

Northland Estates Residential Development

Traffic Impact Study
Final

July 22, 2022

Prepared for:

2600261 Ontario Inc.

Northland Estates Residential Development

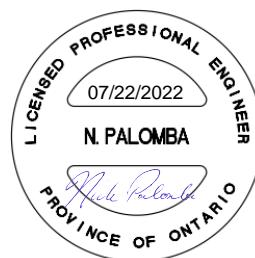
Traffic Impact Study Final

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RVA 226233
July 22, 2022

EXECUTIVE SUMMARY

R.V. Anderson Associates Limited (RVA) was retained by 2600261 Ontario Inc. to complete a Traffic Impact Study (TIS) for the proposed residential subdivision development, located on Northland Avenue in the city of Port Colborne, with a planned build-out year of 2024.

The development is planned to include 122 single family detached units, 50 townhouse units, and a 50-unit mid-rise apartment block with ground floor commercial, with vehicular access provided by two new local road connections to Northland Avenue west of West Side Road (Provincial Highway 58).

The proposed development is projected to generate approximately 167 total two-way trips during the weekday a.m. peak hour (56 inbound and 111 outbound), and 275 total two-way trips during the weekday p.m. peak hour (158 inbound and 117 outbound).

Per the results of the intersection capacity analysis, the site generated traffic is not expected to result in any capacity, delay, or queuing concerns at the study area intersections upon build-out of the development, and the intersections are expected to continue operating acceptably up to the final 2034 horizon year.

The existing roadway system has sufficient capacity to accommodate the anticipated traffic generation from the subject development. Beyond the proposed two local road connections to Northland Avenue, there are no geometric improvements recommended at the study area intersections as a result of the site generated traffic.

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1.0 INTRODUCTION

1.1 Study Objective

R.V. Anderson Associates Limited (RVA) was retained by 2600261 Ontario Inc. to complete a Traffic Impact Study (TIS) for the proposed residential subdivision development, located on Northland Avenue in the City of Port Colborne.

The study will include the estimation of traffic generation from the proposed development, the completion of intersection capacity analyses for the study area intersections under existing and future conditions, the identification of the operational impacts of the site generated traffic on the study area intersections, and the recommendation of mitigation measures where required.

1.2 Development Location

The proposed development will be located on vacant lands at the west limit of Northland Avenue (City road), on the west side of West Side Road (Provincial Highway 58), south of Barrick Road (City road). Access to the property will be provided by two new local road connections to Northland Avenue, and an opportunity for a potential future connection to a potential future subdivision on the north side of the site which would provide a connection to Barrick Road.

The development is located northwest of downtown Port Colborne. Immediately north and south of the development are existing single-family homes, and to the east is the existing Port Colborne Mall commercial development and the West Side Road corridor (Provincial Highway 58). Lands immediately to the west of the subject site are primarily forested with some agricultural lands to the southwest. The location of the proposed development and its relation to the City of Port Colborne is shown in **Figure 1-1**.

1.3 Study Area

As confirmed with City and MTO staff, traffic analysis was completed for the following study intersections:

- Proposed local road connections on Northland Avenue (one of which is opposite an access to the Port Colborne Mall);
- West Side Road (Highway 58) at Northland Avenue; and
- West Side Road (Highway 58) at Barrick Road.

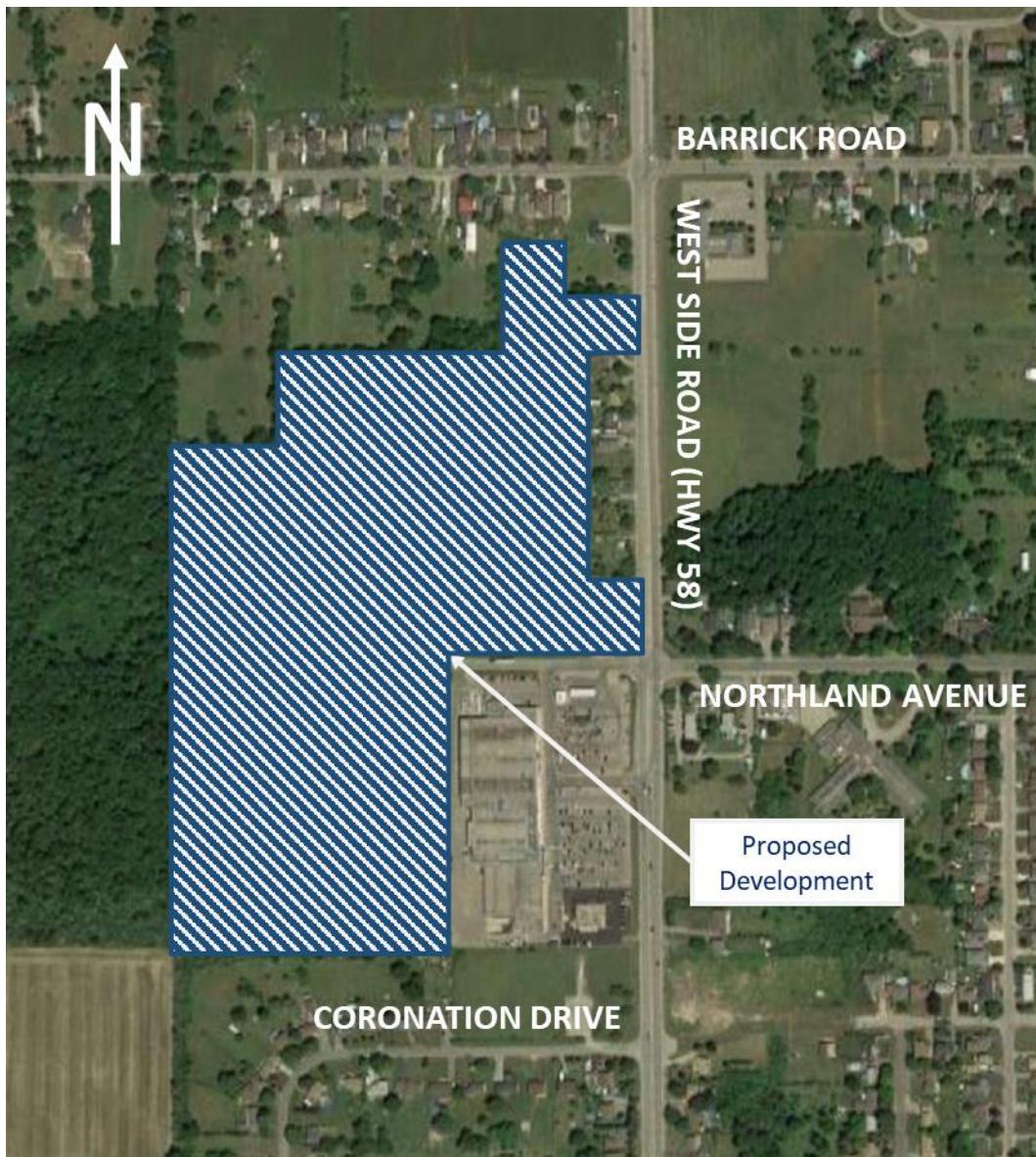


Figure 1-1 – Development Location

2.0 EXISTING CONDITIONS

2.1 Existing Road Network

Northland Avenue is a two-lane east-west local road under the jurisdiction of the City of Port Colborne and has an assumed speed limit of 50km/h. The horizontal and vertical alignments are generally straight and flat, respectively. Northland Avenue west of West Side road (Highway 58) currently services the Port Colborne Mall.

West Side Road (Highway 58) is a four-lane north-south rural highway under the jurisdiction of the MTO, with a posted speed limit of 70km/h within the study area. West Side Road has a flat and straight vertical and horizontal alignment within the study area, respectively. Northbound and southbound left-turn auxiliary lanes are located at the intersection with Barrick Road (unsignalized) and Northland Avenue (signalized). Between Barrick Road and Northland Avenue the road features a centre two-way left-turn lane.

Barrick Road is a two-lane east-west collector roadway under the jurisdiction of the City of Port Colborne, with a posted speed limit of 50km/h within the study area. Within the study area, Barrick Road has a generally straight and flat horizontal and vertical alignment, respectively.

2.2 Active Transportation Facilities

The only pedestrian facilities provided in the vicinity of the site include a curb-facing asphalt path on the east side of West Side Road from Barrick Road to south of the Port Colborne Mall, and sidewalk on the south side of Northland Avenue from the Mall's access on the west side of West Side Road and terminates approximately 100 metres east of West Side Road.

No roadways in this study area have dedicated cycling facilities.

2.3 Transit Services

Niagara Region provides a Niagara Region Transit (NRT) OnDemand rideshare service, which provides service to six other Niagara communities. Currently the service operates from Monday to Friday, 7:00am – 10:00pm.

Additionally, Welland Transit provides service to West Side Road and Barrick Road within the study area as part of the ‘Port Colborne Link’ route. No individual bus stops are located within the study area; however, transit users can “flag down” buses in these areas.

2.4 Existing Traffic Data

Intersection turning movement count (TMC) data was collected in May 2022, which is provided in **Appendix A**. An analysis of the data determined that the overall peak hours for the study area road network generally occurred between 7:45 a.m. and 8:45 a.m. during the weekday a.m. peak period and between 4:15 p.m. and 5:15 p.m. during the weekday p.m. peak period. The 2022 existing volumes for the weekday a.m. and p.m. peak hours are presented in **Figure 2-1**.

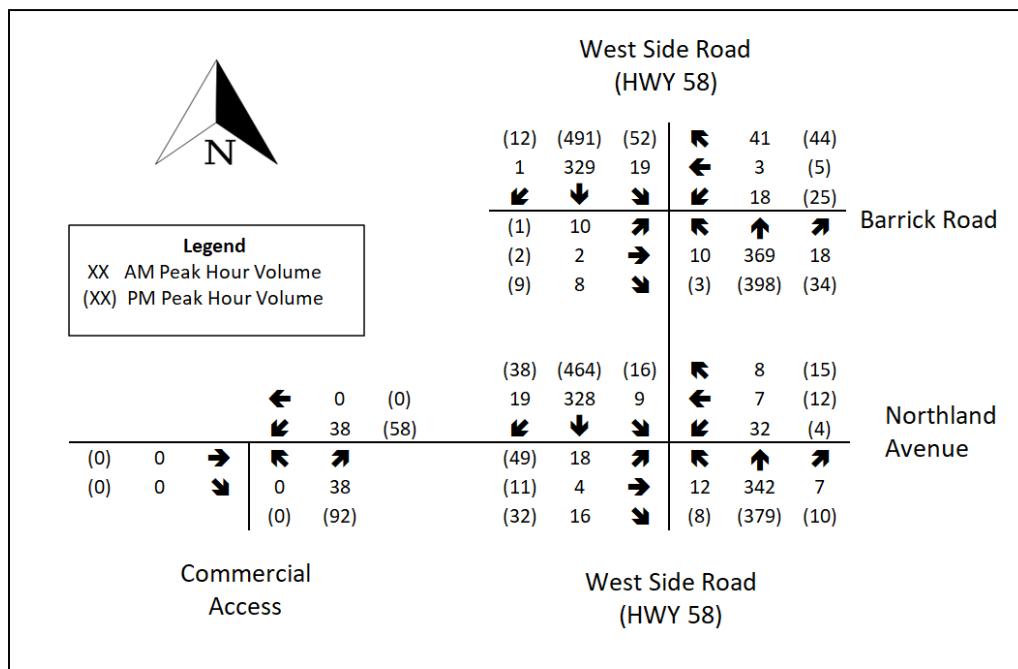


Figure 2-1 – 2022 Existing Traffic Volumes

3.0 FUTURE BACKGROUND TRAFFIC

3.1 Study Horizon Year

Based on consultation with City and MTO staff, the analysis adopted future planning horizons of 2024 (assumed build-out year of the development), 2029 (five years post build-out), and 2034 (ten years post build-out).

3.2 Future Background Developments

RVA is aware of a proposed residential subdivision development at 250 West Side Road. The development is planned to consist of a single apartment building with 75 units, with two driveways located along a future extension of Franklin Avenue. Full build-out of the site is targeted for 2023.

The weekday a.m. and p.m. peak hour site generated traffic for the 250 West Side Road development per the Traffic Impact Study Report (dated 2018) for the development, which was provided by City staff, is shown in **Figure 3-1**.

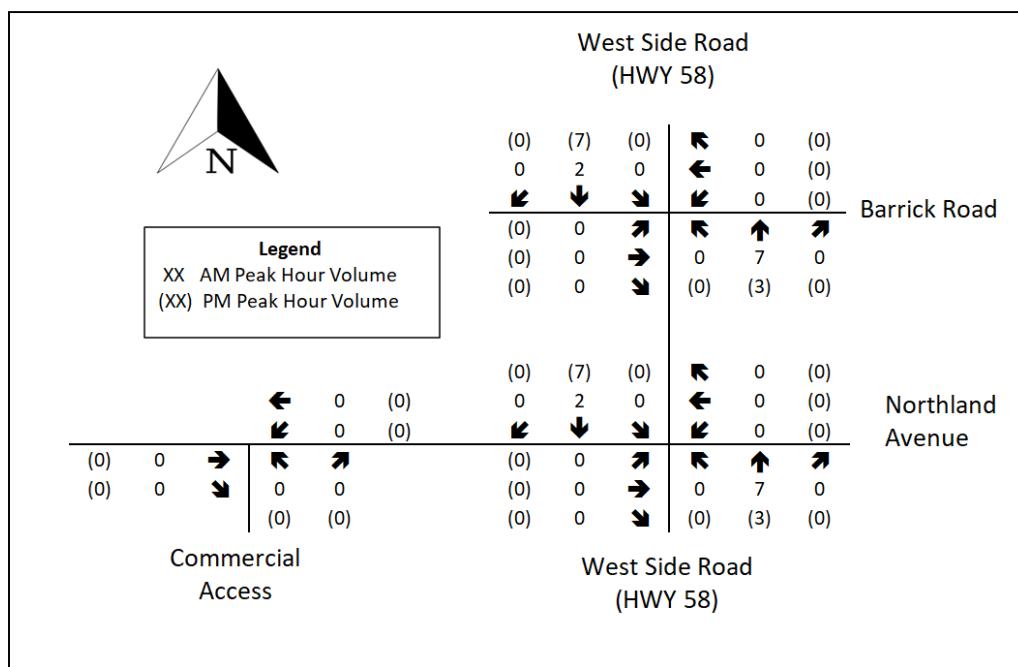


Figure 3-1 – 250 West Side Road Development Traffic Volumes

3.3 Future Background Growth

As per consultation with City and MTO staff, RVA has applied a 1% per annum growth rate to all movements along West side Road, except for movements turning into the existing Port Colborne Mall. The estimated 2024, 2029, and 2034 corridor growth volumes are shown in **Figure 3-2**, **Figure 3-3**, and **Figure 3-4**, respectively.

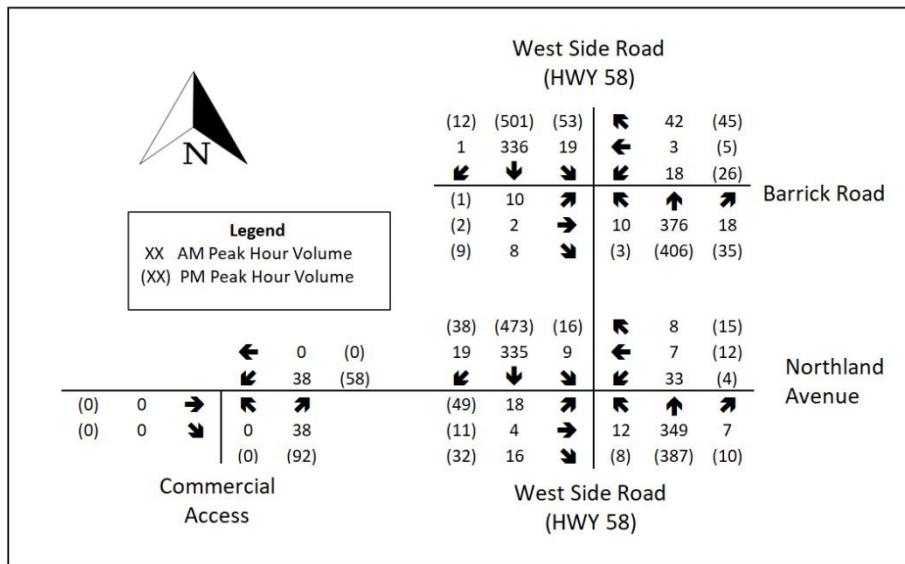


Figure 3-2 – 2024 Corridor Growth Traffic Volumes

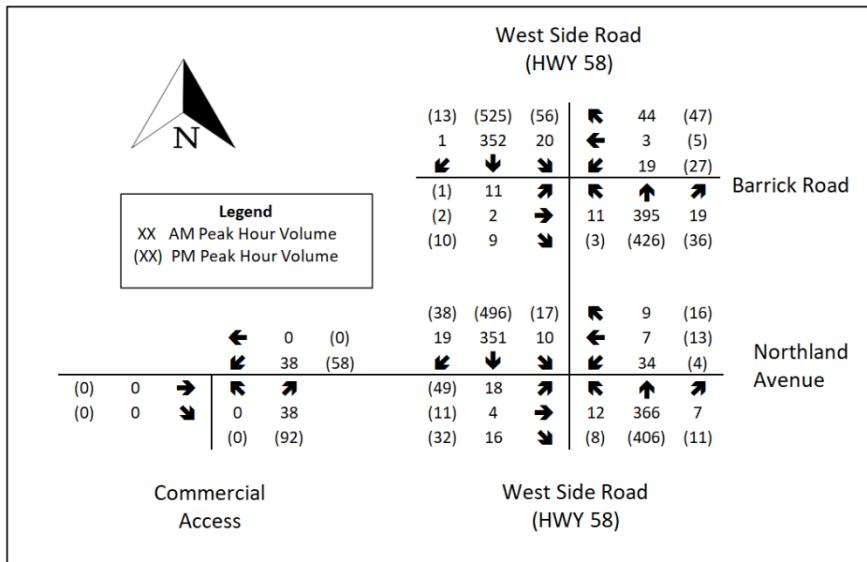


Figure 3-3 – 2029 Corridor Growth Traffic Volume

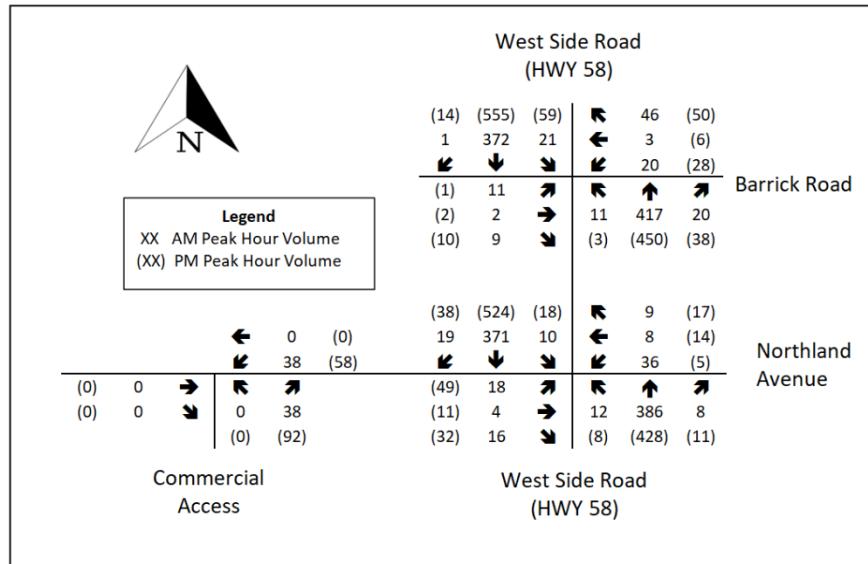


Figure 3-4 – 2034 Corridor Growth Traffic Volume

3.4 Future Background Traffic Volumes

The future background intersection volumes for the horizon years were estimated by adding the background development site traffic with the corridor growth volumes for each horizon year. The resulting 2024, 2029, and 2034 future background traffic volumes are shown in **Figure 3-5**, **Figure 3-6**, and **Figure 3-7**, respectively.

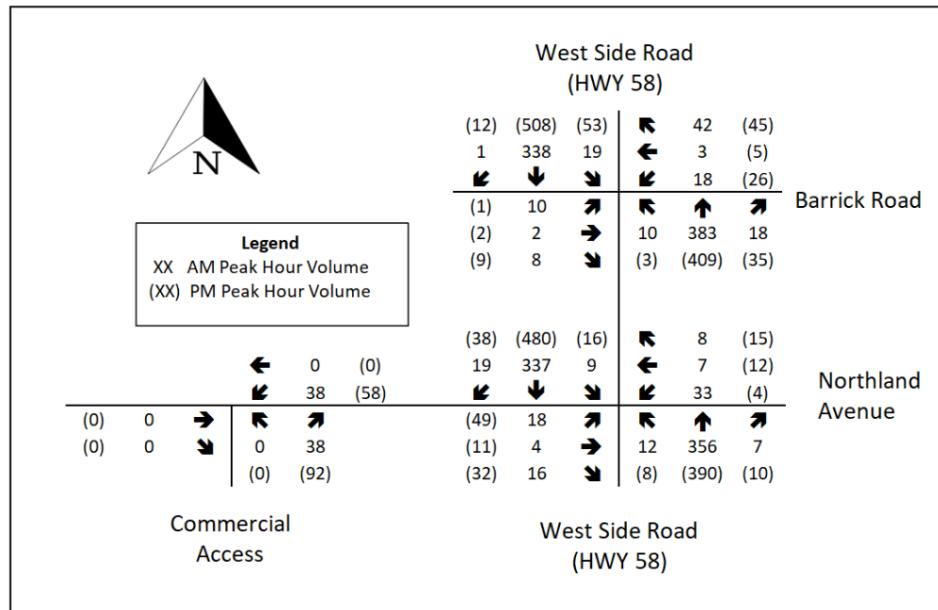


Figure 3-5 – 2024 Future Background Traffic Volumes

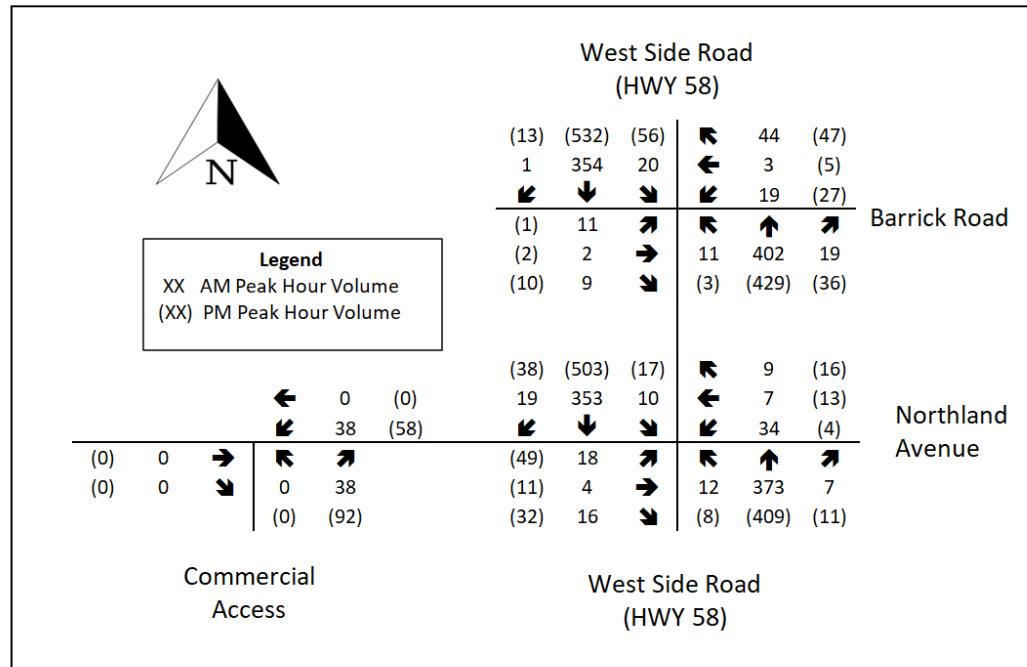


Figure 3-6 – 2029 Future Background Traffic Volumes

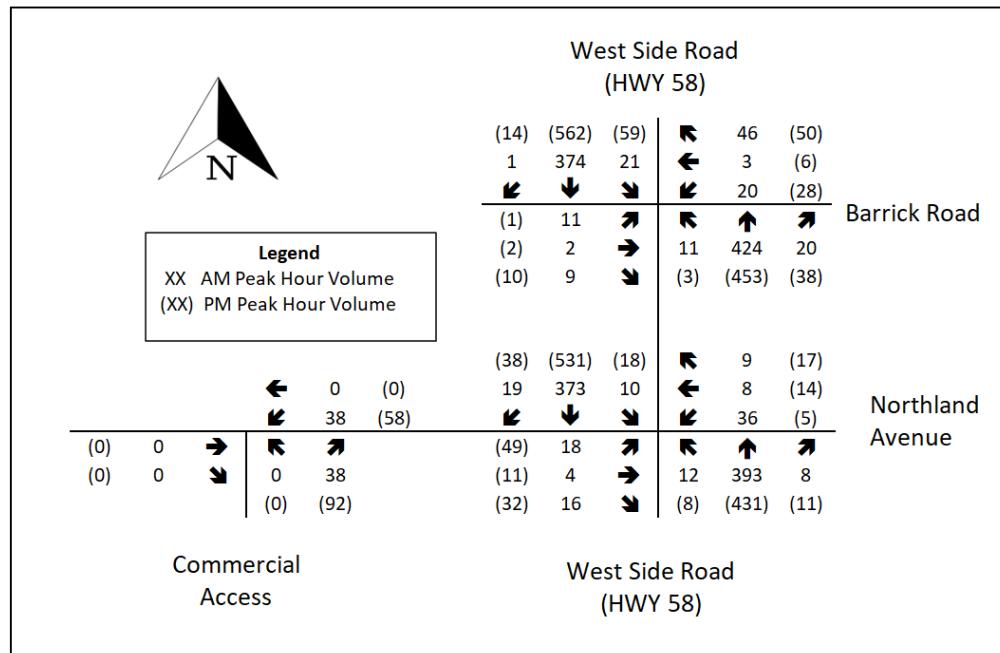


Figure 3-7 – 2029 Future Background Traffic Volumes

4.0 PROPOSED DEVELOPMENT

4.1 PLAN OF SUBDIVISION

The proposed Plan of Subdivision is provided in **Appendix C**. The plan shows 125 single family detached units, 50 townhouse units, and a 50-unit mid-rise apartment block with ground floor commercial, with vehicular access to the development provided by two new local road connections to Northland Avenue west of West Side Road.

Some of the internal local road intersections have intersection approaches on a skewed angle. The skewed angles are between 70 and 90 degrees, meaning the intersections are still considered “right-angled” intersections (70 to 110 degrees) as per Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads.

As per the TAC Geometric Design Guide, the minimum spacing between four-legged intersections on a local road is normally 60 metres, and where adjacent intersections are three-legged (T-intersection) a minimum spacing of 40 metres is desirable. Given all proposed internal intersections are adjacent to three-legged intersections, and spacing between each intersection exceeds 40 metres, intersection spacing internal to the development is considered acceptable per TAC guidelines.

The proposed easternmost local road intersection along Northland Avenue will be approximately 65m west of West Side Road and will be opposite the existing Port Colborne Mall access. It is expected the north and south approaches of this intersection will be stop-controlled, and the east-west approaches (Northland Avenue) will remain free flow. The results of the capacity analysis will confirm this traffic control configuration is acceptable from an operations standpoint and will confirm any need for auxiliary turn lanes.

The proposed local road connection at the western limit of Northland Avenue will result in a new T-intersection on Northland Avenue, with the east-west approaches (Northland Avenue) remaining free flow, and the south approach (service driveway for Port Colborne Mall) remaining stop controlled. Given the south approach at this intersection is a service driveway for deliveries to the mall, and therefore traffic volumes from this driveway during the peak hours of the adjacent road network would be negligible, capacity analysis was not completed for this access intersection.

4.2 Trip Generation

Automobile trip generation for the proposed development during peak periods of the adjacent street traffic was estimated by using the Institute of Transportation Engineers (ITE) Trip Generation Manual (11th edition) methodology for Single-Family Detached (LUC 210), Single-family Attached (LUC 215), Multifamily Housing Mid-Rise (LUC 221), and Strip Retail Plaza (LUC 822) for the ground floor commercial at the apartment block.

As presented in **Table 4-1**, the proposed development is projected to generate approximately 167 total two-way trips during the weekday a.m. peak hour (56 inbound and 111 outbound), and 275 total two-way trips during the weekday p.m. peak hour (158 inbound and 117 outbound).

The traffic generation estimates for the ground floor commercial component of the apartment block are considered conservative, as it assumes all traffic generated by the commercial use will be “primary trips” (new vehicular traffic added to the network). In reality, a proportion of the traffic servicing this commercial use will be “pass-by trips” (not new traffic added to the network, but rather traffic already on the network passing the site) and “internal capture trips” (also not new traffic added to the network, but rather pedestrian traffic travelling between the ground floor commercial use and the apartment units within the apartment block).

Table 4-1: Trip Generation

LUC	# Units (sq.ft gfa)	Peak Hours	Total Site Trips	Directional Distribution		Directional Site Trips		
				In	Out	In	Out	
Single Family Detached (LUC #210)	122	AM	89	26%	74%	23	66	
		PM	120	63%	37%	76	44	
Single Family Attached (LUC #215)	50	AM	20	31%	69%	6	14	
		PM	26	57%	43%	15	11	
Multi-Family Housing, Mid-Rise (LUC #221)	50	AM	19	53%	77%	4	15	
		PM	20	61%	39%	12	8	
Strip Retail Plaza <40k ft² gfa (LUC #822)	(16,150)	AM	39	60%	40%	23	16	
		PM	109	50%	50%	55	54	
				Total	AM	56	111	
					PM	158	117	

4.3 Trip Distribution

Given the majority of trips generated by the site during the weekday a.m. and p.m. peak hours will be commuter trips, and given the predominantly residential nature of the development, 2016 Transportation Tomorrow Survey (TTS) commuter data was reviewed to estimate the distribution of the site generated traffic to the surrounding road network. **Table 4-2** outlines the estimated trip distribution assumptions for the site generated trips, which is based on the analyzed TTS data provided in **Appendix B**.

Table 4-2: Trip Distribution

Direction	Distribution Percentages
North on West Side Road	56%
South on West Side Road	44%
Total	100%

4.4 Trip Assignment

The site generated traffic has been assigned to individual turning movements at the study area intersections based on the trip generation estimates and the trip distribution assumptions. The estimated peak hour site generated traffic for the proposed residential development is shown in **Figure 4-1**.

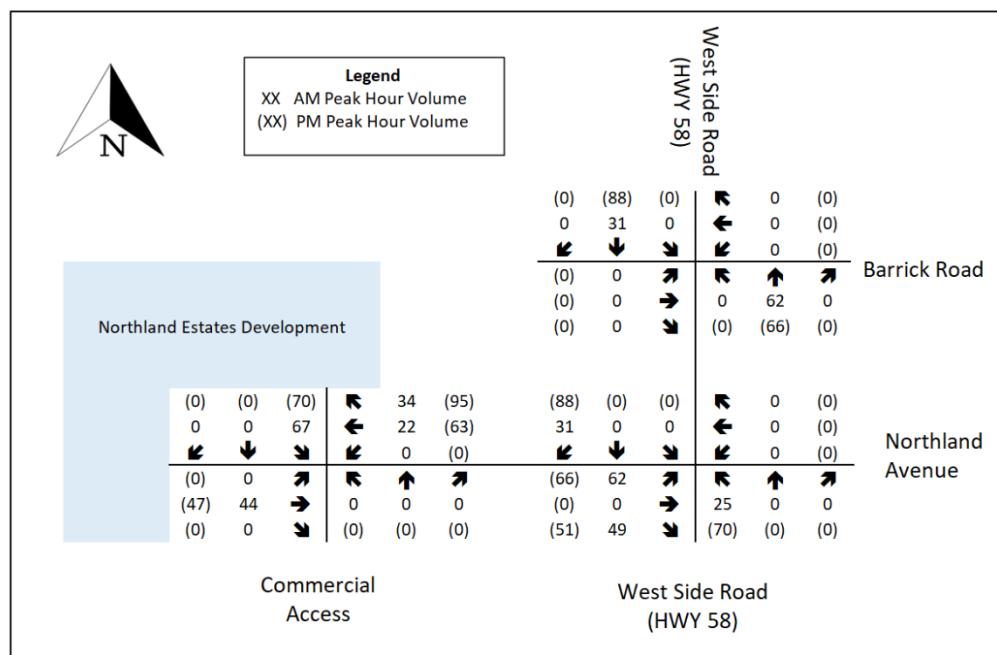


Figure 4-1 – Trip Assignment Traffic Volumes

5.0 FUTURE TOTAL TRAFFIC

5.1 Future Total Traffic Volumes

The future total intersection volumes for the 2024, 2029, and 2034 horizon years were developed by combining the estimated site generated traffic from the development with the future background traffic at each horizon year. The resulting 2024, 2029, and 2034 future total intersection volumes, for weekday a.m. and p.m. peak hours, are presented in **Figure 5-1**, **Figure 5-2**, and **Figure 5-3**, respectively.

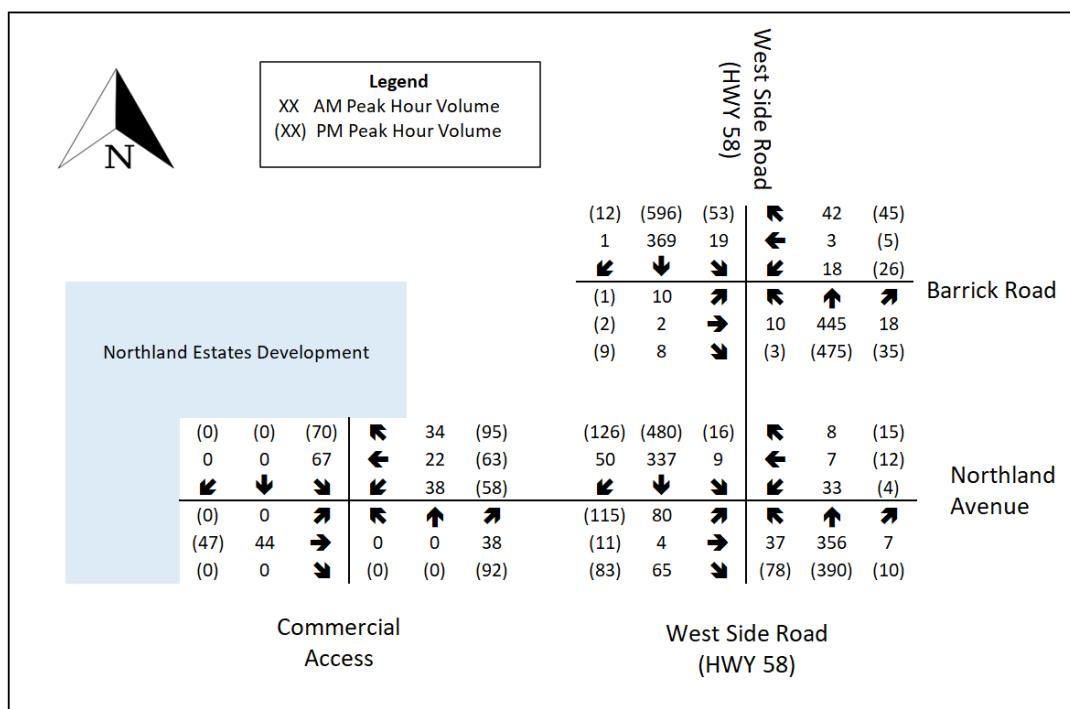


Figure 5-1 – 2024 Future Total Traffic Volumes

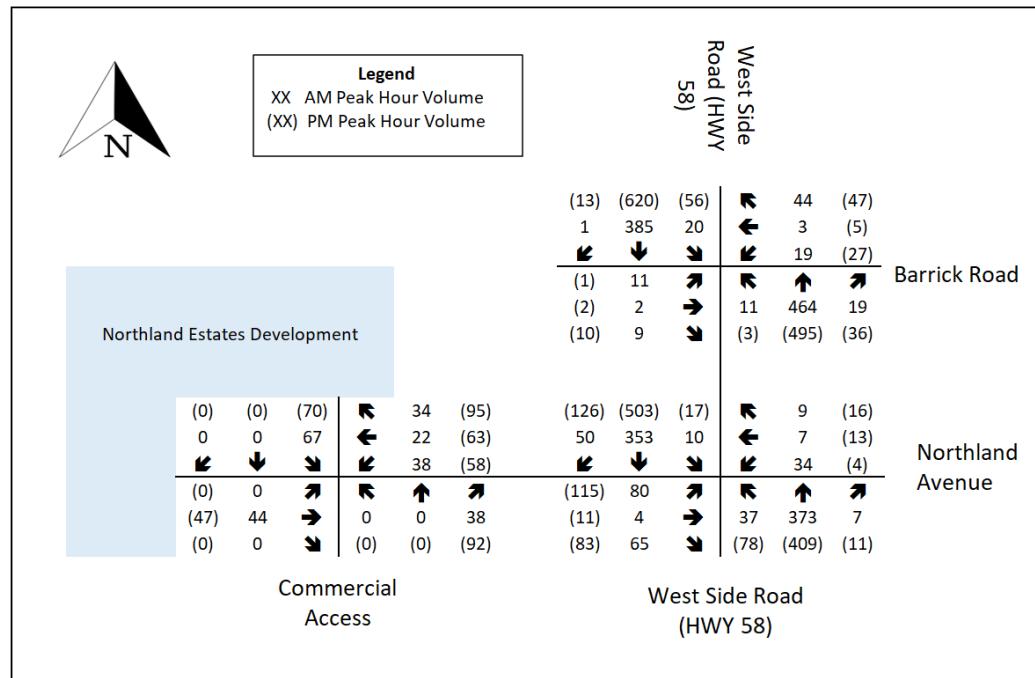


Figure 5-2 – 2029 Future Total Traffic Volumes

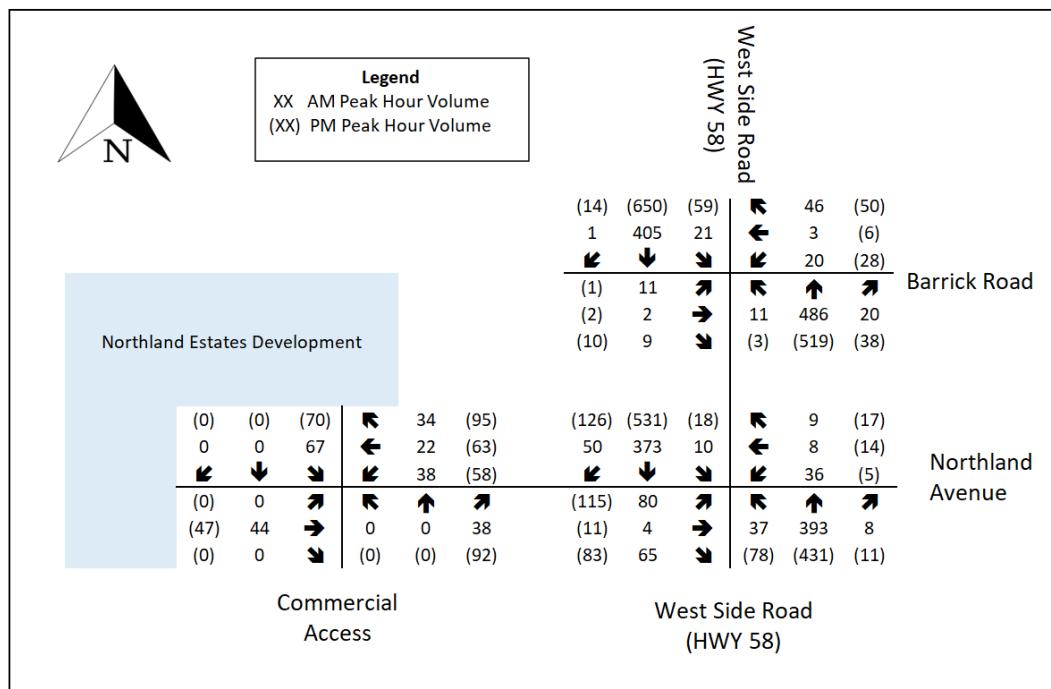


Figure 5-3 – 2034 Future Total Traffic Volumes

6.0 CAPACITY ANALYSIS

6.1 Capacity Analysis Methodology

The industry standard Synchro macroscopic traffic analysis software was utilized to analyse the intersections. Key performance measures such as Level of Service (LOS), volume-to-capacity ratio (v/c ratio), and 95th percentile queuing was reported, and are defined below:

- **Average vehicle control delay** is used to characterize LOS for the entire intersection, an approach, or movement. Delay quantifies the variations in travel time and is also a surrogate measure of driver discomfort and fuel consumption. The MTO defines an LOS 'D' as a 'critical' movement.
- **V/c ratio** quantifies the degree to which the capacity of each signal phase is utilized by a defined lane group. The MTO defines a v/c ratio greater than 0.85 and 0.9 as 'critical' for through or shared-through movements and turning movements, respectively.
- **95th percentile queue** is the queue length which is expected to be exceeded only 5% of the time; it is common practice to identify preferred storage length requirements for auxiliary turn lanes at signalized intersections based on estimated peak hour 95th percentile queueing.

Table 6-1 identifies the control delay thresholds (seconds of delay per vehicle) for each LOS based on Highway Capacity Manual (HCM) methodology.

Table 6-1: Characteristics of Level of Service at Intersections

LEVEL OF SERVICE (LOS)	CONTROL DELAY (seconds / vehicle)	
	SIGNALIZED INTERSECTION	UN SIGNALIZED INTERSECTION
A	≤ 10	≤ 10
B	> 10 to 20	> 10 to 15
C	> 20 to 35	> 15 to 25
D	> 35 to 55	> 25 to 35
E	> 55 to 80	> 35 to 50
F	> 80	> 50

Existing signal timing plans for the signalized study area intersections were provided by the City for use in the analysis; the signal timing plans are provided in **Appendix D**.

6.2 Capacity Analysis Results

The following tables presents the capacity analysis results for the study area intersections under all existing and future conditions scenarios. Detailed Highway Capacity Manual (HCM) output reports from the Synchro software are provided in **Appendix E**.

6.2.1 Proposed local road intersection on Northland Avenue

Table 6-2: Capacity Analysis Results – Northland Site Access

SCENARIO	MOVE.	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR		
		V/C	LOS	95TH % QUEUE (M)	V/C	LOS	95TH % QUEUE (M)
2022 Existing	NBLTR	0.03	A	<1 veh	0.04	A	<1 veh
	WBLTR	0.04	A	<1 veh	0.09	A	<1 veh
2024 Future Background	NBLTR	0.03	A	<1 veh	0.04	A	<1 veh
	WBLTR	0.04	A	<1 veh	0.09	A	<1 veh
2024 Future Total	WBLTR	0.03	A	<1 veh	0.04	A	<1 veh
	NBLTR	0.04	A	<1 veh	0.10	A	<1 veh
	SBLTR	0.10	B	<1 veh	0.15	B	<1 veh
2034 Future Total	WBLTR	0.03	A	<1 veh	0.04	A	<1 veh
	NBLTR	0.04	A	<1 veh	0.10	A	<1 veh
	SBLTR	0.10	B	<1 veh	0.15	B	<1 veh

Under existing and all future scenarios, all movements at the intersection of Northland Avenue and the proposed local road intersection opposite the Mall Access is operating with v/c ratios not exceeding 0.15, delays primarily at LOS “A” with only the southbound approach at LOS “B” during both peak hours, and no queuing issues (less than one vehicle for all movements).

No geometric improvements are required at this intersection due to the introduction of the future site generated traffic.

6.2.2 Northland Avenue at West Side Road (Hwy 58)

Table 6-3: Capacity Analysis Results – Northland Avenue at West Side Road (Hwy 58)

SCENARIO	MOVE.	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR			STORAGE LENGTH
		V/C	LOS	95TH % QUEUE (M)	V/C	LOS	95TH % QUEUE (M)	
2022 Existing	EBL	0.17	C	7	0.29	C	14	45m
	EBTR	0.04	C	<1 veh	0.07	C	9	-
	WBL	0.29	C	10	0.03	C	<1 veh	30m
	WBTR	0.06	C	<1 veh	0.06	C	7	-
	NBL	0.02	A	<1 veh	0.01	A	<1 veh	30m
	NBTTR	0.16	A	13	0.16	A	13	-
	SBL	0.01	A	<1 veh	0.02	A	<1 veh	90m
	SBTTR	0.16	A	12	0.21	A	17	-
2024 Future Background	EBL	0.17	C	7	0.29	C	14	45m
	EBTR	0.04	C	<1 veh	0.07	C	9	-
	WBL	0.30	C	11	0.03	C	<1 veh	30m
	WBTR	0.06	C	<1 veh	0.06	C	7	-
	NBL	0.02	A	<1 veh	0.01	A	<1 veh	30m
	NBTTR	0.17	A	13	0.17	A	14	-
	SBL	0.02	A	<1 veh	0.02	A	<1 veh	90m
	SBTTR	0.16	A	13	0.22	A	17	-
2024 Future Total	EBL	0.50	C	21	0.58	C	27	45m
	EBTR	0.06	C	10	0.10	C	12	-
	WBL	0.21	C	11	0.02	C	<1 veh	30m
	WBTR	0.04	C	<1 veh	0.06	C	7	-
	NBL	0.07	A	<1 veh	0.16	A	10	30m
	NBTTR	0.18	A	16	0.17	A	17	-
	SBL	0.02	A	<1 veh	0.02	A	<1 veh	90m
	SBTTR	0.19	A	16	0.26	A	25	-
2034 Future Total	EBL	0.50	C	21	0.58	C	27	45m
	EBTR	0.06	C	10	0.10	C	12	-
	WBL	0.23	C	11	0.03	C	<1 veh	30m
	WBTR	0.04	C	<1 veh	0.07	C	7	-
	NBL	0.07	A	<1 veh	0.17	A	10	30m
	NBTTR	0.20	A	18	0.19	A	19	-
	SBL	0.02	A	<1 veh	0.03	A	<1 veh	90m
	SBTTR	0.21	A	18	0.28	A	27	-

Under all existing and future scenarios, northbound and southbound movements on West Side Road are forecast to have v/c ratios not exceeding 0.31, delays of LOS “A”, and no queuing issues. The eastbound and westbound movements on Northland Avenue are forecast to have v/c ratios not exceeding 0.29, delays of LOS “C”, and no queuing issues.

With no change in LOS in 2024 during the peak hours upon build-out of the subject development, it can be expected that the impact of the site generated traffic at the intersection will be nominal. The 95th percentile queue length for the eastbound approach is not expected to extend to the proposed local road connection on Northland Avenue which is planned to be approximately 65 metres west of the signalized intersection.

No improvements are required at this intersection due to the introduction of the future site traffic.

6.2.3 West Side Road (Hwy 58) at Barrick Road

Table 6-4: Capacity Analysis Results – West Side Road (Hwy 58) at Barrick Road

SCENARIO	MOVE.	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR			STORAGE LENGTH
		V/C	LOS	95TH % QUEUE (M)	V/C	LOS	95TH % QUEUE (M)	
2022 Existing	EBLTR	0.06	C	<1 veh	0.03	B	<1 veh	-
	WBLTR	0.12	B	<1 veh	0.18	C	<1 veh	-
	NBL	0.01	A	<1 veh	0.00	A	<1 veh	270m
	SBL	0.02	A	<1 veh	0.05	A	<1 veh	110m
2024 Future Background	EBLTR	0.06	C	<1 veh	0.03	B	<1 veh	-
	WBLTR	0.13	B	<1 veh	0.20	C	<1 veh	-
	NBL	0.01	A	<1 veh	0.00	A	<1 veh	270m
	SBL	0.02	A	<1 veh	0.05	A	<1 veh	110m
2024 Future Total	EBLTR	0.06	C	<1 veh	0.03	B	<1 veh	-
	WBLTR	0.14	B	<1 veh	0.23	C	<1 veh	-
	NBL	0.01	A	<1 veh	0.00	A	<1 veh	270m
	SBL	0.02	A	<1 veh	0.05	A	<1 veh	110m
2034 Future Total	EBLTR	0.08	C	<1 veh	0.04	C	<1 veh	-
	WBLTR	0.17	C	<1 veh	0.29	C	9	-
	NBL	0.01	A	<1 veh	0.00	A	<1 veh	270m
	SBL	0.02	A	<1 veh	0.06	A	<1 veh	110m

Under all existing and future scenarios, the intersection of Barrick Road and West Side Road is operating with reserve capacity (v/c ratios not exceeding 0.29), no delay issues (LOS “A” for the left-turn movements on West Side Road and free flow for the north-south through movements, and LOS “C” for the Barrick Road approaches), and no queuing issues (less than one vehicle). With no change in LOS in 2024 during peak hours upon build-out of the subject development, it can be expected that the impact of the site generated traffic at the intersection will be nominal.

No improvements are required at this intersection due to the introduction of the future site traffic.

7.0 LEFT-TURN LANE WARRANTS

The Ontario Ministry of Transportation (MTO) left-turn lane warrant was completed for the left-turn movement from Northland Avenue into the Mall access for the a.m. and p.m. peak hours using the projected 2034 volumes. Per the results of the left-turn lane warrant, as illustrated in **Appendix F**, a left-turn lane is not warranted at this access.

8.0 SIGNAL WARRANTS

MTO Signal warrants were completed for unsignalized study intersections, with the completed signal warrant spreadsheets provided in **Appendix G**. Traffic signals are not warranted at any of the study area intersections for the final 2034 future total horizon year, and therefore will not be warranted for any of the preceding horizon years.

9.0 SUMMARY OF FINDINGS

The findings of the traffic impact study can be summarized as follows:

- The proposed development is projected to generate approximately 169 total two-way trips during the weekday a.m. peak hour (57 inbound and 112 outbound), and 278 total two-way trips during the weekday p.m. peak hour (159 inbound and 54 outbound);
- As per the results of the intersection capacity analysis, the site generated traffic is not expected to result in any capacity, delay, or queuing concerns at the study area intersections upon build-out the development, and the intersections are expected to continue operating acceptably up to the final 2034 horizon year;
- Auxiliary left-turn lanes are not warranted on Northland Avenue for the 2034 horizon year based on the MTO's warrant methodology.
- New traffic signals are not warranted at any of the unsignalized study area intersections up to the final 2034 horizon year;
- The proposed internal road network layout is considered acceptable per TAC geometric design guidelines; and
- The existing roadway system has sufficient capacity to accommodate the anticipated traffic generation from the subject development without any modifications.

APPENDIX A

TMC Data

APPENDIX B

Transportation Tomorrow Survey

APPENDIX C

Draft Site Plan

APPENDIX D

Signal Timing Plans

APPENDIX E

Synchro Software Output Reports

APPENDIX F

Auxiliary Left-Turn Lane Warrants

APPENDIX G

Signal Warrants

APPENDIX A

TMC Data

West Side Rd (Hwy 58) @ Northland Ave

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 7:45:00

To: 8:45:00

Municipality: Port Colborne

Site #: 0000000002

Intersection: West Side Rd (Hwy 58) & Northland

TFR File #: 2

Count date: 27-Apr-2022

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: West Side Rd (Hwy 58) runs N/S

North Leg Total: 748

North Entering: 356

North Peds: 0

Peds Cross: ☒

Heavys	0	36	1	37
Trucks	1	4	0	5
Cars	18	288	8	314
Totals	19	328	9	

East Leg Total: 67

East Entering: 47

East Peds: 0

Peds Cross: ☒

Heavys	Trucks	Cars	Totals
1	2	35	38



West Side Rd (Hwy 58)

Heavys Trucks Cars Totals

Cars 32 Trucks 0 Heavys 32

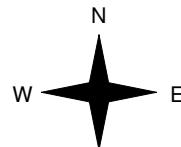
Cars 7 Trucks 0 Heavys 7

Cars 7 Trucks 0 Heavys 8

Totals 46 0 1 46

Heavys	Trucks	Cars	Totals
2	2	14	18
0	0	4	4
0	0	16	16
2	2	34	

West Side Rd (Hwy 58)



Northland Ave

Northland Ave

Cars	Trucks	Heavys	Totals
19	0	1	20

Peds Cross:	☒
West Peds:	0
West Entering:	38
West Leg Total:	76

Cars	311
Trucks	4
Heavys	37
Totals	352

Cars	10	306	7	323
Trucks	1	4	0	5
Heavys	1	32	0	33
Totals	12	342	7	

Peds Cross:	☒
South Peds:	0
South Entering:	361
South Leg Total:	713

Comments

West Side Rd (Hwy 58) @ Northland Ave

Afternoon Peak Diagram

Specified Period

From: 16:00:00

To: 18:00:00

One Hour Peak

From: 16:15:00

To: 17:15:00

Municipality: Port Colborne

Site #: 0000000002

Intersection: West Side Rd (Hwy 58) & Northland

TFR File #: 2

Count date: 27-Apr-2022

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: West Side Rd (Hwy 58) runs N/S

North Leg Total: 961

North Entering: 518

North Peds: 0

Peds Cross: ☒

	Heavys	Cars	Totals
0	8	0	8
0	5	0	5
38	451	16	505
Totals	38	464	16

	Heavys	Cars	Totals
4	4	4	12
4	4	4	12
435	435	435	1295
Totals	443	443	1295

East Leg Total: 68

East Entering: 31

East Peds: 0

Peds Cross: ☐

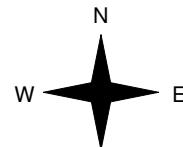
Heavys Trucks Cars Totals

0	0	58	58
---	---	----	----



West Side Rd (Hwy 58)

Northland Ave



Heavys Trucks Cars Totals

0	0	49	49
---	---	----	----

0	0	11	11
---	---	----	----

0	0	32	32
---	---	----	----

0	0	92	92
---	---	----	----



West Side Rd (Hwy 58)

Cars Trucks Heavys Totals

15	0	0	15
----	---	---	----

12	0	0	12
----	---	---	----

4	0	0	4
---	---	---	---

31	0	0	31
----	---	---	----

Northland Ave



Peds Cross: ☐

Cars 487

Trucks 5

Heavys 8

Totals 500

Cars 8

Trucks 0

Heavys 0

Totals 8

Cars 371

Trucks 4

Heavys 4

Totals 379

Cars 10

Trucks 0

Heavys 0

Totals 10

Peds Cross: ☐

South Peds: 0

South Entering: 397

South Leg Total: 897

Comments

West Side Rd (Hwy 58) @ Northland Ave

Total Count Diagram

Municipality: Port Colborne

Site #: 0000000002

Intersection: West Side Rd (Hwy 58) & Northland

TFR File #: 2

Count date: 27-Apr-2022

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

** Signalized Intersection **

Major Road: West Side Rd (Hwy 58) runs N/S

North Leg Total: 3063

North Entering: 1576

North Peds: 0

Peds Cross: ☒

Heavys	0	68	1	69
Trucks	1	18	0	19
Cars	115	1328	45	1488
Totals	116	1414	46	

Heavys 60

Trucks 18

Cars 1409

Totals 1487

East Leg Total: 253

East Entering: 143

East Peds: 0

Peds Cross: ☒

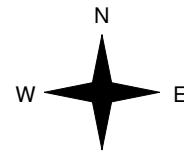
Heavys Trucks Cars Totals
2 2 184 188



West Side Rd (Hwy 58)

Cars	Trucks	Heavys	Totals
83	0	0	83
37	0	0	37
21	1	1	23
141	1	1	

Northland Ave



Heavys Trucks Cars Totals
2 4 117 123
0 0 32 32
0 0 79 79
2 4 228

West Side Rd (Hwy 58)

Northland Ave

Cars Trucks Heavys Totals
109 0 1 110

Peds Cross: ☒
West Peds: 0
West Entering: 234
West Leg Total: 422

Cars 1428
Trucks 19
Heavys 69
Totals 1516

Cars 32 1209 32 1273
Trucks 1 14 0 15
Heavys 2 58 0 60
Totals 35 1281 32

Peds Cross: ☐
South Peds: 0
South Entering: 1348
South Leg Total: 2864

Comments

West Side Rd (Hwy 58) @ Barrick Rd

Morning Peak Diagram

Specified Period

From: 7:00:00

To: 9:00:00

One Hour Peak

From: 7:45:00

To: 8:45:00

Municipality: Port Colborne

Site #: 0000000001

Intersection: West Side Rd (Hwy 58) & Barrick Rd

TFR File #: 1

Count date: 27-Apr-2022

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

** Non-Signalized Intersection **

Major Road: West Side Rd (Hwy 58) runs N/S

North Leg Total: 769

North Entering: 349

North Peds: 0

Peds Cross: ☒

Heavys 0 36 1 37

Trucks 0 4 0 4

Cars 1 289 18 308

Totals 1 329 19

Heavys 33

Trucks 6

Cars 381

Totals 420

East Leg Total: 101

East Entering: 62

East Peds: 0

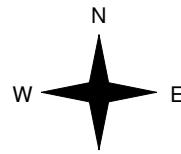
Peds Cross: ☒

Heavys Trucks Cars Totals
3 0 11 14



West Side Rd (Hwy 58)

Barrick Rd



Heavys Trucks Cars Totals
1 0 9 10
0 1 1 2
0 0 8 8
1 1 18

West Side Rd (Hwy 58)

	Cars	Trucks	Heavys	Totals
↑	39	0	2	41
←	1	0	2	3
↓	17	1	0	18
→	57	1	4	

Barrick Rd



Peds Cross: ☒
West Peds: 0
West Entering: 20
West Leg Total: 34

Cars 314
Trucks 5
Heavys 36
Totals 355

Cars 9 333 16 358
Trucks 0 6 1 7
Heavys 1 30 1 32
Totals 10 369 18

Peds Cross: ☐
South Peds: 0
South Entering: 397
South Leg Total: 752

Comments

West Side Rd (Hwy 58) @ Barrick Rd

Afternoon Peak Diagram

Specified Period

From: 16:00:00

To: 18:00:00

One Hour Peak

From: 16:15:00

To: 17:15:00

Municipality: Port Colborne

Site #: 0000000001

Intersection: West Side Rd (Hwy 58) & Barrick Rd

TFR File #: 1

Count date: 27-Apr-2022

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

** Non-Signalized Intersection **

Major Road: West Side Rd (Hwy 58) runs N/S

North Leg Total: 998

North Entering: 555

North Peds: 0

Peds Cross: ☒

Heavys	1	8	1	10
Trucks	0	6	0	6
Cars	11	477	51	539
Totals	12	491	52	

East Leg Total: 162

East Entering: 74

East Peds: 0

Peds Cross: ☒

Heavys	1	1	18	20
Trucks	1	1	18	20
Cars	18	18	18	20
Totals	20	20	20	20

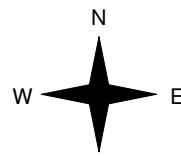


West Side Rd (Hwy 58)

Cars	43	0	1	44
Trucks	4	1	0	5
Heavys	25	0	0	25
Totals	72	1	1	74

Heavys	0	0	1	1
Trucks	0	0	2	2
Cars	0	0	9	9
Totals	0	0	12	12

West Side Rd (Hwy 58)



Barrick Rd



Peds Cross:	☒
West Peds:	0
West Entering:	12
West Leg Total:	32

Cars	511
Trucks	6
Heavys	8
Totals	525

Cars	3	390	34	427
Trucks	0	4	0	4
Heavys	0	4	0	4
Totals	3	398	34	

Peds Cross:	☒
South Peds:	0
South Entering:	435
South Leg Total:	960

Comments

West Side Rd (Hwy 58) @ Barrick Rd

Total Count Diagram

Municipality: Port Colborne

Site #: 0000000001

Intersection: West Side Rd (Hwy 58) & Barrick Rd

TFR File #: 1

Count date: 27-Apr-2022

Weather conditions:

Cloudy/Dry

Person(s) who counted:

Cam

**** Non-Signalized Intersection ****

Major Road: West Side Rd (Hwy 58) runs N/S

North Leg Total: 3201

North Entering: 1635

North Peds: 0

Peds Cross: ☒

Heavys	2	68	2	72
Trucks	0	15	1	16
Cars	28	1376	143	1547
Totals	30	1459	146	

Heavys 66

Trucks 16

Cars 1484

Totals 1566

East Leg Total: 509

East Entering: 263

East Peds: 0

Peds Cross: ☒

Heavys Trucks Cars Totals
6 2 65 73

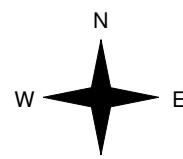


West Side Rd (Hwy 58)

	Cars	Trucks	Heavys	Totals
↑	162	0	6	168
←	10	2	2	14
↓	78	1	2	81
→	250	3	10	

Heavys Trucks Cars Totals
2 2 24 28
1 1 5 7
0 0 28 28
3 3 57

Barrick Rd



Barrick Rd

	Cars	Trucks	Heavys	Totals
→	239	3	4	246

Peds Cross: ☒
West Peds: 0
West Entering: 63
West Leg Total: 136

Cars 1482
Trucks 16
Heavys 70
Totals 1568

Cars 27 1298 91 1416
Trucks 0 14 1 15
Heavys 2 58 1 61
Totals 29 1370 93

Peds Cross: ☐
South Peds: 0
South Entering: 1492
South Leg Total: 3060

Comments

APPENDIX B

Transportation Tomorrow Survey

Transportation Tomorrow Survey

Tue Apr 26 2022 11:16:31 GMT-0400 (Eastern Daylight Time) - Run Time: 1798ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of household - pd_hhld

Column: Planning district of employment - pd_emp

RowG:(59)

ColG:

TblG:

Filters:

No Filters

Trip 2016

Table:

APPENDIX C

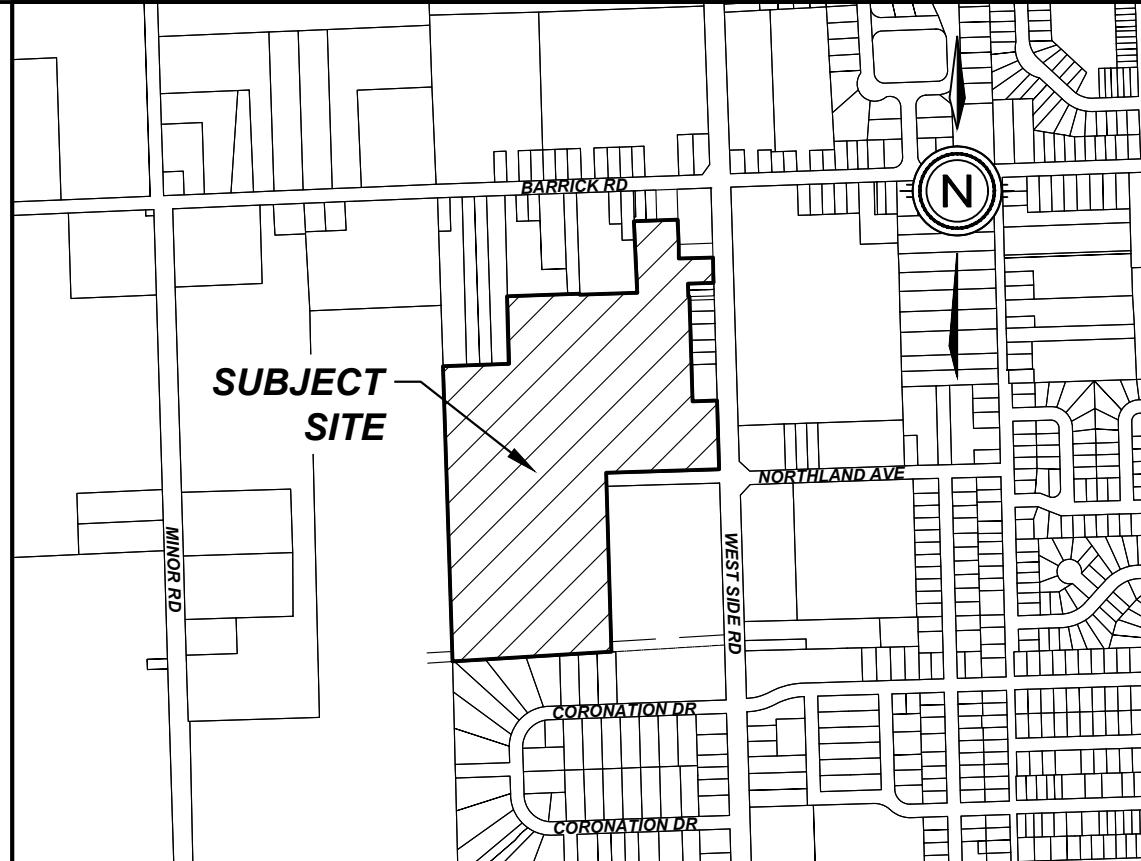
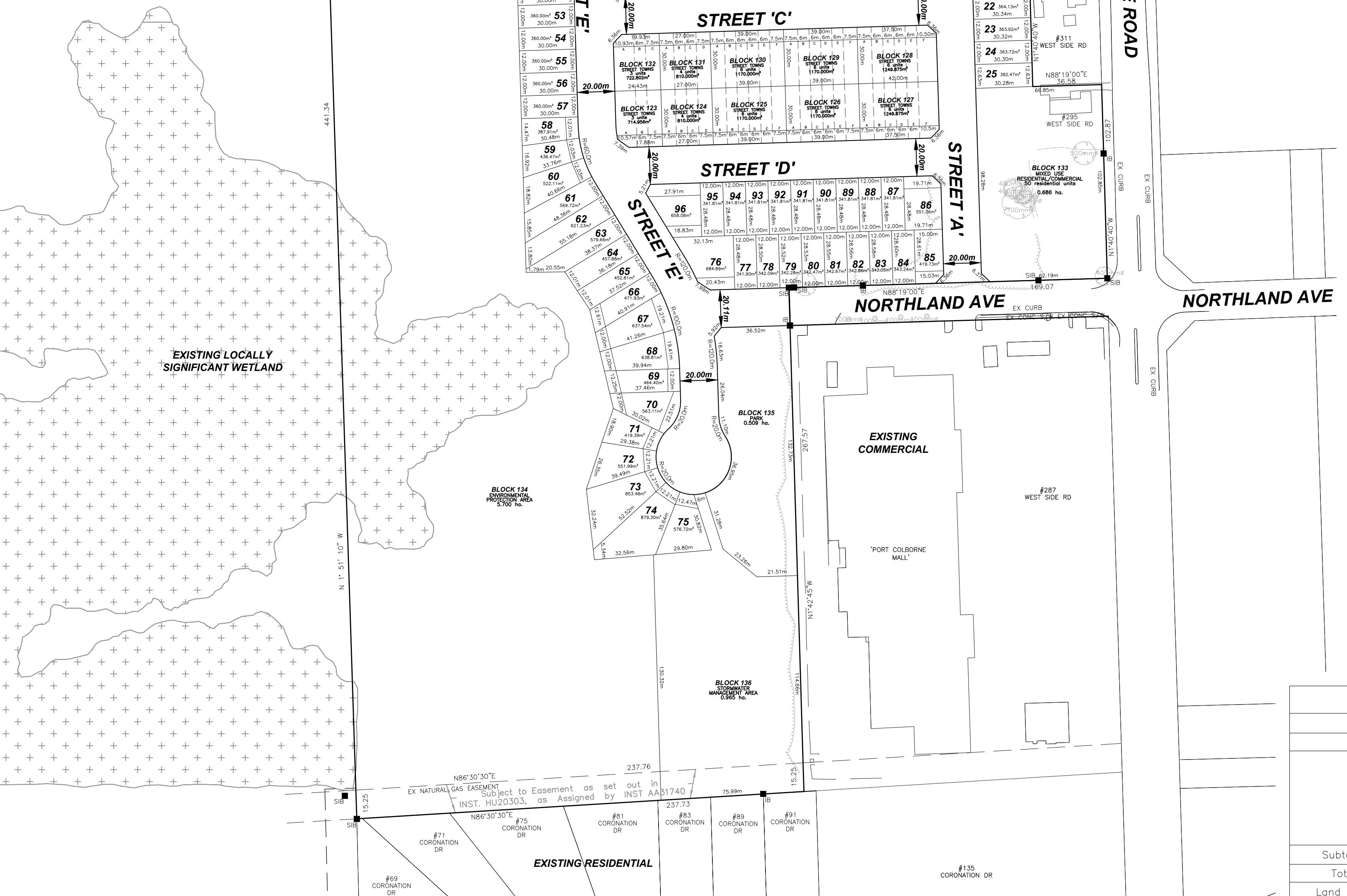
Draft Site Plan

NORTHLAND ESTATES

CITY OF PORT COLBORNE

STREET TOWNHOUSE BLOCK UNIT AREA

BLOCK 123 TOTAL AREA = 714.956m ²	BLOCK 128 TOTAL AREA = 1249.875m ²
UNIT A 309.956m ²	UNIT A 225.000m ²
B 180.000m ²	B 180.000m ²
C 225.000m ²	C 180.000m ²
BLOCK 124 TOTAL AREA = 810.000m²	D 180.000m ²
UNIT A 225.000m ²	E 180.000m ²
B 180.000m ²	F 304.875m ²
C 180.000m ²	BLOCK 129 TOTAL AREA = 1170.000m²
D 225.000m ²	UNIT A 225.000m ²
BLOCK 125 TOTAL AREA = 1170.000m²	B 180.000m ²
UNIT A 225.000m ²	C 180.000m ²
B 180.000m ²	D 180.000m ²
C 180.000m ²	E 180.000m ²
D 180.000m ²	F 225.000m ²
E 180.000m ²	BLOCK 130 TOTAL AREA = 1170.000m²
F 225.000m ²	UNIT A 225.000m ²
BLOCK 126 TOTAL AREA = 1170.000m²	B 180.000m ²
UNIT A 225.000m ²	C 180.000m ²
B 180.000m ²	D 180.000m ²
C 180.000m ²	E 180.000m ²
D 180.000m ²	F 225.000m ²
E 180.000m ²	BLOCK 131 TOTAL AREA = 810.000m²
F 225.000m ²	UNIT A 225.000m ²
BLOCK 127 TOTAL AREA = 1249.875m²	B 180.000m ²
UNIT A 225.000m ²	C 180.000m ²
B 180.000m ²	D 225.000m ²
C 180.000m ²	BLOCK 132 TOTAL AREA = 722.802m²
D 180.000m ²	UNIT A 317.802m ²
E 180.000m ²	B 180.000m ²
F 304.875m ²	C 225.000m ²



KEY PLAN

N.T.S.

DRAFT PLAN OF SUBDIVISION

**PART OF LOT 31, CONCESSION 2
GEOGRAPHIC TOWNSHIP OF HUMBERSTONE
CITY OF PORT COLBORNE
REGIONAL MUNICIPALITY OF NIAGARA**

OWNER'S CERTIFICATE

BEING THE REGISTERED OWNER, I HEREBY
AUTHORIZE UPPER CANADA CONSULTANTS TO
PREPARE AND SUBMIT THIS DRAFT PLAN OF
UBDIVISION TO THE CITY OF PORT COLBORNE
FOR APPROVAL.

JUNE 24, 2022
2600261 ONTARIO INC. DATE

SURVEYOR'S CERTIFICATE

HEREBY CERTIFY THAT THE BOUNDARIES OF
THE LANDS TO BE SUBDIVIDED ARE
CORRECTLY SHOWN.

ROY S. KIRKUP, B.Sc., O.L.I.P., Ontario Land Surveyor DATE
KIRKUP MASCOE URE SURVEYING
(a Division of J.D. Barnes Limited)

REQUIREMENTS OF SECTION 51(17) OF THE PLANNING ACT

- | | | |
|----------|--------------------|-------------------------------------|
| SEE PLAN | e) SEE PLAN | i) VARIOUS TEXTURES
OVER BEDROCK |
| SEE PLAN | f) SEE PLAN | j) SEE PLAN |
| SEE PLAN | g) SEE PLAN | k) FULL SERVICE |
| SEE PLAN | h) MUNICIPAL WATER | l) SEE PLAN |

LAND USE SCHEDULE

LAND USE	LOT/BLOCK	# OF UNITS	AREA(ha)	AREA(%)
LE FAMILY RESIDENTIAL	LOT 1-122	122	5.014	30.11
EET TOWNS RESIDENTIAL	BLOCK 123-132	50	1.024	6.15
USE RESIDENTIAL/COMMERCIAL	BLOCK 133	50	0.686	4.12
ONMENTAL PROTECTION AREA	BLOCK 134		5.700	34.23
PARK	BLOCK 135		0.509	3.06
ORMWATER MGMT AREA	BLOCK 136		0.965	5.80
0.3m RESERVE	BLOCK 137-138		0.001	0.01
UTURE DEVELOPMENT	BLOCK 139		0.051	0.31
ROADWAY			2.700	16.22
TOTAL		222	16.650	100.00

GREENFIELD DENSITY CALCULATION

	People		Jobs						
	Units	Ratio	Units	Ratio	Total				
	222 Dwellings	2.28 people per dwelling ¹	222 Dwellings	5% "at home" employment	11.10 Jobs				
			16,576.42ft ² of commercial space	1 employee per 500ft ² of commercial space ²	33.15 Jobs				
Subtotal	506.16 people		44.25 jobs						
Total	550.41 people and jobs								
Land Area	10.95 hectares (exclusive of the Environmental Protection Area)								
Greenfield Density	50.27 people and jobs per hectare								



NG TITLE	DRAFTING	MK
DRAFT PLAN OF SUBDIVISION	DATE	MAY 13, 2022
	PRINTED	JUNE 29, 2022
	SCALE	1:1500
DWG No.	REV	
21132-DP		0

APPENDIX D

Signal Timing Plans

Signal Code: H58NRT

Intersection: HIGHWAY #58 & NORTHLAND DR./CANADIAN TIRE

Municipality: ptcolborne

Owner: MTO

Last Modified: 2011-10-20 2:08:18 PM

Timing Parameters	NBD & SBD HWY 58	EBD & WBD NORTHLAND	n/a	n/a	n/a	n/a
Min Green	20	10	0	0	0	0
Walk	26	17	0	0	0	0
Ped Clearance	15	31	0	0	0	0
Vehicle Ext.	4.5	3	0	0	0	0
Max Green	41	30	0	0	0	0
Yellow	5	4	0	0	0	0
All Red	2	2.2	0	0	0	0
Offset						
Minimum Cycle		43.2		0		
Pedestrian Cycle		102.2				
Maximum Cycle		84.2		0		
Operation		SA				
Installed On:		2000-06-27				
Count Date:		--/--/----				
FA = Fully Actuated	SA = Semi Actuated		FT = Fixed Time			

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APPENDIX E

Synchro Software Output Reports

Northland TIS

3: West Side Road (Hwy 58)/Hwy 58 & Barrick Road

2022 AM Existing Traffic

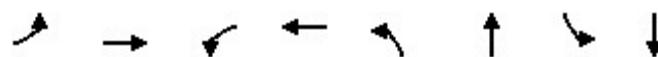
Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	2	8	18	3	41	10	369	18	19	329	1
Future Volume (Veh/h)	10	2	8	18	3	41	10	369	18	19	329	1
Sign Control	Stop				Stop			Free			Free	
Grade	0%				0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	2	8	19	3	43	11	388	19	20	346	1
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	647	816	174	642	806	204	347			407		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	647	816	174	642	806	204	347			407		
tC, single (s)	7.9	7.5	6.9	7.7	7.3	7.0	4.3			4.2		
tC, 2 stage (s)												
tF (s)	3.7	4.5	3.3	3.6	4.4	3.3	2.3			2.2		
p0 queue free %	96	99	99	94	99	95	99			98		
cM capacity (veh/h)	294	227	846	335	244	794	1146			1127		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	21	65	11	259	148	20	231	116				
Volume Left	11	19	11	0	0	20	0	0				
Volume Right	8	43	0	0	19	0	0	1				
cSH	377	528	1146	1700	1700	1127	1700	1700				
Volume to Capacity	0.06	0.12	0.01	0.15	0.09	0.02	0.14	0.07				
Queue Length 95th (m)	1.3	3.2	0.2	0.0	0.0	0.4	0.0	0.0				
Control Delay (s)	15.1	12.8	8.2	0.0	0.0	8.3	0.0	0.0				
Lane LOS	C	B	A			A						
Approach Delay (s)	15.1	12.8	0.2			0.4						
Approach LOS	C	B										
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization		26.5%				ICU Level of Service			A			
Analysis Period (min)			15									

Northland TIS
6: West Side Road (Hwy 58) & Northland Avenue

2022 AM Existing Traffic

Existing



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	19	21	34	17	13	376	10	373
v/c Ratio	0.10	0.08	0.17	0.06	0.02	0.14	0.01	0.15
Control Delay	24.7	14.1	25.8	17.7	4.4	3.7	4.3	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	14.1	25.8	17.7	4.4	3.7	4.3	3.7
Queue Length 50th (m)	2.0	0.4	3.6	0.8	0.5	8.0	0.4	7.8
Queue Length 95th (m)	7.1	5.5	10.4	5.5	2.0	12.6	1.7	12.4
Internal Link Dist (m)		66.5		394.2		238.8		423.1
Turn Bay Length (m)	50.0		50.0		30.0		90.0	
Base Capacity (vph)	596	804	617	837	718	2597	744	2544
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.03	0.06	0.02	0.02	0.14	0.01	0.15

Intersection Summary

Northland TIS

6: West Side Road (Hwy 58) & Northland Avenue

2022 AM Existing Traffic

Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↑	↑		↑	↑↑		↑	↑↑	
Traffic Volume (vph)	18	4	16	32	7	8	12	342	7	9	328	19
Future Volume (vph)	18	4	16	32	7	8	12	342	7	9	328	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.88		1.00	0.92		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1615	1688		1674	1769		1644	3314		1706	3247	
Flt Permitted	0.75	1.00		0.74	1.00		0.53	1.00		0.53	1.00	
Satd. Flow (perm)	1269	1688		1311	1769		917	3314		949	3247	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	19	4	17	34	8	9	13	368	8	10	353	20
RTOR Reduction (vph)	0	15	0	0	8	0	0	1	0	0	3	0
Lane Group Flow (vph)	19	6	0	34	9	0	13	375	0	10	370	0
Heavy Vehicles (%)	13%	0%	0%	9%	0%	0%	11%	10%	0%	7%	12%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases		4			8			2			6	
Actuated Green, G (s)	6.0	6.0		6.0	6.0		47.1	47.1		47.1	47.1	
Effective Green, g (s)	6.0	6.0		6.0	6.0		47.1	47.1		47.1	47.1	
Actuated g/C Ratio	0.09	0.09		0.09	0.09		0.71	0.71		0.71	0.71	
Clearance Time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)	114	152		118	160		651	2354		674	2306	
v/s Ratio Prot		0.00			0.00			0.11		c0.11		
v/s Ratio Perm		0.01		c0.03			0.01			0.01		
v/c Ratio		0.17	0.04		0.29	0.06		0.02	0.16		0.01	0.16
Uniform Delay, d1	27.8	27.5		28.2	27.6		2.8	3.1		2.8	3.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.1		1.4	0.1		0.1	0.1		0.0	0.1	
Delay (s)	28.5	27.6		29.5	27.7		2.9	3.3		2.8	3.3	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		28.0			28.9			3.3			3.3	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay		5.9			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.17										
Actuated Cycle Length (s)		66.3			Sum of lost time (s)			13.2				
Intersection Capacity Utilization		36.1%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

Northland TIS
8: Northland Access & Northland Avenue

2022 AM Existing Traffic

Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	38	0	0	0	0	38	0	0	0
Future Volume (Veh/h)	0	0	0	38	0	0	0	0	38	0	0	0
Sign Control	Free				Free				Stop			Stop
Grade		0%				0%			0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	41	0	0	0	0	41	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage veh)												
Upstream signal (m)					91							
pX, platoon unblocked												
vC, conflicting volume	0			0			82	82	0	123	82	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			0			82	82	0	123	82	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	96	100	100	100
cM capacity (veh/h)	1623			1623			888	788	1085	804	788	1085
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	0	41	41	0								
Volume Left	0	41	0	0								
Volume Right	0	0	41	0								
cSH	1700	1623	1085	1700								
Volume to Capacity	0.00	0.03	0.04	0.00								
Queue Length 95th (m)	0.0	0.6	0.9	0.0								
Control Delay (s)	0.0	7.3	8.4	0.0								
Lane LOS		A	A	A								
Approach Delay (s)	0.0	7.3	8.4	0.0								
Approach LOS		A	A									
Intersection Summary												
Average Delay			7.9									
Intersection Capacity Utilization		13.3%			ICU Level of Service				A			
Analysis Period (min)			15									

Northland TIS

3: West Side Road (Hwy 58)/Hwy 58 & Barrick Road

2022 PM Existing Traffic

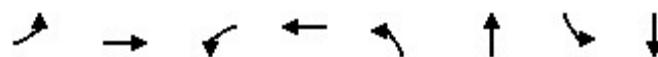
Existing

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	2	9	25	5	44	3	398	34	52	491	12
Future Volume (Veh/h)	1	2	9	25	5	44	3	398	34	52	491	12
Sign Control	Stop				Stop			Free			Free	
Grade	0%				0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	1	2	9	26	5	45	3	410	35	54	506	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	878	1071	259	804	1060	222	518			445		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	878	1071	259	804	1060	222	518			445		
tC, single (s)	7.5	6.5	6.9	7.5	6.9	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.2	3.3	2.2			2.2		
p0 queue free %	100	99	99	90	97	94	100			95		
cM capacity (veh/h)	218	211	746	262	183	781	1058			1119		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	12	76	3	273	172	54	337	181				
Volume Left	1	26	3	0	0	54	0	0				
Volume Right	9	45	0	0	35	0	0	12				
cSH	459	412	1058	1700	1700	1119	1700	1700				
Volume to Capacity	0.03	0.18	0.00	0.16	0.10	0.05	0.20	0.11				
Queue Length 95th (m)	0.6	5.1	0.1	0.0	0.0	1.2	0.0	0.0				
Control Delay (s)	13.0	15.7	8.4	0.0	0.0	8.4	0.0	0.0				
Lane LOS	B	C	A			A						
Approach Delay (s)	13.0	15.7	0.1			0.8						
Approach LOS	B	C										
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization		38.3%				ICU Level of Service				A		
Analysis Period (min)			15									

Northland TIS
6: West Side Road (Hwy 58) & Northland Avenue

2022 PM Existing Traffic

Existing



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	50	44	4	27	8	397	16	512
v/c Ratio	0.22	0.15	0.02	0.09	0.01	0.16	0.02	0.20
Control Delay	26.7	13.2	23.2	16.4	4.4	4.4	4.4	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.7	13.2	23.2	16.4	4.4	4.4	4.4	4.5
Queue Length 50th (m)	5.3	1.1	0.4	1.2	0.3	8.4	0.6	11.1
Queue Length 95th (m)	13.7	8.6	2.7	7.1	1.5	13.2	2.3	16.7
Internal Link Dist (m)		66.5		394.2		238.8		423.1
Turn Bay Length (m)	50.0		50.0		30.0		90.0	
Base Capacity (vph)	666	816	607	833	596	2534	707	2522
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.05	0.01	0.03	0.01	0.16	0.02	0.20

Intersection Summary

Northland TIS

6: West Side Road (Hwy 58) & Northland Avenue

2022 PM Existing Traffic

Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↑	↑		↑	↑↑		↑	↑↑	
Traffic Volume (vph)	49	11	32	4	12	15	8	379	10	16	464	38
Future Volume (vph)	49	11	32	4	12	15	8	379	10	16	464	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.89		1.00	0.92		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1705		1690	1761		1722	3567		1825	3543	
Flt Permitted	0.74	1.00		0.73	1.00		0.46	1.00		0.52	1.00	
Satd. Flow (perm)	1421	1705		1296	1761		839	3567		995	3543	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	50	11	33	4	12	15	8	387	10	16	473	39
RTOR Reduction (vph)	0	29	0	0	13	0	0	1	0	0	5	0
Lane Group Flow (vph)	50	15	0	4	14	0	8	396	0	16	507	0
Heavy Vehicles (%)	0%	0%	0%	8%	0%	0%	6%	2%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	8.0	8.0		8.0	8.0		44.1	44.1		44.1	44.1	
Effective Green, g (s)	8.0	8.0		8.0	8.0		44.1	44.1		44.1	44.1	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.68	0.68		0.68	0.68	
Clearance Time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)	174	208		158	215		566	2408		671	2392	
v/s Ratio Prot		0.01			0.01			0.11			c0.14	
v/s Ratio Perm	c0.04			0.00			0.01			0.02		
v/c Ratio	0.29	0.07		0.03	0.06		0.01	0.16		0.02	0.21	
Uniform Delay, d1	26.1	25.4		25.2	25.3		3.5	3.9		3.5	4.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.1		0.1	0.1		0.0	0.1		0.1	0.2	
Delay (s)	27.0	25.5		25.3	25.5		3.5	4.0		3.6	4.2	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		26.3			25.4			4.0			4.2	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay		6.7			HCM 2000 Level of Service				A			
HCM 2000 Volume to Capacity ratio		0.22										
Actuated Cycle Length (s)		65.3			Sum of lost time (s)				13.2			
Intersection Capacity Utilization		37.0%			ICU Level of Service				A			
Analysis Period (min)		15										
c Critical Lane Group												

Northland TIS
8: Northland Access & Northland Avenue

2022 PM Existing Traffic

Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	58	0	0	0	0	92	0	0	0
Future Volume (Veh/h)	0	0	0	58	0	0	0	0	92	0	0	0
Sign Control	Free				Free				Stop			Stop
Grade		0%				0%			0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	63	0	0	0	0	100	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage veh)												
Upstream signal (m)					91							
pX, platoon unblocked												
vC, conflicting volume	0			0			126	126	0	226	126	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			0			126	126	0	226	126	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	100	91	100	100	100
cM capacity (veh/h)	1623			1623			823	735	1085	643	735	1085
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	0	63	100	0								
Volume Left	0	63	0	0								
Volume Right	0	0	100	0								
cSH	1700	1623	1085	1700								
Volume to Capacity	0.00	0.04	0.09	0.00								
Queue Length 95th (m)	0.0	0.9	2.3	0.0								
Control Delay (s)	0.0	7.3	8.7	0.0								
Lane LOS		A	A	A								
Approach Delay (s)	0.0	7.3	8.7	0.0								
Approach LOS		A	A									
Intersection Summary												
Average Delay			8.1									
Intersection Capacity Utilization		15.7%			ICU Level of Service				A			
Analysis Period (min)			15									

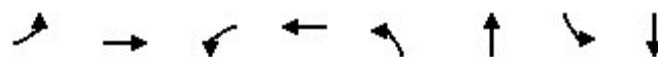
2024 AM Future Background Traffic
3: West Side Road (Hwy 58)/Hwy 58 & Barrick Road

2024 AM FB Traffic
Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	2	8	18	3	42	10	383	18	19	338	1
Future Volume (Veh/h)	10	2	8	18	3	42	10	383	18	19	338	1
Sign Control	Stop				Stop			Free			Free	
Grade	0%				0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	2	8	19	3	44	11	403	19	20	356	1
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	666	840	178	662	832	211	357				422	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	666	840	178	662	832	211	357				422	
tC, single (s)	7.9	7.5	6.9	7.7	7.3	7.0	4.3				4.2	
tC, 2 stage (s)												
tF (s)	3.7	4.5	3.3	3.6	4.4	3.3	2.3				2.2	
p0 queue free %	96	99	99	94	99	94	99				98	
cM capacity (veh/h)	284	218	840	323	235	785	1136				1113	
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	21	66	11	269	153	20	237	120				
Volume Left	11	19	11	0	0	20	0	0				
Volume Right	8	44	0	0	19	0	0	1				
cSH	366	517	1136	1700	1700	1113	1700	1700				
Volume to Capacity	0.06	0.13	0.01	0.16	0.09	0.02	0.14	0.07				
Queue Length 95th (m)	1.4	3.3	0.2	0.0	0.0	0.4	0.0	0.0				
Control Delay (s)	15.4	13.0	8.2	0.0	0.0	8.3	0.0	0.0				
Lane LOS	C	B	A			A						
Approach Delay (s)	15.4	13.0	0.2			0.4						
Approach LOS	C	B										
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization		26.5%				ICU Level of Service				A		
Analysis Period (min)			15									

2024 AM Future Background Traffic
6: West Side Road (Hwy 58) & Northland Avenue

2024 AM FB Traffic
Existing



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	19	21	35	17	13	391	10	382
v/c Ratio	0.10	0.08	0.17	0.06	0.02	0.15	0.01	0.15
Control Delay	24.7	14.1	25.8	17.7	4.4	3.7	4.3	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	14.1	25.8	17.7	4.4	3.7	4.3	3.7
Queue Length 50th (m)	2.0	0.4	3.7	0.8	0.5	8.3	0.4	8.0
Queue Length 95th (m)	7.1	5.5	10.7	5.5	2.0	13.1	1.7	12.7
Internal Link Dist (m)		66.5		394.2		238.8		423.1
Turn Bay Length (m)	50.0		50.0		30.0		90.0	
Base Capacity (vph)	596	804	617	837	712	2596	732	2544
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.03	0.06	0.02	0.02	0.15	0.01	0.15

Intersection Summary

2024 AM Future Background Traffic
6: West Side Road (Hwy 58) & Northland Avenue

2024 AM FB Traffic

Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↑	↑		↑	↑↑		↑	↑↑	
Traffic Volume (vph)	18	4	16	33	7	8	12	356	7	9	337	19
Future Volume (vph)	18	4	16	33	7	8	12	356	7	9	337	19
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.88		1.00	0.92		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1615	1688		1674	1769		1644	3314		1706	3247	
Flt Permitted	0.75	1.00		0.74	1.00		0.53	1.00		0.52	1.00	
Satd. Flow (perm)	1269	1688		1311	1769		909	3314		935	3247	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	19	4	17	35	8	9	13	383	8	10	362	20
RTOR Reduction (vph)	0	15	0	0	8	0	0	1	0	0	3	0
Lane Group Flow (vph)	19	6	0	35	9	0	13	390	0	10	379	0
Heavy Vehicles (%)	13%	0%	0%	9%	0%	0%	11%	10%	0%	7%	12%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	6.0	6.0		6.0	6.0		47.1	47.1		47.1	47.1	
Effective Green, g (s)	6.0	6.0		6.0	6.0		47.1	47.1		47.1	47.1	
Actuated g/C Ratio	0.09	0.09		0.09	0.09		0.71	0.71		0.71	0.71	
Clearance Time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)	114	152		118	160		645	2354		664	2306	
v/s Ratio Prot		0.00			0.00			c0.12			0.12	
v/s Ratio Perm	0.01			c0.03			0.01			0.01		
v/c Ratio	0.17	0.04		0.30	0.06		0.02	0.17		0.02	0.16	
Uniform Delay, d1	27.8	27.5		28.2	27.6		2.8	3.2		2.8	3.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.1		1.4	0.1		0.1	0.2		0.0	0.2	
Delay (s)	28.5	27.6		29.6	27.7		2.9	3.3		2.9	3.3	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		28.0			29.0			3.3			3.3	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay		5.9			HCM 2000 Level of Service				A			
HCM 2000 Volume to Capacity ratio		0.18										
Actuated Cycle Length (s)		66.3			Sum of lost time (s)				13.2			
Intersection Capacity Utilization		36.2%			ICU Level of Service				A			
Analysis Period (min)		15										
c Critical Lane Group												

2024 AM Future Background Traffic
8: Northland Access & Northland Avenue

2024 AM FB Traffic
Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	38	0	0	0	0	38	0	0	0
Future Volume (Veh/h)	0	0	0	38	0	0	0	0	38	0	0	0
Sign Control	Free				Free				Stop			Stop
Grade		0%				0%			0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	41	0	0	0	0	41	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage veh)												
Upstream signal (m)					91							
pX, platoon unblocked												
vC, conflicting volume	0			0			82	82	0	123	82	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			0			82	82	0	123	82	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	96	100	100	100
cM capacity (veh/h)	1623			1623			888	788	1085	804	788	1085
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	0	41	41	0								
Volume Left	0	41	0	0								
Volume Right	0	0	41	0								
cSH	1700	1623	1085	1700								
Volume to Capacity	0.00	0.03	0.04	0.00								
Queue Length 95th (m)	0.0	0.6	0.9	0.0								
Control Delay (s)	0.0	7.3	8.4	0.0								
Lane LOS		A	A	A								
Approach Delay (s)	0.0	7.3	8.4	0.0								
Approach LOS		A	A									
Intersection Summary												
Average Delay			7.9									
Intersection Capacity Utilization		13.3%			ICU Level of Service				A			
Analysis Period (min)			15									

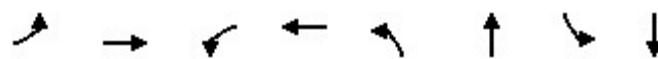
2024 PM Future Background Traffic
3: West Side Road (Hwy 58)/Hwy 58 & Barrick Road

2024 PM FB Traffic
Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	2	9	26	5	45	3	409	35	53	508	12
Future Volume (Veh/h)	1	2	9	26	5	45	3	409	35	53	508	12
Sign Control	Stop				Stop			Free			Free	
Grade	0%				0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	1	2	9	27	5	46	3	422	36	55	524	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	906	1104	268	828	1092	229	536				458	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	906	1104	268	828	1092	229	536				458	
tC, single (s)	7.5	6.5	6.9	7.5	6.9	6.9	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.2	3.3	2.2				2.2	
p0 queue free %	100	99	99	89	97	94	100				95	
cM capacity (veh/h)	207	202	736	251	175	774	1042				1106	
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	12	78	3	281	177	55	349	187				
Volume Left	1	27	3	0	0	55	0	0				
Volume Right	9	46	0	0	36	0	0	12				
cSH	445	399	1042	1700	1700	1106	1700	1700				
Volume to Capacity	0.03	0.20	0.00	0.17	0.10	0.05	0.21	0.11				
Queue Length 95th (m)	0.6	5.4	0.1	0.0	0.0	1.2	0.0	0.0				
Control Delay (s)	13.3	16.2	8.5	0.0	0.0	8.4	0.0	0.0				
Lane LOS	B	C	A			A						
Approach Delay (s)	13.3	16.2	0.1			0.8						
Approach LOS	B	C										
Intersection Summary												
Average Delay			1.7									
Intersection Capacity Utilization		38.9%				ICU Level of Service			A			
Analysis Period (min)			15									

2024 PM Future Background Traffic
6: West Side Road (Hwy 58) & Northland Avenue

2024 PM FB Traffic
Existing



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	50	44	4	27	8	408	16	529
v/c Ratio	0.22	0.15	0.02	0.09	0.01	0.16	0.02	0.21
Control Delay	26.7	13.2	23.2	16.4	4.4	4.5	4.4	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.7	13.2	23.2	16.4	4.4	4.5	4.4	4.6
Queue Length 50th (m)	5.3	1.1	0.4	1.2	0.3	8.7	0.6	11.5
Queue Length 95th (m)	13.7	8.6	2.7	7.1	1.5	13.5	2.3	17.4
Internal Link Dist (m)		66.5		394.2		238.8		423.1
Turn Bay Length (m)	50.0		50.0		30.0		90.0	
Base Capacity (vph)	666	816	607	833	586	2534	699	2522
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.08	0.05	0.01	0.03	0.01	0.16	0.02	0.21

Intersection Summary

2024 PM Future Background Traffic
6: West Side Road (Hwy 58) & Northland Avenue

2024 PM FB Traffic

Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↑	↑		↑	↑↑		↑	↑↑	
Traffic Volume (vph)	49	11	32	4	12	15	8	390	10	16	480	38
Future Volume (vph)	49	11	32	4	12	15	8	390	10	16	480	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.89		1.00	0.92		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1705		1690	1761		1722	3567		1825	3544	
Flt Permitted	0.74	1.00		0.73	1.00		0.46	1.00		0.51	1.00	
Satd. Flow (perm)	1421	1705		1296	1761		826	3567		984	3544	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	50	11	33	4	12	15	8	398	10	16	490	39
RTOR Reduction (vph)	0	29	0	0	13	0	0	1	0	0	5	0
Lane Group Flow (vph)	50	15	0	4	14	0	8	407	0	16	524	0
Heavy Vehicles (%)	0%	0%	0%	8%	0%	0%	6%	2%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	8.0	8.0		8.0	8.0		44.1	44.1		44.1	44.1	
Effective Green, g (s)	8.0	8.0		8.0	8.0		44.1	44.1		44.1	44.1	
Actuated g/C Ratio	0.12	0.12		0.12	0.12		0.68	0.68		0.68	0.68	
Clearance Time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)	174	208		158	215		557	2408		664	2393	
v/s Ratio Prot		0.01			0.01			0.11		c0.15		
v/s Ratio Perm	c0.04			0.00			0.01			0.02		
v/c Ratio	0.29	0.07		0.03	0.06		0.01	0.17		0.02	0.22	
Uniform Delay, d1	26.1	25.4		25.2	25.3		3.5	3.9		3.5	4.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.9	0.1		0.1	0.1		0.0	0.2		0.1	0.2	
Delay (s)	27.0	25.5		25.3	25.5		3.5	4.0		3.6	4.3	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		26.3			25.4			4.0			4.2	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay		6.7			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.23										
Actuated Cycle Length (s)		65.3			Sum of lost time (s)			13.2				
Intersection Capacity Utilization		37.0%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

2024 PM Future Background Traffic
8: Northland Access & Northland Avenue

2024 PM FB Traffic
Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	58	0	0	0	0	92	0	0	0
Future Volume (Veh/h)	0	0	0	58	0	0	0	0	92	0	0	0
Sign Control	Free				Free				Stop			Stop
Grade		0%				0%			0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	63	0	0	0	0	100	0	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type	None				None							
Median storage veh)												
Upstream signal (m)					91							
pX, platoon unblocked												
vC, conflicting volume	0			0			126	126	0	226	126	0
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	0			0			126	126	0	226	126	0
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	100	91	100	100	100
cM capacity (veh/h)	1623			1623			823	735	1085	643	735	1085
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	0	63	100	0								
Volume Left	0	63	0	0								
Volume Right	0	0	100	0								
cSH	1700	1623	1085	1700								
Volume to Capacity	0.00	0.04	0.09	0.00								
Queue Length 95th (m)	0.0	0.9	2.3	0.0								
Control Delay (s)	0.0	7.3	8.7	0.0								
Lane LOS		A	A	A								
Approach Delay (s)	0.0	7.3	8.7	0.0								
Approach LOS		A	A									
Intersection Summary												
Average Delay			8.1									
Intersection Capacity Utilization		15.7%			ICU Level of Service				A			
Analysis Period (min)			15									

2024 AM Future Total Traffic

2024 AM FT Traffic

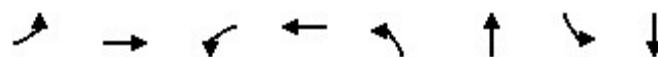
Existing

3: West Side Road (Hwy 58)/Hwy 58 & Barrick Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	2	8	18	3	42	10	445	18	19	369	1
Future Volume (Veh/h)	10	2	8	18	3	42	10	445	18	19	369	1
Sign Control	Stop				Stop			Free			Free	
Grade	0%				0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	11	2	8	19	3	44	11	468	19	20	388	1
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	730	938	194	742	928	244	389				487	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	730	938	194	742	928	244	389				487	
tC, single (s)	7.9	7.5	6.9	7.7	7.3	7.0	4.3				4.2	
tC, 2 stage (s)												
tF (s)	3.7	4.5	3.3	3.6	4.4	3.3	2.3				2.2	
p0 queue free %	96	99	99	93	99	94	99				98	
cM capacity (veh/h)	252	187	820	281	202	748	1104				1051	
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	21	66	11	312	175	20	259	130				
Volume Left	11	19	11	0	0	20	0	0				
Volume Right	8	44	0	0	19	0	0	1				
cSH	328	468	1104	1700	1700	1051	1700	1700				
Volume to Capacity	0.06	0.14	0.01	0.18	0.10	0.02	0.15	0.08				
Queue Length 95th (m)	1.6	3.7	0.2	0.0	0.0	0.4	0.0	0.0				
Control Delay (s)	16.7	14.0	8.3	0.0	0.0	8.5	0.0	0.0				
Lane LOS	C	B	A			A						
Approach Delay (s)	16.7	14.0	0.2			0.4						
Approach LOS	C	B										
Intersection Summary												
Average Delay			1.5									
Intersection Capacity Utilization		26.5%				ICU Level of Service				A		
Analysis Period (min)			15									

2024 AM Future Total Traffic
6: West Side Road (Hwy 58) & Northland Avenue

2024 AM FT Traffic
Existing



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	86	74	35	17	40	391	10	416
v/c Ratio	0.40	0.22	0.16	0.06	0.07	0.17	0.02	0.18
Control Delay	30.0	9.1	24.9	16.8	5.6	5.1	5.2	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.0	9.1	24.9	16.8	5.6	5.1	5.2	4.9
Queue Length 50th (m)	9.4	0.4	3.7	0.8	1.5	8.3	0.4	8.4
Queue Length 95th (m)	20.9	9.6	10.5	5.2	5.3	16.0	2.1	16.3
Internal Link Dist (m)		66.5		394.2		238.8		423.1
Turn Bay Length (m)	50.0		50.0		30.0		90.0	
Base Capacity (vph)	584	797	576	820	615	2321	654	2270
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.09	0.06	0.02	0.07	0.17	0.02	0.18

Intersection Summary

2024 AM Future Total Traffic
6: West Side Road (Hwy 58) & Northland Avenue

2024 AM FT Traffic
Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↑	↑		↑	↑↑		↑	↑↑	
Traffic Volume (vph)	80	4	65	33	7	8	37	356	7	9	337	50
Future Volume (vph)	80	4	65	33	7	8	37	356	7	9	337	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.86		1.00	0.92		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1615	1649		1674	1769		1644	3314		1706	3229	
Flt Permitted	0.75	1.00		0.71	1.00		0.51	1.00		0.52	1.00	
Satd. Flow (perm)	1269	1649		1249	1769		880	3314		935	3229	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	86	4	70	35	8	9	40	383	8	10	362	54
RTOR Reduction (vph)	0	60	0	0	8	0	0	1	0	0	9	0
Lane Group Flow (vph)	86	14	0	35	9	0	40	390	0	10	407	0
Heavy Vehicles (%)	13%	0%	0%	9%	0%	0%	11%	10%	0%	7%	12%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.0	9.0		9.0	9.0		44.1	44.1		44.1	44.1	
Effective Green, g (s)	9.0	9.0		9.0	9.0		44.1	44.1		44.1	44.1	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.67	0.67		0.67	0.67	
Clearance Time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)	172	223		169	240		585	2204		621	2147	
v/s Ratio Prot		0.01			0.01			0.12		c0.13		
v/s Ratio Perm	c0.07			0.03			0.05			0.01		
v/c Ratio	0.50	0.06		0.21	0.04		0.07	0.18		0.02	0.19	
Uniform Delay, d1	26.6	25.0		25.5	24.9		3.9	4.2		3.8	4.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.3	0.1		0.6	0.1		0.2	0.2		0.0	0.2	
Delay (s)	28.8	25.1		26.1	25.0		4.1	4.4		3.8	4.4	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		27.1			25.7			4.4			4.4	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay		8.8			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.24										
Actuated Cycle Length (s)		66.3			Sum of lost time (s)			13.2				
Intersection Capacity Utilization		52.8%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

2024 AM Future Total Traffic
8: Northland Access & Northland Avenue

2024 AM FT Traffic
Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	44	0	38	22	34	0	0	38	67	0	0
Future Volume (Veh/h)	0	44	0	38	22	34	0	0	38	67	0	0
Sign Control	Free			Free			Stop			Stop		
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	48	0	41	24	37	0	0	41	73	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)					91							
pX, platoon unblocked												
vC, conflicting volume	61			48			172	191	48	214	172	42
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	61			48			172	191	48	214	172	42
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	96	90	100	100
cM capacity (veh/h)	1542			1559			775	685	1021	699	702	1028
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	48	102	41	73								
Volume Left	0	41	0	73								
Volume Right	0	37	41	0								
cSH	1542	1559	1021	699								
Volume to Capacity	0.00	0.03	0.04	0.10								
Queue Length 95th (m)	0.0	0.6	1.0	2.6								
Control Delay (s)	0.0	3.1	8.7	10.7								
Lane LOS		A	A	B								
Approach Delay (s)	0.0	3.1	8.7	10.7								
Approach LOS		A	B									
Intersection Summary												
Average Delay		5.5										
Intersection Capacity Utilization		29.1%		ICU Level of Service					A			
Analysis Period (min)		15										

2024 PM Future Total Traffic

2024 PM FT Traffic

Existing

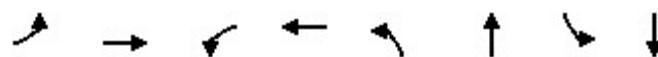
3: West Side Road (Hwy 58)/Hwy 58 & Barrick Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	2	9	26	5	45	3	475	35	53	596	12
Future Volume (Veh/h)	1	2	9	26	5	45	3	475	35	53	596	12
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	1	2	9	27	5	46	3	490	36	55	614	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	1030	1262	313	941	1250	263	626			526		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1030	1262	313	941	1250	263	626			526		
tC, single (s)	7.5	6.5	6.9	7.5	6.9	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.2	3.3	2.2			2.2		
p0 queue free %	99	99	99	87	96	94	100			95		
cM capacity (veh/h)	166	162	689	207	138	735	965			1044		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	12	78	3	327	199	55	409	217				
Volume Left	1	27	3	0	0	55	0	0				
Volume Right	9	46	0	0	36	0	0	12				
cSH	382	340	965	1700	1700	1044	1700	1700				
Volume to Capacity	0.03	0.23	0.00	0.19	0.12	0.05	0.24	0.13				
Queue Length 95th (m)	0.7	6.6	0.1	0.0	0.0	1.3	0.0	0.0				
Control Delay (s)	14.7	18.7	8.7	0.0	0.0	8.6	0.0	0.0				
Lane LOS	B	C	A			A						
Approach Delay (s)	14.7	18.7	0.0			0.7						
Approach LOS	B	C										
Intersection Summary												
Average Delay			1.6									
Intersection Capacity Utilization		41.3%				ICU Level of Service			A			
Analysis Period (min)			15									

2024 PM Future Total Traffic
6: West Side Road (Hwy 58) & Northland Avenue

2024 PM FT Traffic
Existing



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	117	96	4	27	80	408	16	619
v/c Ratio	0.47	0.26	0.02	0.08	0.15	0.16	0.02	0.25
Control Delay	30.8	9.5	22.0	15.3	6.7	5.2	5.6	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.8	9.5	22.0	15.3	6.7	5.2	5.6	5.2
Queue Length 50th (m)	13.0	1.1	0.4	1.2	3.4	9.0	0.6	13.3
Queue Length 95th (m)	26.6	11.5	2.6	6.9	10.2	17.2	2.9	24.6
Internal Link Dist (m)		66.5		394.2		238.8		423.1
Turn Bay Length (m)	50.0		50.0		30.0		90.0	
Base Capacity (vph)	651	808	565	814	525	2481	684	2438
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.12	0.01	0.03	0.15	0.16	0.02	0.25

Intersection Summary

2024 PM Future Total Traffic
6: West Side Road (Hwy 58) & Northland Avenue

2024 PM FT Traffic
Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↑	↑		↑	↑↑		↑	↑↑	
Traffic Volume (vph)	115	11	83	4	12	15	78	390	10	16	480	126
Future Volume (vph)	115	11	83	4	12	15	78	390	10	16	480	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.87		1.00	0.92		1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1666		1690	1761		1722	3567		1825	3481	
Flt Permitted	0.74	1.00		0.69	1.00		0.42	1.00		0.51	1.00	
Satd. Flow (perm)	1421	1666		1236	1761		756	3567		984	3481	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	117	11	85	4	12	15	80	398	10	16	490	129
RTOR Reduction (vph)	0	73	0	0	13	0	0	1	0	0	19	0
Lane Group Flow (vph)	117	23	0	4	14	0	80	407	0	16	600	0
Heavy Vehicles (%)	0%	0%	0%	8%	0%	0%	6%	2%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4				8			2			6
Permitted Phases		4				8			2			6
Actuated Green, G (s)	9.5	9.5		9.5	9.5		44.2	44.2		44.2	44.2	
Effective Green, g (s)	9.5	9.5		9.5	9.5		44.2	44.2		44.2	44.2	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.66	0.66		0.66	0.66	
Clearance Time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)	201	236		175	250		499	2356		650	2299	
v/s Ratio Prot		0.01				0.01			0.11		c0.17	
v/s Ratio Perm		c0.08				0.00			0.11		0.02	
v/c Ratio		0.58	0.10		0.02	0.06		0.16	0.17		0.02	0.26
Uniform Delay, d1	26.8	25.0		24.7	24.8		4.3	4.3		3.9	4.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.2	0.2		0.1	0.1		0.7	0.2		0.1	0.3	
Delay (s)	31.1	25.2		24.8	24.9		5.0	4.5		4.0	4.9	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		28.4				24.9			4.6		4.9	
Approach LOS		C				C			A		A	
Intersection Summary												
HCM 2000 Control Delay			8.9				HCM 2000 Level of Service			A		
HCM 2000 Volume to Capacity ratio			0.32									
Actuated Cycle Length (s)			66.9				Sum of lost time (s)			13.2		
Intersection Capacity Utilization			63.8%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

2024 PM Future Total Traffic
8: Northland Access & Northland Avenue

2024 PM FT Traffic
Existing

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	47	0	58	63	95	0	0	92	70	0	0
Future Volume (Veh/h)	0	47	0	58	63	95	0	0	92	70	0	0
Sign Control	Free				Free				Stop			Stop
Grade		0%				0%			0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	51	0	63	68	103	0	0	100	76	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None				None						
Median storage veh)												
Upstream signal (m)						91						
pX, platoon unblocked												
vC, conflicting volume	171			51			296	348	51	396	296	120
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	171			51			296	348	51	396	296	120
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	100	90	85	100	100
cM capacity (veh/h)	1406			1555			635	552	1017	492	590	932
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	51	234	100	76								
Volume Left	0	63	0	76								
Volume Right	0	103	100	0								
cSH	1406	1555	1017	492								
Volume to Capacity	0.00	0.04	0.10	0.15								
Queue Length 95th (m)	0.0	1.0	2.5	4.1								
Control Delay (s)	0.0	2.2	8.9	13.6								
Lane LOS		A	A	B								
Approach Delay (s)	0.0	2.2	8.9	13.6								
Approach LOS		A	B									
Intersection Summary												
Average Delay		5.3										
Intersection Capacity Utilization		36.2%			ICU Level of Service				A			
Analysis Period (min)		15										

Northland TIS

2034 AM FT Traffic

Existing

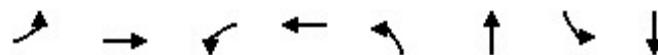
3: West Side Road (Hwy 58)/Hwy 58 & Barrick Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	2	9	20	3	46	11	486	20	21	405	1
Future Volume (Veh/h)	11	2	9	20	3	46	11	486	20	21	405	1
Sign Control	Stop				Stop			Free			Free	
Grade	0%				0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	12	2	9	21	3	48	12	512	21	22	426	1
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	800	1028	214	814	1018	266	427				533	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	800	1028	214	814	1018	266	427				533	
tC, single (s)	7.9	7.5	6.9	7.7	7.3	7.0	4.3				4.2	
tC, 2 stage (s)												
tF (s)	3.7	4.5	3.3	3.6	4.4	3.3	2.3				2.2	
p0 queue free %	95	99	99	92	98	93	99				98	
cM capacity (veh/h)	220	162	798	248	176	723	1067				1010	
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	23	72	12	341	192	22	284	143				
Volume Left	12	21	12	0	0	22	0	0				
Volume Right	9	48	0	0	21	0	0	1				
cSH	294	428	1067	1700	1700	1010	1700	1700				
Volume to Capacity	0.08	0.17	0.01	0.20	0.11	0.02	0.17	0.08				
Queue Length 95th (m)	1.9	4.5	0.3	0.0	0.0	0.5	0.0	0.0				
Control Delay (s)	18.3	15.1	8.4	0.0	0.0	8.6	0.0	0.0				
Lane LOS	C	C	A			A						
Approach Delay (s)	18.3	15.1	0.2			0.4						
Approach LOS	C	C										
Intersection Summary												
Average Delay			1.7									
Intersection Capacity Utilization		28.6%				ICU Level of Service				A		
Analysis Period (min)			15									

Northland TIS
6: West Side Road (Hwy 58) & Northland Avenue

2034 AM FT Traffic

Existing



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	86	74	39	19	40	432	11	455
v/c Ratio	0.40	0.22	0.18	0.06	0.07	0.19	0.02	0.20
Control Delay	30.0	9.1	25.3	16.6	5.6	5.1	5.3	5.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.0	9.1	25.3	16.6	5.6	5.1	5.3	5.0
Queue Length 50th (m)	9.4	0.4	4.1	0.9	1.5	9.4	0.4	9.5
Queue Length 95th (m)	20.9	9.6	11.4	5.7	5.4	17.7	2.2	18.1
Internal Link Dist (m)		66.5		394.2		238.8		423.1
Turn Bay Length (m)	50.0		50.0		30.0		90.0	
Base Capacity (vph)	584	797	576	821	593	2322	630	2269
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.09	0.07	0.02	0.07	0.19	0.02	0.20

Intersection Summary

Northland TIS

2034 AM FT Traffic

Existing

6: West Side Road (Hwy 58) & Northland Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↑	↑		↑	↑↑		↑	↑↑	
Traffic Volume (vph)	80	4	65	36	8	9	37	393	8	10	373	50
Future Volume (vph)	80	4	65	36	8	9	37	393	8	10	373	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.86		1.00	0.92		1.00	1.00		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1615	1649		1674	1769		1644	3314		1706	3232	
Flt Permitted	0.75	1.00		0.71	1.00		0.49	1.00		0.50	1.00	
Satd. Flow (perm)	1267	1649		1249	1769		847	3314		899	3232	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	86	4	70	39	9	10	40	423	9	11	401	54
RTOR Reduction (vph)	0	60	0	0	9	0	0	1	0	0	8	0
Lane Group Flow (vph)	86	14	0	39	10	0	40	431	0	11	447	0
Heavy Vehicles (%)	13%	0%	0%	9%	0%	0%	11%	10%	0%	7%	12%	3%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.0	9.0		9.0	9.0		44.1	44.1		44.1	44.1	
Effective Green, g (s)	9.0	9.0		9.0	9.0		44.1	44.1		44.1	44.1	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.67	0.67		0.67	0.67	
Clearance Time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)	171	223		169	240		563	2204		597	2149	
v/s Ratio Prot		0.01			0.01			0.13		c0.14		
v/s Ratio Perm	c0.07			0.03			0.05			0.01		
v/c Ratio	0.50	0.06		0.23	0.04		0.07	0.20		0.02	0.21	
Uniform Delay, d1	26.6	25.0		25.6	24.9		3.9	4.3		3.8	4.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.3	0.1		0.7	0.1		0.2	0.2		0.1	0.2	
Delay (s)	28.9	25.1		26.3	25.0		4.1	4.5		3.8	4.5	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		27.1			25.8			4.4			4.5	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay		8.7			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.26										
Actuated Cycle Length (s)		66.3			Sum of lost time (s)			13.2				
Intersection Capacity Utilization		52.8%			ICU Level of Service			A				
Analysis Period (min)		15										
c Critical Lane Group												

Northland TIS
8: Northland Access & Northland Avenue

2034 AM FT Traffic

Existing

Movement	EBL	EBT	EBC	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	44	0	38	22	34	0	0	38	67	0	0
Future Volume (Veh/h)	0	44	0	38	22	34	0	0	38	67	0	0
Sign Control	Free			Free			Stop			Stop		
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	48	0	41	24	37	0	0	41	73	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)					91							
pX, platoon unblocked												
vC, conflicting volume	61			48			172	191	48	214	172	42
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	61			48			172	191	48	214	172	42
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			97			100	100	96	90	100	100
cM capacity (veh/h)	1542			1559			775	685	1021	699	702	1028
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	48	102	41	73								
Volume Left	0	41	0	73								
Volume Right	0	37	41	0								
cSH	1542	1559	1021	699								
Volume to Capacity	0.00	0.03	0.04	0.10								
Queue Length 95th (m)	0.0	0.6	1.0	2.6								
Control Delay (s)	0.0	3.1	8.7	10.7								
Lane LOS		A	A	B								
Approach Delay (s)	0.0	3.1	8.7	10.7								
Approach LOS		A	B									
Intersection Summary												
Average Delay		5.5										
Intersection Capacity Utilization		29.1%		ICU Level of Service								
Analysis Period (min)		15										

Northland TIS

2034 PM FT Traffic

Existing

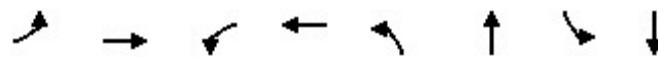
3: West Side Road (Hwy 58)/Hwy 58 & Barrick Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	2	10	28	6	50	3	519	38	59	650	14
Future Volume (Veh/h)	1	2	10	28	6	50	3	519	38	59	650	14
Sign Control	Stop				Stop			Free			Free	
Grade	0%				0%			0%			0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	1	2	10	29	6	52	3	535	39	61	670	14
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1128	1379	342	1028	1366	287	684			574		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1128	1379	342	1028	1366	287	684			574		
tC, single (s)	7.5	6.5	6.9	7.5	6.9	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.2	3.3	2.2			2.2		
p0 queue free %	99	99	98	84	95	93	100			94		
cM capacity (veh/h)	137	137	660	177	115	710	919			1002		
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3				
Volume Total	13	87	3	357	217	61	447	237				
Volume Left	1	29	3	0	0	61	0	0				
Volume Right	10	52	0	0	39	0	0	14				
cSH	350	301	919	1700	1700	1002	1700	1700				
Volume to Capacity	0.04	0.29	0.00	0.21	0.13	0.06	0.26	0.14				
Queue Length 95th (m)	0.9	8.9	0.1	0.0	0.0	1.5	0.0	0.0				
Control Delay (s)	15.7	21.8	8.9	0.0	0.0	8.8	0.0	0.0				
Lane LOS	C	C	A			A						
Approach Delay (s)	15.7	21.8	0.0			0.7						
Approach LOS	C	C										
Intersection Summary												
Average Delay			1.9									
Intersection Capacity Utilization		43.3%				ICU Level of Service				A		
Analysis Period (min)			15									

Northland TIS
6: West Side Road (Hwy 58) & Northland Avenue

2034 PM FT Traffic

Existing



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	117	96	5	31	80	451	18	671
v/c Ratio	0.47	0.26	0.02	0.10	0.16	0.18	0.03	0.28
Control Delay	30.9	9.4	22.2	15.1	6.9	5.3	5.6	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.9	9.4	22.2	15.1	6.9	5.3	5.6	5.4
Queue Length 50th (m)	13.0	1.1	0.5	1.5	3.4	10.1	0.7	15.0
Queue Length 95th (m)	26.7	11.5	2.9	7.4	10.4	19.1	3.1	27.3
Internal Link Dist (m)		66.5		394.2		238.8		423.1
Turn Bay Length (m)	50.0		50.0		30.0		90.0	
Base Capacity (vph)	648	808	565	816	500	2480	655	2440
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.12	0.01	0.04	0.16	0.18	0.03	0.28

Intersection Summary

Northland TIS

2034 PM FT Traffic

Existing

6: West Side Road (Hwy 58) & Northland Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑		↑	↑		↑	↑↑		↑	↑↑	
Traffic Volume (vph)	115	11	83	5	14	17	78	431	11	18	531	126
Future Volume (vph)	115	11	83	5	14	17	78	431	11	18	531	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.87		1.00	0.92		1.00	1.00		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1825	1666		1690	1763		1722	3567		1825	3488	
Flt Permitted	0.74	1.00		0.69	1.00		0.40	1.00		0.49	1.00	
Satd. Flow (perm)	1416	1666		1236	1763		719	3567		944	3488	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	117	11	85	5	14	17	80	440	11	18	542	129
RTOR Reduction (vph)	0	73	0	0	15	0	0	1	0	0	16	0
Lane Group Flow (vph)	117	23	0	5	16	0	80	450	0	18	655	0
Heavy Vehicles (%)	0%	0%	0%	8%	0%	0%	6%	2%	0%	0%	2%	0%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4				8			2			6
Permitted Phases	4				8			2			6	
Actuated Green, G (s)	9.5	9.5		9.5	9.5		44.2	44.2		44.2	44.2	
Effective Green, g (s)	9.5	9.5		9.5	9.5		44.2	44.2		44.2	44.2	
Actuated g/C Ratio	0.14	0.14		0.14	0.14		0.66	0.66		0.66	0.66	
Clearance Time (s)	6.2	6.2		6.2	6.2		7.0	7.0		7.0	7.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)	201	236		175	250		475	2356		623	2304	
v/s Ratio Prot		0.01				0.01			0.13		c0.19	
v/s Ratio Perm	c0.08			0.00			0.11			0.02		
v/c Ratio	0.58	0.10		0.03	0.07		0.17	0.19		0.03	0.28	
Uniform Delay, d1	26.8	25.0		24.7	24.9		4.3	4.4		3.9	4.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	4.2	0.2		0.1	0.1		0.8	0.2		0.1	0.3	
Delay (s)	31.1	25.2		24.8	25.0		5.1	4.6		4.0	5.1	
Level of Service	C	C		C	C		A	A		A	A	
Approach Delay (s)		28.4			24.9			4.7			5.0	
Approach LOS		C			C			A			A	
Intersection Summary												
HCM 2000 Control Delay		8.8			HCM 2000 Level of Service			A				
HCM 2000 Volume to Capacity ratio		0.34										
Actuated Cycle Length (s)		66.9			Sum of lost time (s)			13.2				
Intersection Capacity Utilization		65.2%			ICU Level of Service			C				
Analysis Period (min)		15										
c Critical Lane Group												

Northland TIS
8: Northland Access & Northland Avenue

2034 PM FT Traffic

Existing

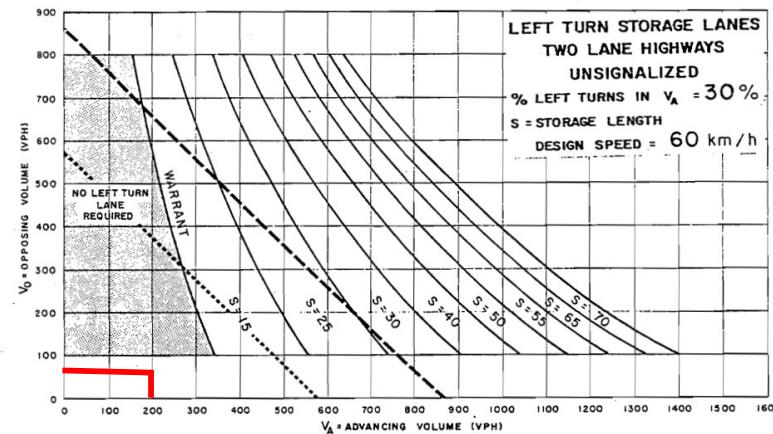
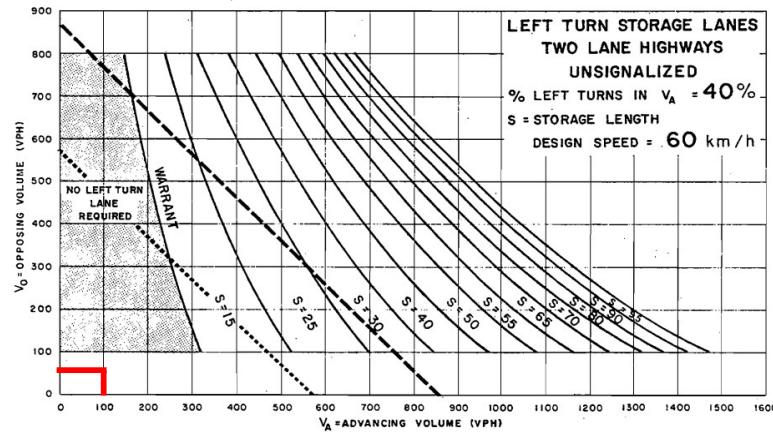
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	47	0	58	63	95	0	0	92	70	0	0
Future Volume (Veh/h)	0	47	0	58	63	95	0	0	92	70	0	0
Sign Control	Free				Free			Stop			Stop	
Grade		0%				0%			0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	51	0	63	68	103	0	0	100	76	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None				None						
Median storage veh)												
Upstream signal (m)						91						
pX, platoon unblocked												
vC, conflicting volume	171			51			296	348	51	396	296	120
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	171			51			296	348	51	396	296	120
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			96			100	100	90	85	100	100
cM capacity (veh/h)	1406			1555			635	552	1017	492	590	932
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	51	234	100	76								
Volume Left	0	63	0	76								
Volume Right	0	103	100	0								
cSH	1406	1555	1017	492								
Volume to Capacity	0.00	0.04	0.10	0.15								
Queue Length 95th (m)	0.0	1.0	2.5	4.1								
Control Delay (s)	0.0	2.2	8.9	13.6								
Lane LOS		A	A	B								
Approach Delay (s)	0.0	2.2	8.9	13.6								
Approach LOS		A	B									
Intersection Summary												
Average Delay		5.3										
Intersection Capacity Utilization		36.2%			ICU Level of Service					A		
Analysis Period (min)			15									

APPENDIX F

Auxiliary Left-Turn Lane Warrants

Northland Access & Northland Avenue - Left Turn Lane Warrant

AM			
EB		WB	
Vo	95	Vo	54
Va	54	Va	95
LT	0	LT	38
%	0%	%	40%
AM			
EB		WB	
Vo	213	Vo	42
Va	42	Va	213
LT	0	LT	58
%	0%	%	27%



APPENDIX G

Signal Warrants

Signal Warrant Results

Intersection: Northland Ave / Northland Access		Count Date: 2034			
Summary Results					
Justification		Compliance		Signal Justified?	
1. Minimum Vehicular Volume	A Total Volume	29	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Crossing Volume	49	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. Delay to Cross Traffic	A Main Road	18	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Crossing Road	58	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3. Combination	A Justificaton 1	29	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Justification 2	18	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4. 4-Hr Volume		13	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Intersection: Barrick & West Side Road (HWY 58)		Count Date: 2034			
Summary Results					
Justification		Compliance		Signal Justified?	
1. Minimum Vehicular Volume	A Total Volume	100	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Crossing Volume	49	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2. Delay to Cross Traffic	A Main Road	95	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Crossing Road	43	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3. Combination	A Justificaton 1	49	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	B Justification 2	43	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4. 4-Hr Volume		30	%	<input type="checkbox"/>	<input checked="" type="checkbox"/>

