TRAFFIC OPERATIONS ASSESSMENT

13290 NUNNVILLE ROAD

TOWN OF CALEDON

PREPARED FOR:
BOLTON SUMMIT DEVELOPMENTS INC.

PREPARED BY:
C.F. CROZIER & ASSOCIATES INC.
2800 HIGH POINT DRIVE, SUITE 100
MILTON, ON L9T 6P4

APRIL 2022

CFCA FILE NO. 0649-6278

CROZIER
CONSULTING ENGINEERS

Revision Number	Date	Comments
Rev.0	April 2022	Issued for Client Review
Rev.1	April 2022	Issued for Submission

1.0 Executive Summary

C.F. Crozier & Associates (Crozier) was retained by Bolton Summit Developments Inc. to prepare a Traffic Operations Assessment in support of concurrent Official Plan Amendment (OPA) and Zoning By-Law Amendment (ZBA) application for the property located at 13290 Nunnville Road in the Town of Caledon.

The Concept Plan proposes 15 townhouse dwelling units, a private road, and associated landscaped areas with site access to occur via the existing cul-de-sac at the end of Nunnville Road. The analysis undertaken herein was completed using the Concept Plan prepared by WSP, dated April 04, 2022. Any minor changes to the Concept Plan are not expected to materially affect the conclusions set out within this report.

Under 2022 existing conditions, the intersection of Albion-Vaughan Road at Nunnville Road operates at a Level of Service (LOS) "D" during the weekday A.M. peak period and "C" during the weekday P.M. peak period, with control delay of 31.5 and 22.6 seconds for the weekday A.M. and P.M. peak hours respectively. The highest volume to capacity ratio of 0.11 is observed at the eastbound leg during weekday A.M. peak hour.

Under 2027 future background conditions, the intersection of Albion-Vaughan Road at Nunnville Road operates at a Level of Service "D" and "C" during the weekday A.M. and P.M. peak period, respectively. The future background conditions are expected to be similar with the existing conditions. The intersection of 13247 & 13233 Nunnville Road at Nunnville road is expected to operate with a level of service "A" with no overcapacity movements.

The proposed development is expected to generate 7 two-way (2 inbound and 5 outbound) trips during the weekday A.M. peak hour and 9 two-way (5 inbound and 4 outbound) trips during the weekday P.M. peak hour. The proposed development is expected to have a negligible impact on the surrounding road network.

Based on AutoTURN analysis, trucks can maneuver through the site without encroaching on any obstacles or curbs.

The sight lines are sufficient at the site access entrance to the cul-de-sac for circulating and entering traffic as per the Transportation Association of Canada Geometric Design Guide for Canadian Roads (TAC GDGCR).

The Zoning By-Law Amendment (ZBA) and Official Plan Amendment (OPA) can be supported from a traffic operations perspective as the boundary road system can accommodate the increase in traffic volumes attribute to the proposed development.

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2.0 Introduction

C.F. Crozier & Associates (Crozier) was retained by Bolton Summit Developments Inc. to prepare a Traffic Operations Assessment (TOA) in support of concurrent Official Plan Amendment (OPA) and Zoning By-Law Amendment (ZBA) applications for the property located at 13290 Nunnville Road in the Town of Caledon.

The purpose of the Traffic Operation Assessment is to evaluate the impacts of the proposed development on the surrounding road network and recommend transportation-related mitigation measures, if required.

The following intersections were reviewed in the scope of this study:

- Nunnville Road at Albion Vaughan Road
- 13247 and 13233 Nunnville Road Access at Nunnville Road (proposed access for nearby background development)

The following horizon years were analyzed as part of this study during the AM and PM peak hours:

- Existing conditions (2022)
- Five-year horizon (2027) future conditions

The study has been completed in accordance with the Terms of Reference and scope of work approved by Town of Caledon Staff. A scope of work was sent to Town of Caledon Staff on January 21, 2022, and comments were received on February 03, 2022. (Provided **in Appendix A).**

3.0 Existing Conditions

3.1 Development Lands

The proposed development covers an area approximately 0.86 ha. The latest Concept Plan prepared by WSP, proposes to include 15 townhouse dwelling units, a private road, associated landscaped areas with a total number of 34 parking spaces. The site access is proposed via the existing cul-de-sac located at the end of Nunnville Road.

The latest Concept Plan is included in **Figure 1** dated April 04, 2022.

13290 Nunnville Road
Bolton (Caledon)

Concept

15 Townhouse Units
28.0m+ x 6.1m Lots

Lot Area = 0.86ha (8,553m²)
Lot Area per unit = 94.2m²
Lot Frontage = 82.5m
Min. Unit Width = 6.1m
Building Area = 1,431m² (16.8%)
Min. Backyard Amenity Space = 30.5m²
Min. Front Yard (to garage) = 6.0m
Min. Front Yard (to main wall) = 4.5m
Min.Rear Yard = 7.5m
Min. Interior Side Yard = 1.71m
Min. Exterior Side Yard = 0.75m
Max. Height = 12.0m
Landscaped Area = 1,302m² (15.2%)
(includes Amenity Area, Sidewalks and Front Yards)
Natural Area = 4,753m² (55.6%)
(includes Buffer and Woodlot)
Hard Paved Area = 1,035m² (12.1%)
(includes Roads and Driveways)

Note: the Development Limit is based on Dripline and Long-term Stable Top-of-Slope (LTSTOS) lines. The Buffer Line is based on 5.0m to the Dripline or 6.0m to the LTSTOS lines.

Prepared by:

wsp

Checked	Drawn
Date: April 4, 2022	Proj. No.: 211-09988-01
Scale: 1 : 500 (11x17)	Aerial Image

Apr 04, 2022 – 8:25pm
C:\Users\WBeckett\Documents\Jobs\Nunnville\13290Nunnville-DP--220404\13290Nunnville--DP--220404.dwg – Iobc:Concept1

3.2 Boundary Road Network

Albion-Vaughan Road is a north-south roadway with a two-lane cross-section. Albion-Vaughan Road is under the jurisdiction of the Town of Caledon and is defined as a medium capacity arterial. The roadway does not have sidewalks on either side. Curbs and gutters are available on west side of the roadway, while unpaved shoulders are present on the east side. The roadway has a posted speed limit of 60 km/h throughout the study area.

Nunnville Road is generally a north-south roadway with a two-lane cross-section, although it intersects with Albion-Vaughan Road in an east-west direction. The roadway has sidewalk on the west side and has a posted speed limit of 40km/h throughout the study area. Streetlighting is present along the entire roadway.

3.3 Study Intersections

The intersection of **Albion-Vaughan Road at Nunnville Road** is a three-legged stop-controlled intersection, with stop-control on the minor approach (Nunnville Road). The northbound approach on Albion-Vaughan Road consists of a single through lane and a single left-turn lane. The southbound approach on Albion-Vaughan Road consists of a single through lane and a single shared through/right-turn lane. The eastbound approach along Nunnville Road consists of a single shared left/right-turn lane. Streetlighting is present at the intersection.

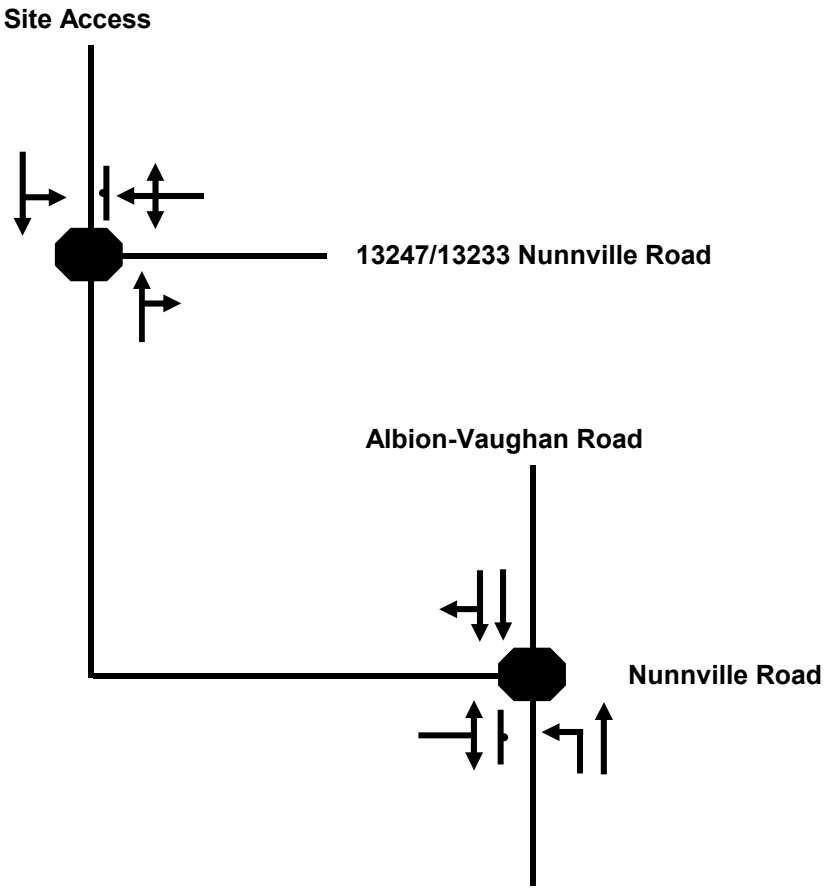
Figure 2 illustrates the study roadways and existing lane configurations.

3.4 Traffic Data

Turning movement counts at the intersections of Albion-Vaughan Road were collected from the traffic counts conducted by Spectrum Traffic Data Inc. on Thursday, June 13, 2019, between weekday A.M. and P.M. peak hours of 7:00 A.M. and 9:00 A.M. and during the weekday P.M. peak hours of 4:00 P.M. and 6:00 P.M. Traffic data contained in **Appendix B** provides a summary of the turning movement counts.

3.5 Traffic Modelling

The evaluation of intersections within this report is conducted based on the methodology outlined in the Highway Capacity Manual (2000), using Synchro 11 modelling software. Intersections are assessed using a Level of Service (LOS) metric, with ranges of intersection delays assigned a letter from “A” to “F”. For stop-controlled intersections, a Level of Service “A” or “B” would typically be measured during off-peak hours when lesser traffic volumes are on the roadways. Levels of Service “C” through “F” would typically be observed during commuter peak hours when significant vehicle volumes would cause lengthy travel times. The Level of Service definitions for signalized and stop-controlled intersections are included in **Appendix C**.



Legend	13290 Nunnville Road	CROZIER CONSULTING ENGINEERS	Figure 2
xx A.M. Peak Hour Traffic Volumes (xx) P.M. Peak Hour Traffic Volumes {xx} Weekend Peak Hour Traffic Volumes	Study Roadways		Project No. 0649-6278 Date. 2022. 1. 21 Analyst. Aarzoo D

3.6 Intersection Operations

Existing traffic operations at the Albion-Vaughan Road at Nunnville Road were analyzed based in observed traffic volumes during the weekday A.M. and P.M. peak hours, as illustrated in **Figure 3.** Detailed capacity analyses are included in **Appendix D**. **Table 1** summarizes the existing traffic operations within the study area.

Table 1: 2022 Existing Levels of Service

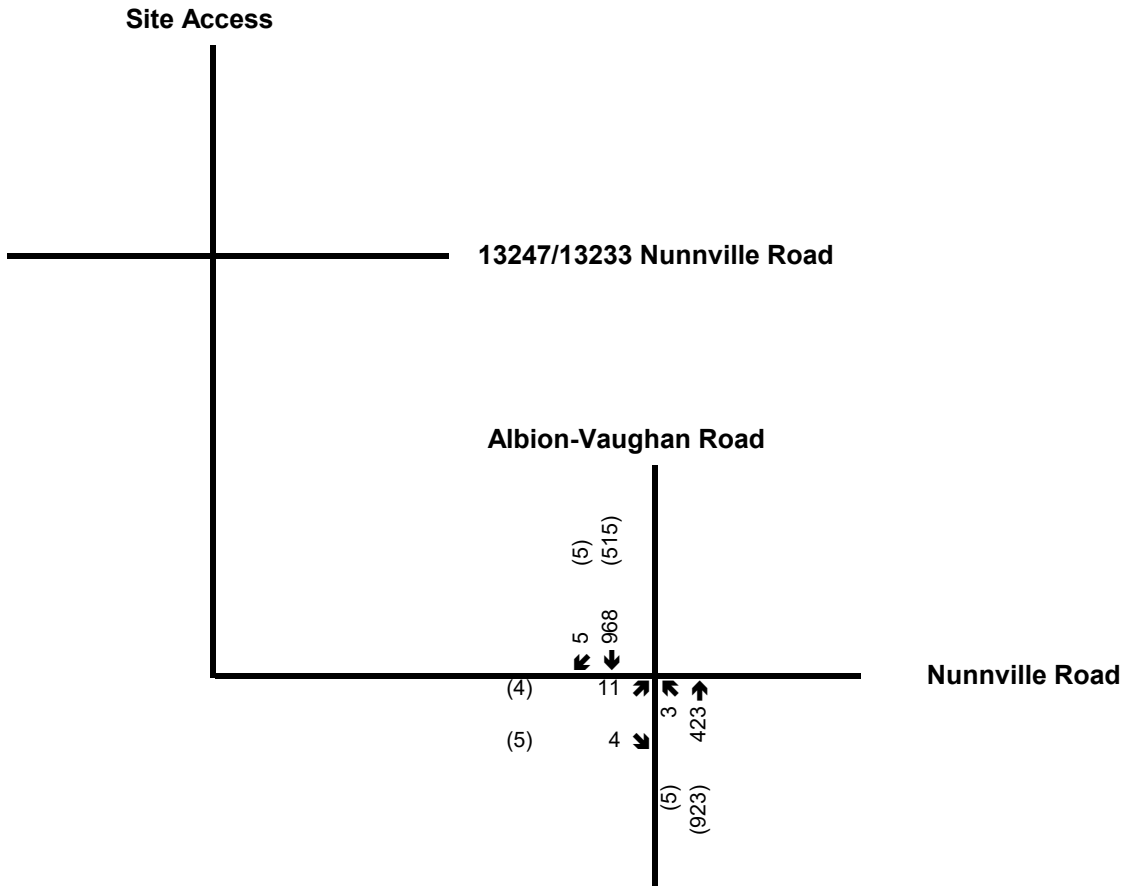
Intersection	Control	Peak Hour	Level of Service	Control Delay	Maximum V/C Ratio > 0.85 [2] (Approach)	95th Percentile Queue Length > Storage Length
Albion-Vaughan Road at Nunnville Road	Stop Controlled	Weekday A.M.	D	31.5	0.11 (EB)	None
		Weekday P.M.	C	22.6	0.04 (EB)	None

Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU). The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach (HCM 2000).

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection. In addition, all v/c ratios greater than 0.85 are outlined and highlighted.

As indicated in **Table 1**, the intersection of Albion-Vaughan Road at Nunnville Road operates with a Level of Service "D" during the weekday A.M. peak hour, and a Level of Service "C" during the weekday P.M. peak period. A maximum volume-to-capacity ratio of 0.11 was observed for the eastbound movement during the weekday A.M. peak hours.

Operational analyses of existing traffic volumes indicate that reserve capacity is available for future traffic volume growth on the boundary network.



Legend	13290 Nunnville Road	CROZIER CONSULTING ENGINEERS	Figure 3
xx A.M. Peak Hour Traffic Volumes (xx) P.M. Peak Hour Traffic Volumes {xx} Weekend Peak Hour Traffic Volumes	2022 Existing Traffic Volumes		Project No. 0649-6278 Date. 2022. 1. 21 Analyst. Aarzoo D

4.0 Future Background Conditions

4.1 Study Horizons

Following consultation with Town of Caledon Staff and per the Town's Transportation Impact Guidelines, a horizon year corresponding to five years from the study was considered for the analysis. Therefore, a study horizon year of 2027 was selected to assess full operation of the development on the boundary road network.

4.2 Traffic Growth Rates and Background Development

Per consultation with the Town of Caledon Staff, the traffic growth rate has been applied considering the midblock volumes at Albion-Vaughan Road provided by the staff. Observing the reduction in traffic volume compared to past years, a growth rate of 0.5% has been assumed along Albion-Vaughan Road for through traffic only.

The following background development was identified within the study area:

- 13247 & 13233 Nunnville Rd (prepared by Crozier in January 2020)

Crozier conducted a Transportation Impact Study for the development located at 13247 & 13233 Nunnville Rd, which was most recently submitted in January 2020 and included 29 single detached dwellings. The site generated trips from this development are included in the background traffic and analyzed as part of this study.

Figure 4 illustrates the background development volumes.

4.3 Intersection Operations

Traffic operations at the study intersections were analyzed using Synchro 11.0 software. Results from the intersection capacity analysis based on the existing road network configuration and 2027 future background traffic volumes, are summarized in **Table 2**. Detailed capacity analyses are included in **Appendix D**.

Table 2: 2027 Future Background Operations

Intersection	Control	Peak Hour	Level of Service [1]	Control Delay	Maximum V/C Ratio > 0.85 [2] (Approach)	95th Percentile Queue Length > Storage Length
Albion-Vaughan Road at Nunnville Road	Stop Controlled	Weekday A.M.	D	31.5	0.23 (EB)	None
		Weekday P.M.	C	23	0.11 (EB)	None
13247 & 13233 Nunnville Rd at Nunnville Road	Stop Controlled	Weekday A.M.	A	8.7	0.02 (WB)	None
		Weekday P.M.	A	8.7	0.02 (WB)	None

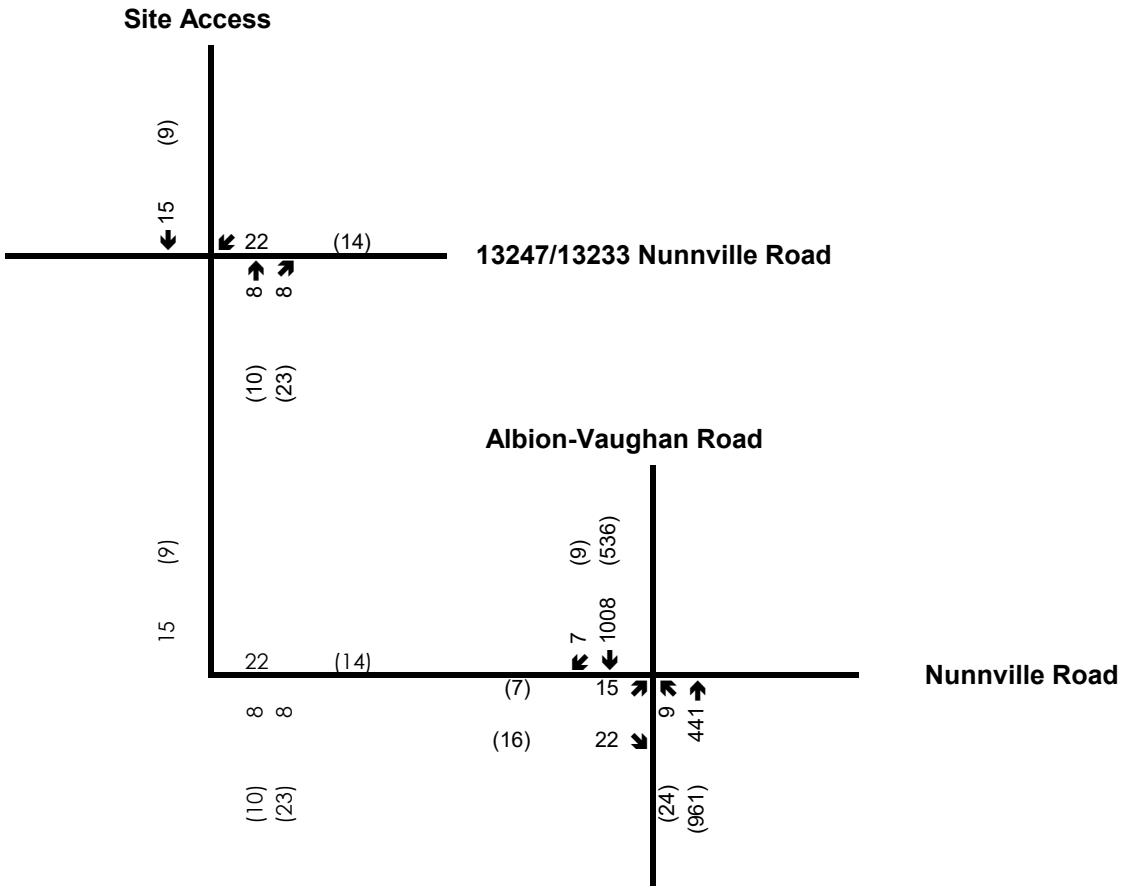
Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU). The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach (HCM 2000).

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection. In addition, all v/c ratios greater than 0.85 are outlined and highlighted.

As indicated in **Table 2**, the intersection of Albion-Vaughan Road at Nunnville Road is expected to operate with a Level of Service "D" & "C" during the weekday A.M. and P.M. peak hour. A maximum volume-to-capacity ratio of 0.23 is observed for the eastbound movement during the weekday A.M. peak hour.

The intersection of 13247 & 13233 Nunnville Road at Nunnville Road is expected to operate with a Level of Service "A" during the weekday A.M. and P.M. peak hour with a control delay of 8.7 seconds.

No geometric improvements are recommended under the future background conditions.



Legend	13290 Nunnville Road	CROZIER CONSULTING ENGINEERS	Figure 4
xx A.M. Peak Hour Traffic Volumes (xx) P.M. Peak Hour Traffic Volumes {xx} Weekend Peak Hour Traffic Volumes	2027 Future Background Traffic Volumes		Project No. 0649-6278 Date. 2022. 1. 21 Analyst. Aarzoo D

5.0 Development Proposal

The subject property is part of an established residential area in Bolton. The property covers 13290 Nunnville Road lot. The proposed development covers an area approximately 0.86 ha with a developable area of 0.38 ha (0.94 ac). The latest Site Plan prepared by WSP, proposes 15 townhouse dwelling units, a private road, and associated landscaped areas.

The subject property is bounded by a TRCA Regulated Area to the north and west, Nunnville Road to the east and an existing residential property to the south.

6.0 Site Generated Traffic

The proposed development will result in additional vehicles on the boundary road network that previously did not exist. The proposed development will also result in additional turning movements on the boundary road intersections.

6.1 ITE Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation Manual 11th Edition was used to forecast the number of trips generated by the proposed residential development. The development proposes 15 townhouse dwelling units which corresponds to (ITE) Land Use Code Category (LUC) 215 "Single Family Attached Housing". No adjustments for pass-by trips or internal trips were made. The site generated trips from the proposed development are tabulated in **Table 3**.

Relevant excerpts from the ITE Trip Generation Manual 11th Edition are included in **Appendix E.**

Table 3 summarizes the number of trips forecasted to be generated by the proposed development.

Table 3: ITE Trip Generation

Land Use	Units/ GFA	Peak Period	Equation Used	In	Out	Two-Way
Townhouse Dwelling Units (LUC 215)	15	A.M.	T = 0.52 (X) - 5.70	2	5	7
		P.M.	T = 0.60 (X) - 3.93	5	4	9
New Trips		**Weekday A.M.**		**2**	**5**	**7**
		Weekday P.M.		**5**	**4**	**9**

The subject site is expected to generate 7 two-way (2 inbound and 5 outbound) trips during the weekday A.M. peak hour, and 9 two-way (5 inbound and 4 outbound) trips during the weekday P.M. peak hour.

6.2 Trip Distribution and Assignment

The trip distribution for the proposed development is based on traffic patterns extracted from 2016 Transportation Tomorrow Survey (TTS). The trip distribution calculations based on the TTS data are summarized in **Table 4**. Detailed calculations are provided in **Appendix F**. The primary trip assignment is illustrated in **Figure 5**.

Table 4: Site Distribution

Direction	A.M. Peak Hour		P.M. Peak Hour	
	In	Out	In	Out
North	44%	28%	25%	40%
South	56%	72%	75%	60%

7.0 Future Total Traffic Conditions

7.1 Intersection Operations

The traffic operations at the intersection Albion-Vaughan Road at Nunnville Road were assessed using Synchro 11.0 software. Results from the intersection capacity analysis, based on the existing road network configuration and 2027 future total traffic volumes, are summarized in **Table 5.**

The total traffic volumes are illustrated in **Figure 5**.

It outlines the 2027 future total traffic Levels of Service. Detailed capacity analysis worksheets are included in **Appendix D.**

Table 5: 2027 Future Total Operations

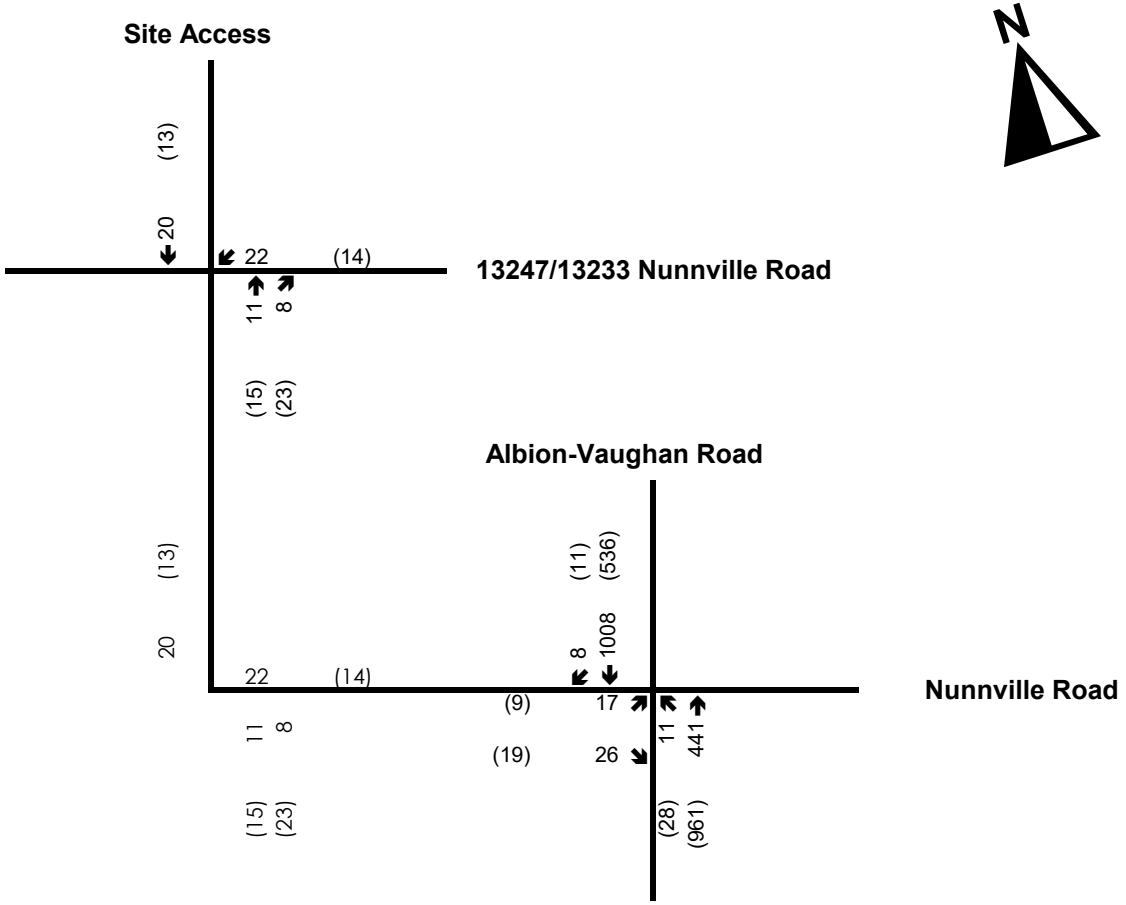
Intersection	Control	Peak Hour	Level of Service [1]	Control Delay	Maximum V/C Ratio > 0.85 [2] (Approach)	95th Percentile Queue Length > Storage Length
Albion-Vaughan Road at Nunnville Road	Stop Controlled	A.M.	D	32.7	0.26 (EB)	None
		P.M.	C	23.8	0.14 (EB)	None
13247 & 13233 Nunnville Rd at Nunnville Road	Stop Controlled (Minor)	A.M.	A	8.8	0.02 (WB)	None
		P.M.	A	8.8	0.02 (WB)	None

Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU). The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach (HCM 2000).

Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection. In addition, all v/c ratios greater than 0.85 are outlined and highlighted.

As indicated in **Table 5**, the intersection of Albion-Vaughan Road at Nunnville Road is projected to operate at a Level of Service "D" during the weekday A.M. peak hour, and a Level of Service "C" during the weekday P.M. peak period and possess similar Level of Service with existing conditions. A maximum volume-to-capacity ratio of 0.26 was observed for the eastbound movement on minor leg during the weekday A.M peak hours. An increase in control delay of 1.2 seconds is observed on the major leg during weekday A.M. and P.M. peak hours with respect to the existing intersection operation.

The unsignalized intersection of Nunnville Road at background site access is anticipated to operate with level of service "A" during weekday A.M. and P.M. peak periods, with a minimum delay of 8.8 seconds during both peak periods. No individual movements are expected to operate with a volume to capacity ratio above 0.85.



Legend	13290 Nunnville Road	CROZIER CONSULTING ENGINEERS	Figure 5
xx A.M. Peak Hour Traffic Volumes (xx) P.M. Peak Hour Traffic Volumes {xx} Weekend Peak Hour Traffic Volumes	2027 Future Total Traffic Volumes		Project No. 0649-6278 Date. 2022. 1. 21 Analyst. Aarzoo D

8.0 Site Access Review

8.1 Sight Distance

The available sightlines at the proposed site access were measured and compared to the standards set out in the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR), June 2017.

Intersection sight distance is calculated using Equation 9.9.1 from the GDGCR as outlined below:

$$ISD = 0.278 * V\ major * tg$$

Where:
ISD = Intersection Sight Distance
V major = design speed of roadway (km/h)
tg = assumed time gap for vehicles to turn from stop onto roadway (s)

The circulating stream distance is calculated with the assumed design speed of 25 kmph at cul-de-sac. The entering stream distance is calculated with the assumed design speed of 50 kmph at Nunnville Road. **Figure 6** shows the sight distance analysis for the proposed site access.

Per the results, the proposed site access off cul-de-sac would meet sight distance requirements and provide sufficient visibility to drivers on the road.

8.2 Dimensional Review

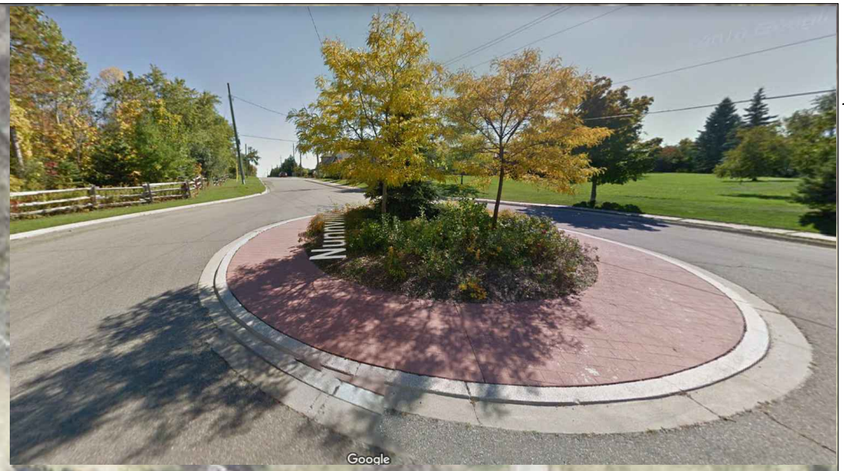
The width and curb radii were reviewed per the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR).

Per Table 8.9.1 of the TAC GDGCR, the typical width of a two-way residential driveway ranges from 2.0 - 7.3 metres and the curb radii ranges from 3.0 - 4.5 metres.

Per section 8.4.9 of the TAC GDGCR, curb radii should be designed to accommodate the design vehicles that are required based on current and anticipated turning movements. The site will be accessed by side loading garbage truck which has a turning radii path of 13.0 metres. Therefore, the site access should be constructed with a minimum curb radii of 13.0 metres. The curbs adjacent to the visitor parking spaces should be constructed such that the road turns are oriented at right angles.

Per the By-Law 2015-058 SCHEDULE “K”, the designated parking space shall be 6.0 metres in length and 3.4 metres in width with an accessible aisle of 1.5 metres on both sides.

Figure 7 shows the required dimensions.



N

LEGEND

- CIRCULATING DISTANCE
- ENTERING DISTANCE
- PASSENGER CAR

Sight Distance Calculation

Feature	Site Access off Nunnville Road cul-de-sac
Assumed Design Speed at cul-de-sac	25 km/h
Assumed Design Speed at Nunnville road	50 km/h
Base Time Gap [1]	6.5s (right-turn)
Grade of Roadway	Less than 3%
Horizontal Alignment of Roadway	Straight
Circulating Stream Distance	45 m
Entering Stream Distance	90.35 m

Note 1: Time gap for right-turning vehicles entering into a cul-de-sac is assumed from Table 9.9.5 in the TAC-GDGCR.

Note 2: Sight Distance values for circulating and entering distance are calculated from equation 9.9.1 in the GDGCR.

Note 3: The circulating stream distance and entering stream distance are understood from NCHRP Report 672 (Exhibit 6-58).

No.	ISSUE	DATE: MMM/DD/YYYY
0	ISSUED FOR REVIEW	04/04/2022

PRELIMINARY
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13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

SIGHT DISTANCE ANALYSIS

CROZIER
CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON. L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project	
A.D.	A.D.		0649-6278
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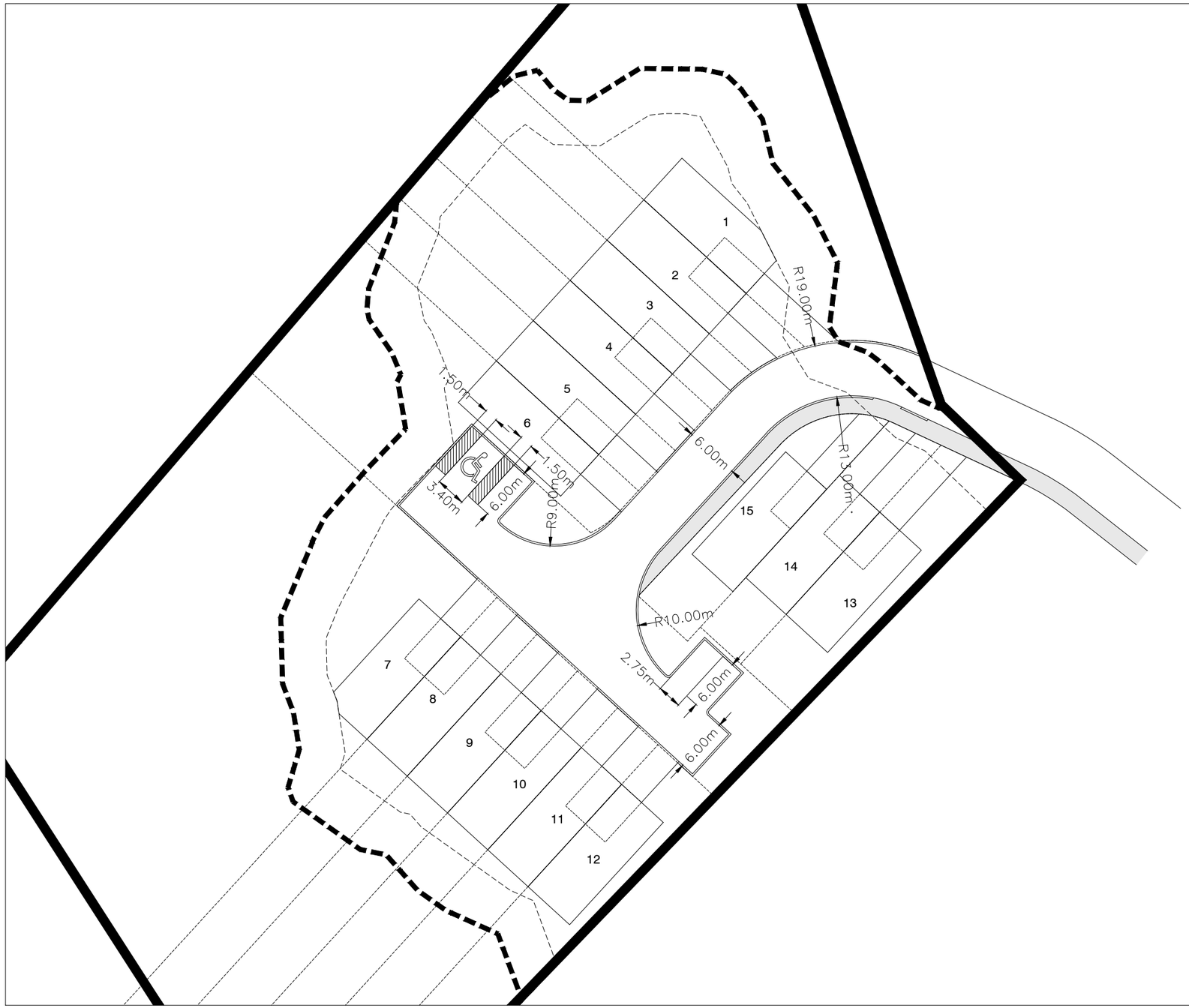
B.B.	B.B.	N.T.S.	FIG 06



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5 0m 5 10 15 20
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0	ISSUED FOR REVIEW	04/04/2022

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Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

DIMENSIONAL REVIEW

CROZIER
CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON. L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project	
A.D.	A.D.		0649-6278
Check By	Check By	Scale	Drawing
B.B.	B.B.	1:250	FIG 07

9.0 Maneuvering Assessment

A maneuvering assessment was conducted to ensure the proposed site design provides adequate space for the design vehicles expected at the site. The maneuvers of these design vehicles are elaborated upon in the following section.

9.1 Waste Vehicles

A maneuvering assessment was conducted for a Region of Peel side-loading vehicle as shown in **Figure 8** for the inbound and outbound maneuver.

The waste vehicle can enter the site via Nunnville Road and maneuver through the internal roadway keeping of minimum of a 13.0 m centerline radius. The outbound maneuver can reverse out using the hammerhead, and then proceed outbound in a forward direction. The vehicle can then circulate the site and exit without any conflicts.

9.2 Emergency Vehicles

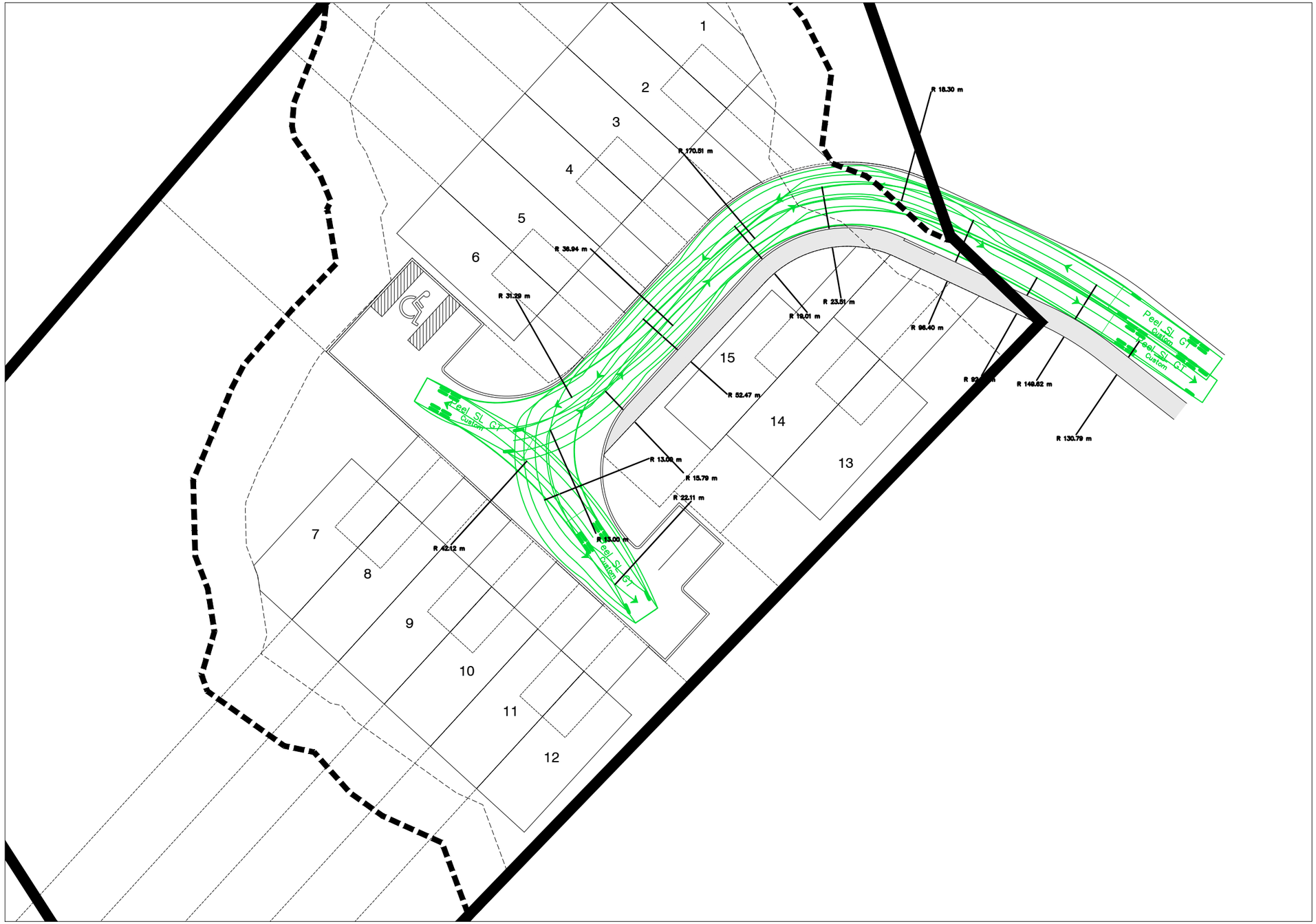
A maneuvering assessment was undertaken to verify the maneuvering of a pumper fire truck measuring 12.19 m in and out of the proposed site. As shown in **Figure 9**, the vehicle can enter and exit the site with no issues. The vehicle must briefly reverse using the hammerhead to exit the site similar to the waste vehicle.

9.3 Passenger Vehicles

A maneuvering assessment was conducted using a Passenger TAC (P-TAC) vehicle as shown in **Figure 9**, which demonstrates that passenger vehicles can enter and exit the property via driveway simultaneously without encroaching on each other's respective paths.

Critical parking spots were analyzed as shown in **Figures 10** and **11.** The vehicle must reverse out of the visitor parking deliberately with respect to the curb and the adjacent parking space. The vehicle can maneuver critical parking spots within a three-point turning movement.

Based on the assessments above, the development can be supported from a maneuverability perspective.



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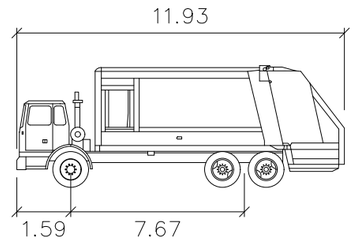
VECHICLE PROFILE



Peel SL GT

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 44.4

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5. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

No.	ISSUE	DATE: MMM/DD/YYYY
0	ISSUED FOR REVIEW	04/04/2022

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

SITE CIRCULATION DIAGRAM
GARBAGE TRUCK

5 0m 5 10 15
SCALE: 1:200

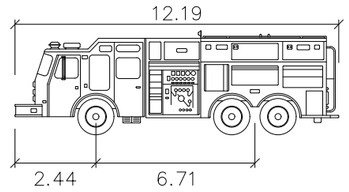
CROZIER
CONSULTING ENGINEERS
2800 High Point Drive
Suite 100
Milton, ON, L9T 6P4
905-875-0026 T
905-875-4915 F
www.cfcrozier.ca
info@cfcrozier.ca

Drawn By	Design By	Project	
A.D.	A.D.		0649-6278
Check By	Check By	Scale	Drawing
B.B.	B.B.	1:200	FIG 08

SCALE: 1:200

N

VECHICLE PROFILE



Pumper Fire Truck

	meters
Width	: 2.49
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 45.0

No.	ISSUE	DATE: MMM/DD/YYYY
0	ISSUED FOR REVIEW	04/04/2022

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

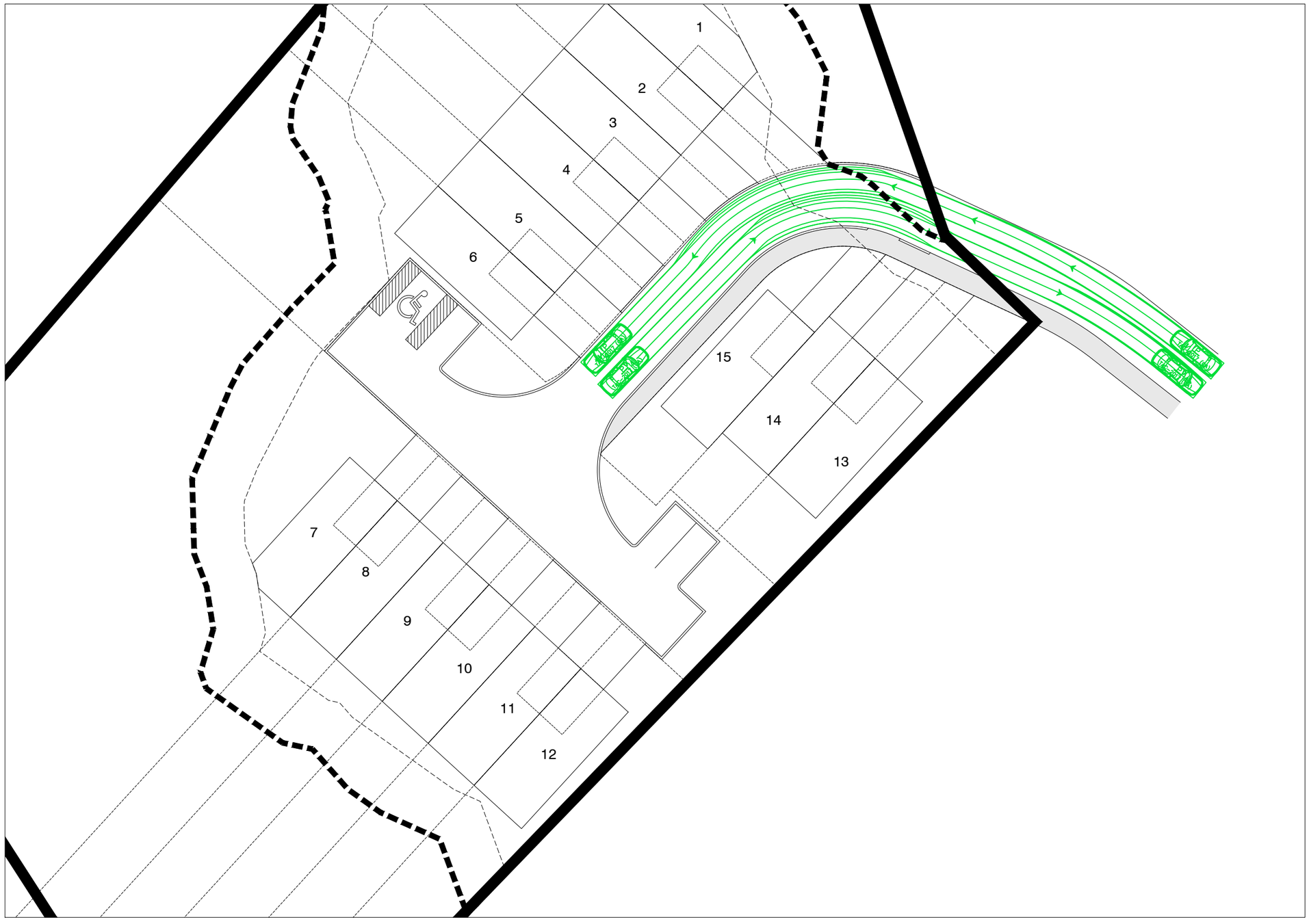
13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

SITE CIRCULATION DIAGRAM
PUMPER FIRE TRUCK

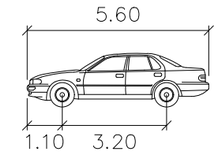
CROZIER
CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project	
A.D.	A.D.		0649-6278
Check By	Check By	Scale	Drawing
B.B.	B.B.	1:200	FIG 09



N

VECHICLE PROFILE



P

	meters
Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 6.0
Steering Angle	: 35.9

SCALE: 1:200

1. THIS DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSOCIATES INC. AND THE REPRODUCTION OF ANY PART WITHOUT PRIOR WRITTEN CONSENT OF THIS OFFICE IS STRICTLY PROHIBITED.
2. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.
3. THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT.
4. DO NOT SCALE THE DRAWINGS.
5. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

No.	ISSUE	DATE: MMM/DD/YYYY
0	ISSUED FOR REVIEW	04/04/2022

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project
13290 NUNNVILLE ROAD
TOWN OF CALEDON

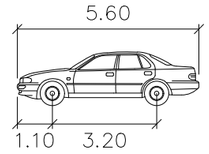
Drawing
SITE CIRCULATION DIAGRAM
PASSENGER CAR

CROZIER
CONSULTING ENGINEERS
2800 High Point Drive
Suite 100
Milton, ON. L9T 6P4
905-875-0026 T
905-875-4915 F
www.cfcrozier.ca
info@cfcrozier.ca

Drawn By	Design By	Project	
A.D.	A.D.		0649-6278
Check By	Check By	Scale	Drawing
B.B.	B.B.	1:200	FIG 10

N

VECHICLE PROFILE



P

	meters
Width	: 2.00
Track	: 2.00
Lock to Lock Time	: 6.0
Steering Angle	: 35.9

No.	ISSUE	DATE: MMM/DD/YYYY
0	ISSUED FOR REVIEW	04/04/2022

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

SITE CIRCULATION DIAGRAM
PASSENGER CAR

CROZIER
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Drawn By	Design By	Project	
A.D.	A.D.		0649-6278
Check By	Check By	Scale	Drawing
B.B.	B.B.	1:200	FIG 11

5 0m 5 10 15
SCALE: 1:200

10.0 Parking Review

10.1 Parking Requirements

To determine the required parking at the subject site, the Town of Caledon Zoning By-Law 2021 Section 05 was reviewed to determine the parking requirements of the proposed residential development.

A summary of the proposed parking and required parking at the development can be found in **Table 6**.

Table 6: Town of Caledon Zoning By-Law Parking Review

Unit Type (# of Units)	Parking Type	Parking Criteria	Required Parking Spaces	Proposed Parking Spaces	Surplus/ Deficit
15 Townhouse Dwelling Units	Dwelling	2.0 spaces per dwelling unit	30	30	0
	Visitor	0.25 spaces per dwelling unit	4	4	0
Total			**34**	**34**	**0**

Based on the Town of Caledon Zoning By-Law, the site is required to provide a total of 34 spaces. The most recent site plan provides total of 34 spaces, satisfying the parking By-law for both visitor and resident spaces.

It is noted that one of the visitor spaces is proposed to be an accessible parking space in accordance with the Town's By-law.

11.0 Conclusion

The findings and recommendations of our analysis are summarized as the following:

- Under 2022 exiting conditions, the study road network operates under capacity with level of service "D" or better during the A.M. and P.M. peak hours.
- During the A.M. and P.M. peak hours in the future background conditions for horizon year 2027, movements are expected to continue to operate under capacity similarly to the existing traffic conditions.
- The proposed development is expected to generate 7 two-way (2 inbound and 5 outbound) trips during the weekday A.M. peak hour, and 9 two-way (5 inbound and 4 outbound) trips during the weekday P.M. peak hour.
- The proposed development is expected to add negligible amounts of traffic to the surrounding road network and the study intersections are expected to continue to operate under capacity with acceptable delays similar to the existing conditions.
- Sufficient sight lines are available on the cul-de-sac at the site access.
- Based on AutoTURN analysis, waste, emergency and passenger vehicle can maneuver through the site with no encroachments.
- The proposed parking spaces at the development meets the required parking spaces per the Town's By-law requirements for resident, visitor and accessible parking.
- The analysis undertaken herein was prepared using the most recent Site Plan. Any minor changes to the plan are not expected to materially affect the conclusions in this report.

In consideration that the proposed site does not materially impact the local transportation network due to the small amount of site-generated traffic, the site access offering sufficient sight lines, and no issues being identified with maneuverability at the site, the proposed development can be supported from a transportation perspective.

We trust that this letter satisfies any transportation related concerns associated with the proposed development. Should you have any questions or require any further information, please do not hesitate to contact the undersigned.

Respectfully submitted by,

C.F. CROZIER & ASSOCIATES INC.

Aarzoo Dhanani, M. Eng, EIT
Engineering Intern, Transportation

C.F. CROZIER & ASSOCIATES INC.

Brandon Bradt, M. Eng. CEM, P. Eng
Project Manager, Transportation

AD/BB

APPENDIX A

Town Correspondence

Aarzoo Dhanani

From: Aarzoo Dhanani
Sent: February 3, 2022 1:07 PM
To: Jillian Britto
Cc: Brandon Bradt; Farah Choudhury
Subject: RE: 13290 Nunnville Rd - Terms of Reference (CFC#6278-13290)

Good Afternoon Jillian,

Thank you for your response and I appreciate you sharing the midblock volumes. We will use the provided data to calculate the growth rate for Albion Vaughan Road for inclusion in the analysis. The proposed parking supply will also be reviewed in comparison to the Town's By-law as a part of our TIS.

Please feel free to contact us, if you had any other comments and I hope you have a great day!

Best,

Aarzoo

From: Jillian Britto <Jillian.Britto@caledon.ca>
Sent: February 3, 2022 11:50 AM
To: Aarzoo Dhanani <adhanani@cfcrozier.ca>
Cc: Brandon Bradt <bbradt@cfcrozier.ca>; Farah Choudhury <fchoudhury@cfcrozier.ca>
Subject: RE: 13290 Nunnville Rd - Terms of Reference (CFC#6278-13290)

Good morning Aarzoo,

Hope you are doing well.

Thank you for providing a terms of reference for the Transportation Impact Study for the above-noted development. Please see below comments from Town Transportation staff:

- 2019 TMCs are acceptable. Please see historical midblock volumes (attached) to determine an appropriate growth rate for Albion Vaughan Road, no growth is required for Nunnville Road.
- The proposed horizon year is acceptable.
- Please add a parking review to the work plan.
- No additional background developments within the Town of Caledon need to be incorporated into the analysis.

My apologies for the delayed response. Please let me know if you have any questions or require any further information.

Regards,

Jillian Britto, P.Eng.
Transportation Engineer
Engineering Services Department

Office: 905.584.2272 x 4108
Email: Jillian.Britto@caledon.ca

Town of Caledon | www.caledon.ca | www.visitcaledon.ca | Follow us @YourCaledon

---

From: Aarzoo Dhanani <adhanani@cfcrozier.ca>
Sent: Monday, January 31, 2022 10:37 AM
To: Jillian Britto <Jillian.Britto@caledon.ca>
Cc: Brandon Bradt <bbradt@cfcrozier.ca>; Farah Choudhury <fchoudhury@cfcrozier.ca>
Subject: RE: 13290 Nunnville Rd - Terms of Reference (CFC#6278-13290)

Hello Jillian,

Hope you had a great weekend. I trust my previous email reached you and would like to follow up on the Terms of Reference included below.

Please feel free to contact us if you have any questions.

Kind regards,
Aarzoo

Aarzoo Dhanani, EIT | Engineering Intern
211 Yonge Street, Suite 301 | Toronto, ON M5B 1M4
T: 416.477.3392

CROZIER
CONSULTING ENGINEERS

Crozier Connections:

Read our latest news and announcements here.

From: Aarzoo Dhanani
Sent: January 21, 2022 11:50 AM

To: Jillian.britto@caledon.ca
Cc: Brandon Bradt <bbradt@cfcrozier.ca>; Farah Choudhury <fchoudhury@cfcrozier.ca>
Subject: 13290 Nunnville Rd - Terms of Reference (CFC#6278-13290)

Hello Jillian,

C.F. Crozier and Consulting Engineers (Crozier) has been retained to provide the Transportation Engineering Services for a proposed residential development located at 13290 Nunnville Road in the Town of Caledon. The Site Plan for the proposed development is attached in this email for your review.

The proposed site includes:

- 15 attached townhouse dwellings contained within 3 blocks
- The blocks will be accessed by an approximately 80 m long and 6 m wide private right-of-way that extends from the end of the existing Nunnville Road cul-de-sac

We are kindly requesting that you review the following Terms of Reference (ToR) and provide feedback regarding our scope of work and methodology. Furthermore, should you not be the appropriate person for correspondence, it would be very appreciated to be directed to the appropriate contact.

Study Methodology for the Transportation Impact Study

The study will be prepared in accordance with the Town of Caledon Transportation Impact Study Guidelines and address the traffic impacts of the proposed development on the boundary road network. The proposed parking supply will also be reviewed in accordance with the Town of Caledon By-Law Requirements.

Given the scope of the proposed development, only the following intersection will be analyzed as part of the scope of study:

- Nunnville Road at Albion Vaughan Road
- 13247 and 13233 Nunnville Road Access at Nunnville Road (new proposed access for a background development)

Due to the impact of the COVID-19 pandemic, we understand that new counts may not be accepted at this time. We have previous counts conducted at the intersection of Nunnville Road and Albion Vaughan Road, dated June 2019. Please confirm the acceptance of these counts to be used in the study, along with an appropriate growth rate.

Analysis Periods and Scenarios

The weekday A.M. and P.M. peak hours for 2022 existing conditions, as well as a 5-year horizon year (2027) will be considered for future background and total traffic conditions.

Background Developments

Crozier has previously conducted a Transportation Impact Study for a development located at 13247 and 13233 Nunnville Road in the Town of Caledon, which was most recently submitted in January 2020. The site-generated trips from this development will be analyzed as part of this study, and additionally, the site access for this development will be analyzed as part of the study area.

Please provide any additional background developments in the vicinity of the proposed development and the associated transportation impact studies that should be included in our analysis.

Future Background Growth Rate

An industry standard 2.0% growth rate per annum would be used to reflect background growth in the area for through movements along Albion Vaughan Road.

Trip Generation and Distribution

Trip Generation for the proposed development will be based on the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th Edition using Single Family Attached Housing (Land Use Code 215).

Site generated traffic to and from the boundary road network will be assigned using 2016 Transportation Tomorrow Survey (TTS) data.

Capacity Analysis Procedures

Weekday A.M. and P.M. peak hours will be analyzed using Synchro 11.0 analysis software, using Highway Capacity Manual (HCM) 2000 procedures.

Sight Distance Analysis

The sight distance availability and geometric characteristics of the proposed cul-de-sac roadway connection will be analyzed with regards to guidance within the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR), June 2017.

Vehicle Maneuvering Analysis

A vehicle maneuvering analysis will be conducted with AutoTURN to determine if expected design vehicles at the site can safely maneuver, enter and exit the site with no conflicts. The design vehicles used will include:

- Passenger vehicle (PTAC)
- Emergency (Fire Truck) vehicle
- Waste Pick-up vehicle

Summary

We request any comments that arise with regards to the above Terms of Reference.

- Please confirm the study intersection are sufficient.
- Please confirm whether previously collected traffic counts are acceptable.
- Please confirm the proposed horizon year or provide updated horizon year(s).
- Please confirm the assumed growth rate of 2% for through movements on Albion Vaughan Road.

I hope the contents outlined in this email are acceptable. Should you have any questions or require any further information, please feel free to contact us.

Kind regards,

Aarzoo Dhanani

immediately, advising of the error and delete this message without making a copy. (Information related to this email is automatically monitored and recorded and the content may be required to be disclosed by the Town to a third party in certain circumstances). Thank you."

APPENDIX B

Traffic Data

Turning Movement Count (1 . NUNNVILLE RD & ALBION VAUGHAN RD)

Start Time	N Approach ALBION VAUGHAN RD					S Approach ALBION VAUGHAN RD					W Approach NUNNVILLE RD					Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	U-Turn N:N	Peds N:	Approach Total	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Left W:N	U-Turn W:W	Peds W:	Approach Total		
07:00:00	0	206	0	0	206	85	0	0	0	85	1	3	0	0	4	295	
07:15:00	1	190	0	0	191	83	0	0	0	83	0	0	0	0	0	274	
07:30:00	1	227	0	0	228	89	0	0	0	89	0	1	0	0	1	318	
07:45:00	1	232	0	0	233	114	0	0	0	114	0	2	0	0	2	349	1236
08:00:00	1	215	0	0	216	108	0	0	0	108	1	2	0	0	3	327	1268
08:15:00	1	266	0	0	267	104	1	0	0	105	1	2	0	0	3	375	1369
08:30:00	2	255	0	0	257	97	2	0	0	99	2	5	0	0	7	363	1414
08:45:00	1	212	0	0	213	71	1	0	0	72	0	2	0	0	2	287	1352
BREAK																	
16:00:00	0	105	0	0	105	231	2	0	0	233	3	3	0	0	6	344	
16:15:00	0	138	0	0	138	215	2	0	0	217	2	1	0	0	3	358	
16:30:00	0	124	0	0	124	233	0	1	0	234	3	0	0	0	3	361	
16:45:00	1	137	0	0	138	212	0	0	0	212	0	1	0	0	1	351	1414
17:00:00	3	120	0	0	123	241	3	0	0	244	2	1	0	0	3	370	1440
17:15:00	1	134	0	0	135	237	2	0	0	239	0	2	0	0	2	376	1458
17:30:00	0	112	0	0	112	227	1	0	0	228	1	0	0	0	1	341	1438
17:45:00	1	119	0	0	120	231	1	0	0	232	1	1	0	0	2	354	1441
Grand Total	14	2792	0	0	2806	2578	15	1	0	2594	17	26	0	0	43	**5443**	-
Approach%	0.5%	99.5%	0%		-	99.4%	0.6%	0%		-	39.5%	60.5%	0%		-	-	-
Totals %	0.3%	51.3%	0%		51.6%	47.4%	0.3%	0%		47.7%	0.3%	0.5%	0%		0.8%	-	-
Heavy	0	66	0		-	47	0	0		-	0	0	0		-	-	-
Heavy %	0%	2.4%	0%		-	1.8%	0%	0%		-	0%	0%	0%		-	-	-
Bicycles	-	-	-		-	-	-	-		-	-	-	-		-	-	-
Bicycle %	-	-	-		-	-	-	-		-	-	-	-		-	-	-

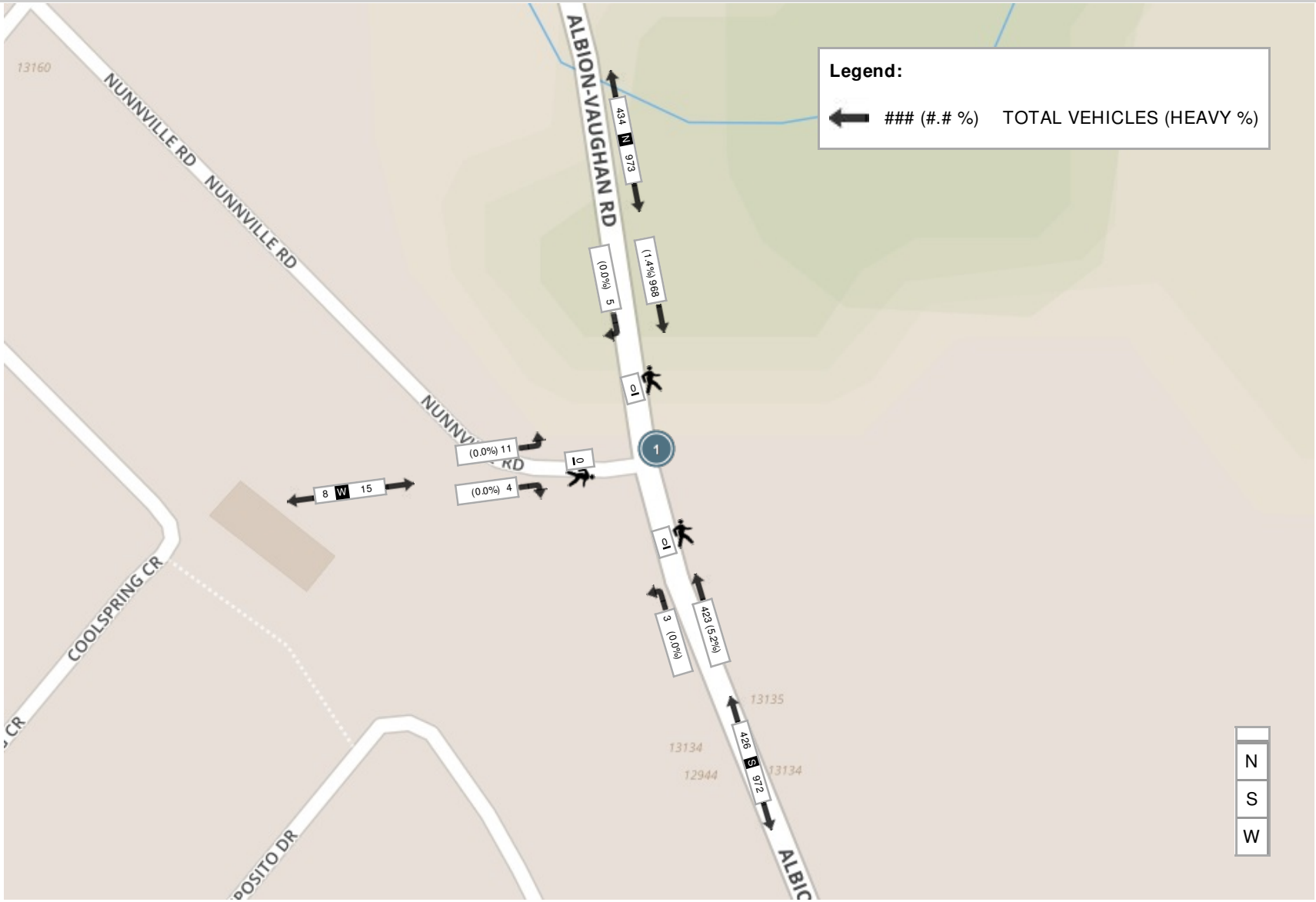
Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (13.83 °C)

Start Time	N Approach ALBION VAUGHAN RD					S Approach ALBION VAUGHAN RD					W Approach NUNNVILLE RD					Int. Total (15 min)
	Right	Thru	U-Turn	Peds	Approach Total	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	
07:45:00	1	232	0	0	233	114	0	0	0	114	0	2	0	0	2	349
08:00:00	1	215	0	0	216	108	0	0	0	108	1	2	0	0	3	327
08:15:00	1	266	0	0	267	104	1	0	0	105	1	2	0	0	3	375
08:30:00	2	255	0	0	257	97	2	0	0	99	2	5	0	0	7	363
Grand Total	5	968	0	0	973	423	3	0	0	426	4	11	0	0	15	**1414**
Approach%	0.5%	99.5%	0%		-	99.3%	0.7%	0%		-	26.7%	73.3%	0%		-	-
Totals %	0.4%	68.5%	0%		68.8%	29.9%	0.2%	0%		30.1%	0.3%	0.8%	0%		1.1%	-
PHF	0.63	0.91	0		0.91	0.93	0.38	0		0.93	0.5	0.55	0		0.54	-
Heavy	0	14	0		14	22	0	0		22	0	0	0		0	-
Heavy %	0%	1.4%	0%		1.4%	5.2%	0%	0%		5.2%	0%	0%	0%		0%	-
Lights	5	932	0		937	377	3	0		380	4	11	0		15	-
Lights %	100%	96.3%	0%		96.3%	89.1%	100%	0%		89.2%	100%	100%	0%		100%	-
Mediums	0	22	0		22	24	0	0		24	0	0	0		0	-
Mediums %	0%	2.3%	0%		2.3%	5.7%	0%	0%		5.6%	0%	0%	0%		0%	-
Articulated Trucks	0	14	0		14	22	0	0		22	0	0	0		0	-
Articulated Trucks %	0%	1.4%	0%		1.4%	5.2%	0%	0%		5.2%	0%	0%	0%		0%	-

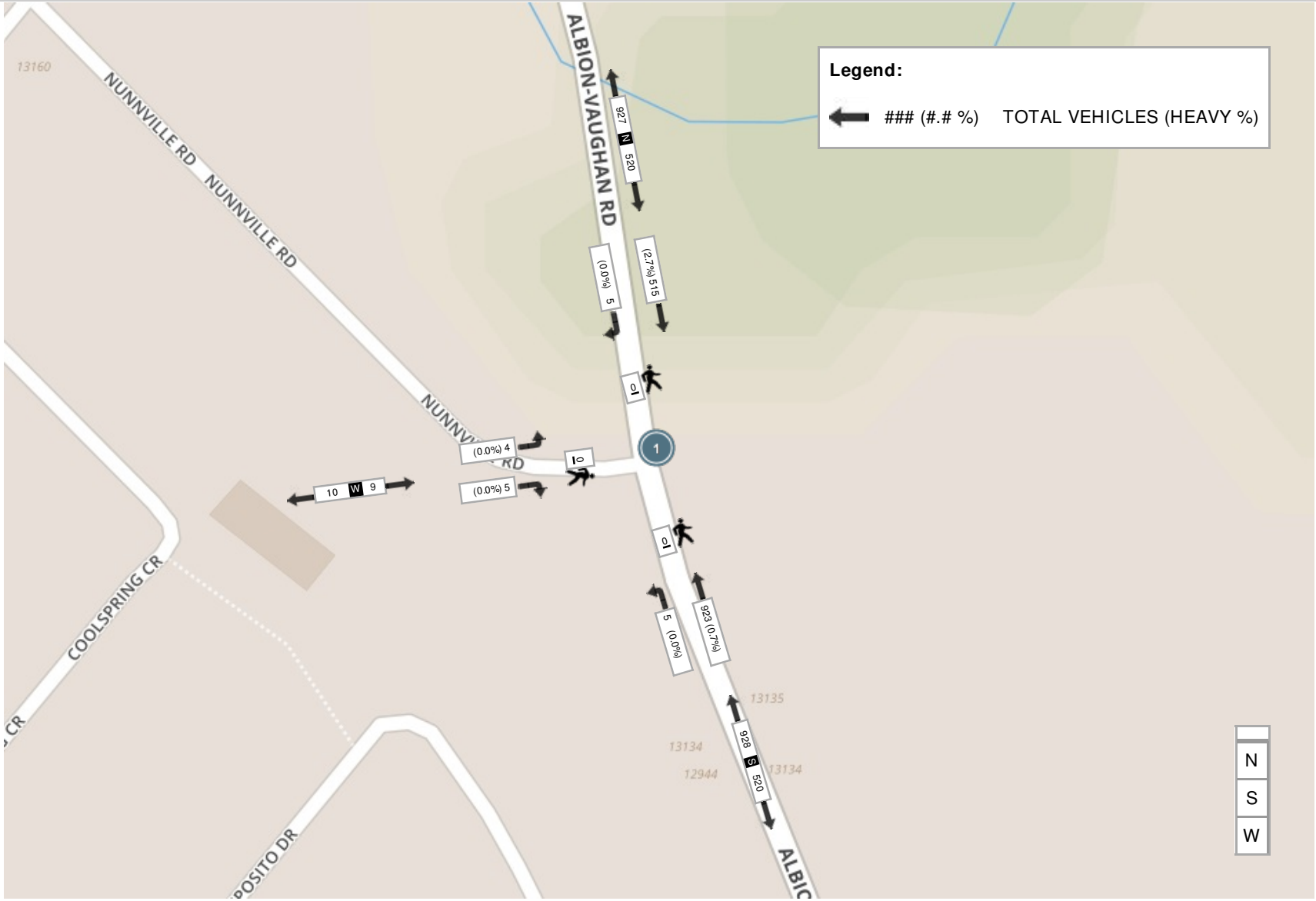
Peak Hour: 04:30 PM - 05:30 PM Weather: Thunderstorm (14.77 °C)

Start Time	N Approach ALBION VAUGHAN RD					S Approach ALBION VAUGHAN RD					W Approach NUNNVILLE RD					Int. Total (15 min)
	Right	Thru	U-Turn	Peds	Approach Total	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	
16:30:00	0	124	0	0	124	233	0	1	0	234	3	0	0	0	3	361
16:45:00	1	137	0	0	138	212	0	0	0	212	0	1	0	0	1	351
17:00:00	3	120	0	0	123	241	3	0	0	244	2	1	0	0	3	370
17:15:00	1	134	0	0	135	237	2	0	0	239	0	2	0	0	2	376
Grand Total	5	515	0	0	520	923	5	1	0	929	5	4	0	0	9	**1458**
Approach%	1%	99%	0%		-	99.4%	0.5%	0.1%		-	55.6%	44.4%	0%		-	-
Totals %	0.3%	35.3%	0%		35.7%	63.3%	0.3%	0.1%		63.7%	0.3%	0.3%	0%		0.6%	-
PHF	0.42	0.94	0		0.94	0.96	0.42	0.25		0.95	0.42	0.5	0		0.75	-
Heavy	0	14	0		14	6	0	0		6	0	0	0		0	-
Heavy %	0%	2.7%	0%		2.7%	0.7%	0%	0%		0.6%	0%	0%	0%		0%	-
Lights	5	489	0		494	903	5	1		909	5	4	0		9	-
Lights %	100%	95%	0%		95%	97.8%	100%	100%		97.8%	100%	100%	0%		100%	-
Mediums	0	12	0		12	14	0	0		14	0	0	0		0	-
Mediums %	0%	2.3%	0%		2.3%	1.5%	0%	0%		1.5%	0%	0%	0%		0%	-
Articulated Trucks	0	14	0		14	6	0	0		6	0	0	0		0	-
Articulated Trucks %	0%	2.7%	0%		2.7%	0.7%	0%	0%		0.6%	0%	0%	0%		0%	-

Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (13.83 °C)



Peak Hour: 04:30 PM - 05:30 PM Weather: Thunderstorm (14.77 °C)



APPENDIX C

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

APPENDIX D

Detailed Capacity Analysis

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	11	4	3	423	968	5
Future Volume (vph)	11	4	3	423	968	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	65.0			0.0
Storage Lanes	1	0	1			1
Taper Length (m)	7.6		100.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.966					0.850
Flt Protected	0.964		0.950			
Satd. Flow (prot)	1789	0	1825	1830	1902	1633
Flt Permitted	0.964		0.950			
Satd. Flow (perm)	1789	0	1825	1830	1902	1633
Link Speed (k/h)	48			60	60	
Link Distance (m)	480.5			176.5	225.3	
Travel Time (s)	36.0			10.6	13.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	12	4	3	460	1052	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	16	0	3	460	1052	5
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.9			4.9	4.9	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24	14	24			14
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 60.9%		ICU Level of Service B	
Analysis Period (min) 15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	11	4	3	423	968	5
Future Volume (Veh/h)	11	4	3	423	968	5
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)	12	4	3	460	1052	5
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	1518	1052	1057			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1518	1052	1057			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	99	100			
cM capacity (veh/h)	132	278	667			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	16	3	460	1052	5
Volume Left	12	3	0	0	0
Volume Right	4	0	0	0	5
cSH	152	667	1700	1700	1700
Volume to Capacity	0.11	0.00	0.27	0.62	0.00
Queue Length 95th (m)	2.6	0.1	0.0	0.0	0.0
Control Delay (s)	31.5	10.4	0.0	0.0	0.0
Lane LOS	D	B			
Approach Delay (s)	31.5	0.1		0.0	
Approach LOS	D				

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	60.9%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	4	5	5	923	515	5
Future Volume (vph)	4	5	5	923	515	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	65.0			0.0
Storage Lanes	1	0	1			1
Taper Length (m)	7.6		100.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.925					0.850
Flt Protected	0.978		0.950			
Satd. Flow (prot)	1738	0	1825	1830	1902	1633
Flt Permitted	0.978		0.950			
Satd. Flow (perm)	1738	0	1825	1830	1902	1633
Link Speed (k/h)	48			60	60	
Link Distance (m)	480.5			176.5	225.3	
Travel Time (s)	36.0			10.6	13.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	4	5	5	1003	560	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	9	0	5	1003	560	5
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.9			4.9	4.9	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24	14	24			14
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 58.6%		ICU Level of Service B	
Analysis Period (min) 15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	5	5	923	515	5
Future Volume (Veh/h)	4	5	5	923	515	5
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)	4	5	5	1003	560	5
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	1573	560	565			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1573	560	565			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	99	100			
cM capacity (veh/h)	122	532	1017			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	9	5	1003	560	5
Volume Left	4	5	0	0	0
Volume Right	5	0	0	0	5
cSH	213	1017	1700	1700	1700
Volume to Capacity	0.04	0.00	0.59	0.33	0.00
Queue Length 95th (m)	1.0	0.1	0.0	0.0	0.0
Control Delay (s)	22.6	8.6	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	22.6	0.0		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	15	22	9	441	1008	7
Future Volume (vph)	15	22	9	441	1008	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	65.0			0.0
Storage Lanes	1	0	1			1
Taper Length (m)	7.6		100.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.919					0.850
Flt Protected	0.980		0.950			
Satd. Flow (prot)	1730	0	1825	1830	1902	1633
Flt Permitted	0.980		0.950			
Satd. Flow (perm)	1730	0	1825	1830	1902	1633
Link Speed (k/h)	48			60	60	
Link Distance (m)	472.7			177.0	225.3	
Travel Time (s)	35.5			10.6	13.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	16	24	10	479	1096	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	40	0	10	479	1096	8
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.9			4.9	4.9	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24	14	24			14
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 63.1%		ICU Level of Service B	
Analysis Period (min) 15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	22	9	441	1008	7
Future Volume (Veh/h)	15	22	9	441	1008	7
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)	16	24	10	479	1096	8
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	1595	1096	1104			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1595	1096	1104			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	91	98			
cM capacity (veh/h)	117	262	640			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	40	10	479	1096	8
Volume Left	16	10	0	0	0
Volume Right	24	0	0	0	8
cSH	175	640	1700	1700	1700
Volume to Capacity	0.23	0.02	0.28	0.64	0.00
Queue Length 95th (m)	6.4	0.4	0.0	0.0	0.0
Control Delay (s)	31.5	10.7	0.0	0.0	0.0
Lane LOS	D	B			
Approach Delay (s)	31.5	0.2		0.0	
Approach LOS	D				

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	22	0	8	8	0	15
Future Volume (vph)	22	0	8	8	0	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.932			
Flt Protected	0.950					
Satd. Flow (prot)	1789	0	1755	0	0	1883
Flt Permitted	0.950					
Satd. Flow (perm)	1789	0	1755	0	0	1883
Link Speed (k/h)	48		40			40
Link Distance (m)	89.7		472.7			111.7
Travel Time (s)	6.7		42.5			10.1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	0	9	9	0	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	24	0	18	0	0	16
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		4.9			4.9
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24	14		14	24	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	22	0	8	8	0	15
Future Volume (Veh/h)	22	0	8	8	0	15
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)	24	0	9	9	0	16
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	30	14			18	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	30	14			18	
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	100			100	
cM capacity (veh/h)	985	1067			1599	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	24	18	16
Volume Left	24	0	0
Volume Right	0	9	0
cSH	985	1700	1599
Volume to Capacity	0.02	0.01	0.00
Queue Length 95th (m)	0.6	0.0	0.0
Control Delay (s)	8.7	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.7	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	7	16	24	961	536	9
Future Volume (vph)	7	16	24	961	536	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	65.0			0.0
Storage Lanes	1	0	1			1
Taper Length (m)	7.6		100.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.908					0.850
Flt Protected	0.984		0.950			
Satd. Flow (prot)	1716	0	1825	1830	1902	1633
Flt Permitted	0.984		0.950			
Satd. Flow (perm)	1716	0	1825	1830	1902	1633
Link Speed (k/h)	48			60	60	
Link Distance (m)	472.7			177.0	225.3	
Travel Time (s)	35.5			10.6	13.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	8	17	26	1045	583	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	25	0	26	1045	583	10
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.9			4.9	4.9	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24	14	24			14
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 60.6%		ICU Level of Service B	
Analysis Period (min) 15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	16	24	961	536	9
Future Volume (Veh/h)	7	16	24	961	536	9
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)	8	17	26	1045	583	10
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	1680	583	593			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1680	583	593			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	97	97			
cM capacity (veh/h)	103	516	993			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	25	26	1045	583	10
Volume Left	8	26	0	0	0
Volume Right	17	0	0	0	10
cSH	225	993	1700	1700	1700
Volume to Capacity	0.11	0.03	0.61	0.34	0.01
Queue Length 95th (m)	2.8	0.6	0.0	0.0	0.0
Control Delay (s)	23.0	8.7	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	23.0	0.2		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	14	0	10	23	0	9
Future Volume (vph)	14	0	10	23	0	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.906			
Flt Protected	0.950					
Satd. Flow (prot)	1789	0	1706	0	0	1883
Flt Permitted	0.950					
Satd. Flow (perm)	1789	0	1706	0	0	1883
Link Speed (k/h)	48		40			40
Link Distance (m)	89.7		472.7			111.7
Travel Time (s)	6.7		42.5			10.1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	0	11	25	0	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	15	0	36	0	0	10
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		4.9			4.9
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	97	97		97	97	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	14	0	10	23	0	9
Future Volume (Veh/h)	14	0	10	23	0	9
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)	15	0	11	25	0	10
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	34	24			36	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	34	24			36	
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	100			100	
cM capacity (veh/h)	980	1053			1575	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	15	36	10
Volume Left	15	0	0
Volume Right	0	25	0
cSH	980	1700	1575
Volume to Capacity	0.02	0.02	0.00
Queue Length 95th (m)	0.4	0.0	0.0
Control Delay (s)	8.7	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.7	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	17	26	11	441	1008	8
Future Volume (vph)	17	26	11	441	1008	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	65.0			0.0
Storage Lanes	1	0	1			1
Taper Length (m)	7.6		100.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.918					0.850
Flt Protected	0.981		0.950			
Satd. Flow (prot)	1730	0	1825	1830	1902	1633
Flt Permitted	0.981		0.950			
Satd. Flow (perm)	1730	0	1825	1830	1902	1633
Link Speed (k/h)	48			60	60	
Link Distance (m)	480.5			176.5	225.3	
Travel Time (s)	36.0			10.6	13.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	18	28	12	479	1096	9
Shared Lane Traffic (%)						
Lane Group Flow (vph)	46	0	12	479	1096	9
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.9			4.9	4.9	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24	14	24			14
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 63.1%		ICU Level of Service B	
Analysis Period (min) 15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	26	11	441	1008	8
Future Volume (Veh/h)	17	26	11	441	1008	8
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)	18	28	12	479	1096	9
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	1599	1096	1105			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1599	1096	1105			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	84	89	98			
cM capacity (veh/h)	116	262	639			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	46	12	479	1096	9
Volume Left	18	12	0	0	0
Volume Right	28	0	0	0	9
cSH	175	639	1700	1700	1700
Volume to Capacity	0.26	0.02	0.28	0.64	0.01
Queue Length 95th (m)	7.6	0.4	0.0	0.0	0.0
Control Delay (s)	32.7	10.7	0.0	0.0	0.0
Lane LOS	D	B			
Approach Delay (s)	32.7	0.3		0.0	
Approach LOS	D				

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	22	0	11	8	0	20
Future Volume (vph)	22	0	11	8	0	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.942			
Flt Protected	0.950					
Satd. Flow (prot)	1789	0	1774	0	0	1883
Flt Permitted	0.950					
Satd. Flow (perm)	1789	0	1774	0	0	1883
Link Speed (k/h)	48		40			40
Link Distance (m)	0.0		480.5			111.7
Travel Time (s)	0.0		43.2			10.1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	0	12	9	0	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	24	0	21	0	0	22
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		4.9			4.9
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24	14		14	24	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	22	0	11	8	0	20
Future Volume (Veh/h)	22	0	11	8	0	20
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)	24	0	12	9	0	22
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	38	16			21	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	38	16			21	
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	100			100	
cM capacity (veh/h)	973	1063			1595	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	24	21	22
Volume Left	24	0	0
Volume Right	0	9	0
cSH	973	1700	1595
Volume to Capacity	0.02	0.01	0.00
Queue Length 95th (m)	0.6	0.0	0.0
Control Delay (s)	8.8	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.8	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	9	19	28	961	536	11
Future Volume (vph)	9	19	28	961	536	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (m)	0.0	0.0	65.0			0.0
Storage Lanes	1	0	1			1
Taper Length (m)	7.6		100.0			
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.909					0.850
Flt Protected	0.984		0.950			
Satd. Flow (prot)	1718	0	1825	1830	1902	1633
Flt Permitted	0.984		0.950			
Satd. Flow (perm)	1718	0	1825	1830	1902	1633
Link Speed (k/h)	48			60	60	
Link Distance (m)	480.5			176.5	225.3	
Travel Time (s)	36.0			10.6	13.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	10	21	30	1045	583	12
Shared Lane Traffic (%)						
Lane Group Flow (vph)	31	0	30	1045	583	12
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	3.7			3.7	3.7	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.9			4.9	4.9	
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	24	14	24			14
Sign Control	Stop			Free	Free	

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 60.6%		ICU Level of Service B	
Analysis Period (min) 15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	9	19	28	961	536	11
Future Volume (Veh/h)	9	19	28	961	536	11
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)	10	21	30	1045	583	12
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	1688	583	595			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1688	583	595			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	96	97			
cM capacity (veh/h)	101	516	991			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	31	30	1045	583	12
Volume Left	10	30	0	0	0
Volume Right	21	0	0	0	12
cSH	222	991	1700	1700	1700
Volume to Capacity	0.14	0.03	0.61	0.34	0.01
Queue Length 95th (m)	3.6	0.7	0.0	0.0	0.0
Control Delay (s)	23.8	8.7	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	23.8	0.2		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	14	0	15	23	0	13
Future Volume (vph)	14	0	15	23	0	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.918			
Flt Protected	0.950					
Satd. Flow (prot)	1789	0	1729	0	0	1883
Flt Permitted	0.950					
Satd. Flow (perm)	1789	0	1729	0	0	1883
Link Speed (k/h)	48		40			40
Link Distance (m)	0.0		480.5			111.7
Travel Time (s)	0.0		43.2			10.1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	15	0	16	25	0	14
Shared Lane Traffic (%)						
Lane Group Flow (vph)	15	0	41	0	0	14
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(m)	3.7		0.0			0.0
Link Offset(m)	0.0		0.0			0.0
Crosswalk Width(m)	1.6		4.9			4.9
Two way Left Turn Lane						
Headway Factor	0.99	0.99	0.99	0.99	0.99	0.99
Turning Speed (k/h)	97	97		97	97	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 13.3%		ICU Level of Service A	
Analysis Period (min) 15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	14	0	15	23	0	13
Future Volume (Veh/h)	14	0	15	23	0	13
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)	15	0	16	25	0	14
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	42	28			41	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	42	28			41	
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	100			100	
cM capacity (veh/h)	968	1046			1568	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	15	41	14
Volume Left	15	0	0
Volume Right	0	25	0
cSH	968	1700	1568
Volume to Capacity	0.02	0.02	0.00
Queue Length 95th (m)	0.4	0.0	0.0
Control Delay (s)	8.8	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.8	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX E

Trip Generation

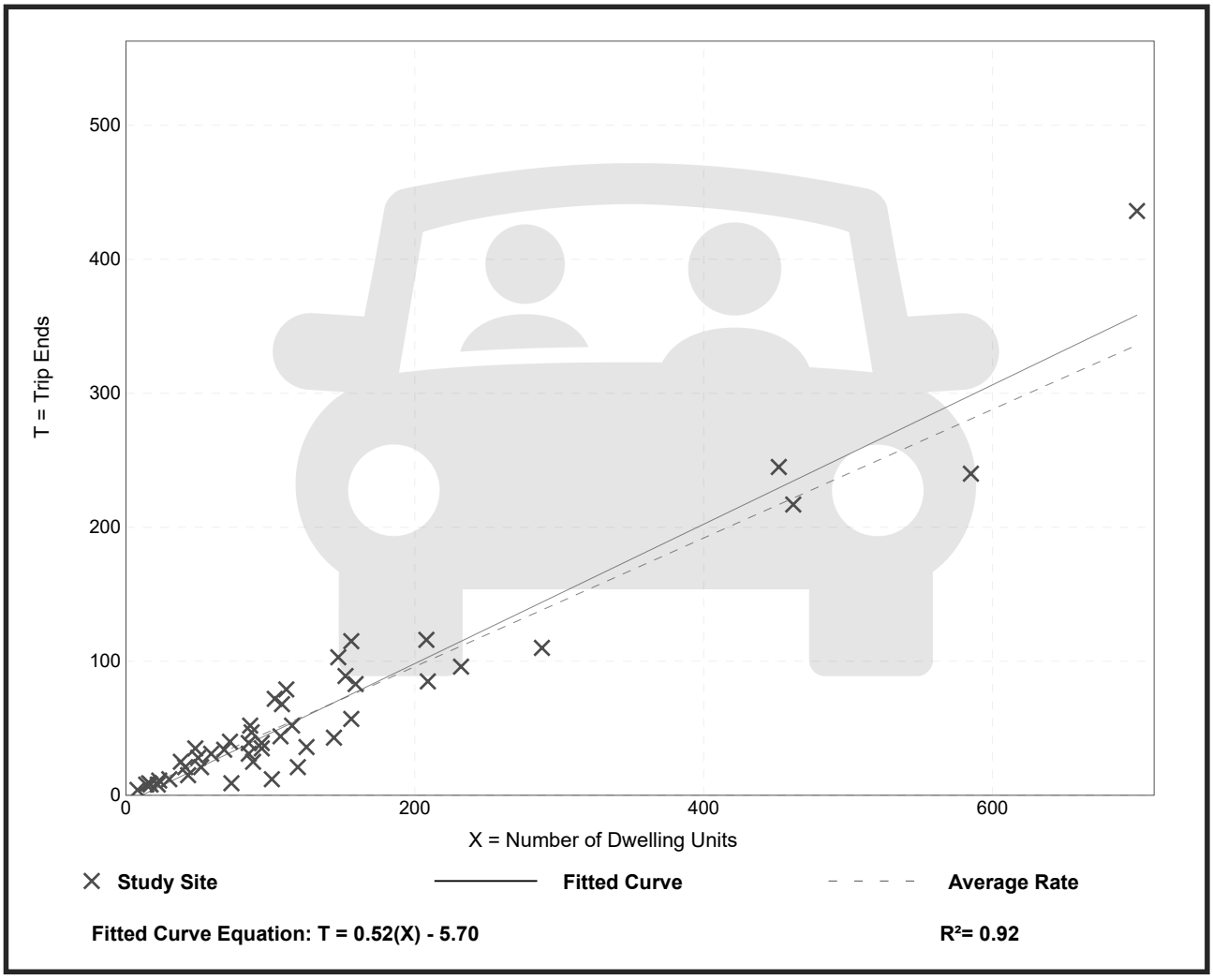
Single-Family Attached Housing
(215)

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: 46
Avg. Num. of Dwelling Units: 135
Directional Distribution: 31% entering, 69% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.48	0.12 - 0.74	0.14

Data Plot and Equation



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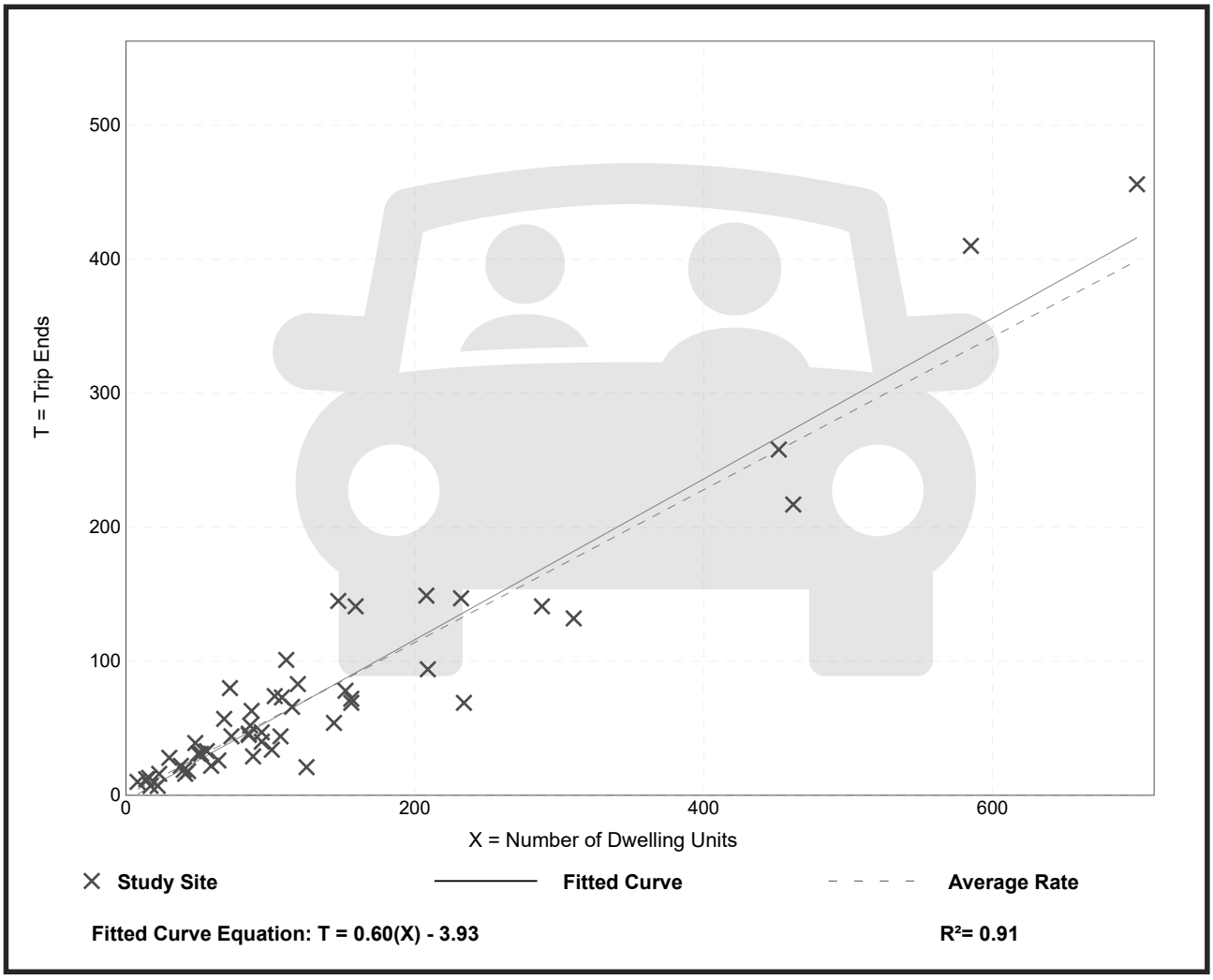
Single-Family Attached Housing
(215)

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: 51
Avg. Num. of Dwelling Units: 136
Directional Distribution: 57% entering, 43% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.57	0.17 - 1.25	0.18

Data Plot and Equation



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APPENDIX F

TTS Analysis

Fri Jan 21 2022 14:51:56 GMT-0500 (Eastern Standard Time) - Run Time: 3417ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of origin - pd_orig

Column: 2006 GTA zone of destination - gta06_dest

Filters:

(2006 GTA zone of destination - gta06_dest In 3192, 3193, 3194, 3190

and

Start time of trip - start_time In 630-930

and

Trip purpose of destination - purp_dest In H

and

Age of person - age In 18-99

and

Primary travel mode of trip - mode_prime Not In O,S,9)

Trip 2016

Table:

,3190,3192,3193,3194

PD 3 of Toronto,0,1,0,0

PD 10 of Toronto,0,1,0,0

Vaughan,1,0,0,2

Caledon,4,7,5,9

Brampton,0,0,0,1

TTS Detailed Distribution - AM Peak IN

Planning District	Household Zones				Total	North		South	
	3190	3192	3193	3194	%	#	%	#	
PD 3 of Toronto	0	1	0	0	1	0%	0	100%	1
PD 10 of Toronto	0	1	0	0	1	0%	0	100%	1
Vaughan	1	0	0	2	3	10%	0	90%	3
Caledon	4	7	5	9	25	50%	12.5	50%	12.5
Brampton	0	0	0	1	1	100%	1	0%	0
Total	5	9	5	12	31		13.5		17.5
							44%		56%

PM IN

Fri Jan 21 2022 14:50:30 GMT-0500 (Eastern Standard Time) - Run Time: 2848ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of origin - pd_orig

Column: 2006 GTA zone of destination - gta06_dest

Filters:

(2006 GTA zone of destination - gta06_dest In 3192, 3193, 3194, 3190

and

Start time of trip - start_time In 1530-1930

and

Trip purpose of destination - purp_dest In H

and

Age of person - age In 18-99

and

Primary travel mode of trip - mode_prime Not In O,S,9)

Trip 2016

Table:

TTS Detailed Distribution - PM Peak IN

Planning District	Household Zones				Total		North		South
	3190	3192	3193	3194	%	#	%	#	
PD 1 of Toronto	91	200	97	33	421	10%	42	90%	379
PD 2 of Toronto	0	0	33	10	43	10%	4	90%	39
PD 3 of Toronto	63	18	15	0	96	15%	14	85%	82
PD 4 of Toronto	19	0	64	51	134	0%	0	100%	134
PD 5 of Toronto	0	15	8	23	46	0%	0	100%	46
PD 7 of Toronto	0	0	22	0	22	0%	0	100%	22
PD 8 of Toronto	101	61	155	0	317	0%	0	100%	317
PD 9 of Toronto	63	61	245	37	406	0%	0	100%	406
PD 10 of Toronto	186	58	114	0	358	0%	0	100%	358
PD 11 of Toronto	0	0	16	0	16	0%	0	100%	16
PD 12 of Toronto	0	15	14	0	29	0%	0	100%	29
PD 13 of Toronto	0	0	0	43	43	0%	0	100%	43
Oshawa	0	0	64	0	64	0%	0	100%	64
East Gwillimbury	43	0	0	0	43	100%	43	0%	0
Newmarket	0	13	35	12	60	100%	60	0%	0
Aurora	22	20	0	0	42	100%	42	0%	0
Richmond Hill	10	40	0	15	65	100%	65	0%	0
Markham	23	23	61	22	129	15%	19	85%	110
King	0	18	81	26	125	100%	125	0%	0
Vaughan	267	494	240	270	1271	10%	127	90%	1144
Caledon	263	758	934	545	2500	50%	1250	50%	1250
Brampton	50	260	210	207	727	0%	0	100%	727
Mississauga	212	278	148	214	852	0%	0	100%	852
Halton Hills	0	0	30	0	30	50%	15	50%	15
Oakville	0	0	20	28	48	0%	0	100%	48
Burlington	0	20	0	0	20	0%	0	100%	20
Kitchener	0	0	22	0	22	15%	3	85%	19
Woolwich	0	21	0	0	21	50%	11	50%	11
Orangeville	0	17	0	0	17	100%	17	0%	0
Barrie	0	21	0	0	21	100%	21	0%	0
Innisfil	0	36	0	0	36	100%	36	0%	0
Bradford-West Gwillimbury	0	63	0	10	73	100%	73	0%	0
New Tecumseth	0	0	13	23	36	100%	36	0%	0
Amaranth	0	0	0	13	13	100%	13	0%	0
Mono	0	51	0	13	64	100%	64	0%	0
Total	1413	2561	2641	1595	8210		2080		6131
							25%		75%

AM OUT

TTS Detailed Distribution - AM Peak OUT

Fri Jan 21 2022 14:37:10 GMT-0500 (Eastern Standard Time) - Run Time: 3546ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of destination - pd_dest

Column: 2006 GTA zone of origin - gta06_orig

Filters:

(2006 GTA zone of origin - gta06_orig In 3192, 3193, 3194, 3190

and

Start time of trip - start_time In 630-930

and

Trip purpose of origin - purp_orig In H

and

Age of person - age In 18-99

and

Primary travel mode of trip - mode_prime Not In O,S,9)

Trip 2016

Table:

,3190,3192,3193,3194

PD 1 of Toronto,91,13,82,33

PD 2 of Toronto,0,0,56,10

PD 3 of Toronto,27,49,55,0

PD 4 of Toronto,60,21,64,51

PD 5 of Toronto,0,0,0,10

PD 7 of Toronto,0,42,43,0

PD 8 of Toronto,78,61,176,0

PD 9 of Toronto,57,159,331,110

PD 10 of Toronto,62,11,69,0

PD 11 of Toronto,0,0,39,0

PD 12 of Toronto,0,15,0,0

PD 13 of Toronto,0,0,8,43

PD 16 of Toronto,0,15,0,0

Oshawa,0,0,22,0

East Gwillimbury,43,0,0,0

Newmarket,0,30,57,0

Aurora,22,20,11,0

Richmond Hill,0,40,0,28

Markham,23,23,73,0

King,0,34,104,26

Vaughan,271,352,225,208

Caledon,440,677,652,613

Brampton,75,195,273,136

Mississauga,133,206,147,214

Halton Hills,0,18,16,0

Oakville,0,0,20,20

Burlington,0,20,0,0

Orangeville,20,17,26,38

Barrie,0,0,14,0

Bradford-West Gwillimbury,0,42,0,10

New Tecumseth,0,0,43,0

Adjala-Tosorontio,0,0,43,0

Essa,0,0,0,22

Springwater,0,0,9,0

Tiny,0,0,0,13

Mono,0,30,14,0

Planning District	Household Zones				Total	North		South		Total	
	3190	3192	3193	3194		%	#	%	#		
PD 1 of Toronto	91	13	82	33	219	0%	0	100%	219	100%	
PD 2 of Toronto	0	0	56	10	66	0%	0	100%	66	100%	
PD 3 of Toronto	27	49	55	0	131	0%	0	100%	131	100%	
PD 4 of Toronto	60	21	64	51	196	0%	0	100%	196	100%	
PD 5 of Toronto	0	0	0	10	10	0%	0	100%	10	100%	
PD 7 of Toronto	0	42	43	0	85	0%	0	100%	85	100%	
PD 8 of Toronto	78	61	176	0	315	0%	0	100%	315	100%	
PD 9 of Toronto	57	159	331	110	657	0%	0	100%	657	100%	
PD 10 of Toronto	62	11	69	0	142	0%	0	100%	142	100%	
PD 11 of Toronto	0	0	39	0	39	0%	0	100%	39	100%	
PD 12 of Toronto	0	15	0	0	15	0%	0	100%	15	100%	
PD 13 of Toronto	0	0	8	43	51	0%	0	100%	51	100%	
PD 16 of Toronto	0	15	0	0	15	0%	0	100%	15	100%	
Oshawa	0	0	22	0	22	0%	0	100%	22	100%	
East Gwillimbury	43	0	0	0	43	100%	43	0%	0	100%	
Newmarket	0	30	57	0	87	100%	87	0%	0	100%	
Aurora	22	20	11	0	53	100%	53	0%	0	100%	
Richmond Hill	0	40	0	28	68	70%	48	30%	20	100%	
Markham	23	23	73	0	119	30%	36	70%	83	100%	
King	0	34	104	26	164	100%	164	0%	0	100%	
Vaughan	271	352	225	208	1056	15%	158	85%	898	100%	
Caledon	440	677	652	613	2382	50%	1191	50%	1191	100%	
Brampton	75	195	273	136	679	0%	0	100%	679	100%	
Mississauga	133	206	147	214	700	0%	0	100%	700	100%	
Halton Hills	0	18	16	0	34	35%	12	65%	22	100%	
Oakville	0	0	20	20	40	0%	0	100%	40	100%	
Burlington	0	20	0	0	20	0%	0	100%	20	100%	
Orangeville	20	17	26	38	101	100%	101	0%	0	100%	
Barrie	0	0	14	0	14	100%	14	0%	0	100%	
Bradford-West Gwillimbury	0	42	0	10	52	100%	52	0%	0	100%	
New Tecumseth	0	0	43	0	43	100%	43	0%	0	100%	
Adjala-Tosorontio	0	0	43	0	43	100%	43	0%	0	100%	
Essa	0	0	0	22	22	100%	22	0%	0	100%	
Springwater	0	0	9	0	9	100%	9	0%	0	100%	
Tiny	0	0	0	13	13	100%	13	0%	0	100%	
Mono	0	30	14	0	44	100%	44	0%	0	100%	
Total	1402	2090	2672	1585	7749		2133		5616		
							28%		72%		

PM OUT

Fri Jan 21 2022 14:48:04 GMT-0500 (Eastern Standard Time) - Run Time: 4078ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of destination - pd_dest
Column: 2006 GTA zone of origin - gta06_orig

Filters:
(2006 GTA zone of origin - gta06_orig In 3192, 3193, 3194, 3190
and
Start time of trip - start_time In 1530-1930
and
Trip purpose of origin - purp_orig In H
and
Age of person - age In 18-99
and
Primary travel mode of trip - mode_prime Not In O,S,9)

Trip 2016
Table:

,3190,3192,3193,3194
PD 1 of Toronto,0,34,12,0
PD 5 of Toronto,9,0,0,40
PD 9 of Toronto,0,0,31,0
PD 10 of Toronto,0,20,0,0
PD 12 of Toronto,0,0,14,0
Vaughan,0,272,33,11
Caledon,112,233,483,303
Brampton,0,30,25,18
Mississauga,0,0,50,0
Halton Hills,0,20,0,0
Erin,0,0,25,0
Orangeville,0,0,43,0
New Tecumseth,0,0,15,0
Adjala-Tosorontio,0,0,0,13
Collingwood,0,11,0,0

TTS Detailed Distribution - PM Peak OUT

Planning District	Household Zones				Total	North		South	
	3190	3192	3193	3194	%	#	%	#	
PD 1 of Toronto	0	34	12	0	46	0%	0	100%	46
PD 5 of Toronto	9	0	0	40	49	0%	0	100%	49
PD 9 of Toronto	0	0	31	0	31	0%	0	100%	31
PD 10 of Toronto	0	20	0	0	20	0%	0	100%	20
PD 12 of Toronto	0	0	14	0	14	0%	0	100%	14
Vaughan	0	272	33	11	316	20%	63	80%	253
Caledon	112	233	483	303	1131	50%	566	50%	566
Brampton	0	30	25	18	73	0%	0	100%	73
Mississauga	0	0	50	0	50	0%	0	100%	50
Halton Hills	0	20	0	0	20	50%	10	50%	10
Erin	0	0	25	0	25	100%	25	0%	0
Orangeville	0	0	43	0	43	100%	43	0%	0
New Tecumseth	0	0	15	0	15	100%	15	0%	0
Adjala-Tosorontio	0	0	0	13	13	100%	13	0%	0
Collingwood	0	11	0	0	11	100%	11	0%	0
Total	121	620	731	385	1857		746		1112
							40%		60%