

TRAFFIC OPERATIONS ASSESSMENT ADDENDUM

13290 NUNNVILLE ROAD

TOWN OF CALEDON

**TOWN OF CALEDON
PLANNING
RECEIVED**

Mar 23, 2023

**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
UPDATED: MARCH 2023**

CFCA FILE NO. 0649-6278

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Revision Number	Date	Comments
Rev.0	April 2022	Issued for Client Review
Rev.1	April 2022	Issued for Submission
Rev.2	March 2023	Issued for Re-Submission

Executive Summary

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) application for the property located at 13290 Nunnville Road in the Town of Caledon.

A TOA was previously prepared in April 2022. This TOA Addendum addressed the Town of Caledon's first submission comments as well as summarizes the changes in the most recent Site Plan.

The Site 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 Site Plan prepared by VA3 Design, dated March 01, 2023. Any minor changes to the Site 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 26.8 and 20.1 seconds for the weekday A.M. and P.M. peak hours, respectively. The highest volume to capacity ratio of 0.08 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 periods, respectively. The future background conditions are expected to be similar to 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 small impact on the surrounding road network with no change in Level of Service expected in the peak hours compared to both the existing and future background operations.

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).

A review of the Town's parking By-Law requirements indicates that the total parking supply for both residential and visitor parking spaces is sufficient.

Therefore, the Zoning By-Law Amendment (ZBA) and Official Plan Amendment (OPA) can be supported from a transportation perspective.

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1.0 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.

A TOA was previously prepared in April 2022. This TOA Addendum addresses the Town of Caledon first submission comments, which are also responded to in a response matrix that is included under separate cover as part of the re-submission package.

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

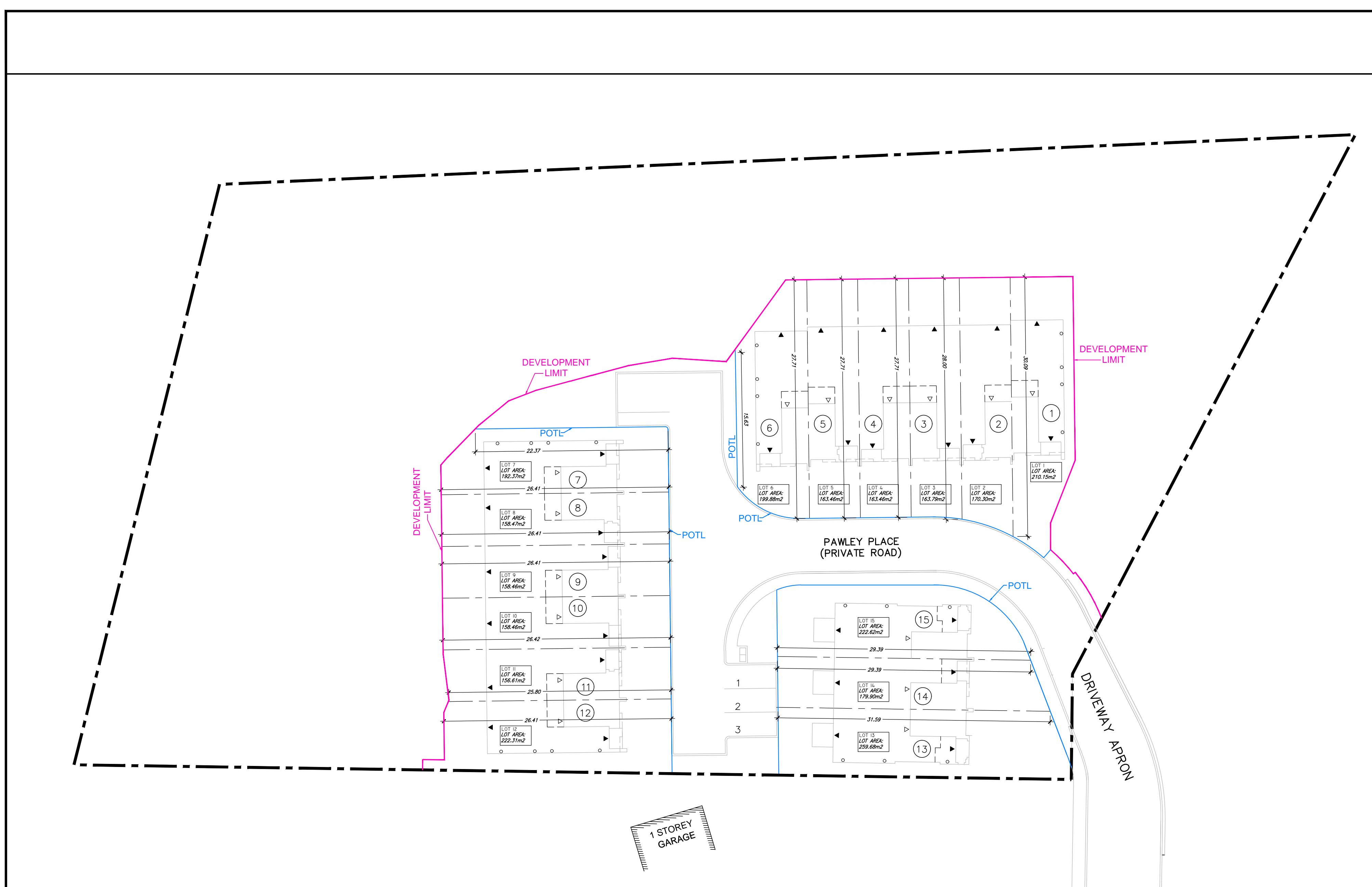
The study has been completed in accordance with the Terms of Reference and scope of work approved by Town of Caledon Staff. A scope of work was sent to Town of Caledon Staff on January 21, 2022, and comments were received on February 3, 2022. (Provided in **Appendix A**).

2.0 Existing Conditions

2.1 Development Lands

The proposed development covers an area approximately 0.86 ha. The latest Site 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.

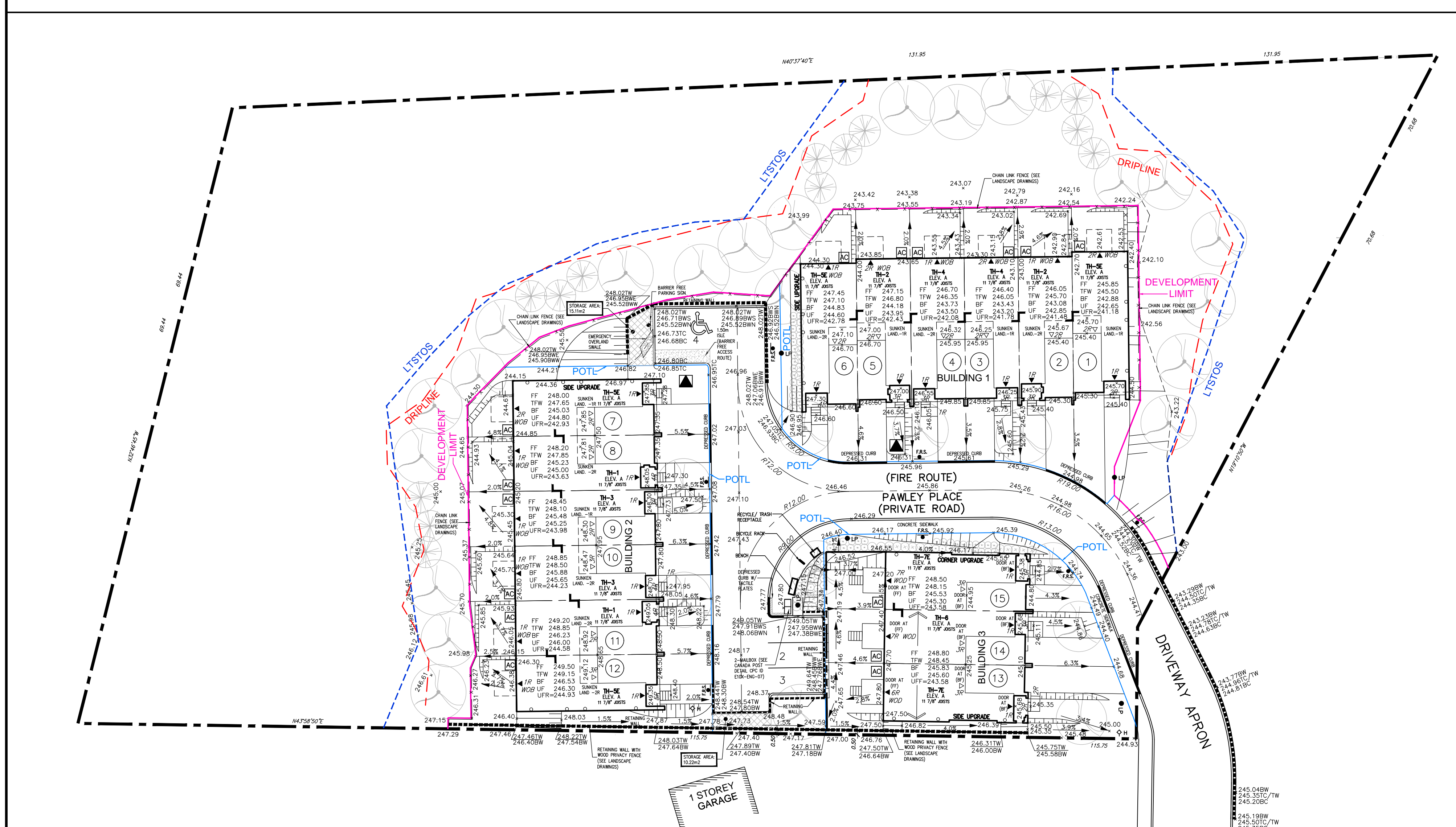
The latest Site Plan prepared by VA3 Design is included in **Figure 1** dated March 01, 2023.



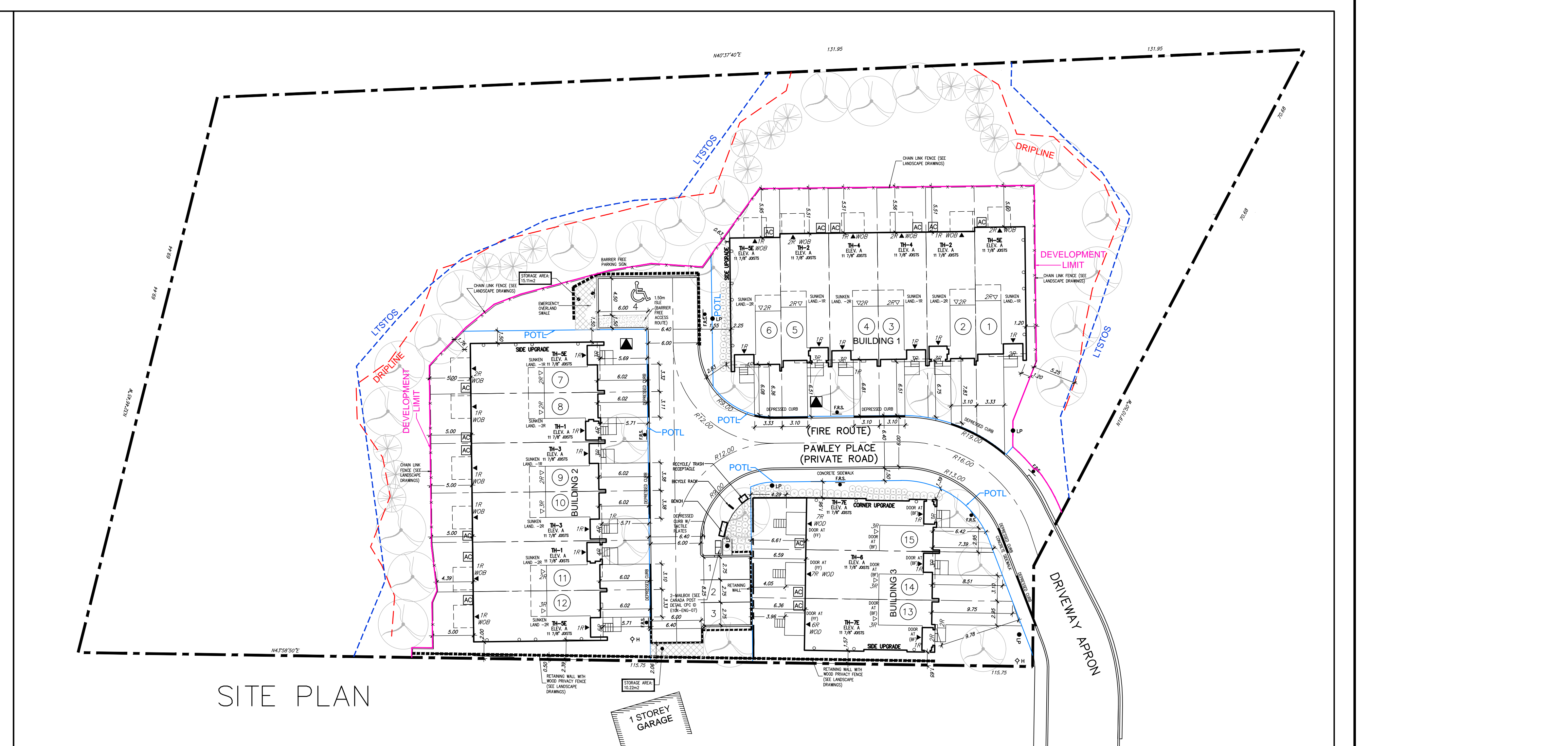
POTL PLAN



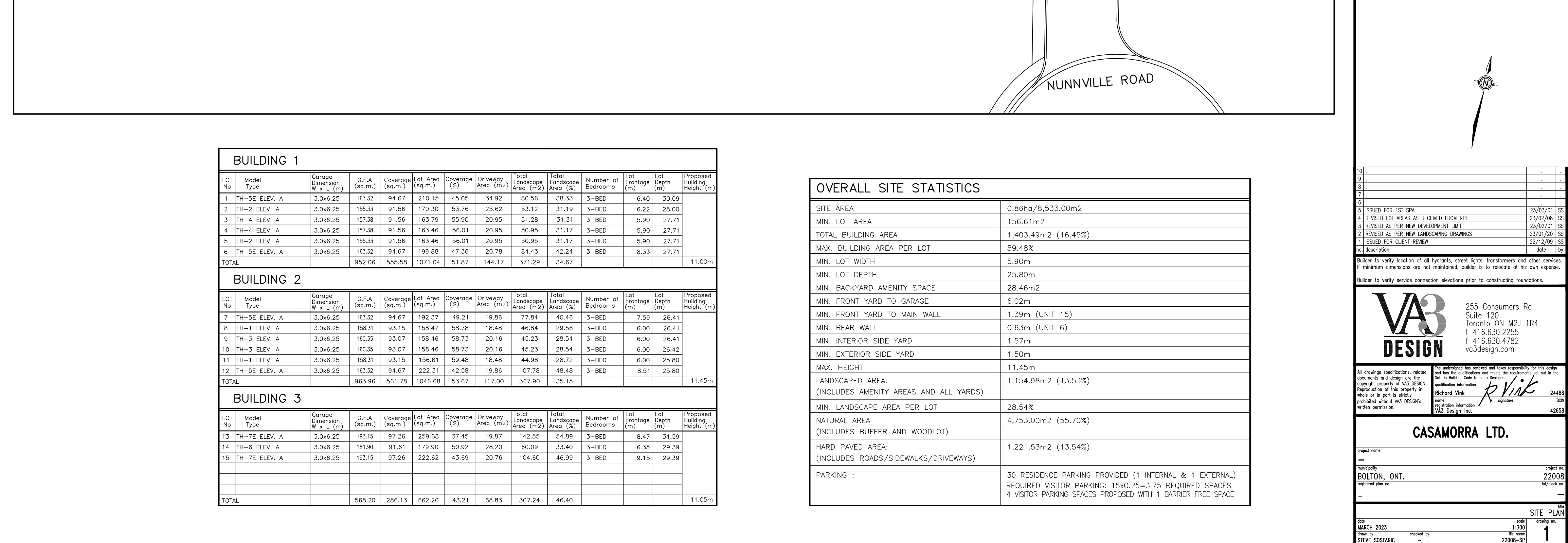
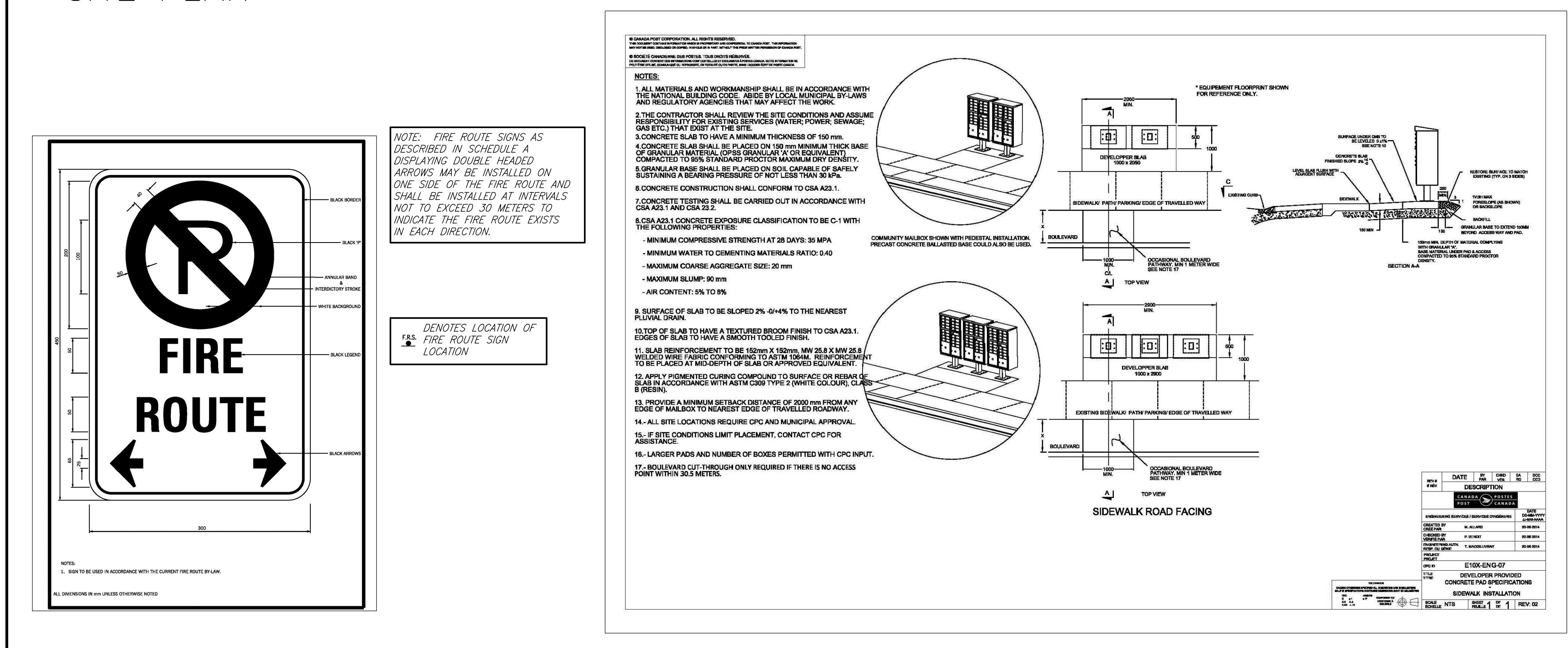
ENVIRONMENTAL AREA PLAN



SITE PLAN



SITE PLAN



2.2 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.

2.3 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 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.

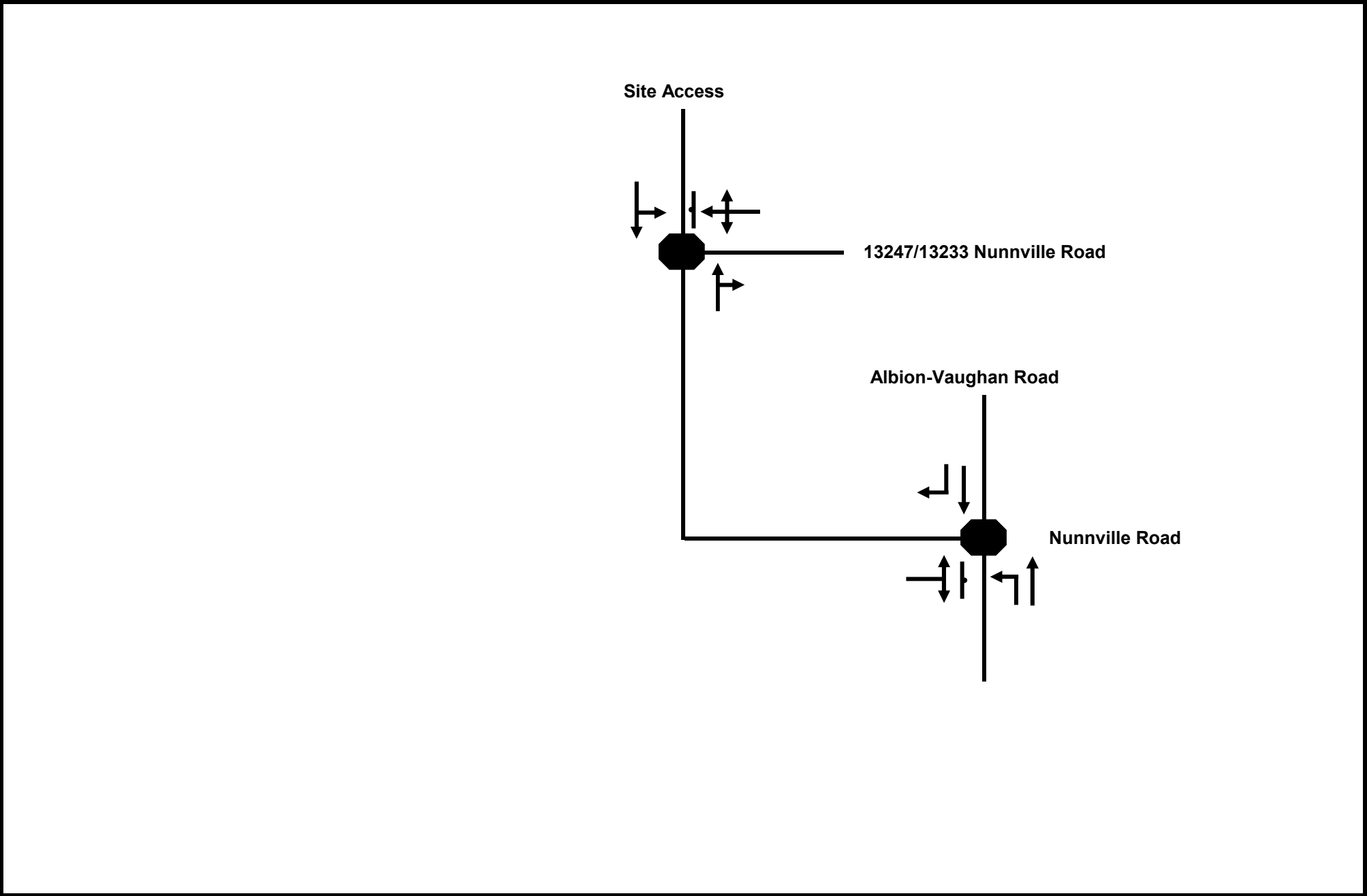
2.4 Traffic Data

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.

2.5 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**.

Per Town staff request, the traffic analysis for existing and future conditions has been updated to reflect a Peak Hour Factor (PHF) of 1.0 for all movements.



Legend

- xx A.M. Peak Hour Traffic Volumes
- {xx} P.M. Peak Hour Traffic Volumes
- {xx} Weekend Peak Hour Traffic Volumes

13290 Nunnville Road

Study Roadways



Figure 2

Project No. 0649-6278
Date. 2023. 2. 22
Analyst. Aarzo D

2.6 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

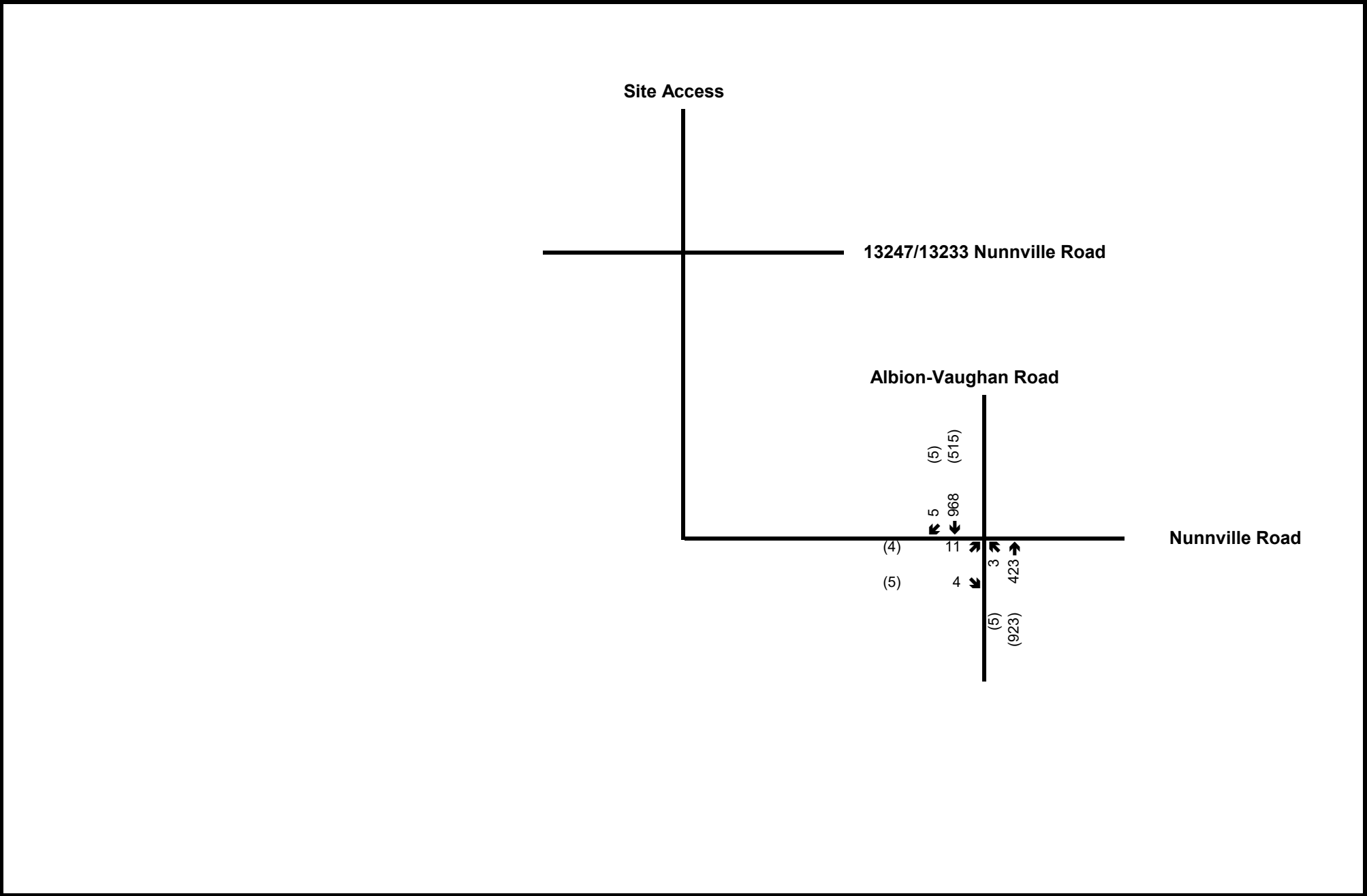
Intersection	Control	Peak Hour	Level of Service	Control Delay (s)	Maximum V/C Ratio > 0.85 ² (Approach)	95 th Percentile Queue Length > Storage Length
Albion-Vaughan Road at Nunnville Road	Stop Controlled	Weekday A.M.	D	26.8	0.08 (EB)	None
		Weekday P.M.	C	20.1	0.04 (EB)	None

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 0.08 was observed for the eastbound movement during the weekday A.M. peak hour.

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



3.0 Future Background Conditions

3.1 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.

3.2 Traffic Growth Rates and Background Development

In the previous submission, the traffic growth rate was 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% was assumed along Albion-Vaughan Road for through traffic only.

However, per Town staff request, the future analyses have been updated to assume a growth rate of 2% for through traffic volumes along Albion Vaughan Road as this area of the Town is still under development.

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.

3.3 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 (s)	Maximum V/C Ratio > 0.85 ² (Approach)	95 th Percentile Queue Length > Storage Length
Albion-Vaughan Road at Nunnville Road	Stop Controlled	Weekday A.M.	D	33.4	0.23 (EB)	None
		Weekday P.M.	C	23.4	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	0.01 (WB)	None

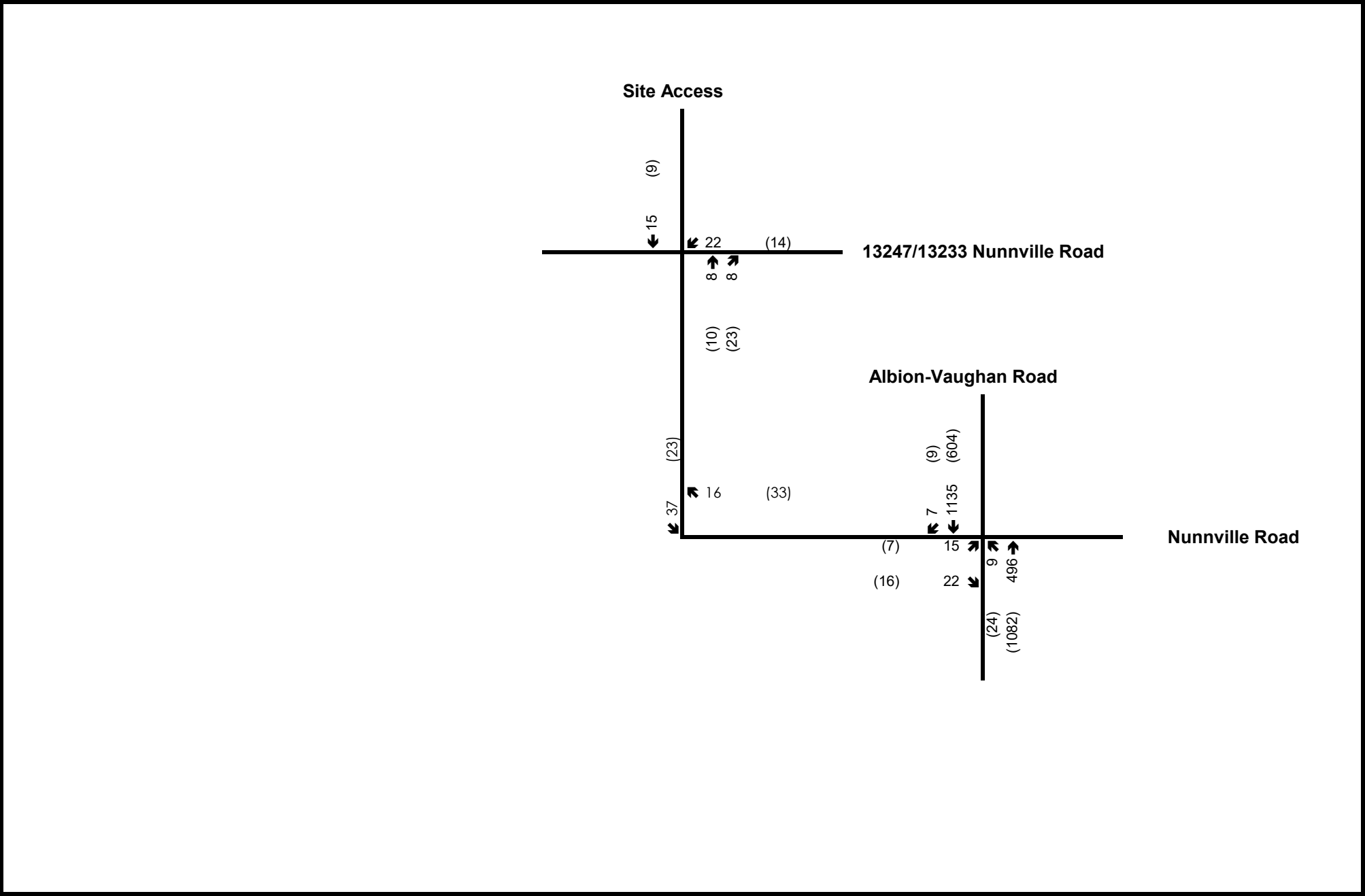
Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU). The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach (HCM 2000).

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 hours. 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 hours with a control delay of 8.7 seconds.

No geometric improvements are recommended under the future background conditions.



4.0 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 VA3, 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.

5.0 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 study intersections.

5.1 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**. It is noted that the average rate was used rather than the fitted equation rates since they provided a more conservative estimate of trip generation rates for the development.

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.	0.48 per unit	2 (31%)	5 (69%)	7
		P.M.	0.57 per unit	5 (57%)	4 (43%)	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.

5.2 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%

6.0 Future Total Traffic Conditions

6.1 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 6**.

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

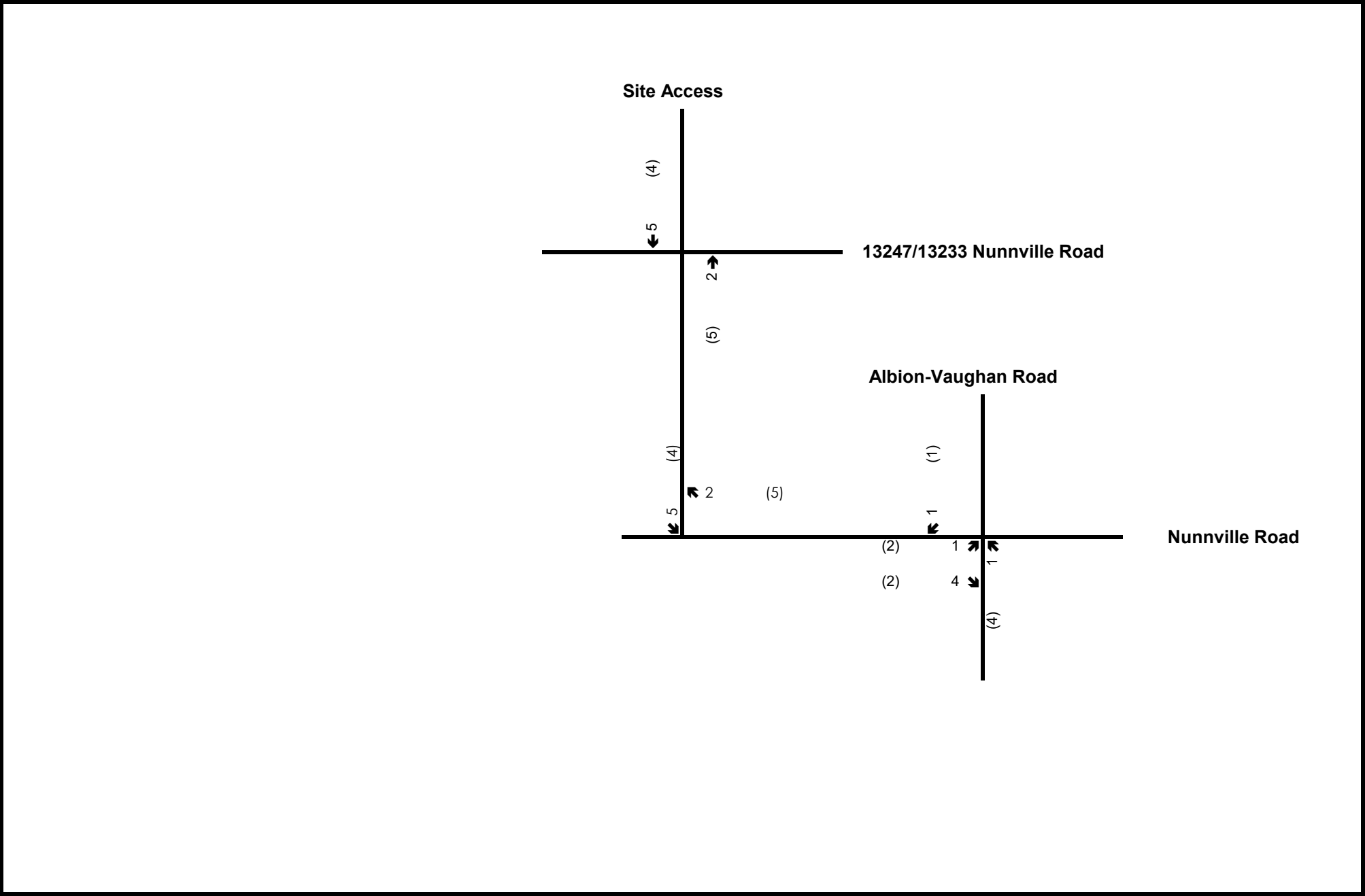
Intersection	Control	Peak Hour	Level of Service ¹	Control Delay (s)	Maximum V/C Ratio > 0.85 ² (Approach)	95 th Percentile Queue Length > Storage Length
Albion-Vaughan Road at Nunnville Road	Stop Controlled	A.M.	D	34.7	0.26 (EB)	None
		P.M.	C	24.9	0.13 (EB)	None
13247 & 13233 Nunnville Rd at Nunnville Road	Stop Controlled (Minor)	A.M.	A	8.8	0.02 (WB)	None
		P.M.	A	8.8	0.01 (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).

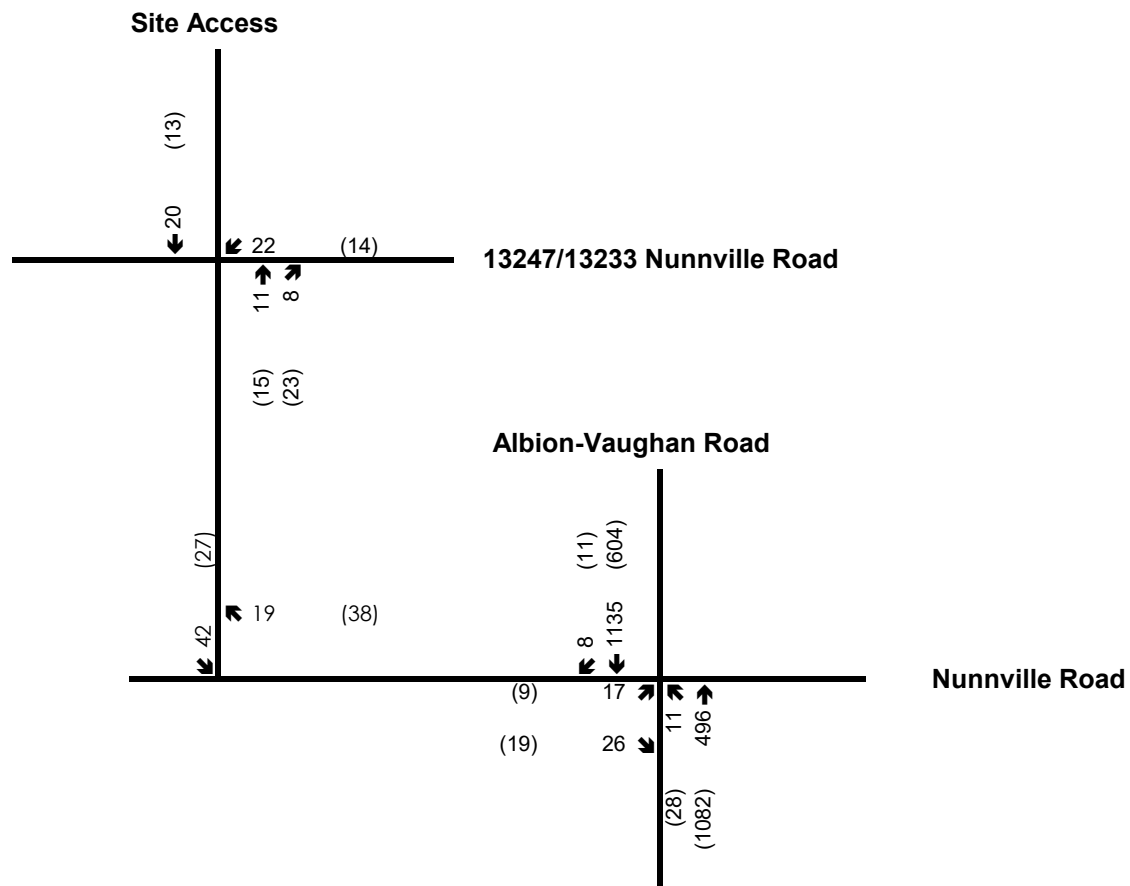
Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection. In addition, all v/c ratios greater than 0.85 are outlined and highlighted.

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. The intersection is expected to experience a similar Level of Service as existing conditions. A maximum volume-to-capacity ratio of 0.26 was observed for the eastbound movement on the minor leg during the weekday A.M. peak hour. A maximum increase in control delay of 7.9 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 maximum 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 xx A.M. Peak Hour Traffic Volumes {xx} P.M. Peak Hour Traffic Volumes {xx} Weekend Peak Hour Traffic Volumes	13290 Nunnville Road	 CROZIER CONSULTING ENGINEERS	Figure 5
	Site Trip Assignment		Project No. 0649-6278 Date. 2023. 2. 22 Analyst. Aarzo D



7.0 Site Access Review

7.1 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 the cul-de-sac. The entering stream distance is calculated with the assumed design speed of 50 kmph at Nunnville Road.

Figure 7 and Figure 8 show the sight distance analysis for the proposed site access as a vehicle approaches the existing cul-de-sac and once the vehicle reaches the cul-de-sac respectively. It is noted that three trees are currently planted in the middle of the cul-de-sac but that only the coniferous tree (shown in red) would be expected to impact vehicle sightlines, which can be seen in the Google image in **Figure 7 and Figure 8**.

Per the results, the proposed shared driveway via the cul-de-sac is expected to provide sufficient visibility to drivers on the roadway since even though there is a small blind spot due to the tree location. This is because the blind spot is only approximately one vehicle car in length and the approaching vehicle would be able to see this vehicle as it approaches the cul-de-sac before stopping.

7.2 Dimensional Review

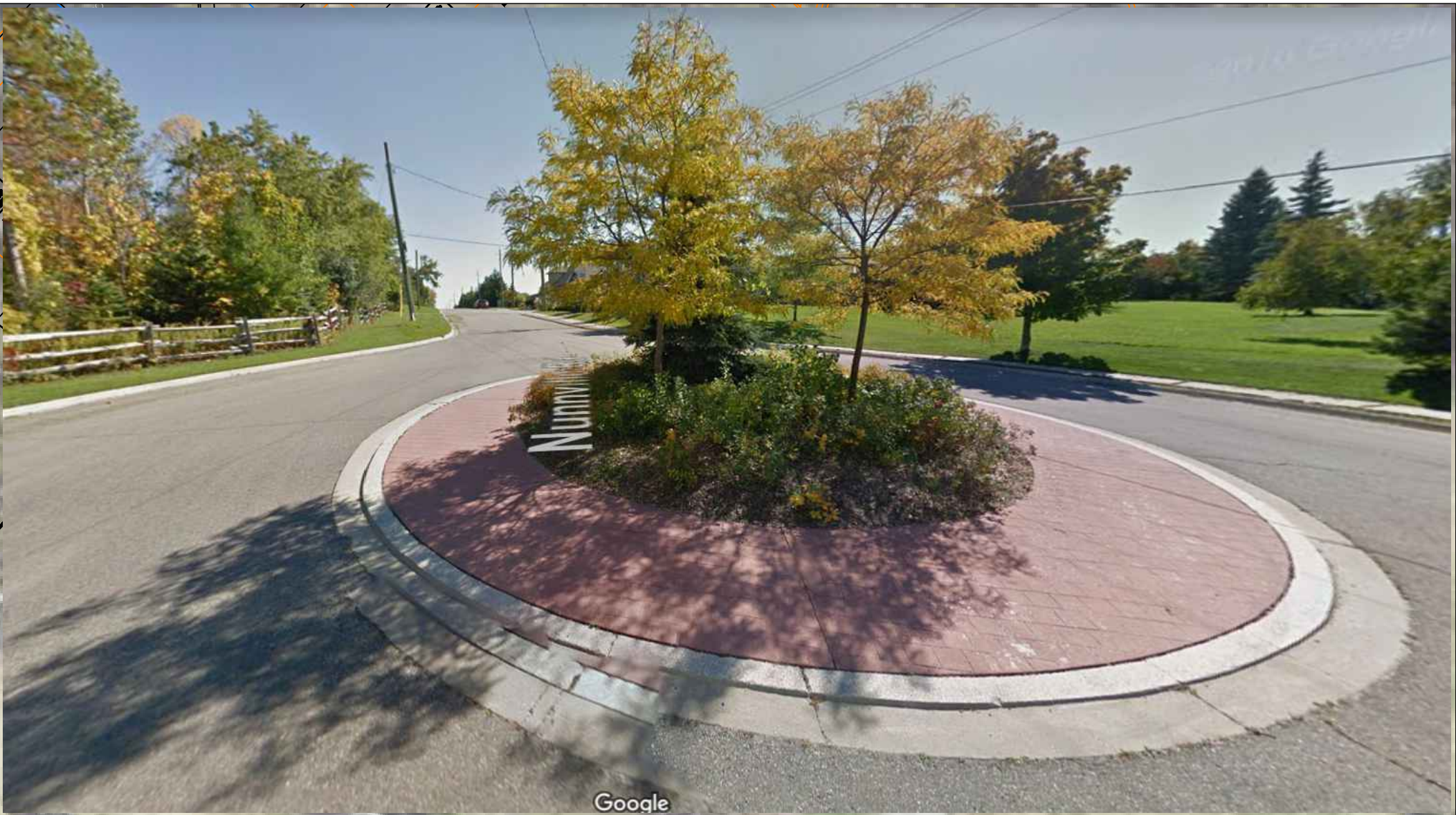
The width and curb radii were reviewed per the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR).

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 radius 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 9 shows the proposed dimensions.



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-GDGR.

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

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

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- THE STREET VIEW IMAGE REFERRED IN SIGHT DISTANCE DRAWING IS TAKEN FROM GOOGLE MAPS DATED SEPTEMBER 2014.

No.	ISSUE	DATE: MMM/DD/YYYY
0	ISSUED FOR REVIEW	04/04/2022
1	ISSUED FOR SUBMISSION	03/06/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

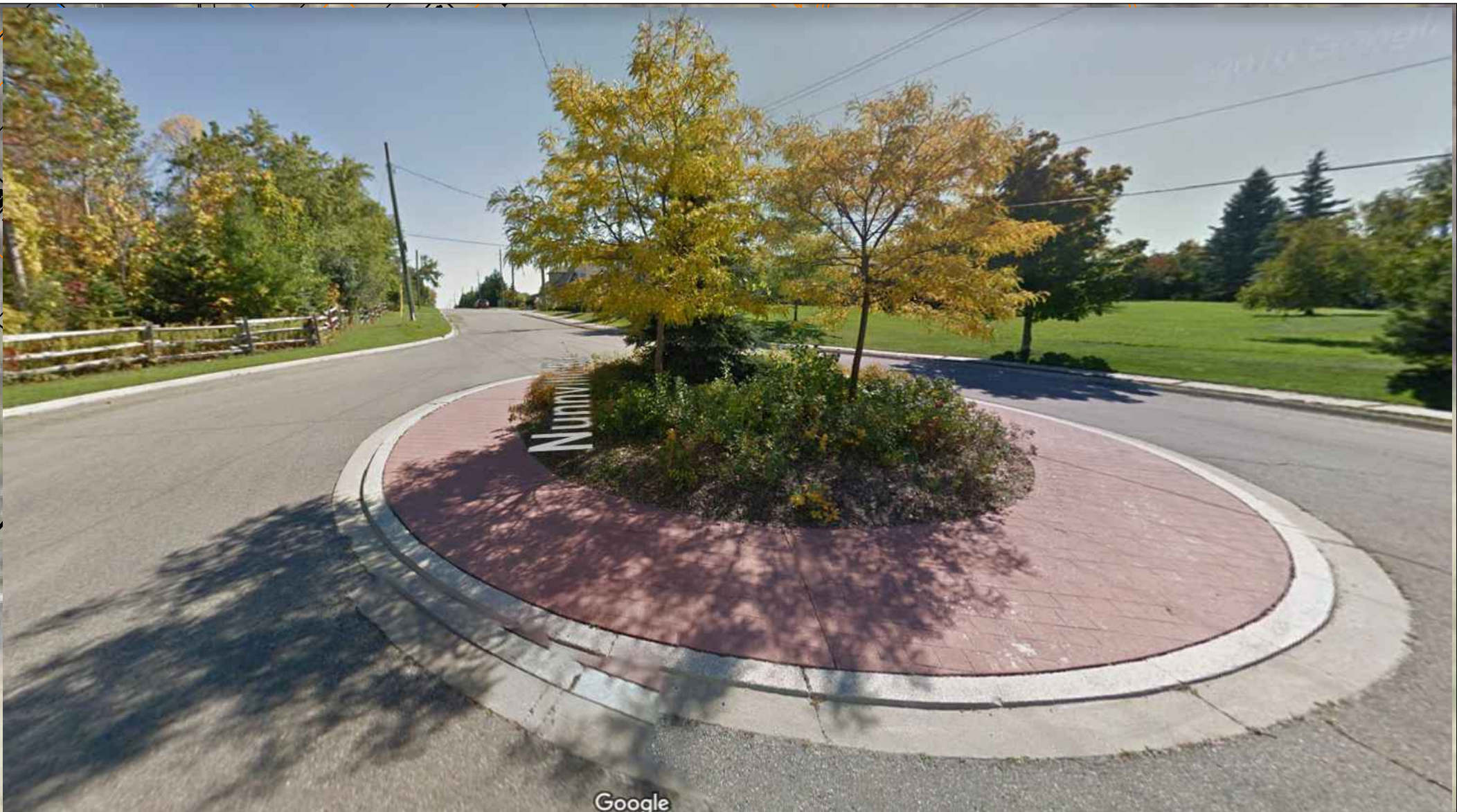
Project
13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing
SIGHT DISTANCE ANALYSIS
STAGE 1



2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905-875-0026 T
905-875-4915 F
info@cfcrozier.ca

Drawn By	A.D.	Design By	A.D.	Project	0649-6278
Check By	B.B.	Check By	B.B.	Scale	1:500
				Drawing	FIG 7



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-GDGR.

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

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

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- THE STREET VIEW IMAGE REFERRED IN SIGHT DISTANCE DRAWING IS TAKEN FROM GOOGLE MAPS DATED SEPTEMBER 2014.

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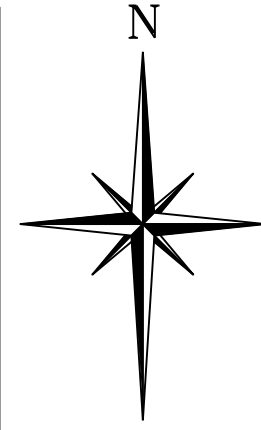
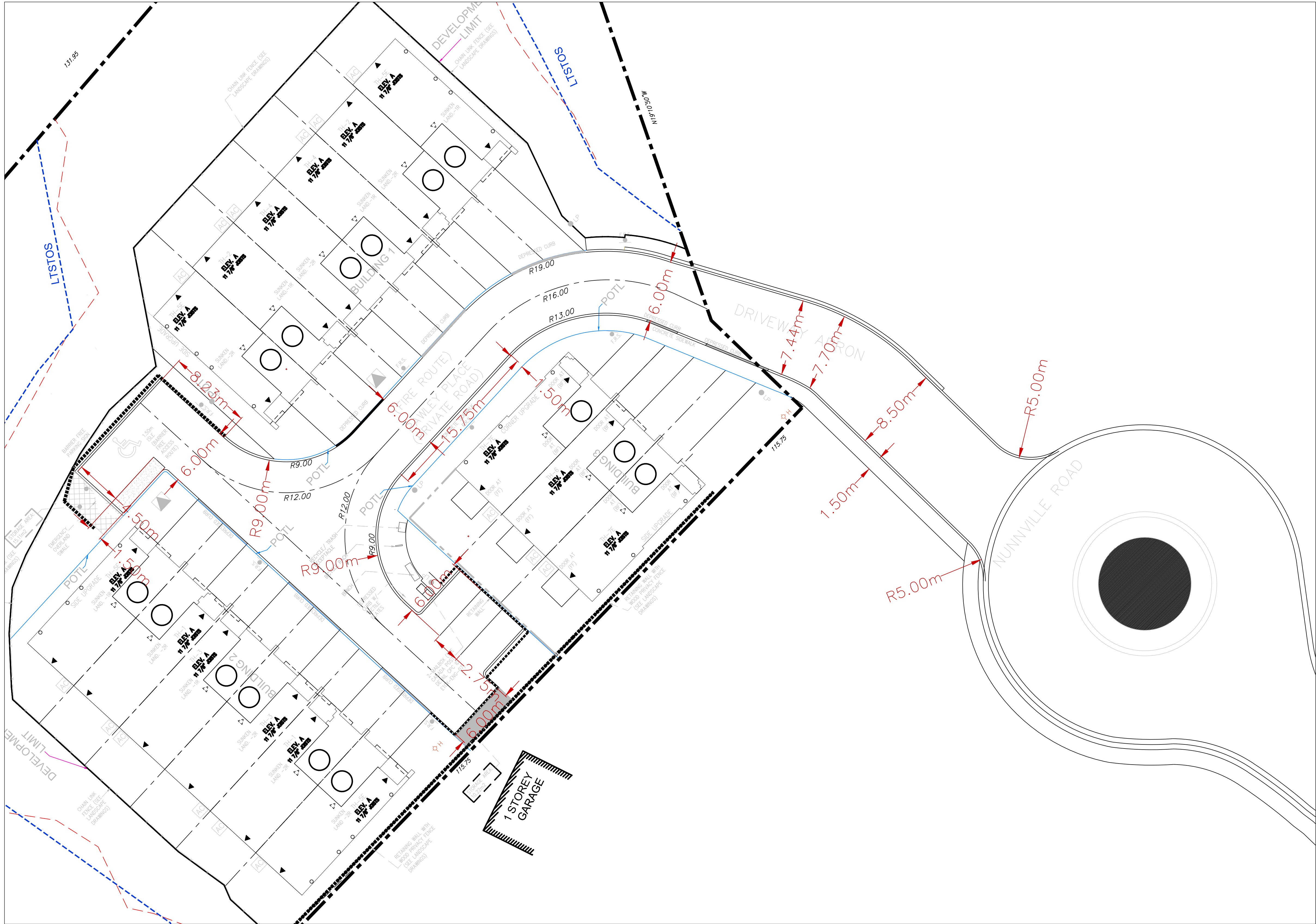
Project
13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing
SIGHT DISTANCE ANALYSIS
STAGE 2



2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905-875-0026 T
905-875-4915 F
www.cfcrozier.ca
info@cfcrozier.ca

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Check By	B.B.	Check By	B.B.	Scale	1:500
				Drawing	FIG 8



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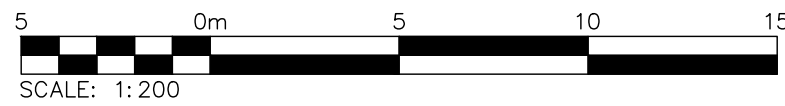
Project
**13290 NUNNVILLE ROAD
TOWN OF CALEDON**

Drawing
DIMENSIONAL REVIEW



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				Drawing	FIG 9



8.0 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.

8.1 Waste Vehicles

A maneuvering assessment was conducted for a Region of Peel side-loading vehicle as shown in **Figure 10-A and Figure 10-B** for the inbound and outbound maneuvers respectively.

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.

8.2 Emergency Vehicles

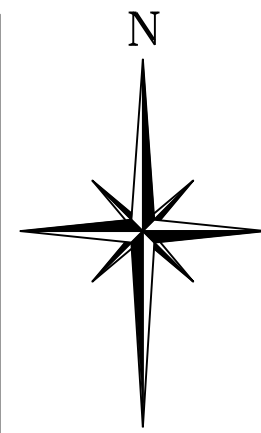
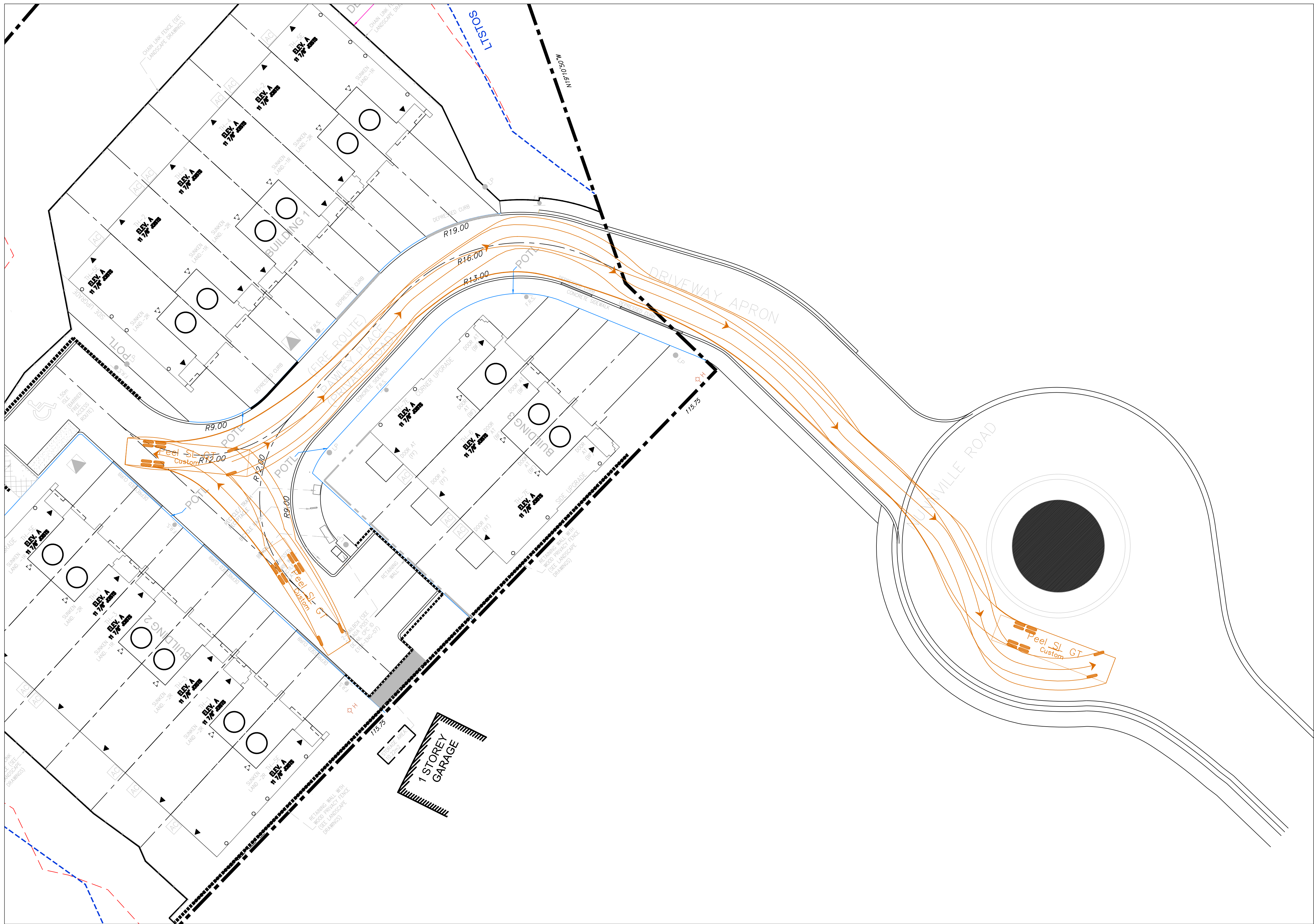
A maneuvering assessment was undertaken to verify the maneuvering of a pumper fire truck measuring 12.19 m in and out of the proposed site. As shown in **Figure 11-A and Figure 11-B**, the vehicle can enter and exit the site with no issues for the inbound and outbound maneuvers respectively. The vehicle must briefly reverse using the hammerhead to exit the site similar to the waste vehicle.

8.3 Passenger Vehicles

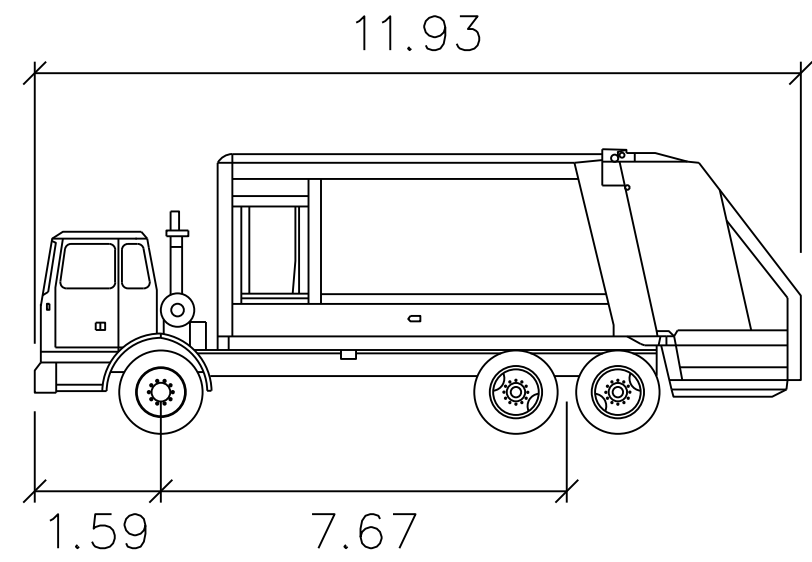
A maneuvering assessment was conducted using a Passenger TAC (P-TAC) vehicle as shown in **Figure 12**, which demonstrates that passenger vehicles can enter and exit the property via driveway simultaneously without encroaching on each other's respective paths.

Critical parking spots were analyzed as shown in **Figure 13 and Figure 14**. 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.



VEHICLE 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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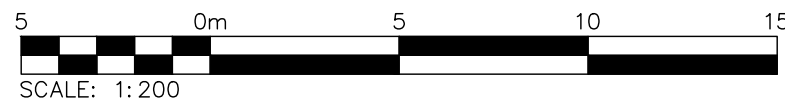
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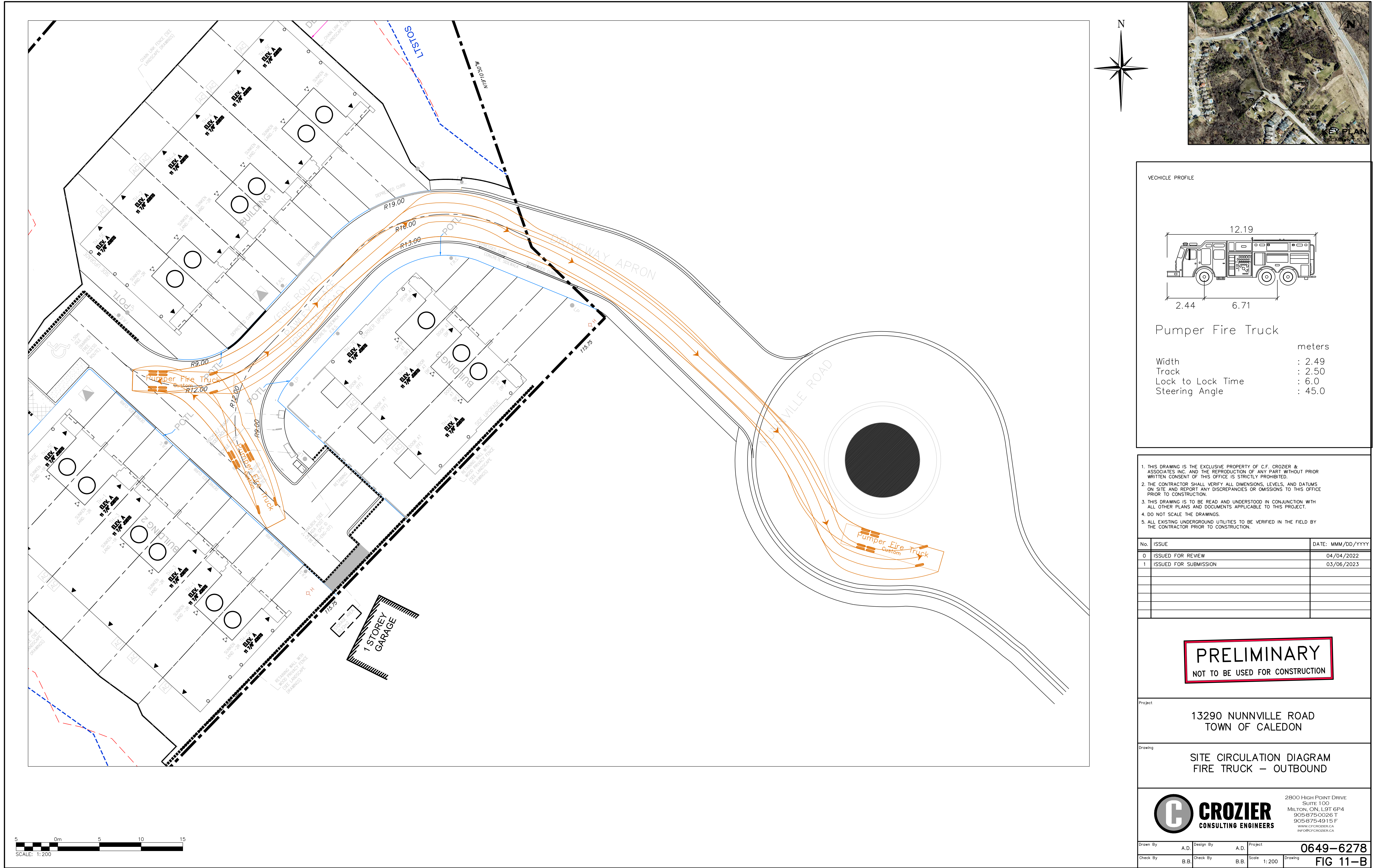
Drawing
SITE CIRCULATION DIAGRAM
GARBAGE TRUCK – OUTBOUND



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				Drawing	FIG 10-B





VEHICLE PROFILE

Pumper Fire Truck

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

units: meters

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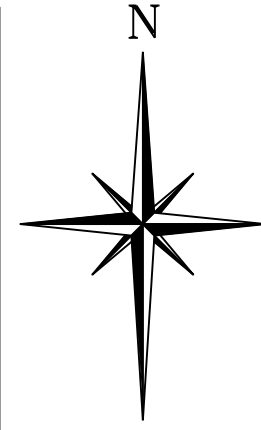
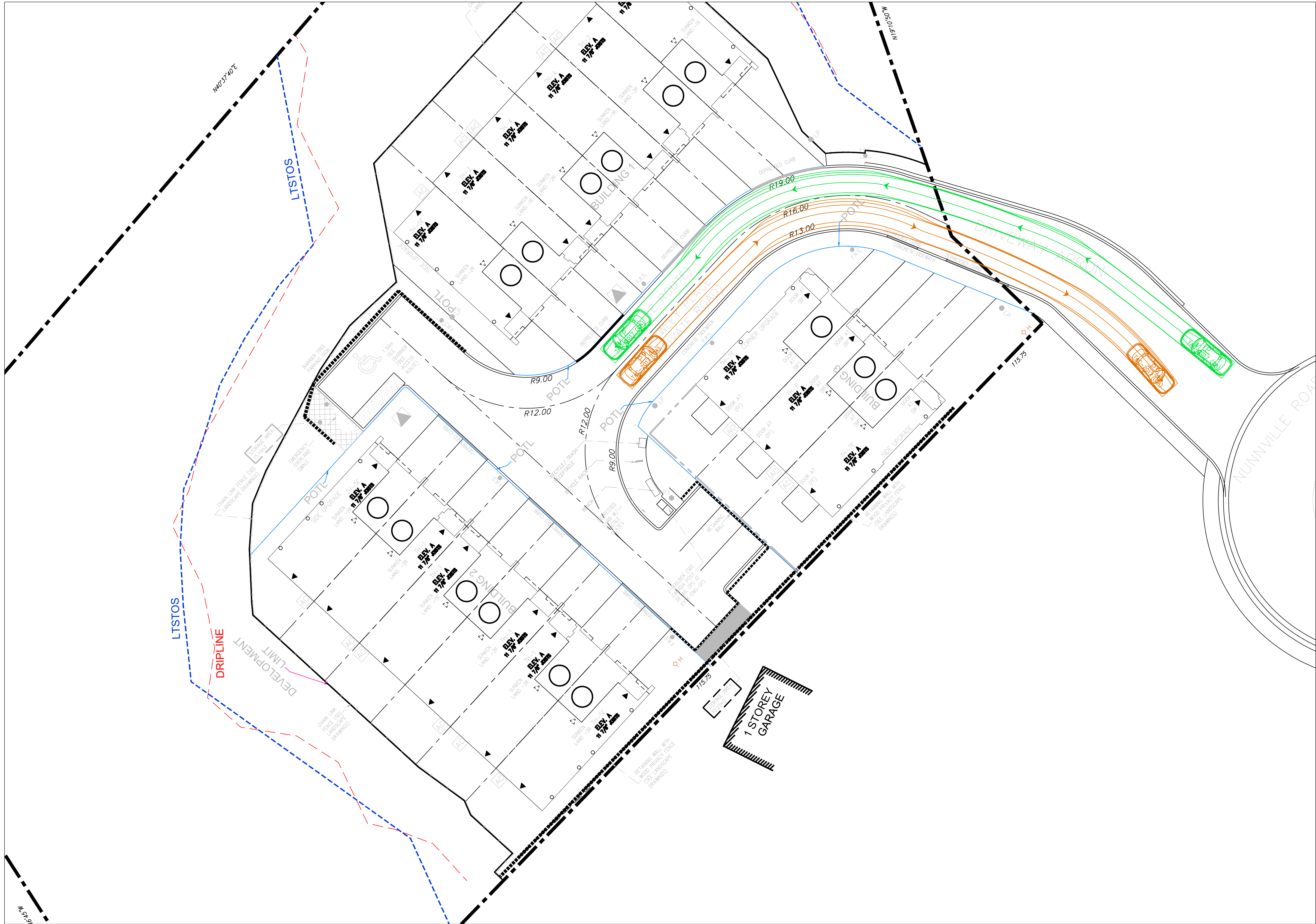
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TOWN OF CALEDON

Drawing
SITE CIRCULATION DIAGRAM
FIRE TRUCK – OUTBOUND

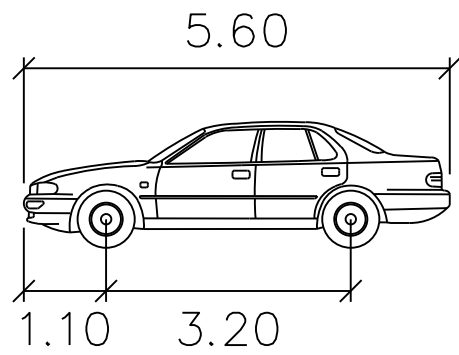
CROZIER
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				Drawing	FIG 11-B



VEHICLE PROFILE



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

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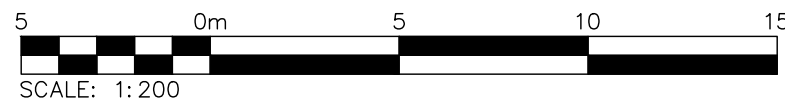
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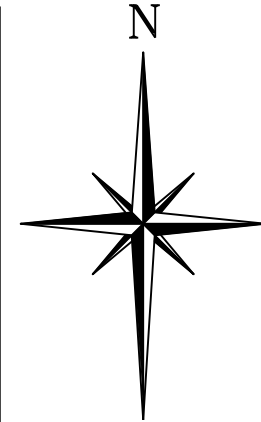
Drawing
SITE CIRCULATION DIAGRAM
PASSENGER CAR



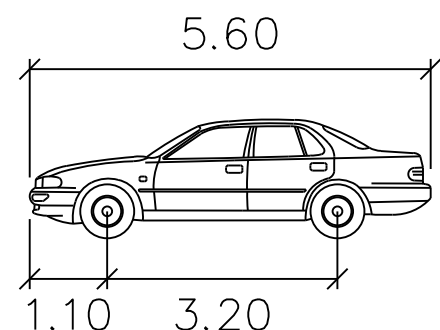
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				Drawing	FIG 12





VEHICLE PROFILE



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

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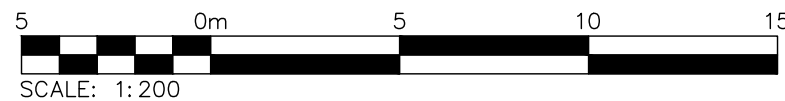
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13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing
SITE CIRCULATION DIAGRAM
PASSENGER CAR – INBOUND



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Milton, ON L9T 6P4
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9.0 Parking Review

9.1 Parking Requirements

To determine the required parking of the proposed residential development, the Town of Caledon Zoning By-Law 2006-50 Section 5 (revised June 3, 2022) was reviewed.

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 2015-058, which stipulates that 1 Type A parking space be required when the number of required spaces is between 1-12 spaces.

None of the residential parking spaces are proposed to be accessible since they are located within the residential driveways.

10.0 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 similar 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

AD/BB

C.F. CROZIER & ASSOCIATES INC.



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

APPENDIX A

Town Correspondence

Aarzo Dhanani

From: Aarzo 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,

Aarzo

From: Jillian Britto <Jillian.Britto@caledon.ca>
Sent: February 3, 2022 11:50 AM
To: Aarzo 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 Aarzo,

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

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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)

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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 Connections: [!\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#) [!\[\]\(882be629d4a853dc90d60f084b0d185d_img.jpg\)](#) [!\[\]\(cadb1a36ec331fde129feec52622b01a_img.jpg\)](#) [!\[\]\(993d39f42bf03c4f62d9b7c594e41af9_img.jpg\)](#)

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,

Aarzo Dhanani

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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%	-

APPENDIX C

LOS 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

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	0.964					0.850
Flt Protected	0.965		0.950			
Satd. Flow (prot)	1787	0	1825	1830	1902	1633
Flt Permitted	0.965		0.950			
Satd. Flow (perm)	1787	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	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	11	4	3	423	968	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	15	0	3	423	968	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	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	11	4	3	423	968	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	1397	968	973			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1397	968	973			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	99	100			
cM capacity (veh/h)	156	311	717			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	15	3	423	968	5	
Volume Left	11	3	0	0	0	
Volume Right	4	0	0	0	5	
cSH	180	717	1700	1700	1700	
Volume to Capacity	0.08	0.00	0.25	0.57	0.00	
Queue Length 95th (m)	2.0	0.1	0.0	0.0	0.0	
Control Delay (s)	26.8	10.0	0.0	0.0	0.0	
Lane LOS	D	B				
Approach Delay (s)	26.8	0.1	0.0			
Approach LOS	D					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			60.9%		ICU Level of Service	
Analysis Period (min)			15		B	























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	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	4	5	5	923	515	5
Shared Lane Traffic (%)						
Lane Group Flow (vph)	9	0	5	923	515	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	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	4	5	5	923	515	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	1448	515	520			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1448	515	520			
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)	145	564	1056			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	9	5	923	515	5	
Volume Left	4	5	0	0	0	
Volume Right	5	0	0	0	5	
cSH	247	1056	1700	1700	1700	
Volume to Capacity	0.04	0.00	0.54	0.30	0.00	
Queue Length 95th (m)	0.9	0.1	0.0	0.0	0.0	
Control Delay (s)	20.1	8.4	0.0	0.0	0.0	
Lane LOS	C	A				
Approach Delay (s)	20.1	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	496	1135	7
Future Volume (vph)	15	22	9	496	1135	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	0.920					0.850
Flt Protected	0.980		0.950			
Satd. Flow (prot)	1732	0	1825	1830	1902	1633
Flt Permitted	0.980		0.950			
Satd. Flow (perm)	1732	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	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	15	22	9	496	1135	7
Shared Lane Traffic (%)						
Lane Group Flow (vph)	37	0	9	496	1135	7
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	69.7%			ICU Level of Service C		
Analysis Period (min)	15					












						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	22	9	496	1135	7
Future Volume (Veh/h)	15	22	9	496	1135	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	15	22	9	496	1135	7
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	1649	1135	1142			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1649	1135	1142			
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	99			
cM capacity (veh/h)	108	249	619			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	37	9	496	1135	7	
Volume Left	15	9	0	0	0	
Volume Right	22	0	0	0	7	
cSH	163	619	1700	1700	1700	
Volume to Capacity	0.23	0.01	0.29	0.67	0.00	
Queue Length 95th (m)	6.4	0.3	0.0	0.0	0.0	
Control Delay (s)	33.4	10.9	0.0	0.0	0.0	
Lane LOS	D	B				
Approach Delay (s)	33.4	0.2		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization			69.7%		ICU Level of Service	
Analysis Period (min)			15			
			C			










						
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	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	22	0	8	8	0	15
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	0	16	0	0	15
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	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	22	0	8	8	0	15
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	27	12			16	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	27	12			16	
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)	988	1069			1602	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	22	16	15			
Volume Left	22	0	0			
Volume Right	0	8	0			
cSH	988	1700	1602			
Volume to Capacity	0.02	0.01	0.00			
Queue Length 95th (m)	0.5	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	1082	604	9
Future Volume (vph)	7	16	24	1082	604	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	0.906					0.850
Flt Protected	0.985		0.950			
Satd. Flow (prot)	1714	0	1825	1830	1902	1633
Flt Permitted	0.985		0.950			
Satd. Flow (perm)	1714	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	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	7	16	24	1082	604	9
Shared Lane Traffic (%)						
Lane Group Flow (vph)	23	0	24	1082	604	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	66.9%			ICU Level of Service C		
Analysis Period (min)	15					

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	16	24	1082	604	9
Future Volume (Veh/h)	7	16	24	1082	604	9
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	7	16	24	1082	604	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	1734	604	613			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1734	604	613			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	93	97	98			
cM capacity (veh/h)	95	502	976			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	23	24	1082	604	9	
Volume Left	7	24	0	0	0	
Volume Right	16	0	0	0	9	
cSH	218	976	1700	1700	1700	
Volume to Capacity	0.11	0.02	0.64	0.36	0.01	
Queue Length 95th (m)	2.6	0.6	0.0	0.0	0.0	
Control Delay (s)	23.4	8.8	0.0	0.0	0.0	
Lane LOS	C	A				
Approach Delay (s)	23.4	0.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			66.9%		ICU Level of Service	
Analysis Period (min)			15			
			C			

						
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	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	14	0	10	23	0	9
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	33	0	0	9
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	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	14	0	10	23	0	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	30	22			33	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	30	22			33	
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	100			100	
cM capacity (veh/h)	984	1056			1579	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	14	33	9			
Volume Left	14	0	0			
Volume Right	0	23	0			
cSH	984	1700	1579			
Volume to Capacity	0.01	0.02	0.00			
Queue Length 95th (m)	0.3	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		2.2				
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	496	1135	8
Future Volume (vph)	17	26	11	496	1135	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	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	17	26	11	496	1135	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	43	0	11	496	1135	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 69.7% ICU Level of Service C						
Analysis Period (min) 15						












						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	26	11	496	1135	8
Future Volume (Veh/h)	17	26	11	496	1135	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	17	26	11	496	1135	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	1653	1135	1143			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1653	1135	1143			
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	90	98			
cM capacity (veh/h)	107	249	619			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	43	11	496	1135	8	
Volume Left	17	11	0	0	0	
Volume Right	26	0	0	0	8	
cSH	164	619	1700	1700	1700	
Volume to Capacity	0.26	0.02	0.29	0.67	0.00	
Queue Length 95th (m)	7.6	0.4	0.0	0.0	0.0	
Control Delay (s)	34.7	10.9	0.0	0.0	0.0	
Lane LOS	D	B				
Approach Delay (s)	34.7	0.2		0.0		
Approach LOS	D					
Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			69.7%	ICU Level of Service		C
Analysis Period (min)			15			












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2: Nunnville Road & Background Site Access










2027 Future Total AM
2022

						
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	0.943					
Flt Protected	0.950					
Satd. Flow (prot)	1789	0	1776	0	0	1883
Flt Permitted	0.950					
Satd. Flow (perm)	1789	0	1776	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	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	22	0	11	8	0	20
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	0	19	0	0	20
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	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	22	0	11	8	0	20
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	35	15			19	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	35	15			19	
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)	978	1065			1597	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	22	19	20			
Volume Left	22	0	0			
Volume Right	0	8	0			
cSH	978	1700	1597			
Volume to Capacity	0.02	0.01	0.00			
Queue Length 95th (m)	0.5	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		3.2				
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	1082	604	11
Future Volume (vph)	9	19	28	1082	604	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	0.908					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)	480.5			176.5	225.3	
Travel Time (s)	36.0			10.6	13.5	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	5%	1%	0%
Adj. Flow (vph)	9	19	28	1082	604	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	28	0	28	1082	604	11
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	66.9%			ICU Level of Service C		
Analysis Period (min)	15					

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	9	19	28	1082	604	11
Future Volume (Veh/h)	9	19	28	1082	604	11
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	9	19	28	1082	604	11
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	1742	604	615			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1742	604	615			
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)	94	502	974			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	28	28	1082	604	11	
Volume Left	9	28	0	0	0	
Volume Right	19	0	0	0	11	
cSH	209	974	1700	1700	1700	
Volume to Capacity	0.13	0.03	0.64	0.36	0.01	
Queue Length 95th (m)	3.5	0.7	0.0	0.0	0.0	
Control Delay (s)	24.9	8.8	0.0	0.0	0.0	
Lane LOS	C	A				
Approach Delay (s)	24.9	0.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			66.9%	ICU Level of Service		C
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	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	14	0	15	23	0	13
Shared Lane Traffic (%)						
Lane Group Flow (vph)	14	0	38	0	0	13
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						

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2027 Future Total PM
2022

						
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	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	14	0	15	23	0	13
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	40	26			38	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	40	26			38	
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	100			100	
cM capacity (veh/h)	972	1049			1572	
Direction, Lane #	WB 1	NB 1	SB 1			
Volume Total	14	38	13			
Volume Left	14	0	0			
Volume Right	0	23	0			
cSH	972	1700	1572			
Volume to Capacity	0.01	0.02	0.00			
Queue Length 95th (m)	0.3	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

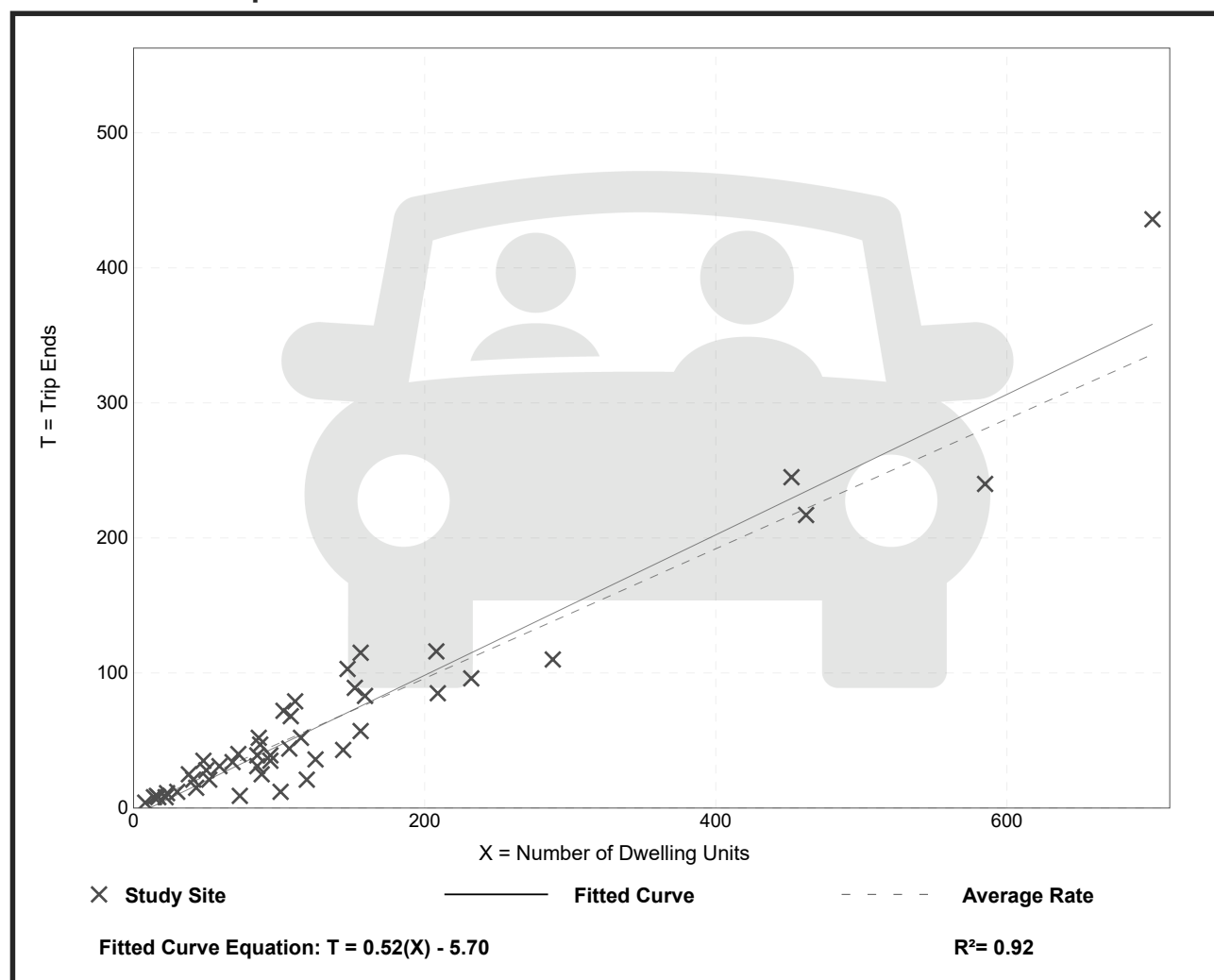
Avg. Num. of Dwelling Units: 135

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



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

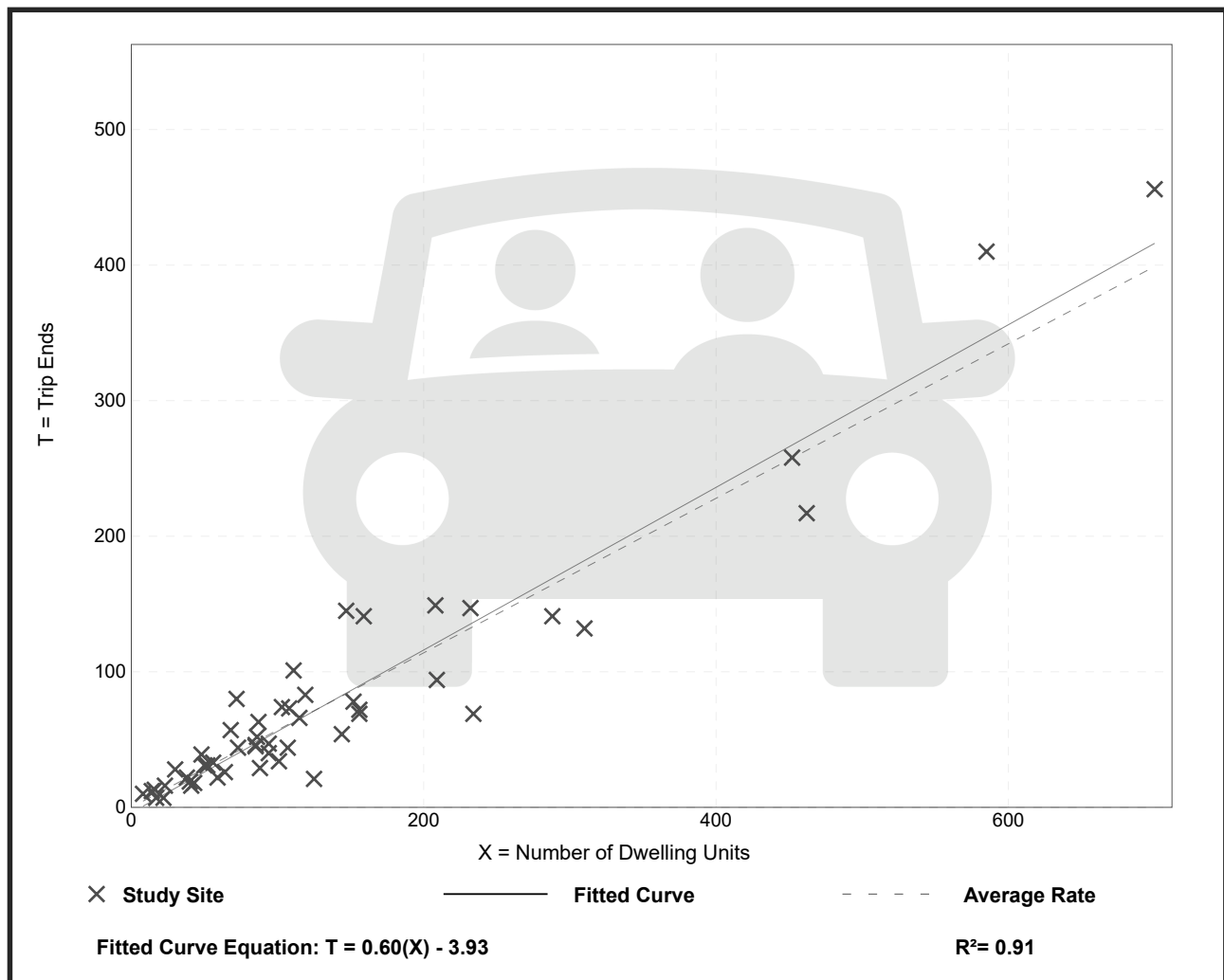
Avg. Num. of Dwelling Units: 136

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



APPENDIX F

Trip Distribution Analysis

Brampton,0,0,0,1

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

TTS Detailed Distribution - PM Peak IN

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

	Planning District	Household Zones				Total	North		South	
Fri Jan 21 2022 14:50:30 GMT-0500 (Eastern Standard Time) - Run Time: 2848ms		3190	3192	3193	3194	%	#	%	#	
	PD 1 of Toronto	91	200	97	33	421	10%	42	90%	379
Cross Tabulation Query Form - Trip - 2016 v1.1	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
Row: Planning district of origin - pd_orig	PD 4 of Toronto	19	0	64	51	134	0%	0	100%	134
Column: 2006 GTA zone of destination - gta06_dest	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
Filters:	PD 9 of Toronto	63	61	245	37	406	0%	0	100%	406
(2006 GTA zone of destination - gta06_dest In 3192, 3193, 3194, 3190	PD 10 of Toronto	186	58	114	0	358	0%	0	100%	358
and	PD 11 of Toronto	0	0	16	0	16	0%	0	100%	16
Start time of trip - start_time In 1530-1930	PD 12 of Toronto	0	15	14	0	29	0%	0	100%	29
and	PD 13 of Toronto	0	0	0	43	43	0%	0	100%	43
Trip purpose of destination - purp_dest In H	Oshawa	0	0	64	0	64	0%	0	100%	64
and	East Gwillimbury	43	0	0	0	43	100%	43	0%	0
Age of person - age In 18-99	Newmarket	0	13	35	12	60	100%	60	0%	0
and	Aurora	22	20	0	0	42	100%	42	0%	0
Primary travel mode of trip - mode_prime Not In O,S,9)	Richmond Hill	10	40	0	15	65	100%	65	0%	0
	Markham	23	23	61	22	129	15%	19	85%	110
Trip 2016	King	0	18	81	26	125	100%	125	0%	0
Table:	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%

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

Household Zones

	Planning District	Household Zones				Total	North		South	Total
		3190	3192	3193	3194	%	#	%	#	
Fri Jan 21 2022 14:37:10 GMT-0500 (Eastern Standard Time) - Run Time: 3546ms	PD 1 of Toronto	91	13	82	33	219	0%	0	100%	219 100%
Cross Tabulation Query Form - Trip - 2016 v1.1	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%
Row: Planning district of destination - pd_dest	PD 5 of Toronto	0	0	0	10	10	0%	0	100%	10 100%
Column: 2006 GTA zone of origin - gta06_orig	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%
Filters:	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%
Start time of trip - start_time In 630-930	PD 13 of Toronto	0	0	8	43	51	0%	0	100%	51 100%
and	PD 16 of Toronto	0	15	0	0	15	0%	0	100%	15 100%
Trip purpose of origin - purp_orig In H	Oshawa	0	0	22	0	22	0%	0	100%	22 100%
and	East Gwillimbury	43	0	0	0	43	100%	43	0%	0 100%
Age of person - age In 18-99	Newmarket	0	30	57	0	87	100%	87	0%	0 100%
and	Aurora	22	20	11	0	53	100%	53	0%	0 100%
Primary travel mode of trip - mode_prime Not In O,S,9)	Richmond Hill	0	40	0	28	68	70%	48	30%	20 100%
Trip 2016	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%
.3190,3192,3193,3194	Caledon	440	677	652	613	2382	50%	1191	50%	1191 100%
PD 1 of Toronto,91,13,82,33	Brampton	75	195	273	136	679	0%	0	100%	679 100%
PD 2 of Toronto,0,0,56,10	Mississauga	133	206	147	214	700	0%	0	100%	700 100%
PD 3 of Toronto,27,49,55,0	Halton Hills	0	18	16	0	34	35%	12	65%	22 100%
PD 4 of Toronto,60,21,64,51	Oakville	0	0	20	20	40	0%	0	100%	40 100%
PD 5 of Toronto,0,0,0,10	Burlington	0	20	0	0	20	0%	0	100%	20 100%
PD 7 of Toronto,0,42,43,0	Orangeville	20	17	26	38	101	100%	101	0%	0 100%
PD 8 of Toronto,78,61,176,0	Barrie	0	0	14	0	14	100%	14	0%	0 100%
PD 9 of Toronto,57,159,331,110	Bradford-West Gwillimbury	0	42	0	10	52	100%	52	0%	0 100%
PD 10 of Toronto,62,11,69,0	New Tecumseth	0	0	43	0	43	100%	43	0%	0 100%
PD 11 of Toronto,0,0,39,0	Adjala-Tosorontio	0	0	43	0	43	100%	43	0%	0 100%
PD 12 of Toronto,0,15,0,0	Essa	0	0	0	22	22	100%	22	0%	0 100%
PD 13 of Toronto,0,0,8,43	Springwater	0	0	9	0	9	100%	9	0%	0 100%
PD 16 of Toronto,0,15,0,0	Tiny	0	0	0	13	13	100%	13	0%	0 100%
Oshawa,0,0,22,0	Mono	0	30	14	0	44	100%	44	0%	0 100%
East Gwillimbury,43,0,0,0	Total	1402	2090	2672	1585	7749		2133		5616
Newmarket,0,30,57,0								28%		72%
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										

