TRAFFIC OPERATIONS ASSESSMENT ADDENDUM

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
UPDATED: APRIL 2023
UPDATED: DECEMBER 2023

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
Rev.2	April 2023	Issued for Re-Submission
Rev.3	December 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 and TOA Addendum was prepared and submitted in April 2023 as an update to the comments received on the April 2022 submission. Additional comments were received by the Town in October 2023 regarding the April 2023 submission, and these have been addressed within the revised TOA Addendum.

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 November 23, 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 from site access to the cul-de-sac are sufficient per the Transportation Association of Canada (TAC) Canadian Roundabout Design Guide 2017.

A comprehensive Pavement Marking and Signage Plan is prepared showing appropriate signage at the site and the cul-de-sac.

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.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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 and a TOA Addendum was prepared to address the Town of Caledon first submission comments.

Further comments regarding the TOA Addendum were received by Town in October 2023 and the TOA Addendum has been updated to address the second 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:

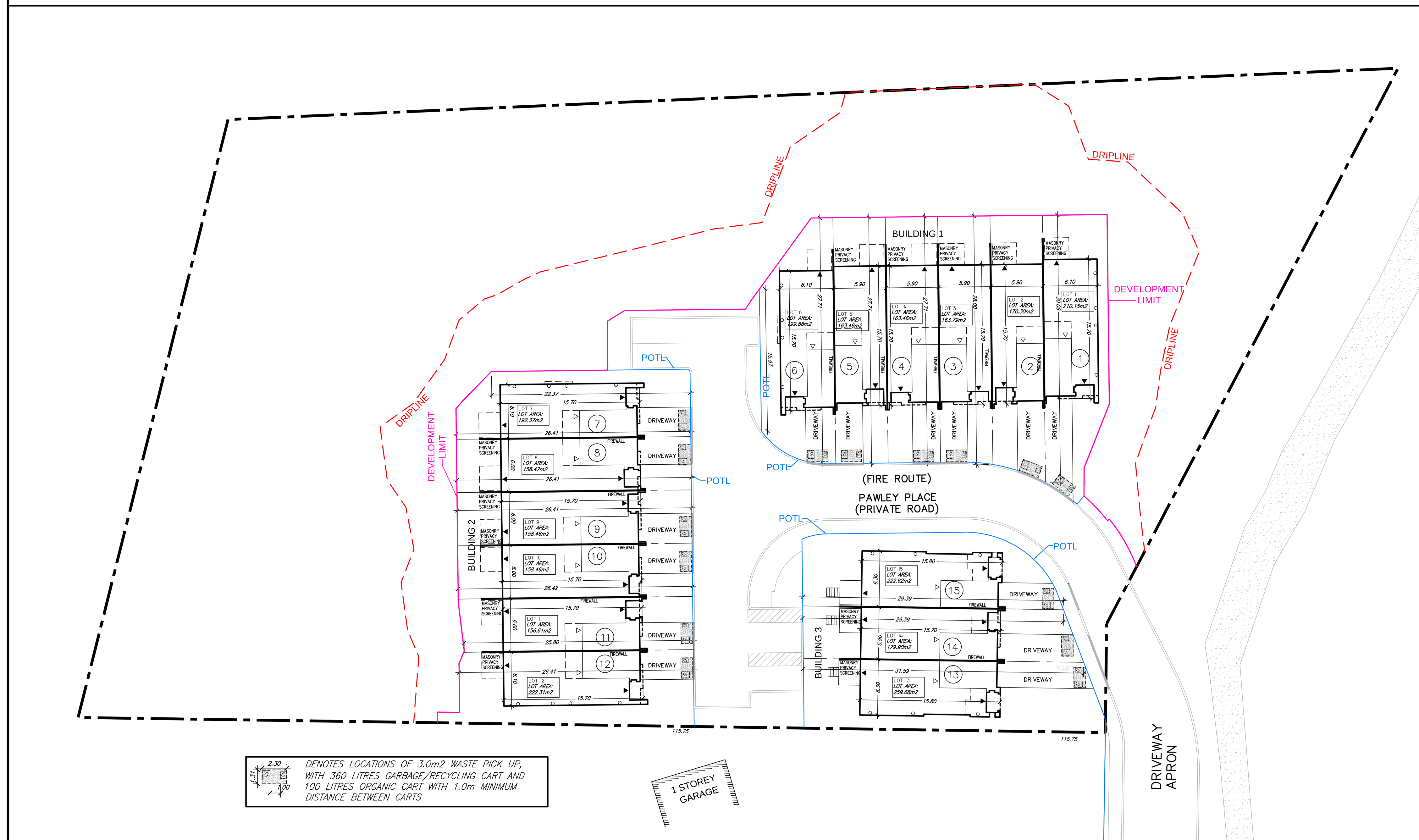
- Existing conditions (2022)
- Five-year horizon (2027) future conditions

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 Development Proposal

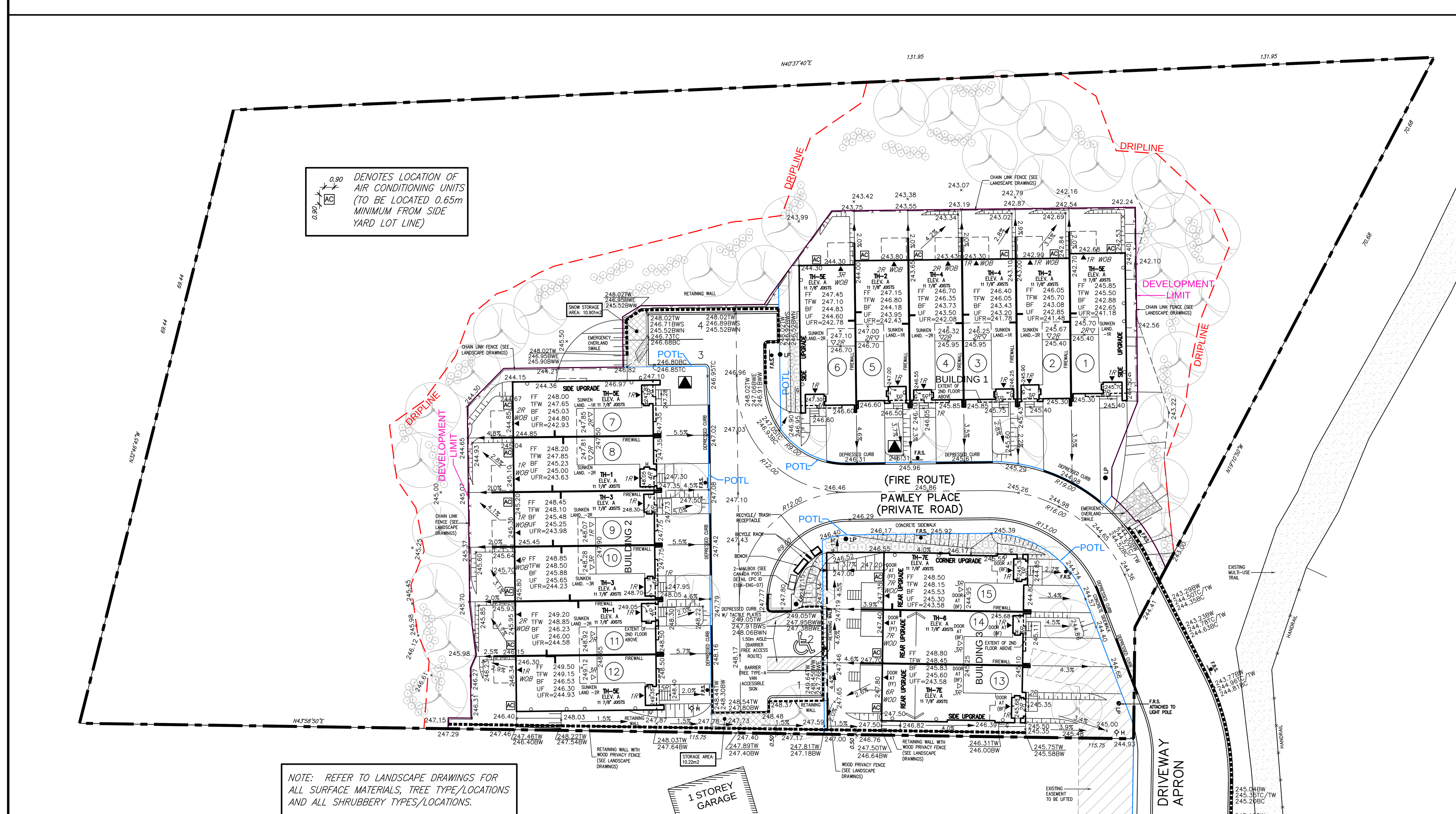
The latest Site Plan prepared by VA3 proposes to include 15 townhouse dwelling units, a private road, associated landscaped areas with a total number of 34 parking spaces. The site access is proposed via the existing cul-de-sac located at the end of Nunnville Road.

The latest Site Plan prepared by VA3 Design is included in **Figure 1** dated November 23, 2023.



POTL AND WASTE COLLECTION PLAN

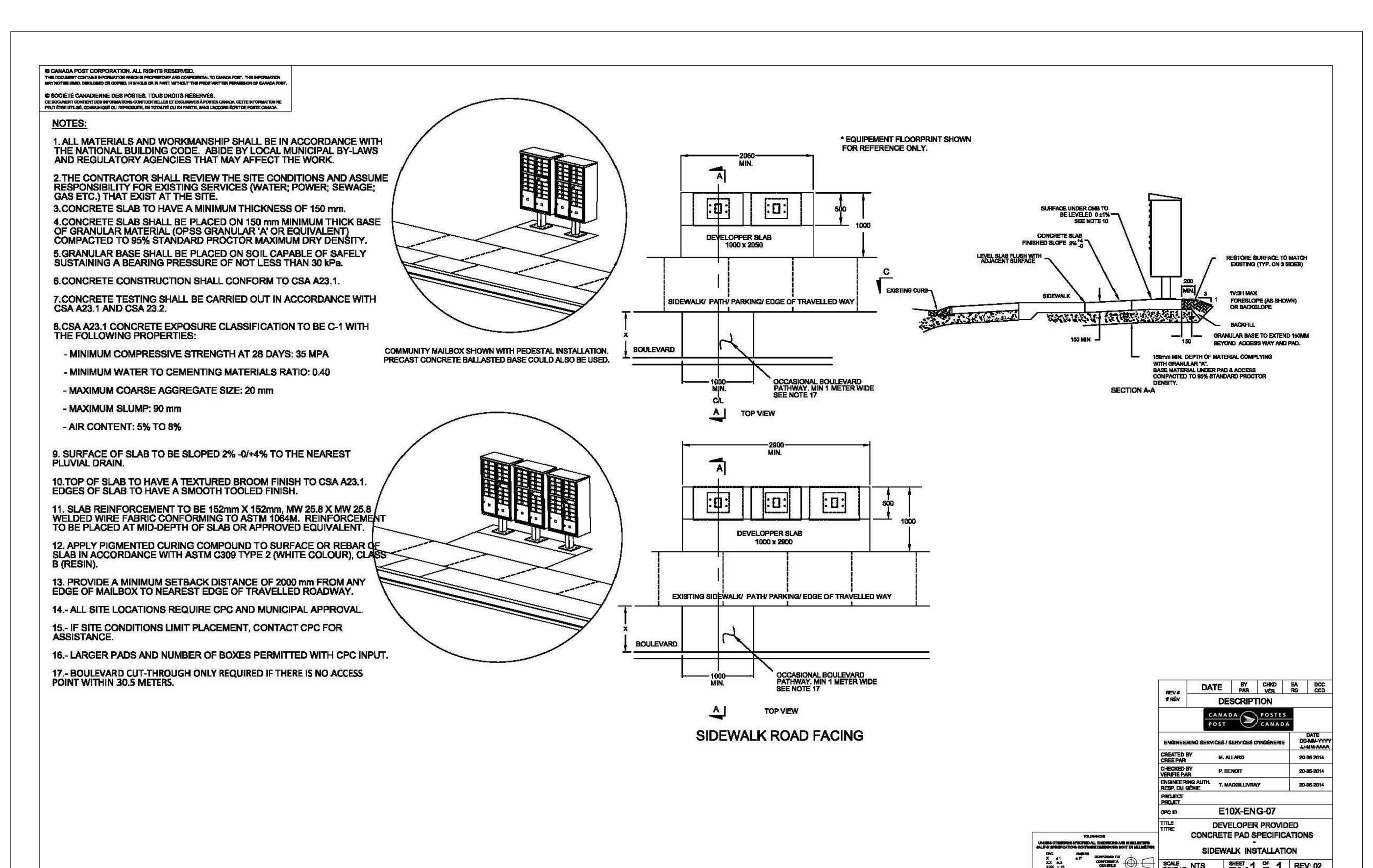
ENVIRONMENTAL AREA PLAN

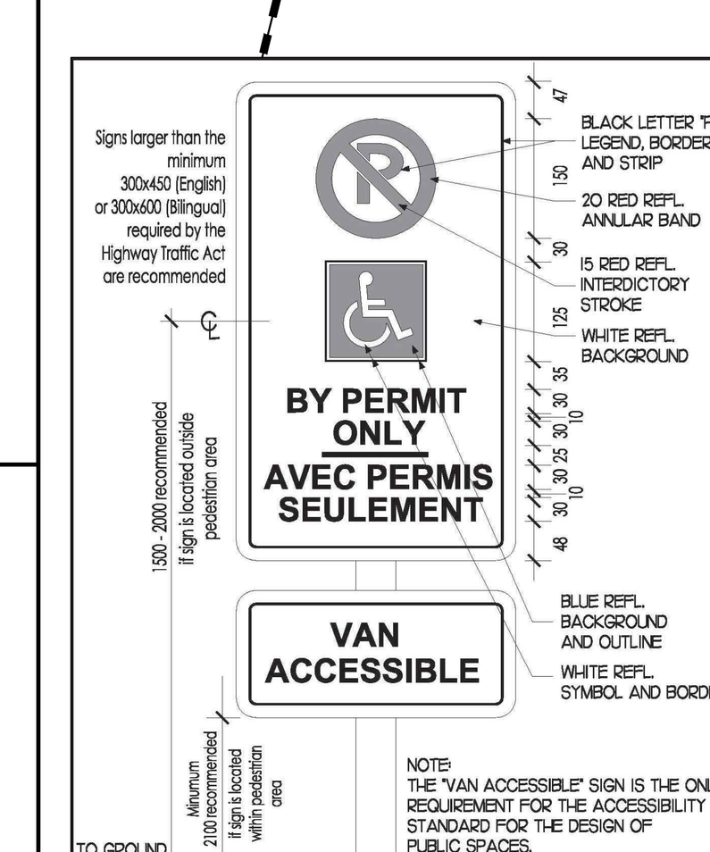


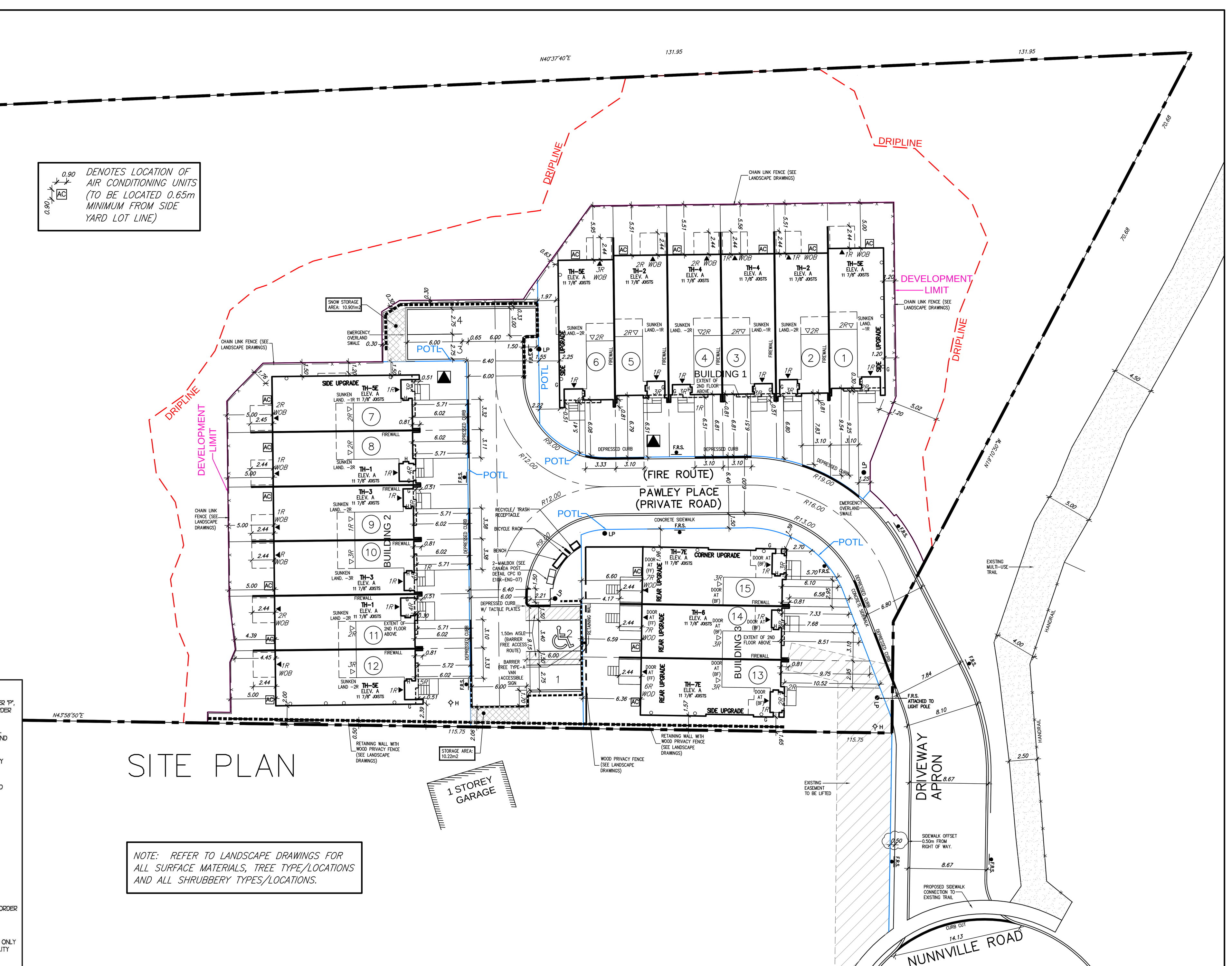
SITE PLAN

NOTE: FIRE ROUTE SIGNS AS DESCRIBED IN SCHEDULE A DISPLAYING DOUBLE HEADED ARROWS MAY BE INSTALLED ON ONE SIDE OF THE FIRE ROUTE AND SHALL BE INSTALLED AT INTERVALS NOT TO EXCEED 30 METERS TO INDICATE THE FIRE ROUTE EXISTS IN EACH DIRECTION.

DENOTES LOCATION OF FIRE ROUTE SIGN LOCATION







SITE PLAN

NOTE: REFER TO LANDSCAPE DRAWINGS FOR ALL SURFACE MATERIALS, TREE TYPE/LOCATIONS AND ALL SHRUBBERY TYPES/LOCATIONS.

BUILDING 1

LOT No.	Model Type	Garage Dimension W x L (m)	G.F.A (sq.m.)	Coverage (sq.m.)	Lot Area (sq.m.)	Coverage (%)	Driveway Area (m2)	Total Landscape Area (m2)	Total Landscape Area (%)	Number of Bedrooms	Rear Yard Amenity Area (m2)	Lot Frontage (m)	Lot Depth (m)	Proposed Building Height (m)
1	TH–5E ELEV. A	3.0x6.25	212.38	94.67	210.15	45.05	34.92	80.56	38.33	3–BED	36.45	6.40	30.09	
2	TH–2 ELEV. A	3.0x6.25	216.09	91.56	170.30	53.76	25.62	53.12	31.19	3–BED	32.45	6.26	28.00	
3	TH–4 ELEV. A	3.0x6.25	212.28	91.56	163.79	55.90	20.95	51.28	31.31	3–BED	32.45	5.90	27.71	
4	TH–4 ELEV. A	3.0x6.25	212.28	91.56	163.46	56.01	20.95	50.95	31.17	3–BED	32.45	5.90	27.71	
5	TH–2 ELEV. A	3.0x6.25	216.09	91.56	163.46	56.01	20.95	50.95	31.17	3–BED	32.45	5.90	27.71	
6	TH–5E ELEV. A	3.0x6.25	214.23	94.67	199.88	47.36	20.78	84.43	42.24	3–BED	27.79	8.33	27.71	
TOTAL			1283.35	555.58	1071.04	51.87	144.17	371.29	34.67					11.00m

BUILDING 2

LOT No.	Model Type	Garage Dimension W x L (m)	G.F.A (sq.m.)	Coverage (sq.m.)	Lot Area (sq.m.)	Coverage (%)	Driveway Area (m2)	Total Landscape Area (m2)	Total Landscape Area (%)	Number of Bedrooms	Rear Yard Amenity Area (m2)	Lot Frontage (m)	Lot Depth (m)	Proposed Building Height (m)
7	TH–5E ELEV. A	3.0x6.25	214.23	94.67	192.37	49.21	19.86	77.84	40.46	3–BED	29.59	7.59	26.41	
8	TH–1 ELEV. A	3.0x6.25	220.65	93.15	158.47	58.78	18.48	46.84	29.56	3–BED	30.03	6.00	26.41	
9	TH–3 ELEV. A	3.0x6.25	215.81	93.07	158.46	58.73	20.16	45.23	28.54	3–BED	29.98	6.00	26.41	
10	TH–3 ELEV. A	3.0x6.25	215.81	93.07	158.46	58.73	20.16	45.23	28.54	3–BED	29.98	6.00	26.42	
11	TH–1 ELEV. A	3.0x6.25	220.65	93.15	156.61	59.48	18.48	44.98	28.72	3–BED	28.22	6.00	25.80	
12	TH–5E ELEV. A	3.0x6.25	212.38	94.67	222.31	42.58	19.86	107.78	48.48	3–BED	40.09	8.51	25.80	
TOTAL			1299.53	561.78	1046.68	53.67	117.00	367.90	35.15					11.45m

BUILDING 3

LOT No.	Model Type	Garage Dimension W x L (m)	G.F.A (sq.m.)	Coverage (sq.m.)	Lot Area (sq.m.)	Coverage (%)	Driveway Area (m2)	Total Landscape Area (m2)	Total Landscape Area (%)	Number of Bedrooms	Rear Yard Amenity Area (m2)	Lot Frontage (m)	Lot Depth (m)	Proposed Building Height (m)
13	TH–7E ELEV. A	3.0x6.25	253.72	97.26	259.68	37.45	19.87	142.55	54.89	3–BED	49.93	8.47	31.59	
14	TH–6 ELEV. A	3.0x6.25	241.46	91.61	179.90	50.92	28.20	60.09	33.40	3–BED	38.52	6.35	29.39	
15	TH–7E ELEV. A	3.0x6.25	253.72	97.26	222.62	43.69	20.76	104.60	46.99	3–BED	54.17	9.15	29.39	
TOTAL			748.90	286.13	662.20	43.21	68.83	307.24	46.40					11.05m

PART OF LOT 33, PLAN ALB–4 AND PART OF LOT 7, CONCESSION 8 AND PART OF ROAD ALLOWANCE BETWEEN CONCESSION 7 AND 8 (STOPPED–UP AND CLOSED BY BY–LAW No. 75–109, INST. No. VS370320): MUNICIPALITY KNOWN AS 13290 NUNNVILLE ROAD
GEOGRAPHIC TOWNSHIP OF ALBION, TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL

OVERALL SITE STATISTICS

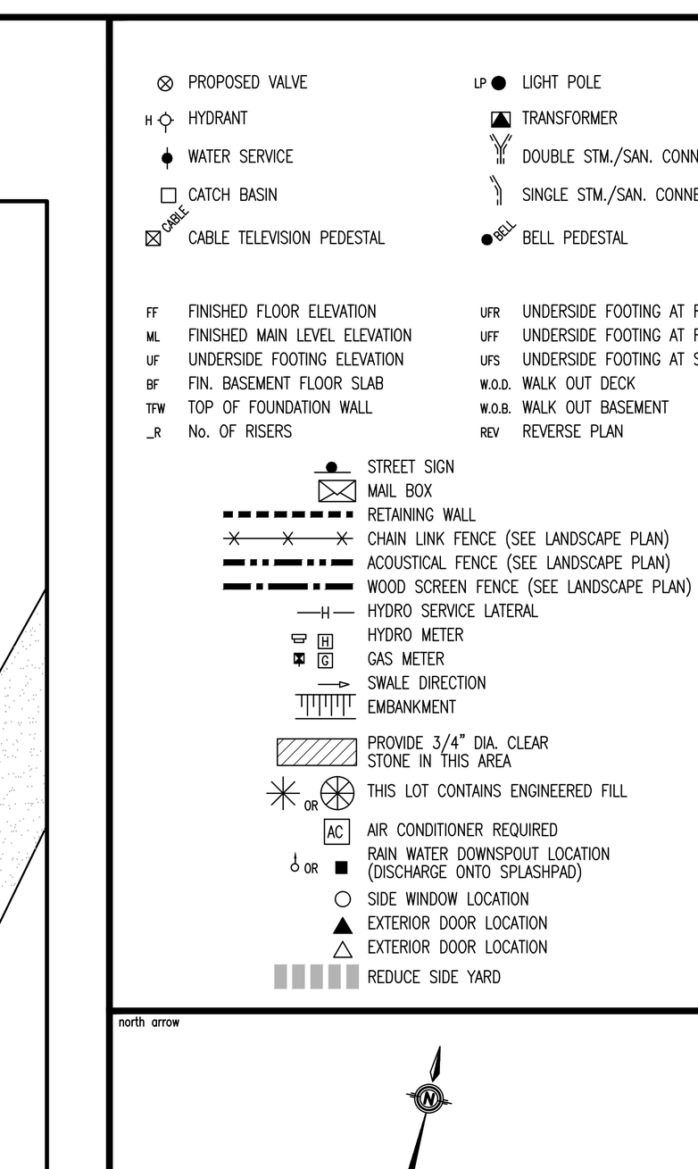
SITE AREA	0.86ha/8,552.52m2
DEVELOPABLE AREA	0.37ha/3,713.28m2
MIN. LOT AREA	156.61m2
TOTAL BUILDING AREA	1,403.49m2 (37.80% OF DEVELOPABLE AREA)
MAX. BUILDING AREA PER LOT	59.48%
MIN. LOT WIDTH	5.90m
MIN. LOT DEPTH	25.80m
MIN. BACKYARD AMENITY SPACE	27.79m2
MIN. FRONT YARD TO GARAGE	6.02m
MIN. FRONT YARD TO MAIN WALL	1.39m (UNIT 13)
MIN. REAR WALL	0.63m (UNIT 7)
MIN. INTERIOR SIDE YARD	1.57m
MIN. EXTERIOR SIDE YARD	1.20m
MAX. HEIGHT	11.45m
LANDSCAPED AREA: (INCLUDES AMENITY AREAS AND ALL YARDS)	1,148.95m2 (30.94% OF DEVELOPABLE AREA)
MIN. LANDSCAPE AREA PER LOT	28.54%
NATURAL AREA (INCLUDES BUFFER AND WOODLOT)	0.49ha/4,839.24m2 (56.58% OF SITE AREA)
HARD PAVED AREA: (INCLUDES ROADS/CURBS/SIDEWALKS/DRIVEWAYS)	1,160.84m2 (31.26% OF DEVELOPABLE AREA)
PARKING :	30 RESIDENCE PARKING PROVIDED (1 INTERNAL & 1 EXTERNAL) REQUIRED VISITOR PARKING: 15x0.25=3.75 REQUIRED SPACES 4 VISITOR PARKING SPACES PROPOSED WITH 1 BARRIER FREE SPACE

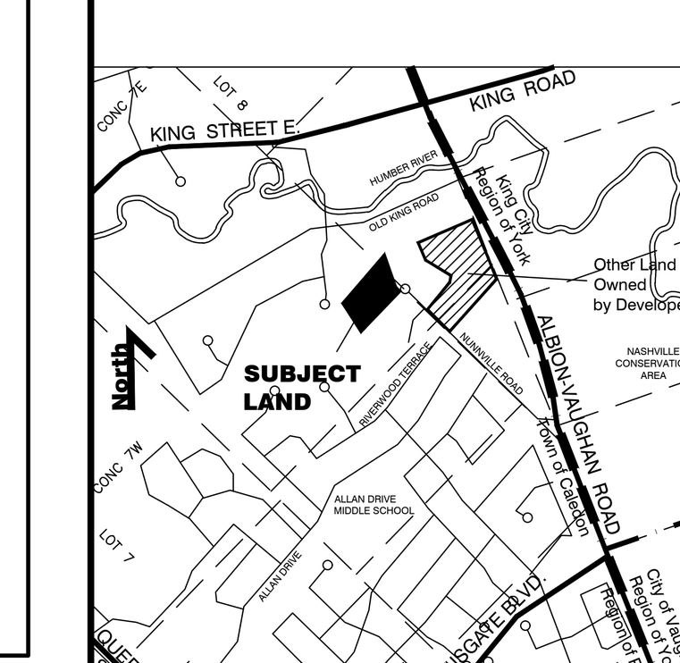
NOTE: ALL GLAZING TO COMPLY WITH CSA A460 BIRD FRIENDLY DESIGN GUIDELINES.

NOTE: LIGHTING FIXTURES SHALL BE INSTALLED IN SUCH A MANNER THAT ALL LIGHT EMITTED FROM THE FIXTURE, EITHER DIRECTLY FROM THE LAMP OR A DIFFUSING ELEMENT, OR INDIRECTLY BY REFLECTION OR REFRACTION FROM ANY PART OF THE FIXTURES IS PROJECTED BELOW THE LAMP AND ONTO THE LOT THE LIGHTING IS INTENDED TO SERVE.

NOTE: THE MAXIMUM HEIGHT OF ALL LIGHTING FIXTURES IS 9.0m

0 5 10 15 20 25 30
BAR SCALE





KEY PLAN
NTS

no.	description	date	by
10	.	.	.
9	.	.	.
8	ISSUED FOR 3RD SPA	23/11/23	SS
7	REVISED AS PER TOWNS COMMENTS	23/11/14	SS
6	ISSUED FOR PRE–CONSULTATION (DART)	23/04/05	SS
5	ISSUED FOR 1ST SPA	23/03/01	SS
4	REVISED LOT AREAS AS RECEIVED FROM RPE	23/02/08	SS
3	REVISED AS PER NEW DEVELOPMENT LIMIT	23/02/01	SS
2	REVISED AS PER NEW LANDSCAPING DRAWINGS	23/01/20	SS
1	ISSUED FOR CLIENT REVIEW	22/12/09	SS

Builder to verify location of all hydrants, street lights, transformers and other services. If minimum dimensions are not maintained, builder is to relocate at his own expense.

Builder to verify service connection elevations prior to constructing foundations.

VA3 DESIGN
255 Consumers Rd
Suite 120
Toronto ON M2J 1R4
t 416.630.2255
f 416.630.4782
va3design.com

The undersigned has reviewed and takes responsibility for this design and has the qualifications and meets the requirements set out in the Ontario Building Code to be a Designer.
qualification information: Richard Vink (name) — BCIN 24488
registration information: VA3 Design Inc. — 42658

BOLTON SUMMIT DEVELOPMENTS INC.

project name: MUNICIPAL FILE # DART 2023–0013
municipality: BOLTON, ONT. — project no. 22008
registered plan no.: – — lot/block no.: –
title: SITE PLAN
date: APRIL 2023 — scale: 1:300 — drawing no.: S1
drawn by: STEVE SOSTARIC — checked by: – — file name: 22008–SP

STEVE – H:\ARCHIVE\WORKING\2022\22008.MOR\SITE PLAN\22008–SP.dwg – Thu – Nov 23 2023 – 2:13 PM

3.0 Existing Conditions

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 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.

3.1 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.

3.2 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.

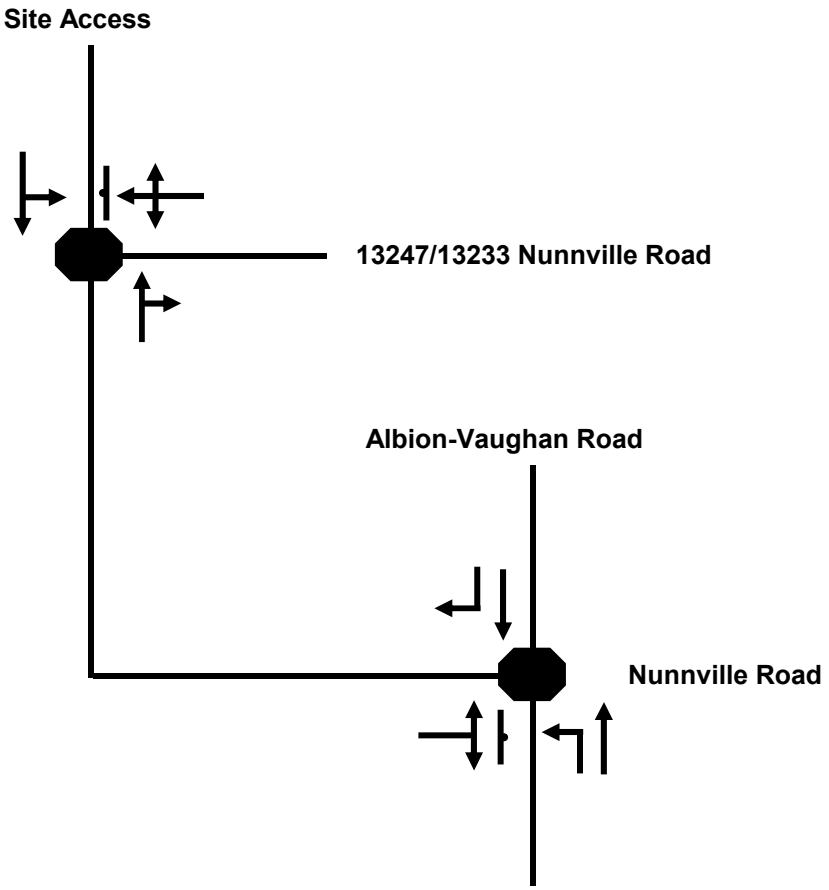
3.3 Traffic Data

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.

3.4 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	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. 2023. 2. 22 Analyst. Aarzoo D

3.5 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

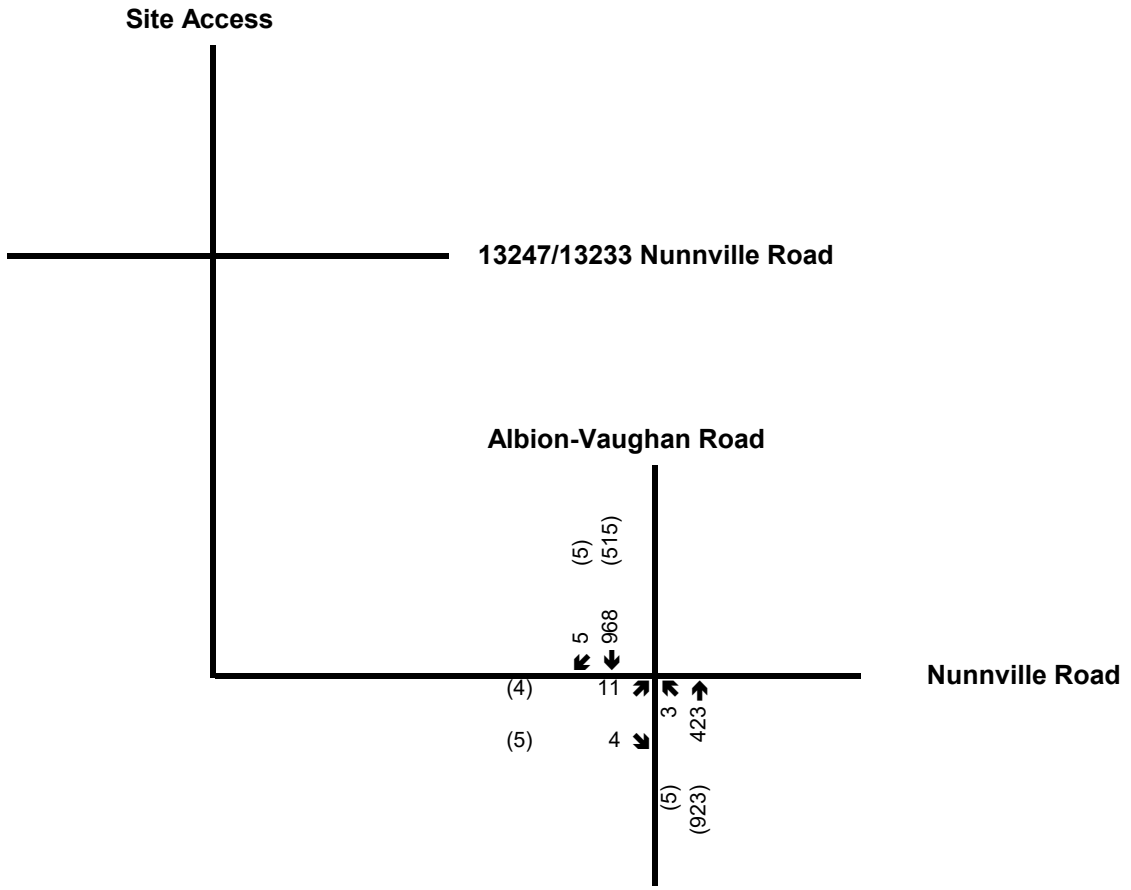
Intersection	Control	Peak Hour	Level of Service	Control Delay (s)	Maximum V/C Ratio > 0.85 [2] (Approach)	95th Percentile Queue Length > Storage Length
Albion-Vaughan Road at Nunnville Road	Stop Controlled	Weekday A.M.	D	26.8	0.08 (EB)	None
		Weekday P.M.	C	20.1	0.04 (EB)	None

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.



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

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.

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 (s)	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	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

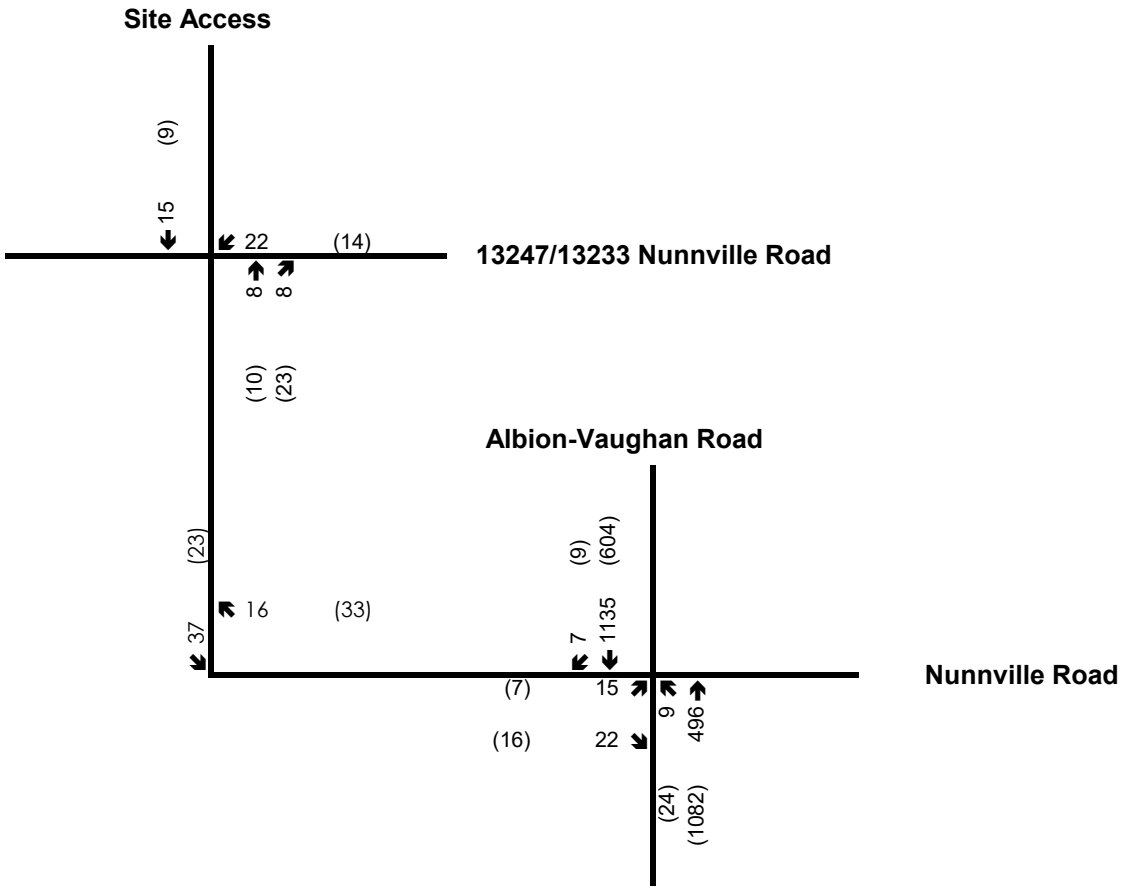
Note 1: The Level of Service of a signalized intersection is based on the average control delay per vehicle (Synchro/ICU). The Level of Service of a stop-controlled intersection is based on the delay associated with the critical minor road approach (HCM 2000).

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.



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. 2023. 2. 22 Analyst. Aarzoo D

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

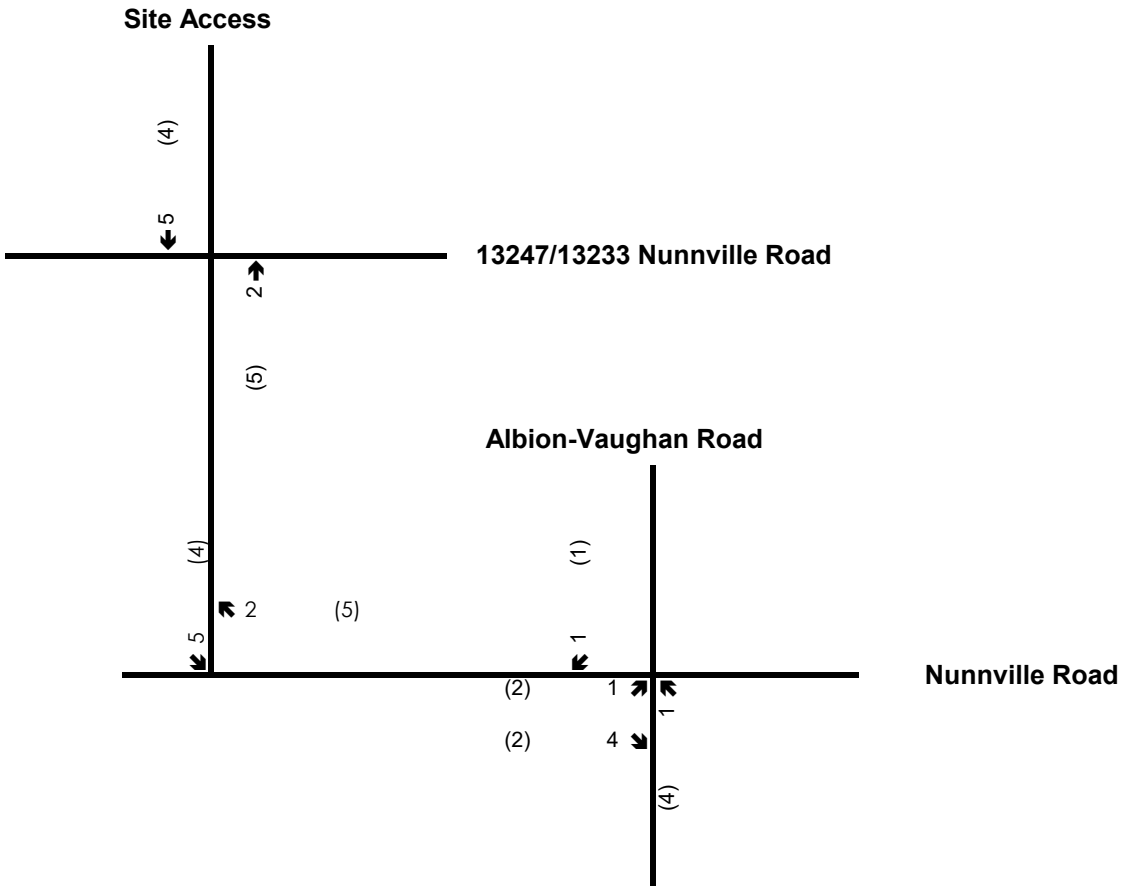
Intersection	Control	Peak Hour	Level of Service [1]	Control Delay (s)	Maximum V/C Ratio > 0.85 [2] (Approach)	95th Percentile Queue Length > Storage Length
Albion-Vaughan Road at Nunnville Road	Stop Controlled	A.M.	D	34.7	0.26 (EB)	None
		P.M.	C	24.9	0.13 (EB)	None
13247 & 13233 Nunnville Rd at Nunnville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

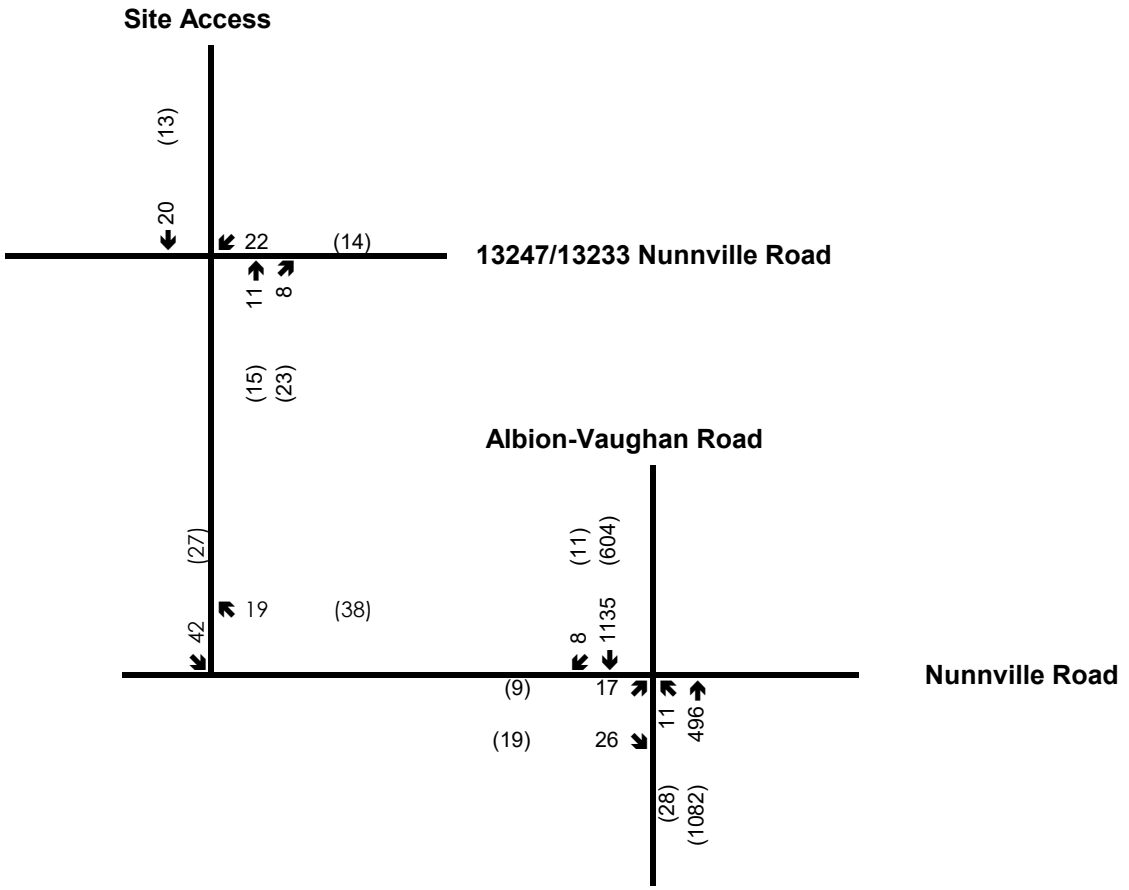
Note 2: The critical v/c ratio is considered to be the maximum v/c ratio for movements at the intersection. In addition, all v/c ratios greater than 0.85 are outlined and highlighted.

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	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	Site Trip Assignment		Project No. 0649-6278 Date. 2023. 2. 22 Analyst. Aarzoo D



Legend	13290 Nunnville Road	CROZIER CONSULTING ENGINEERS	Figure 6
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. 2023. 2. 22 Analyst. Aarzoo D

7.0 Site Access Review

The following section reviews the proposed site access from a geometric perspective based on the guidelines provided in the Transportation Association of Canada (TAC) Canadian Roundabout Design Guide and a dimensional review based on the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR).

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) Canadian Roundabout Design Guide (2017).

7.1.1 Approach Stopping Sight Distance

The cul-de-sac at Nunnville Road was treated as roundabout per the Town's request and section 6.5 of TAC Canadian Roundabout Design Guide was referred to review the sight lines.

Please note that a design speed of 25 kmph is assumed at the cul-de-sac.

Stopping sight distance on a curve approach is calculated using Equation 2.5.2 from the TAC Geometric Design Guide for Canadian Roads as outlined below:

$$SSD = 0.278Vt + 0.,039\ (V^2/a)$$

Where:
SSD = Stopping Sight Distance
t = Braking reaction time, 2.5 s
V = Design speed (km/h)
a = Deceleration rate (m/s^2)

As shown in **Figure 7**, a stopping sight distance of 25 metres is satisfied.

7.1.2 Intersection Sight Distance

The intersection sight distance was obtained based on the Table 6.2 of TAC Canadian Roundabout Design Guide. For an inscribed circle diameter less than 40 metre, entire roundabout should be visible to the vehicle approaching the circulating roadway.

The radius of cul-de-sac is only approximately 30 metres and visibility of entire cul-de-sac is calculated based on two approaches:

- **Visibility to Circulating Roadway at 15 m from Yield Line**

The vehicle egressing the site is observed to have a clear visibility from the 15 m from Yield Line and entire cul-de-sac is visible as well as shown in **Figure 8.**

- **Visibility to Circulating Roadway at Yield Line**

The vehicle egressing the site is observed to have a clear visibility of entire cul-de-sac from the Yield Line as shown in **Figure 9.**

Further it is noted that three trees are currently planted in the middle of the cul-de-sac. It is recommended to maintain the landscape on the central island to ensure that the trees are regularly trimmed, maintaining a maximum height of approximately 1.0 meter to provide visibility to the entering vehicles.

Per the results, the proposed shared driveway via the cul-de-sac is expected to provide sufficient visibility to drivers on the roadway and the cul-de-sac.

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 the site access will be constructed to allow a smooth maneuvering for design vehicles. The curbs adjacent to the visitor parking spaces will 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 10 shows the proposed dimensions.

Sight Distance Calculation

Feature	Site Access off Nunnville Road cul-de-sac
Assumed Design Speed at cul-de-sac	25 km/h
Break Reaction Time	2.5 s
Deceleration Rate	3.4 m/s
Grade of Roadway	Less than 3%
Horizontal Alignment of Roadway	Straight
Stopping Sight Distance	25 m

Note 1: Stopping Sight Distance for vehicle approaching the cul-de-sac is calculated from equation 2.5.2 in the TAC-GDGCR as mentioned in Canadian Roundabout Design Guide Section 6.5.2.

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. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
5. 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
2	ISSUED FOR REVIEW	11/20/2023
3	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

STOPPING SIGHT DISTANCE

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

10 0m 10 20 30 40
SCALE: 1:500

N

Sight Distance Calculation

Feature	Site Access off Nunnville Road cul-de-sac
Assumed Design Speed at cul-de-sac	25 km/h
Grade of Roadway	Less than 3%
Horizontal Alignment of Roadway	Straight
Visibility to the Circulating Roadway	Entire Intersection

Note 1: The visibility is calculated 15 m from yield line per the Section 6.5.3 of Canadian Roundabout Design Guide.

Note 2: The inscribed circle diameter is less than 40 m and therefore entire intersection should be visible.

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. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
5. 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
2	ISSUED FOR REVIEW	11/20/2023
3	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project
13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing
VISIBILITY TO THE CIRCULATING ROADWAY AT 15 M ADVANCE OF THE YIELD LINE

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

10 0m 10 20 30 40
SCALE: 1:500

Drawn By	Design By	Project	
B.L.			0649-6278
Check By	Check By	Scale	Drawing
A.D.	B.B.	1:500	FIG 8

N

Sight Distance Calculation

Feature	Site Access off Nunnville Road cul-de-sac
Assumed Design Speed at cul-de-sac	25 km/h
Grade of Roadway	Less than 3%
Horizontal Alignment of Roadway	Straight
Visibility to the Circulating Roadway	Entire Intersection

Note 1: The visibility is calculated 15 m from yield line per the Section 6.5.3 of Canadian Roundabout Design Guide.

Note 2: The inscribed circle diameter is less than 40 m and therefore entire intersection should be visible.

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. ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
5. 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
2	ISSUED FOR REVIEW	11/20/2023
3	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

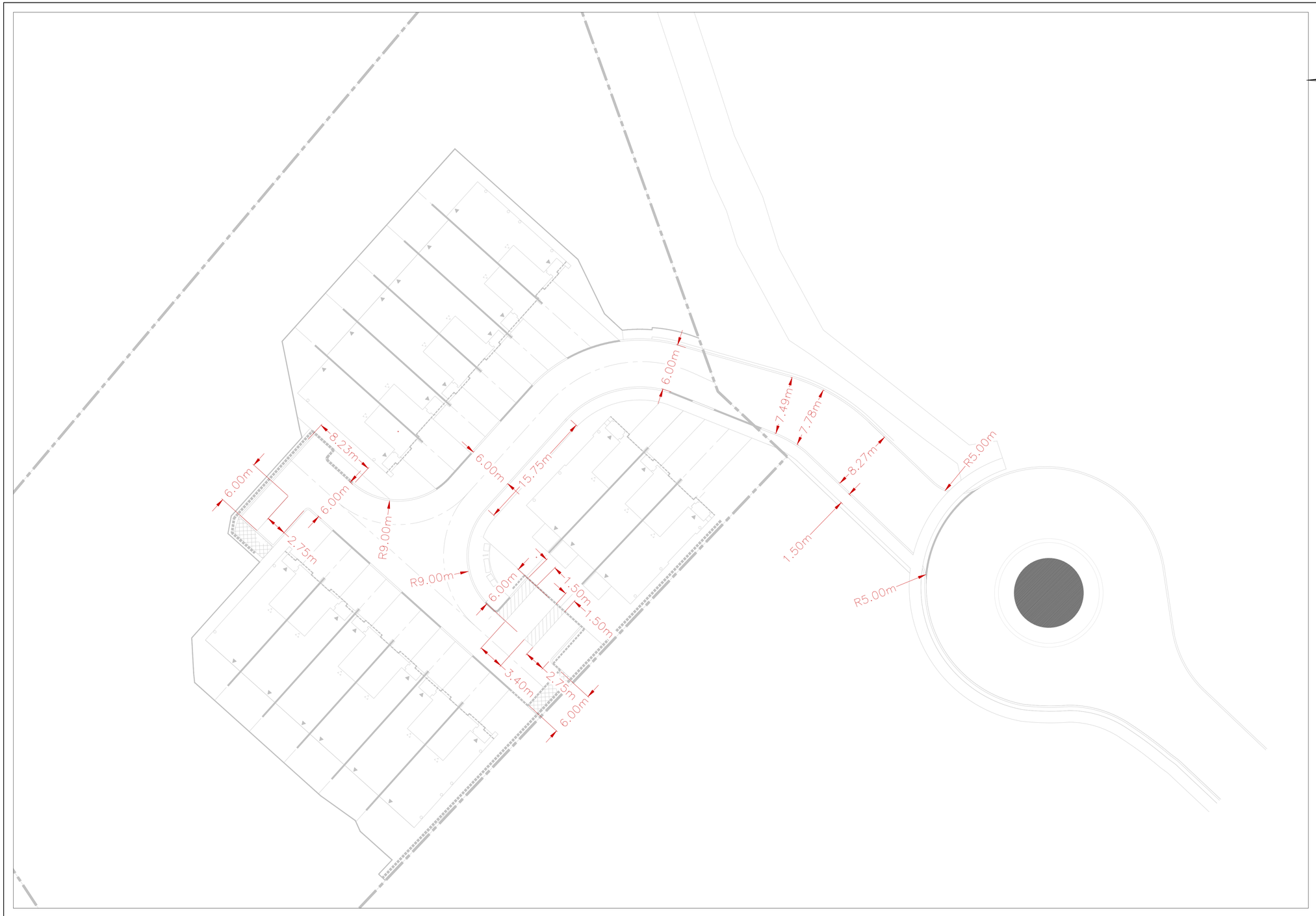
Drawing

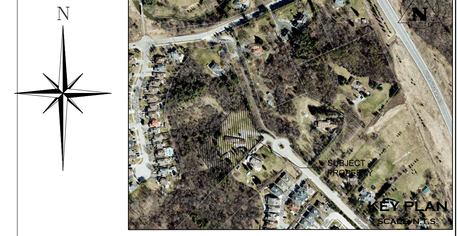
VISIBILITY TO THE CIRCULATING ROADWAY AT ENTRY FROM THE YIELD LINE

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	
B.L.			0649-6278
Check By	Check By	Scale	Drawing
A.D.	B.B.	1:500	FIG 9

10 0m 10 20 30 40
SCALE: 1:500





5 0m 5 10 15 20
SCALE: 1:250

No.	ISSUE	DATE: MM/DD/YYYY
0	ISSUED FOR REVIEW	10/18/2023
1	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

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	
B.L.			0649-6278
Check By	Check By	Scale	Drawing
A.D.	B.B.	1:250	FIG 10

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 11-A and Figure 11-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 12-A** and **Figure 12-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

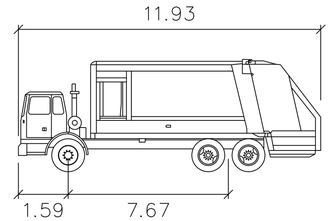
A maneuvering assessment was conducted using a Passenger TAC (P-TAC) vehicle as shown in **Figure 13**, which demonstrates that passenger vehicles can enter and exit the property via driveway simultaneously without encroaching on each other's respective paths.

Critical parking spots were analyzed, and inbound and outbound movements are shown in **Figure 14** and **Figure 15** respectively. 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 with no conflicts.

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

N

VECHICLE PROFILE



Peel SL GT

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

No.	ISSUE	DATE: MM/DD/YYYY
0	ISSUED FOR REVIEW	10/18/2023
1	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

SITE CIRCULATION DIAGRAM
GARBAGE TRUCK – INBOUND

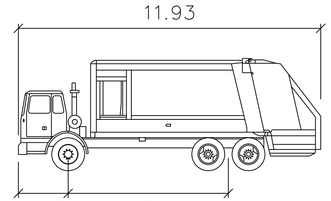
CROZIER
CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

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

5 0m 5 10 15
SCALE: 1:200

N

VECHICLE PROFILE



Peel SL GT

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

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: MM/DD/YYYY
0	ISSUED FOR REVIEW	10/18/2023
1	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

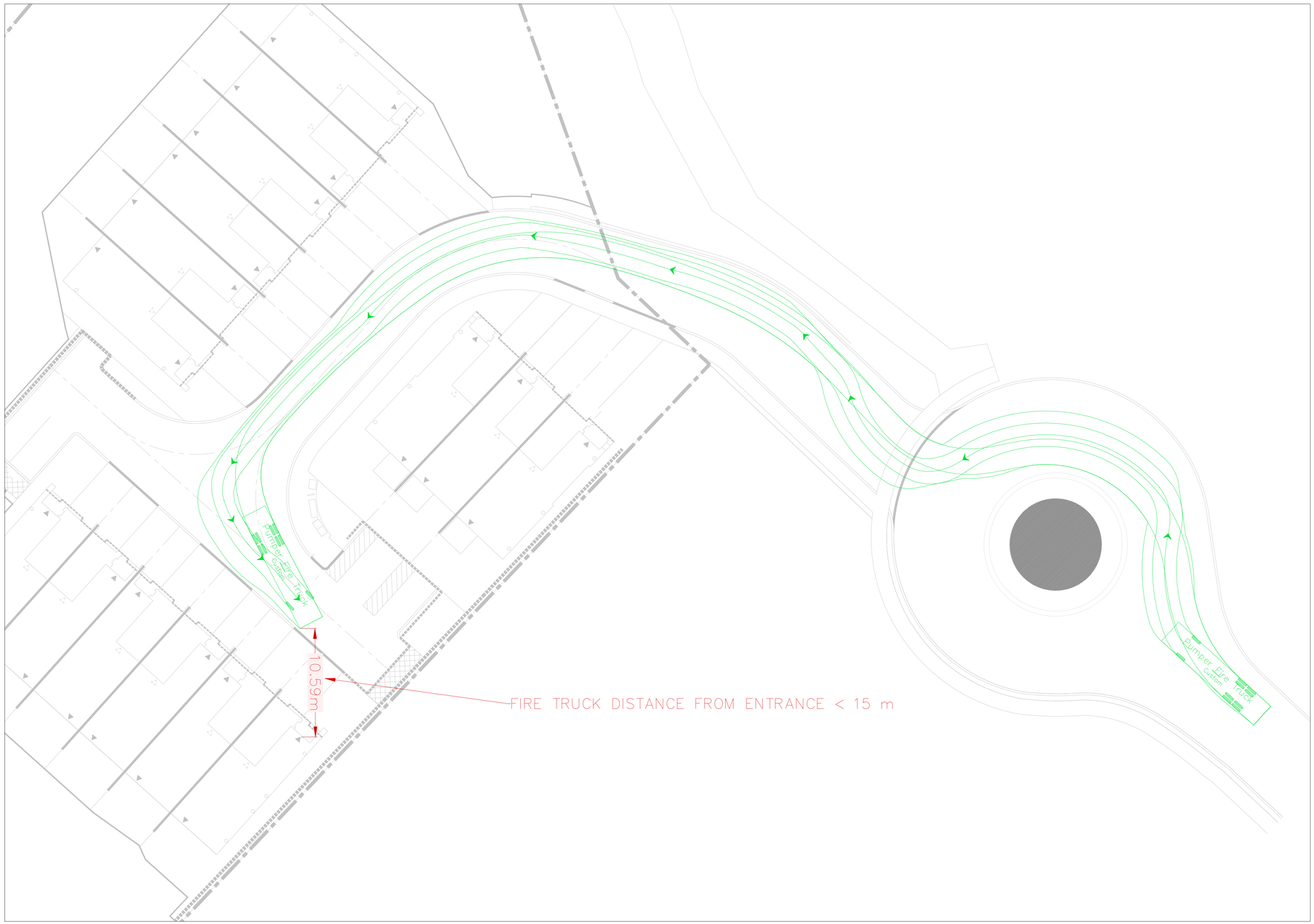
Drawing

SITE CIRCULATION DIAGRAM
GARBAGE TRUCK – OUTBOUND

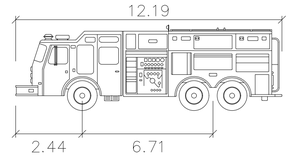
CROZIER
CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON, L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

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

5 0m 5 10 15
SCALE: 1:200



VECHICLE PROFILE



Pumper Fire Truck

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

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: MM/DD/YYYY
0	ISSUED FOR REVIEW	10/18/2023
1	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

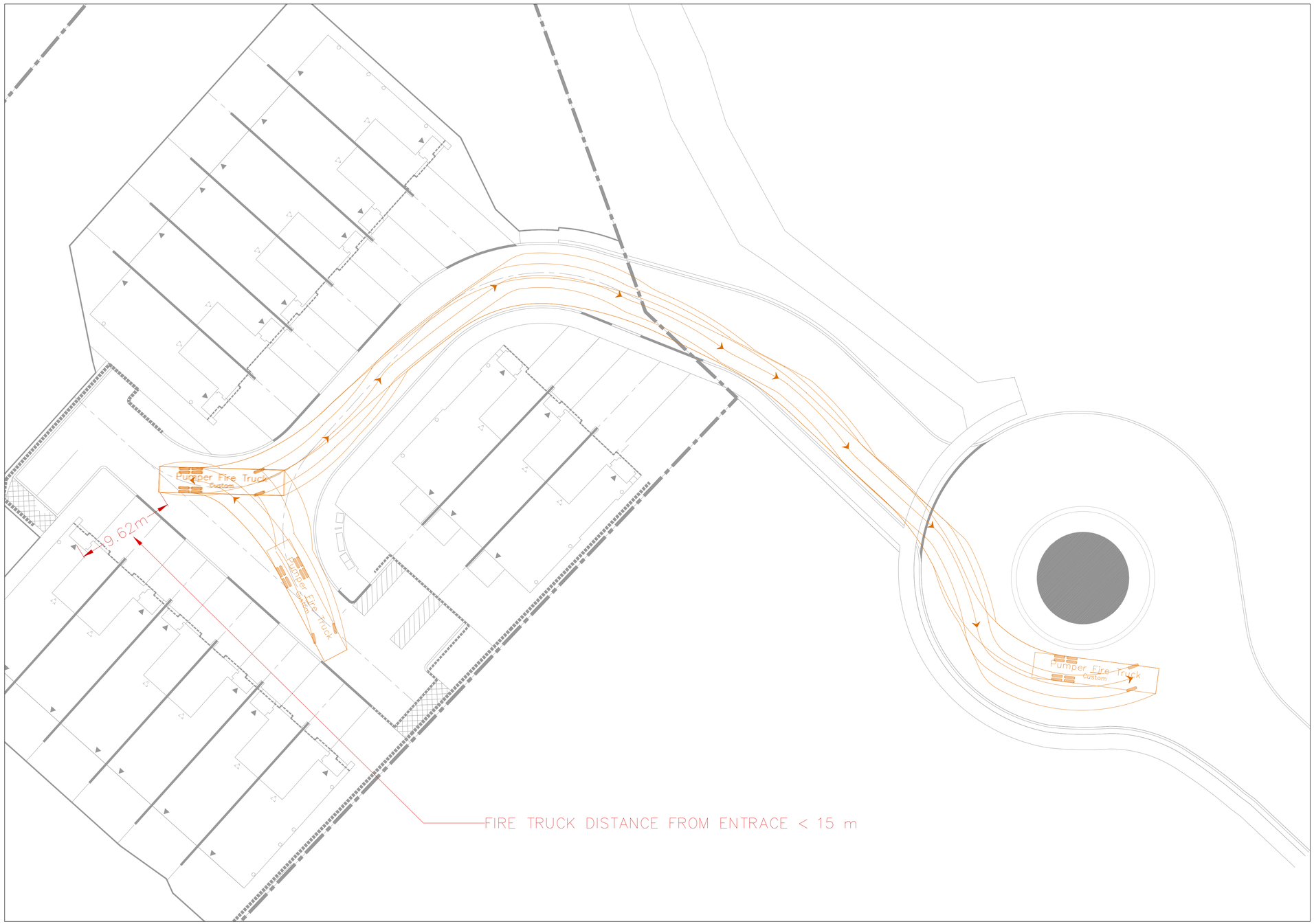
13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

SITE CIRCULATION DIAGRAM
FIRE TRUCK – INBOUND

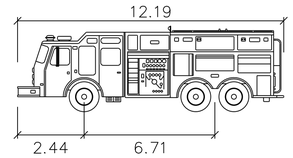
CROZIER
CONSULTING ENGINEERS
2800 High Point Drive
Suite 100
Milton, ON, L9T 6P4
905-875-0026 T
905-875-4915 F
www.cfcrozier.ca
info@cfcrozier.ca

Drawn By	Design By	Project	
B.L.			0649-6278
Check By	Check By	Scale	Drawing
A.D.	B.B.	1:200	FIG 12-A



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: MM/DD/YYYY
0	ISSUED FOR REVIEW	10/18/2023
1	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

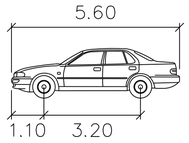
SITE CIRCULATION DIAGRAM
FIRE TRUCK – OUTBOUND

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	
B.L.			0649-6278
Check By	Check By	Scale	Drawing
A.D.	B.B.	1:200	FIG 12-B

5 0m 5 10 15
SCALE: 1:200

VECHICLE PROFILE



P

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

No.	ISSUE	DATE: MM/DD/YYYY
0	ISSUED FOR REVIEW	10/18/2023
1	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

SITE CIRCULATION DIAGRAM
PASSENGER CAR

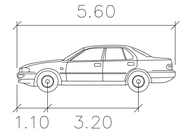
CROZIER
CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON. L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA
INFO@CFCROZIER.CA

Drawn By	Design By	Project	
B.L.			0649-6278
Check By	Check By	Scale	Drawing
A.D.	B.B.	1:200	FIG 13

5 0m 5 10 15
SCALE: 1:200

N

VECHICLE PROFILE



P

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

5 0m 5 10 15
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: MM/DD/YYYY
0	ISSUED FOR REVIEW	10/18/2023
1	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

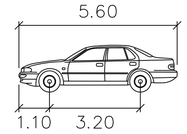
SITE CIRCULATION DIAGRAM
PASSENGER CAR – INBOUND

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	
B.L.			0649-6278
Check By	Check By	Scale	Drawing
A.D.	B.B.	1:200	FIG 14

N

VECHICLE PROFILE



P

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

5 0m 5 10 15
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: MM/DD/YYYY
0	ISSUED FOR REVIEW	10/18/2023
1	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

SITE CIRCULATION DIAGRAM
PASSENGER CAR – OUTBOUND

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	
B.L.			0649-6278
Check By	Check By	Scale	Drawing
A.D.	B.B.	1:200	FIG 15

Pavement Marking and Signage Plan

A Pavement Marking and Signage Plan (PMSP) have been completed that conforms to Ontario Traffic Manual 5, 11 and 15 requirements.

Figure 16 shows the Pavement Marking and Signage Plan

5 0m 5 10 15 20
SCALE: 1:250

N

PAVEMENT MARKINGS LEGEND

5	SOLID WHITE, 10cm
20	SYMBOLS

SIGNAGE LEGEND

SIGN NAME	SIGN NUMBER	SIZE (cm)	OTM BOOK	SECTION
YIELD	Ra-2	75	5	3
WRONG WAY	Rb-20	60x120	5	9
ONE WAY	Rb-21	30x90	5	9
NO PARKING	Rb-51	30x30	5	13
ACCESSIBLE PARKING PERMIT	Rb-93	30x45	5	13
FIRE ROUTE (CUSTOM)	F.R.S.	30x45	–	–
VISITOR PARKING ONLY (CUSTOM)	VISITOR PARKING	30x45	–	–

No.	ISSUE	DATE: MM/DD/YYYY
0	ISSUED FOR REVIEW	10/18/2023
1	ISSUED FOR SUBMISSION	12/01/2023

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project

13290 NUNNVILLE ROAD
TOWN OF CALEDON

Drawing

PAVEMENT MARKING SIGNAGE PLAN

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	
B.L.			0649-6278
Check By	Check By	Scale	Drawing
A.D.	B.B.	1:250	FIG 16

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.

Further, a 1.5 m accessible aisle is provided on both sides of the parking per Schedule "K" TO By-Law BL-2015-058

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 generally available on the cul-de-sac at the site and meets the requirement in Canadian Roundabout Design Guide. However, the vegetation in the middle of the cul-de-sac could be removed or trimmed to maintain a height of maximum 1.0 metre to increase sightlines, if desired.
- Based on AutoTURN analysis, waste, emergency, and passenger vehicle can maneuver through the site with no encroachments.
- The Pavement Marking and Signage Plan shows the appropriate signage at the site and in the cul-de-sac to support efficient movement of vehicles and improve sight lines.
- 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
Manager (Planning), Transportation

AD/BB

I:\600\649 - Bolton Gateway Developments Inc\6278- 13290 Nunnville Rd\Reports\Transportation\3rd Submission\2023.12.01 - Traffic Operations Assessment - 13290 Nunnville Road - Final.Docx

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

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 %	-	-	-		-	-	-	-		-	-	-	-		-	-	-

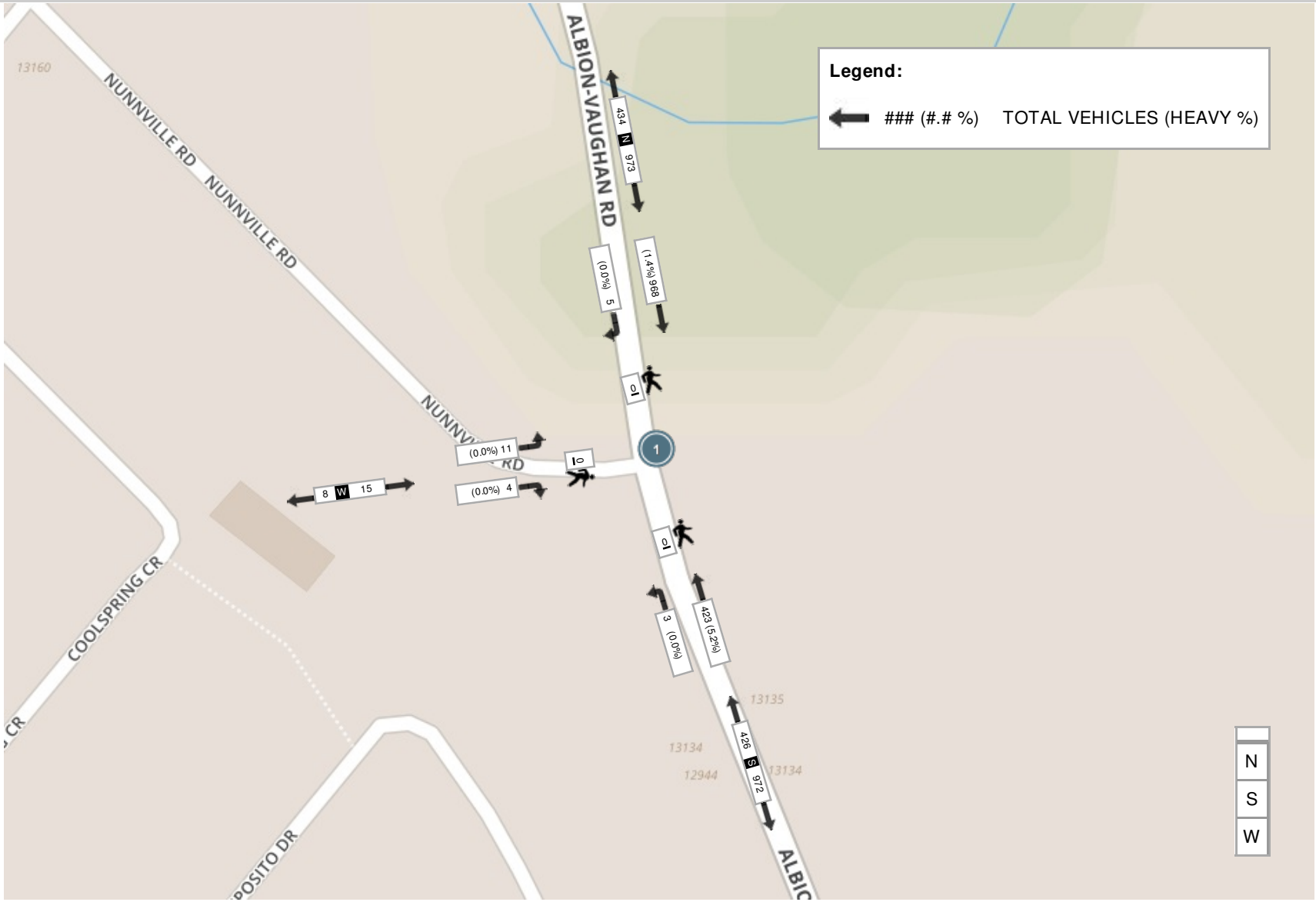
Peak Hour: 07:45 AM - 08:45 AM Weather: Light Rain (13.83 °C)

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%	-

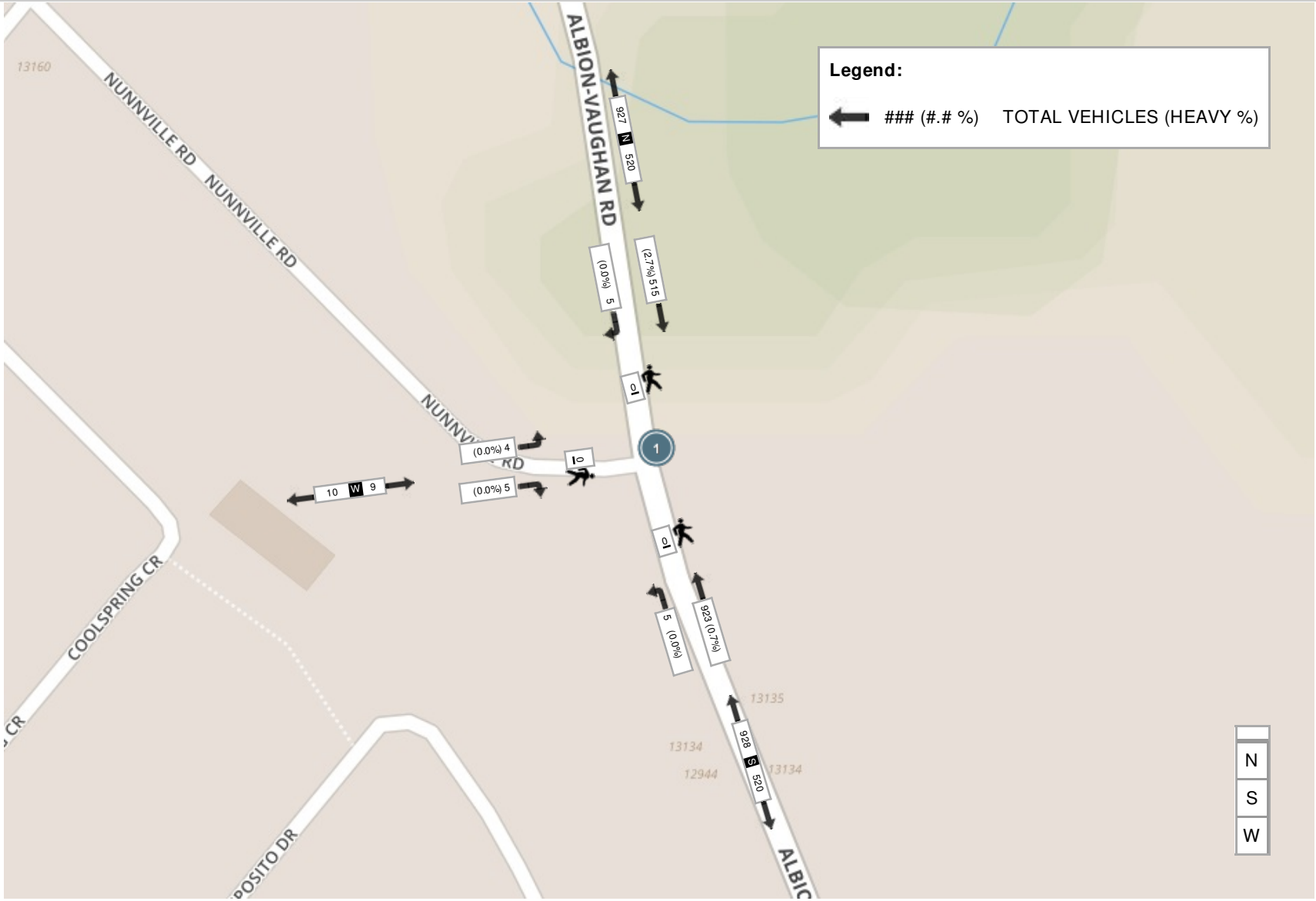
Peak Hour: 04:30 PM - 05:30 PM Weather: Thunderstorm (14.77 °C)

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

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	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	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	C
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	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	C
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	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			

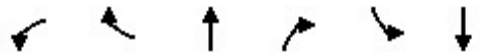
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	26	11	496	1135	8
Future Volume (Veh/h)	17	26	11	496	1135	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	17	26	11	496	1135	8
Pedestrians						
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		

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			

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

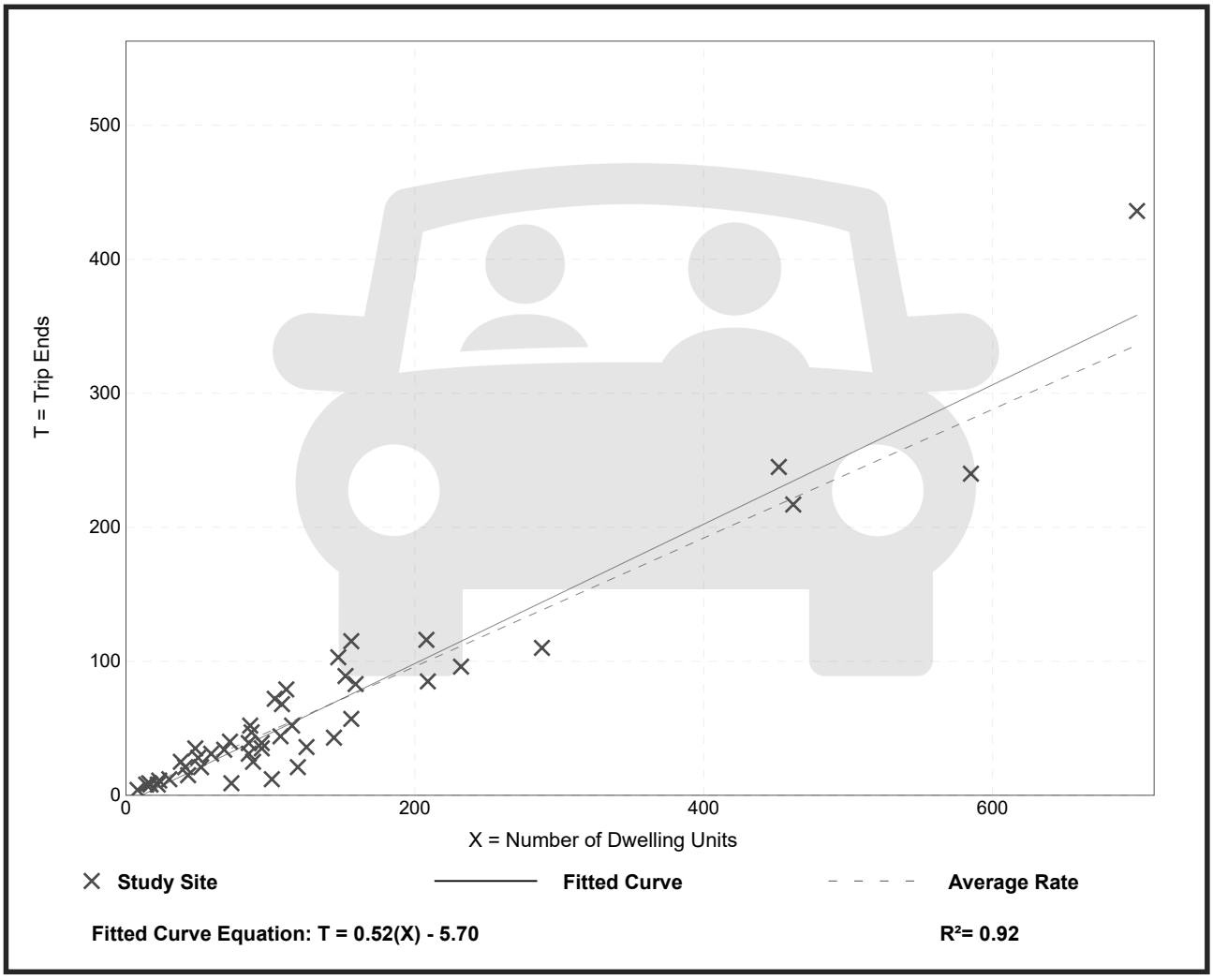
Single-Family Attached Housing
(215)

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



Trip Gen Manual, 11th Edition ● Institute of Transportation Engineers

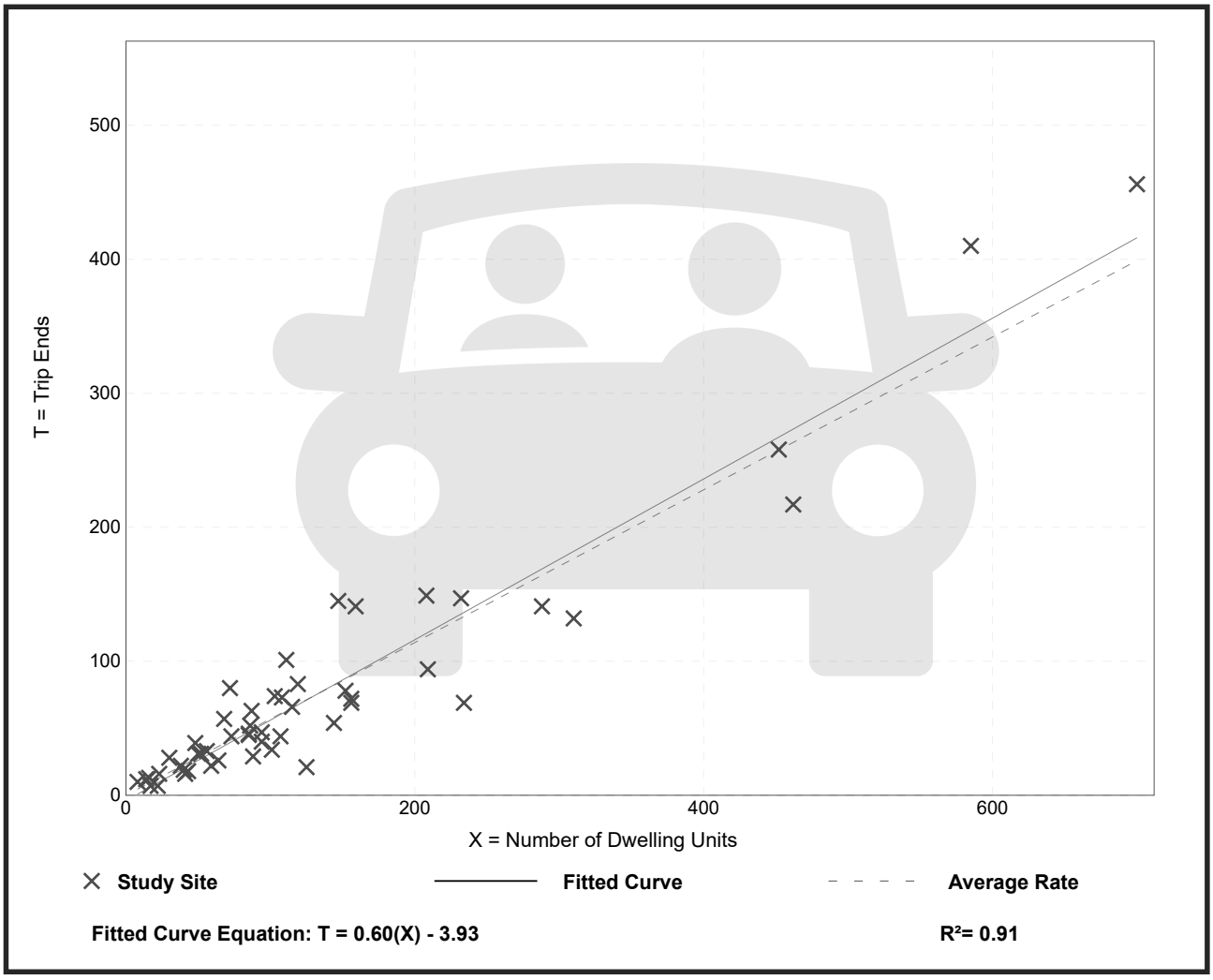
Single-Family Attached Housing
(215)

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



Trip Gen Manual, 11th Edition ● Institute of Transportation Engineers

APPENDIX F

Trip Distribution 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%