ave. North of the proposed GMF site is mostly undeveloped farmland although there are six single-family homes on the north side of Walker Ave near Main St (approx 1,200 m east of the development). There is also undeveloped farmland to the west of the site.

As discussed above, AECOM is not aware of any additional planned area development that will significantly impact traffic growth along Easton Dr (PTH 9A), PTH 9 or PTH 4 in the vicinity of the GMF development.

2.2 Existing Transportation System

2.2.1 Existing Roadways

Easton Dr (PTH 9A)

Easton Dr (PTH 9A) is classed as a Secondary Arterial that extends from Manitoba Ave northwest to the PTH 9/PTH 4 intersection. South of the development site it is a 2-lane undivided roadway with a rural cross-section, paved/gravel shoulders, ditch drainage and a speed limit of 70 km/hr. At both the PTH 9/PTH 4 and Wersch St intersections, Easton Dr widens to provide a raised or painted median with left and right turn auxiliary lanes. In 2019 the annual annual daily traffic (AADT) volume on this portion of Easton Dr was 4,340 vehicles per day (vpd). Within the study area Easton Dr exhibits the characteristics of the special roadway classification category “Suburban Highway”.

PTH 4

PTH 4 is classed as a Primary Arterial that extends north from the PTH 9 at PTH 9A junction to PR 320 before crossing the Red River and continuing east to PTH 59. West of the development site it is a 2-lane undivided roadway with a rural cross-section, gravel shoulders and ditch drainage. At the PTH 9/PTH 9A intersection, PTH 4 widens to provide a raised median with left and right turn auxiliary lanes. The posted speed on PTH 4 is 100 km/hr, however, this reduces to 70 km/hr approx 300 m north of the PTH 9/PTH 9A intersection. In 2019 the annual annual daily traffic (AADT) volume on PTH 4 adjacent to the development site was 3,550 vpd.

Wersch St

Wersch St is a 2-lane undivided collector roadway that extends approx. 590 m north of Easton Dr. The first 120 m of Wersch St north of Easton Dr has an urban cross-section with curbs and an asphalt surface. The remaining 470 m has a rural cross-section with a gravel surface and ditch drainage. Wersch St continues south of Easton Dr to provide access to the Selkirk Regional Health Centre. The posted speed limit on Wersch St is 50 km/hr.

Walker Ave

Walker Ave is a 2-lane undivided collector roadway that extends west from Main St (PR 320), crosses PTH 4 and continues west to Whiskey Ditch Rd. It has a rural cross-section with a gravel surface and ditch drainage. The posted speed limit on Walker Ave is 50 km/hr.

2.2.2 Study Area Intersections

Easton Dr (PTH 9A) at PTH 9/PTH 4

The intersection of Easton Dr (PTH 9A) at PTH 9/PTH 4 is illustrated in Figure 3. There are left and right turn storage lanes on each approach and all right turns are channelized with islands. Acceleration tapers are provided for all right turn movements allowing them to operate as "free" movements instead of "yield" movements. The intersection has traffic signals that operate as actuated-uncoordinated with fully-protected left turns on the NB (PTH 9) and SB (PTH 4) approaches.

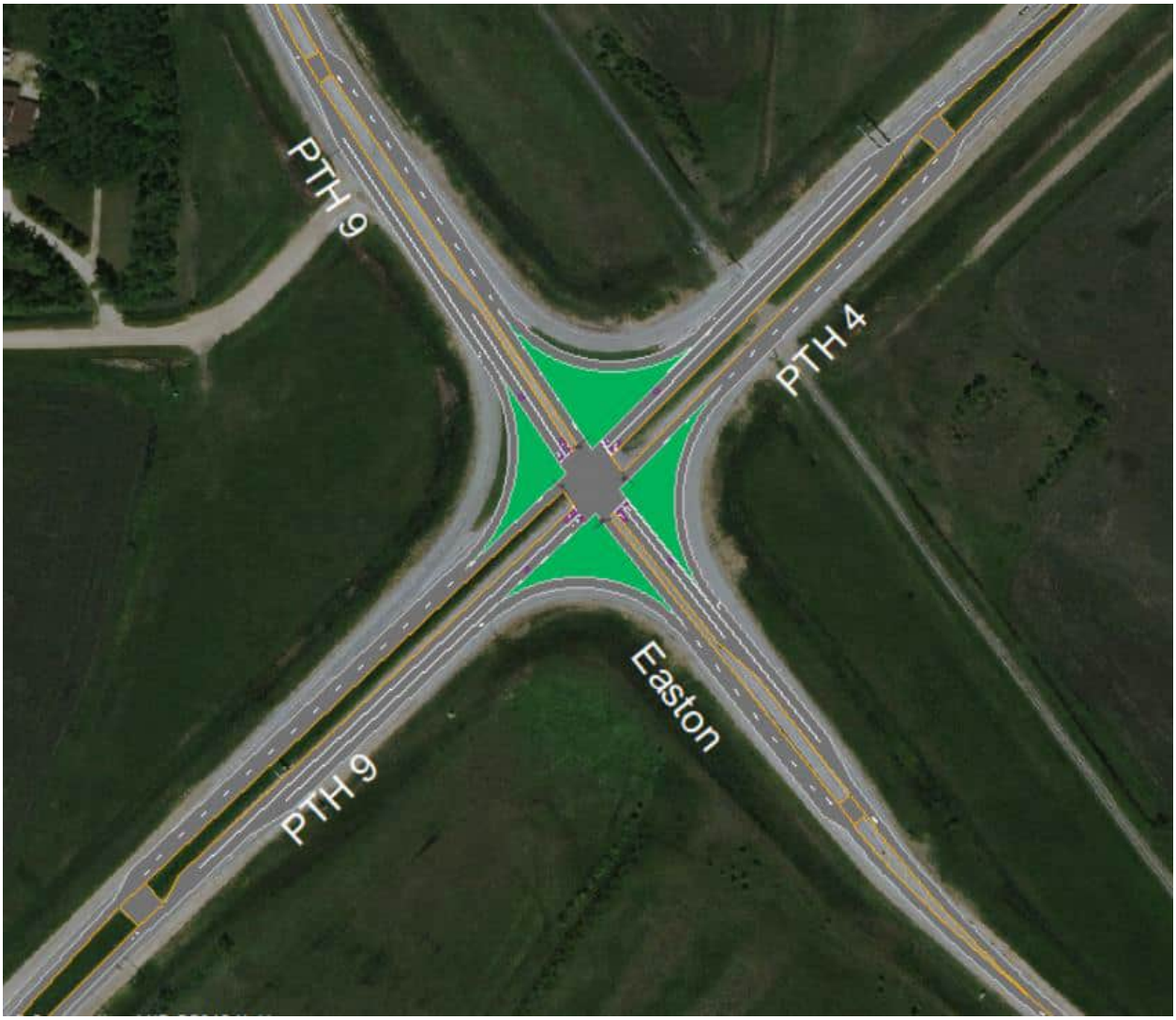


Figure 3: Easton Dr (PTH 9A) at PTH 9/PTH 4

Easton Dr (PTH 9A) at Wersch St

Located 930 m east of PTH 9/PTH 4, the Easton Dr at Wersch St intersection is under 2-way stop control with Easton Dr running free. As shown in Figure 4, Easton Dr widens to provide a painted median with a WB left turn lane and an EB right turn lane. The exit from the Selkirk Regional Health Centre has a channelized right turn with an acceleration lane which allows "free" rights.

Figure 4: Easton Dr at Wersch St

PTH 4 at Walker Ave

Located 1,480 m north of PTH 9/PTH 9A, the PTH 4 at Walker Ave intersection is under 2-way stop control with PTH 4 running free. The shoulders on PTH 4 are paved for 50 m on each side of the Walker Ave intersection but there are no right or left turn storage lanes. The existing intersection configuration is shown in Figure 5.

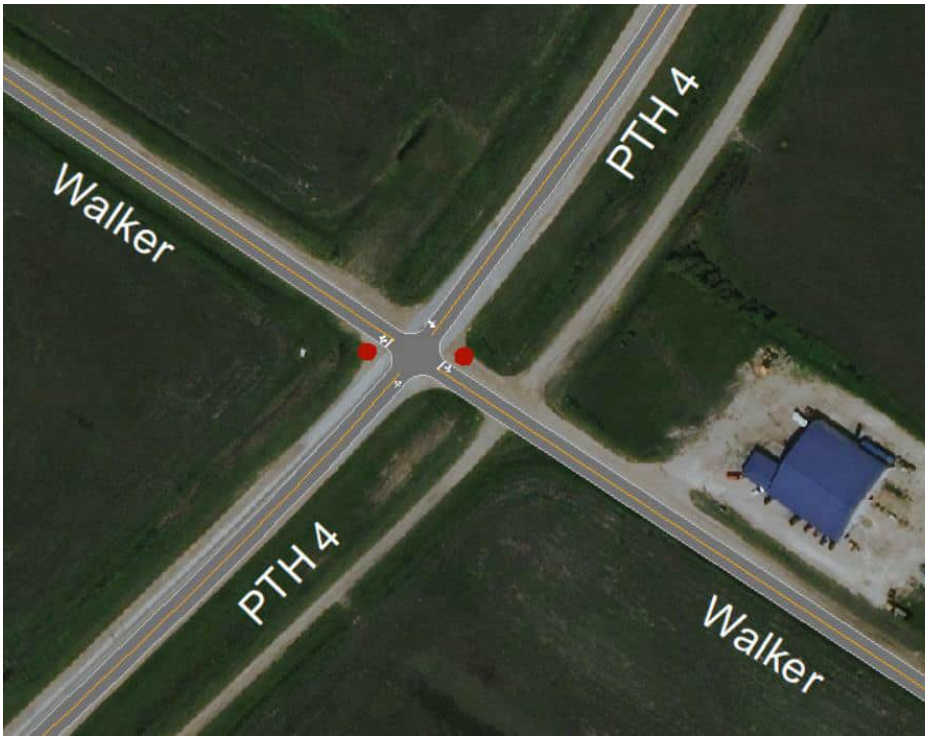


Figure 5: PTH 4 at Walker Ave

2.2.3 Transit and Active Transportation

There is an existing transit route within the City that extends along Easton Dr from Morris Ave east to Wersch St. On weekdays it operates hourly from 06:00 to 18:00.

There is an existing concrete sidewalk on the south side of Easton Dr that extends from Manitoba Ave to the Selkirk Recreation Complex located 195 m west of Wersch St. There are no other existing pedestrian, Active Transportation or cycling facilities in the immediate vicinity of the GMF develolpment.

2.3 Future Transportation System

As far as AECOM is aware, there are no planned roadway improvements within the study area.

3. Pre-Development Traffic Conditions

3.1 Existing Traffic Volumes

MTI provided historical count station data and intersection turning movement count traffic data at the Easton Dr (PTH 9A) at PTH 9/PTH 4 intersection for use in preparing the TIS. As detailed below, this information was used to determine annual traffic growth rates applicable to the study area, and to project existing traffic volumes to the 2024 and 2034 design years.

3.1.1 Count Station Data

MTI provided historical count station traffic data at the following locations:

- Permanent Count Station (PCS) 67 on PTH 4 west of Selkirk Bridge,
- Coverage Count Station (CCS) 205 on PTH 9 north of north junction with PTH 9A,
- CCS 564 on PTH 9A south of north junction with PTH 9.

To determine design year traffic volumes the traffic data must be projected to 2024 and 2034. Historical AADT data from the count stations was analyzed to determine recent traffic growth trends within the study area. The historical AADT at each count station and the corresponding annual growth rates are listed in Table 1.

Table 1: Historical AADT Data

Year	PCS 67 (PTH 4) AADT (veh/day)	CCS 205 (PTH 9) AADT (veh/day)	CCS 564 (PTH 9A) AADT (veh/day)
2011	3,840	4,730	3,670
2012	3,590	-	-
2013	3,590	-	-
2014	3,590	4,560	3,800
2015	-	-	-
2016	4,110	-	-
2017	4,330	5,600	4,340
2018	4,240	-	-
2019	4,240	-	-
Annual Growth Rate, G_r	2.38% / yr	2.97% / yr	2.88% / yr

There are only three years of historical data available at CCS 205 and 564 and the AADT at these locations is based on data from tube counts conducted once per year. Except for 2015 when the count equipment was not functioning properly, the AADT at PCS 67 is based on count data continuously collected throughout each day of the year. Permanent count station data is generally considered much more accurate than coverage count data. For this reason, only AADT data from PCS 67 was considered in the analysis.

A linear regression analysis was conducted using PCS 67 AADT data to determine predicted traffic volumes on study area roadways. This data was then used with the formula listed below to determine an annual growth rate:

$$Vol_{(future)} = Vol_{(initial)} \times (1 + G_r)^n$$

where: $Vol_{(future)}$ = future traffic volume
$Vol_{(initial)}$ = existing traffic volume
G_r = annual growth rate
n = no. of years

The analysis determined that traffic volume at PCS 67 increased at an average rate of 2.38% / yr from 2011 to 2019. This growth rate is quite high compared to the 1.0% annual traffic growth typically experienced in the Winnipeg metropolitan area. It is also high compared to the City of Selkirk population growth rate which was 0.9% / yr from 2011 to 2016. In addition, notes included with the PCS 67 data indicate traffic volumes were higher than anticipated at various times during 2016, 2017 and 2019 due to the impact of flooding detours.

For these reasons the traffic growth rate calculated for PCS 67 may not be indicative of long-term trends in the Selkirk area. For analysis purposes it was assumed a traffic growth rate of 2.0% / yr was appropriate for the study area. As discussed below, this growth rate was used to expand current traffic volumes to develop 2024 and 2034 Pre-Development traffic volumes.

3.1.2 Intersection Turning Movement Counts

MTI did not have any recent intersection turning movement count (TMC) data available for the study area intersections. As a result, traffic counts were conducted at the following locations:

- PTH 9 / PTH 4 at Easton Dr (PTH 9A) collected September 29 and October 7, 2021,
- Easton Dr (PTH 9A) at Wersch St collected September 29 and October 4, 2021,
- PTH 4 at Walker Ave collected September 28 and October 4, 2021.

After reviewing the intersection TMC data the AM and PM peak hours were found to occur between 7:30 and 9:30 and between 15:30 and 17:00 respectively. The traffic count data is included in Appendix A.

3.1.3 Peak Hour Factor

The peak hour factor (PHF) is used to account for the variability of traffic flow within the peak hour. Peak hour factors are calculated using the following formula:

$$PHF = \frac{\text{(peak hour volume)}}{4 \times \text{(peak 15 min. volume)}}$$

Using this formula, the PHF at study area intersections during the AM and PM peak hours were calculated and are listed in Table 2.

Table 2: Peak Hour Factors

Location	AM Peak PHF	PM Peak PHF
PTH 9 / PTH 4 at Easton Dr (PTH 9A)	0.92	0.91
Easton Dr (PTH 9A) at Wersch St	0.71	0.94
PTH 4 at Walker Ave	0.94	0.77

Typically a minimum PHF of 0.89 is used for transportation planning purposes. For the TIS, the minimum PHF was set to 0.89 and the actual intersection PHF's were used if they exceeded the minimum PHF.

3.1.4 Heavy Vehicles

The heavy vehicle percentage (HV%) represents the percentage of vehicles that are larger than personal automobiles and pickup trucks. HV% for study area intersections were taken from the TMC data and are listed in Table 3 for the AM and PM peak periods. For analysis purposes the actual HV% were utilized with a minimum value of 5%.

Table 3: Intersection Heavy Vehicle Percentages (HV%)

Location	Approach	AM Peak HV%	PM Peak HV%
PTH 9 / PTH 4 at Easton Dr (PTH 9A)	Eastbound	47 %	43 %
	Westbound	37 %	2 %
	Northbound	11%	9 %
	Southbound	48 %	35 %
Easton Dr (PTH 9A) at Wersch St	Eastbound	4 %	8 %
	Westbound	4 %	3 %
	Northbound	6 %	2 %
	Southbound	26 %	8 %
PTH 4 at Walker Ave	Eastbound	43 %	43 %
	Westbound	0 %	0 %
	Northbound	13 %	3 %
	Southbound	2 %	4 %

3.2 Background Traffic Projections

To determine design year traffic volumes, the 2021 existing tintersection traffic volumes were projected to 2024 and 2034 using an area growth rate of 2.0% / yr. The PHF during the AM and PM peak periods was applied as part of this process. Since there are no major traffic sources/sinks between study area intersections, traffic volumes were also balanced from block-to-block prior to the expanding the 2021 traffic volumes to the 2024 and 2034 design years.

The resulting peak hour 2021 Background traffic volumes are illustrated in Figure 6 and the 2024 and 2034 Pre-Development traffic volumes are shown in Figures 7 and 8.

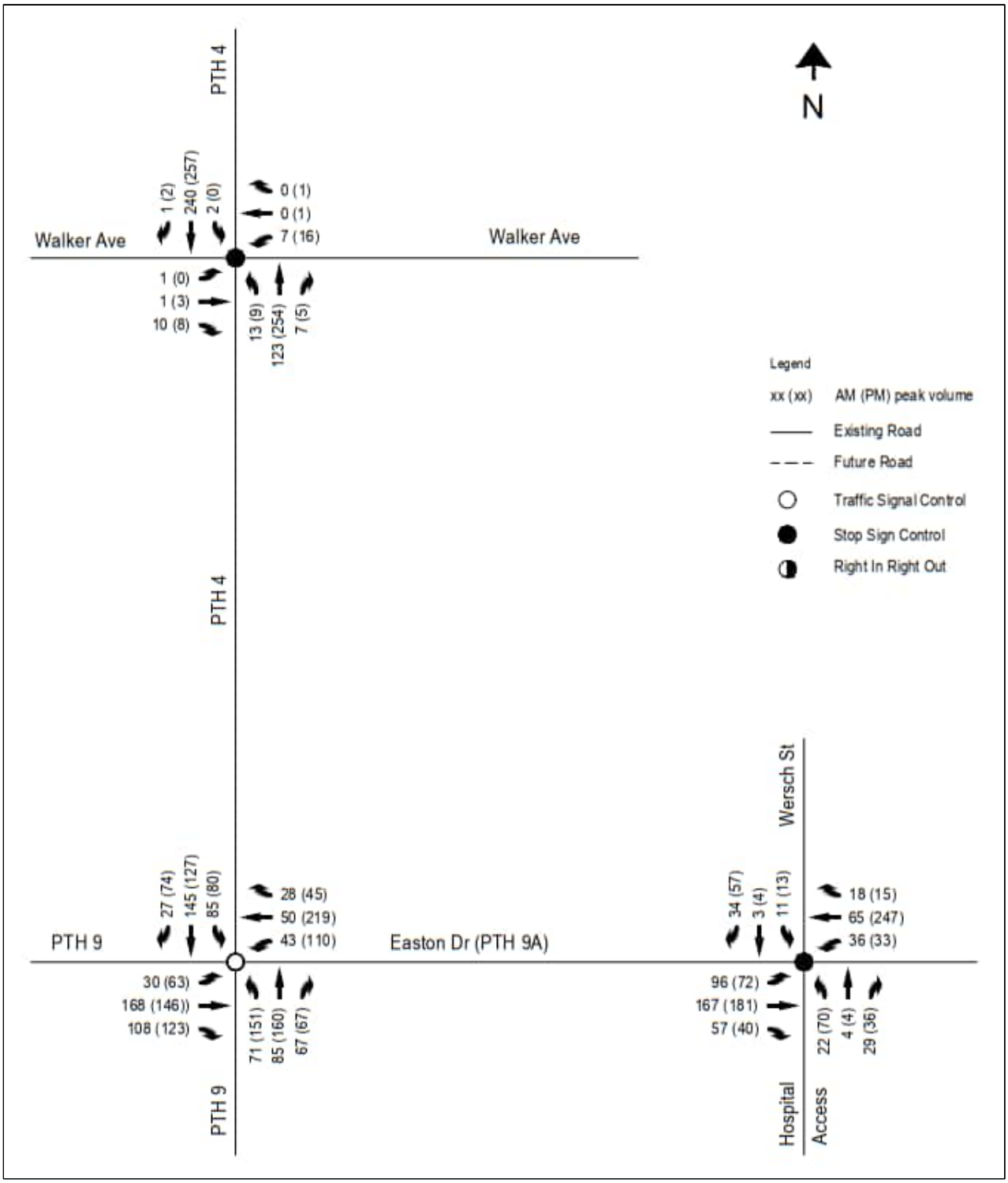


Figure 6: 2021 Background Traffic Volumes

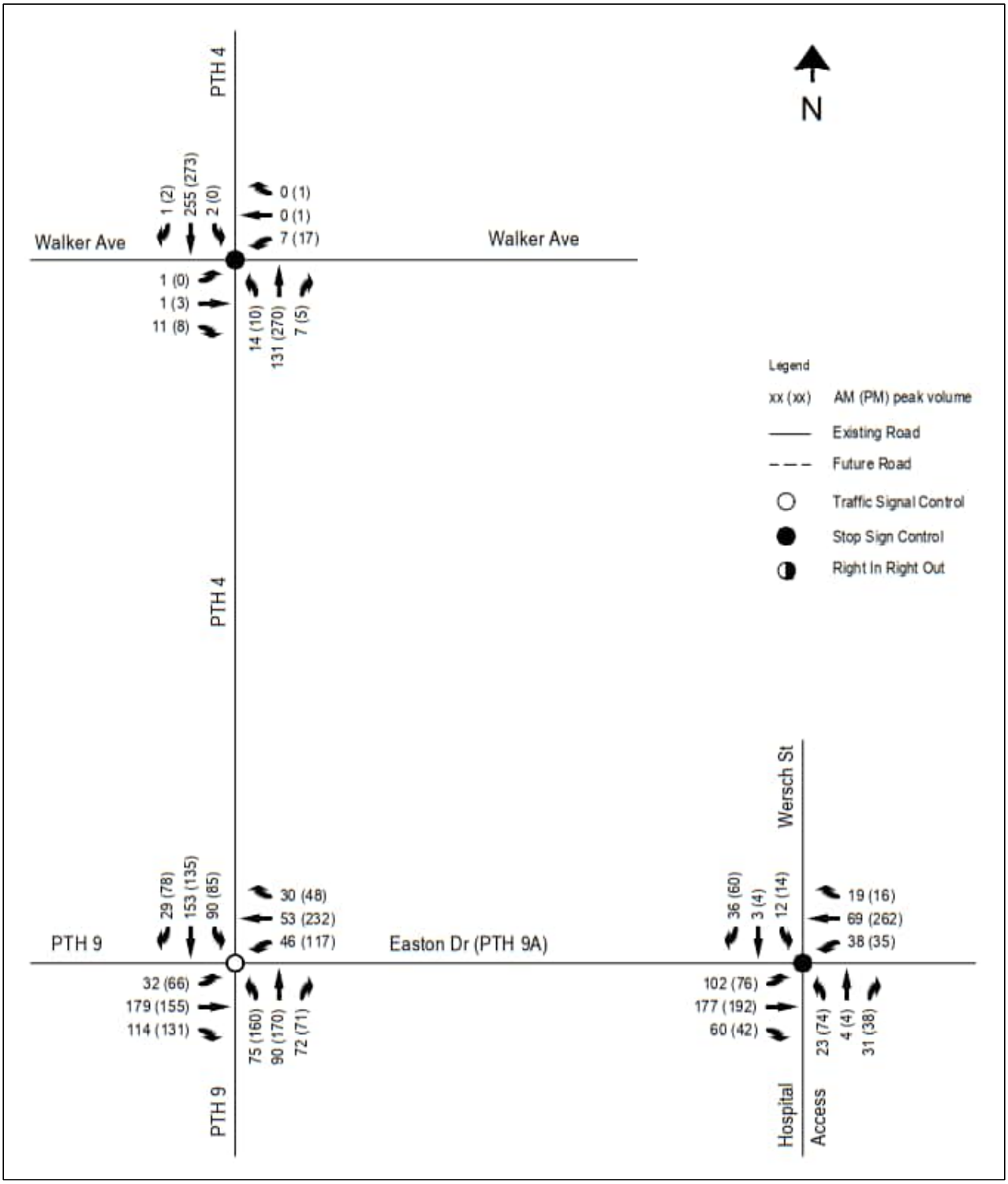


Figure 7: 2025 Pre-Development Traffic Volumes

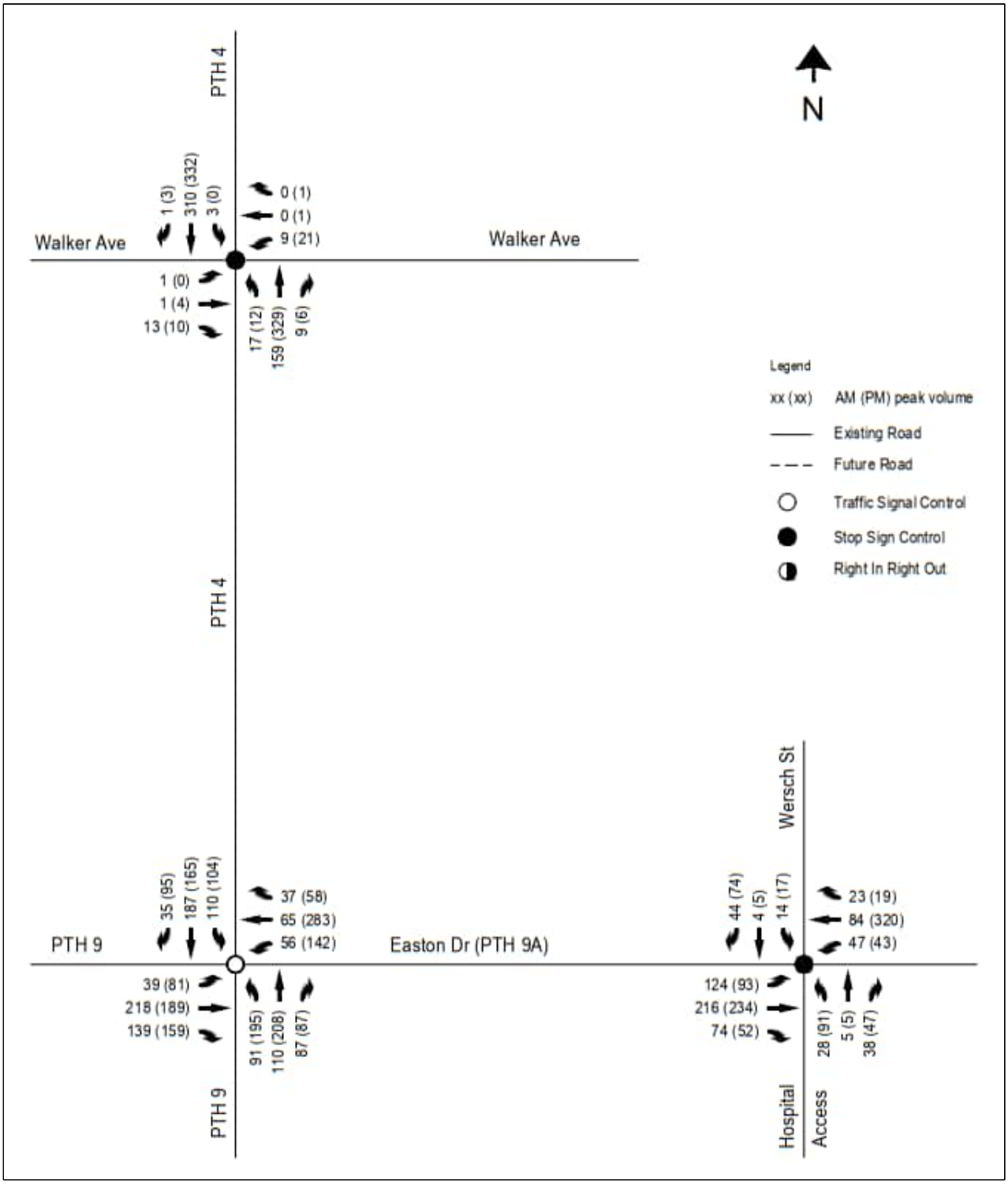


Figure 8: 2035 Pre-Development Traffic Volumes

4. Post-Development Traffic Conditions

4.1 Trip Generation

For residential and commercial developments trip generation is typically calculated using data from the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 10th ed. However, for large industrial developments such as the GMF, the number of trips generated by freight movements and employees can vary widely and are typically provided by the Client based on past experience at similar facilities.

For the GMF development, CPS provided estimates of trips generated by employees as well as material delivery and finished product shipping for each phase of the development. As discussed in Section 1.1.3, to simplify the TIS analysis it was assumed Phase 1 and 2 of the GMF would be developed at the same time with full build-out of the development by 2024 with no interim phases. The trip generation is summarized as follows:

- It is anticipated the GMF development will operate 24-hrs a day, 7-days a week.
- The time of year the facility is in operation is still under consideration but could include 10-months per year to avoid spring road bans, or 7-months per year to avoid spring road bans and summer traffic. Since the 7-month per year operation results in the highest daily trip generation, this scenario was selected for analysis.
- There will be three shifts per day for factory workers with shift change occurring at 06:00, 14: 00 and 22:00. Because trips by factory workers occur during the off-peak periods of the surrounding roadway network, they were not included in the AM / PM peak hour traffic analysis.
- Office workers arrive and depart during the AM / PM peak hours of the surrounding road network and trips generated by these staff were included in the traffic analysis.
- CPS provided daily totals for trucks bringing production materials to the facility, and shipping finished product out. Once both Phase 1 and Phase 2 of the GMF are in operation these will total 198 truck trips per day. This assumes 50% of the finished product will be shipped by truck and and 50% by rail.
- Although the GMF operates 24 hrs per day, it was assumed truck trips would primarily occur during the two 8-hr "day" shifts. For this reason, the total truck trips per day were divided by 16 to determine the average number of truck trips per hour (7 inbound, 7 outbound) that ocurr throughout the day including ghe AM and PM peak hours.

Trips generated by the GMF development during the AM / PM peak periods are summarized in Table 4.

Table 4: Glass Manufacturing Facility Trip Generation

Trip Type	Peak Period	Inbound Trips	Outbound Trips
Office Staff [1]	AM peak	136	0
	PM peak	0	136
Freight Movements by Truck	AM peak [2]	7	7
	PM peak [3]	7	7
Total Trips	**AM peak**	**143**	**7**
	PM peak	**7**	**143**

[1] Assumes one trip per employee; does not include factory worker trips which occur off-peak
[2] Based on 99 inbound trips per day divided by 16-hr
[3] Based on 99 outbound trips per day divided by 16-hr

4.1.1 Primary / Pass-by Trips

Depending on the land use type, trips generated by new developments can be separated into two distinct trip types:

- Primary Trips: new trips made for the specific purpose of visiting the development site, for which the land use traffic generator is the primary reason for the trip,
- Pass-by Trips: trips that are intercepted from the stream of traffic passing the site or diverted from adjacent routes; while they do contribute to traffic volumes at site accesses, they do not create new traffic loading on the adjacent street system.

The proportion of trips in each category depends on the mix of land uses and other site-specific factors. Typically, industrial land uses do not generate pass-by trips so all trips generated by the GMF development were considered new or primary trips.

4.1.2 Internal Capture

Internal capture occurs when two different land uses within the same development attract a portion of each others' trips. Since the GMF contains only a since land use, heavy industrial, no reductions due to internal capture of generated trips was assumed for the analysis.

4.1.3 Mode Split

There is an existing transit route on Easton Dr that extends to Wersch St. and there is a sidewalk on the south side of Easton Dr that extends to the Selkirk Recreation Complex. However, no road or pedestrian connection from Wersch St or Easton Dr to the GMF development is planned. Also, there are no pedestrian or cycling facilities along Walker Ave. To be conservative it was assumed all generated trips would occur by truck/auto with no reductions due to pedestrian or cyclist trips.

4.1.4 Trip Generation Summary

Trips generated by the GMF development at full build-out are summarized as follows:

- AM Peak: 150 primary trips (143 inbound, 7 outbound),
- PM Peak: 150 primary trips (7 inbound, 143 outbound).

4.2 Directional Distribution and Routing

4.2.1 Directional Distribution

Employee Trips

From discussions with CPS as well as AECOM's knowledge of the Selkirk area and adjoining population centres, the distribution of trips generated by GMF employees were assumed as follows:

- 30% from/to Selkirk,
- 10% from/to areas north and west of Selkirk,
- 60% from/to Winnipeg south of Selkirk.

Truck Trips

From information supplied by CPS, all trucks delivering sand to the GMF will travel from/to CPS' Seymourville quarry located northeast of Selkirk while truck delivering other raw materials and/or shipping finished product will travel from/to the south.

4.2.2 Routing

Employee Trips

Based on the directional distribution listed in **Section 4.2.1** and the location of the GMF development, employee trips were routed to the staff site access on Walker Ave as follows:

- **Selkirk Trips (30%)**: 20% will utilize Easton Dr and PTH 4 to access Walker Ave west of the development; the remaining 10% will access Walker Ave east of the development from Main St (PR 320),
- **Trips from North and West (10%)**: All trips will utilize PTH 9 from the west and PTH 4 to access Walker Ave west of the development,
- **Winnipeg Trips (60%)**: All trips will utilize PTH 9 from the south and PTH 4 to access Walker Ave west of the development.

Truck Trips

From information supplied by CPS, all trucks delivering raw materials and shipping finished product will be instructed to utilize PTH 59 and approach the site from the North on PTH 4. Trucks then turn from PTH 4 onto Walker Ave to access the truck site entrance. The intent of this route is to minimize the impact of truck traffic on PTH 9 or on roadways within Selkirk. The raw material and finished product delivery routes are illustrated in **Figure 9**.

Figure 9: Glass Manufacturing Facility – Truck Routes

4.2.3 Trip Assignment

Trips generated by the GMF development were assigned to the site accesses based on the directional distribution and routing assumptions listed above. Trips beyond the site accesses were assigned to through movements at intersections along adjacent roadways. The resulting trip assignment is illustrated in **Figure 10**.

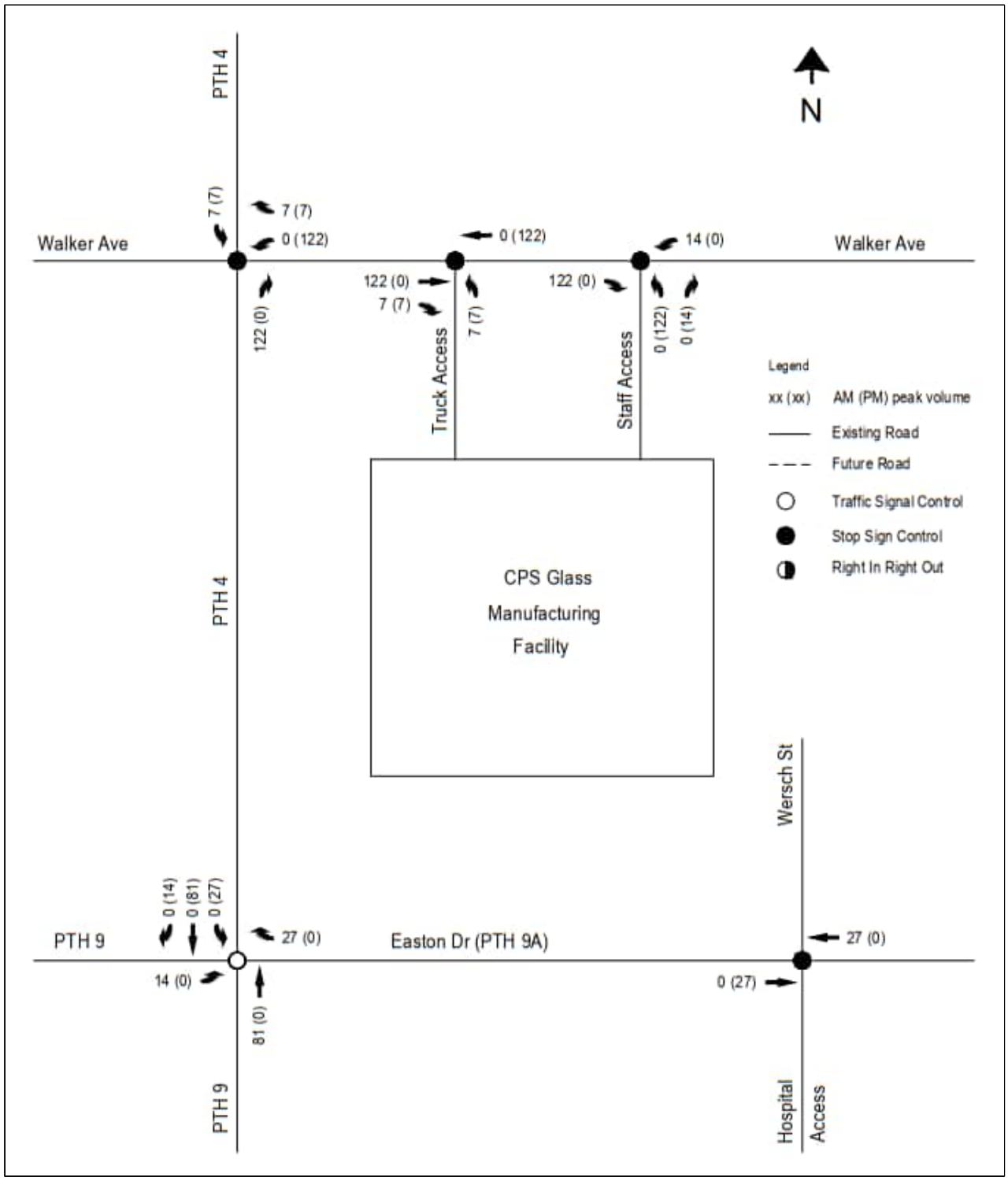


Figure 10: Trip Assignment

4.3 Post-Development Traffic Volumes

The total post-development traffic volume at study area intersections was determined by adding trips generated by the GMF development to pre-development volumes. The 2024 Post-Development traffic volumes are shown in Figure 11 and the 2034 Post-Development traffic volumes are shown in Figure 12.

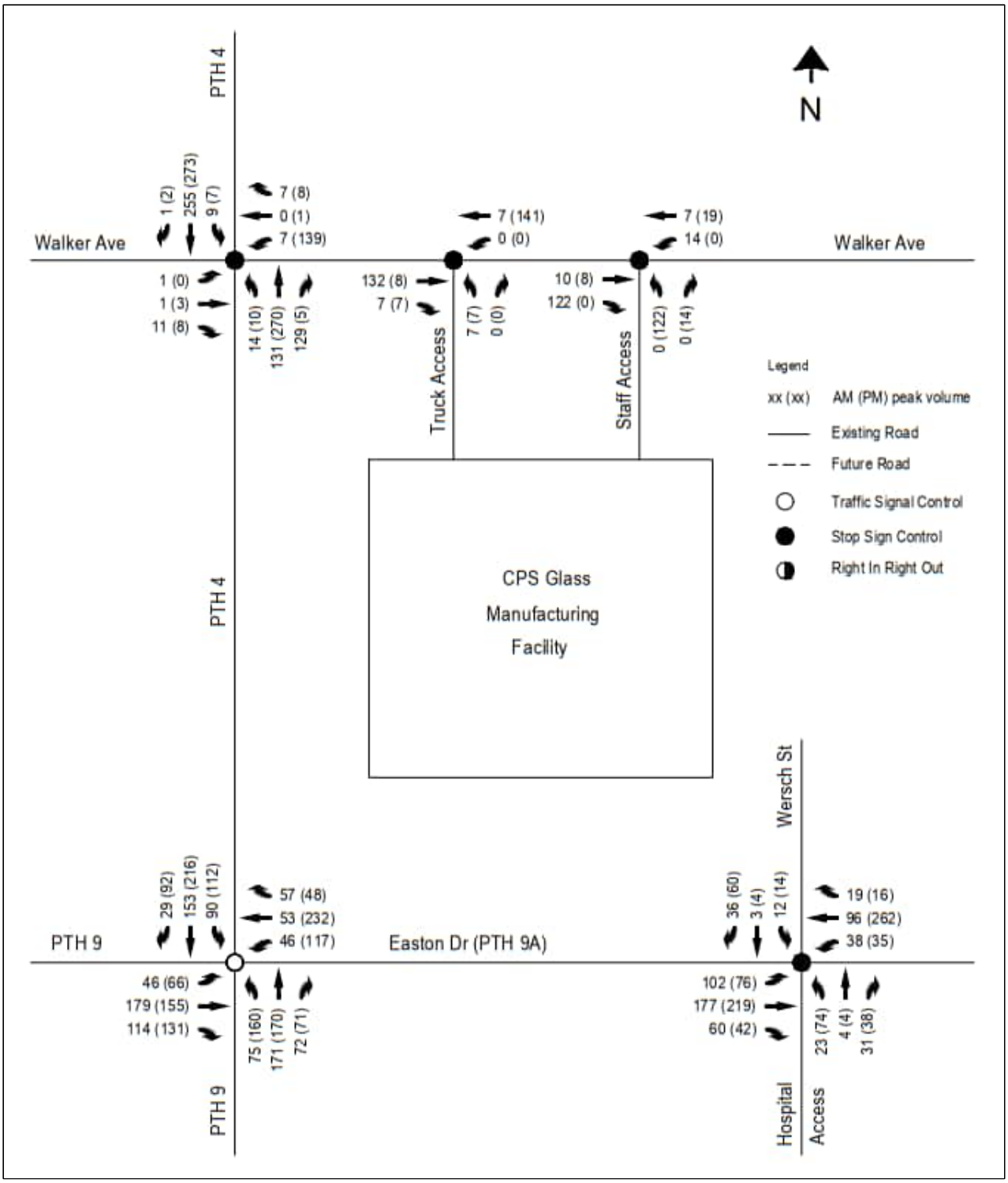


Figure 11: 2024 Post-Development Traffic Volumes

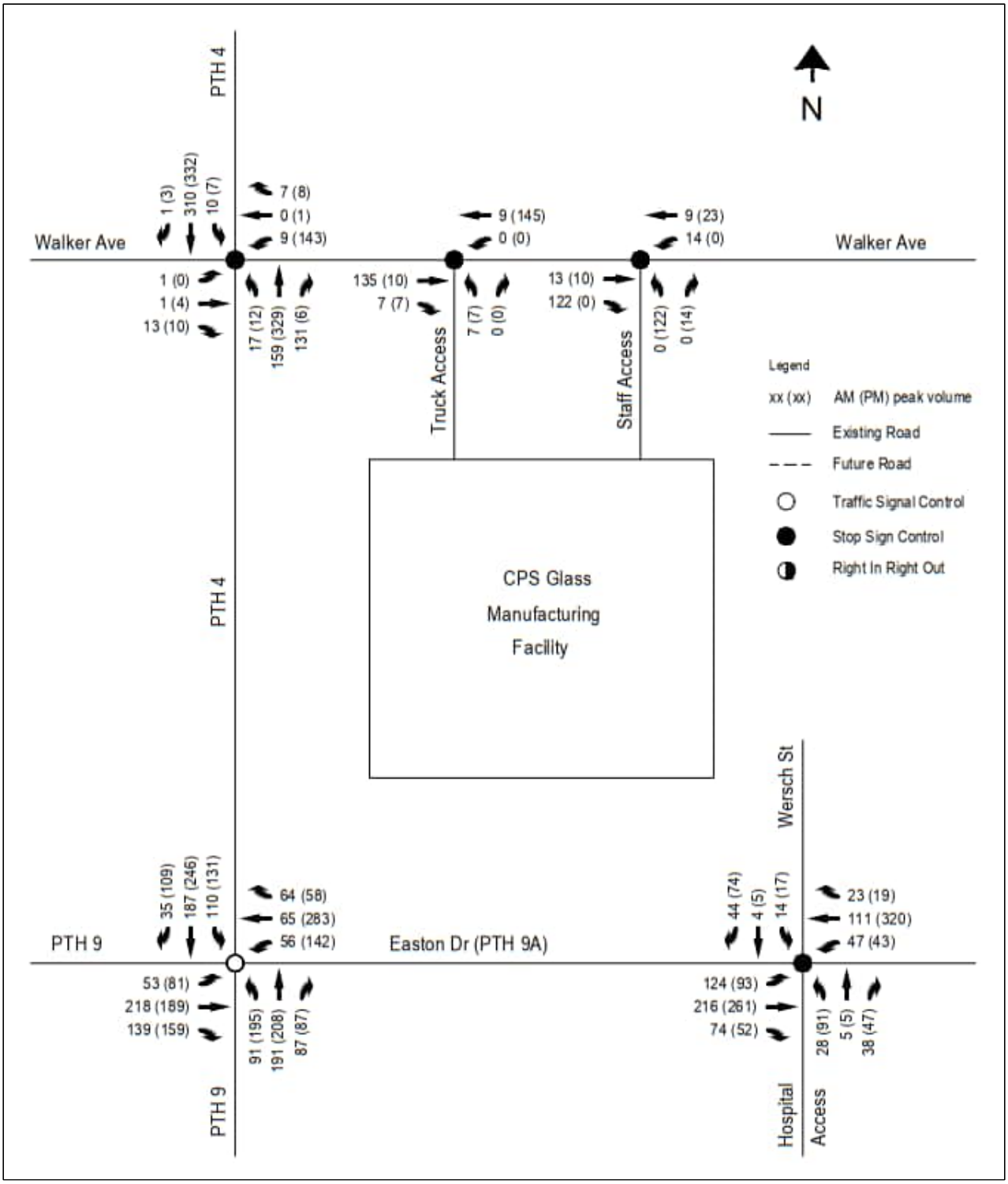


Figure 12: 2034 Post-Development Traffic Volumes

5. Traffic Analysis

The purpose of this task is to analyze traffic operations at study area intersections to assess the impact of projected traffic volume increases under 2024 and 2034 Pre and Post-development conditions, and to develop appropriate mitigation and traffic control strategies.

5.1 Vehicle Delay Based Analysis (Highway Capacity Manual Methodology)

Traffic analyses for signalized and un-signalized intersections are typically conducted according to methodology developed by the Transportation Research Board (TRB) as published in the *Highway Capacity Manual* (HCM), 6th edition. Most of the analyses concern estimates of vehicle delay under various traffic volumes, intersection configurations and traffic control strategies. The delay estimates are used as the basis for determining intersection performance. According to the HCM, the relative performance of an intersection depends on a number of factors including:

- Level of Service - measures the average delay per vehicle during a 15-minute analysis period; levels of service range from A to F (minimal delay to unacceptable delay) and may be measured on an intersection, approach, or per movement basis.
- Degree of Saturation - measured in terms of a ratio of demand flow rate (v) to maximum capacity (c); intersections with volume to capacity (v/c) ratios ≥ 1.0 are at full capacity and likely experience severe congestion.
- Vehicle Delay – vehicle delay on an intersection, approach or per movement basis; measured in seconds per vehicle (sec/veh) or total hours of delay during the peak hour under analysis.

Tables 5 and 6 summarize the Level of Service (LOS) for signalized and un-signalized intersections as listed in the HCM.

Table 5: Signalized Intersections - HCM Level of Service Characteristics

HCM Level of Service	Average Signal Delay per Vehicle (sec/veh)	Characteristics
A	≤ 10	Free flow, low volumes and high speeds, most drivers can select own speed
B	> 10 and ≤ 20	Stable flow, speed restricted slightly by traffic
C	> 20 and ≤ 35	Stable flow, speed controlled by traffic
D	> 35 and ≤ 55	Approaching unstable flow, low speed
E	> 55 and ≤ 80	Unstable flow & speeds, volumes at/near capacity
F	> 80	Forced flow, low speed, volume above capacity

Table 6: Un-Signalized Two-Way and All-Way Stop Control Intersections - HCM Level of Service Characteristics

HCM Level of Service	Total Delay (sec/veh)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

5.2 Intersection Capacity Utilization

Intersection Capacity Utilization (ICU) gives insight into how an intersection is functioning and how much capacity is available to handle traffic fluctuations and incidents. ICU is not a value that can be measured with a stopwatch, but it does give a good reading on the conditions that can be expected at the intersection. ICU can be expressed as a level of service (ICU LOS) or as a percentage of utilized intersection capacity.

The HCM LOS and the ICU LOS are different and cannot be directly compared. HCM is delay-based, whereas ICU is capacity-based. At times the two different measures of intersection performance give very different indications of overall traffic operations. In these situations, the HCM LOS can be used to determine average delays experienced by traffic while the ICU LOS can be used to determine how much reserve capacity is available at each intersection, and how frequently each intersection experiences congestion. A description of the conditions expected for each ICU LOS is provided in Table 7.

Table 7: ICU Level of Service

Level of Service	Intersection Capacity Utilization (%)	Characteristics
A	≤ 60%	The intersection has no congestion. A cycle length of 80 sec. or less will move traffic efficiently. All traffic should be served on the first cycle. Traffic fluctuations, accidents, and lane closures can be handled with minimal congestion. This intersection can accommodate up to 40% more traffic on all movements.
B	> 60% and ≤ 70%	The intersection has very little congestion. Almost all traffic will be served on the first cycle. A cycle length of 90 sec. or less will move traffic efficiently. Traffic fluctuations, accidents, and lane closures can be handled with minimal congestion. This intersection can accommodate up to 30% more traffic on all movements
C	> 70% and ≤ 80%	The intersection has no major congestion. Most traffic should be served on the first cycle. A cycle length of 100 sec. or less will move traffic efficiently. Traffic fluctuations, accidents, and lane closures may cause some congestion. This intersection can accommodate up to 20% more traffic on all movements.

Table 7: ICU Level of Service (cont'd)

Level of Service	Intersection Capacity Utilization (%)	Characteristics
D	> 80% and ≤ 90%	The intersection normally has no congestion. The majority of traffic should be served on the first cycle. A cycle length of 110 sec. or less will move traffic efficiently. Traffic fluctuations, accidents, lane closures and sub-optimal timing can cause congestion. This intersection can accommodate up to 10% more traffic on all movements.
E	>90% and ≤ 100%	The intersection is on the verge of congested conditions. Many vehicles are not served on the first cycle. A cycle length of 120 sec. is required to move all traffic. Minor traffic fluctuations, accidents, lane closures and sub-optimal timing can cause significant congestion. This intersection has less than 10% reserve capacity available.
F	> 100% and ≤ 110%	The intersection is over capacity and likely experiences congestion periods of 15 to 60 min. per day. Residual queues at the end of green are common. A cycle length over 120 sec. is required to move all traffic. Minor traffic fluctuations, accidents, and lane closures can cause increased congestion. Sub optimal signal timings can cause increased congestion.
G	> 110% and ≤ 120%	The intersection is 10% to 20% over capacity and likely experiences congestion periods of 60 to 120 min. per day. Long queues are common. A cycle length over 120 sec. is required to move all traffic. Motorists may be choosing alternate routes, if they exist, or making fewer trips during the peak hour. Signal timings can be used to "ration" capacity to the priority movements.
H	> 120%	The intersection is 20% over capacity and could experience congestion periods of over 120 min. per day. Long queues are common. A cycle length over 120 sec. is required to move all traffic. Motorists may be choosing alternate routes, if they exist, or make fewer trips during the peak hour. Signal timings can be used to "ration" capacity to the priority movements.

5.3 Traffic Analysis Methodology

5.3.1 Synchro

Intersections within the study area were analyzed using Synchro version 11 traffic analysis software. Synchro analyzes both signalized and un-signalized intersections in terms of LOS, v/c, delay, and queues according to the methodology detailed in the HCM 6th edition and calculates the ICU of overall intersection operations. Synchro can be used to evaluate existing operations or to optimize traffic signal phase configurations, timing splits, and cycle lengths. The program can also be used to optimize coordinated signal networks and their associated cycle offsets.

For purposes of this study, Synchro was used to analyze intersection operations under Pre and Post-Development traffic conditions.

5.3.2 Traffic Analysis Assumptions

To perform the traffic analyses several assumptions were made regarding existing traffic conditions at intersections in the study area. These include:

- All lanes were assumed to be minimum 3.7 meters wide,

- Ideal saturated flow for HCM analysis method = 1,900 veh/hr (equivalent to 1,800 pcu/hr in Canadian Capacity Guide),
- Minimum yellow clearance interval = 4.0 sec,
- Minimum all-red clearance interval = 2.0 sec,
- Minimum phase time = 11.0 sec (5.0 sec greentime + 6.0 sec yellow/all-red),
- The signal at PTH 9 / PTH 4 and Easton Dr (PTH 9A) was assumed to operate as actuated-uncoordinated with fully-protected left turns on the NB (PTH 9) and SB (PTH 4) approaches; other left turn phases were allowed to be permitted, protected-permitted or fully protected,
- Cycle lengths, offsets and splits were optimized for each traffic scenario,
- Zero pedestrian calls per crossing per hour,
- All cycle length and phasing optimization was completed by Synchro with further manual adjustment as necessary,
- ICU reference cycle length was set to 90 seconds,
- On-street parking was not permitted.

5.3.3 Traffic Control / Intersection Geometry Assumptions

Existing roadway and intersection geometry was used to analyze the 2021 Background traffic conditions. Since no roadway improvements are anticipated within the study area, the existing roadway and intersection geometry was also used as the basis for analyzing 2024 and 2034 Pre and Post-Development traffic conditions. All existing roads were analyzed with their existing speed limit; private accesses were assumed to have a posted speed of 50 km/hr.

Additional intersection and/or traffic control improvements necessary to provide acceptable traffic operations at study area intersections under either Pre or Post-Development traffic conditions are detailed in the traffic analysis results section below.

5.4 Peak Hour Traffic Analysis Results

Each intersection was analyzed using Synchro 11. Five traffic scenarios were analyzed, listed as follows:

- 2021 Background AM / PM peak hour,
- 2024 Pre-Development AM / PM peak hour,
- 2024 Post-Development AM / PM peak hour,
- 2034 Pre-Development AM / PM peak hour,
- 2034 Post-Development AM / PM peak hour.

The Synchro analysis results for the traffic scenarios analyzed are included in Appendix B and summarized below. All listed queue lengths are based on 95th percentile queues. For analysis purposes Easton Dr was oriented as an east-west roadway and PTH 4 as a north-south roadway.

Note, for design and planning purposes an overall intersection LOS of D or better is usually considered acceptable under peak hour traffic conditions. Possible mitigation measures were only investigated for intersections with overall LOS worse than D or for individual movements with LOS below E.

5.4.1 2021 Background Conditions AM/PM Peak Hour

2021 weekday AM and PM peak hour traffic conditions were analyzed with results as listed in Table 8.

Table 8: 2021 Weekday AM (PM) Peak Hour Periods

Intersection	Intersection HCM LOS / Delay (sec) / ICU %	HCM LOS / Delay (sec) / maximum v/c ratio [1]			
		EB Approach	WB Approach	NB Approach	SB Approach
PTH 9 /PTH 4 at Easton (signal)	C / 24.7 / 54% (C / 26.1 / 59%)	C / 24.1 / th 0.58 (C / 25.8 / th 0.45)	C / 24.2 / lt 0.24 (C / 26.0 / th 0.50)	C / 24.6 / lt 0.73 (C / 24.4 / lt 0.77)	C / 25.6 / lt 0.86 (C / 29.0 / lt 0.84)
Easton at Wersch (stop)	A / 3.0 / 37% (A/ 2.4 / 56%)	A / 2.3 / lt 0.07 (A / 2.0 / lt 0.06)	A / 2.3 / lt 0.03 (A / 0.9 / lt 0.02)	B / 11.4 / lt 0.09 [2] (B / 14.8 / lt 0.23) [2]	B / 10.7 / lt 0.07 (B / 11.9 / lt 0.12)
PTH 4 at Walker (stop)	A / 0.9 / 27% (A / 0.8 / 38%)	B / 10.7 / lt 0.01 (B / 11.4 / lt 0.02)	B / 11.8 / lt 0.01 (B / 13.4 / lt 0.04)	A / 0.8 / lt 0.01 (A / 0.3 / lt 0.01)	A / 0.1 / lt 0.0 (A / 0.0 / lt 0.0)

[1] maximum v/c ratio on left turn (lt), through (th), or right turn (rt) movement

[2] HCM 2000 results are listed for NB approach since HCM 6th does not properly analyze existing NB lane configuration

Intersection operations during the weekday AM and PM peak hours with 2021 Background traffic volumes are discussed below.

- The signal at the PTH 9 / PTH 4 and Easton was set to actuated-uncoordinated with NB/SB protected lefts, a cycle length of C = 90 sec. and optimized splits during the AM and PM peaks,
- All study area intersections operate at LOS C or better during both the AM and PM peak periods,
- All approaches operate at LOS C or better with v/c ratios below 1.0 indicating there is capacity remaining to accommodate additional traffic,
- ICU at all intersections is relatively low with a maximum of 59 % at the PTH 9 / PTH 4 at Easton intersection,
- At intersections with left and right turn auxiliary lanes, all queues are contained within available storage and through queues do not block entry.

Based on the results listed above, no improvements to existing intersection geometry and/or traffic control are required to address operational issues under 2021 background traffic conditions.

5.4.2 2024 Pre-Development AM/PM Peak Hour

The existing intersection geometry and traffic control were maintained for the 2024 design year. Traffic analysis results for weekday AM and PM peak hours with 2024 Pre-Development traffic volumes are listed in Table 9.

Intersection operations during the weekday AM and PM peak hours with 2024 Pre-Development traffic volumes are discussed below.

- The signal at the PTH 9 / PTH 4 and Easton was set to actuated-uncoordinated with NB/SB protected lefts, a cycle length of C = 90 sec. and optimized splits during the AM and PM peaks,
- All study area intersections operate at LOS C or better during both the AM and PM peak periods,
- All approaches operate with v/c ratios below 1.0 indicating there is capacity remaining to accommodate additional traffic,

- ICU at all intersections is relatively low with a maximum of 60 % at the PTH 9 / PTH 4 at Easton intersection,
- At intersections with left and right turn auxiliary lanes, all queues are contained within available storage and through queues do not block entry.

Table 9: 2024 Pre-Development Weekday AM (PM) Peak Hour Periods

Intersection	Intersection HCM LOS / Delay (sec) / ICU %	HCM LOS / Delay (sec) / maximum v/c ratio [1]			
		EB Approach	WB Approach	NB Approach	SB Approach
PTH 9 /PTH 4 at Easton (signal)	C / 24.6 / 55% (C / 26.5 / 60%)	C / 23.5 / th 0.58 (C / 26.0 / th 0.45)	C / 23.7 / lt 0.25 (C / 26.2 / th 0.51)	C / 25.3 / lt 0.75 (C / 25.1 / lt 0.77)	C / 25.4 / lt 0.85 (C / 29.5 / lt 0.84)
Easton at Wersch (stop)	A / 3.0 / 38% (A/ 2.4 / 58%)	A / 2.3 / lt 0.07 (A / 2.0 / lt 0.07)	A / 2.3 / lt 0.03 (A / 0.9 / lt 0.03)	B / 11.6 / lt 0.10 [2] (C / 15.6 / lt 0.25) [2]	B / 11.0 / lt 0.08 (B / 12.2 / lt 0.14)
PTH 4 at Walker (stop)	A / 0.9 / 28% (A / 0.8 / 39%)	B / 10.8 / lt 0.02 (B / 11.6 / lt 0.02)	B / 12.1 / lt 0.01 (B / 13.8 / lt 0.05)	A / 0.8 / lt 0.01 (A / 0.3 / lt 0.01)	A / 0.1 / lt 0.0 (A / 0.0 / lt 0.0)

[1] maximum v/c ratio on left turn (lt), through (th), or right turn (rt) movement

[2] HCM 2000 results are listed for NB approach since HCM 6th does not properly analyze existing NB lane configuration

Based on the results listed above, no improvements to existing intersection geometry and/or traffic control are required to address operational issues under 2024 Pre-Development traffic conditions.

5.4.3 2024 Post-Development Weekday AM and PM Peak Hour

The traffic analysis model was revised to include the site accesses from Walker Ave. The 2024 Post-Development weekday AM and PM peak hour traffic analysis results are listed in Table 10.

Table 10: 2024 Post-Development Weekday AM (PM) Peak Hour Periods

Intersection	Intersection HCM LOS / Delay (sec) / ICU %	HCM LOS / Delay (sec) / maximum v/c ratio [1]			
		EB Approach	WB Approach	NB Approach	SB Approach
PTH 9 /PTH 4 at Easton (signal)	C / 24.8 / 56% (C / 26.8 / 65%)	C / 25.4 / th 0.59 (C / 27.5 / th 0.47)	C / 25.9 / lt 0.27 (C / 27.7 / th 0.52)	C / 22.7 / lt 0.77 (C / 26.1 / lt 0.78)	C / 25.9 / lt 0.85 (C / 26.3 / lt 0.80)
Easton at Wersch (stop)	A / 2.9 / 38% (A/ 2.3 / 59%)	A / 2.3 / lt 0.07 (A / 1.9 / lt 0.07)	A / 1.9 / lt 0.03 (A / 0.9 / lt 0.03)	B / 11.7 / lt 0.10 [2] (C / 15.9 / lt 0.26) [2]	B / 11.2 / lt 0.08 (B / 12.4 / lt 0.14)
PTH 4 at Walker (stop)	A / 0.9 / 33% (A / 4.2 / 45%)	B / 11.0 / lt 0.02 (B / 11.7 / lt 0.02)	B / 11.9 / lt 0.03 (C / 18.7 / lt 0.36)	A / 0.4 / lt 0.01 (A / 0.3 / lt 0.01)	A / 0.3 / lt 0.01 (A / 0.2 / lt 0.01)
Walker at Truck Access (stop)	A / 0.5 / 21% (A / 0.5 / 21%)	A / 0.0 / th 0.0 (A / 0.0 / th 0.0)	A / 0.0 / th 0.0 (A / 0.0 / th 0.0)	B / 10.5 / lt 0.01 (B / 10.6 / lt 0.01)	n/a n/a
Walker at Staff Access (stop)	A / 0.7 / 14% (A / 7.7 / 21%)	A / 0.0 / th 0.0 (A / 0.0 / th 0.0)	A / 5.0 / lt 0.01 (A / 0.0 / lt 0.0)	A / 0.0 / lt 0.0 (A / 9.2 / lt 0.14)	n/a n/a

[1] maximum v/c ratio on left turn (lt), through (th), or right turn (rt) movement

[2] HCM 2000 results are listed for NB approach since HCM 6th does not properly analyze existing NB lane configuration

Intersection operations under 2024 Post-Development traffic conditions are discussed below.

- The signal at the PTH 9/PTH 4 and Easton was set to actuated-uncoordinated with NB/SB protected lefts, a cycle length of C = 90 sec. and optimized splits during the AM and PM peaks,
- All study area intersections continue to operate at LOS C or better during both the AM and PM peak periods,
- All approaches operate with v/c ratios similar to 2024 Pre-Development conditions,
- Delays on approaches at the PTH 9/PTH 4 at Easton intersection increase slightly (1-2 sec/veh) with Post-Development traffic but the LOS on all approaches remains C,
- At Walker Ave the WB approach LOS reduces from B to C during the PM peak compared to Pre-Development conditions but the v/c of 0.36 indicates there is substantial capacity remaining on the WB approach,
- ICU remains relatively low with a maximum of 65 % at the PTH 9/PTH 4 at Easton intersection,
- At the PTH 9/PTH 4 at Easton and Easton at Wersch intersections, left and right turn queues increase slightly but all queues are contained within available storage lanes and through queues do not block entry.

Based on the results listed above, no improvements to existing intersection geometry and/or traffic control are required to address operational issues under 2024 Post-Development traffic conditions.

5.4.4 2034 Pre-Development Weekday AM and PM Peak Hour

The existing intersection geometry and traffic control were maintained for the 2034 design year. Traffic analysis results for weekday AM and PM peak hours with 2034 Pre-Development traffic volumes are listed in Table 11.

Table 11: 2034 Pre-Development Weekday AM (PM) Peak Hour Periods

Intersection	Intersection HCM LOS / Delay (sec) / ICU %	HCM LOS / Delay (sec) / maximum v/c ratio [1]			
		EB Approach	WB Approach	NB Approach	SB Approach
PTH 9 /PTH 4 at Easton (signal)	C / 25.1 / 59% (C / 28.4 / 67%)	C / 24.0 / th 0.60 (C / 27.1 / th 0.48)	C / 24.9 / lt 0.31 (C / 27.2 / th 0.54)	C / 28.1 / lt 0.76 (C / 27.9 / lt 0.80)	C / 24.0 / lt 0.72 (C / 32.1 / lt 0.83)
Easton at Wersch (stop)	A / 3.1 / 44% (A/ 2.6 / 66%)	A / 2.3 / lt 0.09 (A / 2.1 / lt 0.08)	A / 2.4 / lt 0.04 (A / 0.9 / lt 0.03)	B / 12.7 / lt 0.13 [2] (C / 20.4 / lt 0.38) [2]	B / 11.9 / lt 0.11 (B / 14.1 / lt 0.20)
PTH 4 at Walker (stop)	A / 0.9 / 31% (A / 0.9 / 44%)	B / 11.3 / lt 0.03 (B / 12.6 / lt 0.03)	B / 13.3 / lt 0.02 (C / 16.1 / lt 0.07)	A / 0.8 / lt 0.02 (A / 0.3 / lt 0.01)	A / 0.1 / lt 0.0 (A / 0.0 / lt 0.0)

[1] maximum v/c ratio on left turn (lt), through (th), or right turn (rt) movement

[2] HCM 2000 results are listed for NB approach since HCM 6th does not properly analyze existing NB lane configuration

Intersection operations during the weekday AM and PM peak hours with 2034 Pre-Development traffic volumes are discussed below.

- The signal at the PTH 9 / PTH 4 and Easton was set to actuated-uncoordinated with NB/SB protected lefts, a cycle length of C = 90 sec. and optimized splits during the AM and PM peaks,
- All study area intersections operate at LOS C or better during both the AM and PM peak periods,
- Approach delays increase slightly compared to 2024 Pre-Development conditions, but all approaches continue to operate at LOS C or better,

- Compared to 2024 Pre-Development conditions, v/c ratios increase slightly but remain below 1.0 indicating there is capacity remaining to accommodate additional traffic,
- ICU at all intersections is relatively low with a maximum of 67 % at the PTH 9/PTH 4 at Easton intersection,
- At the PTH 9/PTH 4 at Easton and Easton at Wersch intersections all left and right turn lane queues remain less than the available storage length and through lane queues do not block entry.

Based on the results listed above, no improvements to existing intersection geometry and/or traffic control are required to address operational issues under 2034 Pre-Development traffic conditions.

5.4.5 2034 Post-Development Weekday AM and PM Peak Hour

The 2034 Post-Development weekday AM and PM peak hour traffic analysis results are listed in Table 12. As previously, existing intersection geometry and traffic control were maintained but the analysis model was revised to include the GMF truck and staff accesses on Walker Ave.

Table 12: 2034 Post-Development Weekday AM (PM) Peak Hour Periods

Intersection	Intersection HCM LOS / Delay (sec) / ICU %	HCM LOS / Delay (sec) / maximum v/c ratio [1]			
		EB Approach	WB Approach	NB Approach	SB Approach
PTH 9 /PTH 4 at Easton (signal)	C / 25.9 / 60% (C / 28.7 / 71%)	C / 24.9 / th 0.61 (C / 27.8 / th 0.49)	C / 26.0 / lt 0.32 (C / 28.0 / th 0.55)	C / 25.3 / lt 0.76 (C / 28.7 / lt 0.81)	C / 27.3 / lt 0.84 (C / 30.1 / lt 0.81)
Easton at Wersch (stop)	A / 3.0 / 46% (A/ 2.6 / 67%)	A / 2.3 / lt 0.09 (A / 2.0 / lt 0.08)	A / 2.0 / lt 0.04 (A / 0.9 / lt 0.03)	B / 12.9 / lt 0.13 [2] (C / 21.0 / lt 0.39) [2]	B / 12.2 / lt 0.11 (B / 14.3 / lt 0.20)
PTH 4 at Walker (stop)	A / 1.0 / 36% (A / 4.7 / 49%)	B / 11.5 / lt 0.03 (B / 12.7 / lt 0.03)	B / 13.0 / lt 0.03 (C / 24.3 / lt 0.45)	A / 0.5 / lt 0.02 (A / 0.3 / lt 0.01)	A / 0.3 / lt 0.01 (A / 0.2 / lt 0.01)
Walker at Truck Access (stop)	A / 0.5 / 21% (A / 0.4 / 21%)	A / 0.0 / th 0.0 (A / 0.0 / th 0.0)	A / 0.0 / th 0.0 (A / 0.0 / th 0.0)	B / 10.5 / lt 0.01 (B / 10.6 / lt 0.01)	n/a n/a
Walker at Staff Access (stop)	A / 0.7 / 14% (A / 7.5 / 21%)	A / 0.0 / th 0.0 (A / 0.0 / th 0.0)	A / 4.6 / lt 0.01 (A / 0.0 / lt 0.0)	A / 0.0 / lt 0.0 (A / 9.3 / lt 0.14)	n/a n/a

[1] maximum v/c ratio on left turn (lt), through (th), or right turn (rt) movement

[2] HCM 2000 results are listed for NB approach since HCM 6th does not properly analyze existing NB lane configuration

Intersection operations under 2034 Post-Development traffic conditions are discussed below.

- The signal at the PTH 9/PTH 4 and Easton was set to actuated-uncoordinated with NB/SB protected lefts, a cycle length of C = 90 sec. and optimized splits during the AM and PM peaks,
- All study area intersections continue to operate at LOS C or better during both the AM and PM peak periods,
- All approaches operate with v/c ratios similar to 2034 Pre-Development conditions; all are below 1.0 indicating there is capacity remaining to accommodate additional traffic,
- Delays on approaches at the PTH 9/PTH 4 at Easton intersection increase slightly (1-3 sec/veh) with Post-Development traffic but the minimum LOS on all approaches remains C,
- At Walker Ave delays on the WB approach during the PM peak increase from 16.1 to 24.3 sec/veh but the LOS remains C and the v/c of 0.45 indicates there is substantial capacity remaining on the WB approach,

- ICU remains relatively low with a maximum of 71% at the PTH 9/PTH 4 at Easton intersection,
- At the PTH 9/PTH 4 at Easton and Easton at Wersch intersections, left and right turn queues increase slightly with Post-Development traffic, but all queues are contained within available storage lanes and through queues do not block entry.

Based on the results listed above, no improvements to existing intersection geometry and/or traffic control are required to address operational issues under 2034 Post-Development traffic conditions.

5.5 Traffic Signal Warrant Analysis

In addition to peak hour traffic analyses, TIS's typically include traffic signal warrant analyses (TSWA) to determine if traffic signal control is warranted at study area intersections. The TSWA considers six hour peak average traffic volumes and determines if conflicting traffic volumes warrant the use of traffic signal control. The six-hour peak average traffic volume is derived by summing traffic volumes from the peak two hours in the morning, midday and in the afternoon and dividing by six. The TWSA procedure calculates traffic signal warrant priority points for a particular intersection.

5.5.1 MTI Traffic Signal Warrant Policy

Based on MTI's Traffic Signal Warrant Policy No. 400-A-2 (Draft – July 2016) traffic signals are warranted in urban and rural areas if the following criteria is met:

Urban Areas

- A minimum of 100 priority points is required for urban areas with populations greater than 20,000,
- In communities with populations between 6,500 and 20,000, the signal warrant threshold will be based on a priority point sliding scale that ranges from 50 to 100 points using the following equation:

  Priority Points = (0.0037) x (population) + 26
- A minimum of 50 priority points is required in communities with a population of less than 6,500.

The priority points equation was derived from a graph of signal warrant thresholds by population included in the Signal Warrant Policy No. 400-A-2 and shown in Figure 13.

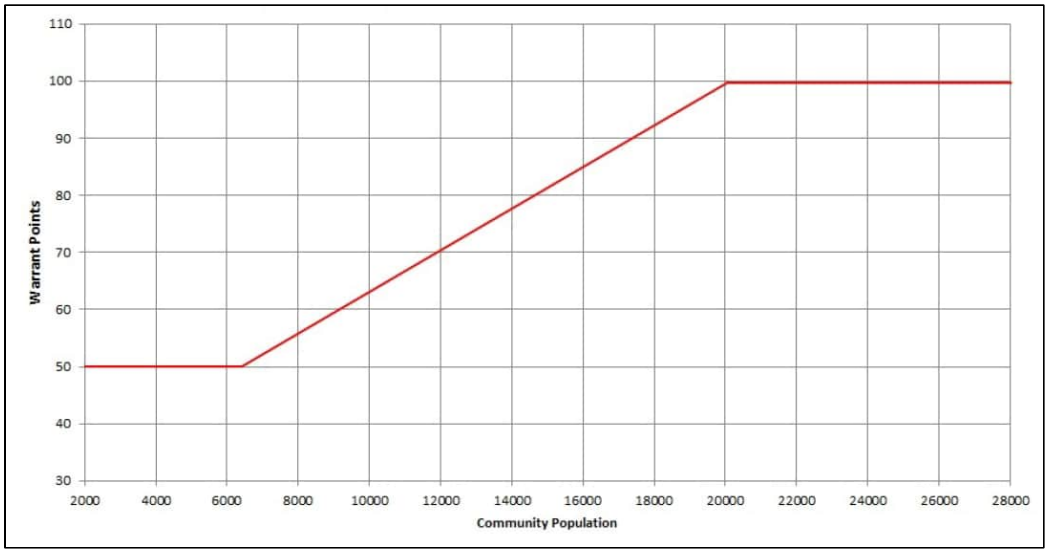


Figure 13: Signal Warrant Thresholds by Population

Rural Areas

- A minimum warrant of 50 priority points is required, and,
- An engineering review indicates there are operational issues that would be improved by the installation of a traffic signal, and,
- No negative conditions created by the traffic signal installation, such as:
  - too close to an adjacent traffic signal or interchange on/off ramp,
  - too close to an adjacent railway level crossing,
  - if it would create an unacceptable increase in traffic volumes on the cross street.

5.5.2 Study Area Intersection TSWA

The two stop controlled intersections included in the study area, Easton Dr at Wersch St and PTH 4 at Walker Ave, both operate at an overall LOS A with minimal delays under 2024 and 2034 Pre and Post-Development traffic conditions. Based on this, there is no need to improve traffic operations by installing traffic signals. As a result, TSWA's were not completed for these locations.

5.6 Rural Intersection Warrant Analysis

In addition to the peak hour traffic analysis and the traffic signal warrant analyses, rural intersection warrants are typically reviewed to determine if intersection improvements are necessary. These warrants are described in MTI's *Warrants and Standards for Intersection Treatments of Rural Two-Lane Highways: Design Guide*. The rural intersection warrants consider daily and peak hour traffic volumes and determine if geometric improvements such as intersection channelization, bypass lanes, or widening are needed. The rural intersection warrants are intended to be applied at rural intersections under two-way stop control where the two-lane highway operates at a high speed. The warrants are not applicable to urban intersections or signalized intersections.

The Easton Dr at Wersch St intersection has already been widening to provide WB left and EB right turn lanes as well as channelized right turns on the south side of the intersection. Also, Easton Dr operates as an urban roadway with a speed limit of 70 km/hr. For these reasons the rural intersection warrants were not applied to this location.

The warrants can be considered at PTH 4 and Walker Ave which operates as a high speed rural intersection. The warrants were completed according to the methodology and in the order specified in Section 1.3.2.2 of the warrant Design Guide. The warrants used the 2034 Post-Development AM and PM peak hour traffic volumes shown in Figure 12. The results of the warrant analysis at the PTH 4 and Walker Ave intersection are detailed below.

5.6.1 Right Turn Cut-Off Warrant

The right turn cut-off warrant was completed for NB right turns from PTH 4 to Walker Ave. The warrant uses average daily right turn traffic volume which was calculated used the following formula from the warrant Design Guide:

$$AADT_{\text{right turn}} = (V_{\text{right}} + V_{\text{returning lefts}}) / (2 \times 0.15)$$

The formula assumes peak hour volume represents 15% of the daily traffic volume. As per the trip routing detailed in Section 4.2.2, all employee trips approach and depart the development from the south on PTH 4. Because inbound employee trips making a NB right from PTH 4 to Walker Ave only occur during the AM peak and returning employee trips making a WB left from Walker Ave to PTH 4 only occur during the PM peak, these volumes were not included in the formula but were added separately to determine the

right turn AADT. Although there are no trucks making a NB right/WB left, a minimum truck percentage of 10% was assumed.

The AADT $_{\text{right turn}}$ was calculated to be 394 veh/day. Using this value along with 10% trucks, Figure 1.3 of the warrant Design Guide indicates a right turn cut-off is not warranted.

5.6.2 Left Turn Bay Warrant

The left turn bay warrant was completed for the NB and SB left turn movements during the AM and PM peak hours.

For the NB left during the AM peak, the volume advancing (V_a), volume opposing (V_o), left turn volume (V_{left}), and left turn ratio (L) were calculated as follows:

V_a = 307 veh/hr

V_o = 321 veh/hr

V_{left} = 17 veh/hr

$L = (V_{left} / V_a) = 17 / 307 = 0.055$

From Figure 1.2.a of the warrant Design Guide, a left turn bay to service the NB left is warranted during the AM peak period.

A left turn bay is not warranted for the NB left during the PM peak or for the SB left during the AM or PM peaks because the left turn ratio on these movements is less than the minimum of 0.05.

5.6.3 Right Turn Conflict Warrant

The right turn conflict warrant was completed for the NB right turn during the AM and PM peak hours.

During the AM peak, the volume advancing (V_a), right turn volume (V_{right}), and right turn ratio (V_{right} / V_a) were calculated as follows:

V_a = 290 veh/hr

V_{right} = 131 veh/hr

$V_{right} / V_a = 131 / 290 = 0.45$

(As per the warrant Design Guide, since a NB left turn bay is already warranted the V_a calculated above does not include NB left turn volume)

From Figure 1.4 of the warrant Design Guide, a NB right turn cut-off is warranted during the AM peak period.

A NB right turn cut-off is not warranted during the PM peak because the right turn ratio is less than the minimum of 0.05.

5.6.4 Bypass Intersection Warrant

The bypass lane warrant was completed for the NB and SB left turn movements during the AM and PM peak hours.

For the NB left during the AM peak, the volume advancing (V_a), volume opposing (V_o), left turn volume (V_{left}), and left turn ratio (L) were calculated as follows:

V_a = 307 veh/hr

V_o = 321 veh/hr

V_{left} = 17 veh/hr

L = 17 / 307 = 0.055

From Figure 1.2.b of the warrant Design Guide, a bypass lane to service NB left turn movements is warranted during the AM peak period.

A bypass lane to service the NB left is not warranted during the PM peak or for the SB left during the AM or PM peaks because the left turn ratio on these movements is less than the minimum of 0.05.

5.6.5 Widened Intersection Warrant

The widened intersection warrant was completed for the NB and SB left turn movements. The PTH 4 AADT of 3,550 veh/day exceeds the minimum warrant criteria for major road AADT of 600 veh/day. The left turn movement AADT was calculated as follows:

NB left AADT = (7 + 12) / (2 x 0.15) = 97 veh/day

SB left AADT = (10 + 7) / (2 x 0.15) = 57 veh/day

(The average of 7 truck trips per hour on the SB left generated by the development were included in the formula since these occur throughout the day instead of just during peak periods)

Since the NB and SB left turn AADT both exceed the minimum warrant criteria of 50 veh/day, a widened intersection is warranted.

5.6.6 Minor Road Analysis

From the requirements listed in the warrant Design Guide, a widened approach and compound radii at major road intersection are warranted on the minor road approach when the design vehicle is a WB-15 or larger, and truck volumes make up 10% or more of the total traffic turning to or from the major highway.

Based on the truck traffic turning SB left from PTH 4 onto Walker Ave and returning WB right, widening the east leg of Walker Ave using 15:1 tapers and improving right turn radii to provide compound curves that can accommodate WB-20 trucks is warranted.

5.6.7 Warrant Analysis Summary

The results of the warrant analyses at the PTH 4 and Walker Ave intersection are summarized as follows:

- A left turn bay to service the NB left turn movement is warranted based on AM peak traffic,
- A NB right turn cut-off is warranted based on AM peak traffic,
- A bypass intersection improvement is warranted based on AM peak traffic,
- A widened intersection improvement is warranted based on NB/SB left turn AADT,
- Widening the east leg of Walker Ave using 15:1 tapers and improving the right urn radii using compound curves that accommodate WB-20 trucks is warranted.

Both the widened and bypass intersection improvements are warranted. In these cases, the bypass intersection treatment is generally preferred as it provides more storage for left and right turn traffic. Examples of widened and bypass intersections from MTI's warrant Design Guide are provided in Figures 14 and 15 respectively.

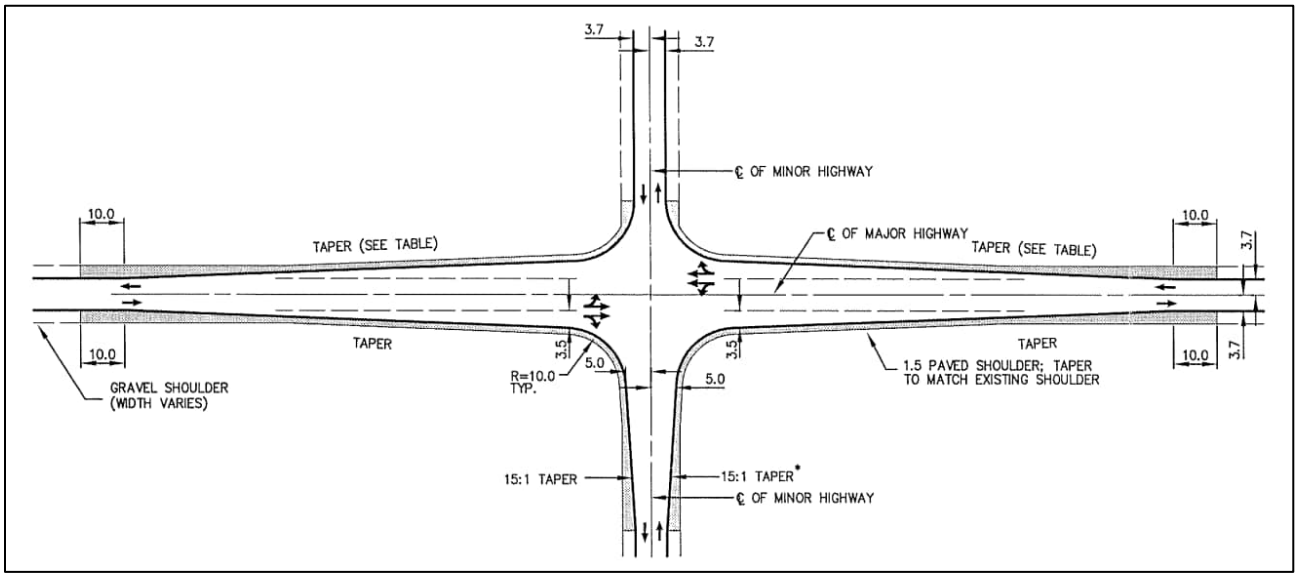


Figure 14: Widened Intersection Example

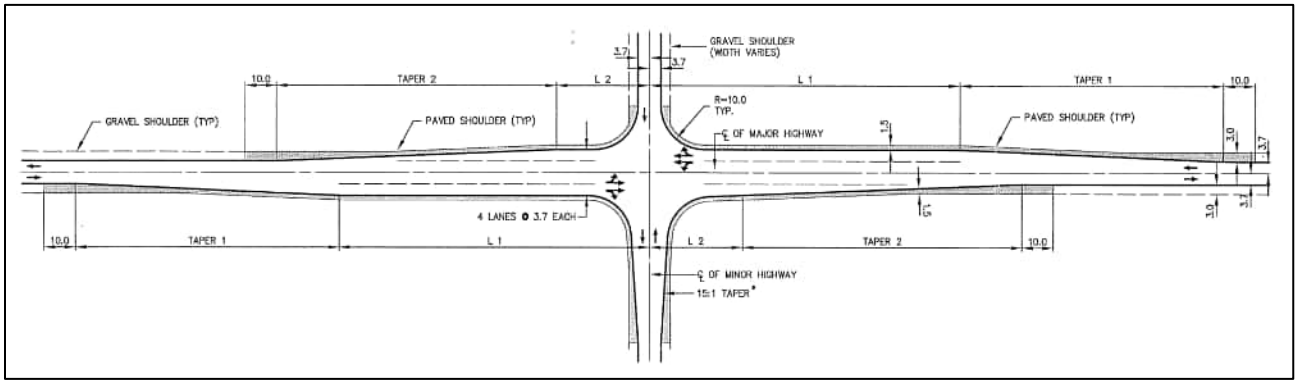


Figure 15: Bypass Intersection Example

Both the widened and bypass intersection treatments eliminate the need for a separate NB right turn bay and a NB right turn cut-off. Also, since SB right turn volumes for the 2034 Post-Development traffic scenario are extremely low (1 veh/hr during the AM peak, 3 veh/hr during the PM peak), a SB left turn only lane with an adjacent SB through+right lane could be considered instead of the SB through+left and through+right lanes that are typically installed as part of a widened or bypass intersection treatment.

6. Summary and Recommendations

6.1 Traffic Impact Analysis Summary

The results of the TIS are summarized as follows:

- Canadian Premium Sand Inc. (CPS) plans to build a Glass Manufacturing Facility (GMF) in Selkirk, MB. The proposed facility is located on the northeast corner of the PTH 9/PTH 4 at Easton Dr (PTH 9A) intersection.
- As currently proposed, the 85-acre site will include the following land uses:
  - 1,048,000 ft^2 heavy industrial manufacturing,
  - 30,000 ft^2 office building.
- Development of the GMF will occur in two phases with the office building and one 524,000 ft^2 glass manufacturing plant complete by 2024. The timing of Phase 2, which will add a second 524,000 ft^2 glass manufacturing plant, will depend on market demand for the finished glass product.
- To simplify the TIS analysis, it was assumed Phase 1 and 2 of the GMF would be developed at the same time with full build-out of the development by 2024 with no interim phases.
- Access to the GMF development is proposed as follows:
  - All access to the facility will be from PTH 4 via Walker Ave,
  - A truck access is located on the south side of Walker Ave approx. 230 m east of PTH 4,
  - A separate access to the office building and staff parking area is located on the south side of Walker Ave approx. 330 m east of PTH 4.
- The purpose of this TIS is to estimate the type and quantity of traffic generated by the proposed GMF development, determine potential impacts from this traffic on study area intersections, and recommend improvements to ensure traffic generated by the development can be safely accommodated.
- The scope of the TIS included the following intersections:
  - Easton Dr (PTH 9A) at Wersch St (existing traffic control: 2-way stop),
  - Easton Dr (PTH 9A) at PTH 9/PTH 4 (existing traffic control: traffic signal),
  - PTH 4 at Walker Ave (existing traffic control: 2-way stop),
  - Site accesses from Walker Ave (proposed traffic control: 2-way stop).
- PTH 9 south and west of the development and PTH 4 north of the development are 2-lane rural highways with posted speed limit of 100 km/hr. At the Easton Dr (PTH 9A) intersection, speeds reduce to 70 km/hr and the highways widen to provide a divided cross-section with left and right turn lanes. Easton Dr is a 2-lane roadway with a speed limit of 70 km/hr. The roadway widens at the PTH 9/PTH 4 and Wersch St intersections to provide a centre median and left/right turn storage lanes. As far as AECOM is aware, there are no planned roadway improvements within the study area.
- Five different traffic analysis scenarios were included in the TIS:
  - 2021 Background traffic conditions,
  - 2024 Pre-Development traffic conditions,
  - 2024 Post-Development traffic conditions including traffic generated by full build-out of the GMF development,
  - 2034 Pre-Development traffic conditions,
  - 2034 Post-Development traffic conditions including traffic generated by the development (full build-out plus 10 years).

- Based on historical AADT data, existing (background) traffic was projected to the 2024 and 2034 design years using a growth rate of 2.0%.
- Trip generation estimates for the GMF development were calculated using data supplied by CPS based on based on past experience at similar facilities.
- At full build-out (2024 design year) the GMF development is expected to generate 150 trips (143 inbound, 7 outbound) during the AM peak hour, and 150 trips (7 inbound, 143 outbound) during the PM peak hour.
- All generated trips were considered new or primary trips with no reductions due to pass-by, internal capture or mode split.
- Trips generated by the GMF were distributed on area roadways as follows:
  - 30% from/to Selkirk,
  - 10% from/to areas north and west of Selkirk,
  - 60% from/to Winnipeg south of Selkirk.
- 2021 Background traffic analysis results:
  - All study area intersections operate at LOS C or better during both the AM and PM peak periods,
  - All approaches operate at LOS C or better with v/c ratios below 1.0 indicating there is capacity remaining to accommodate additional traffic,
  - ICU at all intersections is relatively low with a maximum of 59 % at the PTH 9/PTH 4 at Easton Dr (PTH 9A) intersection,
  - 95th% queues are accommodated by existing left/right turn lanes and through queues do not block storage lanes.
- 2024 Pre-Development traffic analysis results:
  - All study area intersections operate at LOS C or better during both the AM and PM peak periods,
  - All approaches operate with v/c ratios below 1.0 indicating there is capacity remaining to accommodate additional traffic,
  - ICU at all intersections is relatively low with a maximum of 60 % at the PTH 9/PTH 4 at Easton Dr (PTH 9A) intersection,
  - 95th% queues are accommodated by existing left/right turn lanes and through queues do not block storage lanes.
- 2024 Post-Development traffic analysis results:
  - All study area intersections continue to operate at LOS C or better during both the AM and PM peak periods,
  - All approaches operate with v/c ratios similar to 2024 Pre-Development conditions,
  - Delays on approaches at the PTH 9/PTH 4 at Easton Dr (PTH 9A) intersection increase slightly (1-2 sec/veh) with Post-Development traffic but the LOS on all approaches remains C,
  - At Walker Ave the WB approach LOS reduces from B to C during the PM peak compared to Pre-Development conditions but the v/c of 0.36 indicates there is substantial capacity remaining,
  - ICU remains relatively low with a maximum of 65 % at the PTH 9/PTH 4 and Easton Dr (PTH 9A) intersection,
  - 95th% queues increase slightly but continue to be less than the available left/right turn lane storage and queues on through movements do not block entry to auxiliary lanes.
- 2034 Pre-Development traffic analysis results:
  - All study area intersections operate at LOS C or better during both the AM and PM peak periods,
  - Approach delays increase slightly compared to 2024 Pre-Development conditions, but all approaches continue to operate at LOS C or better,

  - V/c ratios increase slightly but remain below 1.0 indicating there is capacity remaining to accommodate additional traffic,
  - ICU at all intersections is relatively low with a maximum of 67% at the PTH 9/PTH 4 at Easton Dr (PTH 9A) intersection,
  - 95th% queues are accommodated by existing left/right turn lanes and through queues do not block storage lanes.

- 2034 Post-Development traffic analysis results:
  - All study area intersections continue to operate at LOS C or better during both the AM and PM peak periods,
  - All approaches operate with v/c ratios similar to 2034 Pre-Development conditions; all are below 1.0 indicating there is capacity remaining to accommodate additional traffic,
  - Delays on approaches at the PTH 9/PTH 4 at Easton Dr (PTH 9A) intersection increase slightly (1-3 sec/veh) with Post-Development traffic but the minimum LOS on all approaches remains C,
  - At Walker Ave delays on the WB approach during the PM peak increase from 16.1 to 24.3 sec/veh but the LOS remains C and the maximum v/c of 0.45 indicates there is substantial capacity remaining on the WB approach,
  - ICU remains relatively low with a maximum of 71% at the PTH 9/PTH 4 at Easton Dr (PTH 9A) intersection,
  - 95th% queues are accommodated by existing left/right turn lanes and through queues do not block storage lanes.

- Because the 2-way stop controlled intersections at Easton Dr (PTH 9A) and Wersch St and at PTH 4 and Walker Ave operate at LOS A with minimal delays under 2024 and 2034 Pre and Post-Development traffic conditions, there is no need to improve operations by installing signals. Consequently, traffic signal warrant analyses were not completed at these two locations.

- An intersection improvement warrant analysis was completed for the PTH 4 at Walker Ave intersection using MTI's *Warrants and Standards for Intersection Treatments of Rural Two-Lane Highways: Design Guide*. The results of the warrant analysis are summarized as follows:
  - A left turn bay to service the NB left turn movement is warranted based on AM peak traffic,
  - A NB right turn cut-off is warranted based on AM peak traffic,
  - A bypass intersection improvement is warranted based on AM peak traffic,
  - A widened intersection improvement is warranted based on NB/SB left turn AADT,
  - Widening the east leg of Walker Ave using 15:1 tapers and improving the right turn radii using compound curves that accommodate WB-20 trucks is warranted.

6.2 Recommendations

Based on the TIS results summarized above, the following recommendations can be made:

- Under 2021 background traffic conditions all intersections operate at an overall LOS C or better. No improvements to existing intersection geometry and/or traffic control are required to address operational issues.

- Under 2024 Pre and Post-Development traffic conditions all intersections continue to operate at an overall LOS C or better. No improvements to existing intersection geometry and/or traffic control are required to address operational issues.

- Under 2034 Pre and Post-Development traffic conditions all intersections continue to operate at an overall LOS C or better. No improvements to existing intersection geometry and/or traffic control are required to address operational issues.

- Based on MTI's rural intersection improvement warrants, improve the PTH 4 at Walker Ave intersection to include the following:
    - A bypass intersection improvement,
    - Consider installing a SB left only lane instead of a SB through+left lane as part of the bypass improvement,
    - Widen the east leg of Walker Ave using 15:1 tapers and improve right turn radii using compound curves which accommodate WB-20 truck movements.

A concept plan of the proposed improvements at the PTH 4 and Walker Ave intersection is provided in Appendix C.

Appendix A Traffic Count Data

INTERSECTION TURNING MOVEMENT TRAFFIC COUNT - AM PEAK

INTERSECTION: PTH 9 / PTH 4 (N / S) & Easton Dr (PTH 9A) (E / W)

DATE: October 7, 2021

DIRECTION

TIME	Eastbound			Westbound			Northbound			Southbound			SUB TOTALS	TOTAL	Consec 1 Hr. Totals
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT			
7:30	5	23	17	2	7	3	6	9	16	12	21	7	128		
7:45	5	7	6	1				3		4	7	3	36	164	
7:45	5	37	22	7	8	3	2	12	37	12	31	6	182		
8:00	5	22	7			2	1	4	4	6	14	4	69	251	
8:00	2	35	15	6	4	2	5	9	18	7	15	2	120		
8:15	1	13	15	1		2	3		2	4	12	3	56	176	
8:15	6	28	18	2	9	3	6	15	16	15	29	8	155		
8:30	2		7	2		1	1	5	2	7	12	6	45	200	791
8:30	2	23	14	5	10	3	11	18	15	8	17	3	129		
8:45	3	17	13	4	2	4	1	3		7	9	2	65	194	821
8:45	3	28	13	7	14	4	5	18	5	17	28	2	144		
9:00	2	7	7	8	1		1	2	1	5	12	3	3 47	194	764
9:00	6	34	16	10	9	4	22	17	18	17	22	4	179		
9:15	4	10	8	1	1	2	1	1	4	3	11	3	1 48	228	816
9:15	5	28	20	3	7	6	24	15	17	13	23	6	167		
9:30	3	8	8	2	2	3		3	2	8	11	2	52	219	**835**
TOTAL	34	236	135	42	68	28	81	113	142	101	186	38	1204		
	25	84	71	19	2 4	14	8	2 20	15	44	88	26	4 418	1626	
8:30	16	113	63	25	40	17	62	68	55	55	90	15	619		**PEAK HOUR**
9:30	12	42	36	15	2 4	9	3	2 8	7	23	43	10	4 212	835	

COMPILED BY: SBC

A		
B	C	D

LEGEND: Private Vehicles=A Buses=B Single Unit Trucks=C Tractor Trailer Units=D

INTERSECTION TURNING MOVEMENT TRAFFIC COUNT - PM PEAK

INTERSECTION: PTH 9 / PTH 4 (N / S) & Easton Dr (PTH 9A) (E / W)

DATE: September 29, 2021

DIRECTION

TIME	Eastbound			Westbound			Northbound			Southbound			SUB TOTALS	TOTAL	Consec 1 Hr. Totals
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT			
15:00	0	11	10	7	26	9	27	33	10	4	18	6	161		
15:15	1	8	4	1	1	1	1	1	2	2	12	3	36	197	
15:15	1	21	16	10	35	9	32	20	9	5	17	2	177		
15:30	1	14	9			1		4		2	13	2	46	223	
15:30	1	18	8	9	45	11	36	45	17	11	14	5	220		
15:45	5	13	10	3	1 1				3	6	8	3	2 51	273	
15:45	7	23	16	17	47	12	34	32	16	12	15	13	244		
16:00	6	14	13	2	1		6 1	1 1	6	5	13	5	8 66	318	1011
16:00	7	24	13	26	50	8	26	29	13	11	16	11	234		
16:15	4	8	7				1	1	2	6	5	3	37	271	1085
16:15	12	22	23	23	56	12	31	30	13	12	28	12	274		
16:30	5		9	2				1	4	4	8	3	36	310	1172
16:30	12	29	23	29	45	9	37	50	5	19	23	17	298		
16:45	4	13	8	1			1	1	2	4	8	3	45	343	**1242**
16:45	6	28	16	13	57	6	40	43	6	13	22	11	261		
17:00	1	15	7			1		2	2	8	13	6	55	316	1240
	46	176	125	134	361	76	263	282	89	87	153	77	1869		
TOTAL	27	85	67	8	2 1	1 3	6 4	1 11	21	37	80	28	10 ##	2251	
15:45	38	98	75	95	198	41	128	141	47	54	82	53	1050		**PEAK**
16:45	19	35	37	5	1		6 3	1 4	14	19	34	14	8 ##	1242	**HOUR**

COMPILED BY: SBC

	A	
B	C	D

LEGEND: Private Vehicles=A Buses=B Single Unit Trucks=C Tractor Trailer Units=D

INTERSECTION TURNING MOVEMENT COUNT SUMMARY

INTERSECTION: PTH 9 / PTH 4 (N /S) & Easton Dr (PTH 9A) (E / W)

DATE: October 7, 2021 September 29, 2021

0

DIRECTION

	Eastbound			Westbound			Northbound			Southbound			
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	
	80	412	260	176	429	104	344	395	231	188	339	115	
	52	169	138	27	4 5	1 17	6 12	3 31	36	81	168	54	4 HOUR TOTAL
TOTAL	132	581	398	203	438	122	362	429	267	269	507	169	3877

PEAK HOUR SUMMARY

AM PEAK HOUR

																SUBTOTAL	TOTAL	% TRUCKS
8:30	16	113	63	25	40	17	62	68	55	55	90	15	619					
9:30	12	42	36	15	2 4	9	3	2 8	7	23	43	10	4 212					
TOTAL	28	155	99	40	46	26	65	78	62	78	133	25	835				835	26%

NOON PEAK HOUR

																SUBTOTAL	TOTAL	
																		#VALUE!
TOTAL																		

PM PEAK HOUR

																SUBTOTAL	TOTAL	
15:45	38	98	75	95	198	41	128	141	47	54	82	53	1050					
16:45	19	35	37	5	1		6 3	1 4	14	19	34	14	8 184				1242	15%
TOTAL	57	133	112	100	199	41	137	146	61	73	116	67						

	A	
B	C	D

LEGEND: Private Vehicles=A Buses=B Single Unit Trucks=C Tractor Trailer Units=D

PEDESTRIAN SUMMARY

	STREET				AVENUE				
	WEST SIDE		EAST SIDE		NORTH SIDE		SOUTH SIDE		
	AGE	AGE	AGE	AGE	AGE	AGE	AGE	AGE	
	15 - 64	1 - 14, >65	15 - 64	1 - 14, >65	15 - 64	1 - 14, >65	15 - 64	1 - 14, >65	TOTAL
6 HOUR TOTAL									0

INTERSECTION TURNING MOVEMENT TRAFFIC COUNT - AM PEAK

INTERSECTION: Wersch St (N / S) & Easton Dr (PTH 9A) (E / W)

DATE: September 29, 2021

DIRECTION

TIME	Eastbound			Westbound			Northbound			Southbound			SUB TOTALS	TOTAL	Consec 1 Hr. Totals
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT			
7:30	20	26	17	8	18	3	6	1	1	0	0	3	103		
7:45	3			1								2	6	109	
7:45	44	39	25	15	16	10	10	1	7	4	0	3	174		
8:00	3	1			1				1		1		2 5	181	
8:00	9	36	6	6	14	1	4	1	5	1	0	6	89		
8:15	3	1	1	1	1			1		1		1	2 8	99	
8:15	14	33	14	3	13	4	6	0	6	1	0	7	101		
8:30					1				1		1		1 2	104	493
8:30	16	46	8	7	18	1	1	1	6	2	1	13	120		
8:45	2	1 1								1		5	1 9	130	**514**
8:45	11	35	10	14	4	6	4	1	9	3	1	5	103		
9:00	2	1			1 3				1	1	1	2	4 8	115	448
9:00	9	25	8	6	15	1	2	1	11	2	2	10	92		
9:15	1	2		1 1	1			1	1	1		4	4 9	105	454
9:15	9	19	9	9	15	3	3	0	10	1	0	6	84		
9:30	1	1			3	1						3	9	93	**443**
TOTAL	132	259	97	68	113	29	36	6	55	14	4	53	866		
	15	2 6	1	2	2 11	1		2	3 1	4	3	17	14 56	936	
7:45	83	154	53	31	61	16	21	3	24	8	1	29	484		**PEAK HOUR**
8:45	8	1 3	1	1	3			1	1 1	2	2	6	6 24	514	

COMPILED BY: SBC

	A	
B	C	D

LEGEND: Private Vehicles=A Buses=B Single Unit Trucks=C Tractor Trailer Units=D

INTERSECTION TURNING MOVEMENT TRAFFIC COUNT - PM PEAK

INTERSECTION: Wersch St (N / S) & Easton Dr (PTH 9A) (E / W)

DATE: October 4, 2021

DIRECTION

TIME	Eastbound			Westbound			Northbound			Southbound			SUB TOTALS	TOTAL	Consec 1 Hr. Totals
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT			
15:00	8	43	7	6	25	5	5	0	11	1	3	6	120		
15:15	1	3		3									7	127	
15:15	7	26	8	4	25	5	5	2	13	4	0	14	113		
15:30	3	1		1	2		1					3	2 9	124	
15:30	11	30	15	7	58	5	8	2	11	0	0	11	158		
15:45	2	1		2								2	3 4	165	
15:45	10	35	5	14	52	4	12	0	10	4	2	11	159		
16:00		3		1	2								1 5	165	581
16:00	7	22	4	6	46	3	27	1	9	3	1	13	142		
16:15	6								1		1	1	2 7	151	605
16:15	10	32	3	3	52	2	13	0	3	5	0	12	135		
16:30	2			1	1			1				1	2 4	141	**622**
16:30	8	30	3	3	40	1	1	0	4	10	1	32	133		
16:45	2	1 1			1							2	1 6	140	597
16:45	7	37	1	8	22	4	5	1	5	4	0	13	107		
17:00	1	2 1										1	3 2	112	544
	68	255	46	51	320	29	76	6	66	31	7	112	1067		
TOTAL	17	4 9		2	3 9			2	1		1	1 9	14 44	1125	
15:30	38	119	27	30	208	14	60	3	33	12	3	47	594		**PEAK**
16:30	10	1 3		1	3 3			1	1		1	4	8 20	622	**HOUR**

COMPILED BY: SBC

	A	
B	C	D

LEGEND: Private Vehicles=A Buses=B Single Unit Trucks=C Tractor Trailer Units=D

INTERSECTION TURNING MOVEMENT COUNT SUMMARY

INTERSECTION: Wersch St (N /S) & Easton Dr (PTH 9A) (E / W)

DATE: September 29, 2021 October 4, 2021

DIRECTION

	Eastbound			Westbound			Northbound			Southbound			
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	
	200	514	143	119	433	58	112	12	121	45	11	165	
	32 6 15 1	4 5 20 1					4 4 1			4 4 1 26			4 HOUR TOTAL
TOTAL	232	535	144	123	458	59	112	16	126	49	15	192	2061

PEAK HOUR SUMMARY

AM PEAK HOUR

	Eastbound			Westbound			Northbound			Southbound			SUBTOTAL	TOTAL	% TRUCKS
7:45	83	154	53	31	61	16	21	3	24	8	1	29	484		
8:45	8 1 3 1	1 3					1 1			2 2		6	6 24	514	6%
TOTAL	91	158	54	32	64	16	21	4	26	10	3	35	514		

NOON PEAK HOUR

													SUBTOTAL	TOTAL	
															#VALUE!
TOTAL															

PM PEAK HOUR

	Eastbound			Westbound			Northbound			Southbound			SUBTOTAL	TOTAL	% TRUCKS
15:30	38	119	27	30	208	14	60	3	33	12	3	47	594		
16:30	10 1 3			1 3	3 3		1		1		1	4	8 20	622	5%
TOTAL	48	123	27	31	214	14	60	4	34	12	4	51			

	A		
	B	C	D

LEGEND: Private Vehicles=A Buses=B Single Unit Trucks=C Tractor Trailer Units=D

PEDESTRIAN SUMMARY

	STREET				AVENUE				
	WEST SIDE		EAST SIDE		NORTH SIDE		SOUTH SIDE		
	AGE	AGE	AGE	AGE	AGE	AGE	AGE	AGE	
	15 - 64	1 - 14, >65	15 - 64	1 - 14, >65	15 - 64	1 - 14, >65	15 - 64	1 - 14, >65	TOTAL
6 HOUR TOTAL									0

INTERSECTION TURNING MOVEMENT TRAFFIC COUNT - AM PEAK

INTERSECTION: PTH 4 (N / S) & Walker (E / W)

DATE: October 4, 2021

DIRECTION

TIME	Eastbound LEFT	Eastbound THRU	Eastbound RIGHT	Westbound LEFT	Westbound THRU	Westbound RIGHT	Northbound LEFT	Northbound THRU	Northbound RIGHT	Southbound LEFT	Southbound THRU	Southbound RIGHT	SUB TOTALS	TOTAL	Consec 1 Hr. Totals
7:30	0	1	1	0	0	0	2	21	0	1	50	1	77		
7:45								2			1		3	80	
7:45	0	0	1	0	0	0	2	19	3	0	49	0	74		
8:00			1				1	1					3	77	
8:00	0	0	1	4	0	0	1	24	1	0	32	0	63		
8:15							1	2			1		4	67	
8:15	1	0	2	1	0	0	0	18	2	1	43	0	68		
8:30			2				1	4			1		8	76	**300**
8:30	0	0	1	0	0	0	2	14	0	0	37	0	54		
8:45							1			1	1		2	57	277
8:45	0	0	0	1	0	0	1	19	1	0	46	0	68		
9:00			2				1	3			2		8	76	276
9:00	1	0	0	0	0	0	0	15	2	0	26	0	44		
9:15											1		1	45	254
9:15	0	1	0	0	0	0	0	27	2	0	38	0	68		
9:30			1		1		2	1 4			1		1 9	78	**256**
	2	2	6	6			8	157	11	2	321	1	516		
TOTAL			6			1	7	1 16			1 8		2 38	556	
7:30	1	1	5	5			5	82	6	2	174	1	282		**PEAK**
8:30			3				3	9			3		18	300	**HOUR**

COMPILED BY: SBC

A		
B	C	D

LEGEND: Private Vehicles=A Buses=B Single Unit Trucks=C Tractor Trailer Units=D

INTERSECTION TURNING MOVEMENT TRAFFIC COUNT - PM PEAK

INTERSECTION: PTH 4 (N / S) & Walker (E / W)

DATE: September 28, 2021

DIRECTION

TIME	Eastbound LEFT	Eastbound THRU	Eastbound RIGHT	Westbound LEFT	Westbound THRU	Westbound RIGHT	Northbound LEFT	Northbound THRU	Northbound RIGHT	Southbound LEFT	Southbound THRU	Southbound RIGHT	SUB TOTALS	TOTAL	Consec 1 Hr. Totals
15:00	0	2	1	1	0	1	3	45	1	0	29	0	83		
15:15							1				2 1		2 2	87	
15:15	0	0	2	2	0	0	2	44	1	0	47	0	98		
15:30			2					2	1				5	103	
15:30	0	1	0	0	0	0	1	40	0	0	32	0	74		
15:45				1			2	1	1		2		1 6	81	
15:45	0	0	3	0	1	0	1	50	0	0	37	0	92		
16:00			1					1	2		4		1 7	100	371
16:00	0	2	2	0	0	0	1	45	3	0	46	0	99		
16:15									1		2		3	102	386
16:15	0	0	1	2	1	0	2	47	0	0	37	0	90		
16:30									2		3		5	95	378
16:30	0	0	2	4	0	1	0	51	0	0	29	0	87		
16:45							2		1				3	90	387
16:45	0	0	0	4	0	0	2	65	2	0	58	1	132		
17:00		1	2						1		1 0	1	1 5	138	**425**
	5		11	13	2	2	12	387	7		315	1	755		
TOTAL		1	5	1			5	2	10 1		3	12 1	5	36	796	
16:00	2		5	10	1	1	5	208	5		170	1	408		**PEAK HOUR**
17:00		1	2				2	5			1 5	1	1	16	425	

COMPILED BY: SBC

A		
B	C	D

LEGEND: Private Vehicles=A Buses=B Single Unit Trucks=C Tractor Trailer Units=D

INTERSECTION TURNING MOVEMENT COUNT SUMMARY

INTERSECTION: PTH 4 (N /S) & Walker (E / W)

DATE: October 4, 2021 September 28, 2021

DIRECTION

	Eastbound			Westbound			Northbound			Southbound			
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	
	2	7	17	19	2	2	20	544	18	2	636	2	
		1 / 11		1	1		12	3 / 26	1		4 / 20	1	4 HOUR TOTAL
TOTAL	2	8	28	20	3	2	32	573	19	2	660	3	1352

PEAK HOUR SUMMARY

AM PEAK HOUR

	Eastbound			Westbound			Northbound			Southbound			SUBTOTAL	TOTAL	% TRUCKS
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT			
7:30	1	1	5	5			5	82	6	2	174	1	282		
8:30			3				3	9			3		18	300	6%
TOTAL	1	1	8	5			8	91	6	2	177	1	300		

NOON PEAK HOUR

	Eastbound			Westbound			Northbound			Southbound			SUBTOTAL	TOTAL	
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT			
															#VALUE!
TOTAL															

PM PEAK HOUR

	Eastbound			Westbound			Northbound			Southbound			SUBTOTAL	TOTAL	
	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT	LEFT	THRU	RIGHT			
16:00		2	5	10	1	1	5	208	5		170	1	408		
17:00		1	2				2	5			1 / 5	1	1 / 16	425	4%
TOTAL		3	7	10	1	1	7	213	5		176	2			

	A	
B	C	D

LEGEND: Private Vehicles=A Buses=B Single Unit Trucks=C Tractor Trailer Units=D

PEDESTRIAN SUMMARY

	STREET				AVENUE				
	WEST SIDE		EAST SIDE		NORTH SIDE		SOUTH SIDE		
	AGE	AGE	AGE	AGE	AGE	AGE	AGE	AGE	
	15 - 64	1 - 14, >65	15 - 64	1 - 14, >65	15 - 64	1 - 14, >65	15 - 64	1 - 14, >65	TOTAL
6 HOUR TOTAL									0

Glass Manufacturing Facility
Canadian Premium Sand Inc.

Weekday AM Peak Intersection Turning Movement Counts

PTH 9 / PTH 4 at Easton Dr (PTH 9A)
October 7, 2021

Time	Eastbound on PTH 9			Westbound on Easton Dr (PTH 9A)			Northbound on PTH 9			Southbound on PTH 4			15-minute Total	Hourly Volume
	left	thru	right	left	thru	right	left	thru	right	left	thru	right		
Peak: 08:30 - 09:30	28	155	99	40	46	26	65	78	62	78	133	25		835
PHF exp. (PHF=0.92)	*30*	*168*	*108*	*43*	*50*	*28*	*71*	*85*	*67*	*85*	*145*	*27*		*908*
2021 exp. (Gr=0%)	*30*	*168*	*108*	*43*	*50*	*28*	*71*	*85*	*67*	*85*	*145*	*27*		*908*
2021 Balanced	*30*	*168*	*108*	*43*	*50*	*28*	*71*	*85*	*67*	*85*	*145*	*27*		*908*
2024 exp. (Gr=2.0%)	*32*	*179*	*114*	*46*	*53*	*30*	*75*	*90*	*72*	*90*	*153*	*29*		*963*
2034 exp. (Gr=2.0%)	*39*	*218*	*139*	*56*	*65*	*37*	*91*	*110*	*87*	*110*	*187*	*35*		*1174*

Easton Dr (PTH 9A) at Wersch St
September 29, 2021

Time	Eastbound on Easton Dr (PTH 9A)			Westbound on Easton Dr (PTH 9A)			Northbound on Hospital Access			Southbound on Wersch St			15-minute Total	Hourly Volume
	left	thru	right	left	thru	right	left	thru	right	left	thru	right		
Peak: 07:45 - 08:45	91	158	54	32	64	16	21	4	26	10	3	35		514
PHF exp. (PHF=0.89)*	*102*	*178*	*61*	*36*	*72*	*18*	*24*	*4*	*29*	*11*	*3*	*39*		*578*
2021 exp. (Gr=0%)	*102*	*178*	*61*	*36*	*72*	*18*	*24*	*4*	*29*	*11*	*3*	*39*		*578*
2021 Balanced	*96*	*167*	*57*	*36*	*65*	*18*	*22*	*4*	*29*	*11*	*3*	*34*		*542*
2024 exp. (Gr=2.0%)	*102*	*177*	*60*	*38*	*69*	*19*	*23*	*4*	*31*	*12*	*3*	*36*		*575*
2034 exp. (Gr=2.0%)	*124*	*216*	*74*	*47*	*84*	*23*	*28*	*5*	*38*	*14*	*4*	*44*		*701*

* Actual PHF = 0.71. For transportation planning analyses minimum PHF = 0.89 assumed

PTH 4 at Walker Ave
October 4, 2021

Time	Eastbound on Walker Ave			Westbound on Walker Ave			Northbound on PTH 4			Southbound on PTH 4			15-minute Total	Hourly Volume
	left	thru	right	left	thru	right	left	thru	right	left	thru	right		
Peak: 07:30 - 08:30	1	1	8	5	0	0	8	91	6	2	177	1		300
PHF exp. (PHF=0.94)	*1*	*1*	*9*	*5*	*0*	*0*	*9*	*97*	*6*	*2*	*188*	*1*		*319*
2021 exp. (Gr=0%)	*1*	*1*	*9*	*5*	*0*	*0*	*9*	*97*	*6*	*2*	*188*	*1*		*319*
2021 Balanced	*1*	*1*	*10*	*7*	*0*	*0*	*13*	*123*	*7*	*2*	*240*	*1*		*405*
2024 exp. (Gr=2.0%)	*1*	*1*	*11*	*7*	*0*	*0*	*14*	*131*	*7*	*2*	*255*	*1*		*430*
2034 exp. (Gr=2.0%)	*1*	*1*	*13*	*9*	*0*	*0*	*17*	*159*	*9*	*3*	*310*	*1*		*524*

Glass Manufacturing Facility
Canadian Premium Sand Inc.

Weekday PM Peak Intersection Turning Movement Counts

PTH 9 / PTH 4 at Easton Dr (PTH 9A)
September 29, 2021

Time	Eastbound on PTH 9			Westbound on Easton Dr (PTH 9A)			Northbound on PTH 9			Southbound on PTH 4			15-minute Total	Hourly Volume
	left	thru	right	left	thru	right	left	thru	right	left	thru	right		
Peak: 15:45 - 16:45	57	133	112	100	199	41	137	146	61	73	116	67		1242
PHF exp. (PHF=0.91)	*63*	*146*	*123*	*110*	*219*	*45*	*151*	*160*	*67*	*80*	*127*	*74*		*1365*
2021 exp. (Gr=0%)	*63*	*146*	*123*	*110*	*219*	*45*	*151*	*160*	*67*	*80*	*127*	*74*		*1365*
2021 Balanced	*63*	*146*	*123*	*110*	*219*	*45*	*151*	*160*	*67*	*80*	*127*	*74*		*1365*
2024 exp. (Gr=2.0%)	*66*	*155*	*131*	*117*	*232*	*48*	*160*	*170*	*71*	*85*	*135*	*78*		*1448*
2034 exp. (Gr=2.0%)	*81*	*189*	*159*	*142*	*283*	*58*	*195*	*208*	*87*	*104*	*165*	*95*		*1766*

Easton Dr (PTH 9A) at Wersch St
October 4, 2021

Time	Eastbound on Easton Dr (PTH 9A)			Westbound on Easton Dr (PTH 9A)			Northbound on Hospital Access			Southbound on Wersch St			15-minute Total	Hourly Volume
	left	thru	right	left	thru	right	left	thru	right	left	thru	right		
Peak: 15:30 - 16:30	48	123	27	31	214	14	60	4	34	12	4	51		622
PHF exp. (PHF=0.94)	*51*	*131*	*29*	*33*	*228*	*15*	*64*	*4*	*36*	*13*	*4*	*54*		*662*
2021 exp. (Gr=0%)	*51*	*131*	*29*	*33*	*228*	*15*	*64*	*4*	*36*	*13*	*4*	*54*		*662*
2021 Balanced	*72*	*181*	*40*	*33*	*247*	*15*	*70*	*4*	*36*	*13*	*4*	*57*		*772*
2024 exp. (Gr=2.0%)	*76*	*192*	*42*	*35*	*262*	*16*	*74*	*4*	*38*	*14*	*4*	*60*		*819*
2034 exp. (Gr=2.0%)	*93*	*234*	*52*	*43*	*320*	*19*	*91*	*5*	*47*	*17*	*5*	*74*		*999*

* Actual PHF = 0.71. For transportation planning analyses minimum PHF = 0.89 assumed

PTH 4 at Walker Ave
September 28, 2021

Time	Eastbound on Walker Ave			Westbound on Walker Ave			Northbound on PTH 4			Southbound on PTH 4			15-minute Total	Hourly Volume
	left	thru	right	left	thru	right	left	thru	right	left	thru	right		
Pk: 16:00 - 17:00	0	3	7	10	1	1	7	213	5	0	176	2		425
PHF exp. (PHF=0.89)	*0*	*3*	*7*	*11*	*1*	*1*	*7*	*227*	*5*	*0*	*187*	*2*		*452*
2021 exp. (Gr=0%)	*0*	*3*	*7*	*11*	*1*	*1*	*7*	*227*	*5*	*0*	*187*	*2*		*452*
2021 Balanced	*0*	*3*	*8*	*16*	*1*	*1*	*9*	*254*	*5*	*0*	*257*	*2*		*556*
2024 exp. (Gr=2.0%)	*0*	*3*	*8*	*17*	*1*	*1*	*10*	*270*	*5*	*0*	*273*	*2*		*590*
2034 exp. (Gr=2.0%)	*0*	*4*	*10*	*21*	*1*	*1*	*12*	*329*	*6*	*0*	*332*	*3*		*719*

Appendix B Synchro Analysis Results

2021 Background Synchro Analysis

HCM 6th Signalized Intersection Summary
1: PTH 9 & Easton & PTH 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	168	108	43	50	28	71	85	67	85	145	27
Future Volume (veh/h)	30	168	108	43	50	28	71	85	67	85	145	27
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	788	1352	1055	1011	1678	1115	1826	1678	1707	1278	1189	907
Adj Flow Rate, veh/h	30	168	0	43	50	0	71	85	0	85	145	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	75	37	57	60	15	53	5	15	13	42	48	67
Cap, veh/h	221	292		180	362		97	711		99	534	
Arrive On Green	0.22	0.22	0.00	0.22	0.22	0.00	0.06	0.42	0.00	0.08	0.45	0.00
Sat Flow, veh/h	571	1352	894	658	1678	945	1739	1678	1447	1217	1189	769
Grp Volume(v), veh/h	30	168	0	43	50	0	71	85	0	85	145	0
Grp Sat Flow(s),veh/h/ln	571	1352	894	658	1678	945	1739	1678	1447	1217	1189	769
Q Serve(g_s), s	2.9	7.2	0.0	4.0	1.6	0.0	2.6	2.0	0.0	4.5	4.9	0.0
Cycle Q Clear(g_c), s	4.4	7.2	0.0	11.2	1.6	0.0	2.6	2.0	0.0	4.5	4.9	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	221	292		180	362		97	711		99	534	
V/C Ratio(X)	0.14	0.58		0.24	0.14		0.73	0.12		0.86	0.27	
Avail Cap(c_a), veh/h	346	586		324	728		404	711		320	534	
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.2	22.7	0.0	27.7	20.4	0.0	30.0	11.3	0.0	29.3	11.1	0.0
Incr Delay (d2), s/veh	0.3	1.8	0.0	0.7	0.2	0.0	10.1	0.3	0.0	18.8	1.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	2.5	0.0	0.7	0.7	0.0	1.4	0.9	0.0	1.9	1.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.5	24.4	0.0	28.3	20.6	0.0	40.1	11.6	0.0	48.1	12.4	0.0
LnGrp LOS	C	C		C	C		D	B		D	B	
Approach Vol, veh/h		198	A		93	A		156	A		230	A
Approach Delay, s/veh		24.1			24.2			24.6			25.6	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.2	33.4		19.9	9.6	35.0		19.9				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	17.0	27.0		28.0	15.0	29.0		28.0				
Max Q Clear Time (g_c+I1), s	6.5	4.0		9.2	4.6	6.9		13.2				
Green Ext Time (p_c), s	0.2	1.0		2.6	0.2	2.0		0.8				

Intersection Summary			
HCM 6th Ctrl Delay		24.7	
HCM 6th LOS		C	

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	96	167	57	36	65	18	22	4	29	11	3	34
Future Vol, veh/h	96	167	57	36	65	18	22	4	29	11	3	34
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	1000	600	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	10	5	5	5	5	5	5	25	8	25	25	21
Mvmt Flow	96	167	57	36	65	18	22	4	29	11	3	34

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	83	0	0	167	0	0	524	514	-	507	505	74
Stage 1	-	-	-	-	-	-	359	359	-	146	146	-
Stage 2	-	-	-	-	-	-	165	155	-	361	359	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.15	6.75	-	7.35	6.75	6.41
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.75	-	6.35	5.75	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.75	-	6.35	5.75	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.545	4.225	-	3.725	4.225	3.489
Pot Cap-1 Maneuver	1465	-	-	1393	-	-	459	433	0	441	438	937
Stage 1	-	-	-	-	-	-	653	588	0	805	734	-
Stage 2	-	-	-	-	-	-	830	728	0	613	588	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1465	-	-	1393	-	-	407	390	-	404	395	937
Mov Cap-2 Maneuver	-	-	-	-	-	-	407	390	-	404	395	-
Stage 1	-	-	-	-	-	-	604	544	-	745	715	-
Stage 2	-	-	-	-	-	-	776	709	-	563	544	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.3	2.3		10.7
HCM LOS			-	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1465	-	-	1393	-	-	675
HCM Lane V/C Ratio	-	0.066	-	-	0.026	-	-	0.071
HCM Control Delay (s)	-	7.6	0	-	7.7	-	-	10.7
HCM Lane LOS	-	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.2	-	-	0.1	-	-	0.2

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	10	7	0	0	13	123	7	2	240	1
Future Vol, veh/h	1	1	10	7	0	0	13	123	7	2	240	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	5	5	60	5	5	5	60	11	5	5	5	5
Mvmt Flow	1	1	10	7	0	0	13	123	7	2	240	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	398	401	241	403	398	127	241	0	0	130	0	0
Stage 1	245	245	-	153	153	-	-	-	-	-	-	-
Stage 2	153	156	-	250	245	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.8	7.15	6.55	6.25	4.7	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.84	3.545	4.045	3.345	2.74	-	-	2.245	-	-
Pot Cap-1 Maneuver	557	533	674	553	535	915	1050	-	-	1437	-	-
Stage 1	752	698	-	842	765	-	-	-	-	-	-	-
Stage 2	842	763	-	747	698	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	551	525	674	538	527	915	1050	-	-	1437	-	-
Mov Cap-2 Maneuver	551	525	-	538	527	-	-	-	-	-	-	-
Stage 1	742	697	-	831	755	-	-	-	-	-	-	-
Stage 2	831	753	-	733	697	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.7	11.8	0.8	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1050	-	-	647	538	1437	-	-
HCM Lane V/C Ratio	0.012	-	-	0.019	0.013	0.001	-	-
HCM Control Delay (s)	8.5	0	-	10.7	11.8	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0	-	-

HCM 6th Signalized Intersection Summary
1: PTH 9 & Easton & PTH 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	63	146	123	110	219	45	151	160	67	80	127	74
Future Volume (veh/h)	63	146	123	110	219	45	151	160	67	80	127	74
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1159	1366	1174	1826	1826	1826	1796	1826	1455	1381	1292	1515
Adj Flow Rate, veh/h	63	146	0	110	219	0	151	160	0	80	127	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	50	36	49	5	5	5	7	5	30	35	41	26
Cap, veh/h	199	326		280	436		197	796		95	508	
Arrive On Green	0.24	0.24	0.00	0.24	0.24	0.00	0.12	0.44	0.00	0.07	0.39	0.00
Sat Flow, veh/h	720	1366	995	1212	1826	1547	1711	1826	1233	1316	1292	1284
Grp Volume(v), veh/h	63	146	0	110	219	0	151	160	0	80	127	0
Grp Sat Flow(s),veh/h/ln	720	1366	995	1212	1826	1547	1711	1826	1233	1316	1292	1284
Q Serve(g_s), s	5.9	6.5	0.0	6.0	7.4	0.0	6.1	3.9	0.0	4.3	4.7	0.0
Cycle Q Clear(g_c), s	13.3	6.5	0.0	12.5	7.4	0.0	6.1	3.9	0.0	4.3	4.7	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	199	326		280	436		197	796		95	508	
V/C Ratio(X)	0.32	0.45		0.39	0.50		0.77	0.20		0.84	0.25	
Avail Cap(c_a), veh/h	280	480		417	642		505	796		296	508	
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	29.2	23.1	0.0	28.4	23.4	0.0	30.5	12.4	0.0	32.6	14.5	0.0
Incr Delay (d2), s/veh	0.9	1.0	0.0	0.9	0.9	0.0	6.1	0.6	0.0	17.4	1.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	2.3	0.0	1.9	3.5	0.0	3.0	1.8	0.0	1.9	1.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.1	24.0	0.0	29.3	24.3	0.0	36.6	13.0	0.0	50.0	15.7	0.0
LnGrp LOS	C	C		C	C		D	B		D	B	
Approach Vol, veh/h		209	A		329	A		311	A		207	A
Approach Delay, s/veh		25.8			26.0			24.4			29.0	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.1	37.0		23.0	14.2	33.9		23.0				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	16.0	31.0		25.0	21.0	26.0		25.0				
Max Q Clear Time (g_c+I1), s	6.3	5.9		15.3	8.1	6.7		14.5				
Green Ext Time (p_c), s	0.2	2.2		1.7	0.6	1.5		2.5				

Intersection Summary		
HCM 6th Ctrl Delay		26.1
HCM 6th LOS		C

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	72	181	40	33	247	15	70	4	36	13	4	57
Future Vol, veh/h	72	181	40	33	247	15	70	4	36	13	4	57
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	1000	600	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	25	5	5	5	5	5	5	25	5	5	25	9
Mvmt Flow	72	181	40	33	247	15	70	4	36	13	4	57

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	262	0	0	181	0	0	676	653	-	648	646	255
Stage 1	-	-	-	-	-	-	325	325	-	321	321	-
Stage 2	-	-	-	-	-	-	351	328	-	327	325	-
Critical Hdwy	4.35	-	-	4.15	-	-	7.15	6.75	-	7.15	6.75	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.75	-	6.15	5.75	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.75	-	6.15	5.75	-
Follow-up Hdwy	2.425	-	-	2.245	-	-	3.545	4.225	-	3.545	4.225	3.381
Pot Cap-1 Maneuver	1180	-	-	1376	-	-	363	359	0	379	362	767
Stage 1	-	-	-	-	-	-	681	610	0	684	612	-
Stage 2	-	-	-	-	-	-	659	608	0	679	610	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1180	-	-	1376	-	-	309	326	-	349	329	767
Mov Cap-2 Maneuver	-	-	-	-	-	-	309	326	-	349	329	-
Stage 1	-	-	-	-	-	-	633	567	-	636	597	-
Stage 2	-	-	-	-	-	-	591	593	-	627	567	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2	0.9		11.9
HCM LOS			-	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1180	-	-	1376	-	-	598
HCM Lane V/C Ratio	-	0.061	-	-	0.024	-	-	0.124
HCM Control Delay (s)	-	8.2	0	-	7.7	-	-	11.9
HCM Lane LOS	-	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.2	-	-	0.1	-	-	0.4

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	3	8	16	1	1	9	254	5	0	257	2
Future Vol, veh/h	0	3	8	16	1	1	9	254	5	0	257	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	5	50	40	5	5	5	40	5	5	5	5	100
Mvmt Flow	0	3	8	16	1	1	9	254	5	0	257	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	534	535	258	539	534	257	259	0	0	259	0	0
Stage 1	258	258	-	275	275	-	-	-	-	-	-	-
Stage 2	276	277	-	264	259	-	-	-	-	-	-	-
Critical Hdwy	7.15	7	6.6	7.15	6.55	6.25	4.5	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	6	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	6	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.45	3.66	3.545	4.045	3.345	2.56	-	-	2.245	-	-
Pot Cap-1 Maneuver	452	391	697	449	448	774	1114	-	-	1288	-	-
Stage 1	740	615	-	725	677	-	-	-	-	-	-	-
Stage 2	724	602	-	735	688	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	447	387	697	438	444	774	1114	-	-	1288	-	-
Mov Cap-2 Maneuver	447	387	-	438	444	-	-	-	-	-	-	-
Stage 1	733	615	-	718	671	-	-	-	-	-	-	-
Stage 2	715	597	-	723	688	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.4	13.4	0.3	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1114	-	-	572	449	1288	-	-
HCM Lane V/C Ratio	0.008	-	-	0.019	0.04	-	-	-
HCM Control Delay (s)	8.3	0	-	11.4	13.4	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

2024 Pre-Development Synchro Analysis

HCM 6th Signalized Intersection Summary
1: PTH 9 & Easton & PTH 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	179	114	46	53	30	75	90	72	90	153	29
Future Volume (veh/h)	32	179	114	46	53	30	75	90	72	90	153	29
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	788	1352	1055	1011	1678	1115	1826	1678	1707	1278	1189	907
Adj Flow Rate, veh/h	32	179	0	46	53	0	75	90	0	90	153	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	75	37	57	60	15	53	5	15	13	42	48	67
Cap, veh/h	228	310		184	384		100	679		106	516	
Arrive On Green	0.23	0.23	0.00	0.23	0.23	0.00	0.06	0.40	0.00	0.09	0.43	0.00
Sat Flow, veh/h	570	1352	894	651	1678	945	1739	1678	1447	1217	1189	769
Grp Volume(v), veh/h	32	179	0	46	53	0	75	90	0	90	153	0
Grp Sat Flow(s),veh/h/ln	570	1352	894	651	1678	945	1739	1678	1447	1217	1189	769
Q Serve(g_s), s	3.1	7.6	0.0	4.4	1.6	0.0	2.7	2.2	0.0	4.7	5.4	0.0
Cycle Q Clear(g_c), s	4.7	7.6	0.0	11.9	1.6	0.0	2.7	2.2	0.0	4.7	5.4	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	228	310		184	384		100	679		106	516	
V/C Ratio(X)	0.14	0.58		0.25	0.14		0.75	0.13		0.85	0.30	
Avail Cap(c_a), veh/h	354	608		328	755		405	679		359	516	
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	21.6	22.1	0.0	27.4	19.8	0.0	29.9	12.1	0.0	29.0	11.8	0.0
Incr Delay (d2), s/veh	0.3	1.7	0.0	0.7	0.2	0.0	10.8	0.4	0.0	16.9	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	2.7	0.0	0.7	0.7	0.0	1.5	0.9	0.0	1.9	1.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.9	23.8	0.0	28.1	19.9	0.0	40.7	12.5	0.0	45.9	13.3	0.0
LnGrp LOS	C	C		C	B		D	B		D	B	
Approach Vol, veh/h		211	A		99	A		165	A		243	A
Approach Delay, s/veh		23.5			23.7			25.3			25.4	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.6	32.1		20.8	9.7	34.0		20.8				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	19.0	24.0		29.0	15.0	28.0		29.0				
Max Q Clear Time (g_c+I1), s	6.7	4.2		9.6	4.7	7.4		13.9				
Green Ext Time (p_c), s	0.3	1.0		2.9	0.2	2.1		0.9				

Intersection Summary		
HCM 6th Ctrl Delay		24.6
HCM 6th LOS		C

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	102	177	60	38	69	19	23	4	31	12	3	36
Future Vol, veh/h	102	177	60	38	69	19	23	4	31	12	3	36
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	1000	600	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	10	5	5	5	5	5	5	25	8	25	25	21
Mvmt Flow	102	177	60	38	69	19	23	4	31	12	3	36

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	88	0	0	177	0	0	555	545	-	538	536	79
Stage 1	-	-	-	-	-	-	381	381	-	155	155	-
Stage 2	-	-	-	-	-	-	174	164	-	383	381	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.15	6.75	-	7.35	6.75	6.41
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.75	-	6.35	5.75	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.75	-	6.35	5.75	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.545	4.225	-	3.725	4.225	3.489
Pot Cap-1 Maneuver	1459	-	-	1381	-	-	438	415	0	420	420	931
Stage 1	-	-	-	-	-	-	635	575	0	796	728	-
Stage 2	-	-	-	-	-	-	821	721	0	596	575	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1459	-	-	1381	-	-	385	371	-	383	375	931
Mov Cap-2 Maneuver	-	-	-	-	-	-	385	371	-	383	375	-
Stage 1	-	-	-	-	-	-	584	528	-	732	708	-
Stage 2	-	-	-	-	-	-	764	701	-	544	528	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.3	2.3		11
HCM LOS			-	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1459	-	-	1381	-	-	654
HCM Lane V/C Ratio	-	0.07	-	-	0.028	-	-	0.078
HCM Control Delay (s)	-	7.7	0	-	7.7	-	-	11
HCM Lane LOS	-	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.2	-	-	0.1	-	-	0.3

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	11	7	0	0	14	131	7	2	255	1
Future Vol, veh/h	1	1	11	7	0	0	14	131	7	2	255	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	5	5	60	5	5	5	60	11	5	5	5	5
Mvmt Flow	1	1	11	7	0	0	14	131	7	2	255	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	423	426	256	429	423	135	256	0	0	138	0	0
Stage 1	260	260	-	163	163	-	-	-	-	-	-	-
Stage 2	163	166	-	266	260	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.8	7.15	6.55	6.25	4.7	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.84	3.545	4.045	3.345	2.74	-	-	2.245	-	-
Pot Cap-1 Maneuver	536	516	661	531	518	906	1035	-	-	1427	-	-
Stage 1	738	687	-	832	758	-	-	-	-	-	-	-
Stage 2	832	755	-	733	687	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	529	507	661	515	509	906	1035	-	-	1427	-	-
Mov Cap-2 Maneuver	529	507	-	515	509	-	-	-	-	-	-	-
Stage 1	727	686	-	820	747	-	-	-	-	-	-	-
Stage 2	820	744	-	718	686	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	12.1	0.8	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1035	-	-	634	515	1427	-	-
HCM Lane V/C Ratio	0.014	-	-	0.021	0.014	0.001	-	-
HCM Control Delay (s)	8.5	0	-	10.8	12.1	7.5	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0	-	-

HCM 6th Signalized Intersection Summary
1: PTH 9 & Easton & PTH 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	66	155	131	117	232	48	160	170	71	85	135	78
Future Volume (veh/h)	66	155	131	117	232	48	160	170	71	85	135	78
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1159	1366	1174	1826	1826	1826	1796	1826	1455	1381	1292	1515
Adj Flow Rate, veh/h	66	155	0	117	232	0	160	170	0	85	135	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	50	36	49	5	5	5	7	5	30	35	41	26
Cap, veh/h	199	342		285	457		207	777		101	493	
Arrive On Green	0.25	0.25	0.00	0.25	0.25	0.00	0.12	0.43	0.00	0.08	0.38	0.00
Sat Flow, veh/h	712	1366	995	1203	1826	1547	1711	1826	1233	1316	1292	1284
Grp Volume(v), veh/h	66	155	0	117	232	0	160	170	0	85	135	0
Grp Sat Flow(s),veh/h/ln	712	1366	995	1203	1826	1547	1711	1826	1233	1316	1292	1284
Q Serve(g_s), s	6.4	7.0	0.0	6.6	7.9	0.0	6.6	4.3	0.0	4.6	5.3	0.0
Cycle Q Clear(g_c), s	14.3	7.0	0.0	13.6	7.9	0.0	6.6	4.3	0.0	4.6	5.3	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	199	342		285	457		207	777		101	493	
V/C Ratio(X)	0.33	0.45		0.41	0.51		0.77	0.22		0.84	0.27	
Avail Cap(c_a), veh/h	275	488		413	651		493	777		271	493	
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	29.6	23.1	0.0	28.8	23.4	0.0	31.0	13.3	0.0	33.2	15.6	0.0
Incr Delay (d2), s/veh	1.0	0.9	0.0	0.9	0.9	0.0	6.0	0.6	0.0	16.2	1.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	2.5	0.0	2.1	3.7	0.0	3.2	2.0	0.0	2.0	1.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.6	24.0	0.0	29.8	24.3	0.0	37.0	13.9	0.0	49.4	16.9	0.0
LnGrp LOS	C	C		C	C		D	B		D	B	
Approach Vol, veh/h		221	A		349	A		330	A		220	A
Approach Delay, s/veh		26.0			26.2			25.1			29.5	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	11.6	37.0		24.3	14.8	33.8		24.3				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	15.0	31.0		26.0	21.0	25.0		26.0				
Max Q Clear Time (g_c+I1), s	6.6	6.3		16.3	8.6	7.3		15.6				
Green Ext Time (p_c), s	0.2	2.4		1.8	0.6	1.6		2.6				

Intersection Summary		
HCM 6th Ctrl Delay		26.5
HCM 6th LOS		C

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	76	192	42	35	262	16	74	4	38	14	4	60
Future Vol, veh/h	76	192	42	35	262	16	74	4	38	14	4	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	1000	600	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	25	5	5	5	5	5	5	25	5	5	25	9
Mvmt Flow	76	192	42	35	262	16	74	4	38	14	4	60

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	278	0	0	192	0	0	716	692	-	686	684	270
Stage 1	-	-	-	-	-	-	344	344	-	340	340	-
Stage 2	-	-	-	-	-	-	372	348	-	346	344	-
Critical Hdwy	4.35	-	-	4.15	-	-	7.15	6.75	-	7.15	6.75	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.75	-	6.15	5.75	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.75	-	6.15	5.75	-
Follow-up Hdwy	2.425	-	-	2.245	-	-	3.545	4.225	-	3.545	4.225	3.381
Pot Cap-1 Maneuver	1163	-	-	1364	-	-	341	340	0	358	344	752
Stage 1	-	-	-	-	-	-	665	598	0	669	600	-
Stage 2	-	-	-	-	-	-	642	595	0	664	598	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1163	-	-	1364	-	-	287	306	-	328	310	752
Mov Cap-2 Maneuver	-	-	-	-	-	-	287	306	-	328	310	-
Stage 1	-	-	-	-	-	-	614	553	-	618	584	-
Stage 2	-	-	-	-	-	-	572	580	-	609	553	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2	0.9		12.2
HCM LOS			-	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1163	-	-	1364	-	-	576
HCM Lane V/C Ratio	-	0.065	-	-	0.026	-	-	0.135
HCM Control Delay (s)	-	8.3	0	-	7.7	-	-	12.2
HCM Lane LOS	-	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.2	-	-	0.1	-	-	0.5

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	3	8	17	1	1	10	270	5	0	273	2
Future Vol, veh/h	0	3	8	17	1	1	10	270	5	0	273	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	5	50	40	5	5	5	40	5	5	5	5	100
Mvmt Flow	0	3	8	17	1	1	10	270	5	0	273	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	568	569	274	573	568	273	275	0	0	275	0	0
Stage 1	274	274	-	293	293	-	-	-	-	-	-	-
Stage 2	294	295	-	280	275	-	-	-	-	-	-	-
Critical Hdwy	7.15	7	6.6	7.15	6.55	6.25	4.5	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	6	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	6	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.45	3.66	3.545	4.045	3.345	2.56	-	-	2.245	-	-
Pot Cap-1 Maneuver	429	373	682	426	428	759	1098	-	-	1271	-	-
Stage 1	726	604	-	709	665	-	-	-	-	-	-	-
Stage 2	708	590	-	720	677	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	424	369	682	415	423	759	1098	-	-	1271	-	-
Mov Cap-2 Maneuver	424	369	-	415	423	-	-	-	-	-	-	-
Stage 1	718	604	-	701	658	-	-	-	-	-	-	-
Stage 2	698	584	-	708	677	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.6	13.8	0.3	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1098	-	-	554	426	1271	-	-
HCM Lane V/C Ratio	0.009	-	-	0.02	0.045	-	-	-
HCM Control Delay (s)	8.3	0	-	11.6	13.8	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

2024 Post-Development Synchro Analysis

HCM 6th Signalized Intersection Summary
1: PTH 9 & Easton & PTH 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	46	179	14	46	53	57	75	171	72	90	153	29
Future Volume (veh/h)	46	179	14	46	53	57	75	171	72	90	153	29
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1307	1352	1055	1011	1678	1604	1826	1796	1707	1278	1189	907
Adj Flow Rate, veh/h	46	179	0	46	53	0	75	171	0	90	153	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	40	37	57	60	15	20	5	7	13	42	48	67
Cap, veh/h	292	304		173	378		98	771		106	547	
Arrive On Green	0.23	0.23	0.00	0.23	0.23	0.00	0.06	0.43	0.00	0.09	0.46	0.00
Sat Flow, veh/h	944	1352	894	651	1678	1359	1739	1796	1447	1217	1189	769
Grp Volume(v), veh/h	46	179	0	46	53	0	75	171	0	90	153	0
Grp Sat Flow(s),veh/h/ln	944	1352	894	651	1678	1359	1739	1796	1447	1217	1189	769
Q Serve(g_s), s	2.9	8.2	0.0	4.7	1.8	0.0	3.0	4.2	0.0	5.1	5.6	0.0
Cycle Q Clear(g_c), s	4.6	8.2	0.0	13.0	1.8	0.0	3.0	4.2	0.0	5.1	5.6	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	292	304		173	378		98	771		106	547	
V/C Ratio(X)	0.16	0.59		0.27	0.14		0.77	0.22		0.85	0.28	
Avail Cap(c_a), veh/h	446	525		279	651		325	771		315	547	
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	23.4	24.1	0.0	29.9	21.6	0.0	32.4	12.5	0.0	31.3	11.6	0.0
Incr Delay (d2), s/veh	0.2	1.8	0.0	0.8	0.2	0.0	11.9	0.7	0.0	16.7	1.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	2.9	0.0	0.8	0.8	0.0	1.6	1.9	0.0	2.1	1.8	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.7	25.9	0.0	30.7	21.7	0.0	44.2	13.2	0.0	48.0	12.9	0.0
LnGrp LOS	C	C		C	C		D	B		D	B	
Approach Vol, veh/h		225	A		99	A		246	A		243	A
Approach Delay, s/veh		25.4			25.9			22.7			25.9	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	12.1	35.9		21.7	9.9	38.0		21.7				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	18.0	27.0		27.0	13.0	32.0		27.0				
Max Q Clear Time (g_c+I1), s	7.1	6.2		10.2	5.0	7.6		15.0				
Green Ext Time (p_c), s	0.3	2.2		2.6	0.1	2.3		0.7				

Intersection Summary			
HCM 6th Ctrl Delay		24.8	
HCM 6th LOS		C	

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	102	177	60	38	96	19	23	4	31	12	3	36
Future Vol, veh/h	102	177	60	38	96	19	23	4	31	12	3	36
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	1000	600	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	10	5	5	5	5	5	5	25	8	25	25	21
Mvmt Flow	102	177	60	38	96	19	23	4	31	12	3	36

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	115	0	0	177	0	0	582	572	-	565	563	106
Stage 1	-	-	-	-	-	-	381	381	-	182	182	-
Stage 2	-	-	-	-	-	-	201	191	-	383	381	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.15	6.75	-	7.35	6.75	6.41
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.75	-	6.35	5.75	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.75	-	6.35	5.75	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.545	4.225	-	3.725	4.225	3.489
Pot Cap-1 Maneuver	1426	-	-	1381	-	-	420	400	0	403	405	899
Stage 1	-	-	-	-	-	-	635	575	0	769	708	-
Stage 2	-	-	-	-	-	-	794	701	0	596	575	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1426	-	-	1381	-	-	368	356	-	366	361	899
Mov Cap-2 Maneuver	-	-	-	-	-	-	368	356	-	366	361	-
Stage 1	-	-	-	-	-	-	582	527	-	705	688	-
Stage 2	-	-	-	-	-	-	738	681	-	542	527	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.3	1.9		11.2
HCM LOS			-	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1426	-	-	1381	-	-	629
HCM Lane V/C Ratio	-	0.072	-	-	0.028	-	-	0.081
HCM Control Delay (s)	-	7.7	0	-	7.7	-	-	11.2
HCM Lane LOS	-	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.2	-	-	0.1	-	-	0.3

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	11	7	0	7	14	131	129	9	255	1
Future Vol, veh/h	1	1	11	7	0	7	14	131	129	9	255	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	5	5	60	5	5	100	60	11	5	78	5	5
Mvmt Flow	1	1	11	7	0	7	14	131	129	9	255	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	501	562	256	504	498	196	256	0	0	260	0	0
Stage 1	274	274	-	224	224	-	-	-	-	-	-	-
Stage 2	227	288	-	280	274	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.8	7.15	6.55	7.2	4.7	-	-	4.88	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.84	3.545	4.045	4.2	2.74	-	-	2.902	-	-
Pot Cap-1 Maneuver	476	432	661	473	470	648	1035	-	-	967	-	-
Stage 1	726	678	-	772	713	-	-	-	-	-	-	-
Stage 2	769	668	-	720	678	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	461	420	661	455	457	648	1035	-	-	967	-	-
Mov Cap-2 Maneuver	461	420	-	455	457	-	-	-	-	-	-	-
Stage 1	714	671	-	760	702	-	-	-	-	-	-	-
Stage 2	749	657	-	699	671	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11	11.9	0.4	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1035	-	-	613	535	967	-	-
HCM Lane V/C Ratio	0.014	-	-	0.021	0.026	0.009	-	-
HCM Control Delay (s)	8.5	0	-	11	11.9	8.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	132	7	0	7	7	0
Future Vol, veh/h	132	7	0	7	7	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	5	100	5	5	100	5
Mvmt Flow	132	7	0	7	7	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	139	0	143	136
Stage 1	-	-	-	-	136	-
Stage 2	-	-	-	-	7	-
Critical Hdwy	-	-	4.15	-	7.4	6.25
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.245	-	4.4	3.345
Pot Cap-1 Maneuver	-	-	1426	-	665	905
Stage 1	-	-	-	-	697	-
Stage 2	-	-	-	-	812	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1426	-	665	905
Mov Cap-2 Maneuver	-	-	-	-	665	-
Stage 1	-	-	-	-	697	-
Stage 2	-	-	-	-	812	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	665	-	-	1426	-
HCM Lane V/C Ratio	0.011	-	-	-	-
HCM Control Delay (s)	10.5	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	10	122	14	7	0	0
Future Vol, veh/h	10	122	14	7	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	10	122	14	7	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	132	0	106	71
Stage 1	-	-	-	-	71	-
Stage 2	-	-	-	-	35	-
Critical Hdwy	-	-	4.15	-	6.45	6.25
Critical Hdwy Stg 1	-	-	-	-	5.45	-
Critical Hdwy Stg 2	-	-	-	-	5.45	-
Follow-up Hdwy	-	-	2.245	-	3.545	3.345
Pot Cap-1 Maneuver	-	-	1435	-	884	983
Stage 1	-	-	-	-	944	-
Stage 2	-	-	-	-	980	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1435	-	875	983
Mov Cap-2 Maneuver	-	-	-	-	875	-
Stage 1	-	-	-	-	944	-
Stage 2	-	-	-	-	970	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1435	-
HCM Lane V/C Ratio	-	-	-	0.01	-
HCM Control Delay (s)	0	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

HCM 6th Signalized Intersection Summary
1: PTH 9 & Easton & PTH 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	66	155	131	117	232	48	160	170	71	112	216	92
Future Volume (veh/h)	66	155	131	117	232	48	160	170	71	112	216	92
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1159	1366	1174	1826	1826	1826	1796	1826	1455	1559	1589	1589
Adj Flow Rate, veh/h	66	155	0	117	232	0	160	170	0	112	216	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	50	36	49	5	5	5	7	5	30	23	21	21
Cap, veh/h	190	333		272	445		206	774		140	632	
Arrive On Green	0.24	0.24	0.00	0.24	0.24	0.00	0.12	0.42	0.00	0.09	0.40	0.00
Sat Flow, veh/h	712	1366	995	1203	1826	1547	1711	1826	1233	1485	1589	1346
Grp Volume(v), veh/h	66	155	0	117	232	0	160	170	0	112	216	0
Grp Sat Flow(s),veh/h/ln	712	1366	995	1203	1826	1547	1711	1826	1233	1485	1589	1346
Q Serve(g_s), s	6.7	7.3	0.0	6.9	8.3	0.0	6.9	4.5	0.0	5.6	7.2	0.0
Cycle Q Clear(g_c), s	15.0	7.3	0.0	14.3	8.3	0.0	6.9	4.5	0.0	5.6	7.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	190	333		272	445		206	774		140	632	
V/C Ratio(X)	0.35	0.47		0.43	0.52		0.78	0.22		0.80	0.34	
Avail Cap(c_a), veh/h	243	434		361	580		453	774		315	632	
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	31.2	24.4	0.0	30.4	24.7	0.0	32.2	13.8	0.0	33.5	15.8	0.0
Incr Delay (d2), s/veh	1.1	1.0	0.0	1.1	1.0	0.0	6.3	0.7	0.0	10.0	1.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	2.6	0.0	2.2	3.9	0.0	3.3	2.1	0.0	2.5	3.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	32.3	25.4	0.0	31.5	25.7	0.0	38.5	14.5	0.0	43.5	17.3	0.0
LnGrp LOS	C	C		C	C		D	B		D	B	
Approach Vol, veh/h		221	A		349	A		330	A		328	A
Approach Delay, s/veh		27.5			27.7			26.1			26.3	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.1	38.0		24.4	15.1	36.0		24.4				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	16.0	32.0		24.0	20.0	28.0		24.0				
Max Q Clear Time (g_c+I1), s	7.6	6.5		17.0	8.9	9.2		16.3				
Green Ext Time (p_c), s	0.3	2.4		1.4	0.5	2.8		2.1				

Intersection Summary			
HCM 6th Ctrl Delay		26.8	
HCM 6th LOS		C	

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	76	219	42	35	262	16	74	4	38	14	4	60
Future Vol, veh/h	76	219	42	35	262	16	74	4	38	14	4	60
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	1000	600	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	25	5	5	5	5	5	5	25	5	5	25	9
Mvmt Flow	76	219	42	35	262	16	74	4	38	14	4	60

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	278	0	0	219	0	0	743	719	-	713	711	270
Stage 1	-	-	-	-	-	-	371	371	-	340	340	-
Stage 2	-	-	-	-	-	-	372	348	-	373	371	-
Critical Hdwy	4.35	-	-	4.15	-	-	7.15	6.75	-	7.15	6.75	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.75	-	6.15	5.75	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.75	-	6.15	5.75	-
Follow-up Hdwy	2.425	-	-	2.245	-	-	3.545	4.225	-	3.545	4.225	3.381
Pot Cap-1 Maneuver	1163	-	-	1333	-	-	327	328	0	343	331	752
Stage 1	-	-	-	-	-	-	643	581	0	669	600	-
Stage 2	-	-	-	-	-	-	642	595	0	642	581	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1163	-	-	1333	-	-	275	295	-	313	298	752
Mov Cap-2 Maneuver	-	-	-	-	-	-	275	295	-	313	298	-
Stage 1	-	-	-	-	-	-	593	536	-	617	584	-
Stage 2	-	-	-	-	-	-	571	580	-	588	536	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.9	0.9		12.4
HCM LOS			-	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1163	-	-	1333	-	-	565
HCM Lane V/C Ratio	-	0.065	-	-	0.026	-	-	0.138
HCM Control Delay (s)	-	8.3	0	-	7.8	-	-	12.4
HCM Lane LOS	-	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.2	-	-	0.1	-	-	0.5

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	3	8	139	1	8	10	270	5	7	273	2
Future Vol, veh/h	0	3	8	139	1	8	10	270	5	7	273	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	5	50	40	5	5	88	40	5	5	100	5	100
Mvmt Flow	0	3	8	139	1	8	10	270	5	7	273	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	585	583	274	587	582	273	275	0	0	275	0	0
Stage 1	288	288	-	293	293	-	-	-	-	-	-	-
Stage 2	297	295	-	294	289	-	-	-	-	-	-	-
Critical Hdwy	7.15	7	6.6	7.15	6.55	7.08	4.5	-	-	5.1	-	-
Critical Hdwy Stg 1	6.15	6	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	6	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.45	3.66	3.545	4.045	4.092	2.56	-	-	3.1	-	-
Pot Cap-1 Maneuver	418	365	682	417	421	598	1098	-	-	883	-	-
Stage 1	713	595	-	709	665	-	-	-	-	-	-	-
Stage 2	705	590	-	708	668	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	405	358	682	403	413	598	1098	-	-	883	-	-
Mov Cap-2 Maneuver	405	358	-	403	413	-	-	-	-	-	-	-
Stage 1	705	590	-	701	658	-	-	-	-	-	-	-
Stage 2	687	584	-	690	662	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.7	18.7	0.3	0.2
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1098	-	-	547	410	883	-	-
HCM Lane V/C Ratio	0.009	-	-	0.02	0.361	0.008	-	-
HCM Control Delay (s)	8.3	0	-	11.7	18.7	9.1	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1.6	0	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	8	7	0	141	7	0
Future Vol, veh/h	8	7	0	141	7	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	5	100	5	5	100	5
Mvmt Flow	8	7	0	141	7	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	15	0	153	12
Stage 1	-	-	-	-	12	-
Stage 2	-	-	-	-	141	-
Critical Hdwy	-	-	4.15	-	7.4	6.25
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.245	-	4.4	3.345
Pot Cap-1 Maneuver	-	-	1583	-	655	1060
Stage 1	-	-	-	-	807	-
Stage 2	-	-	-	-	693	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1583	-	655	1060
Mov Cap-2 Maneuver	-	-	-	-	655	-
Stage 1	-	-	-	-	807	-
Stage 2	-	-	-	-	693	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	655	-	-	1583	-
HCM Lane V/C Ratio	0.011	-	-	-	-
HCM Control Delay (s)	10.6	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	7.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	8	0	0	19	122	14
Future Vol, veh/h	8	0	0	19	122	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	8	0	0	19	122	14

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	8	0	27	8
Stage 1	-	-	-	-	8	-
Stage 2	-	-	-	-	19	-
Critical Hdwy	-	-	4.15	-	6.45	6.25
Critical Hdwy Stg 1	-	-	-	-	5.45	-
Critical Hdwy Stg 2	-	-	-	-	5.45	-
Follow-up Hdwy	-	-	2.245	-	3.545	3.345
Pot Cap-1 Maneuver	-	-	1593	-	980	1065
Stage 1	-	-	-	-	1007	-
Stage 2	-	-	-	-	996	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1593	-	980	1065
Mov Cap-2 Maneuver	-	-	-	-	980	-
Stage 1	-	-	-	-	1007	-
Stage 2	-	-	-	-	996	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	988	-	-	1593	-
HCM Lane V/C Ratio	0.138	-	-	-	-
HCM Control Delay (s)	9.2	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0	-

2034 Pre-Development Synchro Analysis

HCM 6th Signalized Intersection Summary
1: PTH 9 & Easton & PTH 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	218	139	56	65	37	91	110	87	110	187	35
Future Volume (veh/h)	39	218	139	56	65	37	91	110	87	110	187	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	788	1352	1055	1011	1678	1115	1826	1678	1707	1278	1189	907
Adj Flow Rate, veh/h	39	218	0	56	65	0	91	110	0	110	187	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	75	37	57	60	15	53	5	15	13	42	48	67
Cap, veh/h	236	362		181	449		119	592		152	487	
Arrive On Green	0.27	0.27	0.00	0.27	0.27	0.00	0.07	0.35	0.00	0.13	0.41	0.00
Sat Flow, veh/h	563	1352	894	629	1678	945	1739	1678	1447	1217	1189	769
Grp Volume(v), veh/h	39	218	0	56	65	0	91	110	0	110	187	0
Grp Sat Flow(s),veh/h/ln	563	1352	894	629	1678	945	1739	1678	1447	1217	1189	769
Q Serve(g_s), s	4.0	10.0	0.0	6.0	2.1	0.0	3.6	3.2	0.0	6.2	7.8	0.0
Cycle Q Clear(g_c), s	6.1	10.0	0.0	16.0	2.1	0.0	3.6	3.2	0.0	6.2	7.8	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	236	362		181	449		119	592		152	487	
V/C Ratio(X)	0.17	0.60		0.31	0.14		0.76	0.19		0.72	0.38	
Avail Cap(c_a), veh/h	316	554		271	687		344	592		309	487	
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.1	22.6	0.0	29.6	19.8	0.0	32.4	15.9	0.0	29.8	14.6	0.0
Incr Delay (d2), s/veh	0.3	1.6	0.0	1.0	0.1	0.0	9.6	0.7	0.0	6.3	2.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	3.5	0.0	1.0	0.9	0.0	1.9	1.4	0.0	2.2	2.5	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.4	24.3	0.0	30.6	19.9	0.0	42.0	16.5	0.0	36.1	16.9	0.0
LnGrp LOS	C	C		C	B		D	B		D	B	
Approach Vol, veh/h		257	A		121	A		201	A		297	A
Approach Delay, s/veh		24.0			24.9			28.1			24.0	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	14.9	31.0		24.9	10.9	35.0		24.9				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	18.0	25.0		29.0	14.0	29.0		29.0				
Max Q Clear Time (g_c+I1), s	8.2	5.2		12.0	5.6	9.8		18.0				
Green Ext Time (p_c), s	0.3	1.2		3.4	0.2	2.5		0.9				

Intersection Summary		
HCM 6th Ctrl Delay		25.1
HCM 6th LOS		C

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	124	216	74	47	84	23	28	5	38	14	4	44
Future Vol, veh/h	124	216	74	47	84	23	28	5	38	14	4	44
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	1000	600	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	10	5	5	5	5	5	5	25	8	25	25	21
Mvmt Flow	124	216	74	47	84	23	28	5	38	14	4	44

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	107	0	0	216	0	0	678	665	-	657	654	96
Stage 1	-	-	-	-	-	-	464	464	-	190	190	-
Stage 2	-	-	-	-	-	-	214	201	-	467	464	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.15	6.75	-	7.35	6.75	6.41
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.75	-	6.35	5.75	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.75	-	6.35	5.75	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.545	4.225	-	3.725	4.225	3.489
Pot Cap-1 Maneuver	1435	-	-	1336	-	-	362	353	0	348	358	911
Stage 1	-	-	-	-	-	-	573	527	0	761	702	-
Stage 2	-	-	-	-	-	-	781	694	0	535	527	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1435	-	-	1336	-	-	306	305	-	308	310	911
Mov Cap-2 Maneuver	-	-	-	-	-	-	306	305	-	308	310	-
Stage 1	-	-	-	-	-	-	513	472	-	682	677	-
Stage 2	-	-	-	-	-	-	713	670	-	474	472	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.3	2.4		11.9
HCM LOS			-	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1435	-	-	1336	-	-	581
HCM Lane V/C Ratio	-	0.086	-	-	0.035	-	-	0.107
HCM Control Delay (s)	-	7.7	0	-	7.8	-	-	11.9
HCM Lane LOS	-	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.3	-	-	0.1	-	-	0.4

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	13	9	0	0	17	159	9	3	310	1
Future Vol, veh/h	1	1	13	9	0	0	17	159	9	3	310	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	5	5	60	5	5	5	60	11	5	5	5	5
Mvmt Flow	1	1	13	9	0	0	17	159	9	3	310	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	515	519	311	522	515	164	311	0	0	168	0	0
Stage 1	317	317	-	198	198	-	-	-	-	-	-	-
Stage 2	198	202	-	324	317	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.8	7.15	6.55	6.25	4.7	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.84	3.545	4.045	3.345	2.74	-	-	2.245	-	-
Pot Cap-1 Maneuver	466	457	612	461	459	873	983	-	-	1392	-	-
Stage 1	688	649	-	797	732	-	-	-	-	-	-	-
Stage 2	797	729	-	682	649	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	458	447	612	443	449	873	983	-	-	1392	-	-
Mov Cap-2 Maneuver	458	447	-	443	449	-	-	-	-	-	-	-
Stage 1	675	647	-	782	718	-	-	-	-	-	-	-
Stage 2	782	715	-	664	647	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.3	13.3	0.8	0.1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	983	-	-	585	443	1392	-	-
HCM Lane V/C Ratio	0.017	-	-	0.026	0.02	0.002	-	-
HCM Control Delay (s)	8.7	0	-	11.3	13.3	7.6	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.1	0	-	-

HCM 6th Signalized Intersection Summary
1: PTH 9 & Easton & PTH 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	81	189	159	142	283	58	195	208	87	104	165	95
Future Volume (veh/h)	81	189	159	142	283	58	195	208	87	104	165	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1159	1366	1174	1826	1826	1826	1796	1826	1455	1381	1292	1515
Adj Flow Rate, veh/h	81	189	0	142	283	0	195	208	0	104	165	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	50	36	49	5	5	5	7	5	30	35	41	26
Cap, veh/h	196	391		291	523		243	715		125	445	
Arrive On Green	0.29	0.29	0.00	0.29	0.29	0.00	0.14	0.39	0.00	0.10	0.34	0.00
Sat Flow, veh/h	679	1366	995	1166	1826	1547	1711	1826	1233	1316	1292	1284
Grp Volume(v), veh/h	81	189	0	142	283	0	195	208	0	104	165	0
Grp Sat Flow(s),veh/h/ln	679	1366	995	1166	1826	1547	1711	1826	1233	1316	1292	1284
Q Serve(g_s), s	9.1	9.1	0.0	9.1	10.4	0.0	8.7	6.2	0.0	6.2	7.6	0.0
Cycle Q Clear(g_c), s	19.4	9.1	0.0	18.2	10.4	0.0	8.7	6.2	0.0	6.2	7.6	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	196	391		291	523		243	715		125	445	
V/C Ratio(X)	0.41	0.48		0.49	0.54		0.80	0.29		0.83	0.37	
Avail Cap(c_a), veh/h	225	449		340	599		454	715		249	445	
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	32.1	23.4	0.0	30.9	23.9	0.0	32.9	16.5	0.0	35.2	19.5	0.0
Incr Delay (d2), s/veh	1.4	0.9	0.0	1.3	0.9	0.0	6.1	1.0	0.0	13.1	2.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.6	3.2	0.0	2.8	4.9	0.0	4.2	3.0	0.0	2.5	2.7	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	33.5	24.3	0.0	32.2	24.8	0.0	39.0	17.6	0.0	48.3	21.9	0.0
LnGrp LOS	C	C		C	C		D	B		D	C	
Approach Vol, veh/h		270	A		425	A		403	A		269	A
Approach Delay, s/veh		27.1			27.2			27.9			32.1	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.5	37.0		28.7	17.3	33.3		28.7				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	15.0	31.0		26.0	21.0	25.0		26.0				
Max Q Clear Time (g_c+I1), s	8.2	8.2		21.4	10.7	9.6		20.2				
Green Ext Time (p_c), s	0.2	2.9		1.2	0.7	1.9		2.1				

Intersection Summary			
HCM 6th Ctrl Delay		28.4	
HCM 6th LOS		C	

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	93	234	52	43	320	19	91	5	47	17	5	74
Future Vol, veh/h	93	234	52	43	320	19	91	5	47	17	5	74
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	1000	600	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	25	5	5	5	5	5	5	25	5	5	25	9
Mvmt Flow	93	234	52	43	320	19	91	5	47	17	5	74

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	339	0	0	234	0	0	875	845	-	839	836	330
Stage 1	-	-	-	-	-	-	420	420	-	416	416	-
Stage 2	-	-	-	-	-	-	455	425	-	423	420	-
Critical Hdwy	4.35	-	-	4.15	-	-	7.15	6.75	-	7.15	6.75	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.75	-	6.15	5.75	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.75	-	6.15	5.75	-
Follow-up Hdwy	2.425	-	-	2.245	-	-	3.545	4.225	-	3.545	4.225	3.381
Pot Cap-1 Maneuver	1102	-	-	1316	-	-	267	275	0	282	279	696
Stage 1	-	-	-	-	-	-	605	552	0	608	554	-
Stage 2	-	-	-	-	-	-	579	549	0	603	552	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1102	-	-	1316	-	-	211	239	-	250	242	696
Mov Cap-2 Maneuver	-	-	-	-	-	-	211	239	-	250	242	-
Stage 1	-	-	-	-	-	-	544	496	-	547	536	-
Stage 2	-	-	-	-	-	-	496	531	-	537	496	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.1	0.9		14.1
HCM LOS			-	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1102	-	-	1316	-	-	492
HCM Lane V/C Ratio	-	0.084	-	-	0.033	-	-	0.195
HCM Control Delay (s)	-	8.6	0	-	7.8	-	-	14.1
HCM Lane LOS	-	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.3	-	-	0.1	-	-	0.7

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	4	10	21	1	1	12	329	6	0	332	3
Future Vol, veh/h	0	4	10	21	1	1	12	329	6	0	332	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	5	50	40	5	5	5	40	5	5	5	5	100
Mvmt Flow	0	4	10	21	1	1	12	329	6	0	332	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	691	693	334	697	691	332	335	0	0	335	0	0
Stage 1	334	334	-	356	356	-	-	-	-	-	-	-
Stage 2	357	359	-	341	335	-	-	-	-	-	-	-
Critical Hdwy	7.15	7	6.6	7.15	6.55	6.25	4.5	-	-	4.15	-	-
Critical Hdwy Stg 1	6.15	6	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	6	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.45	3.66	3.545	4.045	3.345	2.56	-	-	2.245	-	-
Pot Cap-1 Maneuver	355	313	629	352	364	703	1040	-	-	1208	-	-
Stage 1	674	566	-	655	624	-	-	-	-	-	-	-
Stage 2	655	551	-	668	637	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	350	309	629	339	359	703	1040	-	-	1208	-	-
Mov Cap-2 Maneuver	350	309	-	339	359	-	-	-	-	-	-	-
Stage 1	665	566	-	646	615	-	-	-	-	-	-	-
Stage 2	644	543	-	653	637	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.6	16.1	0.3	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1040	-	-	485	348	1208	-	-
HCM Lane V/C Ratio	0.012	-	-	0.029	0.066	-	-	-
HCM Control Delay (s)	8.5	0	-	12.6	16.1	0	-	-
HCM Lane LOS	A	A	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.2	0	-	-

2034 Post-Development Synchro Analysis

HCM 6th Signalized Intersection Summary
1: PTH 9 & Easton & PTH 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	53	218	139	56	65	64	91	191	87	110	187	35
Future Volume (veh/h)	53	218	139	56	65	64	91	191	87	110	187	35
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1307	1352	1055	1011	1678	1604	1826	1796	1707	1278	1189	907
Adj Flow Rate, veh/h	53	218	0	56	65	0	91	191	0	110	187	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	40	37	57	60	15	20	5	7	13	42	48	67
Cap, veh/h	318	358		176	445		119	687		131	501	
Arrive On Green	0.27	0.27	0.00	0.27	0.27	0.00	0.07	0.38	0.00	0.11	0.42	0.00
Sat Flow, veh/h	934	1352	894	629	1678	1359	1739	1796	1447	1217	1189	769
Grp Volume(v), veh/h	53	218	0	56	65	0	91	191	0	110	187	0
Grp Sat Flow(s),veh/h/ln	934	1352	894	629	1678	1359	1739	1796	1447	1217	1189	769
Q Serve(g_s), s	3.4	10.4	0.0	6.3	2.2	0.0	3.8	5.4	0.0	6.5	7.9	0.0
Cycle Q Clear(g_c), s	5.6	10.4	0.0	16.7	2.2	0.0	3.8	5.4	0.0	6.5	7.9	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	318	358		176	445		119	687		131	501	
V/C Ratio(X)	0.17	0.61		0.32	0.15		0.76	0.28		0.84	0.37	
Avail Cap(c_a), veh/h	426	515		248	639		307	687		298	501	
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.8	23.7	0.0	31.0	20.7	0.0	33.7	15.7	0.0	32.2	14.6	0.0
Incr Delay (d2), s/veh	0.2	1.7	0.0	1.0	0.1	0.0	9.7	1.0	0.0	13.2	2.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	3.7	0.0	1.1	0.9	0.0	2.0	2.6	0.0	2.5	2.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.0	25.3	0.0	32.0	20.8	0.0	43.4	16.7	0.0	45.4	16.7	0.0
LnGrp LOS	C	C		C	C		D	B		D	B	
Approach Vol, veh/h		271	A		121	A		282	A		297	A
Approach Delay, s/veh		24.9			26.0			25.3			27.3	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.9	34.1		25.5	11.0	37.0		25.5				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	18.0	26.0		28.0	13.0	31.0		28.0				
Max Q Clear Time (g_c+I1), s	8.5	7.4		12.4	5.8	9.9		18.7				
Green Ext Time (p_c), s	0.3	2.4		3.1	0.2	2.7		0.8				

Intersection Summary			
HCM 6th Ctrl Delay		25.9	
HCM 6th LOS		C	

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	124	216	74	47	111	23	28	5	38	14	4	44
Future Vol, veh/h	124	216	74	47	111	23	28	5	38	14	4	44
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	1000	600	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	10	5	5	5	5	5	5	25	8	25	25	21
Mvmt Flow	124	216	74	47	111	23	28	5	38	14	4	44

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	134	0	0	216	0	0	705	692	-	684	681	123
Stage 1	-	-	-	-	-	-	464	464	-	217	217	-
Stage 2	-	-	-	-	-	-	241	228	-	467	464	-
Critical Hdwy	4.2	-	-	4.15	-	-	7.15	6.75	-	7.35	6.75	6.41
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.75	-	6.35	5.75	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.75	-	6.35	5.75	-
Follow-up Hdwy	2.29	-	-	2.245	-	-	3.545	4.225	-	3.725	4.225	3.489
Pot Cap-1 Maneuver	1403	-	-	1336	-	-	347	340	0	334	345	879
Stage 1	-	-	-	-	-	-	573	527	0	736	682	-
Stage 2	-	-	-	-	-	-	756	675	0	535	527	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1403	-	-	1336	-	-	292	293	-	295	298	879
Mov Cap-2 Maneuver	-	-	-	-	-	-	292	293	-	295	298	-
Stage 1	-	-	-	-	-	-	512	471	-	658	658	-
Stage 2	-	-	-	-	-	-	689	651	-	473	471	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.3	2		12.2
HCM LOS			-	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1403	-	-	1336	-	-	559
HCM Lane V/C Ratio	-	0.088	-	-	0.035	-	-	0.111
HCM Control Delay (s)	-	7.8	0	-	7.8	-	-	12.2
HCM Lane LOS	-	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.3	-	-	0.1	-	-	0.4

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	1	13	9	0	7	17	159	131	10	310	1
Future Vol, veh/h	1	1	13	9	0	7	17	159	131	10	310	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	5	5	60	5	5	100	60	11	5	78	5	5
Mvmt Flow	1	1	13	9	0	7	17	159	131	10	310	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	593	655	311	597	590	225	311	0	0	290	0	0
Stage 1	331	331	-	259	259	-	-	-	-	-	-	-
Stage 2	262	324	-	338	331	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.8	7.15	6.55	7.2	4.7	-	-	4.88	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.84	3.545	4.045	4.2	2.74	-	-	2.902	-	-
Pot Cap-1 Maneuver	413	382	612	410	416	621	983	-	-	939	-	-
Stage 1	676	640	-	739	688	-	-	-	-	-	-	-
Stage 2	736	644	-	670	640	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	398	369	612	390	402	621	983	-	-	939	-	-
Mov Cap-2 Maneuver	398	369	-	390	402	-	-	-	-	-	-	-
Stage 1	662	632	-	723	674	-	-	-	-	-	-	-
Stage 2	712	630	-	646	632	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.5	13	0.5	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	983	-	-	567	466	939	-	-
HCM Lane V/C Ratio	0.017	-	-	0.026	0.034	0.011	-	-
HCM Control Delay (s)	8.7	0	-	11.5	13	8.9	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0.1	0	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	135	7	0	9	7	0
Future Vol, veh/h	135	7	0	9	7	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	5	100	5	5	100	5
Mvmt Flow	135	7	0	9	7	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	142	0	148	139
Stage 1	-	-	-	-	139	-
Stage 2	-	-	-	-	9	-
Critical Hdwy	-	-	4.15	-	7.4	6.25
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.245	-	4.4	3.345
Pot Cap-1 Maneuver	-	-	1423	-	660	901
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	810	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1423	-	660	901
Mov Cap-2 Maneuver	-	-	-	-	660	-
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	810	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	660	-	-	1423	-
HCM Lane V/C Ratio	0.011	-	-	-	-
HCM Control Delay (s)	10.5	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	13	122	14	9	0	0
Future Vol, veh/h	13	122	14	9	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	13	122	14	9	0	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	135	0	111	74
Stage 1	-	-	-	-	74	-
Stage 2	-	-	-	-	37	-
Critical Hdwy	-	-	4.15	-	6.45	6.25
Critical Hdwy Stg 1	-	-	-	-	5.45	-
Critical Hdwy Stg 2	-	-	-	-	5.45	-
Follow-up Hdwy	-	-	2.245	-	3.545	3.345
Pot Cap-1 Maneuver	-	-	1431	-	879	979
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	978	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1431	-	870	979
Mov Cap-2 Maneuver	-	-	-	-	870	-
Stage 1	-	-	-	-	941	-
Stage 2	-	-	-	-	968	-

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

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1431	-
HCM Lane V/C Ratio	-	-	-	0.01	-
HCM Control Delay (s)	0	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	0	-

HCM 6th Signalized Intersection Summary
1: PTH 9 & Easton & PTH 4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	81	189	159	142	283	58	195	208	87	131	246	109
Future Volume (veh/h)	81	189	159	142	283	58	195	208	87	131	246	109
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1159	1366	1174	1826	1826	1826	1796	1826	1455	1559	1589	1589
Adj Flow Rate, veh/h	81	189	0	142	283	0	195	208	0	131	246	0
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	50	36	49	5	5	5	7	5	30	23	21	21
Cap, veh/h	192	386		284	516		242	703		162	560	
Arrive On Green	0.28	0.28	0.00	0.28	0.28	0.00	0.14	0.39	0.00	0.11	0.35	0.00
Sat Flow, veh/h	679	1366	995	1166	1826	1547	1711	1826	1233	1485	1589	1346
Grp Volume(v), veh/h	81	189	0	142	283	0	195	208	0	131	246	0
Grp Sat Flow(s),veh/h/ln	679	1366	995	1166	1826	1547	1711	1826	1233	1485	1589	1346
Q Serve(g_s), s	9.3	9.3	0.0	9.3	10.6	0.0	8.9	6.4	0.0	6.9	9.5	0.0
Cycle Q Clear(g_c), s	19.8	9.3	0.0	18.6	10.6	0.0	8.9	6.4	0.0	6.9	9.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	192	386		284	516		242	703		162	560	
V/C Ratio(X)	0.42	0.49		0.50	0.55		0.81	0.30		0.81	0.44	
Avail Cap(c_a), veh/h	211	424		317	567		425	703		295	560	
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	33.0	24.0	0.0	31.8	24.5	0.0	33.5	17.2	0.0	35.1	20.0	0.0
Incr Delay (d2), s/veh	1.5	1.0	0.0	1.4	0.9	0.0	6.3	1.1	0.0	9.3	2.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	3.3	0.0	2.9	5.0	0.0	4.3	3.1	0.0	3.1	4.2	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	34.4	25.0	0.0	33.1	25.4	0.0	39.8	18.2	0.0	44.4	22.4	0.0
LnGrp LOS	C	C		C	C		D	B		D	C	
Approach Vol, veh/h		270	A		425	A		403	A		377	A
Approach Delay, s/veh		27.8			28.0			28.7			30.1	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	14.8	37.0		28.7	17.4	34.4		28.7
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0
Max Green Setting (Gmax), s	16.8	31.0		25.0	20.0	27.0		25.0
Max Q Clear Time (g_c+I1), s	8.9	8.4		21.8	10.9	11.5		20.6
Green Ext Time (p_c), s	0.3	2.9		0.9	0.6	2.9		1.7

Intersection Summary	
HCM 6th Ctrl Delay	28.7
HCM 6th LOS	C

Notes

Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	93	261	52	43	320	19	91	5	47	17	5	74
Future Vol, veh/h	93	261	52	43	320	19	91	5	47	17	5	74
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	Yield	-	-	None	-	-	Free	-	-	None
Storage Length	-	-	1000	600	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	25	5	5	5	5	5	5	25	5	5	25	9
Mvmt Flow	93	261	52	43	320	19	91	5	47	17	5	74

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	339	0	0	261	0	0	902	872	-	866	863	330
Stage 1	-	-	-	-	-	-	447	447	-	416	416	-
Stage 2	-	-	-	-	-	-	455	425	-	450	447	-
Critical Hdwy	4.35	-	-	4.15	-	-	7.15	6.75	-	7.15	6.75	6.29
Critical Hdwy Stg 1	-	-	-	-	-	-	6.15	5.75	-	6.15	5.75	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.15	5.75	-	6.15	5.75	-
Follow-up Hdwy	2.425	-	-	2.245	-	-	3.545	4.225	-	3.545	4.225	3.381
Pot Cap-1 Maneuver	1102	-	-	1286	-	-	255	265	0	270	269	696
Stage 1	-	-	-	-	-	-	585	536	0	608	554	-
Stage 2	-	-	-	-	-	-	579	549	0	583	536	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1102	-	-	1286	-	-	201	230	-	238	233	696
Mov Cap-2 Maneuver	-	-	-	-	-	-	201	230	-	238	233	-
Stage 1	-	-	-	-	-	-	525	481	-	545	536	-
Stage 2	-	-	-	-	-	-	495	531	-	518	481	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2	0.9		14.3
HCM LOS			-	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	-	1102	-	-	1286	-	-	482
HCM Lane V/C Ratio	-	0.084	-	-	0.033	-	-	0.199
HCM Control Delay (s)	-	8.6	0	-	7.9	-	-	14.3
HCM Lane LOS	-	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	-	0.3	-	-	0.1	-	-	0.7

Intersection	
Int Delay, s/veh	4.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	4	10	143	1	8	12	329	6	7	332	3
Future Vol, veh/h	0	4	10	143	1	8	12	329	6	7	332	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	5	50	40	5	5	88	40	5	5	100	5	100
Mvmt Flow	0	4	10	143	1	8	12	329	6	7	332	3

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	709	707	334	711	705	332	335	0	0	335	0	0
Stage 1	348	348	-	356	356	-	-	-	-	-	-	-
Stage 2	361	359	-	355	349	-	-	-	-	-	-	-
Critical Hdwy	7.15	7	6.6	7.15	6.55	7.08	4.5	-	-	5.1	-	-
Critical Hdwy Stg 1	6.15	6	-	6.15	5.55	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	6	-	6.15	5.55	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.45	3.66	3.545	4.045	4.092	2.56	-	-	3.1	-	-
Pot Cap-1 Maneuver	345	307	629	344	357	550	1040	-	-	832	-	-
Stage 1	662	557	-	655	624	-	-	-	-	-	-	-
Stage 2	651	551	-	656	628	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	333	300	629	329	348	550	1040	-	-	832	-	-
Mov Cap-2 Maneuver	333	300	-	329	348	-	-	-	-	-	-	-
Stage 1	653	551	-	646	615	-	-	-	-	-	-	-
Stage 2	632	543	-	634	622	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.7	24.3	0.3	0.2
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1040	-	-	479	336	832	-	-
HCM Lane V/C Ratio	0.012	-	-	0.029	0.452	0.008	-	-
HCM Control Delay (s)	8.5	0	-	12.7	24.3	9.4	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	2.3	0	-	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	10	7	0	145	7	0
Future Vol, veh/h	10	7	0	145	7	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	5	100	5	5	100	5
Mvmt Flow	10	7	0	145	7	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	17	0	159	14
Stage 1	-	-	-	-	14	-
Stage 2	-	-	-	-	145	-
Critical Hdwy	-	-	4.15	-	7.4	6.25
Critical Hdwy Stg 1	-	-	-	-	6.4	-
Critical Hdwy Stg 2	-	-	-	-	6.4	-
Follow-up Hdwy	-	-	2.245	-	4.4	3.345
Pot Cap-1 Maneuver	-	-	1581	-	649	1057
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	690	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1581	-	649	1057
Mov Cap-2 Maneuver	-	-	-	-	649	-
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	690	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	649	-	-	1581	-
HCM Lane V/C Ratio	0.011	-	-	-	-
HCM Control Delay (s)	10.6	-	-	0	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

Intersection	
Int Delay, s/veh	7.5

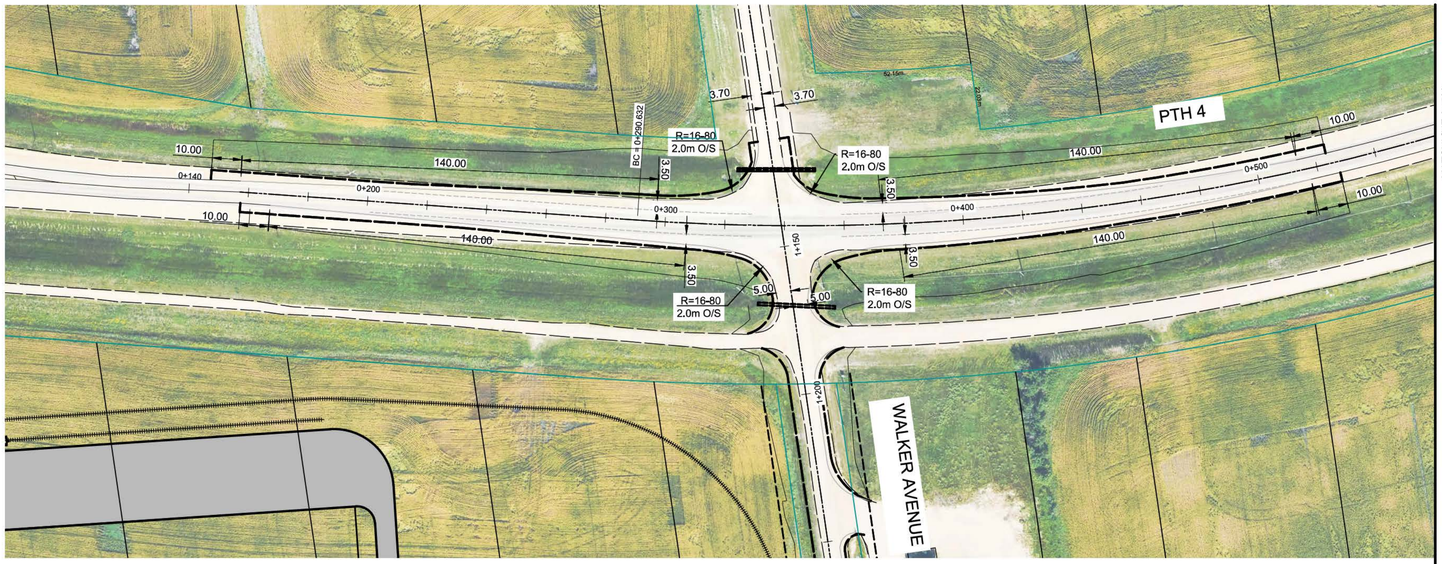
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	10	0	0	23	122	14
Future Vol, veh/h	10	0	0	23	122	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	5	5	5	5	5	5
Mvmt Flow	10	0	0	23	122	14

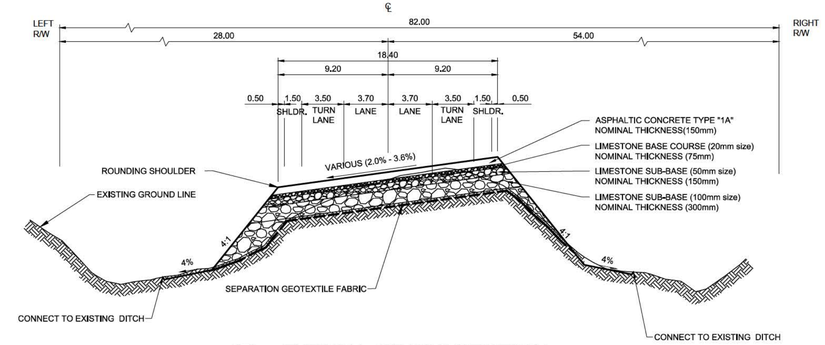
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	10	0	33	10
Stage 1	-	-	-	-	10	-
Stage 2	-	-	-	-	23	-
Critical Hdwy	-	-	4.15	-	6.45	6.25
Critical Hdwy Stg 1	-	-	-	-	5.45	-
Critical Hdwy Stg 2	-	-	-	-	5.45	-
Follow-up Hdwy	-	-	2.245	-	3.545	3.345
Pot Cap-1 Maneuver	-	-	1590	-	973	1063
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	992	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1590	-	973	1063
Mov Cap-2 Maneuver	-	-	-	-	973	-
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	992	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	9.3
HCM LOS			A

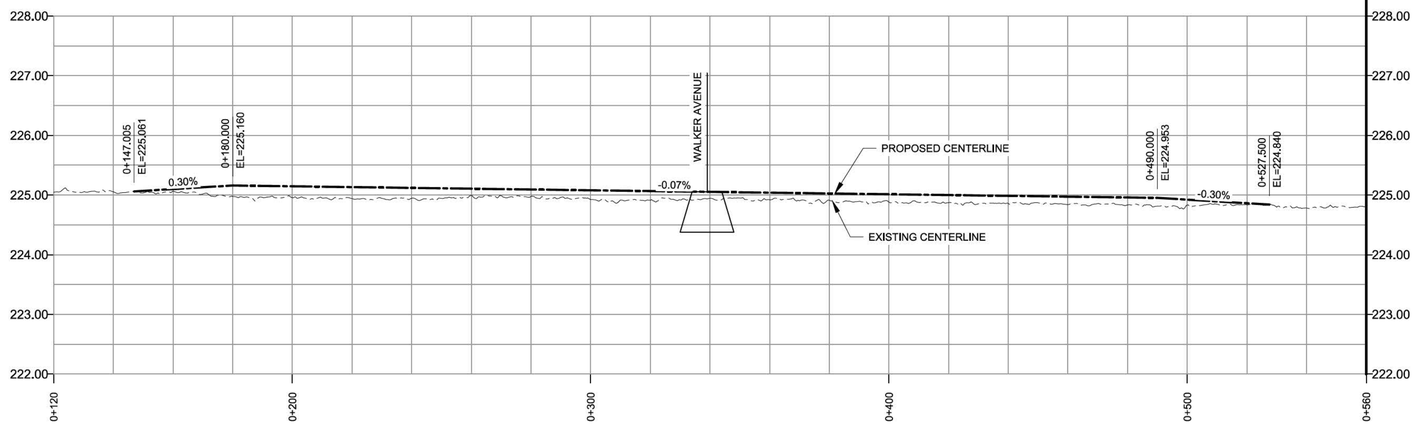
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	982	-	-	1590	-
HCM Lane V/C Ratio	0.138	-	-	-	-
HCM Control Delay (s)	9.3	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0	-

Appendix C PTH 4 at Walker Ave Concept Plan





1 TYPICAL CROSS SECTION
PTH 4 - WIDENED INTERSECTION N.T.S



METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

SCALE 1:1000 METRES 0 25 50
SCALE 1:1 MILLIMETRES 0 25 50

PROFILE LEGEND

	EXISTING	PROPOSED
CENTER LINE		
LEFT DITCH		
RIGHT DITCH		
C.S.C. OR P.C.C. THRU GRADE		
C.S.C. OR P.C.C. THRU CROSSING		
CROSSING		

PLAN LEGEND

	EXISTING	PROPOSED
CENTER LINE OF ROADWAY		
RIGHT OF WAY		
EDGE OF GRAVEL LANES		
HYDRO POLE	H	
CULVERTS		
FLOW DIRECTION		
BORE HOLES		

ENG STAMP

NO	DD/MM/YY	REVISIONS	BY	CKD	APP
A	20/10/2021	PRELIMINARY DESIGN			

CONSULTANT: AECOM

CONSULTANT DWG NO:

CPS CANADIAN PREMIUM SAND

DESIGNED BY:	DRAWN BY:	HORIZ SCALE: 1:1000
MM/BC	MM	VERT SCALE: 1:100
CHECKED BY:	APPROVED BY:	DATE:
SBC		OCT 20, 2021

TITLE:
FLOAT GLASS PLANT SITE PROJECT
PTH 4 AT WALKER AVENUE WIDENING

PTH 4
STATION 0+147 TO STATION 0+527

OWNER: CANADIAN PREMIUM SAND LTD
PROJECT: FLOAT GLASS PLANT SITE PROJECT
PHASE: PRELIMINARY DESIGN
OWNER DWG NO: RT-01.DWG
SHT: RT-01
REV: A

10/20/21 01:34pm mirkinl L:\Legacy\CAWPG1FP001\Data\Projects\60588114\900-CAD_GIS\910-CAD\20-SHEETS\C\2021\Ref-In\Plant Site\RT-01.dwg Layout:RT-01

Appendix D MTI Comment Response Letter

AECOM Canada Ltd.
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Canada

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May 27, 2022

Project Number:
60663147.15

Highway Planning and Design Branch
Manitoba Infrastructure
1420-215 Garry Street
Winnipeg, Manitoba
R3C 3P3

Attention: Ms. Karen Toews, C.E.T.
Manager of Roadside Development

Canadian Premium Sand Inc. Traffic Impact Study for a Glass Manufacturing Facility – Review Comment Responses

Dear Ms. Toews,

Thank-you for completing a review of the Traffic Impact Study (TIS) submitted by AECOM for the Glass Manufacturing Facility on behalf of Canadian Premium Sand Inc. (CPS). Responses to the review comments are provided below (comment responses in italics).

General comment

Please make sure this is noted as a TIS rather than a TIA as those are very different things for MTI.

Wording in the final report has been revised from "Traffic Impact Assessment" to "Traffic Impact Study".

Page 10 – Section 3.1.2

This section references Appendix A. MTI has questions related to the truck % at the intersection of PTH 9/4 within Appendix A.

Traffic Count Data:

- October 7, 2021 Count (PTH 9/PTH 4 at Easton Dr (PTH 9A) - Questioning the high percentage of semis here (~30%) and 0 single unit trucks
- September 29, 2021 Count (PTH 9/PTH 4 at Easton Dr (PTH 9A) - Again, very high volumes of semis and no single unit trucks? Are single units and tractor trailers combined?

The traffic count tally sheets for the PTH 9/PTH 4 at Easton Dr (PTH 9A) intersection are attached. Cars, trucks and buses were counted separately. The truck counts include <u>both</u> single-units (SU-9) and tractor-trailers.

Pg. 11, under Figure 3

"For analysis purposes the observed HV% were adjusted to better represent average conditions. The minimum and maximum HV% was set to 5% and 25% respectively for all intersection movements; existing HV% were used if they were between the minimum and maximum values."

MTI recommends that the true HV% be used if over 25% so the design volumes can account for the worst case scenario.

The traffic analyses were revised to include true HV%. This resulted in minimal changes to approach delay and maximum v/c ratios.

Page 15 – Section 4.1

3rd bullet point – Suggest; "...occur during off-peak periods of the surrounding road network,"

4th bullet point – Suggest; "...AM/PM peak hours of the surrounding road network,"

Wording in the final report has been revised as per the comments.

Page 29 – Section 5.5.1

Where does the priority points equation come from?

The equation was derived from the graph included in the 2016 draft TEB Policy 400-A-2. It provides the same results as the graph for communities with population between 6.500 and 20,000. The TIS was revised to clarify this and to include a copy of the graph.

Pg. 36 – Section 6.2 Recommendations

Last major bullet point:

"Based on MTI's rural intersection improvement warrants, improve the PTH 4 at Walker Ave intersection to include the following:

- A bypass intersection improvement,
- Consider installing a SB left only lane instead of a SB through+left lane as part of the bypass improvement,
- Widen the east leg of Walker Ave using 15:1 tapers and improve right turn radii using compound curves which accommodate WB-20 truck movements."

Please provide drawing showing this.

A concept plan illustrating the proposed improvements at PTH 4 and Walker Avenue has been included in the final TIS report Appendices.

A final copy of the TIS for the CPS Glass Manufacturing Facility is attached which includes the revisions noted above. Please feel free to contact me at 204-955-2461 or brad.cook@aecom.com with any questions regarding AECOM's response to the TIS comments provided by MTI.

Yours sincerely,

S. Brad Cook, P.Eng.
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enclosures: CPS Glass Manufacturing Facility – Traffic Impact Study (Final)

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