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TRANSPORTATION IMPACT STUDY

Eric Challenger

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	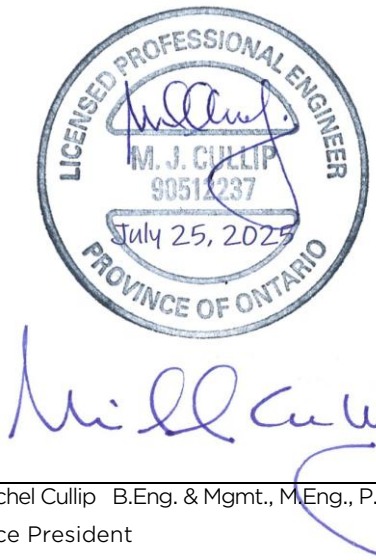
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Document Contents

1 Introduction 1

1.1 Report Objective 1

1.2 Study Structure 1

2 Existing Conditions 2

2.1 Road Network 2

2.2 Traffic Volumes 3

2.3 Traffic Operations 3

3 Future Background Conditions 5

3.1 Road Network 5

3.2 Traffic Volumes 5

3.3 Traffic Operations 6

4 Proposed Development 8

4.1 Site Location 8

4.2 Land-Use & Phasing 8

4.3 Site Access & Internal Road Network 8

4.4 Site Traffic 8

5 Future Conditions 11

5.1 Traffic Volumes 11

5.2 Traffic Operations 11

5.3 Turn Lane Requirements 13

5.4 Sight Line Analysis 14

6 Summary 15

Tables

Table 1: Intersection Operations – 2022 Conditions 4
Table 2: Historical Traffic Volumes 6
Table 3: Intersection Operations – 2025 Background 7
Table 4: Intersection Operations - 2030 Background 7
Table 5: Intersection Operations - 2035 Background 7
Table 6: Trip Generation Rates 9
Table 7: Trip Generation Estimates 9
Table 8: Intersection Operations – 2025 Total Conditions 12
Table 9: Intersection Operations - 2030 Total Conditions 12
Table 10: Intersection Operations - 2035 Total Conditions 13
Table 11: Sight Line Assessment 14

Figures

Figure 1: Site Location 16
Figure 2: Area Road Network 17
Figure 3: Traffic Volumes – 2022 19
Figure 4: Traffic Volumes – 2025 Background 20
Figure 5: Traffic Volumes – 2030 Background 21
Figure 6: Traffic Volumes – 2035 Background 22
Figure 7: Site Plan 23
Figure 8: Site Generated Traffic 24
Figure 9: Traffic Volumes – 2025 Total 25
Figure 10: Traffic Volumes – 2030 Total 26
Figure 11: Traffic Volumes – 2035 Total 27

Appendices

Appendix A: Traffic Counts
Appendix B: Level of Service Definitions
Appendix C: Existing Operations
Appendix D: Background Operations
Appendix E: Future Operations
Appendix F: Left Turn Warrants

1 Introduction

Tatham Engineering Limited was retained by Eric Challenger to address the traffic impacts associated with the proposed residential development to be located at 65 Northeys Bay Road in the Township of North Kawartha. The location of the development is illustrated in Figure 1.

1.1 REPORT OBJECTIVE

The objective of this report is to present the findings of the transportation impact study and to address the requirements of the Township of North Kawartha and Peterborough County. With respect to the potential transportation impacts of the development on the local road network, the following will be discussed:

- the operations of the study area road system prior to the proposed development;
- the growth in the traffic volumes not otherwise attributed to the development (i.e. from overall growth in the area and/or other developments);
- the number of new trips the proposed development is likely to generate;
- the operations of the study area road system upon the completion of the proposed development; and,
- the resulting impacts and need for mitigating measures (if required) to ensure acceptable overall road operations.

1.2 STUDY STRUCTURE

The report is structured as follows;

- Chapter 1: introduction and study purpose;
- Chapter 2: existing conditions, detailing the road system and corresponding traffic operations;
- Chapter 3: future conditions, prior to the completion of the proposed development (referred to as future background conditions), and the expected growth in traffic levels and the resulting operating conditions;
- Chapter 4: proposed development and associated details including land use, access, traffic volumes and parking;
- Chapter 5: future conditions, with completion of the proposed development (referred to as future total conditions); and
- Chapter 6: summary of the report and key findings.

2 Existing Conditions

This chapter will describe the road network, traffic volumes and operations for the existing conditions.

2.1 ROAD NETWORK

The road network to be addressed in the study consist of Highway 28, Northeys Bay Road (County Road 56) and their respective intersection.

2.1.1 Road Sections

Northeys Bay Road / County Road 56

As per the *Peterborough County 2022 Transportation Master Plan Update*[1], County Road 56 (also known as Northeys Bay Road) is classified as a Class B County road providing the function of a collector road. Northeys Bay Road is also identified as a Special Character Road. As per the *2022 TMP Update,* the term special character road describes a road corridor with unique natural, cultural, historical and/or recreational attributes or qualities that differentiates the road from others in the network. A special character road may warrant special treatments (i.e. lower posted speeds, different design specifications) due to their distinctive characteristics.

Northeys Bay Road is oriented north-south through the study area and has a 2-lane rural cross section with grass/gravel shoulders and open ditches. The road has a posted speed limit of 60 km/h and hence a design speed of 70 km/h has been assumed (posted speed + 10 km/h for lower speed roads). In considering the intended function of a Class B county road, Northeys Bay Road has an assumed planning capacity of 750 vehicles per hour per lane (vphpl).

Highway 28

Highway 28 is designated as a Class 2B – Arterial provincial highway under the jurisdiction of the MTO. The highway has an overall north-south orientation but is generally oriented east-west in the vicinity of its intersection with Northeys Bay Road. Highway 28 has a 2-lane rural cross-section with paved shoulders and open ditches on both sides of the road. The highway has a posted speed limit of 80 km/h and thus a design speed of 100 km/h has been assumed (posted speed limit + 20 km/h). As a provincial highway, the road has an assumed planning capacity 1,000 vphpl..

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[1] *Peterborough County 2022 Transportation Master Plan Update*. Paradigm Transportation Solutions Ltd. & Stantec. October 2022.

Photos of the area road network are provided in Figure 2.

2.1.2 Intersection

Highway 28 and Northeys Bay Road

The intersection of Highway 28 and Northeys Bay Road is an unsignalized, 3-leg intersection with stop control on Northeys Bay Road. The east approach (Highway 28) consists of a single through lane and exclusive left turn lane, whereas the west approach consists of a through lane and 60 metre right turn taper. The south approach (Northeys Bay Road) consists of a single shared left-right turn lane.

2.2 TRAFFIC VOLUMES

To determine existing volumes through the study area, traffic counts were conducted at the intersection of Highway 28 with Northeys Bay Road on Tuesday September 20, 2022 from 7:00 to 10:00 and 15:00 to 18:00.

The 2022 traffic volumes are illustrated in Figure 3 whereas additional details are provided in Appendix A.

2.3 TRAFFIC OPERATIONS

The assessment of existing conditions provides the baseline from which the future traffic volumes and operations (both with and without the subject development) can be assessed. As the capacity, and hence operations of a road system are effectively dictated by its intersections, the analysis focused on the operations of the noted key intersection. The analysis is based on the following:

- the 2022 peak hour traffic volumes;
- the existing intersection configuration and control; and
- procedures outlined in the *2000 Highway Capacity Manual*[2] (using Synchro v.11 software).

For unsignalized intersections, the analysis considers the following for the critical (i.e. stop controlled) movements on the minor road and also the left turn movements (either separate or shared with the through lane) on the major road:

- the average delay (measured in seconds);

[2] *Highway Capacity Manual*. Transportation Research Board, Washington DC, 2000.

- level of service (LOS) – level of service 'A' corresponds to the best operating condition with minimal delays whereas level of service 'F' corresponds to poor operations resulting from high intersection delays (level of service definitions are provided in Appendix B); and
- volume to capacity (v/c) ratios – a v/c ratio of less than 1.0 indicates the intersection movement/ approach is operating at less than capacity while v/c of 1.0 indicates capacity has been reached.

A summary of the analysis provided in Table 1; detailed operations worksheets are included in Appendix C.

Table 1: Intersection Operations – 2022 Conditions

INTERSECTION, MOVEMENT & CONTROL			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Highway 28 & Northeys Bay Road	WB L	free	8	A	0.01	8	A	0.00
	NB LR	stop	10	B	0.06	11	B	0.08

L left lane T through lane R right lane LT left-through TR through-right LTR left-through-right

Based on the existing volumes, intersection configuration and control, the intersection of Highway 28 with Northeys Bay Road provides excellent overall operations (LOS B or better) with minimal delays during both peak hours. As such, no intersection improvements are required to support the existing conditions.

3 Future Background Conditions

This chapter will describe the road network and background traffic volumes expected for the years 2025, 2030 and 2035. The 2025 horizon year has been adopted to reflect full build-out of the proposed development, whereas the 2030 and 2035 horizon will address longer-term impacts (5 and 10 years beyond build-out).

3.1 ROAD NETWORK

There are no planned improvements that would otherwise impact the capacity or operations of the road network (i.e. road widening, intersection improvements, etc.). As such, the road network as described in Section 2.1 has been maintained in the assessment of the future background conditions.

3.2 TRAFFIC VOLUMES

Future background traffic volumes expected for the 2025, 2030 and 2035 horizon years have been determined based on the existing traffic volumes, projected growth and in consideration of other development within the immediate area (apart from the subject development).

3.2.1 Background Growth

Population Growth

Based on recent Census data, the population of the Township of North Kawartha increased from 2,479 in 2016 to 2,877 in 2021, which translates to an annual growth rate of 3.0% over the noted 5-year period. It is noted that several communities experienced higher than anticipated population growth through the pandemic as people migrated out of larger urban areas.

The *Peterborough County Official Plan*[3] forecasts an annual population growth rate for the County of 0.8% for the period 2021 to 2051. Similarly for the Township of North Kawartha, the *Official Plan* projects annual growth of 0.8% for the same period. With respect to employment, the *Official Plan* forecasts 0% growth for the Township.

Traffic Growth

Historical Annual Average Daily Traffic (AADT) and Summer Average Daily Traffic (SADT) volumes on Highway 28 between County Road 36 and Peterborough Road 504 were reviewed as reported by MTO for the period 2014 to 2019 (the most recent data available), and are summarized in Table 2. As indicated, the AADT volumes have experienced average annual

[3] *Peterborough County Official Plan*. County of Peterborough. June 29, 2022.

growth of 0.9%; whereas the SADT volumes have experienced an average annual decrease of 0.3%.

Table 2: Historical Traffic Volumes

ROAD SECTION		ANNUAL TRAFFIC VOLUME						AVERAGE ANNUAL GROWTH
		2014	2015	2016	2017	2018	2019	
Highway 28 (County Road 36 to P'boro Rd 504)	AADT	4250	4250	4300	4350	4400	4450	0.9%
	SADT	6200	6200	6300	5950	6050	6100	-0.3%

Overall Background Growth

Based on the above, a 2% annual growth rate has been applied to the volumes on Highway 28 and Northeys Bay Road.

3.2.2 Development Growth

No other planned developments were identified in the immediate area for inclusion in the future background traffic projections.

3.2.3 Total Background Traffic Volumes

Background traffic volumes (i.e. without the subject development) for the 2025, 2030 and 2035 horizon years have been determined based on the following:

- the 2022 volumes; and
- an annual background growth rate of 2%.

The resulting background traffic volumes are illustrated in Figure 4 through Figure 6.

3.3 TRAFFIC OPERATIONS

The intersection of Highway 28 with Northeys Bay Road was analyzed for the 2025, 2030 and 2035 conditions, the results of which are summarized in

Table 3 through Table 5 with detailed worksheets provided in Appendix D. The existing intersection configurations and controls have been maintained.

As indicated, the study area intersection will provide excellent overall operations (LOS B or better) with minimal delays through the 2035 horizon given the projected total volumes. Thus, no improvements are required to accommodate the future background volumes.

Table 3: Intersection Operations – 2025 Background

INTERSECTION, CONTROL & MOVEMENT			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Highway 28 & Northeys Bay Road	free	WB L	8	A	0.01	8	A	0.00
	stop	NB LR	10	B	0.06	11	B	0.09

L left lane T through lane R right lane LT left-through TR through-right LTR left-through-right

Table 4: Intersection Operations - 2030 Background

INTERSECTION, CONTROL & MOVEMENT			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Highway 28 & Northeys Bay Road	free	WB L	8	A	0.01	8	A	0.00
	stop	NB LR	11	B	0.07	12	B	0.10

L left lane T through lane R right lane LT left-through TR through-right LTR left-through-right

Table 5: Intersection Operations - 2035 Background

INTERSECTION, CONTROL & MOVEMENT			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Highway 28 & Northeys Bay Road	free	WB L	8	A	0.01	8	A	0.00
	stop	NB LR	11	B	0.08	12	B	0.12

L left lane T through lane R right lane LT left-through TR through-right LTR left-through-right

4 Proposed Development

This chapter will provide additional details with respect to the proposed development, including its location, the projected site generated traffic volumes and the assignment of such to the adjacent road network.

4.1 SITE LOCATION

As previously noted, the site is to be located at 65 Northeys Bay Road as illustrated in Figure 1. The site currently consists of a 9-hole golf course.

4.2 LAND-USE & PHASING

The proposed development will consist of 58 single detached units a 1.4-hectare commercial block. Through discussions with the developer, a 743 m^2 (8,000 ft^2) multi-unit commercial building has been assumed. While the exact uses for the commercial block have not yet been identified, the intent is to include uses to serve the proposed residential subdivision (i.e. neighbourhood commercial uses).

A site plan is provided in Figure 7. The development will be constructed in a single phase with full build-out assumed by 2025.

4.3 SITE ACCESS & INTERNAL ROAD NETWORK

The site will be served by an internal road network with a single connection to Northeys Bay Road (approximately 405 metres south of Highway 28). The commercial block will be accessed via the internal road network. It is noted that the site access location satisfies MTO's separation requirement from Highway 28 (400 metres).

The internal road network will be designed to municipal standards (i.e. local road with 20 metre right-of-way).

4.4 SITE TRAFFIC

4.4.1 Trip Generation

The number of vehicle trips to be generated by the proposed development for the weekday AM and PM peak hours has been determined based on type of use, development size and trip generation rates as per the *ITE Trip Generation Manual, 11th Edition*[4]. Based on the proposed

[4] *Trip Generation Manual, 11th Edition*. Institute of Transportation Engineers. September 2021.

development, trip rates for a *single family detached* (ITE code 210), *pharmacy/drug store* (ITE code 880), *medical-dental office building* (ITE code 720), *hair salon* (ITE code 918) and *fast casual restaurant* (ITE code 930) land-use have been applied. The associated trip rates and trip estimates are provided in Table 6 and Table 7, respectively.

For the purpose of this study, the commercial building has been assumed to consist of four 185 m^2 (2,000 ft^2) units.

Table 6: Trip Generation Rates

TRIP RATES	VARIABLE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
single detached	unit	0.15	0.33	0.48	0.32	0.25	0.57
pharmacy/ drug store	1000 ft^2 GFA	1.91	1.03	2.94	4.17	4.34	8.51
medical/ dental office	1000 ft^2 GFA	2.45	0.65	3.10	1.18	2.75	3.93
hair salon	1000 ft^2 GFA	0.61	0.61	1.21	0.25	1.20	1.45
fast casual restaurant	1000 ft^2 GFA	0.72	0.72	1.43	6.90	5.65	12.55

Table 7: Trip Generation Estimates

TRIP RATES	PROPOSED SIZE	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		In	Out	Total	In	Out	Total
single detached	58 units	9	19	28	19	14	33
pharmacy/ drug store	2,000 ft^2 GFA	4	2	6	8	9	17
medical/ dental office	2,000 ft^2 GFA	5	1	6	2	6	8
hair salon	2,000 ft^2 GFA	1	1	2	1	2	3
fast casual restaurant	2,000 ft^2 GFA	1	2	3	14	11	25
Total		**20**	**25**	**45**	**44**	**42**	**86**

As indicated, the proposed residential development is expected to generate 45 trips during AM peak hour and 86 trips during PM peak hour.

4.4.2 Trip Distribution & Assignment

The distribution of the new trips generated by the site has been developed based on distribution data provided in the 2016 Transportation Tomorrow Survey (TTS). The TTS is a comprehensive travel survey conducted in the Greater Golden Horseshoe Area once every five years. As per the *TTS 2016 Data Guide*, the subject development resides in Traffic Boundary Zone 8852. As such, the trip data was filtered to show all trips to/from the respective traffic zone from which the following distribution was established:

- to/from the north – <1%;
- to/from the south – 27%;
- to/from the east – <1%; and
- to/from the west – 72%.

In considering the trip distribution above, the location of the site within the noted traffic boundary zone, the proximity to other built up urban areas and available travel routes, the following assignment has been assumed:

- to/from the north via Highway 28 – 5%;
- to/from the south via Highway 28 – 20%
- to/from the west via Highway 28 – 70%; and
- to/from the east via Northeys Bay Road – 5%..

It is expected that traffic assigned to/from the west via Highway 28 will access east-west routes located beyond the immediate study area (i.e. County Road 36).

The resulting site generated traffic volumes assigned to the road network are illustrated in Figure 8.

5 Future Conditions

This chapter will address the resulting impacts of the proposed development on the adjacent road system with focus on the following:

- operations of the study area road network;
- operations of the site access;
- available sight lines along Northeys Bay Road at the proposed site access location; and
- potential improvements to the study area road network, if necessary.

5.1 TRAFFIC VOLUMES

To assess the impacts of the increased traffic volumes resulting from the proposed development, the site generated traffic was combined with the 2025, 2030 and 2035 background volumes. The resulting total traffic volumes are presented in Figure 9 through Figure 11.

5.2 TRAFFIC OPERATIONS

The operations of the subject intersection were again investigated considering the total traffic volumes for each horizon year. The analysis results are summarized in Table 8 through Table 10, with operational reports provided in Appendix E.

As indicated, the study area intersection will continue to provide excellent overall operations (LOS B or better) with minimal delays through the 2035 horizon given the projected total volumes. It is noted that the 2035 total operations are comparable to those experienced under background conditions, indicating that the subject development will not have a significant impact on the study area road network.

The site access is expected to provide excellent operations (LOS A), which is not unexpected given the limited volumes on both Northeys Bay Road and generated by the proposed development.

It is to be noted that the assessment has not considered the removal of trips generated by the existing golf course. As such, the assessment is considered conservative in that the net increase in traffic generated by the site will be less than what has been considered in the analysis.

In considering the above, no improvements are required to address the intersection operations under future total conditions.

Table 8: Intersection Operations – 2025 Total Conditions

INTERSECTION, CONTROL & MOVEMENT			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Highway 28 & Northeys Bay Road	free	WB L	8	A	0.01	8	A	0.01
	stop	NB LR	11	B	0.10	12	B	0.16
Northeys Bay Road & Site Access	stop	WB LR	9	A	0.03	9	A	0.05
	free	SB LT	3	A	0.01	4	A	0.03

L left lane T through lane R right lane LT left-through TR through-right LTR left-through-right

Table 9: Intersection Operations - 2030 Total Conditions

INTERSECTION, CONTROL & MOVEMENT			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Highway 28 & Northeys Bay Road	free	WB L	8	A	0.01	8	A	0.01
	stop	NB LR	11	B	0.11	13	B	0.18
Northeys Bay Road & Site Access	stop	WB LR	9	A	0.03	9	A	0.05
	free	SB LT	3	A	0.01	4	A	0.03

L left lane T through lane R right lane LT left-through TR through-right LTR left-through-right

Table 10: Intersection Operations - 2035 Total Conditions

INTERSECTION, CONTROL & MOVEMENT			WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
			Delay	LOS	V/C	Delay	LOS	V/C
Highway 28 & Northeys Bay Road	free	WB L	8	A	0.01	8	A	0.01
	stop	NB LR	12	B	0.13	13	B	0.20
Northeys Bay Road & Site Access	stop	WB LR	9	A	0.03	9	A	0.05
	free	SB LT	3	A	0.01	3	A	0.03

L left lane T through lane R right lane LT left-through TR through-right LTR left-through-right

5.3 TURN LANE REQUIREMENTS

Despite the otherwise excellent operations provided at the site access, the need for exclusive turn lanes on Northeys Bay Road at the site access has been reviewed based on the following:

- TAC guidelines for auxiliary lanes at unsignalized intersections;
- a design speed of 70 km/h (reflective of the 60 km/h speed limit); and
- the projected 2035 total volumes.

5.3.1 Right Turn Lanes

With respect to right turn lanes, such are generally warranted where right turn volumes exceed 60 vehicles per hour and/or impede through traffic. As the right turn volumes on Northeys Bay Road at the site access are in the order of 1 to 2 vehicles per hour, an exclusive right turn lane is not required.

5.3.2 Left Turn Lanes

In considering the need for an exclusive left turn lane, TAC warrants for auxiliary left turn lanes on 2-lane, undivided roads were considered. The warrants are based on design speed, advancing volume (i.e. traffic travelling in the same direction as the left-turning traffic), opposing volume (i.e. traffic travelling in the opposite direction as the left-turning traffic) and percentage of left turns in the advancing volume. The warrants were assessed for the 2035 horizon.

Based on the results of the assessment, a left turn lane on Northeys Bay Road at the site access is not warranted. The completed warrants are provided in Appendix F.

5.4 SIGHT LINE ANALYSIS

Sight lines along Northeys Bay Road at the proposed site access have been reviewed in consideration of the following:

- County of Peterborough sight line requirements as per *Schedule* "A" to By-law No. 2012-26 (adequate visibility in both directions based on posted speed limit); and
- minimum Stopping Sight Distance (SSD) requirements as per Transportation Association of Canada (TAC)

Minimum stopping sight distance provides sufficient distance for an approaching motorist to observe a hazard in the road and bring their vehicle to a complete stop prior to the hazard.

Table 11 summarizes the County's sight distance requirements for a posted speed limit of 60 km/h and TAC's minimum stopping sight distance for a design speed of 70 km/h. The available sight lines along Northeys Bay Road at the site access are also summarized in Table 11.

Table 11: Sight Line Assessment

LOCATION	POSTED SPEED	DESIGN SPEED	SIGHT DISTANCE REQUIREMENTS		AVAILABLE SIGHT DISTANCES TO/FROM	
			County	TAC	South	North
Site Access	60 km/h	70 km/h	130 m	105 m	135 m	130 m

As indicated, the sight lines in both directions are 130 metres or greater and thus satisfy both the County and TAC sight line requirements.

6 Summary

Proposed Development

The study has addressed the transportation impacts associated with the residential development with commercial block to be located at 65 Northeys Bay Road in the Township of North Kawartha. Upon completion, the development is expected to generate an additional 45 trips during the AM peak hour and 86 trips during the PM peak hour.

Transportation Assessment

In addressing the study area traffic operations, the intersection of Highway 28 and Northeys Bay Road was analyzed under existing (2022) and future (2025, 2030 and 2035) horizon periods. The operations assessment indicates that the study area road network will continue to provide excellent operations through the 2035 horizon.

The site access was also reviewed and will provide excellent operations.

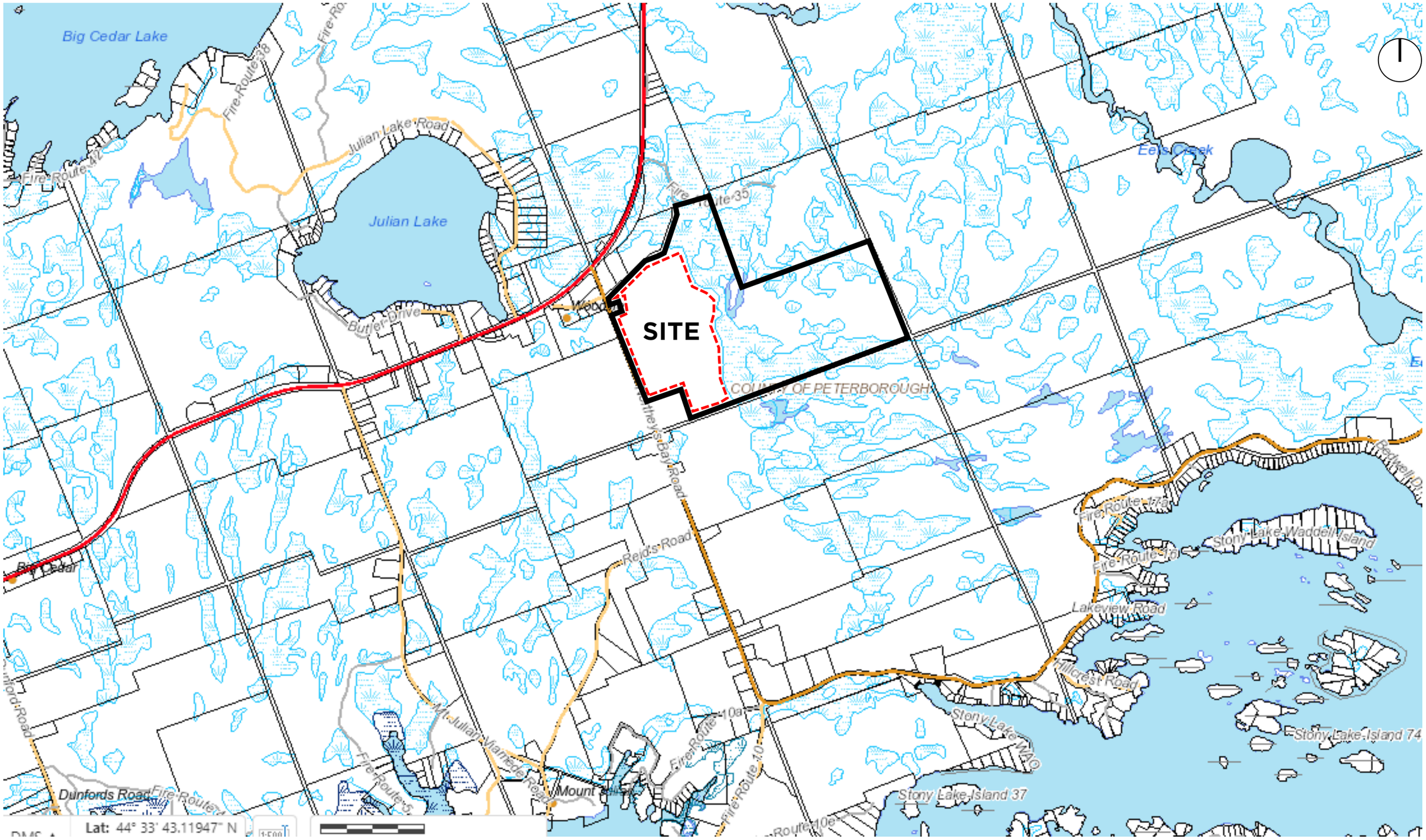
No improvements are required to address existing or future traffic conditions.

Turn Lane Requirements

The need for exclusive right and left turn lanes on Northeys Bay Road at the site access were reviewed in context of TAC warrant criteria for exclusive turn lanes. Based on the projected volumes on Northeys Bay Road and the turning volumes accessing the site, exclusive turn lanes are not warranted.

Sight Line Assessment

The available sight lines along Northeys Bay Road at the proposed site access were reviewed in context of County requirements and TAC guidelines for minimum stopping sight distance. In all instances the available sight lines satisfy both County and TAC requirements; thus no improvements to the sight lines are required.



Source: Peterborough County Maps

WOODVIEW GOLF SUBDIVISION

Figure 1: Site Location

Source: Peterborough County Maps

WOODVIEW GOLF SUBDIVISION

Figure 2A: Area Road Network

Looking to the north along Northeys Bay Road from site access

Looking to the south along Northeys Bay Road from site access

Looking to the west along Highway 28 from Northeys Bay Road

Looking to the east along Highway 28 from Northeys Bay Road

WOODVIEW GOLF SUBDIVISION

Figure 2B: Area Road Network

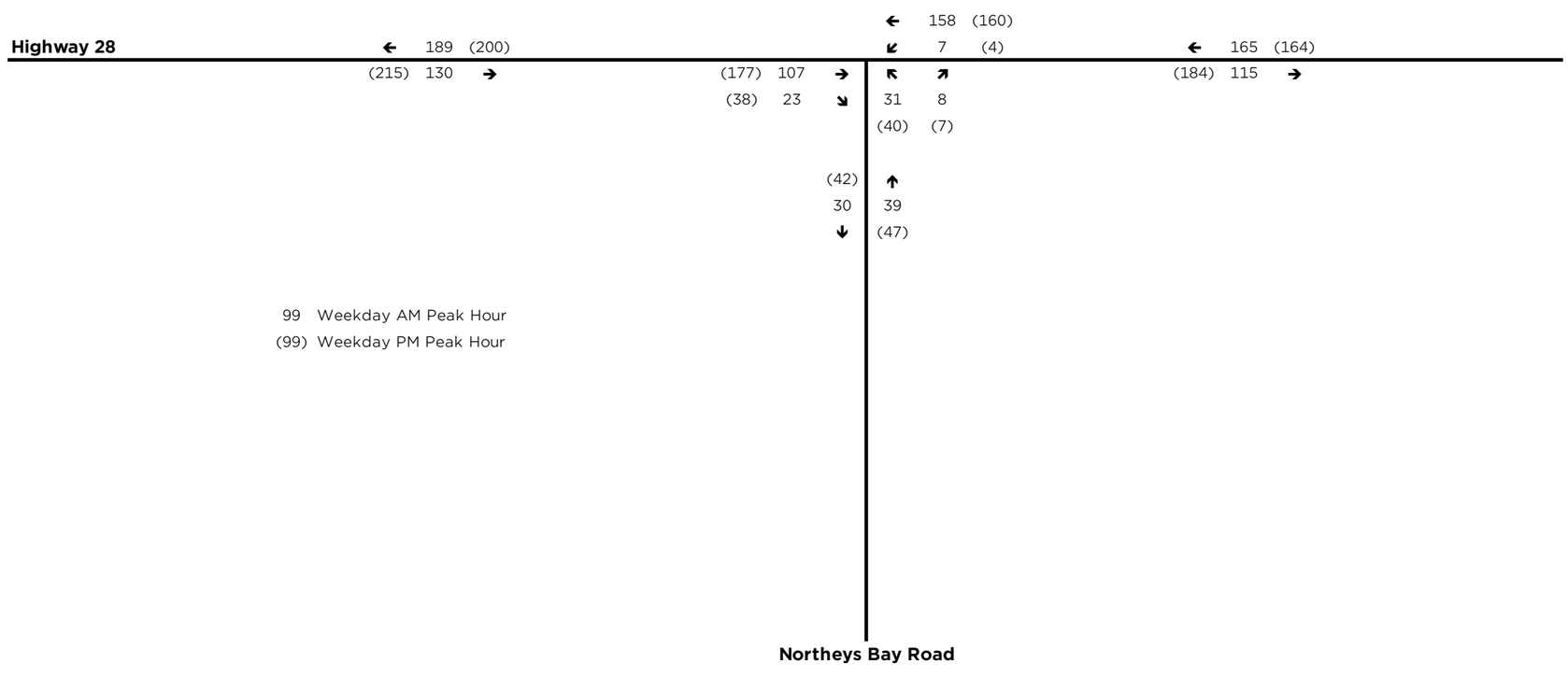


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Figure 3: Traffic Volumes - 2022

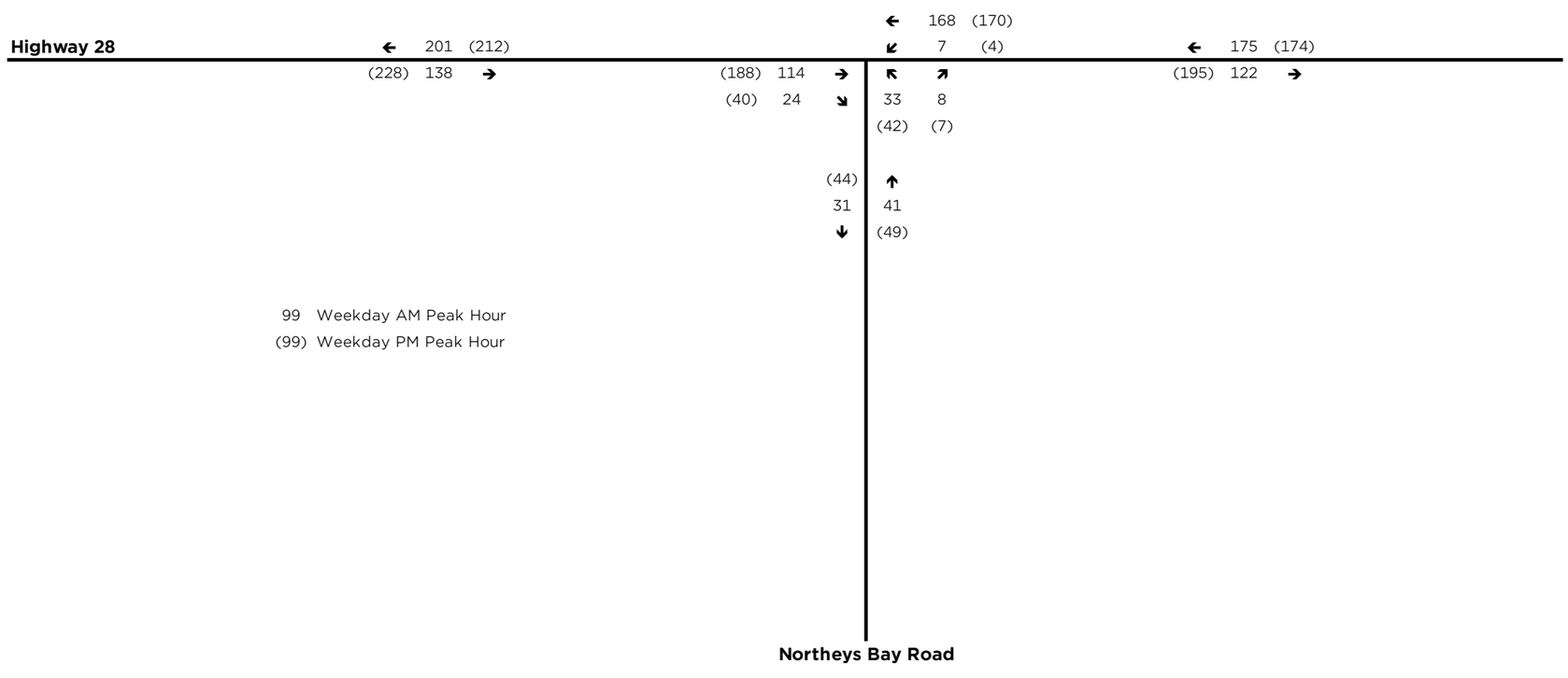

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Figure 4: Traffic Volumes – 2025 Background

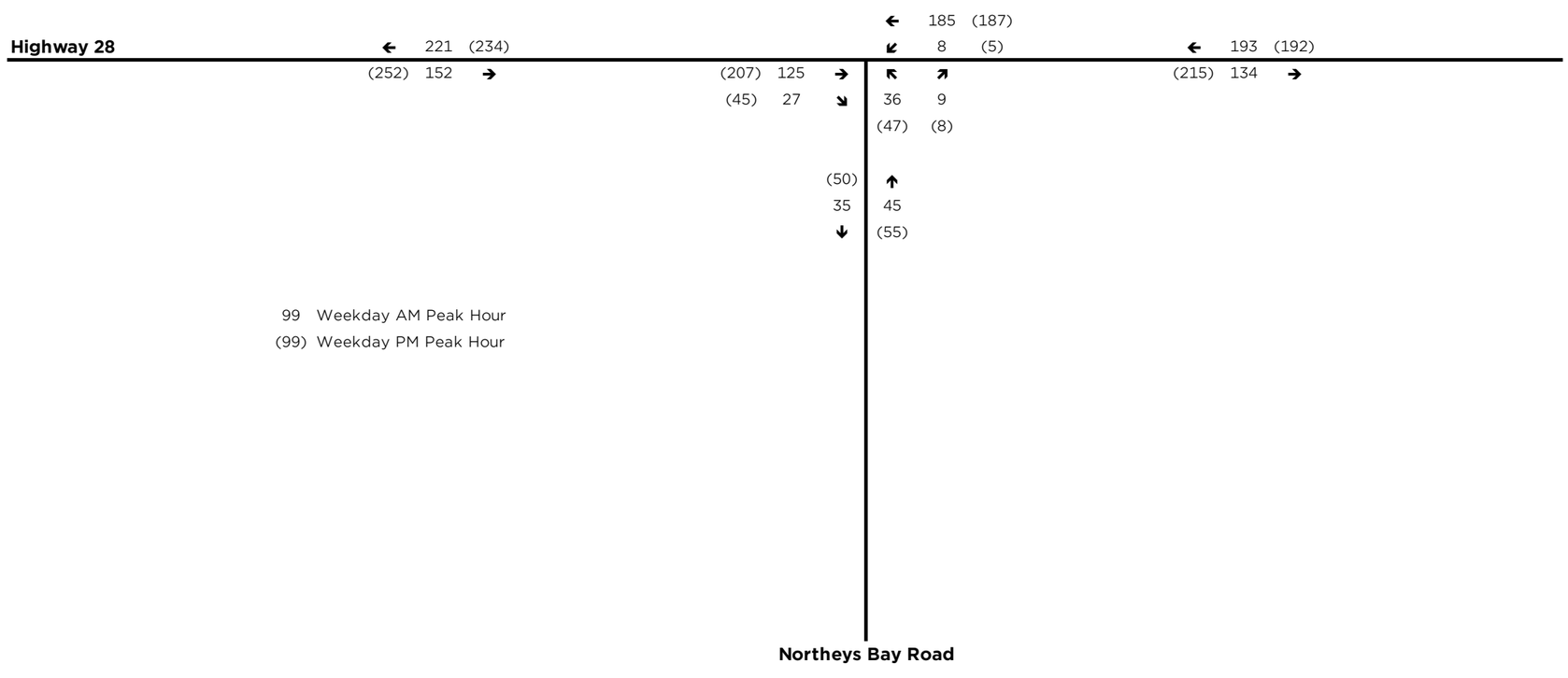

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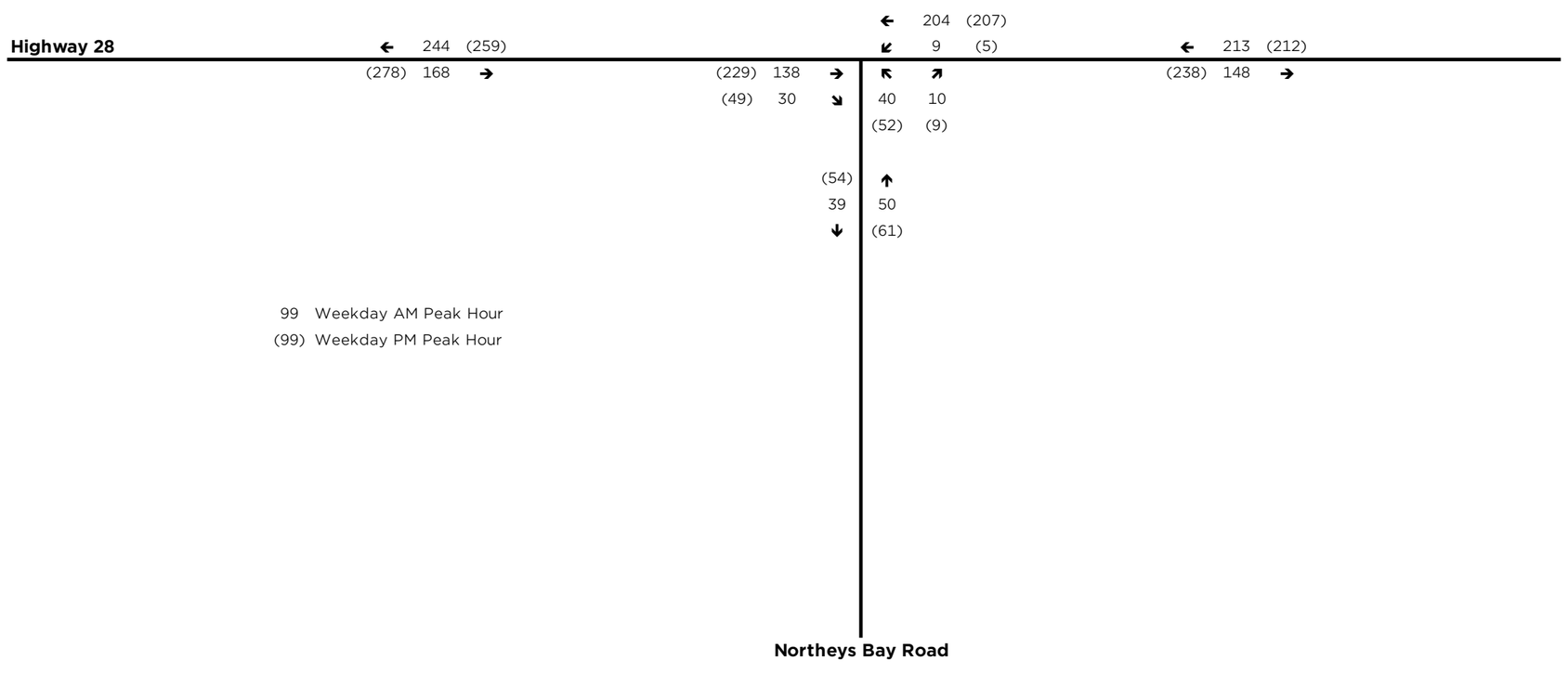
Figure 5: Traffic Volumes – 2030 Background



WOODVIEW GOLF SUBDIVISION

Figure 6: Traffic Volumes – 2035 Background

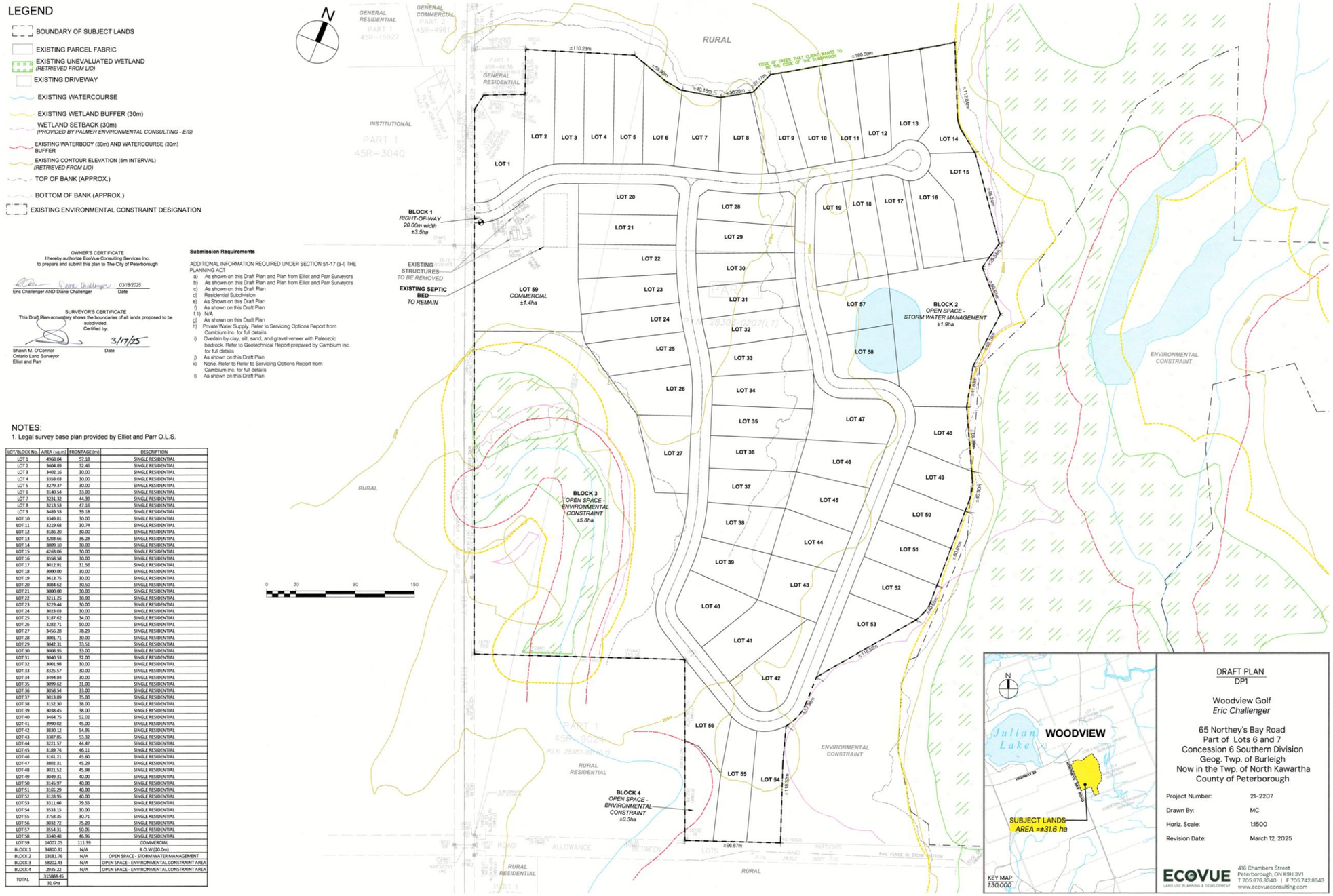


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Figure 7: Site Plan

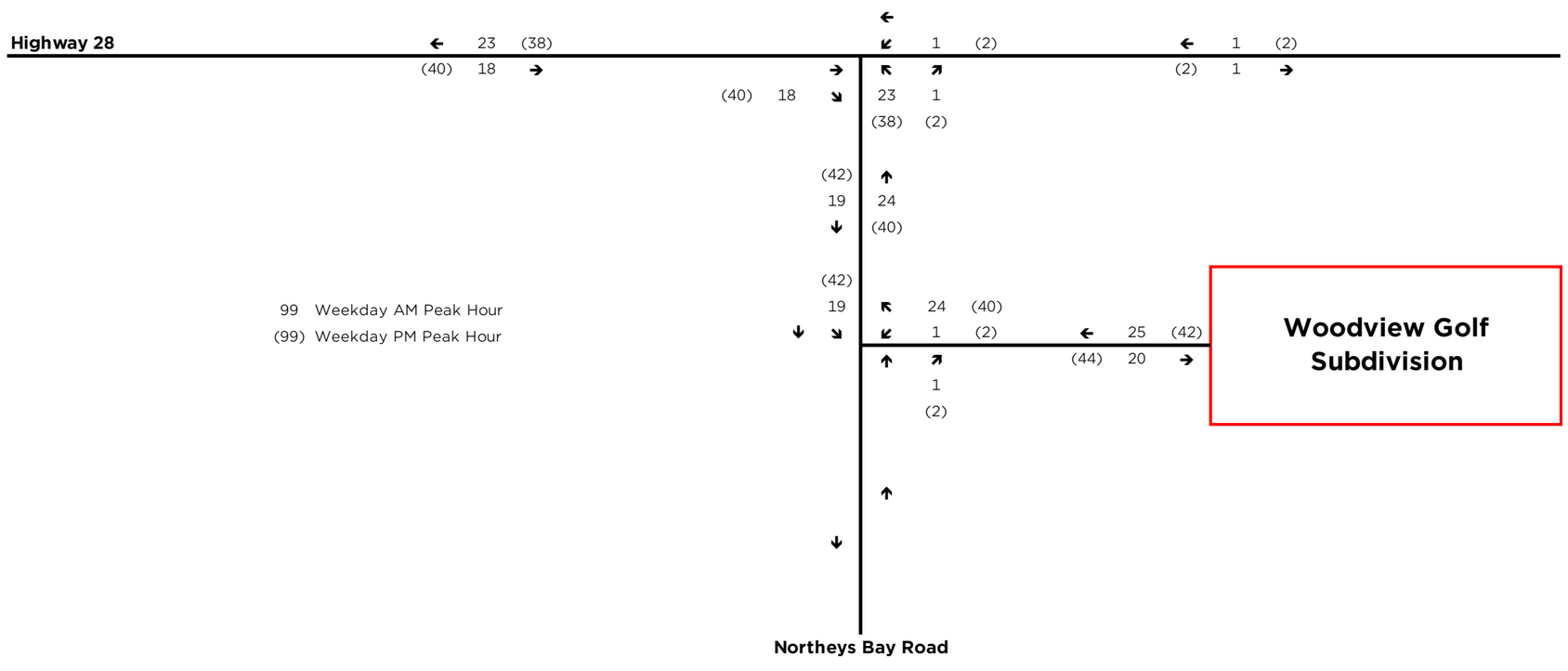

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Figure 8: Site Generated Traffic

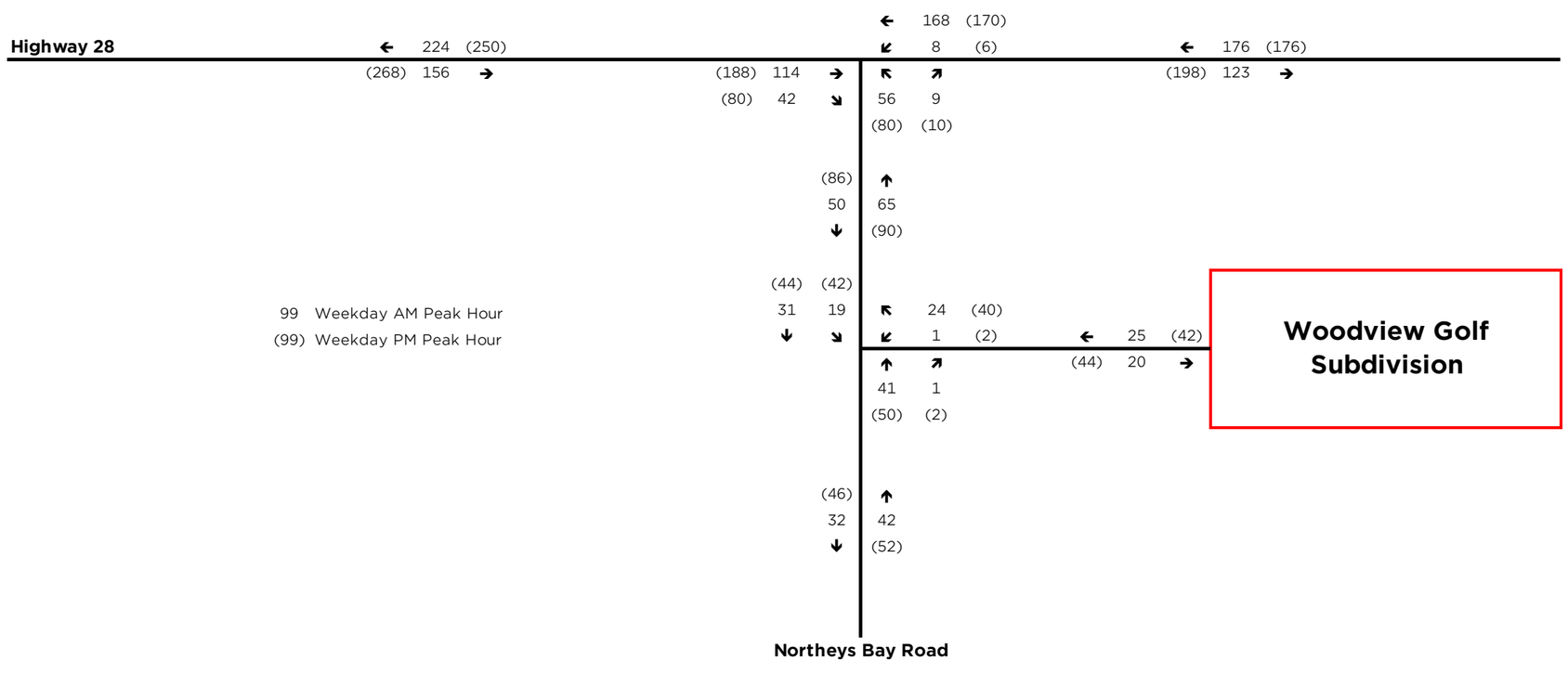

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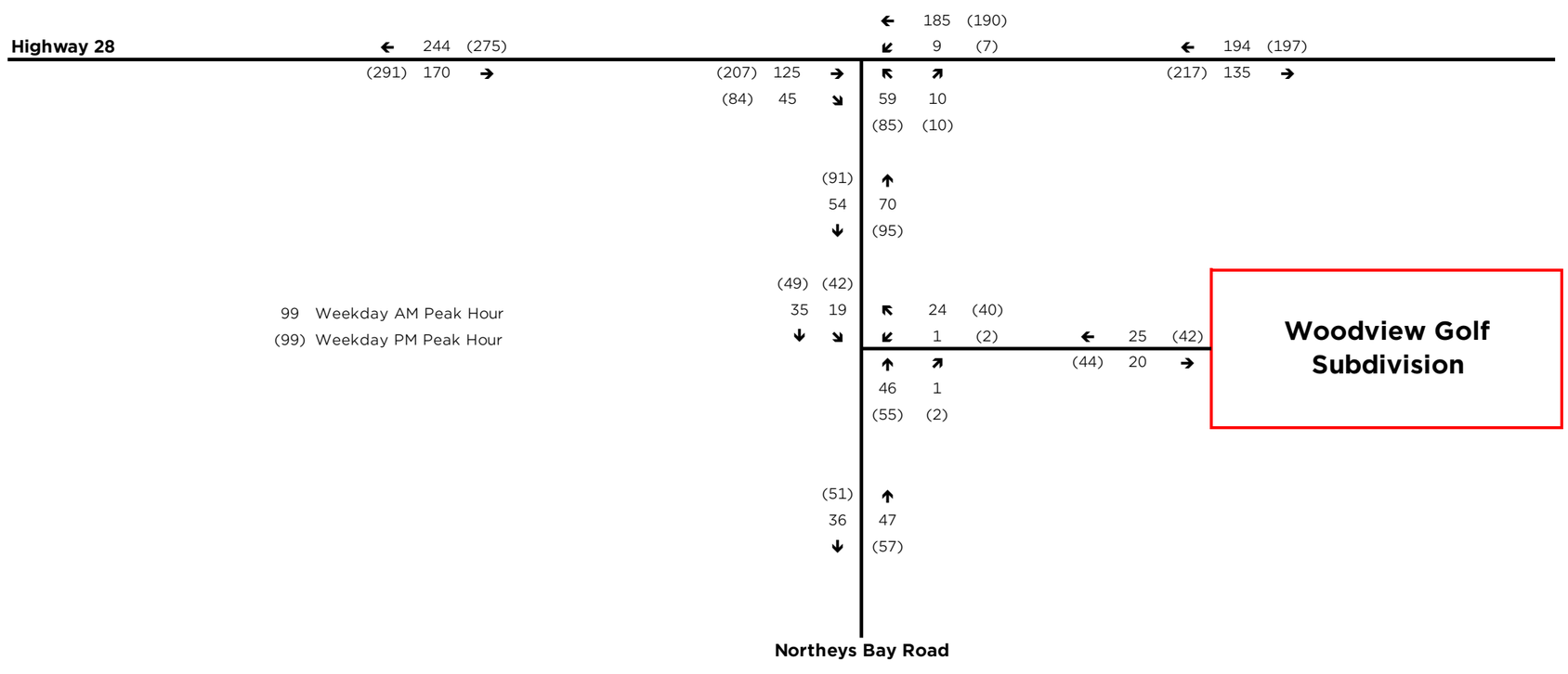
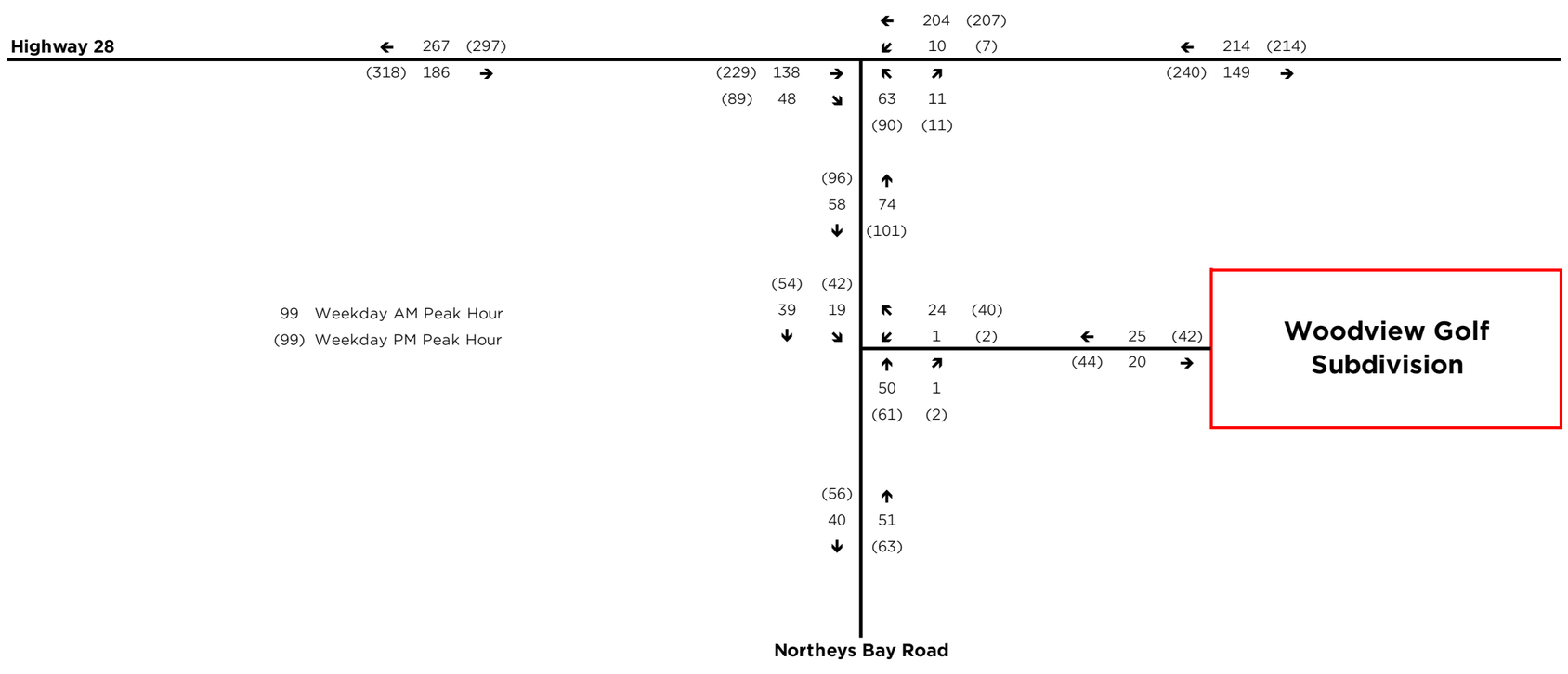
Figure 9: Traffic Volumes – 2025 Total



WOODVIEW GOLF SUBDIVISION

Figure 10: Traffic Volumes – 2030 Total



WOODVIEW GOLF SUBDIVISION

Figure 11: Traffic Volumes – 2035 Total

Appendix A:
Traffic Counts

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Project #22-317 - Tatham Engineering Ltd

Intersection Count Report

Intersection:	Hwy 28 & Northeys Bay Rd
Municipality:	North Kawartha
Count Date:	Tuesday, Sep 20, 2022
Site Code:	2231700001
Count Categories:	Cars, Trucks, Bicycles, Pedestrians
Count Period:	07:00-10:00, 15:00-18:00
Weather:	Clear
Comments:	

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Map

Intersection:	Hwy 28 & Northeys Bay Rd
Site Code:	2231700001
Municipality:	North Kawartha
Count Date:	Sep 20, 2022

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Summary

Intersection:	Hwy 28 & Northeys Bay Rd
Site Code:	2231700001
Municipality:	North Kawartha
Count Date:	Sep 20, 2022

Northeys Bay Rd - Traffic Summary

	North Approach Totals						South Approach Totals						
	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles						
Hour	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Total
07:00 - 08:00	0	0	0	0	0	0	19	0	10	0	29	0	29
08:00 - 09:00	0	0	0	0	0	0	17	0	10	0	27	0	27
09:00 - 10:00	0	0	0	0	0	0	31	0	8	0	39	0	39
BREAK													
15:00 - 16:00	0	0	0	0	0	0	16	0	7	0	23	0	23
16:00 - 17:00	0	0	0	0	0	0	40	0	7	0	47	0	47
17:00 - 18:00	0	0	0	0	0	0	25	0	9	0	34	0	34
GRAND TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**148**	**0**	**51**	**0**	**199**	**0**	**199**

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Summary

Intersection:	Hwy 28 & Northeys Bay Rd
Site Code:	2231700001
Municipality:	North Kawartha
Count Date:	Sep 20, 2022

Hwy 28 - Traffic Summary

	East Approach Totals						West Approach Totals						
	Includes Cars, Trucks, Bicycles						Includes Cars, Trucks, Bicycles						
Hour	Left	Thru	Right	U-Turn	Total	Peds	Left	Thru	Right	U-Turn	Total	Peds	Total
07:00 - 08:00	14	124	0	0	138	0	0	83	5	0	88	0	226
08:00 - 09:00	12	140	0	0	152	0	0	100	14	0	114	0	266
09:00 - 10:00	7	158	0	0	165	0	0	107	23	0	130	0	295
BREAK													
15:00 - 16:00	2	162	0	0	164	0	0	139	21	0	160	0	324
16:00 - 17:00	4	160	0	0	164	0	0	177	38	0	215	0	379
17:00 - 18:00	25	136	0	0	161	0	0	176	29	0	205	0	366
GRAND TOTAL	**64**	**880**	**0**	**0**	**944**	**0**	**0**	**782**	**130**	**0**	**912**	**0**	**1856**

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Hwy 28 & Northeys Bay Rd
Site Code: 2231700001
Municipality: North Kawartha
Count Date: Sep 20, 2022

South Approach - Northeys Bay Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↩	Total	↰	↑	↱	↩	Total	↰	↑	↱	↩	Total	
07:00	2	0	1	0	3	1	0	0	0	1	0	0	0	0	0	0
07:15	6	0	3	0	9	1	0	0	0	1	0	0	0	0	0	0
07:30	1	0	3	0	4	0	0	0	0	0	0	0	0	0	0	0
07:45	7	0	3	0	10	1	0	0	0	1	0	0	0	0	0	0
08:00	6	0	3	0	9	0	0	1	0	1	0	0	0	0	0	0
08:15	7	0	1	0	8	0	0	1	0	1	0	0	0	0	0	0
08:30	2	0	2	0	4	0	0	1	0	1	0	0	0	0	0	0
08:45	1	0	1	0	2	1	0	0	0	1	0	0	0	0	0	0
09:00	6	0	3	0	9	0	0	0	0	0	0	0	0	0	0	0
09:15	9	0	1	0	10	0	0	0	0	0	0	0	0	0	0	0
09:30	8	0	0	0	8	1	0	1	0	2	0	0	0	0	0	0
09:45	6	0	3	0	9	1	0	0	0	1	0	0	0	0	0	0
SUBTOTAL	61	0	24	0	85	6	0	4	0	10	0	0	0	0	0	0

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Hwy 28 & Northeys Bay Rd
Site Code: 2231700001
Municipality: North Kawartha
Count Date: Sep 20, 2022

South Approach - Northeys Bay Rd

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	
15:00	3	0	1	0	4	1	0	0	0	1	0	0	0	0	0	0
15:15	3	0	4	0	7	1	0	0	0	1	0	0	0	0	0	0
15:30	4	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0
15:45	4	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0
16:00	9	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0
16:15	11	0	3	0	14	3	0	0	0	3	0	0	0	0	0	0
16:30	9	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0
16:45	8	0	4	0	12	0	0	0	0	0	0	0	0	0	0	0
17:00	9	0	4	0	13	0	0	0	0	0	0	0	0	0	0	0
17:15	10	0	2	0	12	0	0	0	0	0	0	0	0	0	0	0
17:30	4	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0
17:45	1	0	2	0	3	1	0	0	0	1	0	0	0	0	0	0
SUBTOTAL	75	0	23	0	98	6	0	0	0	6	0	0	0	0	0	0
GRAND TOTAL	136	0	47	0	183	12	0	4	0	16	0	0	0	0	0	0

Ontario Traffic Inc.
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Traffic Count Data

Intersection: Hwy 28 & Northeys Bay Rd
Site Code: 2231700001
Municipality: North Kawartha
Count Date: Sep 20, 2022

East Approach - Hwy 28

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	↰	↑	↱	↻	Total	
07:00	3	22	0	0	25	1	4	0	0	5	0	0	0	0	0	0
07:15	0	29	0	0	29	2	2	0	0	4	0	0	0	0	0	0
07:30	1	30	0	0	31	1	4	0	0	5	0	0	0	0	0	0
07:45	5	28	0	0	33	1	5	0	0	6	0	0	0	0	0	0
08:00	2	32	0	0	34	0	0	0	0	0	0	0	0	0	0	0
08:15	2	34	0	0	36	0	1	0	0	1	0	0	0	0	0	0
08:30	4	29	0	0	33	0	3	0	0	3	0	0	0	0	0	0
08:45	2	37	0	0	39	2	4	0	0	6	0	0	0	0	0	0
09:00	2	28	0	0	30	1	1	0	0	2	0	0	0	0	0	0
09:15	0	37	0	0	37	0	0	0	0	0	0	0	0	0	0	0
09:30	0	43	0	0	43	2	3	0	0	5	0	0	0	0	0	0
09:45	2	44	0	0	46	0	2	0	0	2	0	0	0	0	0	0
SUBTOTAL	23	393	0	0	416	10	29	0	0	39	0	0	0	0	0	0

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Hwy 28 & Northeys Bay Rd
Site Code: 2231700001
Municipality: North Kawartha
Count Date: Sep 20, 2022

East Approach - Hwy 28

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	
15:00	0	40	0	0	40	0	1	0	0	1	0	0	0	0	0	0
15:15	1	38	0	0	39	0	1	0	0	1	0	0	0	0	0	0
15:30	0	39	0	0	39	0	4	0	0	4	0	0	0	0	0	0
15:45	1	37	0	0	38	0	2	0	0	2	0	0	0	0	0	0
16:00	0	37	0	0	37	0	7	0	0	7	0	0	0	0	0	0
16:15	1	38	0	0	39	0	4	0	0	4	0	0	0	0	0	0
16:30	1	33	0	0	34	1	4	0	0	5	0	0	0	0	0	0
16:45	1	34	0	0	35	0	3	0	0	3	0	0	0	0	0	0
17:00	4	30	0	0	34	0	2	0	0	2	0	0	0	0	0	0
17:15	3	44	0	0	47	0	2	0	0	2	0	0	0	0	0	0
17:30	9	31	0	0	40	0	4	0	0	4	0	0	0	0	0	0
17:45	9	22	0	0	31	0	1	0	0	1	0	0	0	0	0	0
SUBTOTAL	30	423	0	0	453	1	35	0	0	36	0	0	0	0	0	0
GRAND TOTAL	53	816	0	0	869	11	64	0	0	75	0	0	0	0	0	0

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Traffic Count Data

Intersection: Hwy 28 & Northeys Bay Rd
Site Code: 2231700001
Municipality: North Kawartha
Count Date: Sep 20, 2022

West Approach - Hwy 28

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	↰	↑	↱	↶	Total	
07:00	0	19	1	0	20	0	3	0	0	3	0	0	0	0	0	0
07:15	0	14	0	0	14	0	8	0	0	8	0	0	0	0	0	0
07:30	0	15	1	0	16	0	4	0	0	4	0	0	0	0	0	0
07:45	0	19	3	0	22	0	1	0	0	1	0	0	0	0	0	0
08:00	0	30	5	0	35	0	2	0	0	2	0	0	0	0	0	0
08:15	0	21	2	0	23	0	3	0	0	3	0	0	0	0	0	0
08:30	0	9	5	0	14	0	4	0	0	4	0	0	0	0	0	0
08:45	0	26	2	0	28	0	5	0	0	5	0	0	0	0	0	0
09:00	0	33	9	0	42	0	3	0	0	3	0	0	0	0	0	0
09:15	0	18	5	0	23	0	4	0	0	4	0	0	0	0	0	0
09:30	0	24	4	0	28	0	1	0	0	1	0	0	0	0	0	0
09:45	0	23	3	0	26	0	1	2	0	3	0	0	0	0	0	0
SUBTOTAL	0	251	40	0	291	0	39	2	0	41	0	0	0	0	0	0

Ontario Traffic Inc.
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Traffic Count Data

Intersection: Hwy 28 & Northeys Bay Rd
Site Code: 2231700001
Municipality: North Kawartha
Count Date: Sep 20, 2022

West Approach - Hwy 28

Start Time	Cars					Trucks					Bicycles					Total Peds
	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	↰	↑	↱	↷	Total	
15:00	0	31	7	0	38	0	5	0	0	5	0	0	0	0	0	0
15:15	0	34	2	0	36	0	3	0	0	3	0	0	0	0	0	0
15:30	0	38	7	0	45	0	6	0	0	6	0	0	0	0	0	0
15:45	0	20	5	0	25	0	2	0	0	2	0	0	0	0	0	0
16:00	0	61	10	0	71	0	3	2	0	5	0	0	0	0	0	0
16:15	0	43	9	0	52	0	0	2	0	2	0	0	0	0	0	0
16:30	0	33	7	0	40	0	1	0	0	1	0	0	0	0	0	0
16:45	0	35	8	0	43	0	1	0	0	1	0	0	0	0	0	0
17:00	0	45	11	0	56	0	0	0	0	0	0	0	0	0	0	0
17:15	0	52	5	0	57	0	1	1	0	2	0	0	0	0	0	0
17:30	0	28	7	0	35	0	1	1	0	2	0	0	0	0	0	0
17:45	0	48	4	0	52	0	1	0	0	1	0	0	0	0	0	0
SUBTOTAL	0	468	82	0	550	0	24	6	0	30	0	0	0	0	0	0
GRAND TOTAL	0	719	122	0	841	0	63	8	0	71	0	0	0	0	0	0

Peak Hour Diagram

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Specified Period		One Hour Peak	
From:	07:00:00	From:	09:00:00
To:	10:00:00	To:	10:00:00

Intersection: Hwy 28 & Northeys Bay Rd
Site Code: 2231700001
Count Date: Sep 20, 2022

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Hwy 28 runs E/W

East Approach

	Out	In	Total
Cars	156	105	261
Trucks	9	10	19
Bicycles	0	0	0
	165	**115**	**280**

Peds: 0

Hwy 28

			Totals
0	0	0	**0**
0	9	98	**107**
0	2	21	**23**

Peds: 0

Peds: 0

Hwy 28

	Totals			
	0	0	0	0
	158	152	6	0
	7	4	3	0

Peds: 0

West Approach

	Out	In	Total
Cars	119	181	300
Trucks	11	8	19
Bicycles	0	0	0
	130	**189**	**319**

Totals	31	8	0
Cars	29	7	0
Trucks	2	1	0
Bicycles	0	0	0

Northeys Bay Rd

South Approach

	Out	In	Total
Cars	36	25	61
Trucks	3	5	8
Bicycles	0	0	0
	39	**30**	**69**

Cars - Trucks - Bicycles

Comments

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Peak Hour Summary

Intersection: Hwy 28 & Northeys Bay Rd
Site Code: 2231700001
Count Date: Sep 20, 2022
Period: 07:00 - 10:00

Peak Hour Data (09:00 - 10:00)

Start Time	North Approach						South Approach Northeys Bay Rd						East Approach Hwy 28						West Approach Hwy 28						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
09:00					0		6		3	0	0	9	3	29		0	0	32		36	9	0	0	45	86
09:15					0		9		1	0	0	10	0	37		0	0	37		22	5	0	0	27	74
09:30					0		9		1	0	0	10	2	46		0	0	48		25	4	0	0	29	87
09:45					0		7		3	0	0	10	2	46		0	0	48		24	5	0	0	29	87
Grand Total					**0**	**0**	**31**		**8**	**0**	**0**	**39**	**7**	**158**		**0**	**0**	**165**		**107**	**23**	**0**	**0**	**130**	**334**
Approach %						-	79.5		20.5	0		-	4.2	95.8		0		-		82.3	17.7	0		-	
Totals %						0	9.3		2.4	0		11.7	2.1	47.3		0		49.4		32	6.9	0		38.9	
PHF						**0**	**0.86**		**0.67**	**0**		**0.98**	**0.58**	**0.86**		**0**		**0.86**		**0.74**	**0.64**	**0**		**0.72**	**0.96**
Cars						0	29		7	0		36	4	152		0		156		98	21	0		119	311
% Cars						0	93.5		87.5	0		92.3	57.1	96.2		0		94.5		91.6	91.3	0		91.5	93.1
Trucks						0	2		1	0		3	3	6		0		9		9	2	0		11	23
% Trucks						0	6.5		12.5	0		7.7	42.9	3.8		0		5.5		8.4	8.7	0		8.5	6.9
Bicycles						0	0		0	0		0	0	0		0		0		0	0	0		0	0
% Bicycles						0	0		0	0		0	0	0		0		0		0	0	0		0	0
Peds					0	-					0	-					0	-					0	-	0
% Peds					0	-					0	-					0	-					0	-	

Peak Hour Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:00:00
To: 17:00:00

Intersection: Hwy 28 & Northeys Bay Rd
Site Code: 2231700001
Count Date: Sep 20, 2022

Weather conditions: Clear

**** Unsignalized Intersection ****

Major Road: Hwy 28 runs E/W

East Approach

	Out	In	Total
Cars	145	179	324
Trucks	19	5	24
Bicycles	0	0	0
	164	**184**	**348**

Peds: 0

Hwy 28

			Totals
0	0	0	**0**
0	5	172	**177**
0	4	34	**38**

Peds: 0

Peds: 0

Hwy 28

	Totals			
	0	0	0	0
	160	142	18	0
	4	3	1	0

Peds: 0

West Approach

	Out	In	Total
Cars	206	179	385
Trucks	9	21	30
Bicycles	0	0	0
	215	**200**	**415**

Totals	40	7	0
Cars	37	7	0
Trucks	3	0	0
Bicycles	0	0	0

Northeys Bay Rd

South Approach

	Out	In	Total
Cars	44	37	81
Trucks	3	5	8
Bicycles	0	0	0
	47	**42**	**89**

Cars - Trucks - Bicycles

Comments

Ontario Traffic Inc.
Traffic Monitoring • Services & Products

Peak Hour Summary

Intersection:	Hwy 28 & Northeys Bay Rd
Site Code:	2231700001
Count Date:	Sep 20, 2022
Period:	15:00 - 18:00

Peak Hour Data (16:00 - 17:00)

Start Time	North Approach						South Approach Northeys Bay Rd						East Approach Hwy 28						West Approach Hwy 28						Total Vehicles
					Peds	Total					Peds	Total					Peds	Total					Peds	Total	
16:00					0		9	0	0	0	0	9	0	44	0	0	0	44	64	12	0	0	0	76	129
16:15					0		14	3	0	0	0	17	1	42	0	0	0	43	43	11	0	0	0	54	114
16:30					0		9	0	0	0	0	9	2	37	0	0	0	39	34	7	0	0	0	41	89
16:45					0		8	4	0	0	0	12	1	37	0	0	0	38	36	8	0	0	0	44	94
Grand Total					**0**	**0**	**40**	**7**	**0**	**0**	**47**	**4**	**160**	**0**	**0**	**0**	**164**	**177**	**38**	**0**	**0**	**0**	**215**	**426**
Approach %						-	85.1	14.9	0		-	2.4	97.6	0			-	82.3	17.7	0			-	
Totals %						0	9.4	1.6	0		11	0.9	37.6	0			38.5	41.5	8.9	0			50.5	
PHF						**0**	**0.71**	**0.44**	**0**		**0.69**	**0.5**	**0.91**	**0**			**0.93**	**0.69**	**0.79**	**0**			**0.71**	**0.83**
Cars						0	37	7	0		44	3	142	0			145	172	34	0			206	395
% Cars						0	92.5	100	0		93.6	75	88.8	0			88.4	97.2	89.5	0			95.8	92.7
Trucks						0	3	0	0		3	1	18	0			19	5	4	0			9	31
% Trucks						0	7.5	0	0		6.4	25	11.3	0			11.6	2.8	10.5	0			4.2	7.3
Bicycles						0	0	0	0		0	0	0	0			0	0	0	0			0	0
% Bicycles						0	0	0	0		0	0	0	0			0	0	0	0			0	0
Peds					0	-				0	-					0	-					0	-	0
% Peds					0	-				0	-					0	-					0	-	

Appendix B:
Level of Service Definitions

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CAPACITY ANALYSIS AT UNSIGNALIZED INTERSECTIONS

Highway Capacity Manual Methodology

The level of service at an unsignalized intersection is determined on the basis of control delay for each critical lane. This method of analysis is taken from the Highway Capacity Manual, Special Report 209, by the Transportation Research Board, 1997.

The average control delay for any particular critical movement (control delay includes initial deceleration, queue move-up time, stopped delay, and final acceleration delay) is a function of the service rate or capacity of the approach and degree of saturation. The level of service criteria for unsignalized intersections is outlined below and is related to ranges in vehicle delay.

Level of Service	Expected Delay to Minor Street Traffic	Average Control Delay 'd' (sec/veh)
A	Little or no delays	$0 < d \leq 10$
B	Short traffic delays	$10 \leq d \leq 15$
C	Average traffic delays	$15 \leq d \leq 25$
D	Long traffic delays	$25 \leq d \leq 35$
E	Very long traffic delays	$35 \leq d \leq 50$
F	Extreme delays with queuing which may cause congestion affecting other traffic movements in the intersection	$d > 50$

Appendix C:
Existing Operations

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	107	23	7	158	31	8
Future Volume (Veh/h)	107	23	7	158	31	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	116	25	8	172	34	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			141		304	116
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			141		304	116
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		95	99
cM capacity (veh/h)			1442		684	936

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	116	25	8	172	43
Volume Left	0	0	8	0	34
Volume Right	0	25	0	0	9
cSH	1700	1700	1442	1700	725
Volume to Capacity	0.07	0.01	0.01	0.10	0.06
Queue Length 95th (m)	0.0	0.0	0.1	0.0	1.4
Control Delay (s)	0.0	0.0	7.5	0.0	10.3
Lane LOS			A		B
Approach Delay (s)	0.0		0.3		10.3
Approach LOS					B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	18.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	177	38	4	160	40	7
Future Volume (Veh/h)	177	38	4	160	40	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	192	41	4	174	43	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			233		374	192
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			233		374	192
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		93	99
cM capacity (veh/h)			1335		625	850

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	192	41	4	174	51
Volume Left	0	0	4	0	43
Volume Right	0	41	0	0	8
cSH	1700	1700	1335	1700	652
Volume to Capacity	0.11	0.02	0.00	0.10	0.08
Queue Length 95th (m)	0.0	0.0	0.1	0.0	1.9
Control Delay (s)	0.0	0.0	7.7	0.0	11.0
Lane LOS			A		B
Approach Delay (s)	0.0		0.2		11.0
Approach LOS					B

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	19.3%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix D:
Background Operations

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	114	24	7	168	33	8
Future Volume (Veh/h)	114	24	7	168	33	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	124	26	8	183	36	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			150		323	124
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			150		323	124
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		95	99
cM capacity (veh/h)			1431		667	927

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	124	26	8	183	45
Volume Left	0	0	8	0	36
Volume Right	0	26	0	0	9
cSH	1700	1700	1431	1700	707
Volume to Capacity	0.07	0.02	0.01	0.11	0.06
Queue Length 95th (m)	0.0	0.0	0.1	0.0	1.5
Control Delay (s)	0.0	0.0	7.5	0.0	10.4
Lane LOS			A		B
Approach Delay (s)	0.0		0.3		10.4
Approach LOS					B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	18.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	188	40	4	170	42	7
Future Volume (Veh/h)	188	40	4	170	42	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	204	43	4	185	46	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			247		397	204
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			247		397	204
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		92	99
cM capacity (veh/h)			1319		606	837

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	204	43	4	185	54
Volume Left	0	0	4	0	46
Volume Right	0	43	0	0	8
cSH	1700	1700	1319	1700	632
Volume to Capacity	0.12	0.03	0.00	0.11	0.09
Queue Length 95th (m)	0.0	0.0	0.1	0.0	2.1
Control Delay (s)	0.0	0.0	7.7	0.0	11.2
Lane LOS			A		B
Approach Delay (s)	0.0		0.2		11.2
Approach LOS					B

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	19.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	125	27	8	185	36	9
Future Volume (Veh/h)	125	27	8	185	36	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	136	29	9	201	39	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			165		355	136
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			165		355	136
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		94	99
cM capacity (veh/h)			1413		639	913

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	136	29	9	201	49
Volume Left	0	0	9	0	39
Volume Right	0	29	0	0	10
cSH	1700	1700	1413	1700	681
Volume to Capacity	0.08	0.02	0.01	0.12	0.07
Queue Length 95th (m)	0.0	0.0	0.1	0.0	1.8
Control Delay (s)	0.0	0.0	7.6	0.0	10.7
Lane LOS			A		B
Approach Delay (s)	0.0		0.3		10.7
Approach LOS					B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	19.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	207	45	5	187	47	8
Future Volume (Veh/h)	207	45	5	187	47	8
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	225	49	5	203	51	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			274		438	225
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			274		438	225
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		91	99
cM capacity (veh/h)			1289		574	814

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	225	49	5	203	60
Volume Left	0	0	5	0	51
Volume Right	0	49	0	0	9
cSH	1700	1700	1289	1700	600
Volume to Capacity	0.13	0.03	0.00	0.12	0.10
Queue Length 95th (m)	0.0	0.0	0.1	0.0	2.5
Control Delay (s)	0.0	0.0	7.8	0.0	11.7
Lane LOS			A		B
Approach Delay (s)	0.0		0.2		11.7
Approach LOS					B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	20.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	138	30	9	204	40	10
Future Volume (Veh/h)	138	30	9	204	40	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	150	33	10	222	43	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			183		392	150
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			183		392	150
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		93	99
cM capacity (veh/h)			1392		608	896

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	150	33	10	222	54
Volume Left	0	0	10	0	43
Volume Right	0	33	0	0	11
cSH	1700	1700	1392	1700	651
Volume to Capacity	0.09	0.02	0.01	0.13	0.08
Queue Length 95th (m)	0.0	0.0	0.2	0.0	2.1
Control Delay (s)	0.0	0.0	7.6	0.0	11.0
Lane LOS			A		B
Approach Delay (s)	0.0		0.3		11.0
Approach LOS					B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	20.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	229	49	5	207	52	9
Future Volume (Veh/h)	229	49	5	207	52	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	249	53	5	225	57	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			302		484	249
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			302		484	249
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		89	99
cM capacity (veh/h)			1259		540	790

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	249	53	5	225	67
Volume Left	0	0	5	0	57
Volume Right	0	53	0	0	10
cSH	1700	1700	1259	1700	566
Volume to Capacity	0.15	0.03	0.00	0.13	0.12
Queue Length 95th (m)	0.0	0.0	0.1	0.0	3.0
Control Delay (s)	0.0	0.0	7.9	0.0	12.2
Lane LOS			A		B
Approach Delay (s)	0.0		0.2		12.2
Approach LOS					B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	22.1%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix E:
Future Operations

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	114	42	8	168	56	9
Future Volume (Veh/h)	114	42	8	168	56	9
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	124	46	9	183	61	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			170		325	124
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			170		325	124
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		91	99
cM capacity (veh/h)			1407		665	927

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	124	46	9	183	71
Volume Left	0	0	9	0	61
Volume Right	0	46	0	0	10
cSH	1700	1700	1407	1700	692
Volume to Capacity	0.07	0.03	0.01	0.11	0.10
Queue Length 95th (m)	0.0	0.0	0.1	0.0	2.6
Control Delay (s)	0.0	0.0	7.6	0.0	10.8
Lane LOS			A		B
Approach Delay (s)	0.0		0.4		10.8
Approach LOS					B

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	19.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	1	24	41	1	19	31
Future Volume (Veh/h)	1	24	41	1	19	31
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	26	45	1	21	34
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	122	46			46	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	122	46			46	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	97			99	
cM capacity (veh/h)	862	1024			1562	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	27	46	55
Volume Left	1	0	21
Volume Right	26	1	0
cSH	1017	1700	1562
Volume to Capacity	0.03	0.03	0.01
Queue Length 95th (m)	0.6	0.0	0.3
Control Delay (s)	8.6	0.0	2.9
Lane LOS	A		A
Approach Delay (s)	8.6	0.0	2.9
Approach LOS	A		

Intersection Summary			
Average Delay		3.1	
Intersection Capacity Utilization		19.3%	ICU Level of Service
Analysis Period (min)		15	

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	188	80	6	170	80	10
Future Volume (Veh/h)	188	80	6	170	80	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	204	87	7	185	87	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			291		403	204
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			291		403	204
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		86	99
cM capacity (veh/h)			1271		600	837

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	204	87	7	185	98
Volume Left	0	0	7	0	87
Volume Right	0	87	0	0	11
cSH	1700	1700	1271	1700	620
Volume to Capacity	0.12	0.05	0.01	0.11	0.16
Queue Length 95th (m)	0.0	0.0	0.1	0.0	4.2
Control Delay (s)	0.0	0.0	7.8	0.0	11.9
Lane LOS			A		B
Approach Delay (s)	0.0		0.3		11.9
Approach LOS					B

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	40	50	2	42	44
Future Volume (Veh/h)	2	40	50	2	42	44
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	43	54	2	46	48
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	195	55			56	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	195	55			56	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	96			97	
cM capacity (veh/h)	770	1012			1549	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	45	56	94
Volume Left	2	0	46
Volume Right	43	2	0
cSH	998	1700	1549
Volume to Capacity	0.05	0.03	0.03
Queue Length 95th (m)	1.1	0.0	0.7
Control Delay (s)	8.8	0.0	3.7
Lane LOS	A		A
Approach Delay (s)	8.8	0.0	3.7
Approach LOS	A		

Intersection Summary			
Average Delay		3.8	
Intersection Capacity Utilization		21.3%	ICU Level of Service
Analysis Period (min)		15	

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	125	45	9	185	59	10
Future Volume (Veh/h)	125	45	9	185	59	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	136	49	10	201	64	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			185		357	136
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			185		357	136
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		90	99
cM capacity (veh/h)			1390		637	913

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	136	49	10	201	75
Volume Left	0	0	10	0	64
Volume Right	0	49	0	0	11
cSH	1700	1700	1390	1700	666
Volume to Capacity	0.08	0.03	0.01	0.12	0.11
Queue Length 95th (m)	0.0	0.0	0.2	0.0	2.9
Control Delay (s)	0.0	0.0	7.6	0.0	11.1
Lane LOS			A		B
Approach Delay (s)	0.0		0.4		11.1
Approach LOS					B

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	20.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	1	24	46	1	19	35
Future Volume (Veh/h)	1	24	46	1	19	35
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	26	50	1	21	38
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	130	50			51	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	130	50			51	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	97			99	
cM capacity (veh/h)	852	1018			1555	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	27	51	59
Volume Left	1	0	21
Volume Right	26	1	0
cSH	1010	1700	1555
Volume to Capacity	0.03	0.03	0.01
Queue Length 95th (m)	0.6	0.0	0.3
Control Delay (s)	8.7	0.0	2.7
Lane LOS	A		A
Approach Delay (s)	8.7	0.0	2.7
Approach LOS	A		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	19.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	207	84	7	190	85	10
Future Volume (Veh/h)	207	84	7	190	85	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	225	91	8	207	92	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			316		448	225
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			316		448	225
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		84	99
cM capacity (veh/h)			1244		565	814

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	225	91	8	207	103
Volume Left	0	0	8	0	92
Volume Right	0	91	0	0	11
cSH	1700	1700	1244	1700	584
Volume to Capacity	0.13	0.05	0.01	0.12	0.18
Queue Length 95th (m)	0.0	0.0	0.1	0.0	4.8
Control Delay (s)	0.0	0.0	7.9	0.0	12.5
Lane LOS			A		B
Approach Delay (s)	0.0		0.3		12.5
Approach LOS					B

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	22.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	40	55	2	42	49
Future Volume (Veh/h)	2	40	55	2	42	49
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	43	60	2	46	53
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	206	61			62	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	206	61			62	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	96			97	
cM capacity (veh/h)	759	1004			1541	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	45	62	99
Volume Left	2	0	46
Volume Right	43	2	0
cSH	990	1700	1541
Volume to Capacity	0.05	0.04	0.03
Queue Length 95th (m)	1.1	0.0	0.7
Control Delay (s)	8.8	0.0	3.6
Lane LOS	A		A
Approach Delay (s)	8.8	0.0	3.6
Approach LOS	A		

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	138	48	10	204	63	11
Future Volume (Veh/h)	138	48	10	204	63	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	150	52	11	222	68	12
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			202		394	150
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			202		394	150
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		89	99
cM capacity (veh/h)			1370		606	896

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	150	52	11	222	80
Volume Left	0	0	11	0	68
Volume Right	0	52	0	0	12
cSH	1700	1700	1370	1700	637
Volume to Capacity	0.09	0.03	0.01	0.13	0.13
Queue Length 95th (m)	0.0	0.0	0.2	0.0	3.3
Control Delay (s)	0.0	0.0	7.6	0.0	11.5
Lane LOS			A		B
Approach Delay (s)	0.0		0.4		11.5
Approach LOS					B

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	1	24	50	1	19	39
Future Volume (Veh/h)	1	24	50	1	19	39
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	26	54	1	21	42
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	138	54			55	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	138	54			55	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	97			99	
cM capacity (veh/h)	843	1012			1550	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	27	55	63
Volume Left	1	0	21
Volume Right	26	1	0
cSH	1005	1700	1550
Volume to Capacity	0.03	0.03	0.01
Queue Length 95th (m)	0.6	0.0	0.3
Control Delay (s)	8.7	0.0	2.5
Lane LOS	A		A
Approach Delay (s)	8.7	0.0	2.5
Approach LOS	A		

Intersection Summary			
Average Delay	2.7		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	229	89	7	207	90	11
Future Volume (Veh/h)	229	89	7	207	90	11
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	249	97	8	225	98	12
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			346		490	249
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			346		490	249
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		82	98
cM capacity (veh/h)			1213		534	790

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	249	97	8	225	110
Volume Left	0	0	8	0	98
Volume Right	0	97	0	0	12
cSH	1700	1700	1213	1700	553
Volume to Capacity	0.15	0.06	0.01	0.13	0.20
Queue Length 95th (m)	0.0	0.0	0.2	0.0	5.6
Control Delay (s)	0.0	0.0	8.0	0.0	13.1
Lane LOS			A		B
Approach Delay (s)	0.0		0.3		13.1
Approach LOS					B

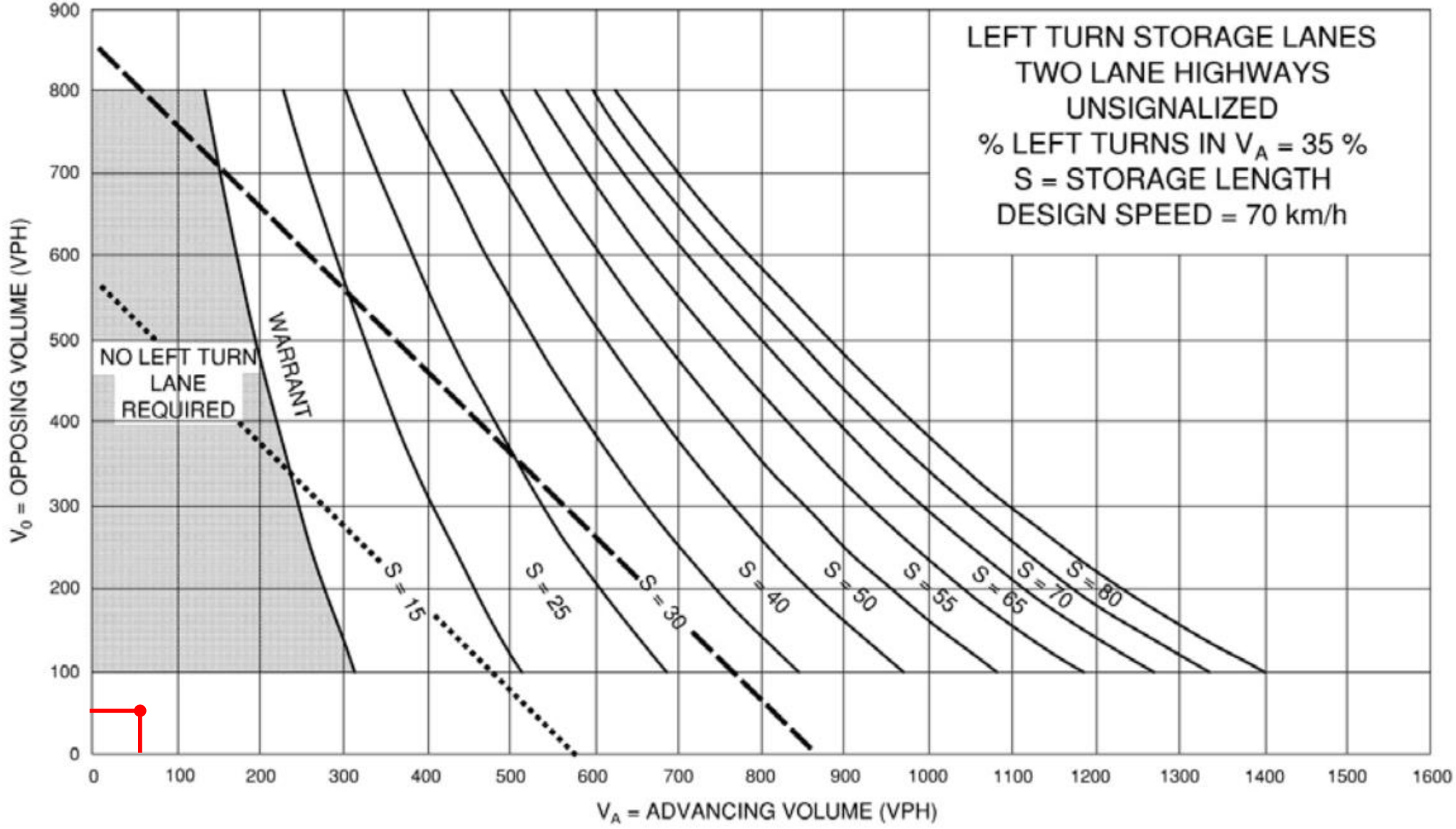
Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	24.4%	ICU Level of Service	A
Analysis Period (min)	15		

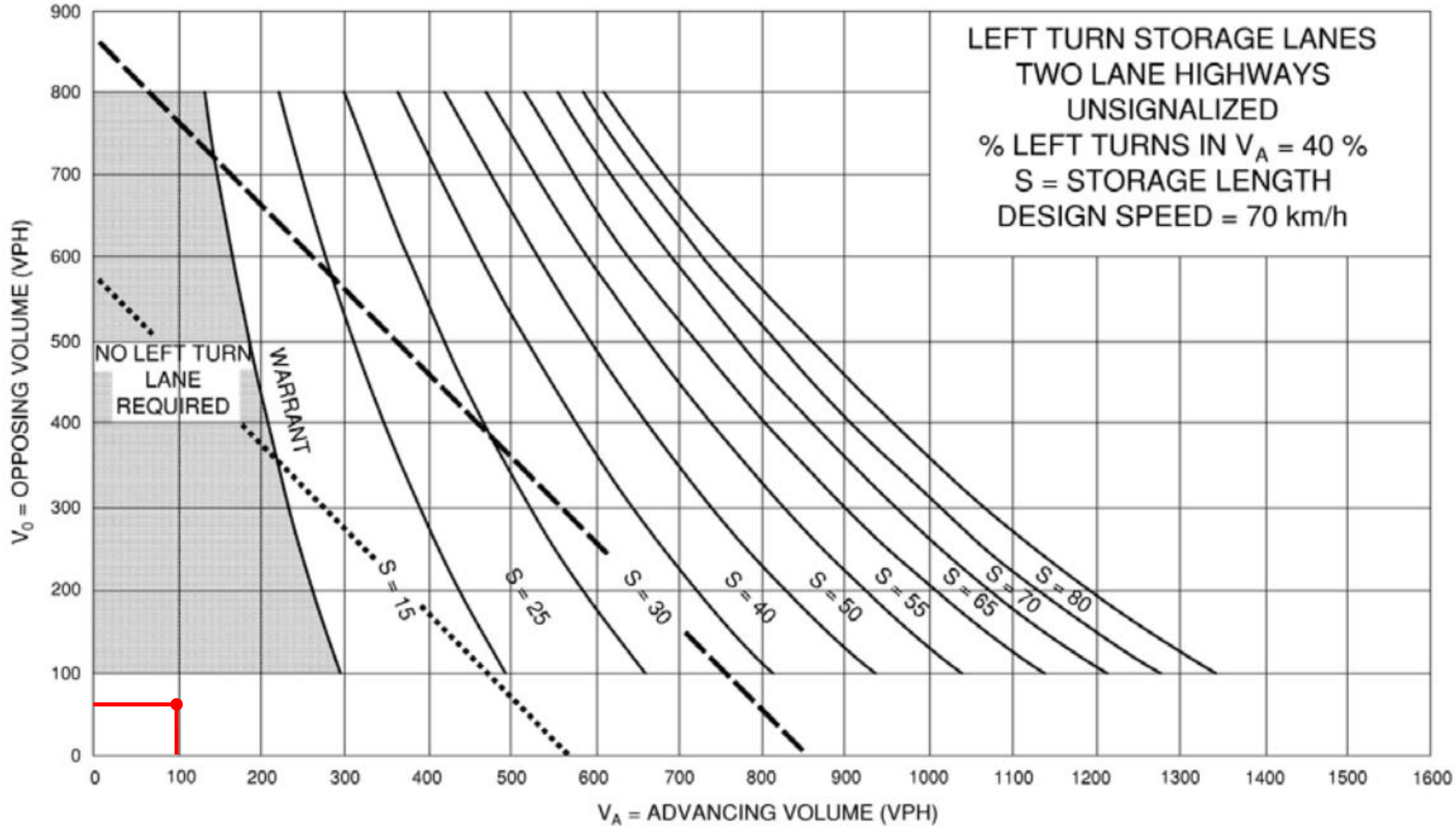
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	40	61	2	42	54
Future Volume (Veh/h)	2	40	61	2	42	54
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	43	66	2	46	59
Pedestrians						
Lane Width (m)						
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	218	67			68	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	218	67			68	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	96			97	
cM capacity (veh/h)	747	997			1533	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	45	68	105
Volume Left	2	0	46
Volume Right	43	2	0
cSH	982	1700	1533
Volume to Capacity	0.05	0.04	0.03
Queue Length 95th (m)	1.1	0.0	0.7
Control Delay (s)	8.8	0.0	3.4
Lane LOS	A		A
Approach Delay (s)	8.8	0.0	3.4
Approach LOS	A		

Intersection Summary			
Average Delay		3.5	
Intersection Capacity Utilization		21.8%	ICU Level of Service
Analysis Period (min)		15	

Appendix F:
Left Turn Warrants


LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 35 %
S = STORAGE LENGTH
DESIGN SPEED = 70 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S = 15
S = 25
S = 30
S = 40
S = 50
S = 55
S = 65
S = 70
S = 80
V_O = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600


LEFT TURN STORAGE LANES
TWO LANE HIGHWAYS
UNSIGNALIZED
% LEFT TURNS IN V_A = 40 %
S = STORAGE LENGTH
DESIGN SPEED = 70 km/h
NO LEFT TURN LANE REQUIRED
WARRANT
S = 15
S = 25
S = 30
S = 40
S = 50
S = 55
S = 65
S = 70
S = 80
V_0 = OPPOSING VOLUME (VPH)
V_A = ADVANCING VOLUME (VPH)
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600