

AUGUST 18, 2021

REFER TO FILE: 1838-5493

Town of Collingwood, Engineering Services
P.O. Box 157, 545 Tenth Line North
Collingwood, Ontario L9Y 3Z5

**Attention: Sheldon Hancock, C.E.T.
Engineering Technologist**

**RE: HARBOUR HOUSE DEVELOPMENT
TRAFFIC OPINION LETTER UPDATE
TOWN OF COLLINGWOOD, COUNTY OF SIMCOE**

Dear Sheldon,

This updated letter has been prepared to support the Zoning By-law Amendment and Site Plan Applications and address the transportation aspects relating to the proposed mixed-use development at 31 Huron Street in the Town of Collingwood. The development is part of The Shipyards Development Area in the Town of Collingwood.

An original Traffic Opinion Letter was submitted in July 2020. This update will address changes to the site plan and comments provided by the Town.

Background

The site is approximately 0.47 hectares (1.16 acres) in size and is located in the northwest quadrant of the intersection of Huron Street and Heritage Drive in the Town of Collingwood. The site is bounded by Side Launch Way to the north, Heritage Drive to the east, Huron Street to the south, and a vacant block to the west.

The site is located within the Shipyards Development Area, which is located at the north end of downtown Collingwood, fronting the Georgian Bay shoreline. The Shipyards Development Area is bounded by Heritage Drive to the east, Huron Street to the south, and an unopened road allowance for Beech Street to the west.

R.J. Burnside & Associates Limited (Burnside) issued a Traffic Impact Study, dated October 2003, for the entirety of The Shipyards development. A subsequent Addendum was prepared in February 2004 to address comments received from the Town and provide a revised analysis based on changes to the overall concept plan.

The recommendations that came from the studies have been implemented including the signalization of Huron Street and Heritage Drive, a two-way centre left-turn from High Street to east of Heritage Drive, a one-way northbound extension of Hurontario Street (north of Huron Street), northbound and southbound left-turn lanes on Pine Street, Hurontario Street and Heritage Drive, and the optimization of the existing signalized intersections.

Development Proposal

The proposed development consists of one six-storey mid-rise building with 130 residential units and 16,469 square feet (1,530 m²) of retail space. The development proposes parking to be provide in three locations. 30 surface level parking spaces are proposed which would be used by the

commercial units. The first level (P1) of underground parking facilities will have 126 paid parking spaces to be used by visitors to the residences and commercial businesses, with a total of 156 public parking spaces. The second level (P2) of the underground parking will accommodate 130 parking spaces to service the residential units. The site plan also proposes 12 barrier free spaces and 119 bicycle parking spaces, exceeding the By-law requirements. Twenty percent (20%) of the required By-law parking spaces will be electrical charging spaces.

It is noted that of the 156 commercial parking spaces, 61 parking spaces are a potential surplus which could be used for Shipyards parking relief, should the Town desire. It is also noted that an additional 100 parking spaces could be provided beneath the neighbouring Town lands, which could be accessed through P1. The feasibility of providing additional public parking spaces to support the downtown core would be determined through consultation between the proponent and Town.

These details are summarized in the development Site Statistics included as **Attachment A**. The Site Plan dated August 13, 2021, prepared by Streetcar, has also been included with **Attachment A**.

Access to the site is proposed through a full moves entrance to Side Launch Way and a second full moves entrance to Heritage Drive. The proposed entrance to Side Launch Way is approximately 30 metres (curb radii to curb radii) from the intersection of Heritage Drive and Side Launch Way. The proposed entrance to Heritage Drive is approximately 30 metres from the intersection of Huron Street and Heritage Drive and 17 metres from the intersection of Heritage Drive and Side Launch Way.

Sidewalks are proposed along the perimeter of the site, including the east side of the existing commercial plaza entrance to the west of the site.

Internal to the site there will be a no right-turn permitted sign for vehicles exiting the parking garage. This has been proposed so as to reduce the number of vehicles moving through the site and encourage motorists to utilize the entrance to Side Launch Way. The entrance to the underground parking is also oriented towards Side Launch Way, directing drivers towards the northern access.

Boundary Road Network

The boundary road network is described in **Table 1** below.

Table 1: Boundary Road Network

Roadway	Huron Street/First Street	Side Launch Way	Heritage Drive
Direction	East-West	East-West	North-South
Classification	Arterial Road	Local Road	Local Road
Jurisdiction	Town of Collingwood ¹	Town of Collingwood, however roadway is unassumed	Town of Collingwood
Posted Speed Limit (km/h)	50 km/h	40 km/h (Assumed)	40 km/h
Total Number of Lanes	5	2	2
Pedestrian/ Cycling Facilities	3m sidewalk on north side of roadway with 3m grass boulevard (varies) 1.5m sidewalk on south side of roadway	1.5m sidewalk with a 3m multi-use pathway on south side of roadway	2.5m sidewalk with a 2m grass boulevard on the west side of the roadway

Note¹: Huron Street/First Street is a segment of Highway 26, which is part of the MTO's connecting link program through the Town of Collingwood.

Existing Operations

Turning movement counts were undertaken by Spectrum Traffic Data Inc. at the intersections of Heritage Drive and Side Launch Way and Heritage Drive and Huron Street on Wednesday July 7th, 2021 from 7 a.m. to 10 a.m. and 4 p.m. to 7 p.m. Ontario was in Stage 2 of their reopening framework as of that date. Traffic data has been included as **Attachment B**. Signal timings for Heritage Drive and Huron Street were provided by the Town and have been included as **Attachment C**.

Table 2 summarizes the peak hours and peak hour factors at the study intersections.

Table 2: Peak Hour Factors

Intersection	Peak Hour	Peak Hour Factor
Heritage Drive and Side Launch Way	8:30 a.m. – 9:30 a.m.	0.82
	4:00 p.m. – 5:00 p.m.	0.87
Heritage Drive and Huron Street	9:00 a.m. – 10:00 a.m.	0.90
	4:00 p.m. – 5:00 p.m.	0.98

Due to the varying peak hours and small variation in volumes between the intersections, the existing volumes were balanced prior to modelling. Existing volumes are illustrated in **Figure 1**. The existing traffic operations are summarized in **Table 3**. Level of Service (LOS) definitions have been included as **Attachment D**. Detailed capacity analysis worksheets have been included as **Attachment E**.

Table 3: Existing Intersection Operations

Intersection	Control	Roadway Peak Hour	LOS	Delay	V/C Ratio
Heritage Drive and Side Launch Way	Stop (minor approach)	Weekday A.M.	A	8.9 s	0.02 (EB)
		Weekday P.M.	A	9.1 s	0.08 (EB)
Heritage Drive and Huron Street	Signalized	Weekday A.M.	B	12.5 s	0.43 (WBT)
		Weekday P.M.	B	12.8 s	0.45 (WBT)

It can be seen that the intersections are operating well under existing traffic volume conditions with reserve capacity for increases in traffic volumes.

Trip Generation

The trip generation of the proposed development was forecasted using the rates provided in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition. The residential dwelling units were assessed using Land Use Category (LUC) 221 “Multifamily Housing (Mid-Rise)” and the commercial space was assessed using LUC 820 “Shopping Centre”. The forecasted trip generation of the proposed development is summarized in **Table 4**. Relevant excerpts from the ITE Trip Generation Manual, 10th Edition have been included as **Attachment F**.

Table 4: Trip Generation (Peak Hour)

Land Use	No. of Units/ GFA	Roadway Peak Hour	Number of Trips		
			Inbound	Outbound	Total
LUC 221: Multifamily Housing (Mid-Rise)	130	Weekday A.M.	11	33	44
		Weekday P.M.	35	22	57
LUC 820: Shopping Centre	16,469 ft²	Weekday A.M.	9	6	15
		Weekday P.M.	30	33	63
Total		Weekday A.M.	20	39	59
		Weekday P.M.	65	55	120

As defined by the ITE Trip Generation Handbook, 3rd Edition, primary trips are made for the specific purpose of visiting the generator. Pass-by trips are made as intermediate stops on the way from an origin to a primary destination without a route diversion. Accordingly, these vehicles do not increase the volume of vehicles on the roadway. The pass-by percentage for commercial uses in the a.m. peak hour is typically assumed to be zero, as most trips would represent employees going into work. In the p.m. peak hour, the average pass-by percentage is 34 percent. Accordingly, based on the trip generation estimate summarized in **Table 4**, the development is expected to generate 21 pass-by and 42 primary commercial trips.

Trip Distribution

As noted previously, a no right-turn permitted sign is proposed for vehicles exiting the parking garage and the entrance to the underground parking is oriented towards Side Launch Way, directing drivers towards the Side Launch Way access. To provide a conservative assessment, it has been assumed that all inbound and outbound vehicles will utilize the intersection of Heritage Drive and Huron Street. In reality, some drivers may approach from the east on Side Launch Way.

Residential parking is contained within the underground parking garage. As drivers are directed to not make a right-turn into the parking lot, 100% of residential trips were assumed to utilize the Side Launch Way access. The eastbound and westbound distribution was established based on the observed traffic volumes on Huron Street. The trip distribution for residential trip generation is illustrated in **Figure 2** and the trip assignment has been illustrated in **Figure 3**.

Commercial parking is split between the underground facilities and the ground level parking lot. The outbound commercial trips were evenly distributed between the two access, while inbound trips were applied only at the Heritage Drive access for a conservative analysis. The trip distribution for the commercial trips is illustrated in **Figure 4** and the trip assignment (including pass-by) has been illustrated in **Figure 5**.

Total Traffic Operations

Analysis of the total traffic operations was conducted by adding the site generated volumes onto the existing roadway volumes. The total volumes are illustrated in **Figure 6**. The traffic operations under total conditions are summarized in **Table 5**. LOS definitions have been included as **Attachment D**. Detailed capacity analysis worksheets have been included as **Attachment E**.

Table 5: Total Intersection Operations

Intersection	Control	Roadway Peak Hour	LOS	Delay	V/C Ratio
Heritage Drive and Side Launch Way	Stop (minor approach)	Weekday A.M.	A	9.0 s	0.07 (EB)
		Weekday P.M.	A	9.4 s	0.12 (EB)
Heritage Drive and Huron Street	Signalized	Weekday A.M.	B	12.5 s	0.44 (WBT)
		Weekday P.M.	B	13.3 s	0.49 (WBT)
North Access and Side Launch Way	Stop (minor approach)	Weekday A.M.	A	8.5 s	0.04 (NB)
		Weekday P.M.	A	8.8 s	0.04 (NB)
East Access and Heritage Way	Stop (minor approach)	Weekday A.M.	A	8.8 s	0.00 (EB)
		Weekday P.M.	A	9.1 s	0.02 (EB)

As summarized above, the addition of the site generated traffic is anticipated to have a minimal impact on the operations of the boundary road network. Based on the above, it is concluded that the study intersections can accommodate the additional traffic generated by the proposed development.

Underground Parking Garage Queuing Analysis

As requested by the Town, an analysis of the future operations of the underground parking garage entrance was undertaken to determine whether the proposed queuing area is sufficient to accommodate the future vehicular demand.

It was confirmed by the architect that the entry to the proposed underground parking garage will be a motion sensor overhead garage door. Information pertaining to the expected door speed was provided by the proponent.

The provided specifics state the garage door has an “up” speed of 24 inches per second, but the potential to reach speeds up to 30 inches per second. With a door height of 7 feet, that equates to total time of approximately 3.5 seconds for the door to open. The door has a timer for how long the door will stay open and a sensor for detecting cars in the doorway. The sensor is required for safety. If a vehicle is detected, the timer will re-set, so the door does not close while a vehicle is proceeding through the entryway. Accordingly, multiple vehicles could proceed through the open doorway if they are detected. The length of the timer will be determined by the building/property manager.

Given the expected speed of the garage door, the proposed underground parking entrance is expected to operate with minimal queues.

Sensitivity Analysis

The proponent has indicated that there is the potential to provide additional parking spaces on P1 both within the building footprint and utilizing the adjacent Town owned lands to the west of the site. This additional parking would be available as public paid parking to support visitors to the downtown during busier hours, during special events or other Town needs.

A sensitivity analysis was conducted for a peak hour turnover of 50% of the proposed 161 spaces. The same distribution as the commercial component was applied and the total traffic volumes analyzed are illustrated in **Figure 7**.

The traffic operations for the sensitivity analysis are summarized in **Table 6**. LOS definitions have been included as **Attachment D**. Detailed capacity analysis worksheets have been included as **Attachment E**.

Table 6: Sensitivity Analysis Intersection Operations

Intersection	Control	Roadway Peak Hour	LOS	Delay	V/C Ratio
Heritage Drive and Side Launch Way	Stop (minor approach)	Weekday A.M.	A	9.2 s	0.12 (EB)
		Weekday P.M.	A	9.6 s	0.17 (EB)
Heritage Drive and Huron Street	Signalized	Weekday A.M.	B	13.1 s	0.49 (WBT)
		Weekday P.M.	B	13.5 s	0.51 (WBT)
North Access and Side Launch Way	Stop (minor approach)	Weekday A.M.	A	8.7 s	0.08 (NB)
		Weekday P.M.	A	9.0 s	0.09 (NB)
East Access and Heritage Way	Stop (minor approach)	Weekday A.M.	A	9.2 s	0.05 (EB)
		Weekday P.M.	A	9.6 s	0.07 (EB)

Even with the increase in traffic volumes resulting from the additional parking spaces, the study intersections are anticipated to continue operating well. Based on the above, it is concluded that the study intersections can accommodate the additional growth in traffic generated by the additional available parking.

Truck Turning

A truck turning analysis was completed using AutoTURN modelling software to confirm vehicle movements within the underground parking, as well as to ensure an aerial Fire Truck and a front-loading garbage truck can manoeuvre through the site without any conflicts to parking stalls or internal curbs.

The vehicle manoeuvring diagrams have been included as **Attachment G**. Two-way vehicle movements are able to safely navigate through the underground parking facilities and the garbage and emergency vehicles can manoeuvre without any conflicts.

Parking

As noted previously, the development proposes parking to be provide in three locations. 30 surface level parking spaces are proposed which would be used by the commercial units. The first level (P1) of underground parking facilities will have 126 paid parking spaces to be used by visitors to the residences and commercial businesses. The second level (P2) of the underground parking will accommodate 130 parking spaces to service the residential units. A breakdown of the Town of Collingwood's By-law requirements and the provided parking are summarized in **Table 7**.

Table 7: Parking Requirements

Land Use	Parking Requirement	Parking Provided
Residential	1 per unit = 130 spaces	130
Residential Visitors	0.25 per unit = 33 spaces	156
Commercial (Shopping Centre)	4/100m ² GFA = 62	
Minimum Parking Requirement		225
Proposed Parking Supply		286
Surplus/Deficit		+61

As summarized above, the proposed development proposes a surplus of 61 parking spaces, which could be used for downtown and Shipyards parking relief, should the Town request it.

Entrance Locations

As noted previously, access to the site is proposed through full moves entrances to Side Launch Way and Heritage Drive. As illustrated in Figure 8.8.2 of the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR), the corner clearance to accesses at major intersections is measured between the edge of curb of the crossroad and the driveway.

The minimum corner clearance was assessed between the Side Launch Way entrance and the intersection of Side Launch Way and Heritage Drive, and between the Heritage Drive entrance and intersections of Heritage Drive with Huron Street and Side Launch Way. The minimum corner clearance requirements, per TAC GDGCR Figure 8.8.2, are summarized in **Table 8**. Relevant excerpts from TAC GDGCR have been included as **Attachment H**.

Table 8: Minimum Corner Clearance Requirements

Access	Roadway Classification	Intersecting Roadway	Control Type	Minimum Clearance	Proposed Separation
Side Launch Way	Local	Heritage Drive	Stop	15 m	40 m
Heritage Drive	Local	Side Launch Way	Stop	15 m	30 m
	Local	Huron Street	Signals	15 m	45 m

As summarized above, the proposed spacing between the site accesses and the nearby intersections meets the minimum requirements described in TAC GDGCR.

Sight Distance Measurement

A sight distance analysis was conducted to confirm that there is sufficient sight distance for drivers approaching and exiting the proposed site accesses. As described previously, Heritage Drive has a posted speed limit of 40 km/h. While Side Launch Way does not currently have a posted speed limit, it was assumed to be 40 km/h as well since the Town of Collingwood's Design Standards specify that local urban roadways have a speed limit of 40 km/h. The Town's Design Standards also specify that 40 km/h posted speed limit roadways have a design speed of 50 km/h.

Stopping Sight Distance

Per the Town's Design Standards, the minimum stopping sight distance for roadways with a design speed of 50 km/h is 65 metres. Side Launch Way intersects with Heritage Drive at a T-intersection approximately 40 metres east of the proposed accesses. While this does not meet the minimum of 65 metres, vehicles approaching from the east will be doing so via a turning movement and will not have attained operating speeds in advance of the accesses. To the west of the proposed access there is more than 65 metres of sight distance available.

Similarly, the intersection of Huron Street and Heritage Drive is approximately 40 metres south of the proposed Heritage Drive access. While this does not meet the minimum requirements, vehicles approaching the access will do so via turning movements and will not have attained operating speeds. To the north of the proposed accesses there is more than 65 metres of stopping sight distance available. Accordingly, the site accesses can be supported from a stopping sight distance perspective.

Relevant excerpts from the Town's Design Standards have been included as **Attachment I**.

Intersection Sight Distance

Section 9.9 of the TAC GDGCR provides intersection sight distance for different intersection control types. For these accesses, the applicable cases include "Case B1 – Left turns from the minor road", "Case B2 – Right turns from the minor road" and "Case F – Left turns from the major road". Comparing all three cases, Case B1 has the greatest sight distance requirement of 105 metres for 50 km/h design speed roads.

As noted above, the Side Launch Way and Heritage Drive accesses are limited in available sight distance to the west and south, respectively, due to t-intersections. As noted previously, vehicles approaching the site will do so via turning movements and will therefore not have attained operating speeds in advance of the accesses. In the other directions, more than 105 metres of sight distance is available for vehicles exiting the accesses. Accordingly, the site accesses can be supported from an intersection sight distance perspective.

Relevant excerpts from TAC GDGCR have been included as **Attachment H**.

Conclusions

The proposed development is forecasted to generate 59 and 118 two-way trips during the weekday a.m. and p.m. peak hours, respectively. Of the 118 trips in the p.m. peak hour, 21 trips are anticipated to be pass-by commercial trips. These are trips that are made as intermediate stops on the way from an origin to a primary destination.

Under existing traffic volume conditions, the intersections of Heritage Drive and Side Launch Way and Heritage Drive and Huron Street are operating with a LOS "B" or better in the weekday a.m. and p.m. peak hours, and a maximum control delay of 12.8 seconds and v/c ratio of 0.45.

Under future traffic volume conditions, the intersections of Heritage Drive and Side Launch Way and Heritage Drive and Huron Street continue operating with a LOS "B" or better in the weekday a.m. and p.m. peak hours, and a maximum control delay of 13.3 seconds and v/c ratio of 0.49.

The proposed site accesses are expected to operate with an LOS "A" in the weekday a.m. and p.m. peak hours, with a maximum control delay of 9.1 seconds and v/c ratio of 0.04.

The door to the underground parking garage is anticipated to have an "up" speed of 24 inches per second, but the potential to reach speeds up to 30 inches per second. With a door height of 7 feet, that equates to total time of approximately 3.5 seconds for the door to open. The door has a timer for how long the door will stay open and a sensor for detecting cars in the doorway. The sensor is required for safety. If a vehicle is detected, the timer will re-set, so the door does not close while a vehicle is proceeding through the entryway. Accordingly, multiple vehicles could proceed through the open doorway if they are detected. The length of the timer will be determined by the building/property manager. Given the expected speed of the garage door, and the ability for vehicles to proceed consecutively, the proposed underground parking entrance is expected to operate with minimal queues.

A sensitivity analysis was undertaken to determine the affect of the surplus underground parking, should it be provided for use by the public. Based on a 50% turnover per hour of the 161 additional spaces the operations are anticipated to remain at a LOS "B" or better.

A truck turning analysis and review of the parking requirements was undertaken. Both found no conflicts and the provided parking results in a surplus of spaces when compared to the Town of Collingwood's By-law requirements.

The locations of the proposed entrances were reviewed and compared with the TAC GDGCR minimum corner clearance requirements. For both accesses, the minimum corner clearance is 15 metres. The proposed Side Launch Way entrance is approximately 40 metres from Heritage Drive, and the proposed Heritage Drive entrance is approximately 30 and 45 metres from Side Launch Way and Huron Street, respectively. As such, the minimum corner clearance is satisfied.

Stopping sight distance and intersection sight distance requirements were also reviewed based on the Town's Design Standards and the TAC GDGCR standards. The review concluded that there is sufficient stopping and intersection sight distance available for vehicles approaching and exiting both site accesses.

Should you have any questions or require any further information, please don't hesitate to contact the undersigned.

Yours truly,

C.F. CROZIER & ASSOCIATES INC.



M. Ferguson
Madeleine Ferguson, P.Eng.
Manager of Transportation
/kh

C.F. CROZIER & ASSOCIATES INC.



Kerianne Hagan, E.I.T.
Engineering Intern, Transportation

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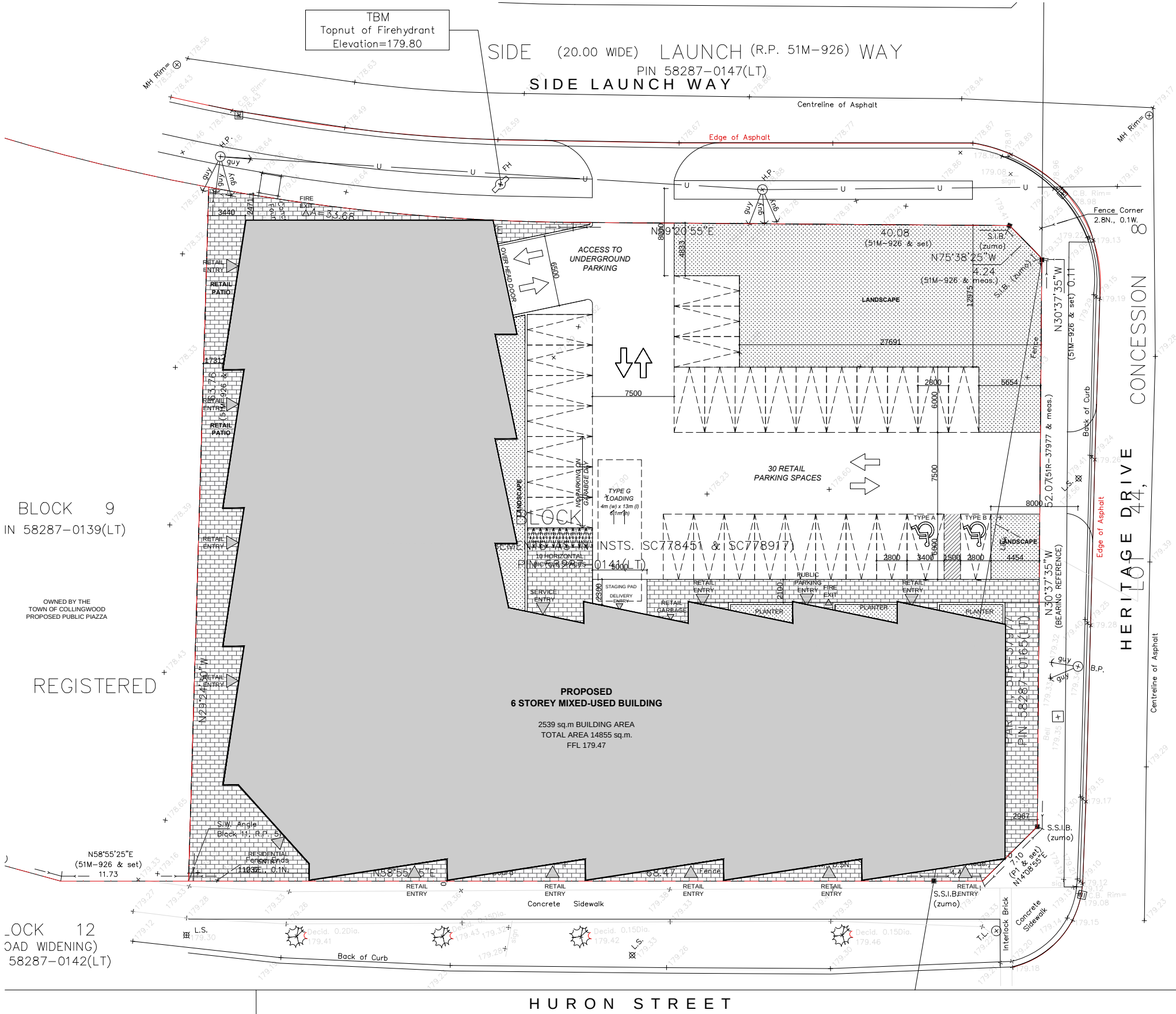
Attachment A: Site Plan & Site Stats (Streetcar, July 2020)
Attachment B: Traffic Data
Attachment C: Signal Timing Plan
Attachment D: Level of Service Definitions
Attachment E: Detailed Capacity Analysis Worksheets
Attachment F: ITE Trip Generation Excerpts
Attachment G: Truck Turning Analysis
Attachment H: TAC GDGCR Excerpts
Attachment I: Town of Collingwood Design Standards Excerpts

Figure 1: Existing Traffic Volumes
Figure 2: Residential Trip Distribution
Figure 3: Residential Trip Assignment
Figure 4: Commercial Trip Distribution
Figure 5: Commercial Trip Assignment
Figure 6: Total traffic Volumes
Figure 7: Sensitivity Analysis Total Traffic Volumes

Attachment A

Site Plan

(Streetcar, July 2020)



SITE STATISTICS AND ZONING REQUIREMENTS:

PROPERTY LEGAL	31 HURON STREET, TOWN OF COLLINGWOOD	
ZONING	IN PROCESS OF BEING REZONED TO SITE SPECIFIC ZONING (C1-X) IN ACCORDANCE WITH THE TOWN OF COLLINGWOOD ZONING BY-LAW 2010-40.	
DESCRIPTION		
AREA	TOTAL	%COVERAGE
BUILDING AREA (GROUND FLOOR)	2539 sq.m.	54%
ASPHALT PARKING & DRIVEWAY AREAS	1070 sq.m.	23%
SEWERIALS & OTHER HARD SURFACES	599 sq.m.	12%
LANDSCAPES OPEN SPACE	522 sq.m.	11%
TOTAL LOT AREA	4690 sq.m.	1.158 ACRES
LAND USE	MIXED USE, RESIDENTIAL AND COMMERCIAL	
ZONING	IN PROCESS OF BEING REZONED TO SITE SPECIFIC ZONING IN ACCORDANCE TO THE TOWN OF COLLINGWOOD ZONING BY-LAW	
BUILDING SETBACKS	REQUIRED	PROVIDED
FRONT YARD (HERITAGE DRIVE)	0m	0m
REAR YARD	7.5m	1.7m MIN
EXTERIOR SIDE YARD SET BACK	0m	0m
PARKING & BICYCLES	REQUIRED	PROVIDED
COMMERCIAL (4 spaces per 100sq.m.)	62	150*
VISITOR (0.15 space per unit)	23	
RESIDENTIAL (1 space per unit)	130	130
BARRIER FREE (2% of total required spaces)	4	12
DELIVERY SPACE	1	1
BICYCLES	15	119
*30 COMMERCIAL PARKING SPACES PROVIDED AT GRADE. *126 PAID PUBLIC PARKING SPACES PROVIDED ON P1. (COMBINED 82 REQUIRED COMMERCIAL PARKING SPACES, 33 REQUIRED VISITOR PARKING SPACES AND POTENTIAL 41 SUPPLEMENTARY PARKING SPACES FOR SHIPYARDS PARKING RELIEF)		
BUILDING HEIGHT	BUILDING HEIGHT PROPOSED 6 STOREY BUILDING 26.0m FROM GROUND FLOOR TO TOP OF PEAKED ROOF	

- GENERAL NOTES:
- THE "LIMITS OF CONSTRUCTION" SHALL BE ASSUMED TO BE THE PROPERTY LINE UNLESS OTHERWISE NOTED
 - FIRE ACCESS ROUTE TO BE POSTED AND DESIGNATED UNDER MUNICIPAL BY-LAW (FIRE ACCESS ROUTE TO BE MIN. 6 M WIDE WITH A MIN. 12 M CENTRELINE TURNING RADIUS AND MAX. 5% SLOPE) COORD. W/ MECH. & SITE PLANS FOR ALL EXISTING & NEW LOCATIONS OF SERVICES & ENTRY OF SERVICES INTO THE BUILDING ENVELOPE. (ALL MECH. ELECT. INFO INDICATED ON ARCHITECTURAL SITE DWG. AT 1:15 FOR GENERAL REFERENCE & COORD. ONLY.)
 - COORD. W/ SITE GRADING PLAN FOR PROPOSED FINAL FINISH GRADE ELEV'S & DRAINAGE SLOPES
 - TYP. DRIVEWAY & PARKING LOT CONC. CURBS AS INDICATED ON DRAWING. W/ OFSD DETAILS & SPEC'S. FOR TYPICAL CURB TYPES SITE DIMENSIONS ARE TYPICALLY DIMENSIONED TO FACE OF CURB
 - THE SUB-GRADE SOILS EXPOSED AFTER EXCAVATION SHALL BE INSPECTED AND CERTIFIED BY A QUALIFIED REGISTERED PROFESSIONAL SOILS ENGINEER AND A COPY OF THE REPORT SHALL BE FORWARDED TO THE MUNICIPALITY
 - ALL FILL PLACED ON THE SITE SHALL BE COMPACTED TO A MINIMUM OF 98-100% STANDARD PROCTOR DENSITY. A SUFFICIENT NUMBER OF TESTS SHALL BE TAKEN AT VARIOUS LEVELS SATISFACTORY TO THE DIRECTOR OF ENGINEERING. TEST RESULTS SHALL BE SENT TO THE MUNICIPALITY WITH A LETTER, SIGNED AND STAMPED BY THE SOILS ENGINEER, STATING THAT A SUFFICIENT NUMBER OF TESTS HAVE BEEN TAKEN AND THE MINIMUM DEGREE OF COMPACTION HAS BEEN REACHED
 - APPROVAL OF THIS DRAWING IS FOR MATERIAL ACCEPTABILITY AND COMPLIANCE WITH MUNICIPAL AND PROVINCIAL SPECIFICATIONS AND STANDARDS ONLY. APPROVAL AND INSPECTION BY THE MUNICIPALITY OF THE WORKS DOES NOT CERTIFY THE LINE AND GRADE OF THE WORKS AND IT IS THE OWNER'S RESPONSIBILITY TO HAVE THEIR ENGINEER CERTIFY THIS ACCORDINGLY
 - SILTATION CONTROL DEVICES SHALL BE INSTALLED PRIOR TO WORKS COMMENCING ON THE SITE AND SHALL BE MAINTAINED FOR THE DURATION OF CONSTRUCTION, TO THE SATISFACTION OF THE MUNICIPALITY
 - PROJECT SIGN TO BE ERECTED @ BEGINNING OF PROJECT. FINAL LOCATION TO BE COORDINATED WITH ARCHITECT ON SITE
 - EARTH BERMS SHOWN ARE DIAGRAMMATIC ONLY. REFER TO GRADING PLAN FOR ACCURATE AND COMPLETE INFORMATION
 - PROVIDE HEAVY DUTY (ASPHALT @ ENTIRE TRUCK ACCESS ROUTE PROVIDE MEDIUM DUTY (MD) ASPHALT @ ALL OTHER DRIVEWAYS AND PARKING SPACES
- GENERAL NOTES -MUNICIPAL
- ALL WORK INVOLVED IN THE CONSTRUCTION, RELOCATION, REPAIR OF MUNICIPAL SERVICES FOR THE PROPOSED DEVELOPMENT SHALL BE TO THE SATISFACTION OF THE MUNICIPALITY
 - STREET EXCAVATION PERMITS ARE REQUIRED FOR ANY WORK IN MUNICIPAL RIGHT OF WAY BY ANY CONTRACTOR
 - CONTRACTOR IS RESPONSIBLE FOR ALL SERVICING, UTILITIES, AND COSTS
 - STORM WATER DRAINAGE MUST NOT HAVE A NEGATIVE IMPACT ON ADJACENT PROPERTIES
 - FIRE ROUTE SIGNS AND 3-WAY FIRE HYDRANTS SHALL BE ESTABLISHED TO THE SATISFACTION OF THE FIRE DEPARTMENT AND AT THE EXPENSE OF THE CONTRACTOR
 - ALL DRIVEWAYS FROM PROPERTY LINES FOR THE FIRST 7.5 M SHALL BE WITHIN 5% MAXIMUM GRADE. THEREAFTER, ALL DRIVEWAYS SHALL BE WITHIN 10% MAXIMUM GRADES
 - THE MUNICIPAL APPROVAL OF THIS SITE PLAN DOES NOT EXEMPT THE CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS NORMALLY REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS, BUT NOT LIMITED TO THE FOLLOWING:
 - BUILDING PERMIT
 - SEWER AND WATER PERMITS
 - ROAD CUT PERMITS
 - RELOCATION OF SERVICES
 - APPROACH APPROVAL PERMITS
 - ENCROACHMENT AGREEMENTS
 - COMMITTEE OF ADJUSTMENT
 - ANY ABANDONED ACCESSES MUST BE REMOVED AND THE CURB AND BOULEVARD RESTORED WITH SOD AT THE CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE MUNICIPALITY

- BEFORE STARTING WORK
- THE CONTRACTOR SHALL NOTIFY THE MUNICIPALITY, ARCHITECT & CONSULTANTS AT LEAST 48 HOURS PRIOR TO COMMENCING CONSTRUCTION
 - THE POSITION OF THE POLE LINES, CONDUITS, WATER MAINS, SEWERS, AND OTHER UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. CONTRACTOR TO VERIFY EXISTING CONDITIONS
 - ALL EXISTING UNDERGROUND UTILITIES WITHIN THE LIMITS OF CONSTRUCTION SHALL BE LOCATED, MARKED AND PROTECTED. ANY UTILITIES DAMAGED OR DISTURBED DURING CONSTRUCTION SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE ENGINEER, AT THE CONTRACTOR'S EXPENSE
 - PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, ALL BENCHMARKS, ELEVATIONS, DIMENSIONS, AND GRADES MUST BE CHECKED BY THE CONTRACTOR AND ANY DISCREPANCIES REPORTED TO THE ENGINEER
 - AT LEAST TWO DIFFERENT BENCHMARKS MUST BE REFERRED TO AT ALL TIMES

- ACCESSIBLE PARKING
- ACCESSIBLE PARKING SIGNAGE AS PER THE HIGHWAY TRAFFIC ACT TO BE INSTALLED AS PER - AODA ARTICLE 80.37 (E) FURTHER TO THE ABOVE, ADDITIONAL VAN ACCESSIBLE SIGNAGE IS REQUIRED FOR TYPE A STALLS AS PER AODA ARTICLE 80.34 (1). AN EXAMPLE OF THE VAN ACCESSIBLE SIGN CAN BE FOUND AT THE FOLLOWING LINK:
<https://store.beaconsult.ca/products/rb-3st-van-accessible>

ALL DRAWINGS AND RELATED DOCUMENTS ARE THE PROPERTY OF STREETCAR DEVELOPMENT INC. AND MAY NOT BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE DEVELOPERS PERMISSION. THIS DRAWING SHOULD NOT BE USED TO CALCULATE AREAS. DO NOT SCALE THIS DRAWING. ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR AND SUCH DIMENSIONS TO BE THEIR RESPONSIBILITY. ALL WORK MUST COMPLY WITH THE RELEVANT BUILDING CODE BY LAW AND RELATED DOCUMENTS. DRAWING ERRORS AND OMISSIONS MUST BE IMMEDIATELY REPORTED TO THE DEVELOPER.

NO.	DATE	REVISION
01.	07 / 31 / 2020	ISSUED FOR SPA
02.	01 / 25 / 2021	ISSUED FOR SPA INFO.
03.	04 / 15 / 2021	ISSUED FOR SPA INFO.
04.	08 / 13 / 2021	ISSUED FOR SPA RESUBMISSION 2

STREETCAR™
RETHINK URBAN LIVING

1230 DUNDAS ST E TORONTO ONTARIO M4M 1S3 416-466-2361

DRAWING:
PROPOSED SITE PLAN

PROJECT:
31 HURON STREET
COLLINGWOOD

SCALE:
1:200

ISSUE DATE:
30 / 07 / 2020

D-001

Attachment B

Traffic Data



Turning Movement Count (1 . SIDE LAUNCH WAY & HERITAGE DR)

Start Time	N Approach HERITAGE DR					S Approach HERITAGE DR					W Approach SIDE LAUNCH WAY					E Approach EAST SIDEWALK			Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	UTurn N:N	Peds N:	Approach Total	Thru S:N	Left S:W	UTurn S:S	Peds S:	Approach Total	Right W:S	Left W:N	UTurn W:W	Peds W:	Approach Total	UTurn E:E	Peds E:	Approach Total		
07:00:00	1	4	0	1	5	9	2	0	1	11	0	3	0	0	3	0	1	0	19	
07:15:00	1	3	0	3	4	3	2	0	2	5	2	2	0	0	4	0	0	0	13	
07:30:00	2	10	0	0	12	3	1	0	0	4	2	1	0	0	3	0	3	0	19	
07:45:00	3	4	0	2	7	7	4	0	3	11	5	0	0	0	5	0	1	0	23	74
08:00:00	0	6	0	1	6	8	1	0	2	9	1	3	0	0	4	0	2	0	19	74
08:15:00	3	8	0	0	11	5	0	0	1	5	1	2	0	0	3	0	1	0	19	80
08:30:00	5	7	0	0	12	11	6	0	3	17	3	0	0	0	3	0	2	0	32	93
08:45:00	3	11	0	0	14	18	4	0	0	22	3	3	0	0	6	0	3	0	42	112
09:00:00	2	16	0	0	18	13	3	0	0	16	2	1	0	0	3	0	0	0	37	130
09:15:00	3	8	0	0	11	5	6	0	2	11	5	0	0	0	5	0	2	0	27	138
09:30:00	1	5	0	10	6	11	1	0	1	12	8	2	0	0	10	0	10	0	28	134
09:45:00	2	12	0	1	14	8	5	0	1	13	5	2	0	0	7	0	0	0	34	126
BREAK																				
16:00:00	4	15	0	1	19	12	9	0	1	21	10	5	0	0	15	0	2	0	55	
16:15:00	3	8	0	1	11	13	2	0	2	15	13	4	0	0	17	0	3	0	43	
16:30:00	3	16	0	1	19	11	1	0	1	12	9	3	0	0	12	0	0	0	43	
16:45:00	3	12	0	3	15	15	2	0	1	17	17	1	0	0	18	0	3	0	50	191
17:00:00	5	14	0	1	19	11	3	0	1	14	16	1	0	0	17	0	2	0	50	186
17:15:00	0	6	0	0	6	10	6	0	1	16	13	3	0	0	16	0	1	0	38	181
17:30:00	2	9	0	0	11	13	5	0	1	18	7	3	0	0	10	0	0	0	39	177
17:45:00	2	10	0	1	12	10	0	0	1	10	9	0	0	0	9	0	1	0	31	158
18:00:00	0	18	0	0	18	14	6	0	0	20	13	0	0	0	13	0	2	0	51	159
18:15:00	0	13	0	0	13	12	1	0	1	13	12	2	0	0	14	0	2	0	40	161
18:30:00	3	10	0	0	13	15	0	0	1	15	7	2	0	0	9	0	6	0	37	159
18:45:00	3	12	0	0	15	17	0	0	2	17	6	1	0	0	7	0	0	0	39	167
Grand Total	54	237	0	26	291	254	70	0	29	324	169	44	0	0	213	0	47	0	828	-
Approach%	18.6%	81.4%	0%	-	-	78.4%	21.6%	0%	-	-	79.3%	20.7%	0%	-	-	0%	-	-	-	-
Totals %	6.5%	28.6%	0%	-	35.1%	30.7%	8.5%	0%	-	39.1%	20.4%	5.3%	0%	-	25.7%	0%	-	0%	-	-
Heavy	0	2	0	-	-	2	0	0	-	-	1	0	0	-	-	0	-	-	-	-
Heavy %	0%	0.8%	0%	-	-	0.8%	0%	0%	-	-	0.6%	0%	0%	-	-	0%	-	-	-	-
Bicycles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycle %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Peak Hour: 08:30 AM - 09:30 AM Weather: Overcast Clouds (17.02 °C)

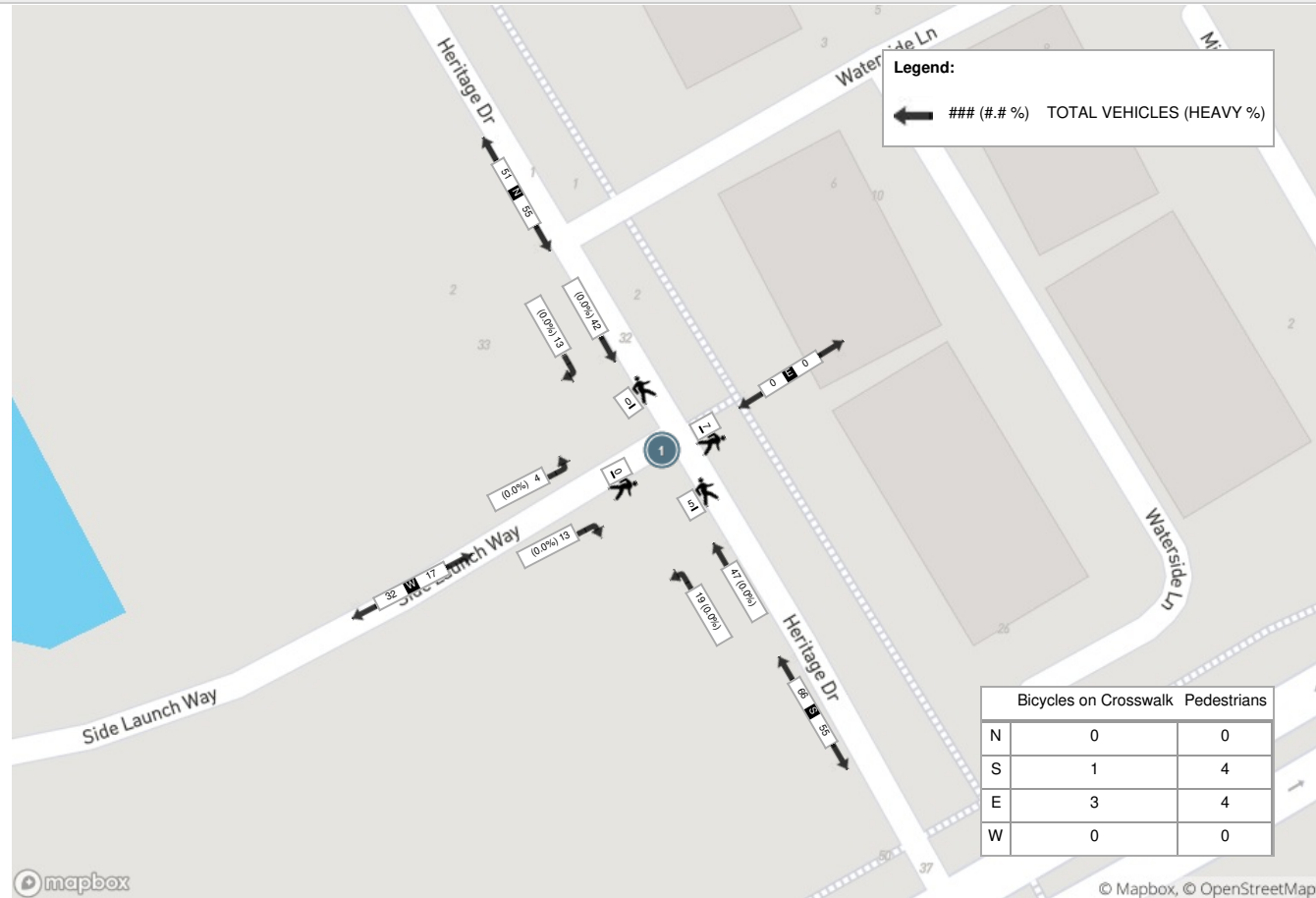
Start Time	N Approach HERITAGE DR					S Approach HERITAGE DR					W Approach SIDE LAUNCH WAY					E Approach EAST SIDEWALK			Int. Total (15 min)
	Right	Thru	UTurn	Peds	Approach Total	Thru	Left	UTurn	Peds	Approach Total	Right	Left	UTurn	Peds	Approach Total	UTurn	Peds	Approach Total	
08:30:00	5	7	0	0	12	11	6	0	3	17	3	0	0	0	3	0	2	0	32
08:45:00	3	11	0	0	14	18	4	0	0	22	3	3	0	0	6	0	3	0	42
09:00:00	2	16	0	0	18	13	3	0	0	16	2	1	0	0	3	0	0	0	37
09:15:00	3	8	0	0	11	5	6	0	2	11	5	0	0	0	5	0	2	0	27
Grand Total	13	42	0	0	55	47	19	0	5	66	13	4	0	0	17	0	7	0	138
Approach%	23.6%	76.4%	0%		-	71.2%	28.8%	0%		-	76.5%	23.5%	0%		-	0%		-	-
Totals %	9.4%	30.4%	0%		39.9%	34.1%	13.8%	0%		47.8%	9.4%	2.9%	0%		12.3%	0%		0%	-
PHF	0.65	0.66	0		0.76	0.65	0.79	0		0.75	0.65	0.33	0		0.71	0		0	-
Heavy	0	0	0		0	0	0	0		0	0	0	0		0	0		0	-
Heavy %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	0%		0%	-
Lights	13	42	0		55	47	18	0		65	13	4	0		17	0		0	-
Lights %	100%	100%	0%		100%	100%	94.7%	0%		98.5%	100%	100%	0%		100%	0%		0%	-
Single-Unit Trucks	0	0	0		0	0	0	0		0	0	0	0		0	0		0	-
Single-Unit Trucks %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	0%		0%	-
Bicycles on Road	0	0	0		0	0	1	0		1	0	0	0		0	0		0	-
Bicycles on Road %	0%	0%	0%		0%	0%	5.3%	0%		1.5%	0%	0%	0%		0%	0%		0%	-
Pedestrians	-	-	-	0	-	-	-	-	4	-	-	-	-	0	-	-	4	-	-
Pedestrians%	-	-	-	0%	-	-	-	-	33.3%	-	-	-	-	0%	-	-	33.3%	-	-
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-	3	-	-
Bicycles on Crosswalk%	-	-	-	0%	-	-	-	-	8.3%	-	-	-	-	0%	-	-	25%	-	-



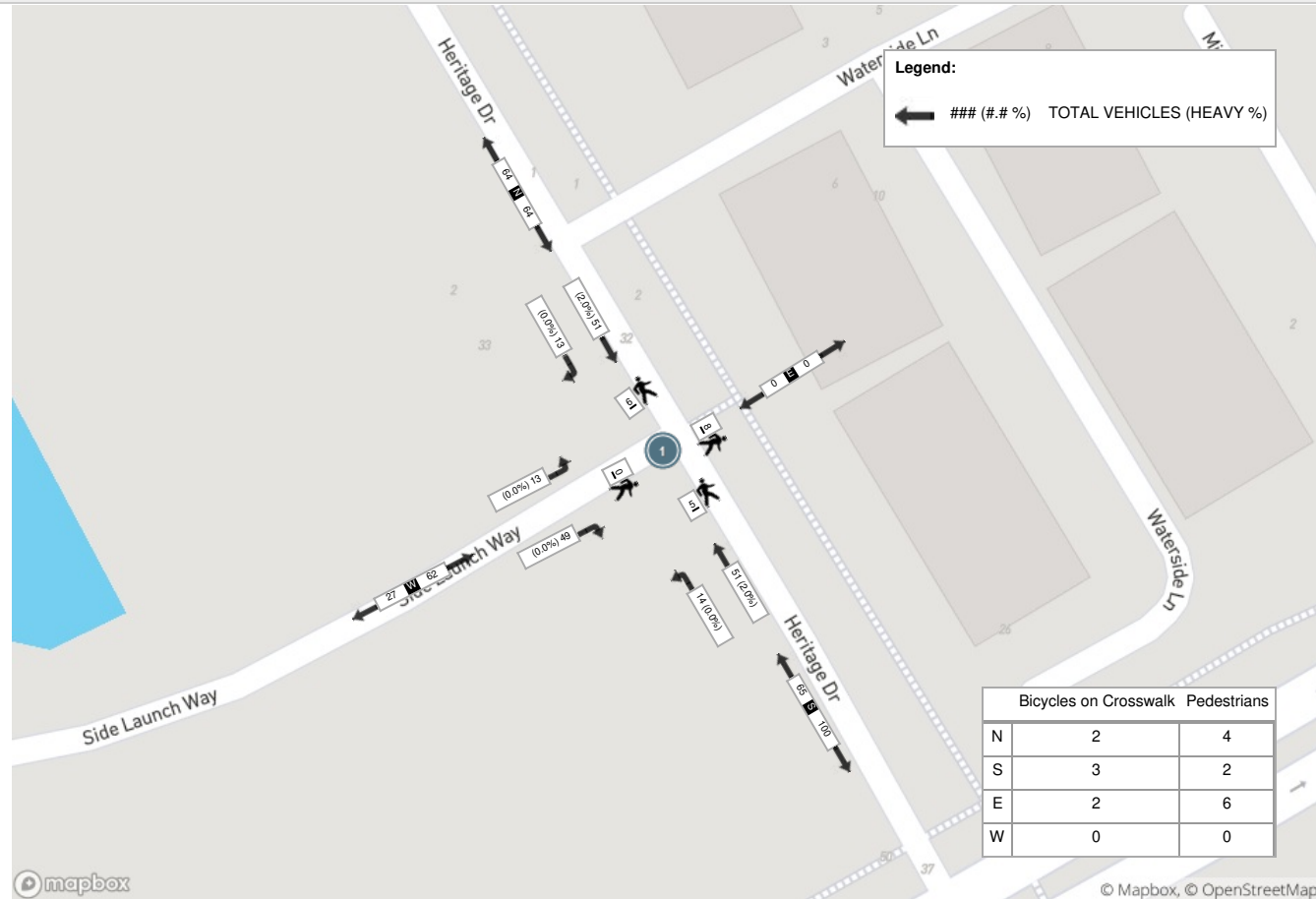
Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (15 °C)

Start Time	N Approach HERITAGE DR					S Approach HERITAGE DR					W Approach SIDE LAUNCH WAY					E Approach EAST SIDEWALK			Int. Total (15 min)
	Right	Thru	UTurn	Peds	Approach Total	Thru	Left	UTurn	Peds	Approach Total	Right	Left	UTurn	Peds	Approach Total	UTurn	Peds	Approach Total	
16:00:00	4	15	0	1	19	12	9	0	1	21	10	5	0	0	15	0	2	0	55
16:15:00	3	8	0	1	11	13	2	0	2	15	13	4	0	0	17	0	3	0	43
16:30:00	3	16	0	1	19	11	1	0	1	12	9	3	0	0	12	0	0	0	43
16:45:00	3	12	0	3	15	15	2	0	1	17	17	1	0	0	18	0	3	0	50
Grand Total	13	51	0	6	64	51	14	0	5	65	49	13	0	0	62	0	8	0	191
Approach%	20.3%	79.7%	0%		-	78.5%	21.5%	0%		-	79%	21%	0%		-	0%		-	-
Totals %	6.8%	26.7%	0%		33.5%	26.7%	7.3%	0%		34%	25.7%	6.8%	0%		32.5%	0%		0%	-
PHF	0.81	0.8	0		0.84	0.85	0.39	0		0.77	0.72	0.65	0		0.86	0		0	-
Heavy	0	1	0		1	1	0	0		1	0	0	0		0	0		0	-
Heavy %	0%	2%	0%		1.6%	2%	0%	0%		1.5%	0%	0%	0%		0%	0%		0%	-
Lights	13	50	0		63	50	14	0		64	49	13	0		62	0		0	-
Lights %	100%	98%	0%		98.4%	98%	100%	0%		98.5%	100%	100%	0%		100%	0%		0%	-
Single-Unit Trucks	0	1	0		1	1	0	0		1	0	0	0		0	0		0	-
Single-Unit Trucks %	0%	2%	0%		1.6%	2%	0%	0%		1.5%	0%	0%	0%		0%	0%		0%	-
Bicycles on Road	0	0	0		0	0	0	0		0	0	0	0		0	0		0	-
Bicycles on Road %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	0%		0%	-
Pedestrians	-	-	-	4	-	-	-	-	2	-	-	-	-	0	-	-	6	-	-
Pedestrians%	-	-	-	21.1%	-	-	-	-	10.5%	-	-	-	-	0%	-	-	31.6%	-	-
Bicycles on Crosswalk	-	-	-	2	-	-	-	-	3	-	-	-	-	0	-	-	2	-	-
Bicycles on Crosswalk%	-	-	-	10.5%	-	-	-	-	15.8%	-	-	-	-	0%	-	-	10.5%	-	-

Peak Hour: 08:30 AM - 09:30 AM Weather: Overcast Clouds (17.02 °C)



Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (15 °C)





Turning Movement Count (2 . HERITAGE DR & FIRST ST / HURON ST)

Start Time	N Approach HERITAGE DR					E Approach HURON ST					W Approach HURON ST					S Approach SOUTH PATHWAY			Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Left N:E	UTurn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	UTurn E:E	Peds E:	Approach Total	Thru W:E	Left W:N	UTurn W:W	Peds W:	Approach Total	UTurn S:S	Peds S:	Approach Total		
07:00:00	2	1	0	0	3	6	89	0	3	95	65	5	0	0	70	0	0	0	168	
07:15:00	2	4	0	1	6	2	98	0	2	100	86	3	0	0	89	0	0	0	195	
07:30:00	3	8	0	1	11	2	136	0	4	138	86	2	0	0	88	0	0	0	237	
07:45:00	2	7	0	1	9	7	131	0	7	138	107	4	0	0	111	0	0	0	258	858
08:00:00	3	3	0	1	6	6	147	0	3	153	88	3	0	0	91	0	0	0	250	940
08:15:00	6	3	0	0	9	2	132	0	4	134	102	3	0	1	105	0	1	0	248	993
08:30:00	6	5	0	0	11	9	154	0	5	163	100	9	0	0	109	0	0	0	283	1039
08:45:00	9	4	0	0	13	5	166	0	4	171	113	16	0	0	129	0	0	0	313	1094
09:00:00	11	6	0	2	17	8	160	0	1	168	105	8	0	0	113	0	1	0	298	1142
09:15:00	7	6	0	0	13	8	138	0	4	146	127	3	1	0	131	0	2	0	290	1184
09:30:00	3	10	0	2	13	3	134	0	3	137	125	9	0	1	134	0	2	0	284	1185
09:45:00	10	7	0	0	17	6	171	0	3	177	137	6	0	0	143	0	2	0	337	1209

BREAK

16:00:00	14	12	0	2	26	11	177	0	3	188	196	9	0	0	205	0	1	0	419	
16:15:00	7	14	0	0	21	9	174	0	4	183	195	7	0	0	202	0	0	0	406	
16:30:00	12	15	0	1	27	3	167	0	1	170	191	9	0	0	200	0	0	0	397	
16:45:00	11	18	0	2	29	5	180	0	5	185	193	13	0	0	206	0	0	0	420	1642
17:00:00	10	18	0	3	28	6	182	0	1	188	192	7	0	1	199	0	1	0	415	1638
17:15:00	7	11	0	1	18	10	162	0	4	172	185	6	0	1	191	0	1	0	381	1613
17:30:00	11	5	0	0	16	7	133	0	2	140	150	11	0	1	161	0	2	0	317	1533
17:45:00	5	10	0	0	15	2	136	0	1	138	163	8	0	1	171	0	0	0	324	1437
18:00:00	17	17	0	3	34	11	149	0	4	160	160	9	0	3	169	0	3	0	363	1385
18:15:00	10	14	0	6	24	4	136	0	6	140	120	8	0	1	128	0	2	0	292	1296
18:30:00	7	11	0	1	18	6	106	0	8	112	104	9	0	1	113	0	0	0	243	1222
18:45:00	10	8	0	0	18	5	100	0	1	105	98	12	0	0	110	0	0	0	233	1131
Grand Total	185	217	0	27	402	143	3458	0	83	3601	3188	179	1	11	3368	0	18	0	7371	-

Approach%	46%	54%	0%	-	4%	96%	0%	-	94.7%	5.3%	0%	-	0%	-	-	-	-	-	-	-
Totals %	2.5%	2.9%	0%	5.5%	1.9%	46.9%	0%	48.9%	43.3%	2.4%	0%	45.7%	0%	0%	-	-	-	-	-	-
Heavy	0	3	0	-	1	109	0	-	105	1	0	-	0	-	-	-	-	-	-	-
Heavy %	0%	1.4%	0%	-	0.7%	3.2%	0%	-	3.3%	0.6%	0%	-	0%	-	-	-	-	-	-	-
Bicycles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycle %	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Peak Hour: 09:00 AM - 10:00 AM Weather: Overcast Clouds (17.02 °C)

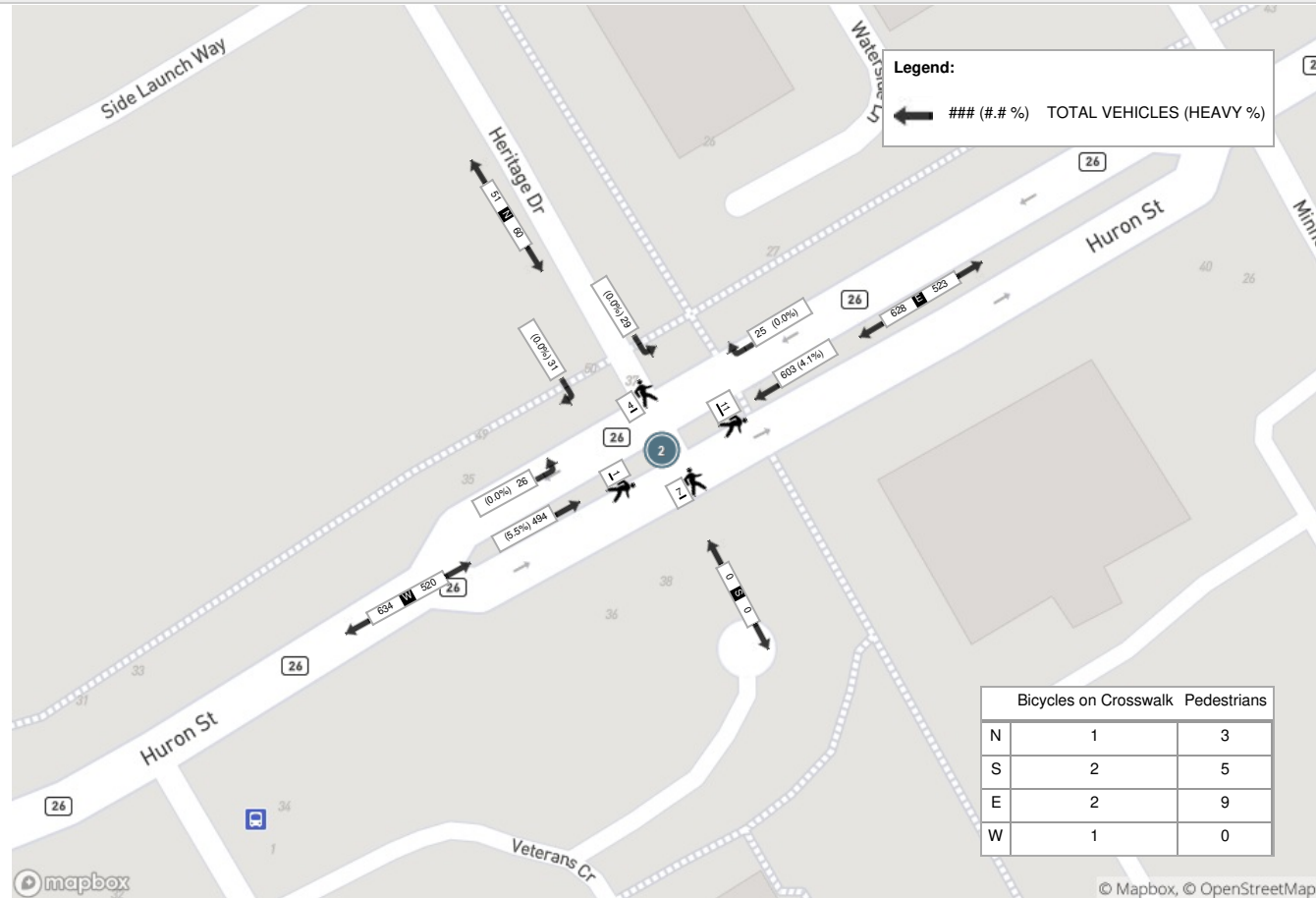
Start Time	N Approach HERITAGE DR					E Approach HURON ST					W Approach HURON ST					S Approach SOUTH PATHWAY			Int. Total (15 min)
	Right	Left	UTurn	Peds	Approach Total	Right	Thru	UTurn	Peds	Approach Total	Thru	Left	UTurn	Peds	Approach Total	UTurn	Peds	Approach Total	
09:00:00	11	6	0	2	17	8	160	0	1	168	105	8	0	0	113	0	1	0	298
09:15:00	7	6	0	0	13	8	138	0	4	146	127	3	1	0	131	0	2	0	290
09:30:00	3	10	0	2	13	3	134	0	3	137	125	9	0	1	134	0	2	0	284
09:45:00	10	7	0	0	17	6	171	0	3	177	137	6	0	0	143	0	2	0	337
Grand Total	31	29	0	4	60	25	603	0	11	628	494	26	1	1	521	0	7	0	1209
Approach%	51.7%	48.3%	0%		-	4%	96%	0%		-	94.8%	5%	0.2%		-	0%		-	-
Totals %	2.6%	2.4%	0%		5%	2.1%	49.9%	0%		51.9%	40.9%	2.2%	0.1%		43.1%	0%		0%	-
PHF	0.7	0.73	0		0.88	0.78	0.88	0		0.89	0.9	0.72	0.25		0.91	0		0	-
Heavy	0	0	0		0	0	25	0		25	27	0	0		27	0		0	-
Heavy %	0%	0%	0%		0%	0%	4.1%	0%		4%	5.5%	0%	0%		5.2%	0%		0%	-
Lights	31	29	0		60	25	578	0		603	467	26	1		494	0		0	-
Lights %	100%	100%	0%		100%	100%	95.9%	0%		96%	94.5%	100%	100%		94.8%	0%		0%	-
Single-Unit Trucks	0	0	0		0	0	18	0		18	21	0	0		21	0		0	-
Single-Unit Trucks %	0%	0%	0%		0%	0%	3%	0%		2.9%	4.3%	0%	0%		4%	0%		0%	-
Buses	0	0	0		0	0	0	0		0	1	0	0		1	0		0	-
Buses %	0%	0%	0%		0%	0%	0%	0%		0%	0.2%	0%	0%		0.2%	0%		0%	-
Articulated Trucks	0	0	0		0	0	7	0		7	5	0	0		5	0		0	-
Articulated Trucks %	0%	0%	0%		0%	0%	1.2%	0%		1.1%	1%	0%	0%		1%	0%		0%	-
Bicycles on Road	0	0	0		0	0	0	0		0	0	0	0		0	0		0	-
Bicycles on Road %	0%	0%	0%		0%	0%	0%	0%		0%	0%	0%	0%		0%	0%		0%	-
Pedestrians	-	-	-	3	-	-	-	-	9	-	-	-	-	0	-	-	5	-	-
Pedestrians%	-	-	-	13%	-	-	-	-	39.1%	-	-	-	-	0%	-	-	21.7%	-	-
Bicycles on Crosswalk	-	-	-	1	-	-	-	-	2	-	-	-	-	1	-	-	2	-	-
Bicycles on Crosswalk%	-	-	-	4.3%	-	-	-	-	8.7%	-	-	-	-	4.3%	-	-	8.7%	-	-



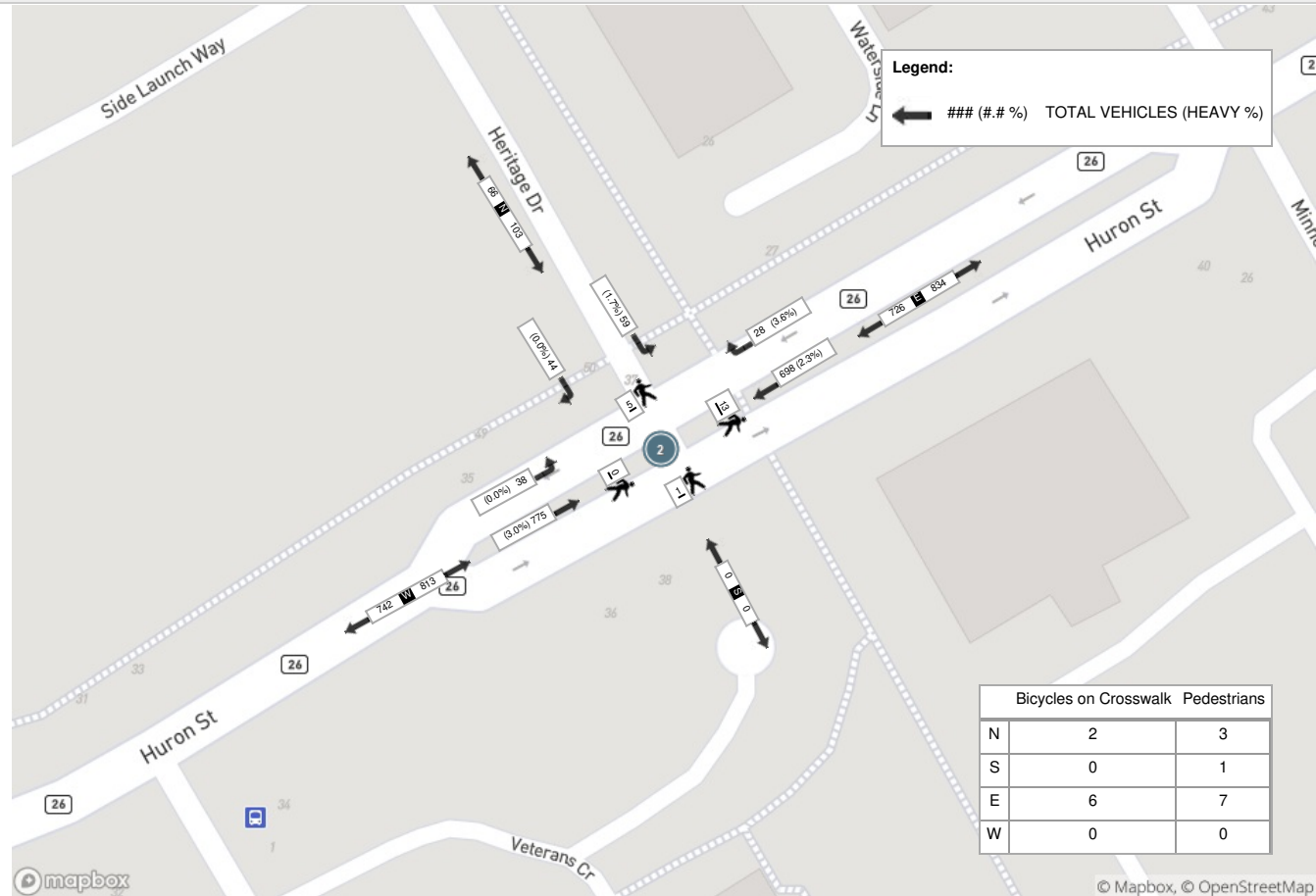
Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (15 °C)

Start Time	N Approach HERITAGE DR					E Approach HURON ST					W Approach HURON ST					S Approach SOUTH PATHWAY			Int. Total (15 min)
	Right	Left	UTurn	Peds	Approach Total	Right	Thru	UTurn	Peds	Approach Total	Thru	Left	UTurn	Peds	Approach Total	UTurn	Peds	Approach Total	
16:00:00	14	12	0	2	26	11	177	0	3	188	196	9	0	0	205	0	1	0	419
16:15:00	7	14	0	0	21	9	174	0	4	183	195	7	0	0	202	0	0	0	406
16:30:00	12	15	0	1	27	3	167	0	1	170	191	9	0	0	200	0	0	0	397
16:45:00	11	18	0	2	29	5	180	0	5	185	193	13	0	0	206	0	0	0	420
Grand Total	44	59	0	5	103	28	698	0	13	726	775	38	0	0	813	0	1	0	1642
Approach%	42.7%	57.3%	0%	-	-	3.9%	96.1%	0%	-	-	95.3%	4.7%	0%	-	-	0%	-	-	-
Totals %	2.7%	3.6%	0%	6.3%	6.3%	1.7%	42.5%	0%	44.2%	44.2%	47.2%	2.3%	0%	49.5%	49.5%	0%	0%	0%	-
PHF	0.79	0.82	0	0.89	0.89	0.64	0.97	0	0.97	0.97	0.99	0.73	0	0.99	0.99	0	0	0	-
Heavy	0	1	0	1	1	1	16	0	17	17	23	0	0	23	23	0	0	0	-
Heavy %	0%	1.7%	0%	1%	1%	3.6%	2.3%	0%	2.3%	2.3%	3%	0%	0%	2.8%	2.8%	0%	0%	0%	-
Lights	44	58	0	102	102	27	682	0	709	709	752	38	0	790	790	0	0	0	-
Lights %	100%	98.3%	0%	99%	99%	96.4%	97.7%	0%	97.7%	97.7%	97%	100%	0%	97.2%	97.2%	0%	0%	0%	-
Single-Unit Trucks	0	1	0	1	1	1	11	0	12	12	12	0	0	12	12	0	0	0	-
Single-Unit Trucks %	0%	1.7%	0%	1%	1%	3.6%	1.6%	0%	1.7%	1.7%	1.5%	0%	0%	1.5%	1.5%	0%	0%	0%	-
Buses	0	0	0	0	0	0	2	0	2	2	0	0	0	0	0	0	0	0	-
Buses %	0%	0%	0%	0%	0%	0%	0.3%	0%	0.3%	0.3%	0%	0%	0%	0%	0%	0%	0%	0%	-
Articulated Trucks	0	0	0	0	0	0	3	0	3	3	11	0	0	11	11	0	0	0	-
Articulated Trucks %	0%	0%	0%	0%	0%	0%	0.4%	0%	0.4%	0.4%	1.4%	0%	0%	1.4%	1.4%	0%	0%	0%	-
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Bicycles on Road %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	-
Pedestrians	-	-	-	3	-	-	-	-	7	-	-	-	-	0	-	-	1	-	-
Pedestrians%	-	-	-	15.8%	-	-	-	-	36.8%	-	-	-	-	0%	-	-	5.3%	-	-
Bicycles on Crosswalk	-	-	-	2	-	-	-	-	6	-	-	-	-	0	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	10.5%	-	-	-	-	31.6%	-	-	-	-	0%	-	-	0%	-	-

Peak Hour: 09:00 AM - 10:00 AM Weather: Overcast Clouds (17.02 °C)



Peak Hour: 04:00 PM - 05:00 PM Weather: Overcast Clouds (15 °C)

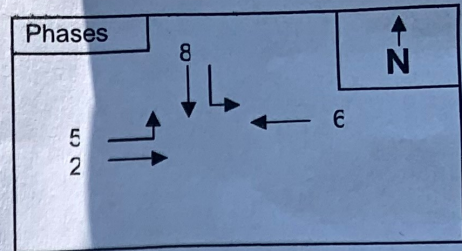


Attachment C

Signal Timing Plan

Traffic Signal Timing Plan

Intersection: Huron Street & Heritage Street
Town/City: Collingwood
Date: August 12, 2009



Startup of signals to be set to flashing Amber on Huron Street (East-West) and flashing Red on Heritage Street (North-South).

Without Pedestrian Actuation (Vehicles Only)

POLE MOUNT
3 APS
1109-3518F SN# 22032

Signal Operation	Huron Street Eastbound	Huron Street Eastbound Adv Green	Huron Street Westbound	Heritage Street Southbound
Phase #	2	5	6	8
Minimum Green	35	7	35	10
Extension	-	-	-	3
Maximum Green	35	7	35	19
Amber Clearance	3.3	3	3.3	3.3
All Red	2.5	2	2.5	2.5

Max. Cycle Length: 77.6 seconds

With Pedestrian Actuation

Signal Operation	Huron Street Eastbound	Huron Street Eastbound Adv Green	Huron Street Westbound	Heritage Street Southbound
Phase #	2	5	6	8
Minimum Green	35	7	35	21.8
Extension	-	-	-	-
Maximum Green	35	7	35	21.8
Amber Clearance	3.3	3	3.3	3.3
All Red	2.5	2	2.5	2.5
Walk	25	-	25	13.4
Ped Clearance (FDW)	10	-	10	8.4

Max. Cycle Length: 80.4 seconds

Notes:

- Based on 2010 traffic conditions
- Amber Clearance and All Red from MTO Book 12

Attachment D

Level of Service Definitions

Level of Service Definitions

Two-Way Stop Controlled Intersections

Level of Service	Control Delay per Vehicle (seconds)	Interpretation
A	≤ 10	EXCELLENT. Large and frequent gaps in traffic on the main roadway. Queuing on the minor street is rare.
B	> 10 and ≤ 15	VERY GOOD. Many gaps exist in traffic on the main roadway. Queuing on the minor street is minimal.
C	> 15 and ≤ 25	GOOD. Fewer gaps exist in traffic on the main roadway. Delay on minor approach becomes more noticeable.
D	> 25 and ≤ 35	FAIR. Infrequent and shorter gaps in traffic on the main roadway. Queue lengths develop on the minor street.
E	> 35 and ≤ 50	POOR. Very infrequent gaps in traffic on the main roadway. Queue lengths become noticeable.
F	> 50	UNSATISFACTORY. Very few gaps in traffic on the main roadway. Excessive delay with significant queue lengths on the minor street.

Adapted from Highway Capacity Manual 2000, Transportation Research Board

Signalized Intersections

Level of Service	Control Delay per Vehicle (seconds)	Interpretation
A	≤ 10	EXCELLENT. Extremely favourable progression with most vehicles arriving during the green phase. Most vehicles do not stop and short cycle lengths may contribute to low delay.
B	> 10 and ≤ 20	VERY GOOD. Very good progression and/or short cycle lengths with slightly more vehicles stopping than LOS "A" causing slightly higher levels of average delay.
C	> 20 and ≤ 35	GOOD. Fair progression and longer cycle lengths lead to a greater number of vehicles stopping than LOS "B".
D	> 35 and ≤ 55	FAIR. Congestion becomes noticeable with higher average delays resulting from a combination of long cycle lengths, high volume-to-capacity ratios and unfavourable progression.
E	> 55 and ≤ 80	POOR. Lengthy delays values are indicative of poor progression, long cycle lengths and high volume-to-capacity ratios. Individual cycle failures are common with individual movement failures also common.
F	> 80	UNSATISFACTORY. Indicative of oversaturated conditions with vehicular demand greater than the capacity of the intersection.

Adapted from Highway Capacity Manual 2000, Transportation Research Board

Attachment E

Detailed Capacity Analysis Worksheets

HCM Unsignalized Intersection Capacity Analysis

1: Heritage Drive & Side Launch Way

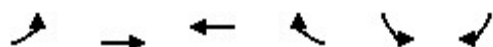
Existing AM
08-13-2021

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	14	19	47	46	13
Future Volume (Veh/h)	4	14	19	47	46	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	5	17	23	57	56	16
Pedestrians				5		
Lane Width (m)				3.6		
Walking Speed (m/s)				1.2		
Percent Blockage				0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				89		
pX, platoon unblocked						
vC, conflicting volume	167	69	72			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	167	69	72			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	98	98			
cM capacity (veh/h)	811	990	1528			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	22	80	72			
Volume Left	5	23	0			
Volume Right	17	0	16			
cSH	943	1528	1700			
Volume to Capacity	0.02	0.02	0.04			
Queue Length 95th (m)	0.6	0.4	0.0			
Control Delay (s)	8.9	2.2	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.9	2.2	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		2.1				
Intersection Capacity Utilization		21.7%		ICU Level of Service	A	
Analysis Period (min)		15				

Lanes, Volumes, Timings

2: Huron Street & Heritage Drive

Existing AM
08-13-2021

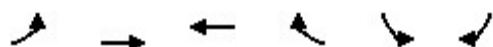


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	34	494	603	32	29	31
Future Volume (vph)	34	494	603	32	29	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0			0.0	0.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	22.0				7.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor	1.00		1.00		0.99	0.99
Frt			0.992			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3506	0	1770	1583
Flt Permitted	0.286				0.950	
Satd. Flow (perm)	531	3539	3506	0	1745	1562
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			8			34
Link Speed (k/h)		50	50		50	
Link Distance (m)		90.3	93.2		89.4	
Travel Time (s)		6.5	6.7		6.4	
Confl. Peds. (#/hr)	4			4	11	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	38	549	670	36	32	34
Shared Lane Traffic (%)						
Lane Group Flow (vph)	38	549	706	0	32	34
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (m)	2.0	10.0	10.0		2.0	2.0
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	2.0	0.6	0.6		2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA		Prot	Perm

Lanes, Volumes, Timings

2: Huron Street & Heritage Drive

Existing AM
08-13-2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Detector Phase	5	2	6		8	8
Switch Phase						
Minimum Initial (s)	7.0	35.0	35.0		21.8	21.8
Minimum Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (%)	14.9%	65.7%	50.7%		34.3%	34.3%
Maximum Green (s)	7.0	47.0	35.0		21.8	21.8
Yellow Time (s)	3.0	3.3	3.3		3.3	3.3
All-Red Time (s)	2.0	2.5	2.5		2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.8	5.8		5.8	5.8
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Max		Max	Max
Walk Time (s)		25.0	25.0		13.4	13.4
Flash Dont Walk (s)		10.0	9.0		5.8	5.8
Pedestrian Calls (#/hr)		0	0		0	0
Act Effct Green (s)	42.8	42.0	35.2		21.9	21.9
Actuated g/C Ratio	0.57	0.56	0.47		0.29	0.29
v/c Ratio	0.09	0.28	0.43		0.06	0.07
Control Delay	7.4	9.1	15.2		22.0	8.6
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	7.4	9.1	15.2		22.0	8.6
LOS	A	A	B		C	A
Approach Delay		9.0	15.2		15.1	
Approach LOS		A	B		B	
Queue Length 50th (m)	2.3	20.8	40.2		3.8	0.0
Queue Length 95th (m)	6.0	29.3	55.1		10.4	6.6
Internal Link Dist (m)		66.3	69.2		65.4	
Turn Bay Length (m)	20.0					
Base Capacity (vph)	415	2213	1637		513	477
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.09	0.25	0.43		0.06	0.07

Intersection Summary

Area Type: Other

Cycle Length: 80.4

Actuated Cycle Length: 75.6

Natural Cycle: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 12.5

Intersection LOS: B

Intersection Capacity Utilization 57.0%

ICU Level of Service B

Analysis Period (min) 15

Lanes, Volumes, Timings
 2: Huron Street & Heritage Drive

Existing AM
 08-13-2021

Splits and Phases: 2: Huron Street & Heritage Drive



HCM Unsignalized Intersection Capacity Analysis

1: Heritage Drive & Side Launch Way

Existing PM
08-12-2021

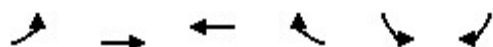


Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			T	T	L
Traffic Volume (veh/h)	13	50	14	52	53	13
Future Volume (Veh/h)	13	50	14	52	53	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	15	57	16	60	61	15
Pedestrians				5	6	
Lane Width (m)				3.6	3.6	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				89		
pX, platoon unblocked						
vC, conflicting volume	166	74	76			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	166	74	76			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	94	99			
cM capacity (veh/h)	811	984	1523			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	72	76	76			
Volume Left	15	16	0			
Volume Right	57	0	15			
cSH	942	1523	1700			
Volume to Capacity	0.08	0.01	0.04			
Queue Length 95th (m)	2.0	0.3	0.0			
Control Delay (s)	9.1	1.6	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.1	1.6	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			3.5			
Intersection Capacity Utilization			22.5%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings

2: Huron Street & Heritage Drive

Existing PM
08-12-2021

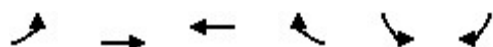


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	38	775	698	28	59	44
Future Volume (vph)	38	775	698	28	59	44
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0			0.0	0.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	22.0				7.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor	1.00		1.00		0.98	
Frt			0.994			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3514	0	1770	1583
Flt Permitted	0.270				0.950	
Satd. Flow (perm)	502	3539	3514	0	1741	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			6			45
Link Speed (k/h)		50	50		50	
Link Distance (m)		90.3	93.2		89.4	
Travel Time (s)		6.5	6.7		6.4	
Confl. Peds. (#/hr)	5			5	13	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	39	791	712	29	60	45
Shared Lane Traffic (%)						
Lane Group Flow (vph)	39	791	741	0	60	45
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (m)	2.0	10.0	10.0		2.0	2.0
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	2.0	0.6	0.6		2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA		Prot	Perm

Lanes, Volumes, Timings

2: Huron Street & Heritage Drive

Existing PM
08-12-2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Detector Phase	5	2	6		8	8
Switch Phase						
Minimum Initial (s)	7.0	35.0	35.0		21.8	21.8
Minimum Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (%)	14.9%	65.7%	50.7%		34.3%	34.3%
Maximum Green (s)	7.0	47.0	35.0		21.8	21.8
Yellow Time (s)	3.0	3.3	3.3		3.3	3.3
All-Red Time (s)	2.0	2.5	2.5		2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.8	5.8		5.8	5.8
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Max		Max	Max
Walk Time (s)		25.0	25.0		13.4	13.4
Flash Dont Walk (s)		10.0	9.0		5.8	5.8
Pedestrian Calls (#/hr)		0	0		0	0
Act Effct Green (s)	42.8	42.0	35.2		21.9	21.9
Actuated g/C Ratio	0.57	0.56	0.47		0.29	0.29
v/c Ratio	0.10	0.40	0.45		0.12	0.09
Control Delay	7.4	10.1	15.5		22.4	8.0
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	7.4	10.1	15.5		22.4	8.0
LOS	A	B	B		C	A
Approach Delay		10.0	15.5		16.3	
Approach LOS		B	B		B	
Queue Length 50th (m)	2.4	32.6	42.8		7.3	0.0
Queue Length 95th (m)	6.1	44.1	58.4		16.5	7.6
Internal Link Dist (m)		66.3	69.2		65.4	
Turn Bay Length (m)	20.0					
Base Capacity (vph)	402	2213	1640		513	491
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.10	0.36	0.45		0.12	0.09

Intersection Summary

Area Type: Other

Cycle Length: 80.4

Actuated Cycle Length: 75.6

Natural Cycle: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.45

Intersection Signal Delay: 12.8

Intersection LOS: B

Intersection Capacity Utilization 59.4%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Huron Street & Heritage Drive



HCM Unsignalized Intersection Capacity Analysis

1: Heritage Drive & Side Launch Way

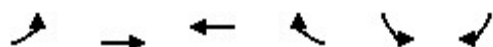
Total AM
08-13-2021

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	50	30	47	46	13
Future Volume (Veh/h)	4	50	30	47	46	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	5	61	37	57	56	16
Pedestrians				5		
Lane Width (m)				3.6		
Walking Speed (m/s)				1.2		
Percent Blockage				0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				89		
pX, platoon unblocked						
vC, conflicting volume	195	69	72			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	195	69	72			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	94	98			
cM capacity (veh/h)	775	990	1528			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	66	94	72			
Volume Left	5	37	0			
Volume Right	61	0	16			
cSH	969	1528	1700			
Volume to Capacity	0.07	0.02	0.04			
Queue Length 95th (m)	1.7	0.6	0.0			
Control Delay (s)	9.0	3.0	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.0	3.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		3.8				
Intersection Capacity Utilization		22.7%		ICU Level of Service	A	
Analysis Period (min)		15				

Lanes, Volumes, Timings

2: Huron Street & Heritage Drive

Total AM
08-13-2021

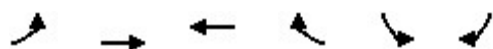


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	43	494	603	43	47	52
Future Volume (vph)	43	494	603	43	47	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0			0.0	0.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	22.0				7.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor	1.00		1.00		0.99	0.99
Frt			0.990			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3498	0	1770	1583
Flt Permitted	0.280				0.950	
Satd. Flow (perm)	521	3539	3498	0	1745	1562
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			12			58
Link Speed (k/h)		50	50		50	
Link Distance (m)		90.3	93.2		66.5	
Travel Time (s)		6.5	6.7		4.8	
Confl. Peds. (#/hr)	4			4	11	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	48	549	670	48	52	58
Shared Lane Traffic (%)						
Lane Group Flow (vph)	48	549	718	0	52	58
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (m)	2.0	10.0	10.0		2.0	2.0
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	2.0	0.6	0.6		2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA		Prot	Perm

Lanes, Volumes, Timings

2: Huron Street & Heritage Drive

Total AM
08-13-2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Detector Phase	5	2	6		8	8
Switch Phase						
Minimum Initial (s)	7.0	35.0	35.0		21.8	21.8
Minimum Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (%)	14.9%	65.7%	50.7%		34.3%	34.3%
Maximum Green (s)	7.0	47.0	35.0		21.8	21.8
Yellow Time (s)	3.0	3.3	3.3		3.3	3.3
All-Red Time (s)	2.0	2.5	2.5		2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.8	5.8		5.8	5.8
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Max		Max	Max
Walk Time (s)		25.0	25.0		13.4	13.4
Flash Dont Walk (s)		10.0	9.0		5.8	5.8
Pedestrian Calls (#/hr)		0	0		0	0
Act Effct Green (s)	42.8	42.0	35.2		21.9	21.9
Actuated g/C Ratio	0.57	0.56	0.47		0.29	0.29
v/c Ratio	0.12	0.28	0.44		0.10	0.12
Control Delay	7.6	9.1	15.2		22.3	7.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	7.6	9.1	15.2		22.3	7.4
LOS	A	A	B		C	A
Approach Delay		8.9	15.2		14.4	
Approach LOS		A	B		B	
Queue Length 50th (m)	2.9	20.8	40.8		6.3	0.0
Queue Length 95th (m)	7.1	29.3	56.0		14.8	8.6
Internal Link Dist (m)		66.3	69.2		42.5	
Turn Bay Length (m)	20.0					
Base Capacity (vph)	411	2213	1635		513	494
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.12	0.25	0.44		0.10	0.12

Intersection Summary

Area Type: Other

Cycle Length: 80.4

Actuated Cycle Length: 75.6

Natural Cycle: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.44

Intersection Signal Delay: 12.5

Intersection LOS: B

Intersection Capacity Utilization 63.6%

ICU Level of Service B

Analysis Period (min) 15

Lanes, Volumes, Timings
 2: Huron Street & Heritage Drive

Total AM
 08-13-2021

Splits and Phases: 2: Huron Street & Heritage Drive



HCM Unsignalized Intersection Capacity Analysis

3: North Access & Side Launch Way

Total AM
08-13-2021

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	18	0	11	32	0	36
Future Volume (Veh/h)	18	0	11	32	0	36
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	0	12	35	0	39
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			20		79	20
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			20		79	20
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	96
cM capacity (veh/h)			1596		917	1058
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	20	47	39			
Volume Left	0	12	0			
Volume Right	0	0	39			
cSH	1700	1596	1058			
Volume to Capacity	0.01	0.01	0.04			
Queue Length 95th (m)	0.0	0.2	0.9			
Control Delay (s)	0.0	1.9	8.5			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.9	8.5			
Approach LOS			A			
Intersection Summary						
Average Delay			4.0			
Intersection Capacity Utilization			19.0%		ICU Level of Service	
					A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

4: Heritage Drive & East Access

Total AM
08-13-2021

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	3	9	77	96	0
Future Volume (Veh/h)	0	3	9	77	96	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	3	10	84	104	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				66		
pX, platoon unblocked						
vC, conflicting volume	208	104	104			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	208	104	104			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	99			
cM capacity (veh/h)	775	951	1488			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	3	94	104			
Volume Left	0	10	0			
Volume Right	3	0	0			
cSH	951	1488	1700			
Volume to Capacity	0.00	0.01	0.06			
Queue Length 95th (m)	0.1	0.2	0.0			
Control Delay (s)	8.8	0.8	0.0			
Lane LOS	A	A				
Approach Delay (s)	8.8	0.8	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization		21.2%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

1: Heritage Drive & Side Launch Way

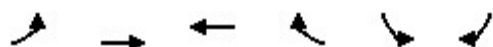
Total PM
08-13-2021

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	88	49	52	53	13
Future Volume (Veh/h)	13	88	49	52	53	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	15	101	56	60	61	15
Pedestrians				5	6	
Lane Width (m)				3.6	3.6	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				89		
pX, platoon unblocked						
vC, conflicting volume	246	74	76			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	246	74	76			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	90	96			
cM capacity (veh/h)	711	984	1523			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	116	116	76			
Volume Left	15	56	0			
Volume Right	101	0	15			
cSH	938	1523	1700			
Volume to Capacity	0.12	0.04	0.04			
Queue Length 95th (m)	3.4	0.9	0.0			
Control Delay (s)	9.4	3.7	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.4	3.7	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		4.9				
Intersection Capacity Utilization		26.4%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings

2: Huron Street & Heritage Drive

Total PM
08-13-2021

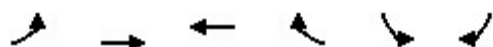


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	72	770	693	59	88	70
Future Volume (vph)	72	770	693	59	88	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0			0.0	0.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	22.0				7.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor	1.00		1.00		0.98	
Frt			0.988			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3490	0	1770	1583
Flt Permitted	0.254				0.950	
Satd. Flow (perm)	472	3539	3490	0	1741	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			14			71
Link Speed (k/h)		50	50		50	
Link Distance (m)		90.3	93.2		66.5	
Travel Time (s)		6.5	6.7		4.8	
Confl. Peds. (#/hr)	5			5	13	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	73	786	707	60	90	71
Shared Lane Traffic (%)						
Lane Group Flow (vph)	73	786	767	0	90	71
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (m)	2.0	10.0	10.0		2.0	2.0
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	2.0	0.6	0.6		2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA		Prot	Perm

Lanes, Volumes, Timings

2: Huron Street & Heritage Drive

Total PM
08-13-2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Detector Phase	5	2	6		8	8
Switch Phase						
Minimum Initial (s)	7.0	35.0	35.0		21.8	21.8
Minimum Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (%)	14.9%	65.7%	50.7%		34.3%	34.3%
Maximum Green (s)	7.0	47.0	35.0		21.8	21.8
Yellow Time (s)	3.0	3.3	3.3		3.3	3.3
All-Red Time (s)	2.0	2.5	2.5		2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.8	5.8		5.8	5.8
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Max		Max	Max
Walk Time (s)		25.0	25.0		13.4	13.4
Flash Dont Walk (s)		10.0	9.0		5.8	5.8
Pedestrian Calls (#/hr)		0	0		0	0
Act Effect Green (s)	45.3	44.5	35.1		21.9	21.9
Actuated g/C Ratio	0.58	0.57	0.45		0.28	0.28
v/c Ratio	0.19	0.39	0.49		0.18	0.14
Control Delay	8.1	9.8	16.7		23.8	7.0
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	8.1	9.8	16.7		23.8	7.0
LOS	A	A	B		C	A
Approach Delay		9.7	16.7		16.4	
Approach LOS		A	B		B	
Queue Length 50th (m)	4.5	32.4	44.3		11.1	0.0
Queue Length 95th (m)	9.7	43.7	60.3		22.7	9.5
Internal Link Dist (m)		66.3	69.2		42.5	
Turn Bay Length (m)	20.0					
Base Capacity (vph)	390	2141	1580		496	494
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.19	0.37	0.49		0.18	0.14

Intersection Summary

Area Type: Other

Cycle Length: 80.4

Actuated Cycle Length: 78

Natural Cycle: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 13.3

Intersection LOS: B

Intersection Capacity Utilization 67.0%

ICU Level of Service C

Analysis Period (min) 15

Lanes, Volumes, Timings
 2: Huron Street & Heritage Drive

Total PM
 08-13-2021

Splits and Phases: 2: Huron Street & Heritage Drive



HCM Unsignalized Intersection Capacity Analysis

3: North Access & Side Launch Way

Total PM
08-13-2021

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	63	0	35	27	0	38
Future Volume (Veh/h)	63	0	35	27	0	38
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	68	0	38	29	0	41
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			68		173	68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			68		173	68
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		100	96
cM capacity (veh/h)			1533		797	995
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	68	67	41			
Volume Left	0	38	0			
Volume Right	0	0	41			
cSH	1700	1533	995			
Volume to Capacity	0.04	0.02	0.04			
Queue Length 95th (m)	0.0	0.6	1.0			
Control Delay (s)	0.0	4.3	8.8			
Lane LOS		A	A			
Approach Delay (s)	0.0	4.3	8.8			
Approach LOS			A			
Intersection Summary						
Average Delay			3.7			
Intersection Capacity Utilization			20.0%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

4: Heritage Drive & East Access

Total PM
08-13-2021

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	17	30	101	141	0
Future Volume (Veh/h)	0	17	30	101	141	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	18	33	110	153	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				66		
pX, platoon unblocked						
vC, conflicting volume	329	153	153			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	329	153	153			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	98			
cM capacity (veh/h)	650	893	1428			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	18	143	153			
Volume Left	0	33	0			
Volume Right	18	0	0			
cSH	893	1428	1700			
Volume to Capacity	0.02	0.02	0.09			
Queue Length 95th (m)	0.5	0.6	0.0			
Control Delay (s)	9.1	1.9	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.1	1.9	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		1.4				
Intersection Capacity Utilization		27.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

1: Heritage Drive & Side Launch Way

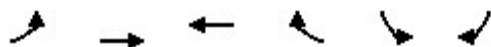
Sensitivity Analysis AM

08-13-2021

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	91	30	47	46	13
Future Volume (Veh/h)	4	91	30	47	46	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82
Hourly flow rate (vph)	5	111	37	57	56	16
Pedestrians				5		
Lane Width (m)				3.6		
Walking Speed (m/s)				1.2		
Percent Blockage				0		
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				89		
pX, platoon unblocked						
vC, conflicting volume	195	69	72			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	195	69	72			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	89	98			
cM capacity (veh/h)	775	990	1528			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	116	94	72			
Volume Left	5	37	0			
Volume Right	111	0	16			
cSH	978	1528	1700			
Volume to Capacity	0.12	0.02	0.04			
Queue Length 95th (m)	3.2	0.6	0.0			
Control Delay (s)	9.2	3.0	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.2	3.0	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		4.8				
Intersection Capacity Utilization		24.9%		ICU Level of Service	A	
Analysis Period (min)		15				

Lanes, Volumes, Timings
2: Huron Street & Heritage Drive

Sensitivity Analysis AM
08-13-2021



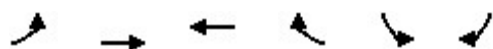
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	79	494	603	88	83	97
Future Volume (vph)	79	494	603	88	83	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0			0.0	0.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	22.0				7.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor	1.00		1.00		0.99	0.99
Frt			0.981			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3461	0	1770	1583
Flt Permitted	0.253				0.950	
Satd. Flow (perm)	471	3539	3461	0	1745	1562
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			25			108
Link Speed (k/h)		50	50		50	
Link Distance (m)		90.3	93.2		66.5	
Travel Time (s)		6.5	6.7		4.8	
Confl. Peds. (#/hr)	4			4	11	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	88	549	670	98	92	108
Shared Lane Traffic (%)						
Lane Group Flow (vph)	88	549	768	0	92	108
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (m)	2.0	10.0	10.0		2.0	2.0
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	2.0	0.6	0.6		2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA		Prot	Perm

Lanes, Volumes, Timings

2: Huron Street & Heritage Drive

Sensitivity Analysis AM

08-13-2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Detector Phase	5	2	6		8	8
Switch Phase						
Minimum Initial (s)	7.0	35.0	35.0		21.8	21.8
Minimum Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (%)	14.9%	65.7%	50.7%		34.3%	34.3%
Maximum Green (s)	7.0	47.0	35.0		21.8	21.8
Yellow Time (s)	3.0	3.3	3.3		3.3	3.3
All-Red Time (s)	2.0	2.5	2.5		2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.8	5.8		5.8	5.8
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Max		Max	Max
Walk Time (s)		25.0	25.0		13.4	13.4
Flash Dont Walk (s)		10.0	9.0		5.8	5.8
Pedestrian Calls (#/hr)		0	0		0	0
Act Effct Green (s)	45.3	44.5	35.1		21.9	21.9
Actuated g/C Ratio	0.58	0.57	0.45		0.28	0.28
v/c Ratio	0.23	0.27	0.49		0.19	0.21
Control Delay	8.4	8.8	16.5		23.8	6.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	8.4	8.8	16.5		23.8	6.2
LOS	A	A	B		C	A
Approach Delay		8.8	16.5		14.3	
Approach LOS		A	B		B	
Queue Length 50th (m)	5.5	20.8	43.7		11.4	0.0
Queue Length 95th (m)	11.3	29.3	60.0		23.1	11.4
Internal Link Dist (m)		66.3	69.2		42.5	
Turn Bay Length (m)	20.0					
Base Capacity (vph)	390	2141	1573		496	516
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.23	0.26	0.49		0.19	0.21

Intersection Summary

Area Type: Other

Cycle Length: 80.4

Actuated Cycle Length: 78

Natural Cycle: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 13.1

Intersection LOS: B

Intersection Capacity Utilization 67.0%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 2: Huron Street & Heritage Drive



HCM Unsignalized Intersection Capacity Analysis

3: North Access & Side Launch Way

Sensitivity Analysis AM

08-13-2021

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	18	0	11	32	0	76
Future Volume (Veh/h)	18	0	11	32	0	76
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	20	0	12	35	0	83
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			20		79	20
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			20		79	20
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	92
cM capacity (veh/h)			1596		917	1058
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	20	47	83			
Volume Left	0	12	0			
Volume Right	0	0	83			
cSH	1700	1596	1058			
Volume to Capacity	0.01	0.01	0.08			
Queue Length 95th (m)	0.0	0.2	2.0			
Control Delay (s)	0.0	1.9	8.7			
Lane LOS		A	A			
Approach Delay (s)	0.0	1.9	8.7			
Approach LOS			A			
Intersection Summary						
Average Delay			5.4			
Intersection Capacity Utilization			20.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

4: Heritage Drive & East Access

Sensitivity Analysis AM

08-13-2021

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	44	90	77	137	0
Future Volume (Veh/h)	0	44	90	77	137	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	48	98	84	149	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				66		
pX, platoon unblocked						
vC, conflicting volume	429	149	149			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	429	149	149			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	95	93			
cM capacity (veh/h)	543	898	1432			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	48	182	149			
Volume Left	0	98	0			
Volume Right	48	0	0			
cSH	898	1432	1700			
Volume to Capacity	0.05	0.07	0.09			
Queue Length 95th (m)	1.4	1.8	0.0			
Control Delay (s)	9.2	4.4	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.2	4.4	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		3.3				
Intersection Capacity Utilization		29.6%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

1: Heritage Drive & Side Launch Way

Sensitivity Analysis PM

08-13-2021

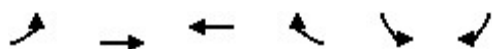
						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	13	127	49	52	53	13
Future Volume (Veh/h)	13	127	49	52	53	13
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	15	146	56	60	61	15
Pedestrians				5	6	
Lane Width (m)				3.6	3.6	
Walking Speed (m/s)				1.2	1.2	
Percent Blockage				0	1	
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				89		
pX, platoon unblocked						
vC, conflicting volume	246	74	76			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	246	74	76			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	85	96			
cM capacity (veh/h)	711	984	1523			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	161	116	76			
Volume Left	15	56	0			
Volume Right	146	0	15			
cSH	950	1523	1700			
Volume to Capacity	0.17	0.04	0.04			
Queue Length 95th (m)	4.9	0.9	0.0			
Control Delay (s)	9.6	3.7	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.6	3.7	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		5.6				
Intersection Capacity Utilization		28.5%		ICU Level of Service		A
Analysis Period (min)		15				

Lanes, Volumes, Timings

2: Huron Street & Heritage Drive

Sensitivity Analysis PM

08-13-2021



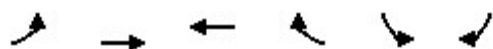
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	115	770	693	97	131	108
Future Volume (vph)	115	770	693	97	131	108
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	20.0			0.0	0.0	0.0
Storage Lanes	1			0	1	1
Taper Length (m)	22.0				7.5	
Lane Util. Factor	1.00	0.95	0.95	0.95	1.00	1.00
Ped Bike Factor	1.00		1.00		0.98	
Frt			0.982			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	3539	3464	0	1770	1583
Flt Permitted	0.237				0.950	
Satd. Flow (perm)	441	3539	3464	0	1741	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			24			110
Link Speed (k/h)		50	50		50	
Link Distance (m)		90.3	93.2		66.5	
Travel Time (s)		6.5	6.7		4.8	
Confl. Peds. (#/hr)	5			5	13	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	117	786	707	99	134	110
Shared Lane Traffic (%)						
Lane Group Flow (vph)	117	786	806	0	134	110
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		3.6	3.6		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane		Yes				
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (m)	2.0	10.0	10.0		2.0	2.0
Trailing Detector (m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Position(m)	0.0	0.0	0.0		0.0	0.0
Detector 1 Size(m)	2.0	0.6	0.6		2.0	2.0
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(m)		9.4	9.4			
Detector 2 Size(m)		0.6	0.6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA		Prot	Perm

Lanes, Volumes, Timings

2: Huron Street & Heritage Drive

Sensitivity Analysis PM

08-13-2021



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Protected Phases	5	2	6		8	
Permitted Phases	2					8
Detector Phase	5	2	6		8	8
Switch Phase						
Minimum Initial (s)	7.0	35.0	35.0		21.8	21.8
Minimum Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (s)	12.0	52.8	40.8		27.6	27.6
Total Split (%)	14.9%	65.7%	50.7%		34.3%	34.3%
Maximum Green (s)	7.0	47.0	35.0		21.8	21.8
Yellow Time (s)	3.0	3.3	3.3		3.3	3.3
All-Red Time (s)	2.0	2.5	2.5		2.5	2.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	5.0	5.8	5.8		5.8	5.8
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	Max		Max	Max
Walk Time (s)		25.0	25.0		13.4	13.4
Flash Dont Walk (s)		10.0	9.0		5.8	5.8
Pedestrian Calls (#/hr)		0	0		0	0
Act Effect Green (s)	45.3	44.5	35.1		21.9	21.9
Actuated g/C Ratio	0.58	0.57	0.45		0.28	0.28
v/c Ratio	0.31	0.39	0.51		0.27	0.21
Control Delay	9.4	9.8	16.8		24.7	6.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	9.4	9.8	16.8		24.7	6.2
LOS	A	A	B		C	A
Approach Delay		9.8	16.8		16.4	
Approach LOS		A	B		B	
Queue Length 50th (m)	7.4	32.4	46.7		16.9	0.0
Queue Length 95th (m)	14.3	43.7	63.6		31.7	11.6
Internal Link Dist (m)		66.3	69.2		42.5	
Turn Bay Length (m)	20.0					
Base Capacity (vph)	375	2141	1574		496	523
Starvation Cap Reductn	0	0	0		0	0
Spillback Cap Reductn	0	0	0		0	0
Storage Cap Reductn	0	0	0		0	0
Reduced v/c Ratio	0.31	0.37	0.51		0.27	0.21

Intersection Summary

Area Type: Other

Cycle Length: 80.4

Actuated Cycle Length: 78

Natural Cycle: 85

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.51

Intersection Signal Delay: 13.5

Intersection LOS: B

Intersection Capacity Utilization 67.5%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 2: Huron Street & Heritage Drive



HCM Unsignalized Intersection Capacity Analysis

3: North Access & Side Launch Way

Sensitivity Analysis PM

08-13-2021

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	63	0	35	27	0	78
Future Volume (Veh/h)	63	0	35	27	0	78
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	68	0	38	29	0	85
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			68	173		68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			68	173		68
tC, single (s)			4.1	6.4		6.2
tC, 2 stage (s)						
tF (s)			2.2	3.5		3.3
p0 queue free %			98	100		91
cM capacity (veh/h)			1533	797		995
Direction, Lane #	EB 1	WB 1	NB 1			
Volume Total	68	67	85			
Volume Left	0	38	0			
Volume Right	0	0	85			
cSH	1700	1533	995			
Volume to Capacity	0.04	0.02	0.09			
Queue Length 95th (m)	0.0	0.6	2.2			
Control Delay (s)	0.0	4.3	9.0			
Lane LOS			A	A		
Approach Delay (s)	0.0	4.3	9.0			
Approach LOS			A			
Intersection Summary						
Average Delay			4.8			
Intersection Capacity Utilization			21.5%	ICU Level of Service	A	
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

4: Heritage Drive & East Access

Sensitivity Analysis PM

08-13-2021

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	57	111	101	180	0
Future Volume (Veh/h)	0	57	111	101	180	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	62	121	110	196	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (m)				66		
pX, platoon unblocked						
vC, conflicting volume	548	196	196			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	548	196	196			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	91			
cM capacity (veh/h)	454	845	1377			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	62	231	196			
Volume Left	0	121	0			
Volume Right	62	0	0			
cSH	845	1377	1700			
Volume to Capacity	0.07	0.09	0.12			
Queue Length 95th (m)	1.9	2.3	0.0			
Control Delay (s)	9.6	4.5	0.0			
Lane LOS	A	A				
Approach Delay (s)	9.6	4.5	0.0			
Approach LOS	A					
Intersection Summary						
Average Delay		3.3				
Intersection Capacity Utilization		34.5%		ICU Level of Service		A
Analysis Period (min)		15				

Attachment F

ITE Trip Generation Excerpts

Land Use: 221

Multifamily Housing (Mid-Rise)

Description

Mid-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have between three and 10 levels (floors). Multifamily housing (low-rise) (Land Use 220), multifamily housing (high-rise) (Land Use 222), off-campus student apartment (Land Use 225), and mid-rise residential with 1st-floor commercial (Land Use 231) are related land uses.

Additional Data

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

For the six sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.46 residents per occupied dwelling unit.

For the five sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 95.7 percent of the total dwelling units were occupied.

Time-of-day distribution data for this land use are presented in Appendix A. For the eight general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:00 and 8:00 a.m. and 4:45 and 5:45 p.m., respectively.

For the four dense multi-use urban sites with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 7:15 and 8:15 a.m. and 4:15 and 5:15 p.m., respectively. For the three center city core sites with 24-hour count data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 6:45 and 7:45 a.m. and 5:00 and 6:00 p.m., respectively.

For the six sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.46 residents per occupied dwelling unit.

For the five sites for which data were provided for both occupied dwelling units and total dwelling units, an average of 95.7 percent of the units were occupied.

The average numbers of person trips per vehicle trip at the five center city core sites at which both person trip and vehicle trip data were collected were as follows:

- 1.84 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.94 during Weekday, AM Peak Hour of Generator
- 2.07 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.59 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 32 dense multi-use urban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.90 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.90 during Weekday, AM Peak Hour of Generator
- 2.00 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.08 during Weekday, PM Peak Hour of Generator

The average numbers of person trips per vehicle trip at the 13 general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.56 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 7 and 9 a.m.
- 1.88 during Weekday, AM Peak Hour of Generator
- 1.70 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 2.07 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), British Columbia (CAN), California, Delaware, District of Columbia, Florida, Georgia, Illinois, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, Ontario, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Utah, Virginia, and Wisconsin.

Source Numbers

168, 188, 204, 305, 306, 321, 357, 390, 436, 525, 530, 579, 638, 818, 857, 866, 901, 904, 910, 912, 918, 934, 936, 939, 944, 947, 948, 949, 959, 963, 964, 966, 967, 969, 970

Multifamily Housing (Mid-Rise) (221)

Vehicle Trip Ends vs: Dwelling Units

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

Setting/Location: General Urban/Suburban

Number of Studies: 53

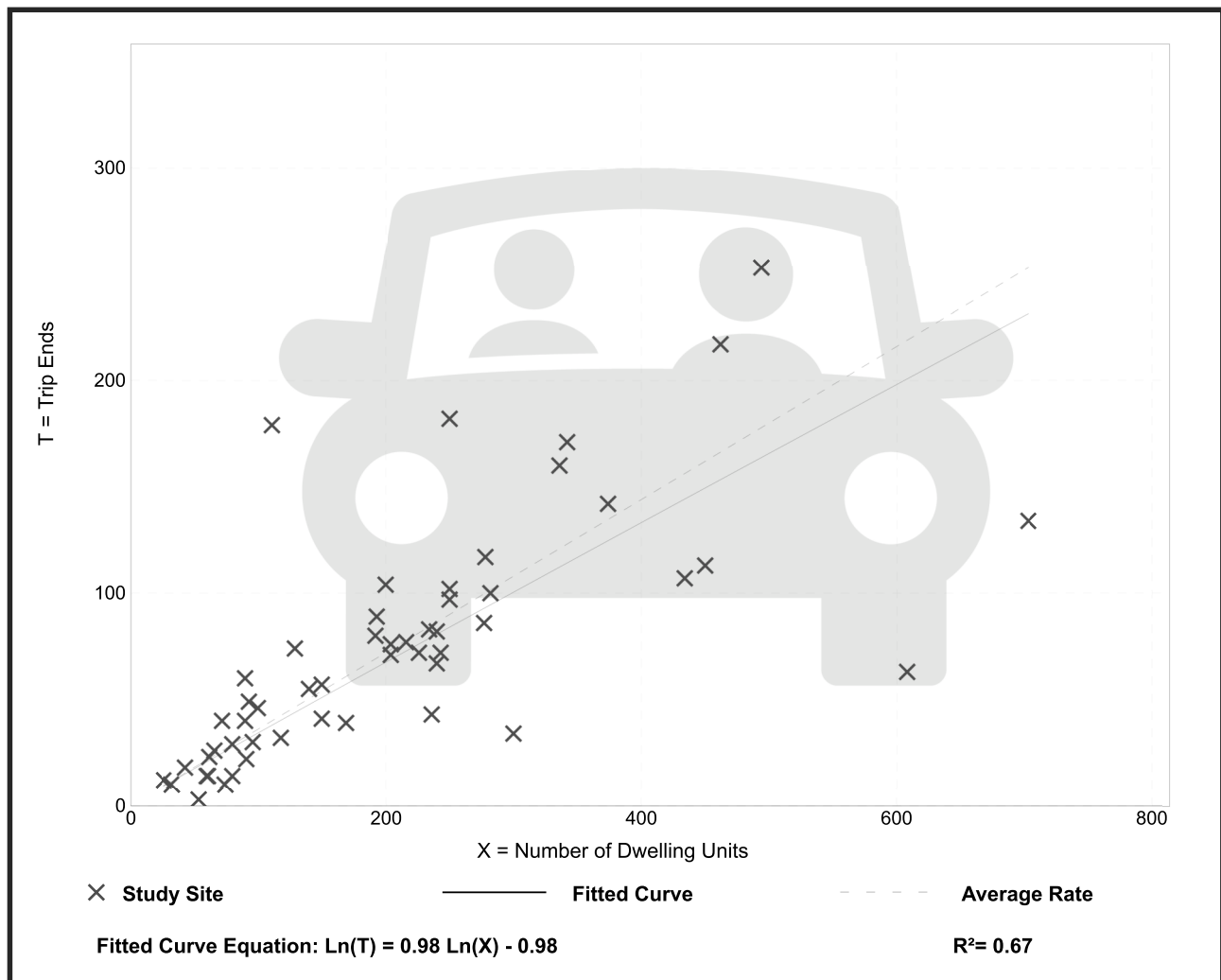
Avg. Num. of Dwelling Units: 207

Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.36	0.06 - 1.61	0.19

Data Plot and Equation



Multifamily Housing (Mid-Rise) (221)

Vehicle Trip Ends vs: Dwelling Units

On a: Weekday,

Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 60

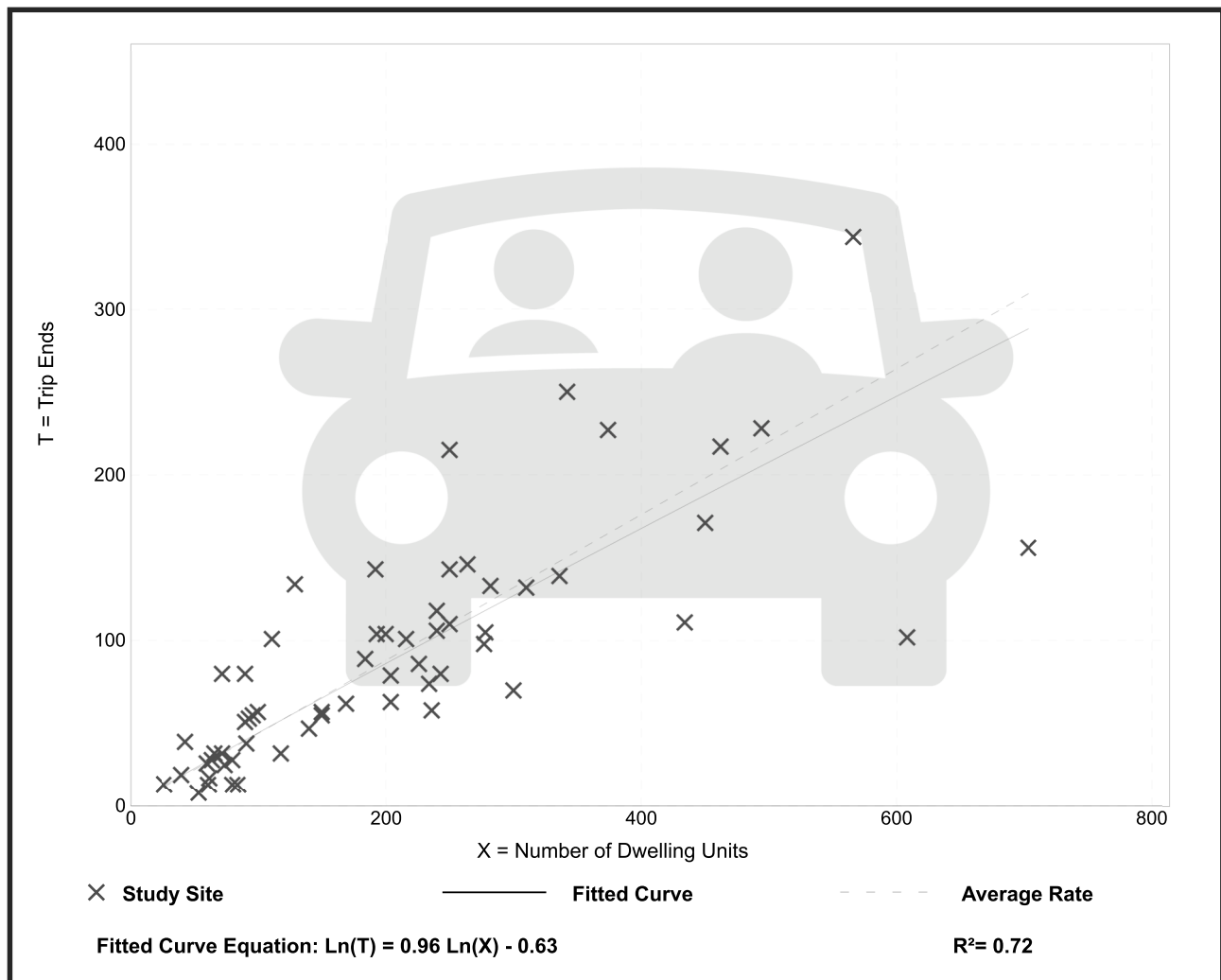
Avg. Num. of Dwelling Units: 208

Directional Distribution: 61% entering, 39% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.44	0.15 - 1.11	0.19

Data Plot and Equation



Land Use: 820

Shopping Center

Description

A shopping center is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. A shopping center's composition is related to its market area in terms of size, location, and type of store. A shopping center also provides on-site parking facilities sufficient to serve its own parking demands. Factory outlet center (Land Use 823) is a related use.

Additional Data

Shopping centers, including neighborhood centers, community centers, regional centers, and super regional centers, were surveyed for this land use. Some of these centers contained non-merchandising facilities, such as office buildings, movie theaters, restaurants, post offices, banks, health clubs, and recreational facilities (for example, ice skating rinks or indoor miniature golf courses).

Many shopping centers, in addition to the integrated unit of shops in one building or enclosed around a mall, include outparcels (peripheral buildings or pads located on the perimeter of the center adjacent to the streets and major access points). These buildings are typically drive-in banks, retail stores, restaurants, or small offices. Although the data herein do not indicate which of the centers studied included peripheral buildings, it can be assumed that some of the data show their effect.

The vehicle trips generated at a shopping center are based upon the total GLA of the center. In cases of smaller centers without an enclosed mall or peripheral buildings, the GLA could be the same as the gross floor area of the building.

Time-of-day distribution data for this land use are presented in Appendix A. For the 10 general urban/suburban sites with data, the overall highest vehicle volumes during the AM and PM on a weekday were counted between 11:45 a.m. and 12:45 p.m. and 12:15 and 1:15 p.m., respectively.

The average numbers of person trips per vehicle trip at the 27 general urban/suburban sites at which both person trip and vehicle trip data were collected were as follows:

- 1.31 during Weekday, AM Peak Hour of Generator
- 1.43 during Weekday, Peak Hour of Adjacent Street Traffic, one hour between 4 and 6 p.m.
- 1.46 during Weekday, PM Peak Hour of Generator

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Alberta (CAN), British Columbia (CAN), California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Nevada, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Vermont, Virginia, Washington, West Virginia, and Wisconsin.

Source Numbers

105, 110, 154, 156, 159, 186, 190, 198, 199, 202, 204, 211, 213, 239, 251, 259, 260, 269, 294, 295, 299, 300, 301, 304, 305, 307, 308, 309, 310, 311, 314, 315, 316, 317, 319, 358, 365, 376, 385, 390, 400, 404, 414, 420, 423, 428, 437, 440, 442, 444, 446, 507, 562, 580, 598, 629, 658, 702, 715, 728, 868, 870, 871, 880, 899, 908, 912, 915, 926, 936, 944, 946, 960, 961, 962, 973, 974, 978

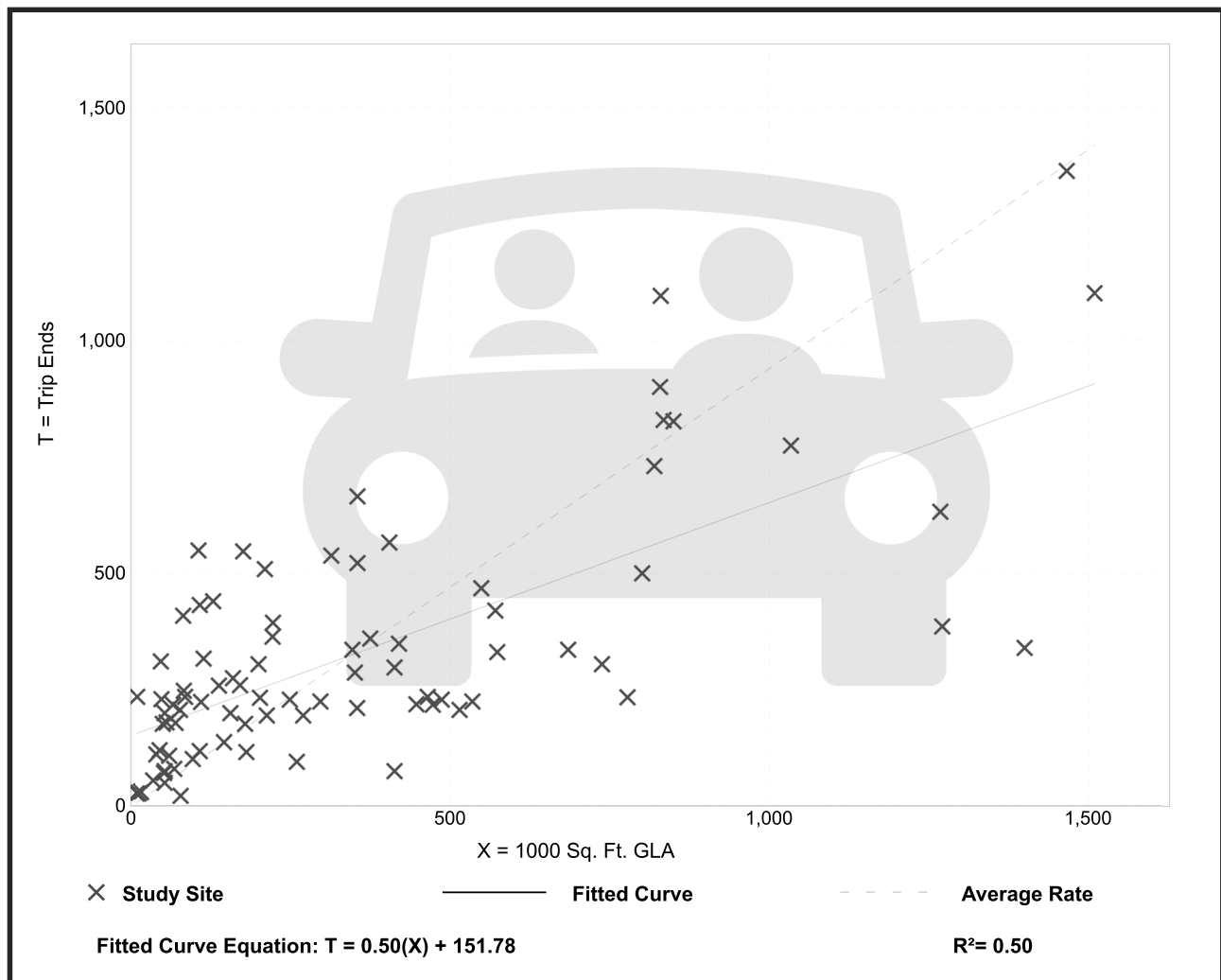
Shopping Center (820)

Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
 On a: Weekday,
 Peak Hour of Adjacent Street Traffic,
 One Hour Between 7 and 9 a.m.
 Setting/Location: General Urban/Suburban
 Number of Studies: 84
 Avg. 1000 Sq. Ft. GLA: 351
 Directional Distribution: 62% entering, 38% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
0.94	0.18 - 23.74	0.87

Data Plot and Equation



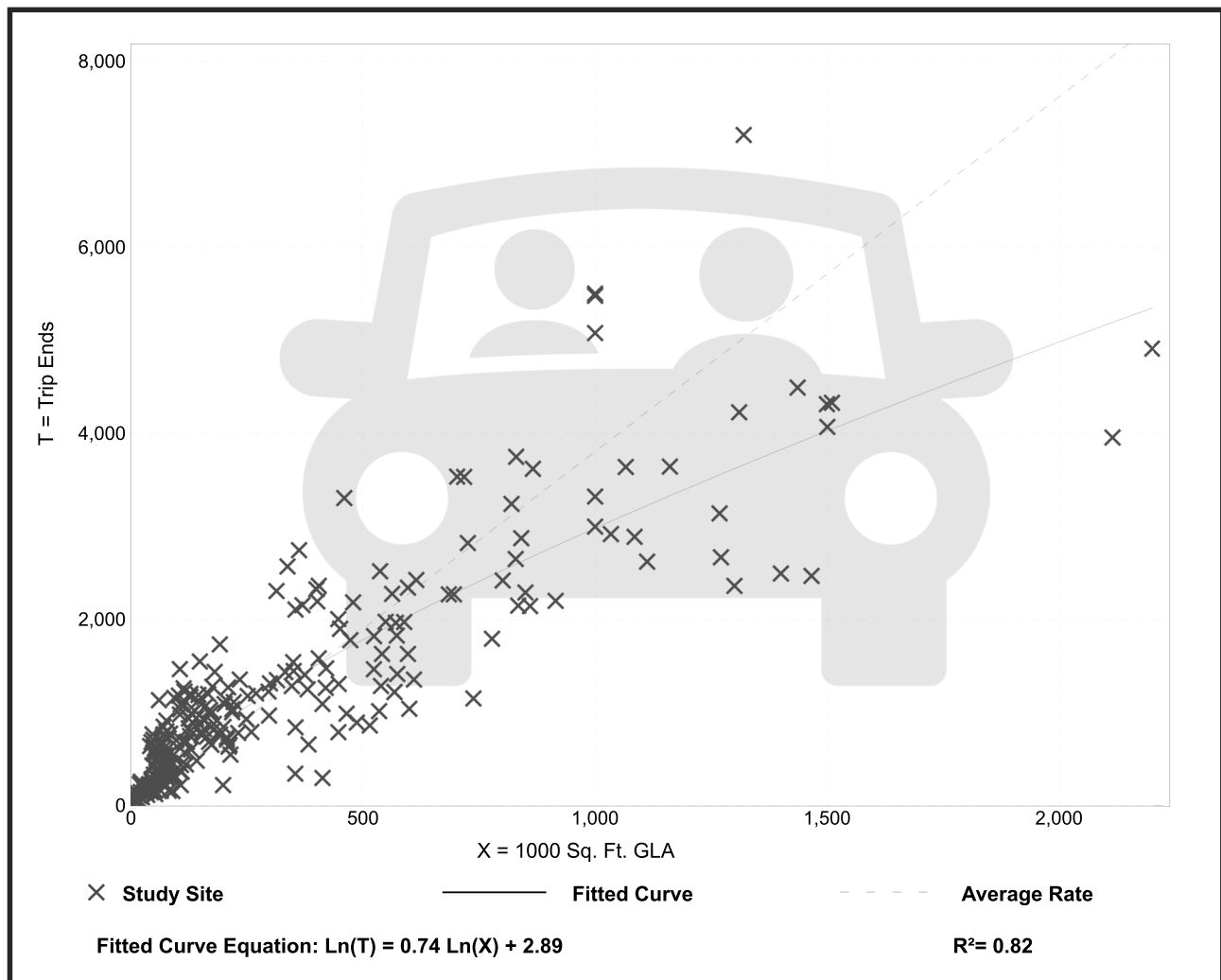
Shopping Center (820)

Vehicle Trip Ends vs: 1000 Sq. Ft. GLA
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
Number of Studies: 261
Avg. 1000 Sq. Ft. GLA: 327
Directional Distribution: 48% entering, 52% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GLA

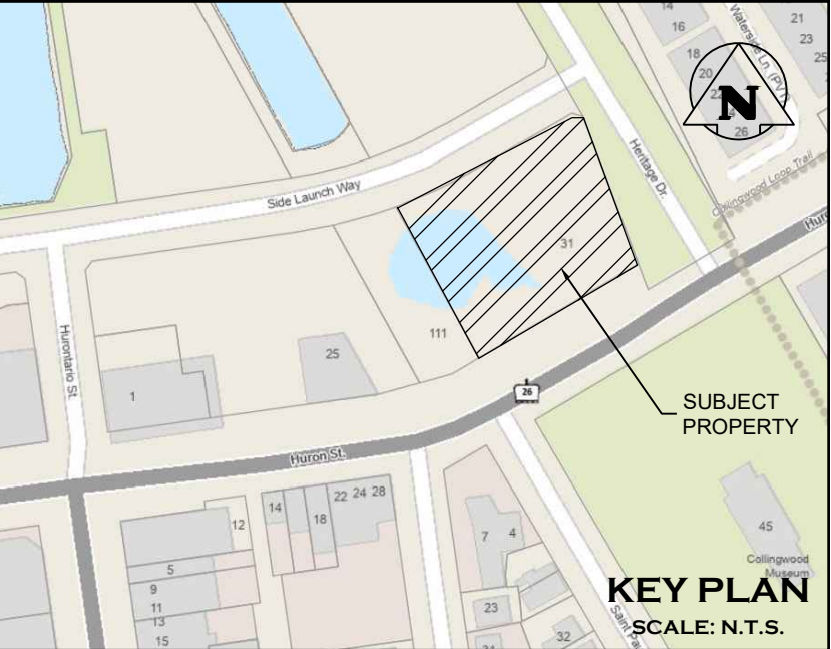
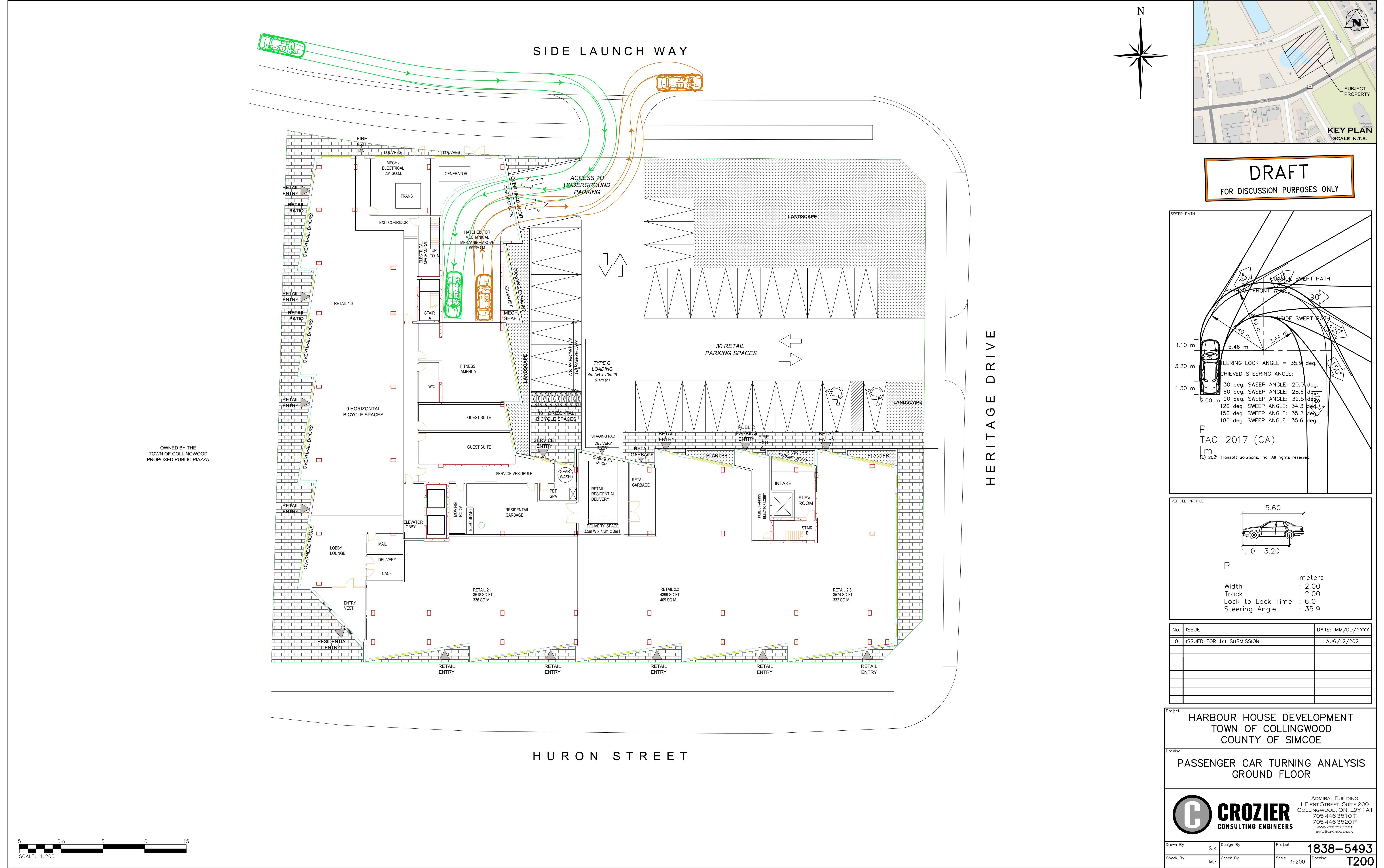
Average Rate	Range of Rates	Standard Deviation
3.81	0.74 - 18.69	2.04

Data Plot and Equation

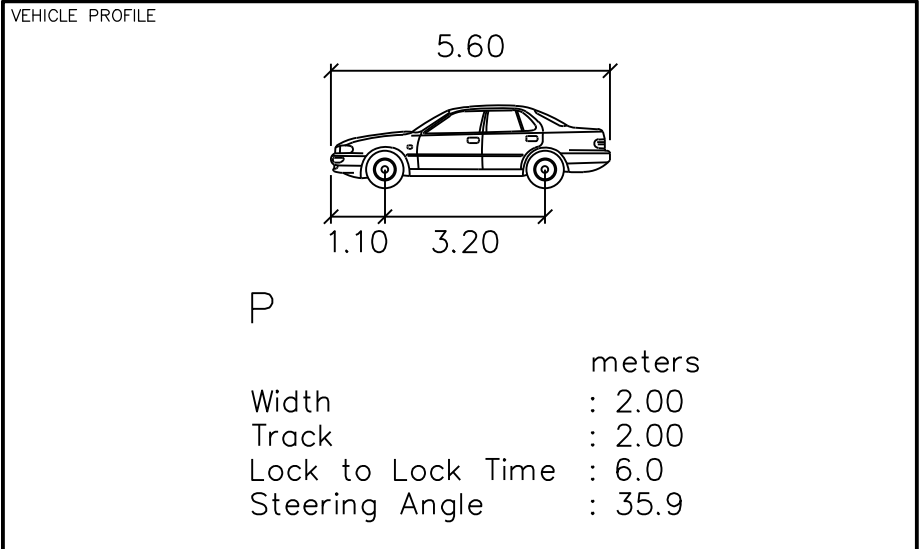
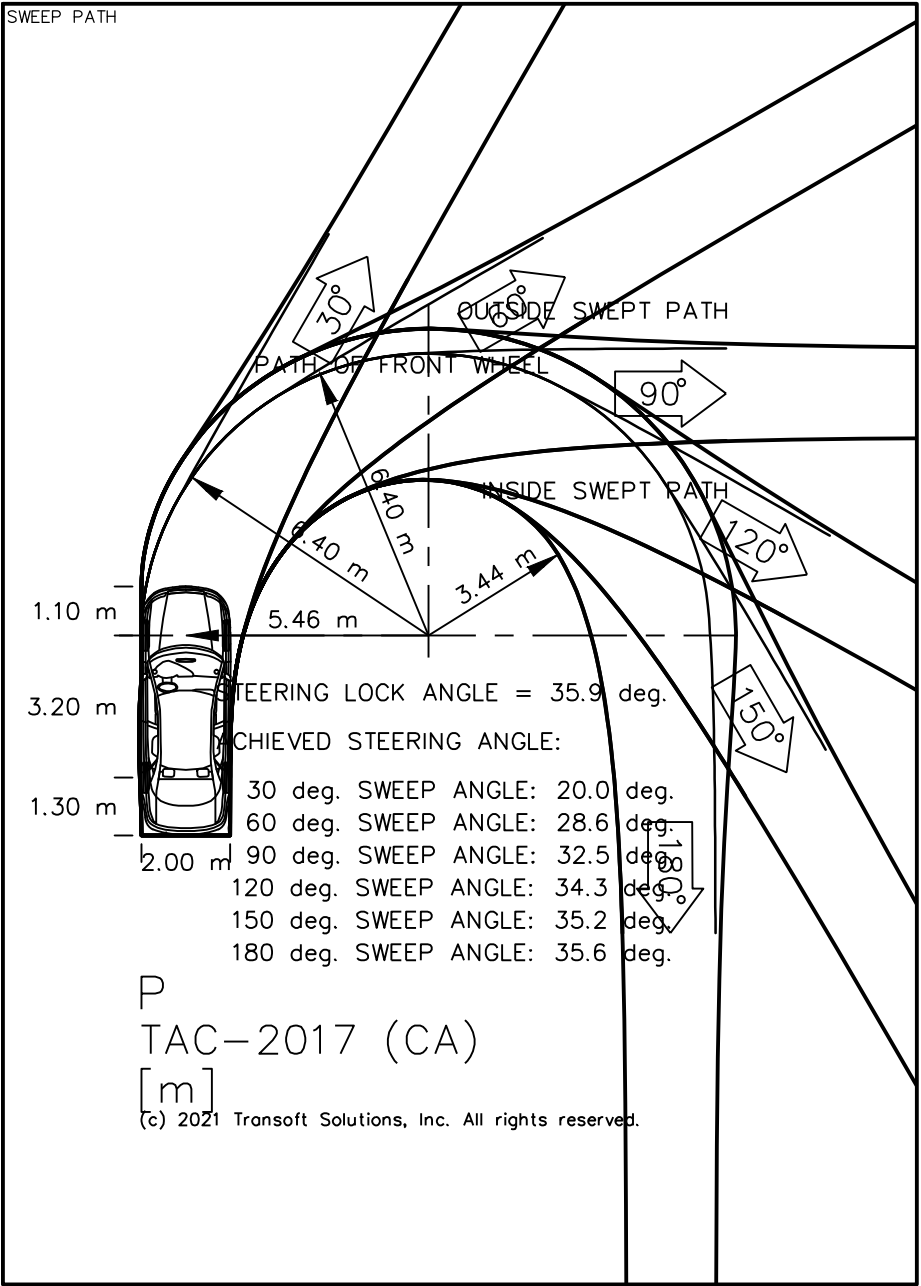


Attachment G

Truck Turning Analysis



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No.	ISSUE	DATE: MM/DD/YYYY
0	ISSUED FOR 1st SUBMISSION	AUG/12/2021

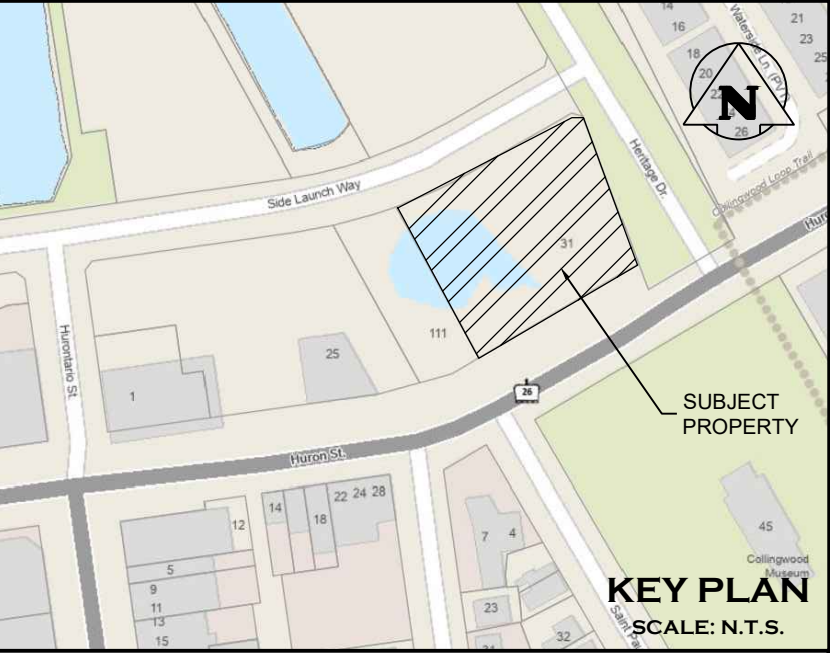
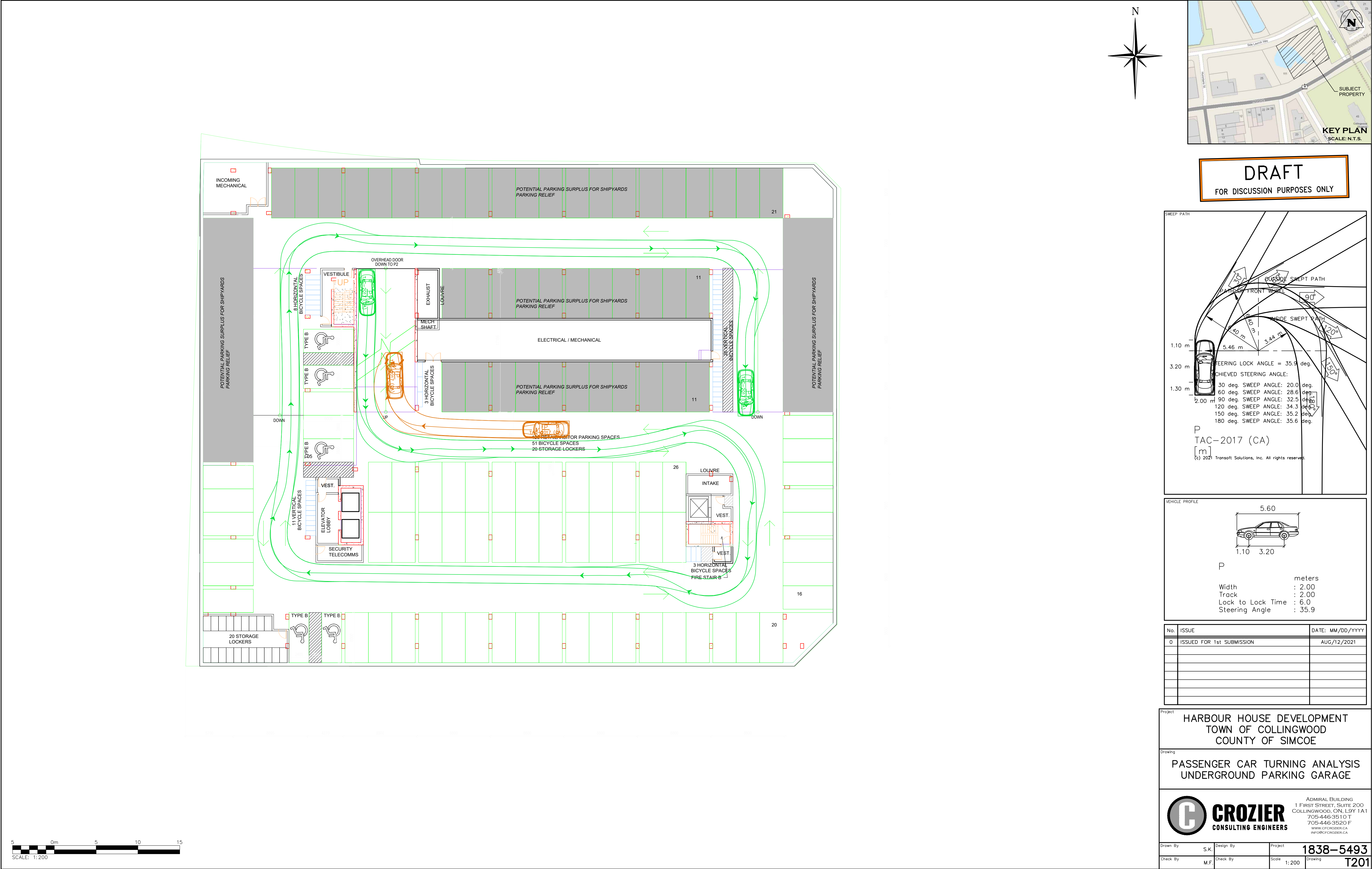
Project
HARBOUR HOUSE DEVELOPMENT
TOWN OF COLLINGWOOD
COUNTY OF SIMCOE

Drawing
PASSENGER CAR TURNING ANALYSIS
GROUND FLOOR

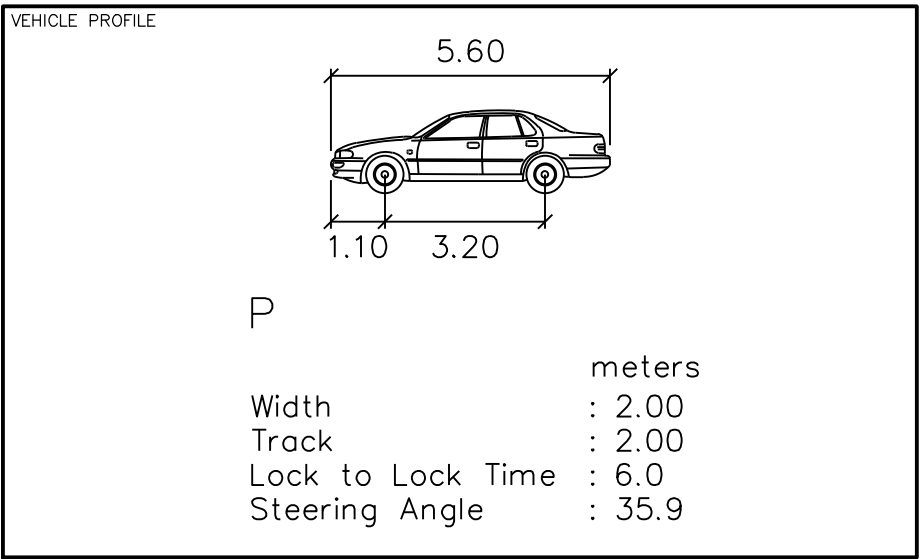
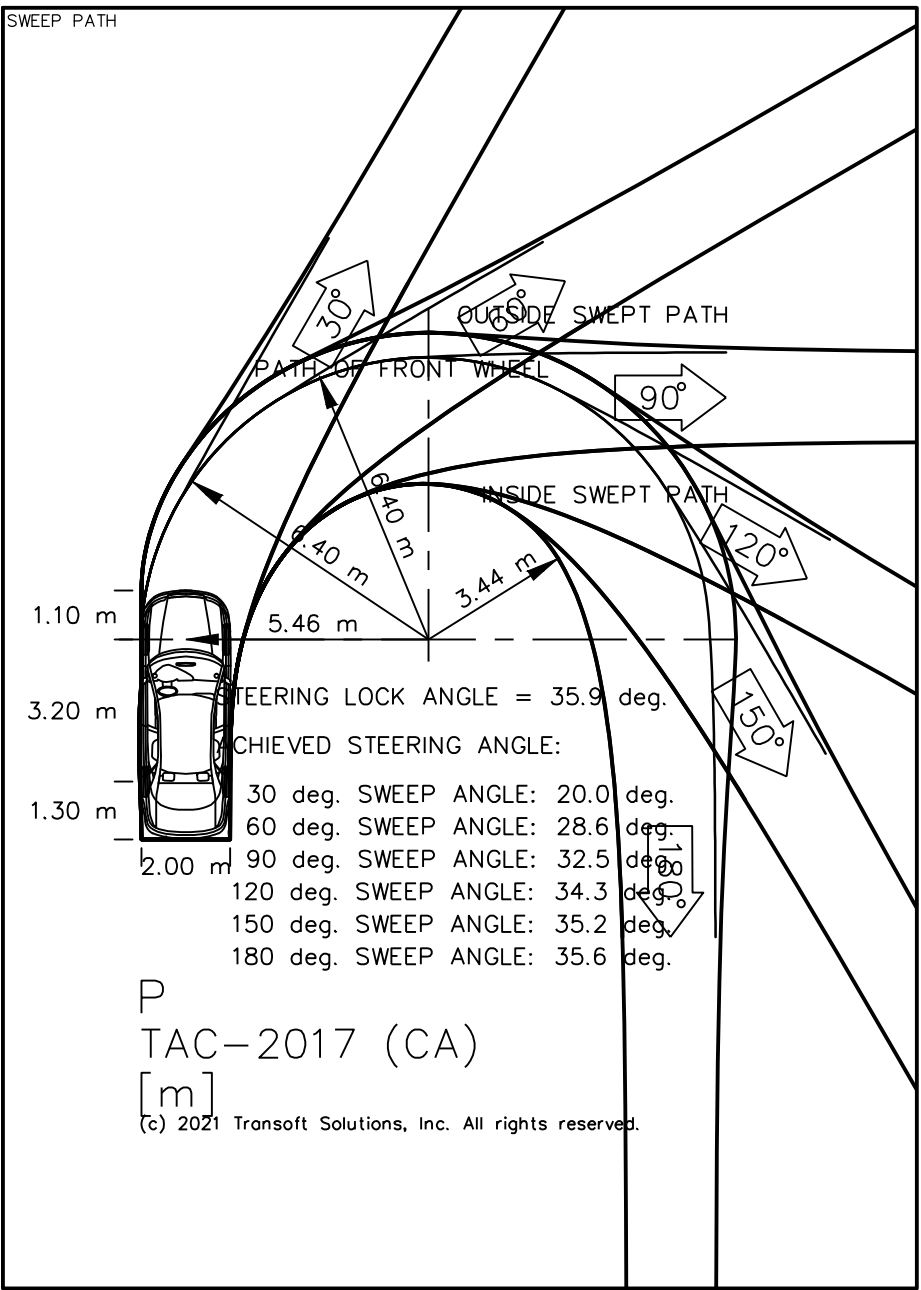
CROZIER
CONSULTING ENGINEERS

ADMIRAL BUILDING
1 FIRST STREET, SUITE 200
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Drawn By	S.K.	Design By	Project	1838-5493
Check By	M.F.	Check By	Scale	1:200
			Drawing	T200



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No.	ISSUE	DATE: MM/DD/YYYY
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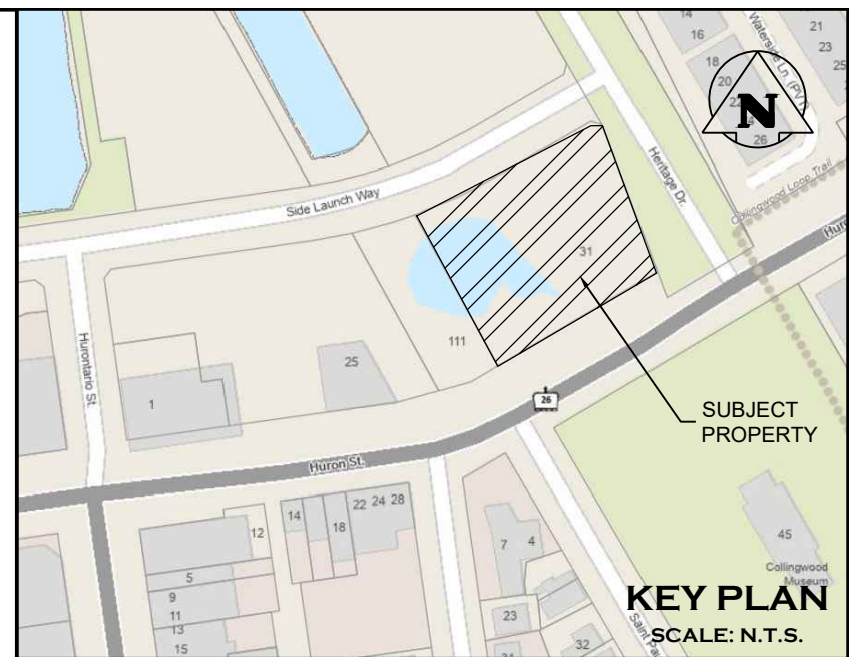
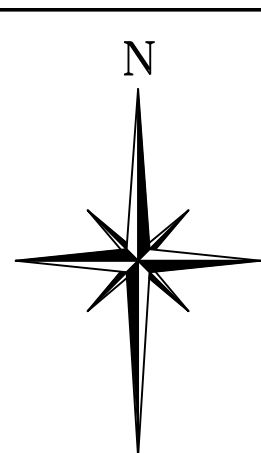
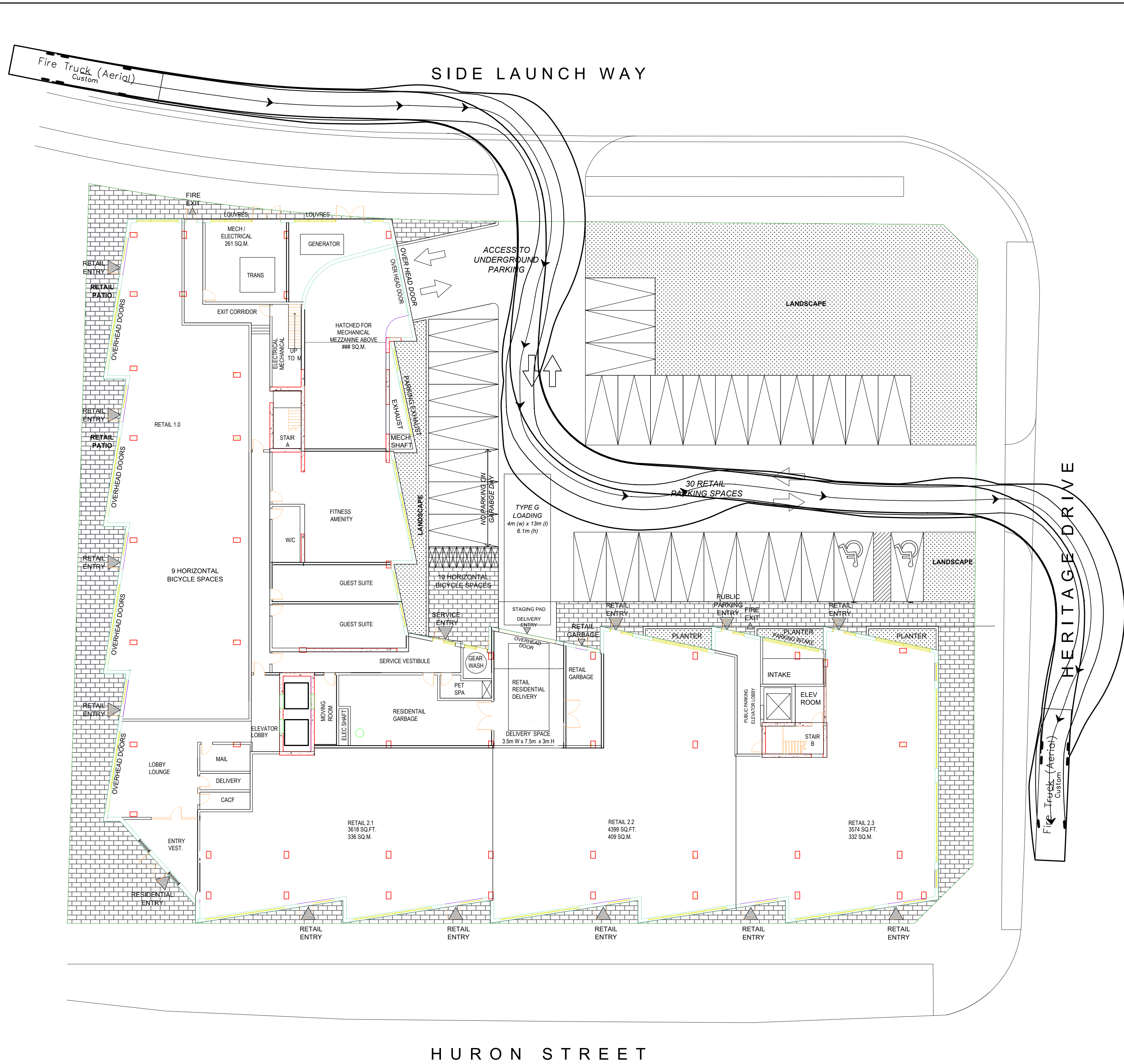
Project
HARBOUR HOUSE DEVELOPMENT
TOWN OF COLLINGWOOD
COUNTY OF SIMCOE

Drawing
PASSENGER CAR TURNING ANALYSIS
UNDERGROUND PARKING GARAGE

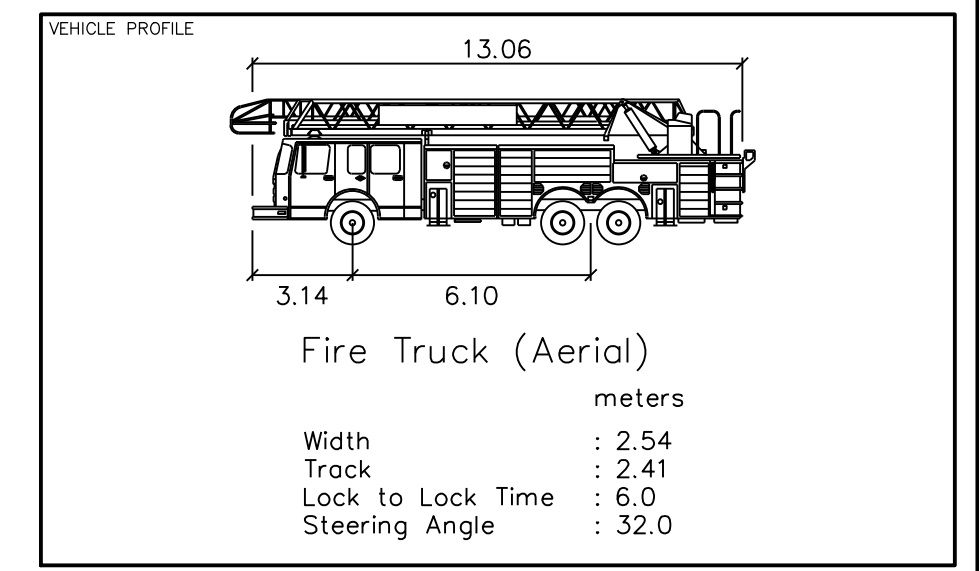
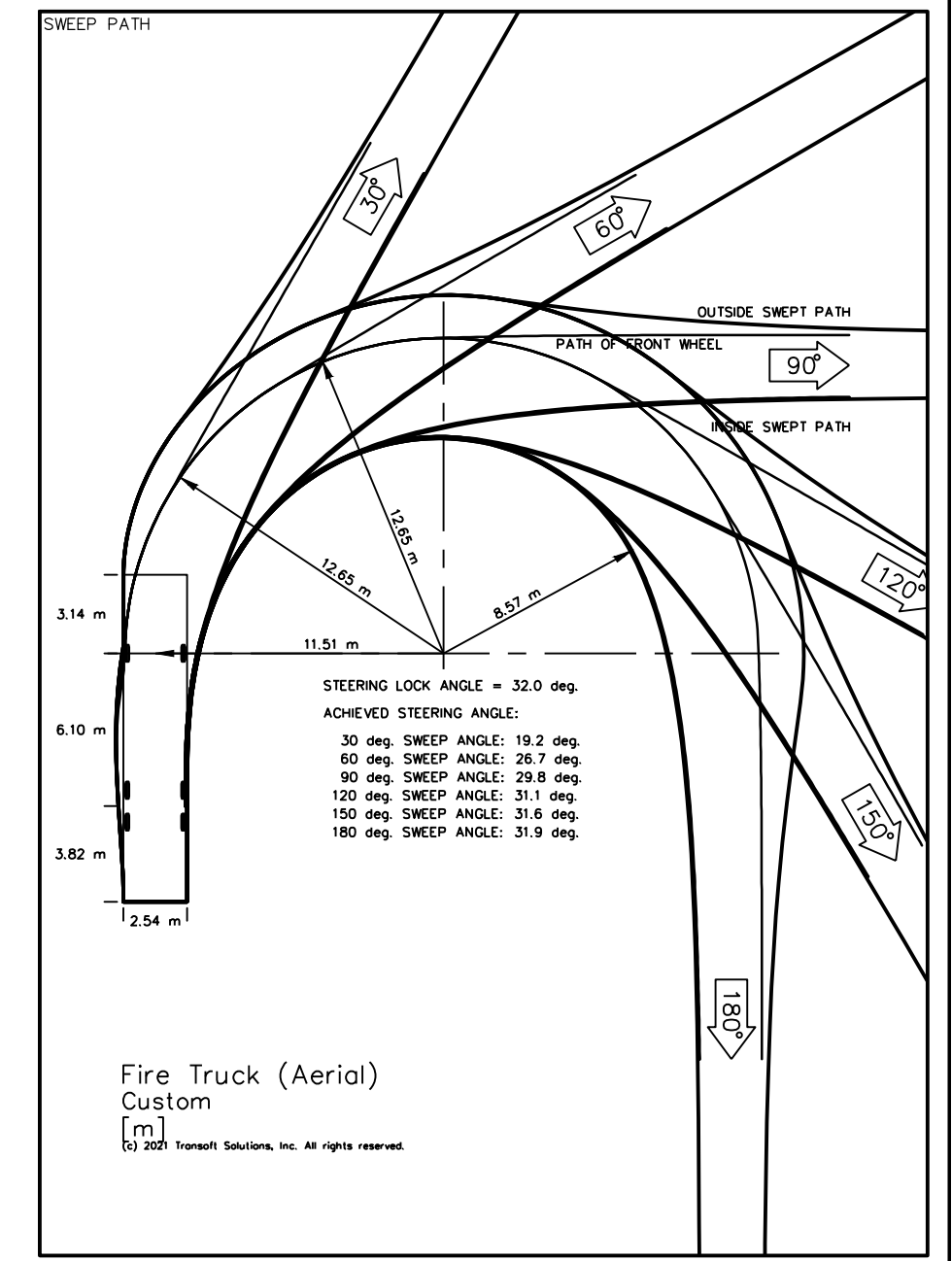
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Drawn By	S.K.	Design By	Project	1838-5493
Check By	M.F.	Check By	Scale	1:200
			Drawing	T201

5 0m 5 10 15
SCALE: 1:200



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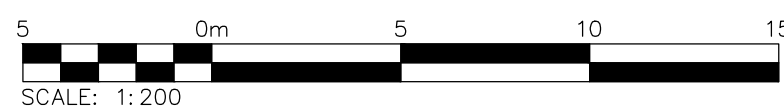
Project
HARBOUR HOUSE DEVELOPMENT
TOWN OF COLLINGWOOD
COUNTY OF SIMCOE

Drawing
FIRE TRUCK TURNING ANALYSIS
GROUND FLOOR

CROZIER
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Drawn By	S.K.	Design By	Project	1838-5493
Check By	M.F.	Check By	Scale	1:200
			Drawing	T202



Attachment H

TAC GDGCR Excerpts

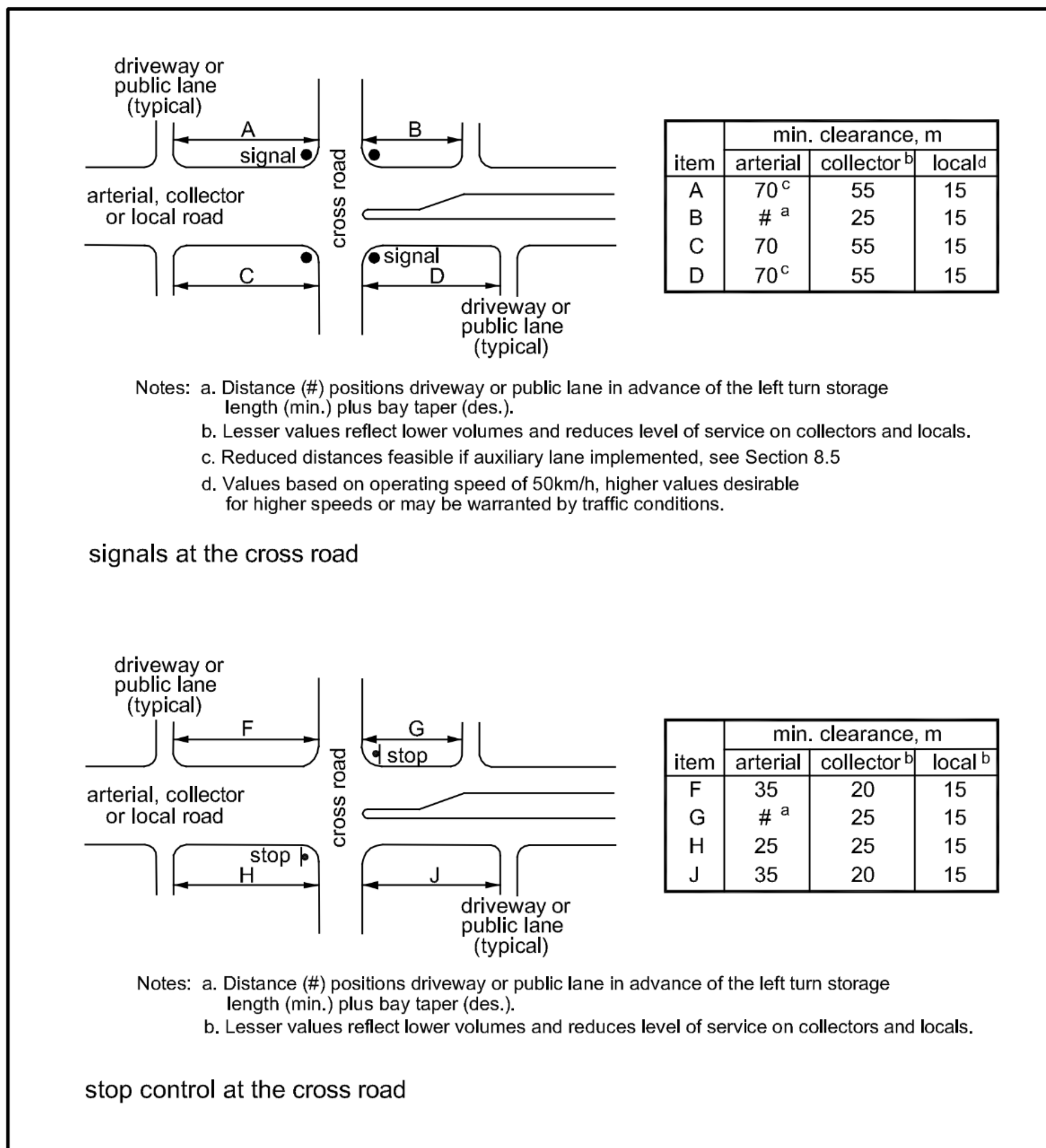


Figure 8.8.2: Suggested Minimum Corner Clearances to Accesses or Public Lanes at Major Intersections

Inadequate corner clearance between accesses and signalized intersections along a major road, such as a major arterial, can create serious operational problems including:

Table 9.9.4: Design Intersection Sight Distance – Case B1, Left Turn From Stop

Design Speed (km/h)	Stopping Sight Distance (m)	Intersection Sight Distance for Passenger Cars	
		Calculated (m)	Design (m)
20	20	41.7	45
30	35	62.6	65
40	50	83.4	85
50	65	104.3	105
60	85	125.1	130
70	105	146.0	150
80	130	166.8	170
90	160	187.7	190
100	185	208.5	210
110	220	229.4	230
120	250	250.2	255
130	285	271.1	275

Note: Intersection sight distance shown is for a stopped passenger car to turn left onto a two-lane highway with no median and grades 3% or less. For other conditions, the time gap should be adjusted and the sight distance recalculated.

Sight distance design for left turns at divided-highway intersections should consider multiple design vehicles and median width. If the design vehicle used to determine sight distance for a divided-highway intersection is larger than a passenger car, then sight distance for left turns will need to be checked for that selected design vehicle and for smaller design vehicles as well. If the divided-highway median is wide enough to store the design vehicle with a clearance to the through lanes of approximately 1 m at both ends of the vehicle, no separate analysis for the departure sight triangle for left turns is needed on the minor-road approach for the near roadway to the left. In most cases, the departure sight triangle for right turns (case B2) will provide sufficient sight distance for a passenger car to cross the near roadway to reach the median. Possible exceptions are addressed in the discussion of case B3.

Attachment I

Town of Collingwood Design Standards Excerpts



Corporation of the Town of Collingwood

Development Standards

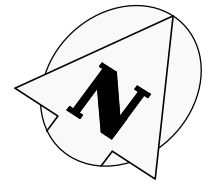
ROAD DESIGN STANDARDS							
	Road Classification						
	Local Residential		Collector			Arterial	
Design Element	urban	rural	urban	rural	industrial		
ROW	20	20	26	26	30	26	
Design Speed	50	60	60	70	70	80	
Posted Speed	40	50	50	60	60	60	
	Design Speed (km/h)						
Design Element	40	50	60	70	80	90	100
stopping sight distance (SSD)	45	65	85	110	135	160	185
horizontal curve radius (m)	55	90	130	190	250	340	420
maximum grade (%)							
rural	-	12	6-12	6-12	6-8	6-8	6-7
urban	8-12	8-12	6-12	6-12	6-8	-	-
minimum grade	0.5	0.5	0.5	0.5	0.5	0.5	0.5
vertical curve - minimum 'k'							
crest curve	4	8	15	25	35	50	70
sag curve	8	12	18	25	30	40	45
sag curve (illuminated road)	4	5	8	12	15	20	25
INTERSECTION DESIGN STANDARDS							
	Intersecting Roads						
Design Element	local - local	local - collector	collector - collector	collector - arterial	arterial - arterial		
angle of intersection (degrees)	70-110	70-110	70-110	80-100	80-100		
minimum curb radius (m)	5	7.5	10	15	18		
minimum corner rounding (m)	5	5	-	-	-		
minimum daylight triangle (m)	3 x 3	5 x 5	10 x 10	15 x 15	15 x 15		
minimum grade through intersection (%)							
major road	0.15	0.15	0.15	0.15	0.15		
minor road	0.5	0.5	0.5	0.5	0.5		
maximum grade through intersection (%)							
major road	3	3	3	3	3		
minor road	2	2	2	2	2		
minimum tangent on approach - from centre of intersection (m)							
major road	40	45	45	75	75		
minor road	40	40	45	45	75		
NOTES							
1. Horizontal curves not required for deflections less than 0 degrees 30 minutes							
2. Vertical curves not required for changes in alignment of 0.5% or less							
3. Increase curb radius to 18.0 metres in industrial areas or if high right turning truck volumes							

NO.	REVISION	APR'D	DATE
1	REVISED RURAL COLLECTOR ROAD WIDTH	EDH	APR 07

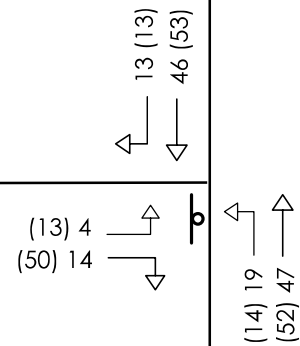
TOWN OF COLLINGWOOD		APR'D: EDH	DATE: JUN/03
		DRAWN:	SCALE: N/A
GEOMETRIC DESIGN STANDARDS FOR ROADS		STD. No.	100

Figures

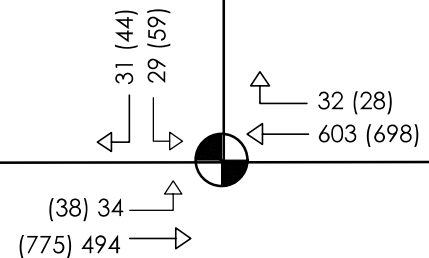
NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.



Side Launch Way



Huron Street



Legend	
	SIGNAL CONTROL
	STOP CONTROL
xx(yy)	A.M. (P.M.) PEAK HOUR TRAFFIC VOLUMES

HARBOUR HOUSE DEVELOPMENT
31 HURON STREET, TOWN OF COLLINGWOOD

EXISTING TRAFFIC VOLUMES

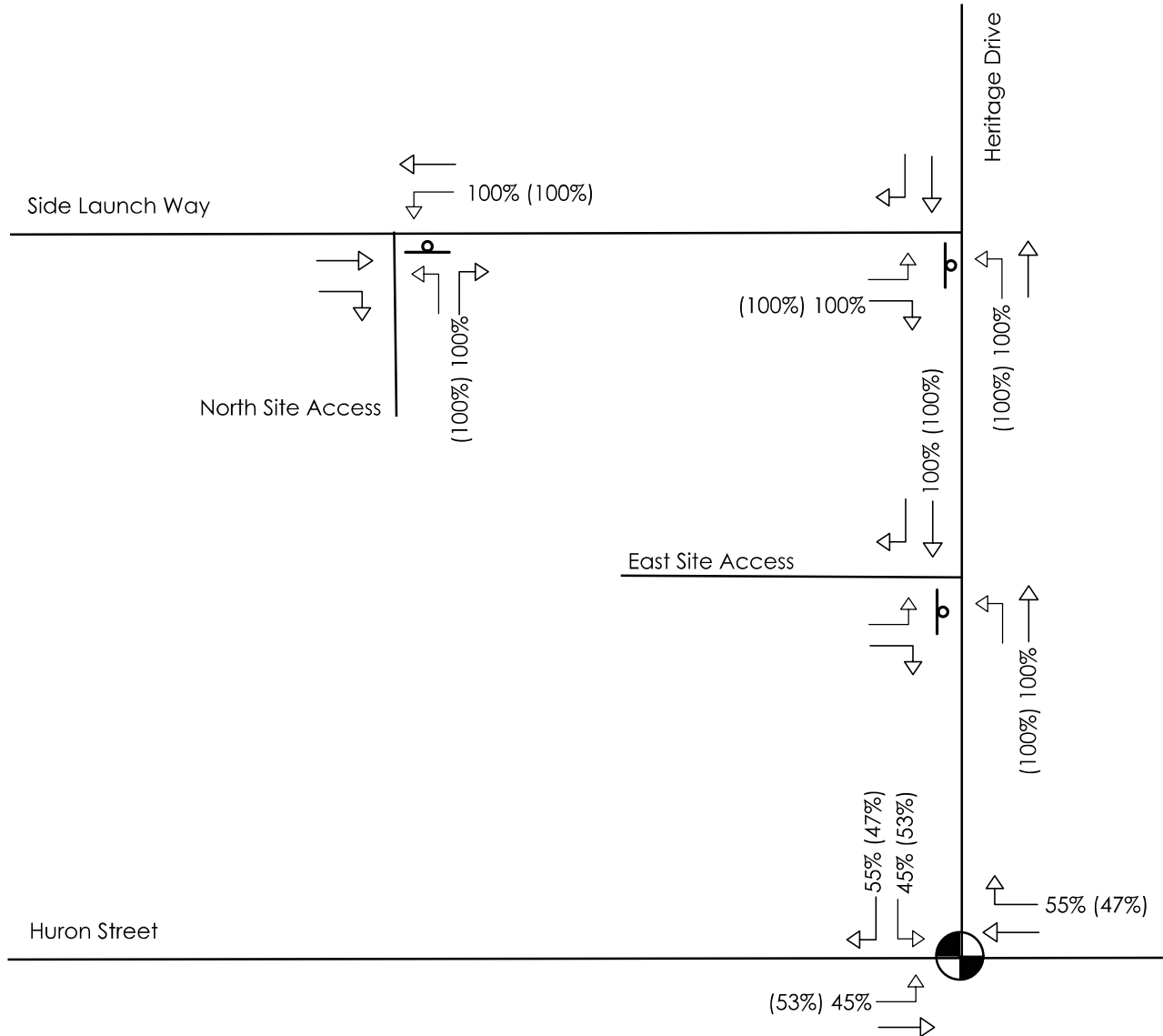
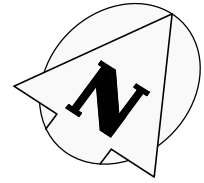


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INFO@CFCROZIER.CA

Drawn	KH	Design	KH	Project No.	1838-5493
Date	2021.08.12	Check	MF	Scale	N.T.S.
				Dwg.	FIG. 1

NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.



Legend	
	SIGNAL CONTROL
	STOP CONTROL
xx(yy)	A.M. (P.M.) PEAK HOUR TRAFFIC VOLUMES

HARBOUR HOUSE DEVELOPMENT
31 HURON STREET, TOWN OF COLLINGWOOD

RESIDENTIAL TRIP DISTRIBUTION

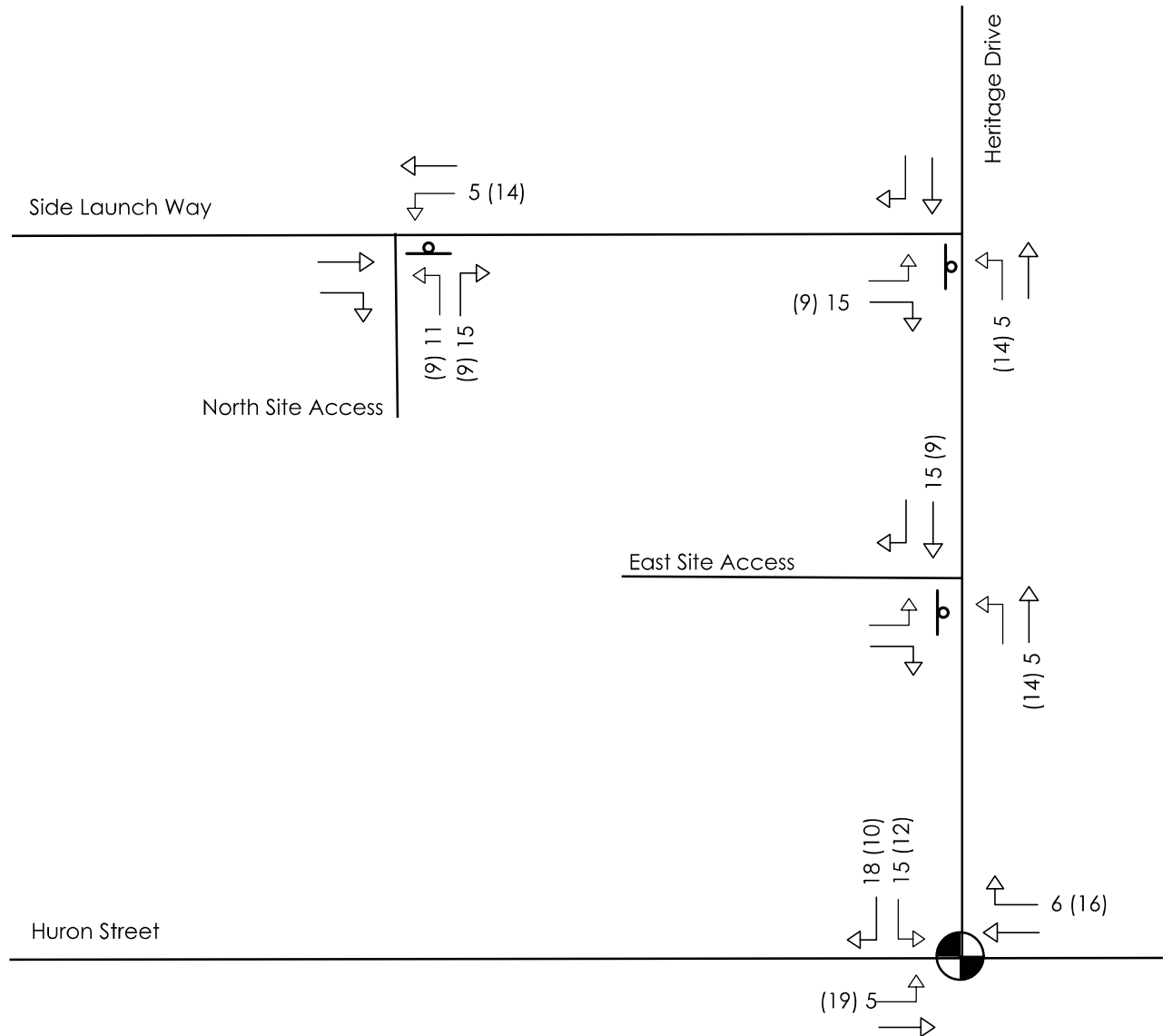
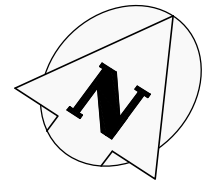


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ADMIRAL BUILDING
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705 446-3510 T
705 446-3520 F
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INFO@CFCROZIER.CA

Drawn	KH	Design	KH	Project No.	1838-5493
Date	2021.08.12	Check	MF	Scale	N.T.S.
				Dwg.	FIG. 2

NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.



Legend	
	SIGNAL CONTROL
	STOP CONTROL
xx(yy)	A.M. (P.M.) PEAK HOUR TRAFFIC VOLUMES

HARBOUR HOUSE DEVELOPMENT
31 HURON STREET, TOWN OF COLLINGWOOD

RESIDENTIAL TRIP ASSIGNMENT

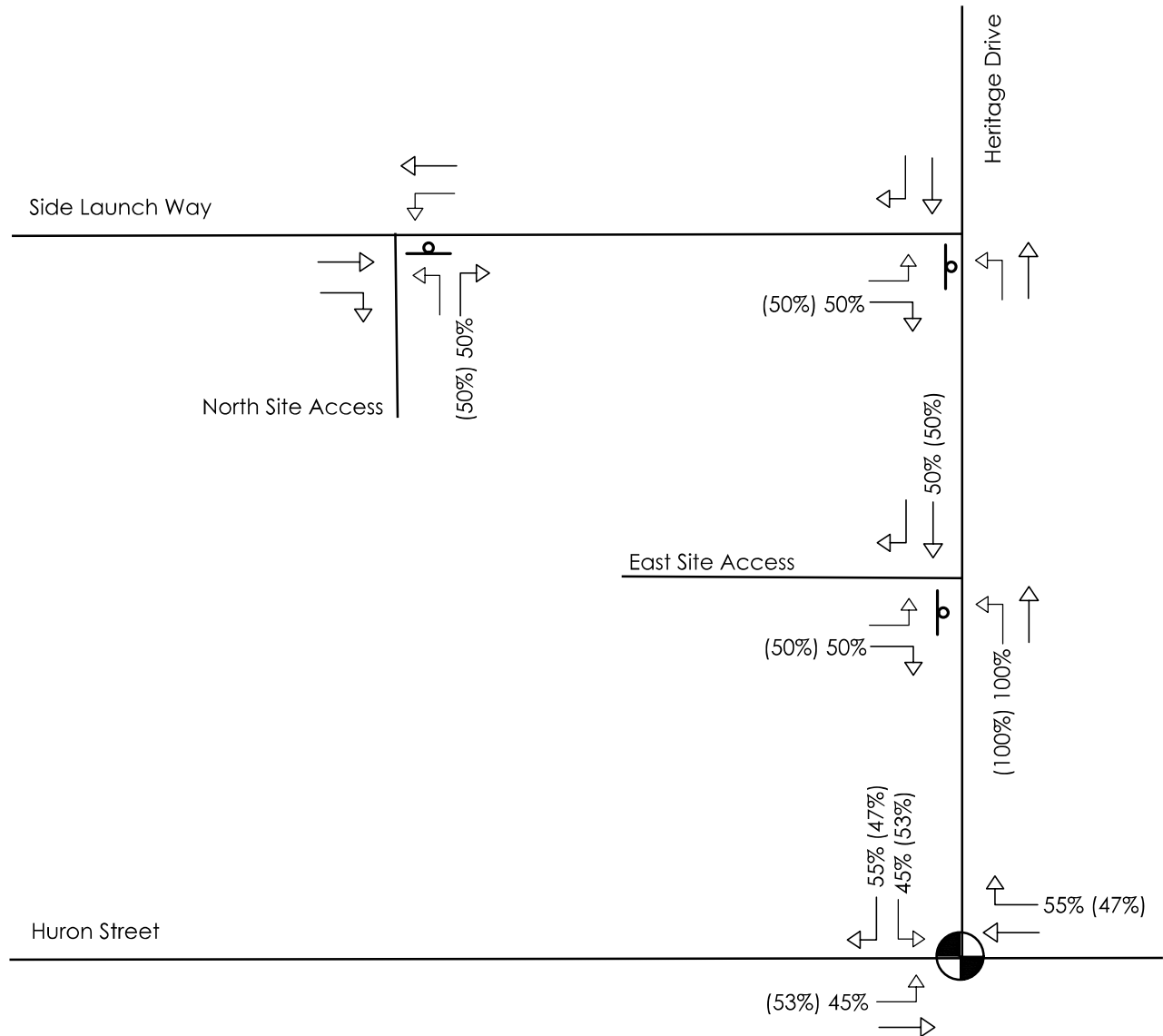
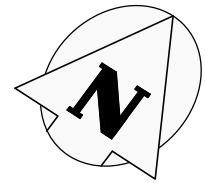


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COLLINGWOOD, ON L9Y 1A1
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705 446-3520 F
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Drawn	KH	Design	KH	Project No.	1838-5493
Date	2021.08.12	Check	MF	Scale	N.T.S.
				Dwg.	FIG. 3

NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.



Legend	
	SIGNAL CONTROL
	STOP CONTROL
xx(yy)	A.M. (P.M.) PEAK HOUR TRAFFIC VOLUMES

HARBOUR HOUSE DEVELOPMENT
31 HURON STREET, TOWN OF COLLINGWOOD

COMMERCIAL TRIP DISTRIBUTION

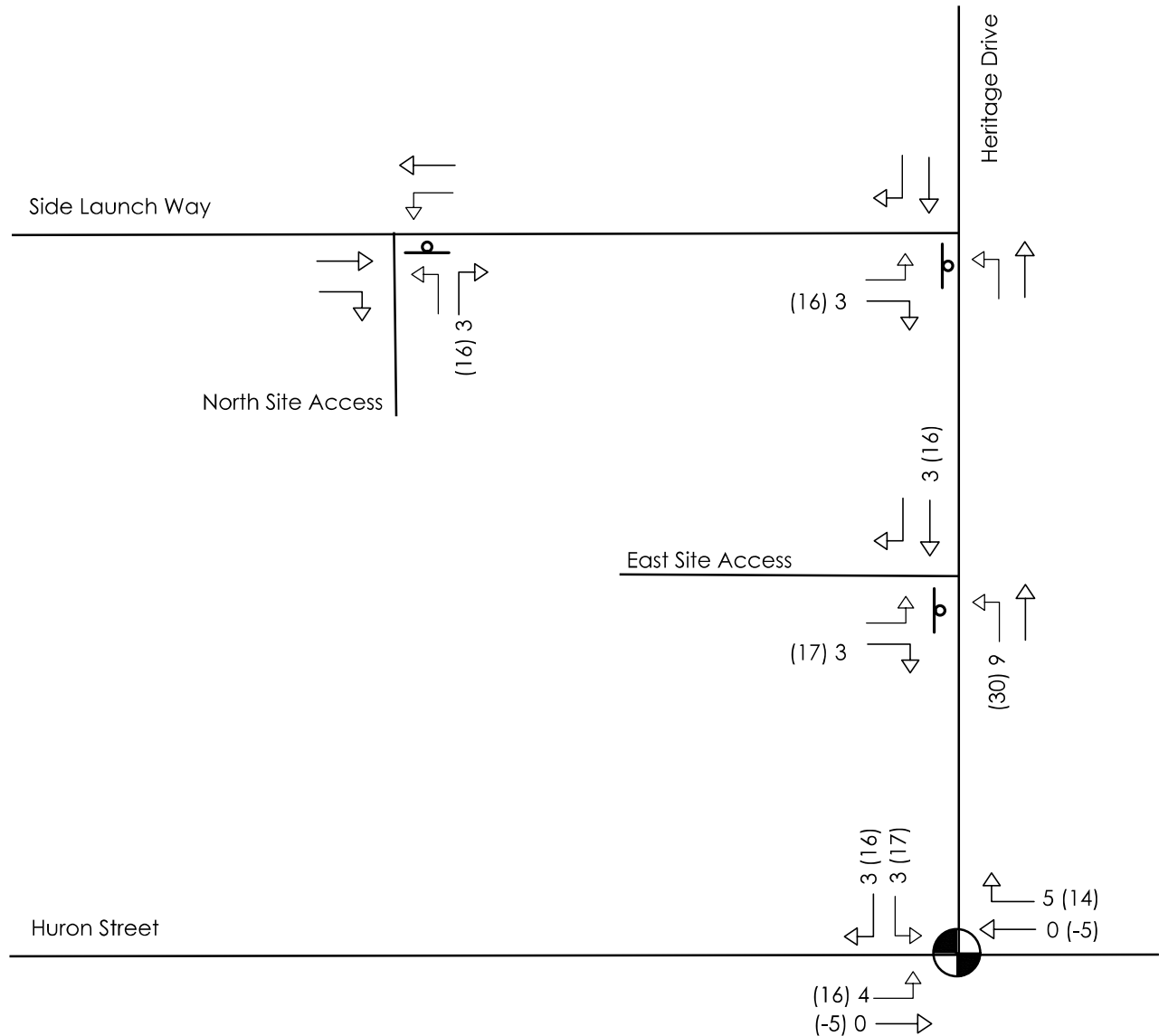
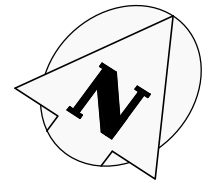


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Date	2021.08.12	Check	MF	Scale	N.T.S.
				Dwg.	FIG. 4

NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.



Legend	
	SIGNAL CONTROL
	STOP CONTROL
xx(yy)	A.M. (P.M.) PEAK HOUR TRAFFIC VOLUMES

HARBOUR HOUSE DEVELOPMENT
31 HURON STREET, TOWN OF COLLINGWOOD

COMMERCIAL TRIP ASSIGNMENT

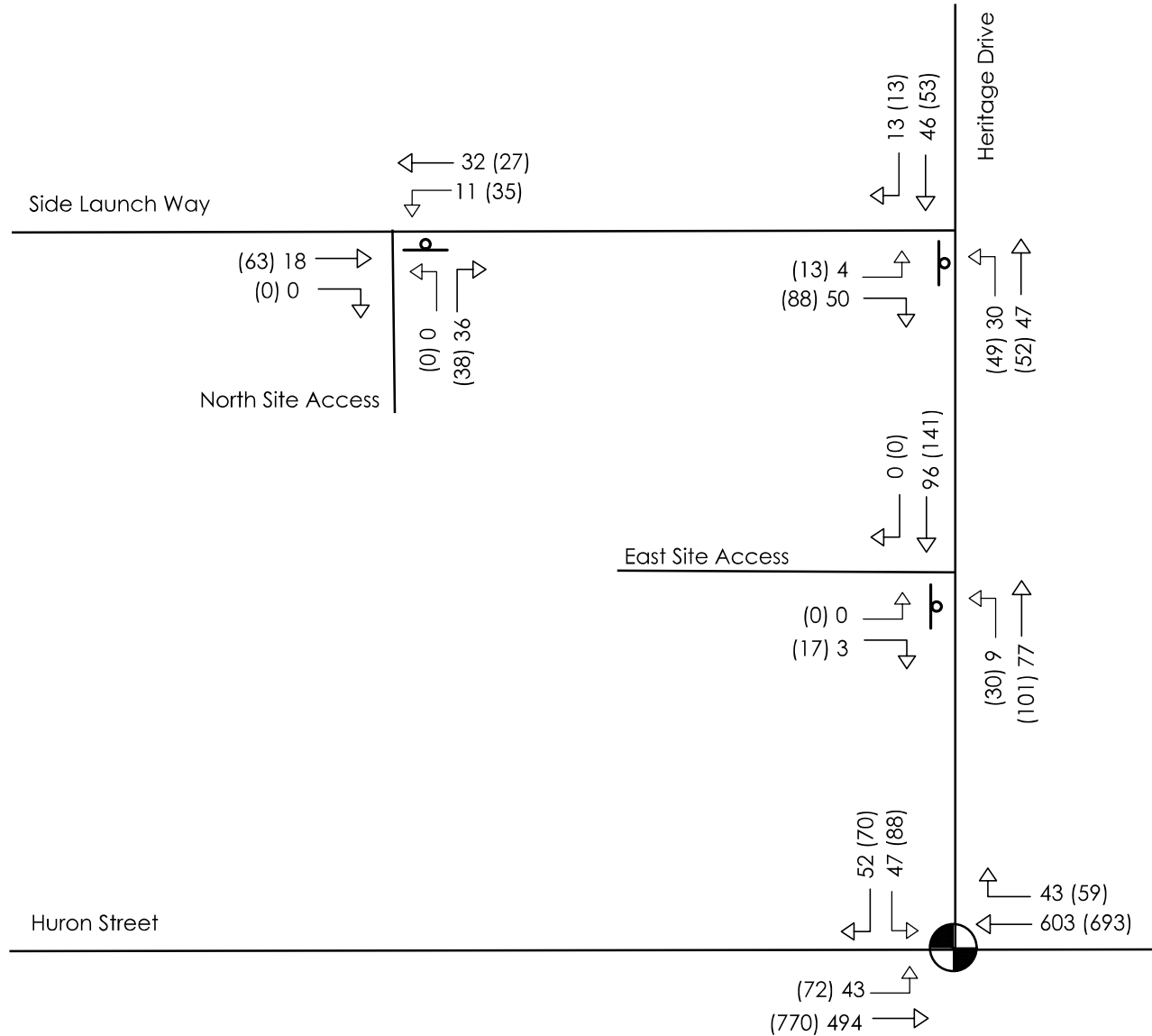
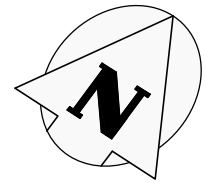


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Drawn	KH	Design	KH	Project No.	1838-5493
Date	2021.08.12	Check	MF	Scale	N.T.S.
				Dwg.	FIG. 5

NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.



Legend	
	SIGNAL CONTROL
	STOP CONTROL
xx(yy)	A.M. (P.M.) PEAK HOUR TRAFFIC VOLUMES

HARBOUR HOUSE DEVELOPMENT
31 HURON STREET, TOWN OF COLLINGWOOD

TOTAL TRAFFIC VOLUMES

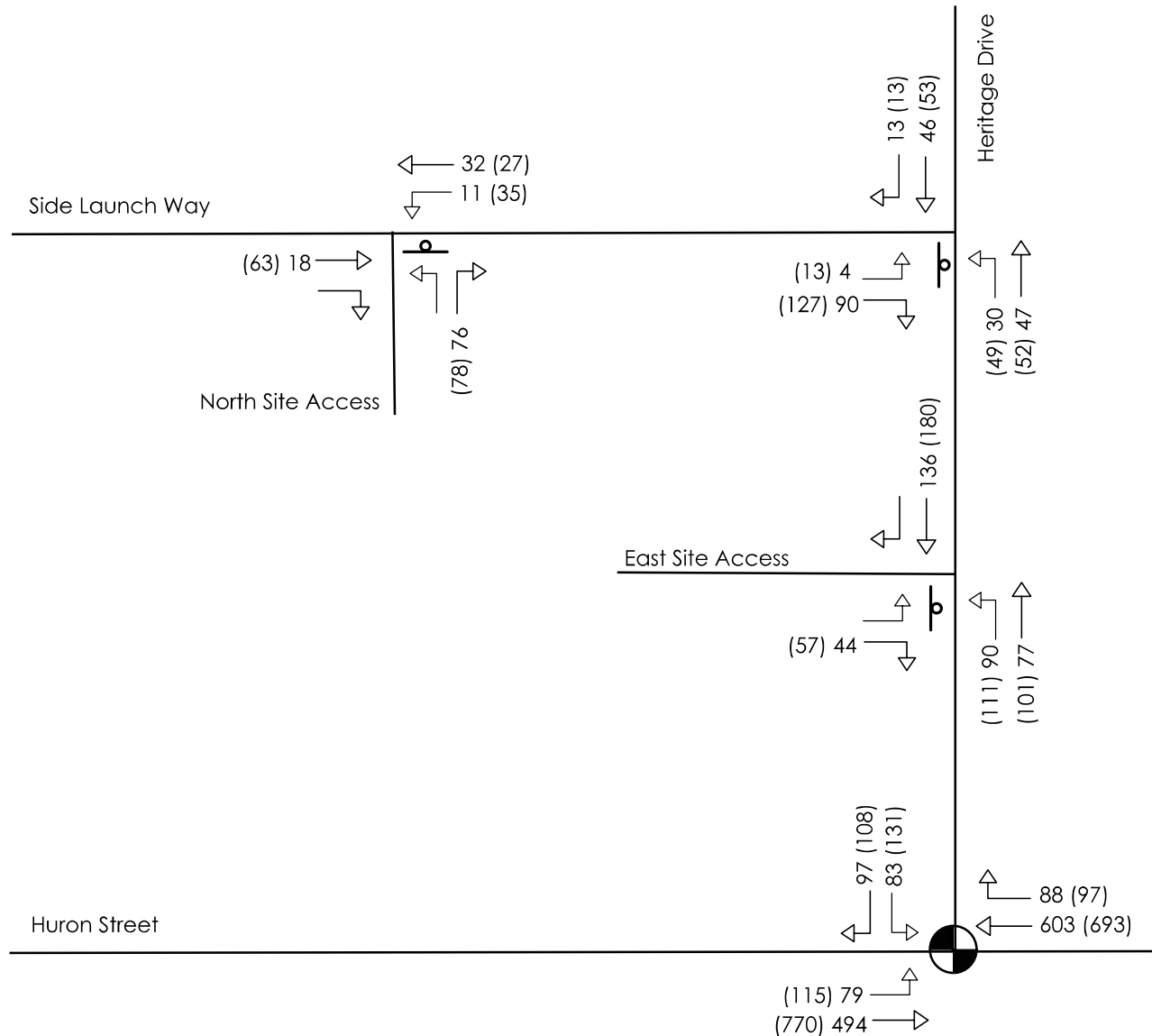
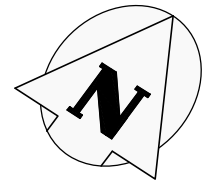


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Date	2021.08.12	Check	MF	Scale	N.T.S.
				Dwg.	FIG. 6

NOTE: THIS FIGURE IS FOR SCHEMATIC PURPOSES ONLY & IS NOT TO BE SCALED.



Legend	
	SIGNAL CONTROL
	STOP CONTROL
xx(yy)	A.M. (P.M.) PEAK HOUR TRAFFIC VOLUMES

HARBOUR HOUSE DEVELOPMENT
31 HURON STREET, TOWN OF COLLINGWOOD

SENSITIVITY ANALYSIS TOTAL TRAFFIC VOLUMES



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Date	2021.08.12	Check	MF	Scale	N.T.S.
				Dwg.	FIG. 7