JEFFERY HOMES
TRAFFIC IMPACT ASSESSMENT

Development of 168 County Road 49
Township of Harvey
Municipality of Trent Lakes

PROJECT NO. 21-1-6814

DECEMBER 15, 2022

Prepared By:

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GREER GALLOWAY
CONSULTING ENGINEERS

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1.0 INTRODUCTION

The Greer Galloway Group Inc. (Greer Galloway) was retained by Jeffery Homes to determine the traffic impact of a proposed development at 168 County Road 49 in the Township of Harvey, Municipality of Trent Lakes, Ontario. Having reviewed the available documents, the following is provided in support of the development application process.

The goal of this document is to assess the potential effects of traffic resulting from the proposed development and identify any roadway improvements that are required to ensure that roadways will continue to operate at an acceptable level of service upon completion of the development.

2.0 METHODOLOGY AND ANALYSIS CRITERIA

The approach for this Traffic Impact Assessment was to follow the guidelines of the MTO General Guidelines for the Preparation of Traffic Impact Studies and utilizing Highway Capacity Software (HCS7) to determine if the existing road network has the ability to service the proposed development at an acceptable level of service.

The traffic volumes generated by the proposed development were estimated using the Institute of Transportation Engineers (ITE) Trip Generation, 10th Edition, Code 210. Any values that could not be obtained due to lack of data were assumed using conservative values. Pedestrian traffic was not considered since there are no pedestrian crossings on the existing road network and pedestrian traffic is not known to be significant.

Analysis of various peak hour time periods (Weekday AM, Weekday PM) was conducted to determine the worst-case scenario. The worst-case scenario was then analyzed using a horizon time of 10 years (to year 2032) to analyze the capacity considering background traffic growth conditions.

The level of service for the worst-case turning movements of the intersection are determined based on the calculated average control delay, as demonstrated below.

A level of service rank ‘F’ is considered unacceptable. Long delay times and queue lengths would be experienced by the minor street approach. Safety also becomes a factor due to drivers experiencing a long delay and having the natural tendency to select smaller than usual gaps when making turns onto the major street. This behavior could also lead to disruptions of the major traffic stream, causing unnecessary delays on the major street.

Table 2-1 – Level of Service Criteria

Level of Service	Average Control Delay (s/vehicle)
A	0 - 15
B	10 - 15
C	15 - 25
D	25 - 35
E	35 - 50
F	50 +

Source: Exhibit 17-2, HCM 2000

3.0 DESCRIPTION OF STUDY AREA

3.1 Description of Existing Site

The development property, 168 County Road 49, is located within Peterborough County at the eastern boundary with the City of Kawartha Lakes. Legally, the property is within part of Lot 19, Concession 19 in the Geographic Township of Harvey, of the Municipality of Trent Lakes. Nearby to the south, Bobcaygeon is part of the City of Kawartha Lakes (the former Victoria County).

The site is bounded by County Road 49 to the west, Moon Line Road North to the east, undeveloped lands to the north and residential properties fronting Ellwood Crescent to the south. A map of the area is provided in the following sections.

3.2 Description of Proposed Development and 2 New Access Roads

The total gross area of the property, currently undeveloped, is approximately 48 hectares but only 17 hectares are being proposed for development at this time. A central, undevelopable wetland (about 5 hectares, exclusive from the 17 hectares of development) separates the development into east and west halves.

The current development is expected to consist of 22 residential lots. Ten (10) lots are proposed for the west side and twelve (12) lots are proposed for the east side.

Two new municipal roads will be constructed to access the development: a new road on the west will connect the west lots to County Road 49, and a new road on the east will connect the east lots to Moon Line Road North. Both roads will terminate in cul-de-sacs.

Names for the new roads have not been determined. For the purpose of this report, the west road will be referred to as “Street A” and the east road will be referred to as “Street B”. Excerpts of the proposed development plan are shown on the next page.

Street A will be located roughly similar the existing residential entrance at 168 County Road 49, approximately 1.7km north of the County Road 36 intersection, and 550m south of Ranch Road/ Anderson Line. Street B will be located between 41 and 55 Moon Line Road North, approximately 330m north of Moon Line Road.

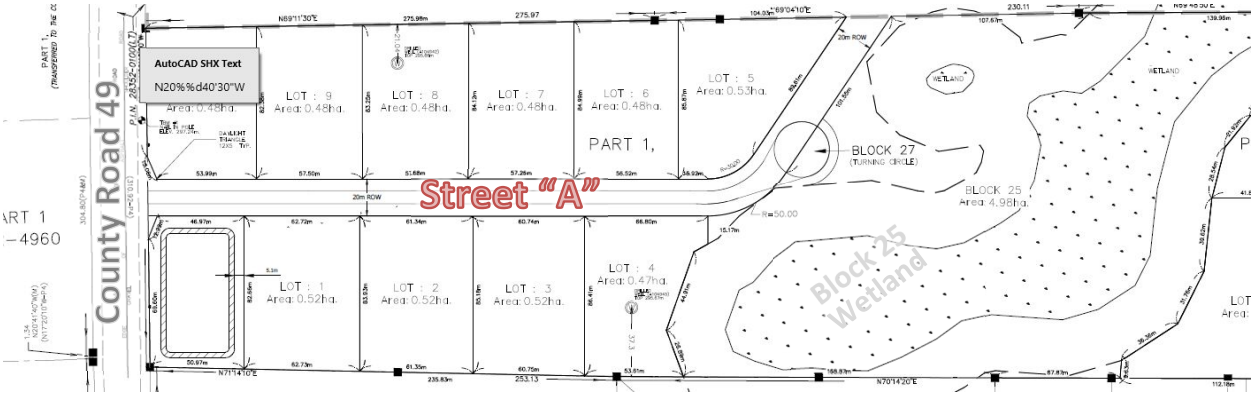


Figure 3-1a – excerpt of proposed development plan – Street A.

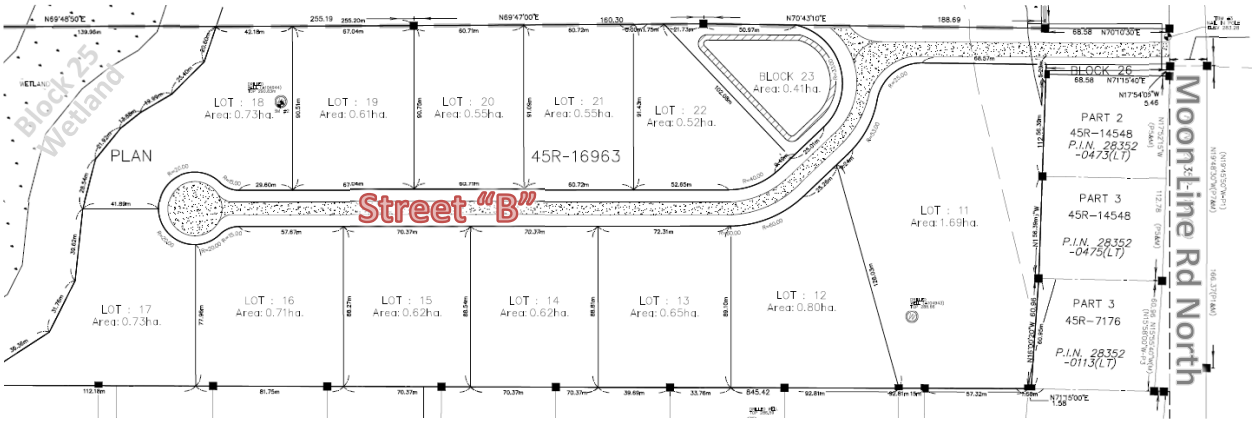


Figure 3-1b – excerpt of proposed development plan – Street B.

Cross sections for the new roads will be developed during the detailed design stage. It is understood the road surfaces will be a minimum of 6.0m wide and surface treated to reduce dust and ease maintenance, similar to Ellwood Crescent to the south.

It is anticipated that the new access roads will intersect County Road 49 and Moon Line Road North at 90 degrees to provide optimal visibility and turning movement geometry for both inbound and outbound traffic. The intersections will be stop controlled, with the existing municipal road being uncontrolled and Streets A and B being stop controlled. Both entrances will be cleared on either side of the proposed access roads, at the intersections with County Road 49 and Moon Line Road North, to ensure good line of sight for turning movements.

3.3 Adjacent Land Uses and Road Network

The area surrounding the proposed development is a mixture of farmland, residential / recreational uses and single-family homes on the east and south sides.

Figure 3-2 – site location and nearby road network.

The roads adjacent to the site are County Road 49 to the west and Moon Line Road North to the east, which is a minor road and conveys traffic to County Road 36. Descriptions for each of these roads are provided below.

3.3.1 County Road 49

County Road 49 is a main road that conveys traffic to and from the Town of Bobcaygeon and is under the jurisdiction of the City of Kawartha Lakes. This is a two-lane paved road with a rural cross–section and a 7.3m all-weather surface that includes partial paved shoulders combined with 0.5 m gravel shoulders in the vicinity of the proposed development.

It has a posted speed of 50 km/h near the downtown area of Bobcaygeon increasing to 80 km/h roughly 900m south of the subject site.

3.3.2 County Road 36

County Road 36 conveys traffic to and from areas east of the Town of Bobcaygeon and will collect traffic from Moon Line Road North via Moon Line Road. It is a two-lane paved road with a posted speed of 50 km/h near the downtown area of Bobcaygeon and increases to 80 km/h at the Trent Lakes Transfer Station 300m west of Moon Line Road.

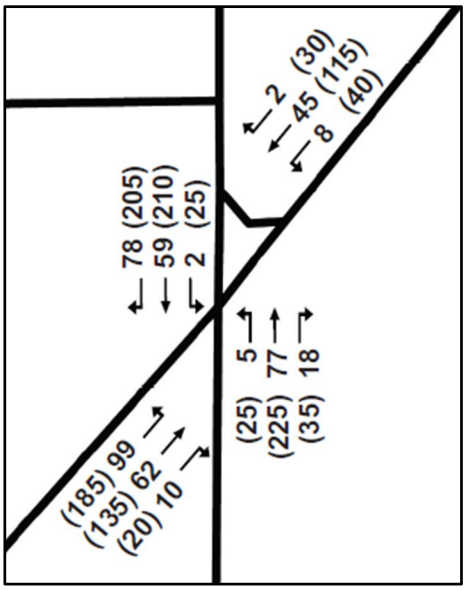
County Roads 36 and 49 intersect in Bobcaygeon. This intersection and County Road 36 south of this intersection (direction towards Lindsay) are within the jurisdiction of the City of Kawartha Lakes. Beyond Taylor Street and the Bobcaygeon Wilderness Park, the county road falls under the jurisdiction of Peterborough County.

3.3.3 Moon Line Road North

Moon Line Road North is a two-lane, surface treated road along the east side of the proposed development. This road is anticipated to convey traffic from Street B to County Road 36 via Moon Line Road. Moon Line Road North originates at the “T” intersection with Moon Line Road (south end) and continues past Ranch Road to the north. (Note that Ranch Road is gravel.) Moon Line Road North is a local road that is under municipal jurisdiction (Municipality of Trent Lakes).

4.0 EXISTING TRAFFIC CONDITIONS

4.1 Kawartha Lakes Transportation Master Plan, 2009 Intersection Volumes



According to the 2012 Transportation Master Plan provided by The City of Kawartha Lakes, the 2009 Peak Hourly Traffic Volumes for the intersection of County Road 49 and County Road 36 are as shown to the left. Afternoon values were used as they showed the higher counts (p.m. values in parenthesis).

Figure 4-1 – CR 36-49 intersection traffic peak hourly volumes (2009). Source: Figure 2-8 "Existing (2009) Intersection Peak Hourly Traffic Volumes – Bobcaygeon" (Transportation Master Plan, Feb 2012)

4.2 Peterborough County Traffic Counts

Peterborough County provided the following traffic data from 2020. This count location is approximately 4.8 km east of the County Road 36-49 intersection.

Table 4-1 – Peterborough County Traffic Data for County Road 36

Day	Date	Description	ADT (2-way)	ADT EB	ADT WB
Wed	05/20/2020	CR-36, 3.2km w of Tait's Bay R	4119		
Mon	07/27/2020	CR-36, 3.2km w of Tait's Bay R	5199	2469	2730
Tues	10/06/2020	CR-36, 3.2km w of Tait's Bay R	5049		

There is an approximate 25% volume increase between the spring and summer measurements. The City of Kawartha Lakes Master Plan references a similar statistic: that summer volumes are estimated at 25% higher than fall volumes. The summer counts indicate an approximately even directionality split through the day.

These counts were taken during the first year of the COVID-19 pandemic, which may or may not represent normal traffic volumes. No data is available for the same year for County Road 49 (which is not within Peterborough County jurisdiction).

4.3 Manual Traffic Count

Greer Galloway also conducted a manual traffic count in 2017 at the intersection of County Roads 36 and 49. The results are summarized in the table below.

Table 4-2 – Manual Traffic Count Results

Year	CR 49 – SB	CR 49 - NB	CR 36 - EB	CR 36 - WB
2017	270	470	122	345

The manual traffic count resulted with 740 vehicles on County Road 49 (36% SB and 64% NB), and 467 vehicles on County Road 36 (26% EB and 74% WB).

These are the most recent counts available before the start of the pandemic.

5.0 PROPOSED TRAFFIC CONDITIONS

5.1 Trip Generation Forecast

Traffic generated by the development was estimated using trip generation rates for Single Family Detached Housing (land use 210) from the ITE Trip Generation Manual, 10th Edition, published by the Institute of Transportation Engineers (ITE). Average trip generation rates and the numbers of trips generated are shown in the following table.

Table 5-1 – Trip Generation for Single Family Houses

Rates & Trips	Period	Total	In	Out
Directional Distribution	a.m. peak	-	26%	74%
	p.m. peak	-	64%	36%
Trips (10 Units, Street ‘A’)	a.m. peak	10	3	7
	p.m. peak	12	8	4
Trips (12 Units, Street ‘B’)	a.m. peak	12	3	9
	p.m. peak	15	9	6

The 10 proposed units along Street ‘A’ will generate an estimated 10 vehicle trips during the weekday AM peak hour and **12 vehicle trips during the weekday PM peak hour**.

The 12 proposed units along Street ‘B’ will generate an estimated 12 vehicle trips during the weekday AM peak hour and **15 vehicle trips during the weekday PM peak hour**.

Since the proposed development is residential, no trip volume reductions were made for “linked trips”, “diverted trips” or “pass-by trips”.

5.2 Site Trip Distribution

The planned residential land use will be similar in nature to nearby residential developments as well as other commuter traffic using County Roads 49 and 36. Therefore, the observed 2017 travel patterns on the study road network were used to develop the distribution of future site traffic on County Road 49 and County Road 36.

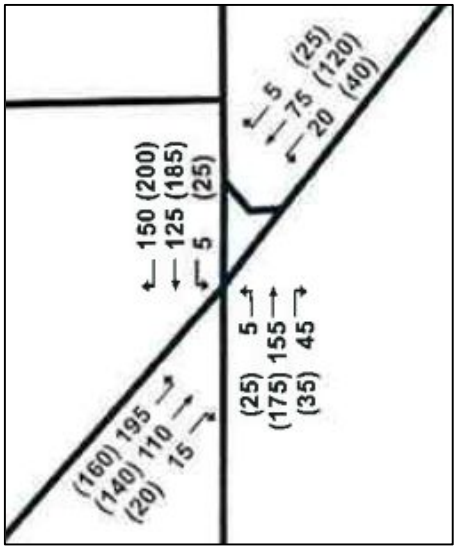
6.0 FUTURE CONDITIONS

6.1 Future Background Traffic

By applying a general 2% annual growth rate to the 2009 traffic volumes presented in the 2012 City of Kawartha Lakes Master Plan, future traffic conditions for the year 2032 can be estimated. This results in the following traffic distributions for County Road 49 and County Road 36, north of their common intersection in downtown Bobcaygeon.

Table 6-1 – Future Background Traffic (2% annually from 2009)

Year	CR 49 – SB	CR 49 - NB	CR 36 - EB	CR 36 - WB
2009	440	440	195	185
2022 (present)	569	569	252	239
2032 (future)	694	694	307	292



It is interesting to note, however, that by the Kawartha Lakes Transportation Master Plan, between 2009 and the 2031 projections, peak afternoon vehicle trips for County 36 appear relatively stable and volume is projected to decrease on County Road 49. **Figure 6-1** (left) shows the master plan projected 2031 volumes. **Figure 4-1** (Page 8) shows the *existing* 2009 traffic for the same intersection.

Figure 6-1 – CR 36-49 intersection traffic peak hourly volumes (2031). Source: Figure 7-2 "Future (2031) Intersection Peak Hourly Traffic Volumes – Bobcaygeon" Transportation Master Plan, Feb 2012)

Alternatively, projecting the 2017 manual traffic count at 2% annual growth to the year 2032, the following table is obtained.

Table 6-2 – Future Background Traffic (2% annually from 2017 manual traffic count)

Year	CR 49 – SB	CR 49 - NB	CR 36 - EB	CR 36 - WB
2017	270	470	122	345
2022 (present)	298	519	135	381
2032 (future)	363	633	164	464

Note that the observed County Road 49 directional distribution is 36% southbound/ 64% northbound, similar to the trip generator distributions (see **Table 5-1**). Considering the available counts and metrics, the manual traffic count – including distributions – was used to model the operation of the new Street 'A' entrance. Applying a 25% increase for seasonal adjustment produces **Table 6-3**, which was used for modelling.

Table 6-3 – Background Traffic Modelling Parameters

Year	CR 49 – SB	CR 49 - NB	CR 36 - EB	CR 36 - WB
2022 (+25%)	373	649	168	476
2032 (+25%)	454	791	205	580

6.2 Modelling

Street A and County Road 49 were modelled under 2022 and 2032 conditions according to **Table 6-3** and the following figures. For the 2022 modelling scenario: assuming 1022 through vehicles on County Road 49 (split 64/36% NB/SB), 8 new trips entering the development (5 NB right turns, 3 SB left turns), and 4 new trips leaving the development (2 WB right turns, 2 WB left turns), Street A operates with a volume/ capacity ratio of 0.01 and level of service of "C" (17.1 s/veh). The 2022 modelling case is illustrated by **Figure 6-2**, below.

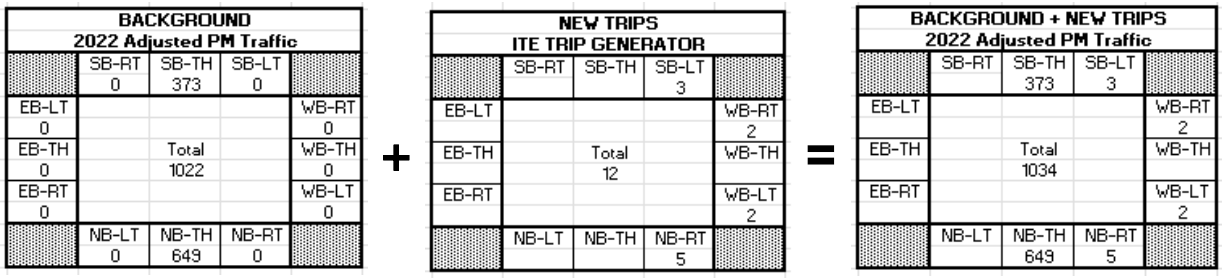


Figure 6-2 – Modelling parameters used at Street A/ County Road 49 for 2022.

For the 10-year 2032 future modelling scenario: assuming 1245 through vehicles on County Road 49 (split 64/36% NB/SB), 8 new trips entering the development (5 NB right turns, 3 SB left turns), and 4 new trips leaving the development (2 WB right turns, 2 WB left turns), Street A operates with a volume/ capacity ratio of 0.02 and level of service of "C" (21.3 s/veh). The 2032 modelling case is illustrated by **Figure 6-3.**

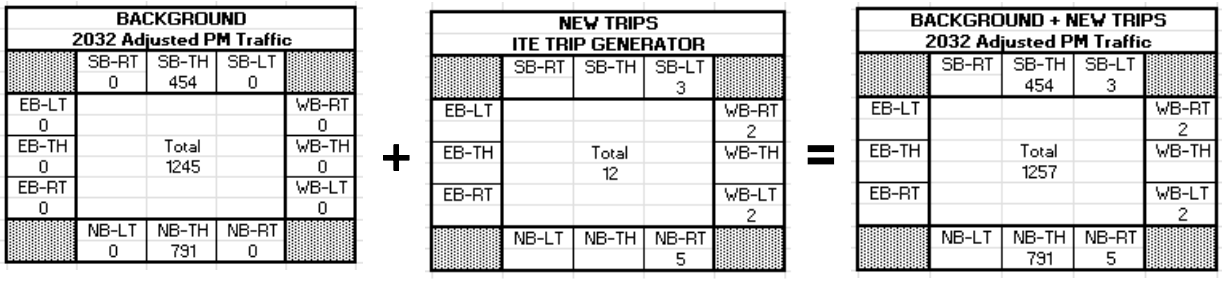


Figure 6-3 – Modelling parameters used for Street A/ County Road 49 for 2032.

Street B and Moon Line Road North is more difficult to accurately model due to an absence of traffic data along Moon Line Road North. However, with similar new trip generation rates as Street A, less background through traffic expected, and significant available capacity at the new Street A intersection, modelling for the Street B intersection is not felt to be necessary.

The increase in traffic from the proposed development will not have significant effects on traffic operations on the adjacent major roads.

7.0 ENTRANCE SAFETY

We are not aware of any existing concerns or history of accidents associated with the existing residential entrance at 168 County Road 49, or any of the other nearby roads and intersections. With two new municipal roads being proposed to service the east and west halves of the development, appropriate lines of sight should be verified.

1. Ministry of Transportation Highway Access Management Guideline

Stopping sight distance is from the point of view of a motorist travelling on the road. It is the distance that a motorist should be able to see to stop safely. This is the minimum standard that should be met.

Stopping Sight Distance (Table 9)

- Posted speed of 80 km/h.
- Design speed allowance of an additional 20 km/h.
- Roughly flat approach grade.
- Distance Required = 185m

The entering sight distance is from the point of view of a motorist waiting to enter or cross the highway. It is the distance a motorist should be able to see to safely enter the road and accelerate to the posted speed without being overtaken by an approaching vehicle.

Entering Sight Distance for 2 Lane Highways (Table 7)

- Posted speed of 80 km/h.
- Design speed allowance of an additional 20 km/h.
- Roughly flat approach grade.
- Distance Required = 320m

2. *Transportation Association of Canada Geometric Design Guide (TAC)*

Similar line of sight requirements are stated in the TAC and are provided below for additional reference.

Stopping Sight Distance (Table 2.5.2)
- Posted speed of 80 km/h (design speed of 100 km/h).
- Level roadway.
- Design speed allowance of an additional 20 km/h.
- Distance Required = 185m (similar to MTO)

Intersection Sight Distance: Right Turn (Table 9.9.6)
- Distance Required = 185m

Intersection Sight Distance: Left Turn (Table 9.9.4)
- Distance Required = 210m

7.1 Sight Distances – County Road 49

County Road 49 is straight and generally flat in both directions at the development property. Measurements were taken from Google Maps, which were paired with StreetView images at the same location.

MTO / TAC 80 km/h minimum stopping sight distance (185 m) is satisfied in both directions. The attached images show County Road 49 sightlines.

7.2 Sight Distances – Moon Line Road North

StreetView is not available for Moon Line Road North. The road appears to be straight and generally flat in both directions, however, by interpolating between contours on the Ontario Flow Assessment Tool (OFAT), there may be a short incline of in the range of 3-6% immediately to the north of the proposed entrance location (high side north). This should be field verified so that actual sightlines can be determined, and to identify any warning signs or measures that may be necessary.

Also note that by the Peterborough County GIS Viewer, approximately 26m of right-way exists between residence #41 and #55 for the Street B entrance.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our observations; applicable standards; a lack of previous safety concerns; and our understanding that the proposed development will not significantly affect existing traffic activity along Moon Line Road North and County Road 49 (as it relates to level of service and other traffic study measurables), we believe the proposed entrances/ access roads will be acceptable for the development.

If there are any questions or comments, please contact the undersigned.

Sincerely,

THE GREER GALLOWAY GROUP INC.
Consulting Engineers

Matthew McIntosh, P.Eng.
Senior Engineer / Project Manager

Nathan Jianopoulos

Nathan Jianopoulos, E.I.T.

Attachments:

1. StreetView Sightlines for County Road 49 x4
2. Google Satellite View from over Moon Line Road North x1
3. Modelling Summary Reports (2022 and 2032)

Photo 1: County Road 49, facing south ~185m north of the development site.

Photo 2: County Road 49, facing north, ~185m south of the development site.

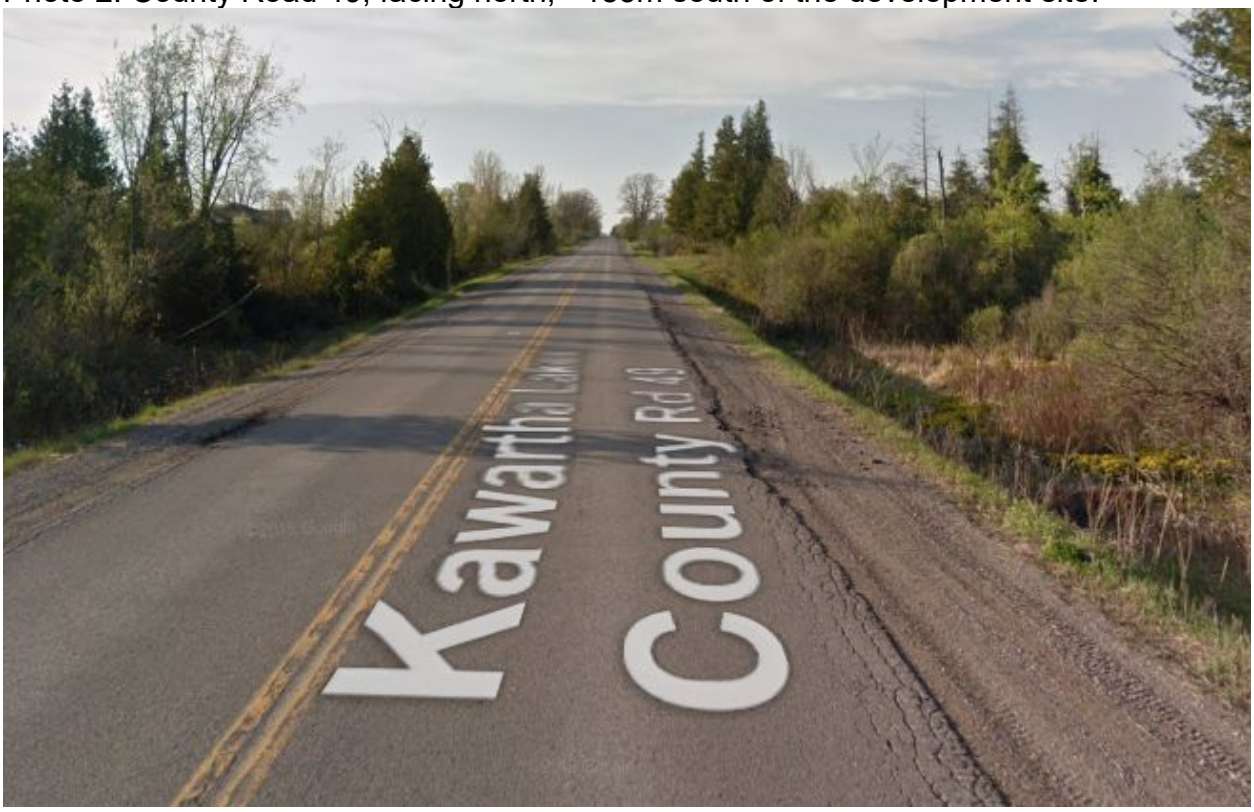
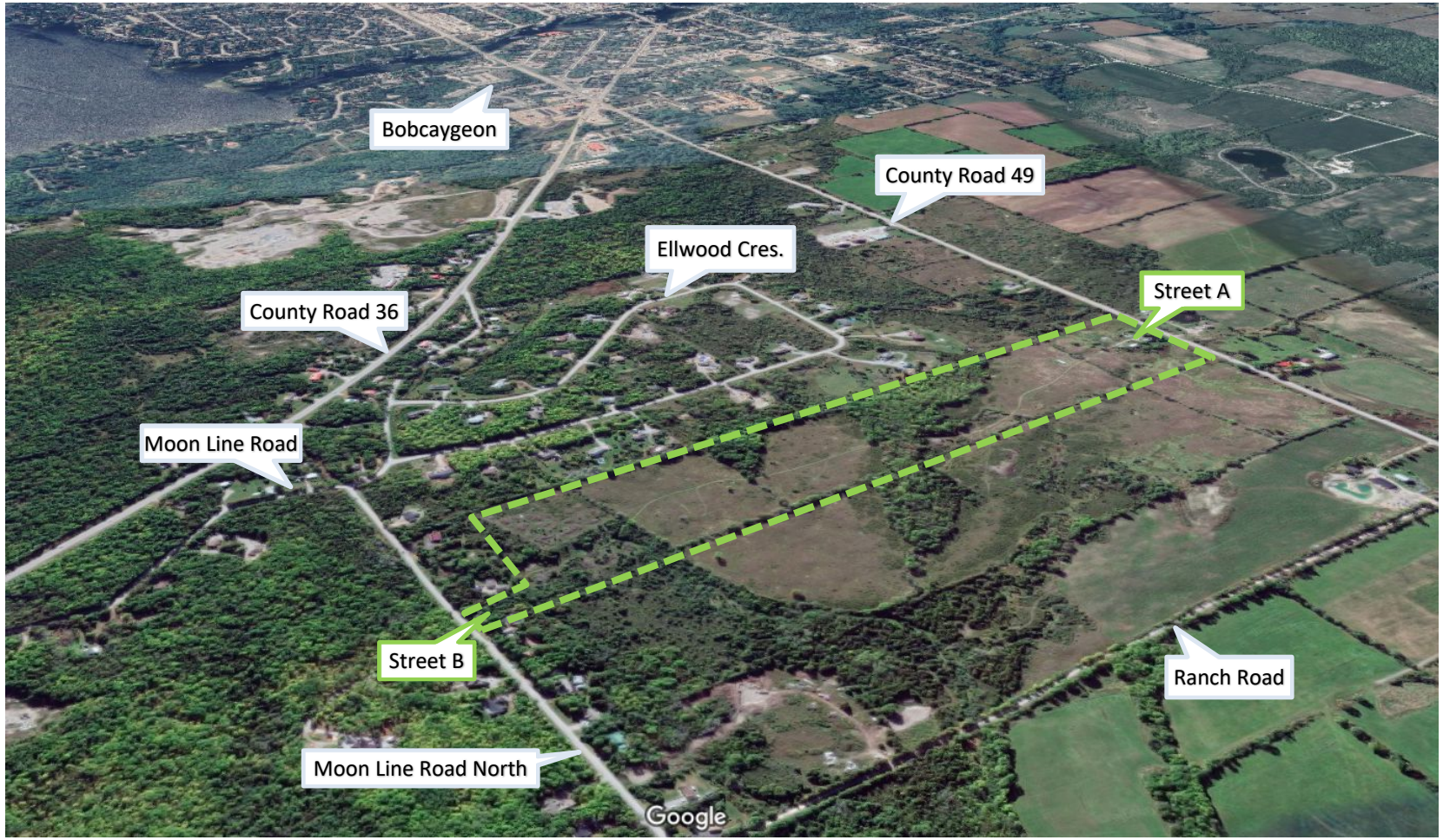


Photo 3: County Road 49, facing south towards Bobcaygeon, from the development site.

Photo 4: County Road 49, facing north towards Anderson Line/ Ranch Road from the development site.

Photo 5: Looking south-west towards CR 36-49 intersection from over Moon Line Road North.



HCS7 Two-Way Stop-Control Report

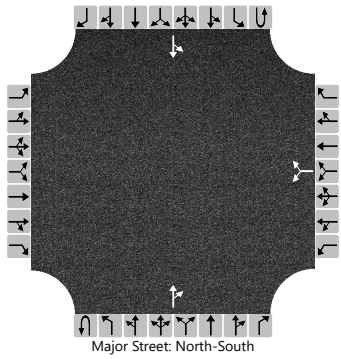
General Information

Analyst	Nathan Jianopoulos
Agency/Co.	Greer Galloway Group
Date Performed	4/4/2022
Analysis Year	2022
Time Analyzed	PM Peak
Intersection Orientation	North-South
Project Description	Jeffery Subdivision

Site Information

Intersection	Street A/ County Road 49
Jurisdiction	City of Kawartha Lakes
East/West Street	Street A
North/South Street	County Road 49
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						2		2			649	5		3	373	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							4							3		
Capacity, c (veh/h)							301							898		
v/c Ratio							0.01							0.00		
95% Queue Length, Q_{95} (veh)							0.0							0.0		
Control Delay (s/veh)							17.1							9.0		
Level of Service (LOS)							C							A		
Approach Delay (s/veh)						17.1								0.1		
Approach LOS						C										

HCS7 Two-Way Stop-Control Report

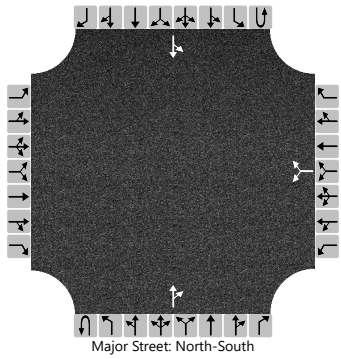
General Information

Analyst	Nathan Jianopoulos
Agency/Co.	Greer Galloway Group
Date Performed	4/4/2022
Analysis Year	2032
Time Analyzed	PM Peak
Intersection Orientation	North-South
Project Description	Jeffery Subdivision

Site Information

Intersection	Street A/ County Road 49
Jurisdiction	City of Kawartha Lakes
East/West Street	Street A
North/South Street	County Road 49
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						2		2			791	5		3	454	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)						7.1		6.2						4.1		
Critical Headway (sec)						6.40		6.20						4.10		
Base Follow-Up Headway (sec)						3.5		3.3						2.2		
Follow-Up Headway (sec)						3.50		3.30						2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							4							3		
Capacity, c (veh/h)							225							787		
v/c Ratio							0.02							0.00		
95% Queue Length, Q_{95} (veh)							0.1							0.0		
Control Delay (s/veh)							21.3							9.6		
Level of Service (LOS)							C							A		
Approach Delay (s/veh)						21.3								0.1		
Approach LOS						C										