



Associated
Engineering

GLOBAL PERSPECTIVE.
LOCAL FOCUS.

REPORT

1788618 Ontario Inc.

5438 Ferry Street Proposed Mixed-Use Development Transportation Impact and Parking Study



JULY 2023



Platinum
member

CONFIDENTIALITY AND © COPYRIGHT

This document is for the sole use of the addressee and Associated Engineering (Ont.) Ltd. The document contains proprietary and confidential information that shall not be reproduced in any manner or disclosed to or discussed with any other parties without the express written permission of Associated Engineering (Ont.) Ltd. Information in this document is to be considered the intellectual property of Associated Engineering (Ont.) Ltd. in accordance with Canadian copyright law.

This report was prepared by Associated Engineering (Ont.) Ltd. for the account of 1788618 Ontario Inc.. The material in it reflects Associated Engineering (Ont.) Ltd.'s best judgement, in the light of the information available to it, at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Associated Engineering (Ont.) Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

TABLE OF CONTENTS

SECTION	PAGE NO.
Table of Contents	i
List of Tables	iii
List of Figures	iv
1 Introduction	1-1
1.1 Background	1-1
1.2 Purpose of Study	1-2
1.3 Study Area	1-2
2 Existing Transportation Conditions	2-1
2.1 Existing Road Network	2-1
2.2 Existing Transit Network	2-2
2.3 Existing Active Transportation Network	2-4
2.4 Existing Traffic Volumes	2-4
2.5 Intersection Capacity Analysis	2-5
3 Future Background Conditions	3-1
3.1 Corridor Growth	3-1
3.2 Adjacent Developments under Construction	3-1
3.3 Planned Roadway Improvements	3-1
3.4 Future Background Traffic Volumes	3-1
3.5 Intersection Capacity Analysis	3-4
4 Forecasted Site Generated Traffic	4-1
4.1 Site Accesses	4-1
4.2 Trip Generation	4-2
4.3 Trip Distribution and Assignment	4-3
5 Future Total Conditions	5-1
5.1 Future Total Traffic Volumes	5-1
5.2 Intersection Capacity Analysis	5-1
6 Parking Review	6-1
6.1 Zoning By-Law Requirements	6-1
6.2 Parking Shortfall Justification – Case Study	6-1
6.3 Proposed Parking Supply	6-4
7 Commercial Loading Review	7-1
7.1 Zoning By-Law Requirement	7-1
7.2 Proposed Loading Supply	7-1
8 Conclusions and Recommendations	8-1

Closure

Appendix A - Development Plan

Appendix B - City Correspondence

Appendix C - Traffic Data

Appendix D - Existing Synchro Outputs

Appendix E - Background Development and Fallsview EA Excerpts

Appendix F - Future Background Synchro Outputs

Appendix G - ITE Plot and TTS Calculations

Appendix H - Future Total Synchro Outputs

Appendix I - Parking Demand Survey Results

Appendix J - TDM Implementation Checklist

LIST OF TABLES

	PAGE NO.
Table 2-1 Road Operating Characteristics	2-1
Table 2-2 Existing 2022 Capacity Analysis – Signalized Intersections	2-7
Table 2-3 Existing 2022 Capacity Analysis – Unsignalized Intersections	2-7
Table 3-1 Future Background 2032 Capacity Analysis – Signalized Intersections (Do Nothing)	3-4
Table 3-2 Future Background 2032 Capacity Analysis – Unsignalized Intersections (Do Nothing)	3-5
Table 3-3 Recommended Signal Timing Plan at Stanley Avenue & Ferry Street	3-6
Table 3-4 Future Background 2032 Intersection Capacity Analysis (EA Improvements)	3-7
Table 4-1 Trip Generation	4-2
Table 4-2 Trip Distribution	4-3
Table 5-1 Future Total 2032 Capacity Analysis – Signalized Intersections (EA Improvements)	5-2
Table 5-2 Future Total 2032 Capacity Analysis – Unsignalized Intersections (EA Improvements)	5-3
Table 6-1 City of Niagara Falls By-Law 79-200 Parking Requirements	6-1
Table 6-2 Parking Rate Comparison	6-2
Table 6-3 Approved Developments with Reduced Parking	6-3
Table 7-1 Loading Summary	7-1

LIST OF FIGURES

		PAGE NO.
Figure 1-1	Proposed Site Plan	1-1
Figure 1-2	Study Area	1-3
Figure 2-1	Existing Lane Configuration and Traffic Control	2-2
Figure 2-2	WEGO Transit Map	2-3
Figure 2-3	Route 104/204 Map	2-3
Figure 2-4	Active Transportation Map	2-4
Figure 2-5	Existing 2022 Traffic Volumes	2-5
Figure 3-1	Future Background 2032 Traffic Volumes (Do Nothing)	3-2
Figure 3-2	Future Background 2032 Traffic Volumes (Buchanan Avenue Closure)	3-3
Figure 3-3	Net Mitigated Effect (Buchanan Avenue Closure)	3-3
Figure 4-1	North Access on Ferry Street	4-1
Figure 4-2	East Access on Fallsview Boulevard	4-1
Figure 4-3	Site Traffic Assignment	4-4
Figure 5-1	Future Total 2032 Traffic Volumes (Buchanan Avenue Closure)	5-1

1 INTRODUCTION

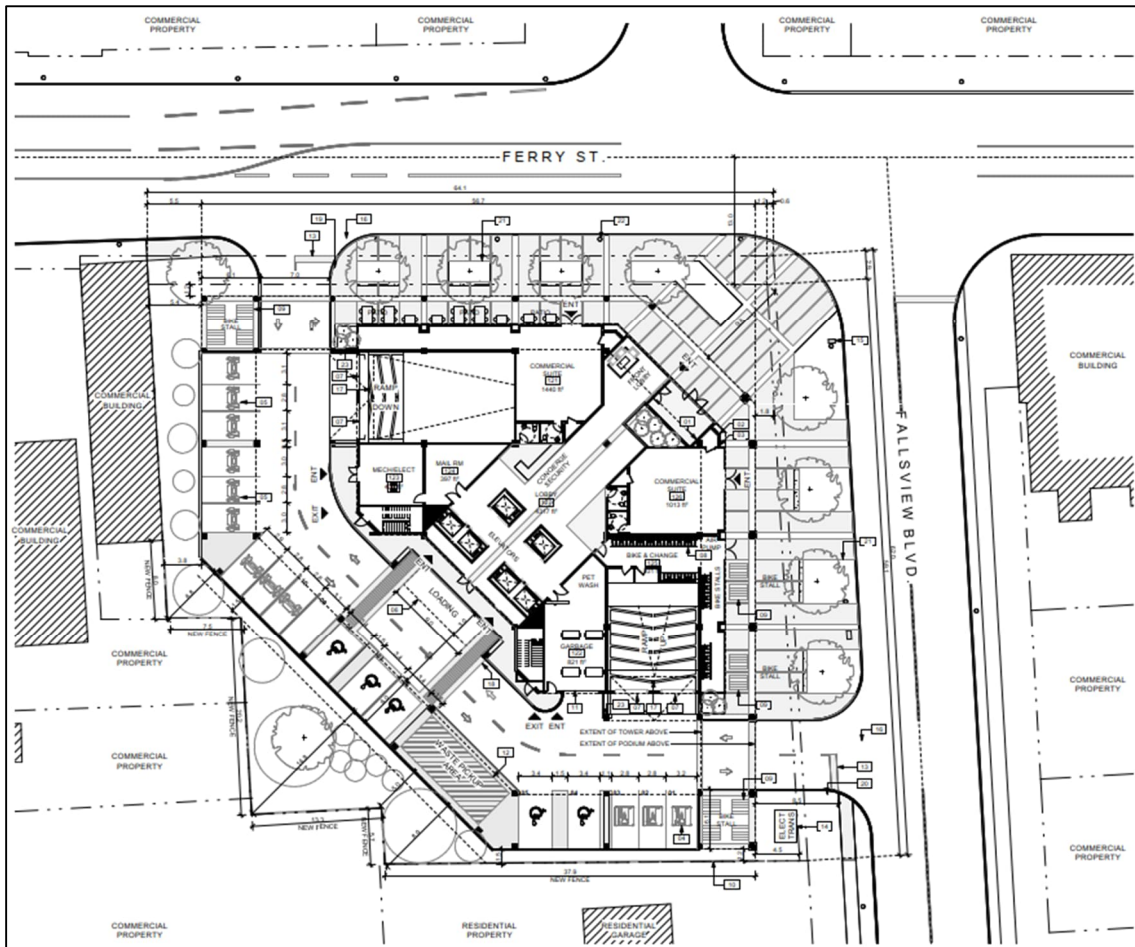
1.1 Background

Associated Engineering (Ont.) Ltd. was retained by 1788618 Ontario Inc. to conduct a Traffic Impact and Parking Study for a proposed mixed-use development. The site is located at 5438 Ferry Street, in the southwest corner of Fallsview Boulevard and Regional Road 20 (Ferry Street) in the tourism core of the City of Niagara Falls.

The development will consist of a 30-storey building with 456 residential condominium units, 228 m² of commercial uses at-grade, four levels of above-grade parking, at-grade parking, and three levels of below-grade parking. Since the proposed development is located within the City's tourism core which provides access to many services and amenities without the need for a vehicle, the applicant is seeking relief from the parking requirements of the zoning by-law.

Two (2) accesses (driveways) are also being proposed to service the mixed-use building, one on Ferry Street and another on Fallsview Boulevard. The proposed site plan is shown in **Figure 1-1**. A copy of the development plan is provided in **Appendix A**.

Figure 1-1 Proposed Site Plan



1.2 Purpose of Study

This traffic impact study has been prepared to:

- Analyze the existing area roadways and traffic operations;
- Analyze the future area travel demands with and without the proposed development;
- Review the location of the proposed accesses;
- Confirm any transportation network improvement requirements to accommodate the planned development;
- Assess parking and commercial loading requirements; and
- Develop a robust transportation demand management plan to support the reduced parking supply.

In consultation with City staff, this study acknowledges the Fallsview Boulevard Environmental Assessment (EA), completed in November 2014, such that the study methodology and assumptions are consistent with the approved EA study.

The Fallsview EA assessed the intersection of Buchanan Avenue/Fallsview Boulevard and Ferry Street, and along Fallsview Boulevard between Ferry Street and Murray Street for safety and operational improvements.

The following highlights the key components carried forward from the Fallsview EA:

- The Study Area in this TIS form a part of the Expanded Study Area in the EA;
- The source of traffic data is based on the EA's projected 2014 base year traffic volumes;
- The analysis period focuses on the weekday PM peak period as it is considered the worst-case scenario;
- The analysis methodology is consistent with the City of Niagara Falls and Niagara Region TIS Guidelines;
- The intersection capacity analysis was conducted using Synchro software and applying the HCM methodology; and
- A 1% annual growth rate was used to estimate future traffic volumes.

The primary differences between this TIS and the Fallsview EA are:

- The two large hotel developments to be built at the east end of Robinson Street were not included as background developments; and
- The study assesses the future horizon year of 2032 (10-year) compared to 2024 (10-year) and 2034 (20-year) in the EA.

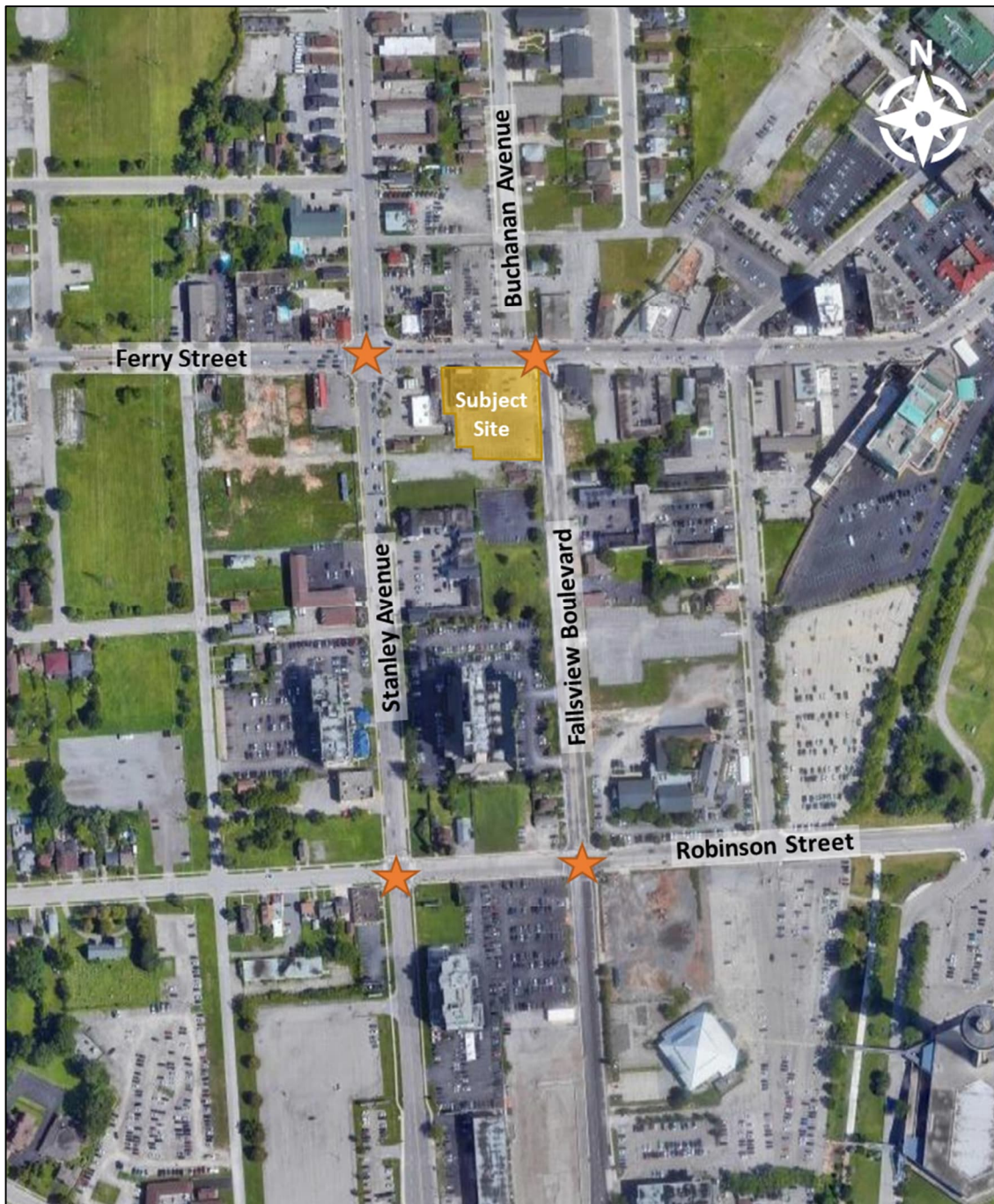
1.3 Study Area

The project Study Area is bounded by Stanley Avenue in the west, Ferry Street in the north, Fallsview Boulevard in the east and Robinson Street in the south, in the City of Niagara Falls (City), and the Region of Niagara (Region). This study assesses the following intersections:

- Stanley Avenue and Ferry Street (signalized);
- Stanley Avenue and Robinson Street (signalized);
- Buchanan Avenue/Fallsview Boulevard and Ferry Street (unsignalized); and
- Fallsview Boulevard and Robinson Street (unsignalized).

The intersections, time periods, horizon year, growth factor and information on other developments in the area were confirmed with the City via email and are provided in **Appendix B**. The Study Area is shown in **Figure 1-2**.

Figure 1-2 Study Area



2 EXISTING TRANSPORTATION CONDITIONS

The following sections present a review of the existing transportation network.

2.1 Existing Road Network

The existing roadways within the Study Area that were considered as part of the traffic analysis are described below. Operating characteristics for each roadway are outlined in **Table 2-1**.

Ferry Street is an east-west arterial roadway under the Region’s jurisdiction west of Stanley Avenue (RR 20) and under the City’s jurisdiction east of Stanley Avenue. To the east, it transitions into Victoria Avenue and passes through the tourism core of the City, eventually terminating at the Niagara Parkway. To the west, it transitions to Lundy’s Lane within the City limits before becoming Regional Road 20, terminating at the QEW in the City of Hamilton.

Stanley Avenue is a north-south Regional Road (RR 102) classified as an arterial roadway. It connects Regional Road 49 (McLeod Road) to Regional Road 61 (Townline Road) in the Town of Niagara-on-the-Lake.

Fallsview Boulevard is a north-south collector road under the City’s jurisdiction. The roadway runs from Ferry Street in the north to Livingstone Street in the south.

Buchanan Avenue is a north-south City collector road from Ferry Street in the south to Kitchener Street in the north.

Robinson Street is a collector City road that runs parallel to Ferry Street in the east-west direction. It spans from the top of the escarpment in the east to Main Street in the west.

Table 2-1 Road Operating Characteristics

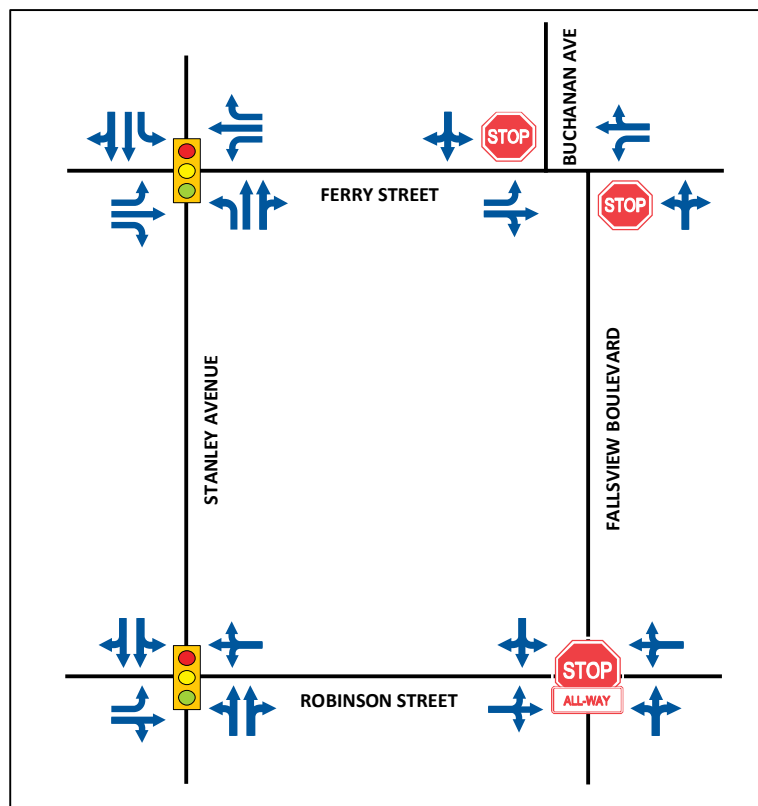
Characteristics	Ferry Street (RR 20)	Stanley Avenue (RR 102)	Fallsview Boulevard/ Buchanan Avenue	Robinson Street
Jurisdiction	Niagara Region (west of Stanley Avenue), City of Niagara Falls (east of Stanley Avenue)	Niagara Region	City of Niagara Falls	City of Niagara Falls
Functional Classification	Arterial	Arterial	Collector	Collector
Number of Lanes	Two	Four	Two	Two
Posted Speed	50 km/h	50 km/h	50 km/h	50 km/h
Cross-Section	Urban	Urban	Urban	Urban
On-Street Parking	No, at all times	No, at all times	Yes, both sides	By Permit Only
AADT	12700	18900	3300	5700
General Direction	East-West	North-South	North-South	East-West

Accordingly, the two intersections on Stanley Avenue are considered Regional intersections while the two intersections on Fallsview Boulevard are City intersections.

\\ae.ca\data\working\inia\2022-5685-00\plan\Reporting\TIS\ppt_5438FerrySt_TIS_Parking_20230719.docx

The existing lane configuration and traffic control is shown in Figure 2-1.

Figure 2-1 Existing Lane Configuration and Traffic Control



2.2 Existing Transit Network

The Study Area is serviced by Niagara Falls Transit, which also operate WEGO, a transit system that connects all Niagara Parks locations to major attractions and hotels in the Niagara Falls tourist district as illustrated in Figure 2-2. The following bus routes operate within the Study Area:

Route 104/204 is a bus route that travels from the Main St Hub to the Niagara Falls Train/Bus Terminal along Ferry Street and Victoria Avenue. Based on the bus schedule updated in September 2022, the bus route operates with headways every 30 minutes. The closest bus stops are located at the northwest and southeast corners of Buchanan Avenue/Fallsview Boulevard and Ferry Street. A map of Route 104/204 is shown in Figure 2-3.

WEGO Red Line is a tourist bus route operating between Campark Resorts to the west and the Fallsview/Clifton Hill tourist area. Based on the bus schedule updated in September 2022, the bus route operates with headways every 30 minutes. The closest bus stop is located at the northeast corner of Buchanan Avenue/Fallsview Boulevard and Ferry Street.

WEGO Blue Line is a tourist bus route operating between Portage Road to the south and the Fallsview/Clifton Hill tourist area. Based on the bus schedule updated in September 2022, the bus route operates with headways every 40 minutes during the fall/winter. The Blue Line typically has buses running every 30 minutes during the summer. The closest bus stop is located at the northeast corner of Buchanan Avenue/Fallsview Boulevard and Ferry Street.

Figure 2-2 WEGO Transit Map

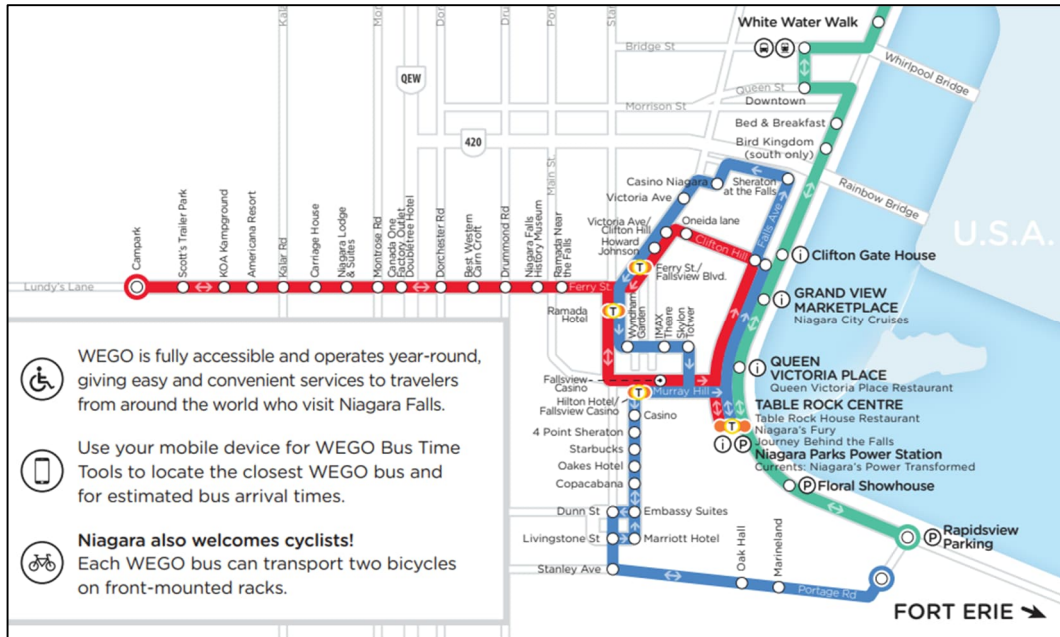
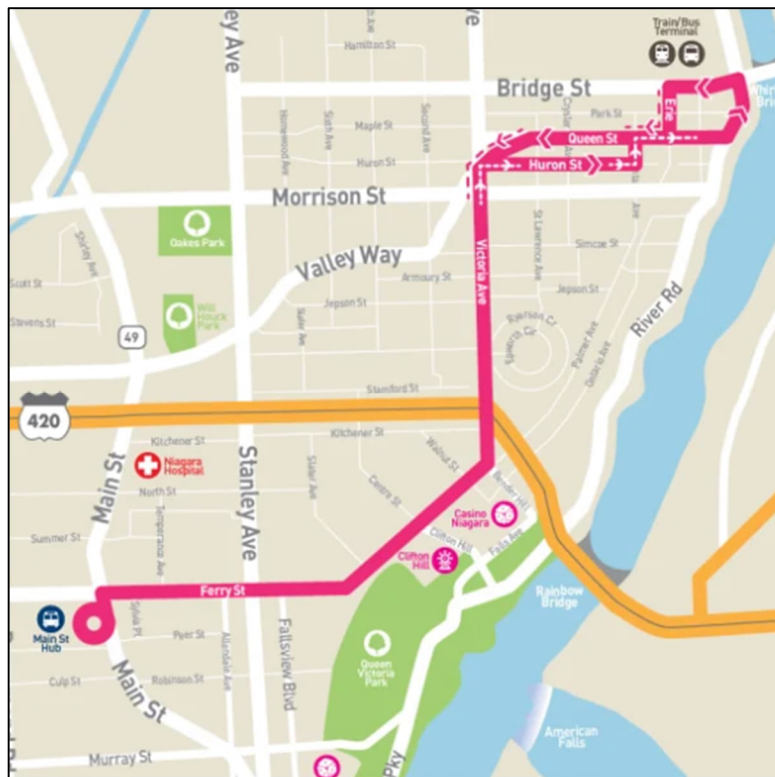


Figure 2-3 Route 104/204 Map



2.3 Existing Active Transportation Network

Continuous sidewalks are provided on both sides of the roadways surrounding the Study Area. Painted crosswalks are provided on all approaches at Stanley Avenue and Ferry Street, Stanley Avenue and Robinson Street, and Fallsview Boulevard and Robinson Street. The pedestrian crossing on the northbound approach of Fallsview Boulevard and Ferry Street is delineated using different pavement materials. Pedestrian phases are also present at the two intersections on Stanley Avenue.

Fallsview Trail runs parallel to the Niagara Parkway. It is located 1.2 km away from the subject site which can be reached within approximately a 16 minute walk or 5 minute bike ride.

The existing active transportation facilities are illustrated in **Figure 2-4**.

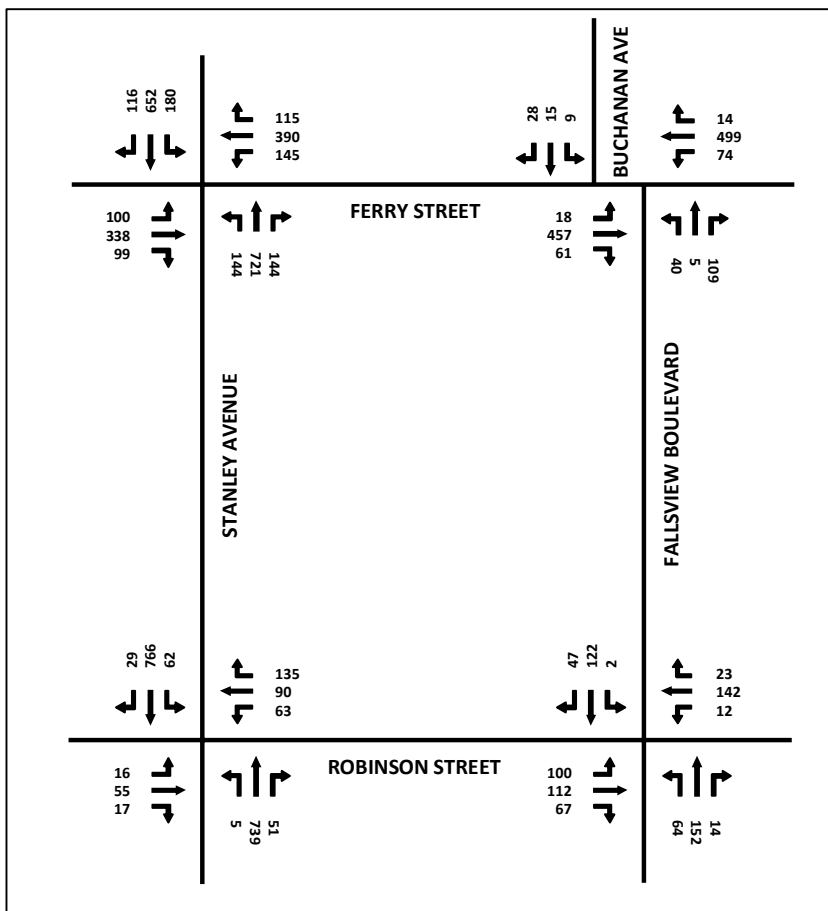
Figure 2-4 Active Transportation Map



2.4 Existing Traffic Volumes

As discussed with City staff, this study builds upon the approved Fallsview EA. Rather than collecting new traffic count data, the source of traffic data is based on the EA as instructed by the City. The base year for the Fallsview EA was 2014, where the future 10- and 20-year traffic volumes were projected using a 1% annual growth. For consistency, the existing 2022 traffic volumes were estimated by applying a 1% annual growth rate to the 2014 base year traffic from the EA. The 2014 base year traffic volumes is available in **Appendix C**. The existing 2022 traffic volumes during the weekday PM peak hour is illustrated in **Figure 2-5**.

Figure 2-5 Existing 2022 Traffic Volumes



2.5 Intersection Capacity Analysis

Capacity analyses for signalized and unsignalized intersections within the Study Area were conducted using Synchro/SimTraffic (Version 11) based on the Highway Capacity Manual (HCM) methodology. A Synchro analysis of the existing traffic levels in 2022 was undertaken to identify any existing operational constraints. As this report acknowledges the Fallsview EA, only the weekday PM peak hour is assessed which is the critical analysis period (peak period that has the highest traffic volumes).

The following criteria were used to evaluate traffic operations:

- **Level of Service (LOS)** which relates directly to average delays per vehicle in seconds. HCM has established grades A through F, where A represents the highest level of service (delay is less than 10 seconds) and F represents the lowest (delays over 50 seconds for unsignalized and 80 seconds for signalized intersections). In general, LOS A through D is acceptable, LOS E is a cause for concern and F may trigger mitigating action.
- **Volume-to-capacity (V/C) ratio** which provides the level of congestion for each movement or lane group. A value over 1.0 indicates that the movement or lane group is over capacity.
- **95th percentile queue** is the maximum queue length in metres. This will be compared against the available storage length of turn lanes or the distance to the upstream intersection.

According to the Niagara Region TIS guidelines, critical movements are considered to be:

At signalized intersections

- V/C ratio greater than 0.85 for through, through-right or right-turn movements; and
- V/C ratio greater than 0.90 for dedicated left-turn movements.

At unsignalized intersections

- LOS D or worse; and
- 95th percentile queues exceeds available storage.

The Regional **signalized** intersections – Stanley Avenue & Ferry Street, and Stanley Avenue & Robinson Street will be evaluated based on the Region's threshold.

According to the City of Niagara Falls TIS guidelines, critical movements are considered to be:

At signalized intersections

- V/C ratio is 0.85 or above for overall intersection, through, or shared through/turning movements);
- V/C ratio is 0.95 or above for dedicated left-turn or right-turn movements; and
- 95th percentile queues exceeds available storage.

At unsignalized intersections

- LOS F on individual movements; and
- 95th percentile queues exceeds available storage.

The City **unsignalized** intersections – Buchanan Avenue/Fallsview Boulevard & Ferry Street, and Fallsview Boulevard & Robinson Street, will be evaluated based on the City's threshold. **Table 2-2** and **Table 2-3** summarize the capacity analysis results for existing conditions, with the critical movements bolded. The Synchro outputs for existing conditions are available in **Appendix D**.

Table 2-2 Existing 2022 Capacity Analysis – Signalized Intersections

Intersection	Overall LOS [Delay (s)]	Overall V/C	Movement	LOS [Delay (s)]	V/C	95 th Queue (m)	Available Storage (m)
Stanley Avenue & Ferry Street	D [39.2]	0.83	EBL	C [26.4]	0.43	21.2	100
			EBT	D [44.3]	0.78	98.1	100
			EBR	C [29.9]	0.10	13.0	45
			WBL	C [25.5]	0.53	29.6	35
			WBT	D [50.1]	0.85	116.9*	75
			WBR	C [28.6]	0.10	12.5	35
			NBL	C [23.5]	0.58	38.1*	25
			NBTR	D [46.8]	0.90	170.8	330
			SBL	C [31.0]	0.74	76.5*	60
			SBTR	C [34.8]	0.73	141.7*	100
Stanley Avenue & Robinson Street	B [15.2]	0.67	EBL	C [20.9]	0.09	6.1	40
			EBTR	C [21.3]	0.17	15.5	110
			WBLTR	D [36.8]	0.80	59.1	105
			NBLTR	B [10.1]	0.50	54.7	285
			SBLTR	B [12.1]	0.62	68.1	330

Table 2-3 Existing 2022 Capacity Analysis – Unsignalized Intersections

Intersection	Movement	LOS [Delay (s)]	V/C	95 th Queue (m)	Available Storage (m)
Buchanan Avenue/Fallsview Boulevard & Ferry Street	EBL	A [9.1]	0.02	0.6	30
	WBL	A [9.7]	0.09	2.5	40
	NBLTR	F [103.9]	0.93	57.5	330
	SBLTR	E [47.8]	0.41	14.0	65
Fallsview Boulevard & Robinson Street	EBLTR	B [13.1]	0.46	0.0	105
	WBLTR	B [11.1]	0.30	0.0	110
	NBLTR	B [12.4]	0.40	0.0	285
	SBLTR	B [11.0]	0.29	0.0	330

Under existing conditions, the overall intersections operate with LOS D or better, and all individual movements operate within the roadway capacity. However, the existing queue lengths exceed the available storage or extend beyond the upstream intersection for the westbound through, northbound left-turn, and southbound lanes at Stanley Avenue & Ferry Street (shown with *).

The following two critical movements have been identified:

- Northbound through/right-turn at Stanley Avenue & Ferry Street with a V/C of 0.90
- Northbound approach at Buchanan Avenue/Fallsview Boulevard & Ferry Street with LOS F

3 FUTURE BACKGROUND CONDITIONS

The future background conditions consider corridor and area growth, and planned road improvements within a 10-year horizon corresponding to the year 2032. The assessment examines the future traffic operations without the proposed development.

3.1 Corridor Growth

As discussed with City staff, a 1% annual growth rate was applied to all movements for the studied intersections from existing 2022 traffic.

3.2 Adjacent Developments under Construction

The mixed-use development located at Stanley Avenue and Ferry Street was included as a background development, which is currently under construction. It consists of 350 residential units, 9612 ft² of commercial space and 150 hotel rooms. Excerpt of the background development traffic volumes is available in **Appendix E**.

3.3 Planned Roadway Improvements

As per the Fallsview EA, the following road improvements were recommended in the report for the intersections relevant to the Study Area. Excerpt from the EA is available in **Appendix E**.

Stanley Avenue & Ferry Street

- Although all four approaches are expected to operate near or over capacity by 2034, no physical improvements were further investigated due to the limited right-of-way (ROW).

Buchanan Avenue/Fallsview Boulevard & Ferry Street

- Close Buchanan Avenue and signalize intersection by 2024 horizon year

Fallsview Boulevard & Robinson Street

- Install traffic signals by 2024 horizon year
- Add exclusive left-turn lanes on all approaches by 2034 horizon year

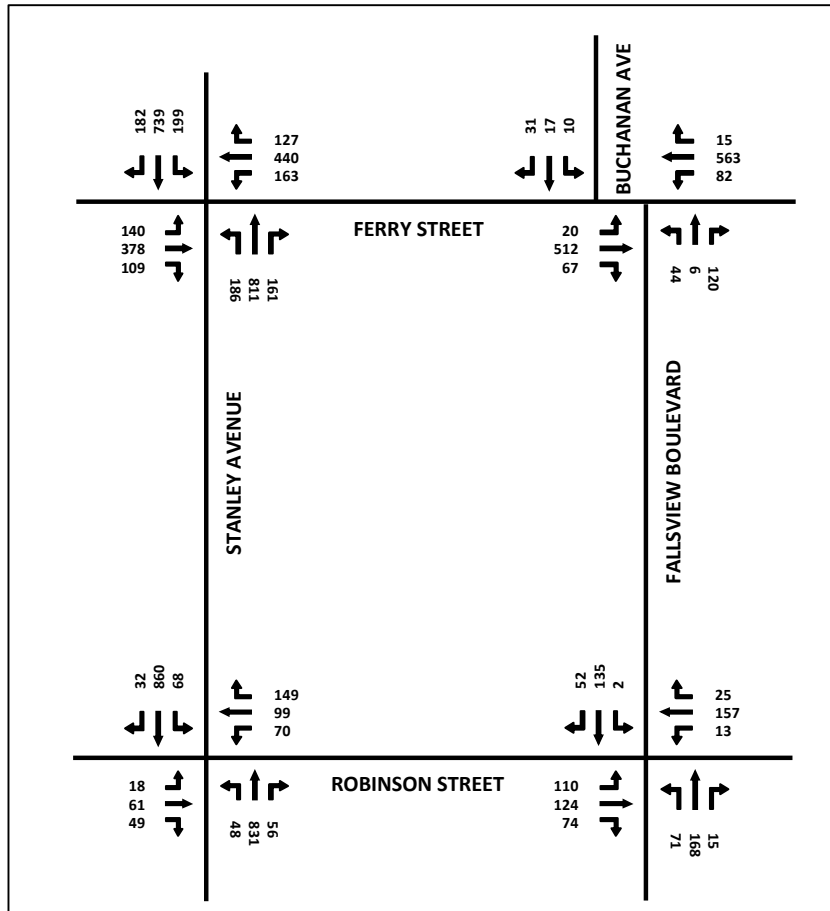
Stanley Avenue & Robinson Street

- Add exclusive left-turn lanes in the westbound and southbound directions by 2034 horizon year

3.4 Future Background Traffic Volumes

The future background 2032 traffic volumes were estimated by incorporating a 1% growth rate per year (onward from 2022) and the mixed-use development under construction at Stanley Avenue and Ferry Street. Two scenarios were assessed: 1) Do Nothing – No Improvements, and 2) Mitigating measures which incorporate the Fallsview EA recommended improvements. The ‘Do Nothing’ scenario will demonstrate whether the improvements as recommended by the EA study are required within a 10-year horizon. The ‘EA Improvements’ scenario will demonstrate whether the recommended mitigation measures effectively improve future traffic operations. **Figure 3-1** illustrates the Do Nothing scenario.

Figure 3-1 Future Background 2032 Traffic Volumes (Do Nothing)



Since one of the improvements include the closure of Buchanan Avenue which eliminates the eastbound left-turn, westbound right-turn, northbound through and southbound movements, the traffic to/from this roadway have been diverted to the surrounding roadways. Vehicles can reroute using Ferry Street to the west, Spring Street, Forsythe Street, and Magdalen Street to the north, and/or Ellen Avenue to the east. With respect to the Study Area, only the traffic volumes for the intersections on Ferry Street are affected.

The diverted future background 2032 traffic volumes is illustrated in **Figure 3-2**. **Figure 3-3** illustrates the net mitigated effect to the Study Area.

Figure 3-2 Future Background 2032 Traffic Volumes (Buchanan Avenue Closure)

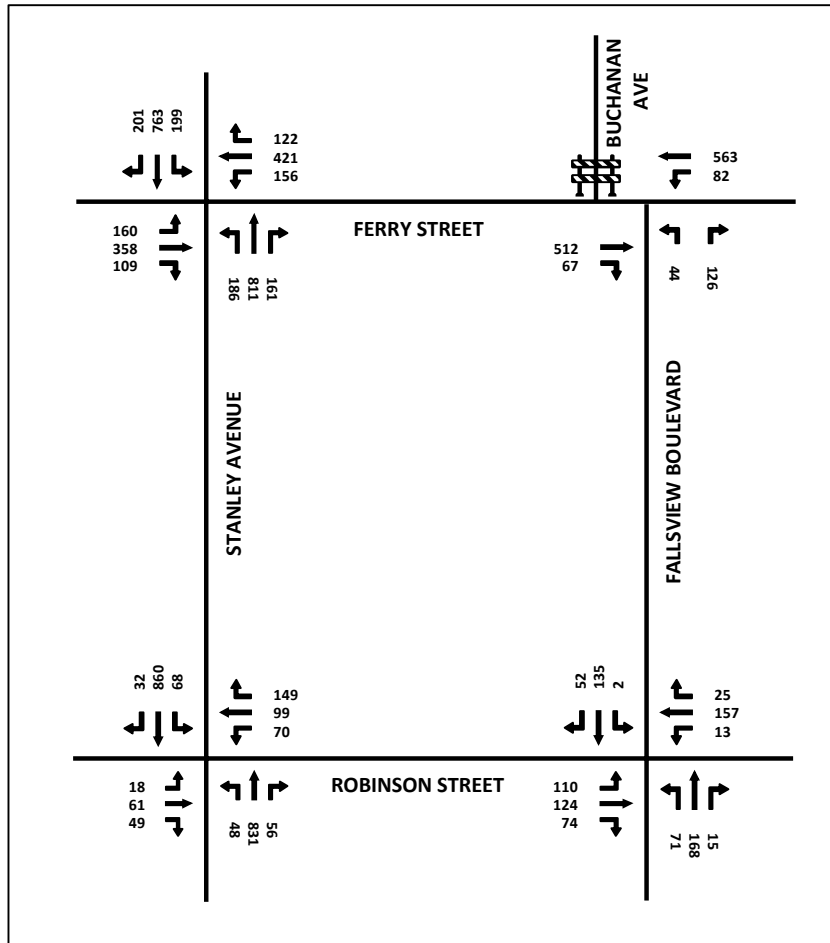
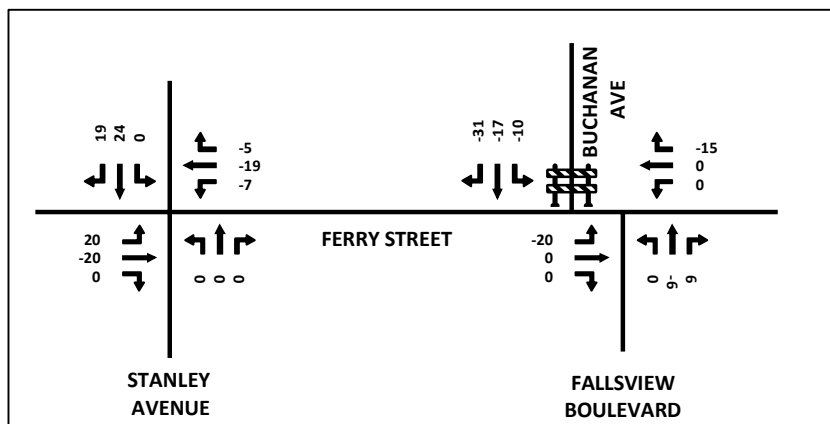


Figure 3-3 Net Mitigated Effect (Buchanan Avenue Closure)



3.5 Intersection Capacity Analysis

Synchro analysis was conducted for the two future background scenarios for the 2032 horizon. The Synchro outputs for future background conditions are available in **Appendix F**.

3.5.1 Do Nothing (Scenario 1)

The existing road network and signal timing plans were used for the Do Nothing scenario. The results of the capacity analyses are summarized in **Table 3-1** and **Table 3-2**.

Table 3-1 Future Background 2032 Capacity Analysis – Signalized Intersections (Do Nothing)

Intersection	Overall LOS [Delay (s)]	Overall V/C	Movement	LOS [Delay (s)]	V/C	95 th Queue (m)	Available Storage (m)
Stanley Avenue & Ferry Street	E [70.5]	0.94	EBL	C [26.5]	0.58	28.6	100
			EBT	D [41.3]	0.78	112.8*	100
			EBR	C [27.5]	0.13	15.4	45
			WBL	C [24.8]	0.58	33.0	35
			WBT	D [51.9]	0.89	136.8*	75
			WBR	C [26.9]	0.11	13.1	35
			NBL	D [45.3]	0.83	78.0*	25
			NBTR	F [118.5]	1.15	201.3	330
			SBL	D [44.3]	0.82	87.5*	60
			SBTR	E [77.2]	1.04	184.9*	100
Stanley Avenue & Robinson Street	B [15.2]	0.67	EBL	B [20.0]	0.10	6.9	40
			EBTR	C [20.5]	0.20	18.3	110
			WBLTR	D [40.5]	0.84	75.2	105
			NBLTR	B [14.0]	0.69	76.3	285
			SBLTR	B [16.2]	0.76	88.3	330

Table 3-2 Future Background 2032 Capacity Analysis – Unsignalized Intersections (Do Nothing)

Intersection	Movement	LOS [Delay (s)]	V/C	95 th Queue (m)	Available Storage (m)
Buchanan Avenue/Fallsview Boulevard & Ferry Street	EBL	A [9.4]	0.03	0.6	30
	WBL	B [10.5]	0.12	3.3	40
	NBLTR	F [562.3]	2.00	127.4	330
	SBLTR	F [158.5]	0.85	33.5	65
Fallsview Boulevard & Robinson Street	EBLTR	C [15.2]	0.54	0.0	105
	WBLTR	B [12.3]	0.35	0.0	110
	NBLTR	B [14.0]	0.46	0.0	285
	SBLTR	B [12.1]	0.34	0.0	330

Under future background conditions (Do Nothing), the intersection of Stanley Avenue & Ferry Street is anticipated to operate with traffic constraints where several movements are operating over capacity, with long delays and/or queuing issues. At Buchanan Avenue/Fallsview Boulevard & Ferry Street, the northbound and southbound approaches are operating at LOS F. Specifically, the demand is double the capacity for the northbound lane and vehicles are expected to wait almost 10 minutes. The two intersections on Robinson Street are expected to operate at acceptable levels of service.

The following critical movements have been identified:

- Westbound through at Stanley Avenue & Ferry Street with a V/C of 0.89 and queues of 137 m
- Northbound through/right-turn at Stanley Avenue & Ferry Street with a V/C of 1.15 and LOS F (2 minute delay)
- Southbound through/right-turn at Stanley Avenue & Ferry Street with a V/C of 1.04 and queues of 185 m
- Northbound approach at Buchanan Avenue/Fallsview Boulevard & Ferry Street with LOS F (9-10 minute delay) and V/C of 2.00
- Southbound approach at Buchanan Avenue/Fallsview Boulevard & Ferry Street with LOS F (2-3 minute delay)

As in the conclusions provided under the Fallsview EA, the analysis suggests that improvements are required at Stanley Avenue & Ferry Street, and Buchanan Avenue/Fallsview Boulevard & Ferry Street. In contrast to the EA findings, the analysis show that additional turn lanes and/or signalization are not required by the 2032 horizon for the Fallsview Boulevard & Robinson Street, and Stanley Avenue & Robinson Street intersections. This discrepancy is primarily due to the two large hotel developments on the east end of Robinson Street contemplated in the Fallsview EA, which were not considered in this study.

3.5.2 EA Mitigating Improvements (Scenario 2)

Stanley Avenue & Ferry Street

Since there is limited right-of-way to accommodate dedicated right-turn lanes for the north and south approaches at Stanley Avenue & Ferry Street, mitigation measures focused on signal timing adjustments.

The existing signal timing plan allocates more time to the east-west traffic even though these movements are operating with residual capacity. Since the capacity constraints are expected for the northbound and southbound movements, 10.5 seconds were reallocated to the north-south phases while maintaining the cycle length of 110 seconds. The recommended signal timing plan at Stanley Avenue & Ferry Street is outlined in **Table 3-3**.

Table 3-3 Recommended Signal Timing Plan at Stanley Avenue & Ferry Street

Timings	NBL	NBTR	SBL	SBTR	EBL	EBTR	WBL	WBTR
Yellow	3	4.1	3	4.1	3	4.1	3	4.1
All-Red	0	2.4	0	2.4	0	2.4	0	2.4
Existing Total Split	13	35.5	13	35.5	15	46.5	15	46.5
Recommended Total Split	11	43	16	48	10	42	9	41
Difference	-2	+7.5	+3	12.5	-5	-4.5	-6	-5.5

Buchanan Avenue/Fallsview Boulevard & Ferry Street

The Fallsview EA preferred solution at Buchanan Avenue/Fallsview Boulevard & Ferry Street, which is to close Buchanan Avenue and signalize the intersection, was incorporated in this scenario. A basic signal timing plan with a cycle length of 60 seconds was assessed.

Since only the studied intersections on Ferry Street are impacted by the diverted traffic volumes and the recommended improvements, the 'EA Mitigating Improvements' scenario only assesses the Stanley Avenue & Ferry Street, and Buchanan Avenue/Fallsview Boulevard & Ferry Street intersections.

The results of the capacity analyses are summarized in **Table 3-4**.

Table 3-4 Future Background 2032 Intersection Capacity Analysis (EA Improvements)

Intersection	Overall LOS [Delay (s)]	Overall V/C	Movement	LOS [Delay (s)]	V/C	95 th Queue (m)	Available Storage (m)
Stanley Avenue & Ferry Street	D [47.0]	0.92	EBL	E [66.5]	0.89	55.4	100
			EBT	D [40.6]	0.76	113.0*	100
			EBR	C [27.8]	0.09	12.0	45
			WBL	D [40.6]	0.72	40.5*	35
			WBT	E [59.3]	0.92	152.7*	75
			WBR	C [28.6]	0.10	14.0	35
			NBL	D [52.6]	0.88	78.7*	25
			NBTR	D [49.1]	0.93	174.2	330
			SBL	E [57.3]	0.89	74.5*	60
			SBTR	D [40.9]	0.87	151.7*	100
Buchanan Avenue/Fallsview Boulevard & Ferry Street	B [16.7]	0.56	EBTR	B [18.0]	0.78	70.7	85
			WBL	B [11.4]	0.42	13.4	40
			WBT	B [16.3]	0.74	66.8	105
			NBLR	B [16.5]	0.20	20.1	330

At Stanley Avenue & Ferry Street, the signal timing adjustments significantly improve traffic operations where all individual movements experience delays less than 70 seconds and operate under capacity although some are still deemed critical.

The following critical movements have been identified:

- Westbound through at Stanley Avenue & Ferry Street with a V/C of 0.92 and queues of 153 m
- Northbound through/right-turn at Stanley Avenue & Ferry Street with a V/C of 0.93
- Southbound through/right-turn at Stanley Avenue & Ferry Street with a V/C of 0.87 and queues of 152 m

At Fallsview Boulevard & Ferry Street, the signalization of the intersection and closure of Buchanan Avenue result in acceptable levels of service. The V/C ratios are below 0.85 and the queues can be accommodated within the existing storage for all movements.

Based on the above analysis, this study confirms that improvements are required at the intersections of Stanley Avenue and Ferry Street, and Buchanan Avenue/Fallsview Boulevard and Ferry Street. It is agreed that there is limited ROW at Stanley Avenue and Ferry Street, and physical improvements would not be feasible without expropriation. However, as an interim solution, signal timing adjustments would reduce delays and congestion. The EA preferred mitigating solution of closing Buchanan Avenue and adding traffic signals resolves the capacity issues at Fallsview Boulevard and Ferry Street. Although the Fallsview EA also identified constraints at the intersections of Stanley Avenue and Robinson Street, and Fallsview Boulevard and Robinson Street, this study demonstrates that no improvements are needed within a 10-year horizon.

4 FORECASTED SITE GENERATED TRAFFIC

4.1 Site Accesses

As shown on the site plan, the developer is proposing two accesses for the subject development: one on Ferry Street and the other on Fallsview Boulevard. The north access is located approximately 50 m west of Fallsview Boulevard, while the east access is located approximately 55 m south of Ferry Street as shown in **Figure 4-1** and **Figure 4-2**, respectively.

Figure 4-1 North Access on Ferry Street



Figure 4-2 East Access on Fallsview Boulevard



According to the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads, 2017 Edition, the suggested minimum corner clearance between driveways and signalized intersections is 70 m on arterial roads and 55 m on a collector road. There is adequate clearance for the access on Fallsview Boulevard even for the future signalization at Fallsview Boulevard and Ferry Street, but not the access on Ferry Street. Due to the lot size, it would not be feasible to simultaneously meet the corner clearances to the west (Stanley Avenue) and east (Fallsview Boulevard). The proposed access is located approximately equal distance between the two intersections and in front of the taper of the auxiliary left-turn lanes. At minimum, TAC recommends locating the site access at a distance equal to or greater than the storage length. Further, the proposed redevelopment will consolidate the two existing accesses on Ferry Street which is an improvement to present conditions.

Sightlines are expected to be adequate as Ferry Street and Fallsview Boulevard are both straight roads without any horizontal or vertical curves. There are also no large obstructions within the boulevard that would block sightlines.

Due to the long queues on Ferry Street in both directions between Stanley Avenue and Fallsview Boulevard, there will be limited gap opportunities to make outbound and inbound left-turns. There are also many potential conflicts between the left-turning movements to/from site access and the auxiliary turn lanes. As such, a right-in/right-out on Ferry Street and a full movement access on Fallsview Boulevard were assessed.

4.2 Trip Generation

Since the commercial uses are intended for the residents of the building and local patrons from the hotels nearby and considering there is a low parking requirement for commercial developments in the tourist core, it is expected that most commercial visitors will not be driving to the site. Further, the commercial space is small and not anticipated to generate significant traffic. Therefore, site traffic from the commercial uses have not been explicitly accounted for. It is assumed that the site traffic is primarily generated by the residential uses.

The site-generated traffic was estimated using the Institute of Transportation Engineers (ITE) Trip Generation Manual 11th Edition for Land Use Code (LUC) 222 Multifamily Housing (High-Rise) as summarized in **Table 4-1**. The ITE plot is available in **Appendix G**. To be conservative, no adjustments have been made to account for the City's modal split target or a reduced parking supply. It is expected that the total auto trips will be even lower given the tourist nature of the area and the close proximity to bus routes.

The mixed-use development is forecasted to generate 90 inbound and 55 outbound trips during the weekday PM peak hour.

Table 4-1 Trip Generation

LUC 222 Multifamily Housing (High-Rise)	Weekday PM		
	In	Out	Total
Directional Distribution	62%	38%	100%
Trip Rate Per Unit	0.198	0.122	0.320
Total Trips (456 units)	90	55	145

4.3 Trip Distribution and Assignment

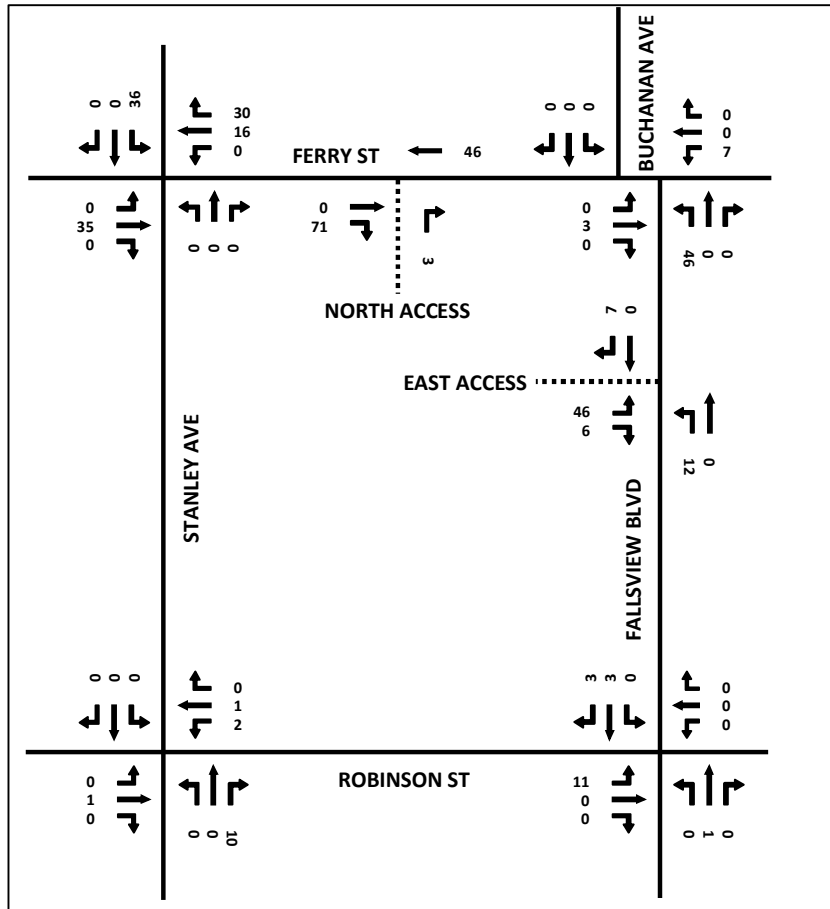
Trip distribution was determined using the 2016 Transportation Tomorrow Survey (TTS) and filtering data for auto home-based trips during the weekday afternoon. Detailed TTS calculations are available in **Appendix G**. A large proportion of traffic are local trips – 43% of trips originating (outbound) from and 67% of trips destined (inbound) to the area are travelling within the City. For external (outside the City) trips, the majority are coming from or going to municipalities in the north via Stanley Avenue or west via Ferry Street. The trip distribution is summarized in **Table 4-2**.

Table 4-2 Trip Distribution

Direction (To/From)	Route	Outbound	Inbound
North	Stanley Avenue	54%	39%
South	Stanley Avenue	3%	11%
	Fallsview Boulevard	6%	1%
East	Ferry Street	6%	8%
West	Ferry Street	29%	39%
	Robinson Street	2%	1%

Traffic was assigned to the road network based on the shortest path, logical routing and permitted movements. Since the north access is assessed as a right-in/right-out, inbound and outbound left-turns were assigned to the east access on Fallsview Boulevard. In anticipation of the Buchanan Avenue closure, no site traffic was assigned to this road. The site traffic assignment is illustrated in **Figure 4-3**.

Figure 4-3 Site Traffic Assignment



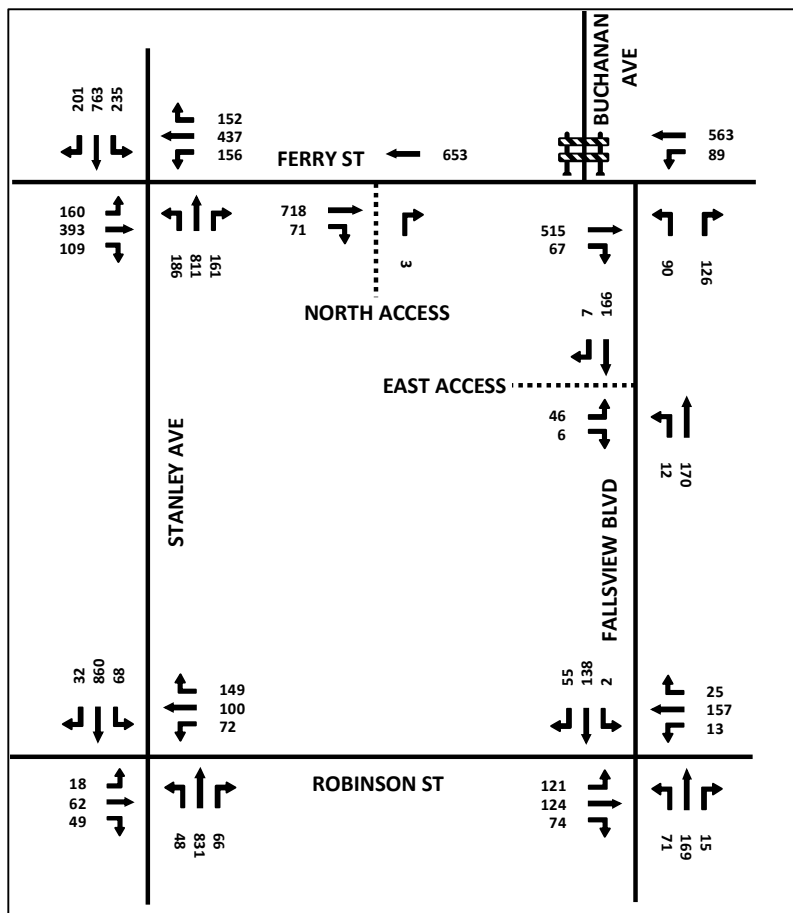
5 FUTURE TOTAL CONDITIONS

The future total conditions consider the site traffic generated by the proposed development added to the 2032 future background conditions. The assessment examines the future traffic operations with the proposed development.

5.1 Future Total Traffic Volumes

The future total 2032 traffic volumes were estimated by adding the forecasted site traffic to the future background 2032 traffic volumes, where a portion of the traffic was diverted due to the Buchanan Avenue closure as illustrated in Figure 5-1.

Figure 5-1 Future Total 2032 Traffic Volumes (Buchanan Avenue Closure)



5.2 Intersection Capacity Analysis

The capacity analysis incorporates the improvements detailed in Section 3.5.2 such as the recommended signal timings at Stanley Avenue and Ferry Street, closure of Buchanan Avenue and signalization of Fallsview Boulevard and Ferry Street.

The results of the capacity analyses for the future total conditions are summarized in Table 5-1 and Table 5-2. The Synchro outputs for future total conditions are available in Appendix H.

Table 5-1 Future Total 2032 Capacity Analysis – Signalized Intersections (EA Improvements)

Intersection	Overall LOS [Delay (s)]	Overall V/C	Movement	LOS [Delay (s)]	V/C	95 th Queue (m)	Available Storage (m)
Stanley Avenue & Ferry Street	D [52.9]	0.97	EBL	E [72.1]	0.92	54.4	100
			EBT	D [44.4]	0.81	128.1*	100
			EBR	C [27.4]	0.09	12.0	45
			WBL	D [47.6]	0.78	47.2*	35
			WBT	E [62.1]	0.94	161.6*	75
			WBR	C [28.4]	0.13	15.3	35
			NBL	E [59.8]	0.91	76.7*	25
			NBTR	E [62.0]	0.99	174.2	330
			SBL	E [71.3]	0.95	95.7*	60
			SBTR	D [41.4]	0.88	151.7*	100
Stanley Avenue & Robinson Street	B [19.3]	0.79	EBL	B [19.9]	0.10	6.9	40
			EBTR	C [20.4]	0.20	18.4	110
			WBLTR	D [41.5]	0.85	76.8	105
			NBLTR	B [14.3]	0.70	77.5	285
			SBLTR	B [16.6]	0.77	90.3	330
Buchanan Avenue/Fallsview Boulevard & Ferry Street	B [16.9]	0.62	EBTR	B [17.9]	0.78	71.4	85
			WBL	B [11.8]	0.45	15.0	40
			WBT	B [16.1]	0.74	66.8	105
			NBLR	B [18.6]	0.36	39.2	330

Table 5-2 Future Total 2032 Capacity Analysis – Unsignalized Intersections (EA Improvements)

Intersection	Movement	LOS [Delay (s)]	V/C	95 th Queue (m)	Available Storage (m)
Fallsview Boulevard & Robinson Street	EBLTR	C [16.1]	0.56	0.0	105
	WBLTR	B [12.5]	0.36	0.0	110
	NBLTR	B [14.4]	0.47	0.0	285
	SBLTR	B [12.4]	0.36	0.0	330
North Access & Ferry Street	NBR	B [14.2]	0.01	0.2	10
Fallsview Boulevard & East Access	EBLR	B [11.3]	0.09	2.4	14
	NBLT	A [0.6]	0.01	0.2	275

Under the future total conditions, the studied intersections operate similarly to pre-development future traffic conditions. The delay increases by at most 14 seconds and queuing increases by up to 21 m (approximately three vehicles). The most significant impact is exhibited by the southbound left-turn movement at Stanley Avenue and Ferry Street. Nonetheless, all individual movements still operate within the roadway capacity and at LOS E or better. There are more critical movements compared to the future background conditions with the Fallsview EA improvements incorporated due to the left-turns exceeding a V/C ratio of 0.90.

All critical movements identified are at the Stanley Avenue and Ferry Street intersection:

- Eastbound left-turn with a V/C of 0.92
- Westbound through with a V/C of 0.94 and queues of 162 m
- Northbound left-turn with a V/C of 0.91 and queues of 77 m
- Northbound through/right-turn with a V/C of 0.99
- Southbound left-turn with a V/C of 0.95 and queues of 96 m
- Southbound through/right-turn with a V/C of 0.88 and queues of 152 m

As noted previously, physical improvements are not feasible at Stanley Avenue and Ferry Street due to the limited ROW. The City and Region are aware of the traffic congestion during peak travel times at Stanley Avenue and Ferry Street. As such, they have requested to include warning clauses in the site plan agreement to warn future tenants.

At Stanley Avenue and Robinson Street, the westbound approach is on the cusp of being critical with a V/C ratio of 0.85. Improvements are still not required at this intersection; however, any additional traffic may necessitate exclusive turning lanes as identified in the Fallsview EA.

The traffic signal at Fallsview Boulevard and Ferry Street provides sufficient capacity to maintain acceptable traffic operations with the added site traffic. The EA preferred solution can accommodate the forecasted site traffic from the proposed development.

The unsignalized intersection at Fallsview Boulevard and Robinson Street continues to operate at good levels of service. Improvements are still not required at this intersection.

Both site accesses are also expected to operate without any constraint, vehicles should have sufficient opportunities to enter and exit the site with minimal delays and queueing.

Overall, the proposed development is anticipated to have a minimal impact on the traffic operations in the Study Area. The surrounding road network can accommodate the additional site traffic without the need for further improvements besides the recommended measures outlined in the Fallsview EA. The EA mitigation measures are effective at maintaining acceptable traffic operations to the 2032 horizon year.

6 PARKING REVIEW

This section discusses the parking requirements and the justification for the parking shortfall from the zoning by-law based on the ITE Parking Generation Manual, Zoning By-Law comparisons, publicly available parking studies, and industry trends.

6.1 Zoning By-Law Requirements

The City’s parking rates requirements are presented in Zoning By-law No. 79-200 Section 4.19.1, Table 1 and Section 4.19.2, Table 1.1. The applicable rates are as follows:

- Dwelling containing 3 or more dwelling units: 1.4 parking spaces per dwelling unit
- Retail store: 1 space per 60m² of floor area

The developer has proposed a parking rate of 1.0 parking spaces per dwelling unit which is a lower rate for the proposed condominium than what is outlined in Zoning By-law No. 79-200. The proposed rate will provide 456 parking stalls for the mixed-use development which is a reduction of 186 parking stalls.

Based on the above parameters, the City of Niagara Falls’ by-law parking requirements and the developer’s proposed parking rate are outlined in **Table 6-1**.

Table 6-1 City of Niagara Falls By-Law 79-200 Parking Requirements

Land Use	Scale	Zoning By-Law		Proposed	
		Parking Rate	Parking Spaces	Parking Rate	Parking Spaces
Residential	456 units	1.4	638		
Commercial	228 m ²	0.017	4		
Total			642	1.0	456plus 9 car-share

6.2 Parking Shortfall Justification – Case Study

The City requested that a parking demand survey be conducted to justify the developer’s proposed parking rate of 1.0 stalls per dwelling unit. AE was unable to obtain permission to conduct a parking survey at potential proxy sites within the City. Alternatively, the City requested comparing parking standards from technical manuals and zoning by-laws from surrounding municipalities, referencing other parking studies, and researching industry trends.

AE researched required by-law parking rates from municipalities surrounding Niagara Falls. Additionally, the Institute of Transportation Engineers (ITE) Parking Generation Manual, 5th Edition (PGM) was used to justify the proposed rate. The findings are outlined in **Table 6-2**.

\\lae.ca\data\working\inia\2022-5685-00\plan\Reporting\TIS\vrpt_5438FerrySt_TIS_Parking_20230719.docx

Table 6-2 Parking Rate Comparison

Source / Location	Dwelling Type	Rate	By-law
ITE PGM (5 th Edition)	Multifamily Housing (High Rise)	Avg Rate: 0.98 Fitted Curve: $P = 1.25X - 105.47$	n/a
Town of Niagara-on-the-Lake	Apartment Building	1.0 space/dwelling unit	Comprehensive Zoning By-law 4316-09, Section 6.39
City of St Catharine's	Residential Uses - Apartment Dwelling Unit within a Mixed Use Building	1.0 space/dwelling unit	Comprehensive Zoning By-law 2013-283, Section 3.12.1
City of Welland	Apartment Dwelling / Multiple Dwelling	Greater than 50m ² : 1.0 space/ dwelling unit 50m ² or less: 0.3 spaces/dwelling unit	Comprehensive Zoning By-law 2017-117, Table 6.4.1
City of Brantford	Mixed-Use Building	1.0 space/dwelling unit Plus 1.0 spaces/30m ² GFA of retail space	Comprehensive Zoning By-law 160-90, Table 6.1
Town of Oakville	Apartment – More than 4 storeys	Up to 1.25 spaces/dwelling unit plus 0.2 spaces/dwelling unit for visitors	Zoning Bylaw 2009-189 (North Oakville between Dundas Street and Highway 407)

ITE Parking Generation Manual

Based on the ITE PGM, 5th Edition, the average parking demand rate is 0.98 for high-rise multifamily housing. The proposed parking rate is consistent with the ITE parking standard.

Zoning By-Law Comparisons

As presented above, several surrounding municipalities are requiring a rate of 1.0 parking spaces per dwelling unit for new apartment complexes within their respective Zoning By-laws. These rates are inclusive of visitor parking unless otherwise stated. The proposed parking rate is also consistent with other surrounding municipalities.

Other Parking Studies

AE's March 2019 *Stanley Avenue and Ferry Street Proposed Mixed Use Development Traffic Impact and Parking Study* also justifies the rate of 1.0 parking spaces per dwelling unit for a development adjacent to this site. That study was able to undertake a parking survey at 15 Towering Heights in the City of St. Catharines. The survey site is a 13-storey building with 125 condominium units and 183 parking spaces. The survey occurred on Thursday February 28, 2019 and Saturday March 2, 2019 from 10:00 pm to 1:00 am to capture the peak parking demand. The parking survey determined that the utilization of the parking lot was between 60% and 64%. Based on the maximum number of parked vehicles, this is equivalent to a parking demand rate of 0.94 spaces/unit which supports the parking reduction being sought. The results of the parking survey are provided in **Appendix I**.

Recently Approved Developments with Reduced Parking

Two nearby developments within the tourist core have recently been approved for a reduced parking including the adjacent development at Stanley Avenue and Ferry Street. The developments are similar in nature as they are mainly residential buildings with commercial uses at-grade as shown in **Table 6-3**. The proposed parking rate aligns with the approved rates of the adjacent developments. The site at 5528 Ferry Street was approved on the condition that 15 car-share spaces, 10-ride transit passes and bicycle storage that can accommodate at least one bicycle per unit be provided.

Table 6-3 Approved Developments with Reduced Parking

Location	Development Proposal	Parking Provided	Parking Rate	Application Status
5528 Ferry Street	3 buildings with a total of 889 apartment dwelling units and 1877 m ² of commercial uses	727 spaces	0.81 space/unit	ZBA Council Approved on August 9, 2022
5613, 5631-5633 Victoria Avenue	2 buildings with a total of 738 dwelling units and 833 m ² of commercial uses	761 spaces for residential uses only	1.03 space/unit	OPA/ZBA Council Approved on August 9, 2022

Industry Trends

In June 2020, Edmonton became the first major city in Canada to remove minimum parking requirements city-wide for new developments. The City of Toronto followed suit in December 2021 by eliminating minimum parking requirements and setting maximum parking rates instead. The current trend will allow businesses and developers to determine their parking needs based on the market. Parking minimums lead to an oversupply of parking which are often underutilized in downtown areas, transit-oriented neighbourhoods and main street areas. By not requiring parking, valuable real estate can be used for active transportation facilities and public spaces which creates a more vibrant, walkable community. The proposed parking strategy follows the trend of avoiding an oversupply of parking and providing only what is needed.

City Transportation Master Plan Goals

In the City's October 2011 Transportation Master Plan (TMP), one of the City's goals is to promote transportation choice while minimizing single occupancy vehicle (SOV) trips. The TMP sets a target of increasing total non-auto trips from 8% in 2006 to 18% by 2031 by implementing transit improvements and transportation demand management (TDM) strategies. The TDM initiatives related to parking include:

- Promoting shared parking practices/facilities at commercial retail and mixed use developments;
- Establishing maximum parking requirements and parking exceptions, for residential, commercial, industrial and institutional developments; and
- Unbundling parking costs from residential units at time of purchase for new multi-unit complexes.

By providing less parking than is required and applying a shared parking strategy between the residential visitors and the commercial uses, the proposed development will contribute to achieving the City's non-auto target.

Transportation Demand Management Plan

A TDM Plan is a set of strategies to reduce dependence on private automobiles. The initiatives can include accommodating features within the site to promote alternative modes of travel such as active transportation, transit, and car sharing.

As discussed with City staff, the TDM plan was developed using the Region of Waterloo's TDM Implementation Checklist.

Pedestrian and Cyclist Strategies creates an environment that supports pedestrian and cycling activity by providing facilities that make moving on the street and the surrounding area accessible, safe and comfortable. The following strategies will encourage walking and cycling:

- Entrances oriented to streets: The main entrance to the residential lobby and commercial suites have direct frontage to the sidewalks on Ferry Street and Fallsview Boulevard.
- Bicycle storage and shower/change facilities: Secured bicycle storage will be provided on the ground floor and parking levels for the commercial and residential tenants. Outdoor bike racks will also be provided for visitors and retail customers. A total of 335 bicycle parking will be provided. A shower/change facility will be located on the main floor adjacent to the bike storage room.

Public Transportation Strategies aim to provide viable travel options to employees, visitors and residents by being in proximity of convenient public transit service. The following strategies will encourage transit use:

- Proximity to transit route: The subject site is located along Routes 104/204, WEGO Blue and Red Lines where the closest bus stop is located at Buchanan Avenue/Fallsview Boulevard and Ferry Street.

Parking Strategies can influence the character of the development and selection of alternative travel mode by reducing the parking supply to match the expected demand. The following strategies will encourage alternate modes of travel:

- Car-share spaces: Nine (9) car-share spaces will be provided for residential and commercial use. This will provide access to a vehicle for occasional use.
- Parking is underground or in a structure: Almost all parking will be provided in an above and underground structure. Some surface parking spaces will be provided at the back of the building, away from major street frontage.

Trip Reduction Incentives are specific initiatives to encourage reduced single occupant vehicle travel.

- Subsidized transit passes: The Owner will provide subsidized transit passes to all occupants for two years.

With the measures incorporated onto the site, a 44% parking reduction can be achieved. Therefore, 360 parking spaces would be adequate for the proposed development. These TDM strategies will also help to achieve the City's mode share target. A summary of the TDM initiatives and its impact on trip and parking reductions is available in **Appendix J**.

6.3 Proposed Parking Supply

The developer is proposing 456 parking spaces plus nine (9) car-share spaces spread between four above-grade levels, three below-grade levels and surface parking.

Although this is a reduction of 186 parking spaces from the City's current zoning by-law, the proposed rate of 1.0 parking spaces per dwelling unit is consistent with the parking standards from the ITE PGM and the Zoning By-laws of surrounding municipalities. It is also supported by a proxy parking demand survey which demonstrate that a rate of 0.94 spaces per unit is adequate for a similar development. Further, there is precedence for reduced parking in the area based on two recently approved developments. A reduction in parking aligns with the City's TMP goal to promote alternative travel modes and reducing SOV trips, as well as follows current industry trends of avoiding an oversupply of parking.

In order to promote alternative modes of transportation, the developer is committed to providing several TDM incentives. For bicycle use, the developer has proposed secure bicycle storage within the building, and bicycle racks outside the building. The Owner will also provide car-share spaces and subsidized transit passes to encourage alternative modes of travel and reduce auto dependency. The site design strategies will facilitate active modes of transportation and help the City to achieve their mode-share target.

The proposed parking supply along with a robust TDM plan is anticipated to be sufficient to meet the parking needs of the residents and visitors of this proposed development.

7 COMMERCIAL LOADING REVIEW

7.1 Zoning By-Law Requirement

Based on Zoning By-Law 79-200, the proposed development is required to provide one (1) loading space for the commercial uses as shown in **Table 7-1**.

Table 7-1 Loading Summary

Land Use	Scale	Required	Proposed
Residential	456 units	0	
Commercial (<2300 m ²)	228 m ²	1	
Total		1	1

7.2 Proposed Loading Supply

One (1) loading space that is 3 m wide by 9 m long will be provided at the back of the building for garbage collection and deliveries. The loading area is adjacent to a two-way drive aisle which can be accessed from/egressed to Ferry Street or Fallsview Boulevard. The truck swept paths will be assessed in the Site Plan Approval stage to confirm that trucks can safely access/egress and circulate within the site.

8 CONCLUSIONS AND RECOMMENDATIONS

The proposed mixed-use development is forecasted to generate 90 inbound and 55 outbound trips during the weekday PM peak hour.

The traffic assessment completed in this study indicates that improvements are required at Stanley Avenue & Ferry Street, and Buchanan Avenue/Fallsview Boulevard & Ferry Street by the 2032 horizon even without the proposed development. The mitigation measures outlined in the Fallsview EA are effective at maintaining acceptable traffic operations to the 2032 horizon year. Overall, the proposed development is anticipated to have an acceptable impact on the traffic operations in the Study Area. By implementing the EA recommended measures, the surrounding road network can accommodate the additional site traffic.

The following summarizes the key findings and recommended improvements in this study:

Stanley Avenue and Ferry Street

The shared through/right lanes in the northbound and southbound directions will operate overcapacity and queuing is a concern without mitigation measures. Since there is limited right-of-way to accommodate dedicated right-turn lanes for the north and south approaches, signal timing adjustments are recommended as an interim solution. This will minimize delays and queue lengths but there are still critical movements such as the eastbound left-turn, westbound through, northbound left-turn, northbound through/right-turn, southbound left-turn, and southbound through/right-turn.

Buchanan Avenue/Fallsview Boulevard and Ferry Street

The northbound and southbound approaches will operate at LOS F with long delays without mitigation measures. The EA preferred solution to close Buchanan Avenue and signalize the intersection will improve traffic operations and provides sufficient capacity to accommodate the forecasted site-generated traffic. All movements operate with V/C ratios less than 0.85 and queues can be accommodated within the available storage.

Fallsview Boulevard and Robinson Street

All movements operate at LOS C or better, and there are no queues. Improvements at this intersection are not required.

Stanley Avenue and Robinson Street

All movements operate at LOC D or better, with V/C ratios not greater than 0.85. Improvements at this intersection are not required.

Site Accesses

The proposed accesses are a right-in/right-out on Ferry Street and a full movement on Fallsview Boulevard. It is recommended that the inbound and outbound left-turns are restricted at the north access to eliminate potential conflicts between turning movements. Due to long queues on Ferry Street, there is also limited opportunities to make a left-turn in and out of that access. Under this configuration, both site accesses are expected to operate without any constraint, and vehicles should have sufficient opportunities to enter and exit the site with minimal delays and queuing. Sightlines are expected to be adequate as Ferry Street and Fallsview Boulevard are both straight roads

without any horizontal or vertical curves. There are also no large obstructions within the boulevard that would block sightlines.

Parking and Loading

The proposed parking of 456 spaces plus 9 car-share spaces is anticipated to be sufficient to meet the needs of residents and visitors for the proposed development. The TDM plan will help to encourage alternative modes of travel and reduce auto dependency, as well as support a reduced parking supply. These strategies also include secured bicycle parking and subsidized transit passes. One loading space for garbage collection and deliveries will be provided as per the zoning by-law.

CLOSURE

This report was prepared for the 1788618 Ontario Inc. to evaluate the traffic impact based on site-generated traffic predictions and forecasted area traffic to 2032, and provide justification for a reduced parking supply for the proposed development at 5438 Ferry Street.

The services provided by Associated Engineering (Ont.) Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
Associated Engineering (Ont.) Ltd.



Sabrina Chan, M.Eng., P.Eng.
Transportation Engineer

Peter Lejcar, P.Eng.
QA Reviewer

A handwritten signature in black ink, appearing to read "David Booker".

David Booker, CET, TSOS
Project Manager

PERMIT STAMP

APPENDIX A - DEVELOPMENT PLAN



CONSULTANTS AND STUDIES

ARCHITECT

MATTHEW TRENDOTA
ARCHITECT
QUARTEK GROUP
905-984-8676
91 ST PAUL ST.
ST. CATHARINES, ON
L2R3M3

URBAN PLANNING

SUSAN SMYTH
URBAN PLANNER
QUARTEK GROUP
905-984-8676
91 ST PAUL ST.
ST. CATHARINES, ON
L2R3M3

CIVIL ENGINEER

DOUG PETERS
CIVIL ENGINEER
QUARTEK GROUP
905-984-8676
91 ST PAUL ST.
ST. CATHARINES, ON
L2R3M3

ELECTRICAL ENGINEER

ADAM MEYER
ELECTRICAL ENGINEER
QUARTEK GROUP
905-984-8676
91 ST PAUL ST.
ST. CATHARINES, ON
L2R3M3

TRAFFIC STUDY

DAVID BOOKER
CET, TSOS, DISCIPLINE LEAD - TRAFFIC SYSTEMS
ASSOCIATED ENGINEERING (ONT) LTD.
905-346-0990
SUITE 300 - 101 LAMPMAN COURT
NIAGARA-ON-THE-LAKE, ON
L0S 1J0

WIND STUDY

DARREN GARNHAM
PROJECT MANAGER
THE BOUNDARY LAYER WIND TUNNEL LABORATORY
THE UNIVERSITY OF WESTERN ONTARIO, FACULTY OF
ENGINEERING
LONDON, ON
N6A 5B9

ONTARIO LAND SURVEY

BRENT LAROCQUE
B.S.C., O.L.S., O.L.I.P
THE LAROCQUE GROUP
12 LYMAN STREET
ST. CATHARINES, ON
L2R 5M7

GEOTECHNICAL REPORT

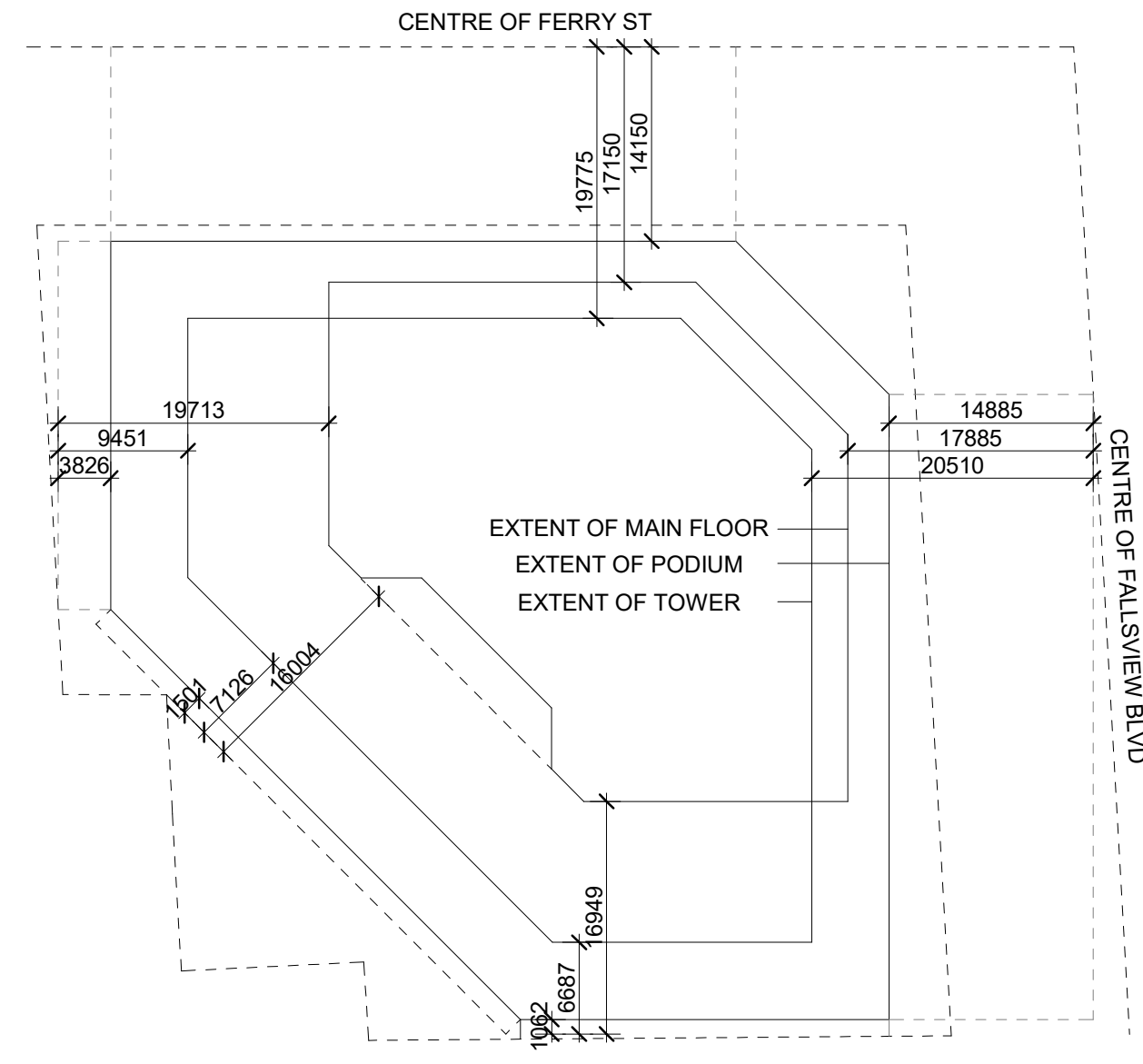
THERESA WEATHERHEAD
905-643-7560
I.E.L. PROJECT MANAGER, ENVIRONMENTAL
TERRAPROBE - AN ENGLOBE COMPANY
903 BARTON STREET, UNIT 22
STONE CREEK, ON
L8E 5P5

CULTURAL HERRITAGE IMPACT STUDY

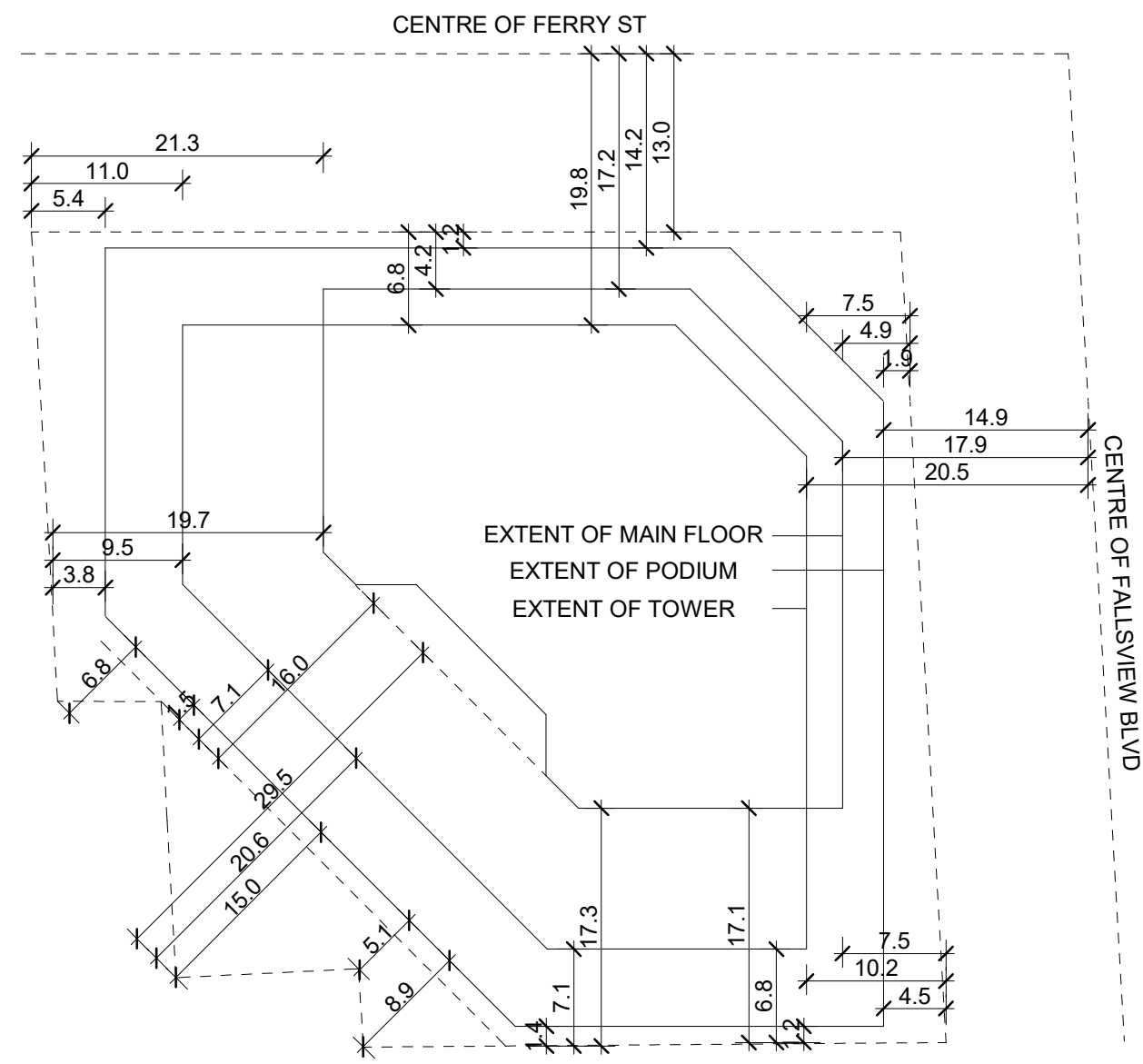
CHRISTIANNE UCHIYAMA
613-507-7817
PRINCIPAL, MANAGER
LHC HERITAGE PLANNING AND ARCHAEOLOGY
937 PRINCESS ST SUITE 400
KINGSTON, ON
K7L 1G8

ENVIRONMENTAL SITE ASSESSMENT & R.O.S.C.

NICOLE METZ
ETPD, ERPC, PROJECT COORDINATOR
HALLEX ENVIRONMENTAL LTD
4999 VICTORIA AVENUE
NIAGARA FALLS, ON
L2E 4C9



2 LIMITING DISTANCE DIAGRAM UNITS: MILLIMETERS
A001 1 : 500



3 ZONING SETBACK DIAGRAM UNITS: METERS
A001 1 : 500



1 Area Plan UNITS: METERS
A001 1 : 3500
GRAPHIC SCALE: 1:3500

VEHICLE PARKING SUMMARY

FLOOR	CAR SHARE	UNIVERSAL	REGULAR
LEVEL P3	0	1	31
LEVEL P2	0	1	68
LEVEL P1	0	1	68
MAIN FLOOR	9	5	4
LEVEL 02	0	1	68
LEVEL 03	0	1	68
LEVEL 04	0	1	68
LEVEL 05	0	1	68
SUBTOTAL		12	481
TOTAL	9		456

BICYCLE PARKING SUMMARY

FLOOR	INDOOR (PRIVATE)	OUTDOOR (PRIVATE)	OUTDOOR (PUBLIC)
LEVEL P2	0	0	0
LEVEL P1	0	0	0
MAIN FLOOR	45	0	60
LEVEL 01	0	40	0
LEVEL 02	0	130	0
LEVEL 03	0	40	0
LEVEL 04	0	20	0
SUBTOTAL	45	230	60
TOTAL		335	

RESIDENTIAL SUITE SUMMARY

LEVEL	SIZE	QTY/FLR	TOTAL QTY
LEVEL 6-29			
SUITE A1 - 1 BED	658 SF	8	192
SUITE A2 - 1 BED	630 SF	2	42
SUITE A3 - 1 BED	539 SF	1	24
SUITE B1 - 2 BED	885 SF	2	42
SUITE B2 - 2 BED+DEN	1153 SF	2	48
SUITE C1 - 2 BED	784 SF	2	48
SUITE D1 - 2 BED	1042 SF	2	48
LEVEL 30 PENTHOUSE LEVEL			
PENTHOUSE SUITES		12	12
TOTAL			456

SITE STATISTICS

MUNICIPAL ADDRESS	5438 FERRY ST NIAGARA FALLS, ON L2G 3R5
LEGAL ADDRESS	PART OF LOT 18 SOUTH SIDE OF FERRY STREET EAST OF STANLEY STREET PART OF LOT 19 SOUTH SIDE OF LUNDY'S LANE PART OF LOT 1 AND PART OF LOTS A&B WEST SIDE OF BUCHANAN STREET REGISTERED PLAN NO. 553 CITY OF NIAGARA FALLS REGIONAL MUNICIPALITY OF NIAGARA
SITE AREA	0.3491 HA (AFTER ROAD WIDENING)
BUILDING FOOTPRINT	0.2707 HA
LOT COVERAGE	0.2707/0.3491x100 = 77%
DENSITY	350 / 0.3491 = 1002 UNITS / HA

COMMERCIAL SUITE SUMMARY

	SIZE	FRONTAGE	STREET
CRU-1	133.7 SM	25.3 M	FERRY ST.
CRU-2	94.1 SM	8.7 M	FALLSVIEW BLVD.
TOTAL	227.8 SM	24 M	

DRAWING LIST

A0	COVER SHEET
A001	SITE PLAN
A200	LEVEL -02 PARKING FLOOR PLAN
A201	LEVEL -01 PARKING FLOOR PLAN
A202	LEVEL 01 MAIN FLOOR PLAN
A203	LEVEL 02 PARKING FLOOR PLAN
A204	LEVEL 03 PARKING FLOOR PLAN
A205	LEVEL 04 PARKING FLOOR PLAN
A206	LEVEL 05 PARKING FLOOR PLAN
A207	LEVEL 06 RESIDENTIAL FLOOR PLAN
A208	ROOF PLAN
A300	NORTH EXTERIOR ELEVATION
A301	EAST EXTERIOR ELEVATION
A302	SOUTH EXTERIOR ELEVATION
A303	WEST EXTERIOR ELEVATION
A400	3D VIEWS AXONOMETRIC
A401	3D RENDERERS
A402	3D RENDERERS

C	FOR ZBA	23JUN2023	MT
B	FOR OWNER REVIEW	31MAY2023	MT
A	FOR COORDINATION	19JUL2022	MT
Issue	Issued for	Date	Int.

Seal

Do not scale drawings. Report any discrepancies to Quartek Group Inc. before proceeding.
Drawings must be sealed by the Architect and / or Engineer prior to the use for any building permit applications and / or government approval. Seals must be signed by the Architect and / or Engineer before drawings are used for any construction.
All construction to be in accordance with the current Ontario Building Code and all applicable Ontario regulations.
All drawings and related documents remain the property of Quartek Group Inc., all drawings are protected under copyright and under contract.

Quartek
Architects + Planners
Engineers + Project Managers
T 905 984 8676
89 - 91 St. Paul Street, Suite 100,
St. Catharines, ON, L2R 3M3
www.quartekgroup.com

Project Title
**FERRY STREET
RESIDENTIAL TOWER**
5438 FERRY ST. NIAGARA FALLS

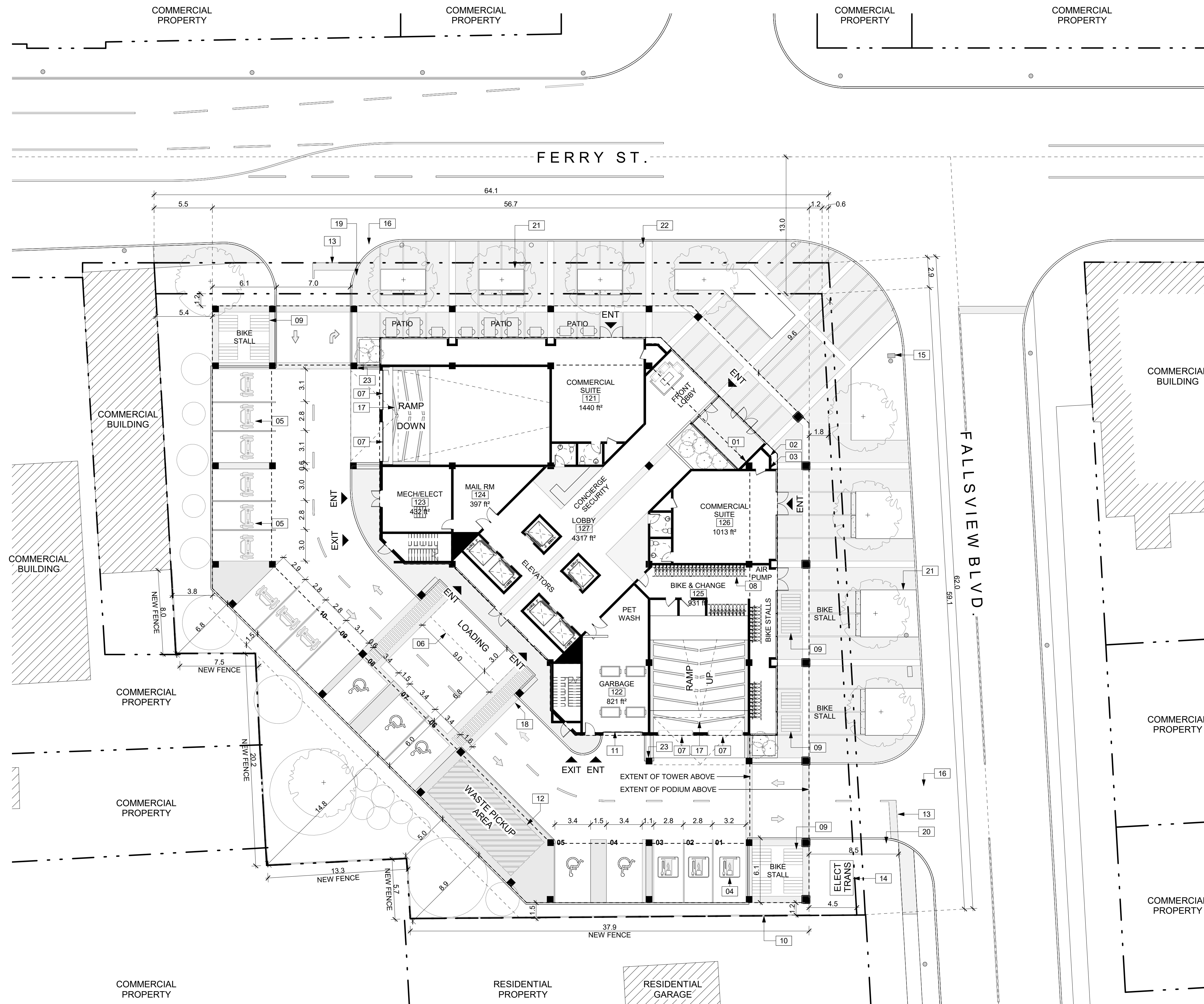
Drawing Title
**AREA PLAN, SITE
STATISTICS, DRAWING
LIST**

Drawn
MT
Designed by
MT

Scale
As indicated
Date Created
03/28/11

Job Number
21171
Issue
C

Drawing Number
A001



SITE PLAN KEYNOTES

- 01 FIRE ALARM PANEL AND SPRINKLER ANNUNCIATOR PANEL
- 02 FIRE DEPARTMENT SIAMESE CONNECTION
- 03 FIRE DEPARTMENT LOCKBOX
- 04 DEDICATED ELECTRIC VEHICLE CHARGING STALLS, 6 TOTAL
- 05 DEDICATED CAR SHARE VEHICLE STALLS, 8 TOTAL
- 06 3M X 9M LOADING STALL
- 07 HIGH SPEED ROLL UP DOOR ACCESS TO ABOVE AND BELOW GRADE PARKING STALLS. KEYCARD READER.
- 08 INTERIOR BICYCLE COMMUTER FACILITY INCLUDING BICYCLE PARKING STALLS, CHANGE ROOMS, AND SHOWER. KEYCARD ACCESS.
- 09 EXTERIOR COVERED BICYCLE PARKING.
- 10 NEW FENCE. REFERENCE LANDSCAPE.
- 11 ACCESS TO INTERIOR GARBAGE/RECYCLING ROOM VIA DOOR AND OVERHEAD DOOR WITH KEYPAD ACCESS FROM EXTERIOR.
- 12 EXTERIOR GARBAGE/RECYCLING PICKUP STAGING AREA.
- 13 ABANDON 3 EXISTING VEHICLE DRIVEWAY ACCESSES TO SITE AND REPLACE WITH 2 NEW VEHICLE ACCESSES.
- 14 TRANSFORMER LOCATION. BOLLARDS AS REQUIRED BY UTILITY.
- 15 EXISTING CITY AND UTILITY INFRASTRUCTURE TO REMAIN.
- 16 LINE OF GARBAGE TRUCK TURN SWEEP RADIUS.
- 17 HERRING BONE PATTERN VEHICLE TRACTION STRIPS ON RAMP. MAXIMUM SLOPE 20%.
- 18 CHANGE IN PAVING COLOUR INDICATING PEDESTRIAN CROSSING AREA.
- 19 RIGHT TURN ONLY SIGN FOR VEHICLES EXITING SITE.
- 20 STOP SIGN FOR VEHICLES EXISTING SITE
- 21 NEW LANDSCAPE PLANTING AREAS AND BENCHES. REFERENCE LANDSCAPE PLANS.
- 22 EXISTING STREET LIGHT STANDARDS TO REMAIN
- 23 STOP SIGN FOR VEHICLES EXITING RAMP

C	FOR ZBA	23JUN2023	MT
B	FOR OWNER REVIEW	31MAY2023	MT
A	FOR COORDINATION	19JUL2022	MT
Issue	Issued for	Date	Int.

Seal

Do not scale drawings. Report any discrepancies to Quartek Group Inc. before proceeding.

Drawings must be sealed by the Architect and / or Engineer prior to the use for any building permit applications and / or government approval. Seals must be signed by the Architect and / or Engineer before drawings are used for any construction.

All construction to be in accordance with the current Ontario Building Code and all applicable Ontario regulations.

All drawings and related documents remain the property of Quartek Group Inc., all drawings are protected under copyright and under contract.

Quartek

Architects • Planners
 Engineers • Project Managers

T 905 984 8676
 89 - 91 St. Paul Street, Suite 100,
 St. Catharines, ON, L2R 3M3
 www.quartekgroup.com

Project Title

FERRY STREET RESIDENTIAL TOWER

5438 FERRY ST. NIAGARA FALLS

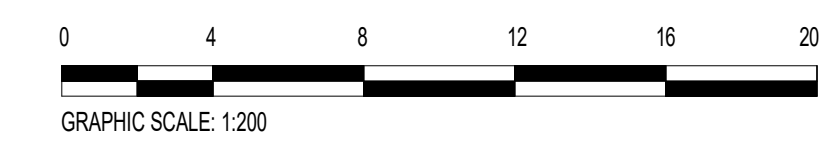
Drawing Title

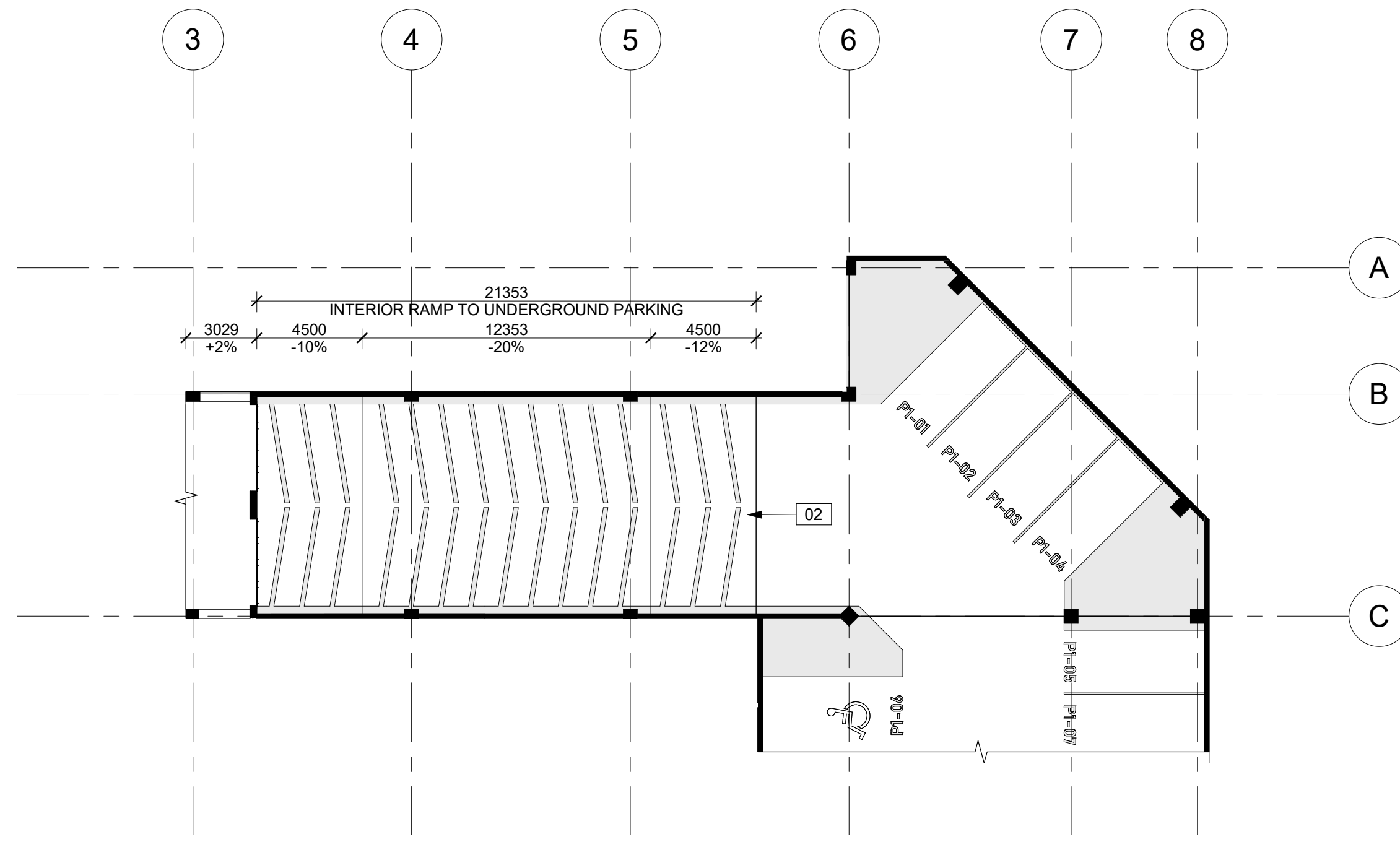
SITE PLAN

Drawn	Designed by
MT	MT
Scale	Date Created
1 : 200	03/28/11
Job Number	Issue
21171	C
Drawing Number	

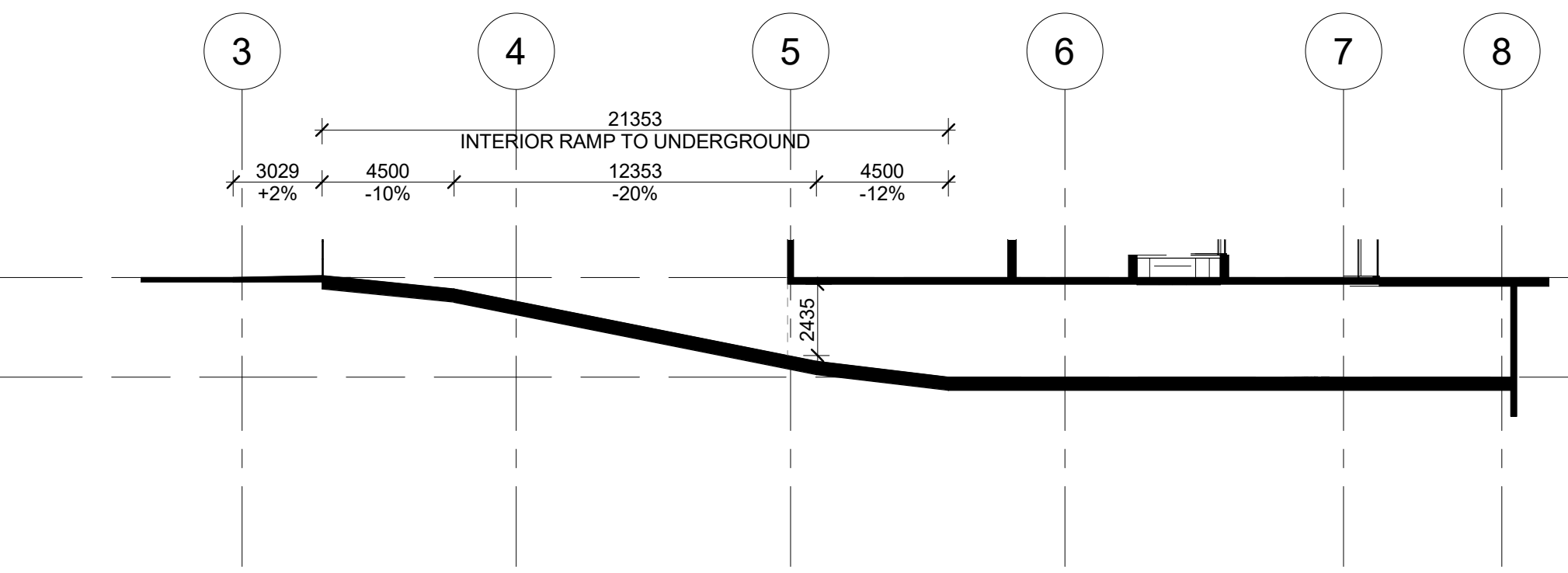
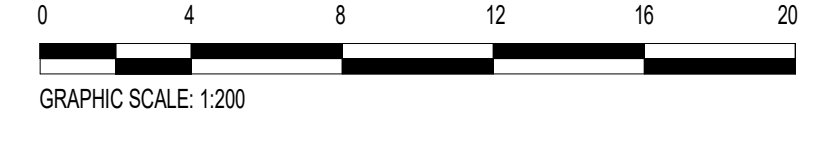
A100

1 LVL_01 MAIN FLOOR1
 A100 1 : 200

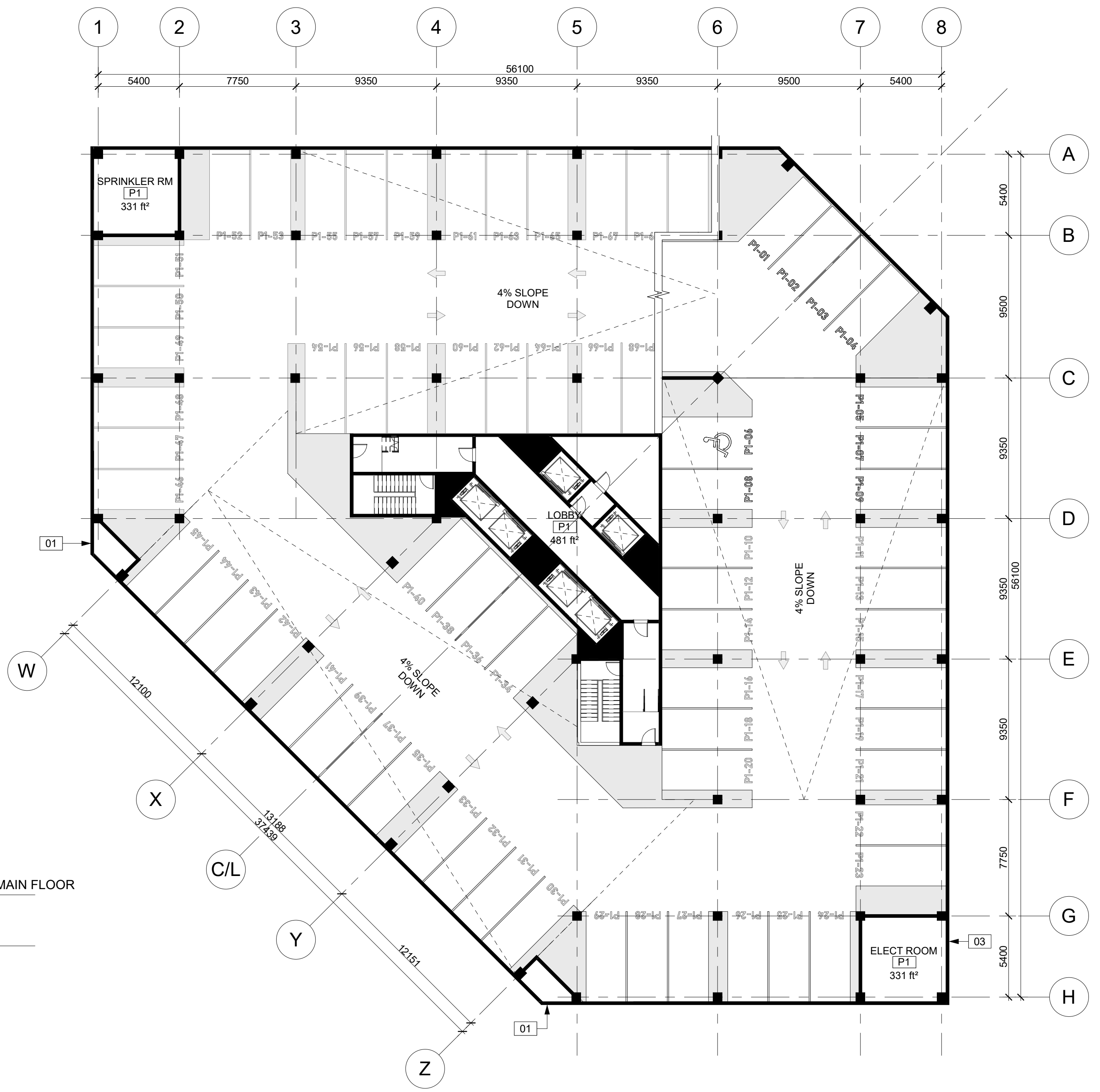
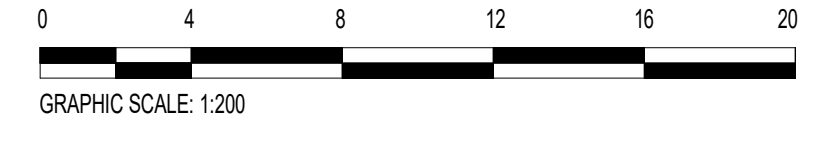




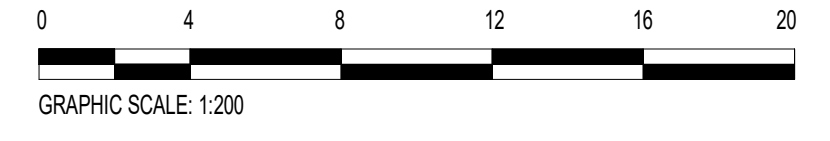
2 RAMP TO BELOW - PLAN
A201 1:200



3 RAMP TO BELOW - SECTION
A201 1:200



1 LVL P1 PARKING
A201 1:200



PARKING LEVEL KEYNOTES

- 01 DUCT SHAFTS FOR BELOW GROUND VENTILATION.
- 02 HERRINGBONE TRACTION AND DRAINAGE PATTERN ON RAMP.
- 03 APPROXIMATE LOCATION OF MAIN ELECTRICAL FEED INTO BUILDING. REFERENCE CIVIL.
- 04 APPROXIMATE LOCATION OF MAIN WATER FEED INTO BUILDING. REFERENCE CIVIL.
- 05 OVERHEAD DOORS INTO MAIN MECHANICAL ROOM.

- 06 KEYCARD ACCESS OPEN AIR BIKE COMPOUND.
- 07 PERFORATED METAL SCREEN WITH PLANTERS AND IRRIGATION SYSTEM.
- 08 PRELIMINARY LOCATION AND SIZE OF MECHANICAL AREAS. PENDING ENGINEERING.

PARKING LEVEL GENERAL NOTES

- A. MECHANICAL AND ELECTRICAL EQUIPMENT ALLOWANCES ARE ESTIMATED. PENDING ENGINEERING.
- B. PARKING LEVEL 02, 03, AND 04 ABOVE GRADE OPEN AIR PARKING. PARKING LEVEL P01 AND P02 BELOW GROUND CLIMATIZED INTERIOR PARKING.

C	FOR ZBA	23JUN2023	MT
B	FOR OWNER REVIEW	31MAY2023	MT
A	FOR COORDINATION	19JUL2022	MT
Issue	Issued for	Date	Int.

Do not scale drawings. Report any discrepancies to Quartek Group Inc. before proceeding.
 Drawings must be sealed by the Architect and / or Engineer prior to the use for any building permit applications and / or government approval. Seals must be signed by the Architect and / or Engineer before drawings are used for any construction.
 All construction to be in accordance with the current Ontario Building Code and all applicable Ontario regulations.
 All drawings and related documents remain the property of Quartek Group Inc., all drawings are protected under copyright and under contract.

Quartek
 Architects • Planners
 Engineers • Project Managers
 T: 905.984.8676
 89 - 91 St. Paul Street, Suite 100,
 St. Catharines, ON, L2R 3M3
 www.quartekgroup.com

Project Title

FERRY STREET RESIDENTIAL TOWER

5438 FERRY ST. NIAGARA FALLS

Drawing Title

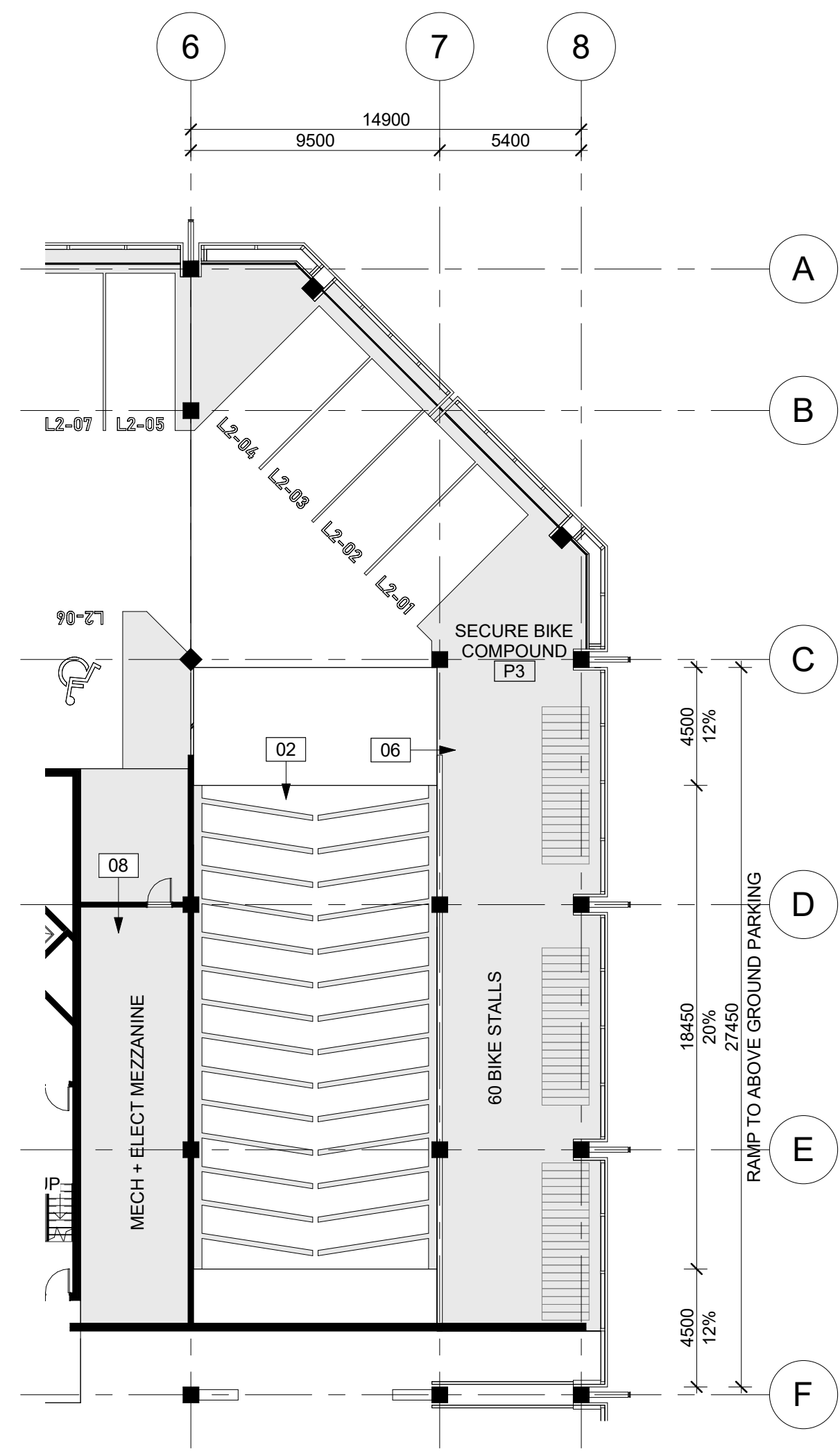
LEVEL -01 FLOOR PLAN

Drawn: MT Designed by: MT

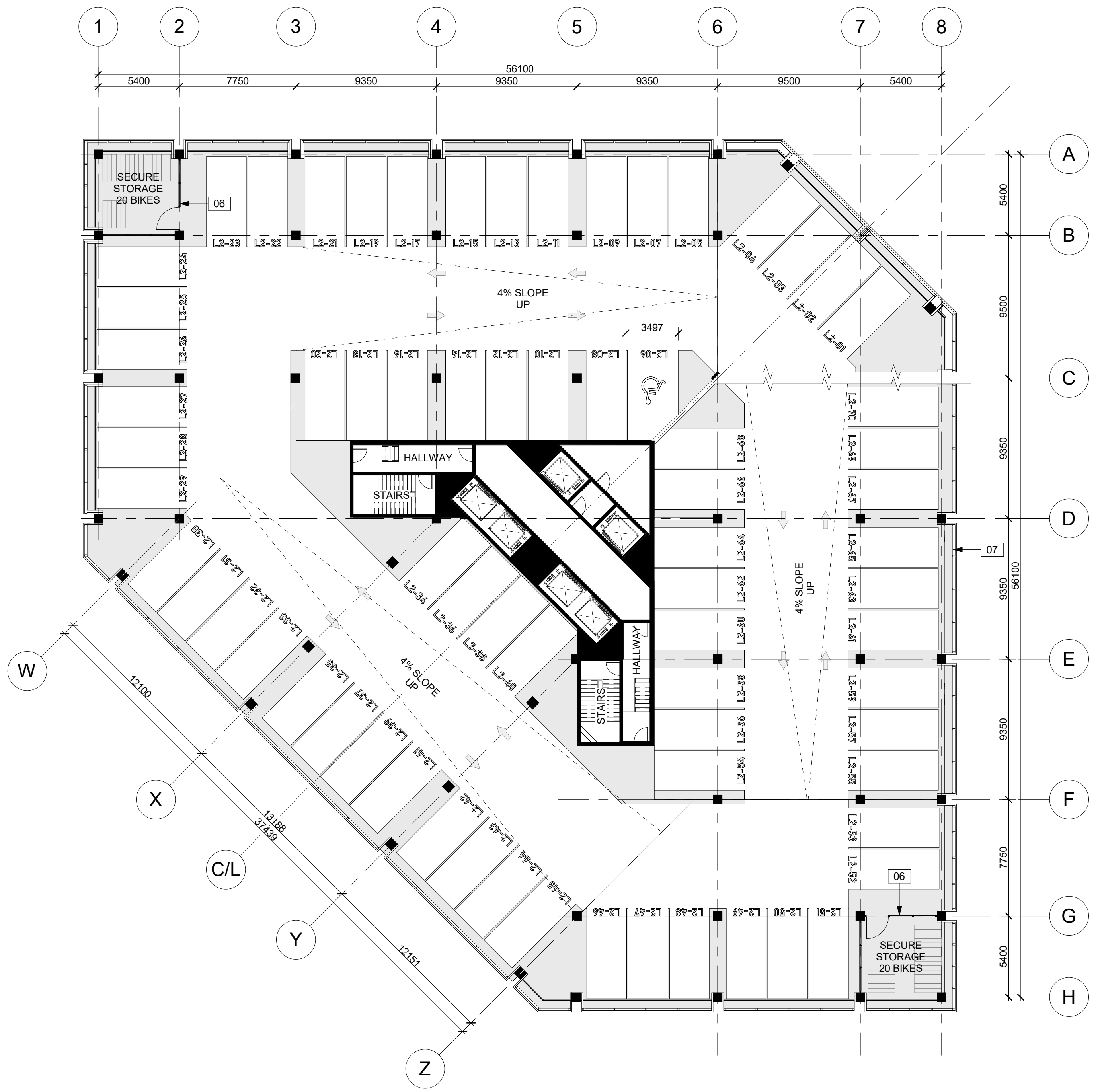
Scale: 1:200 Date Created: 03/28/11

Job Number: 21171 Issue: C

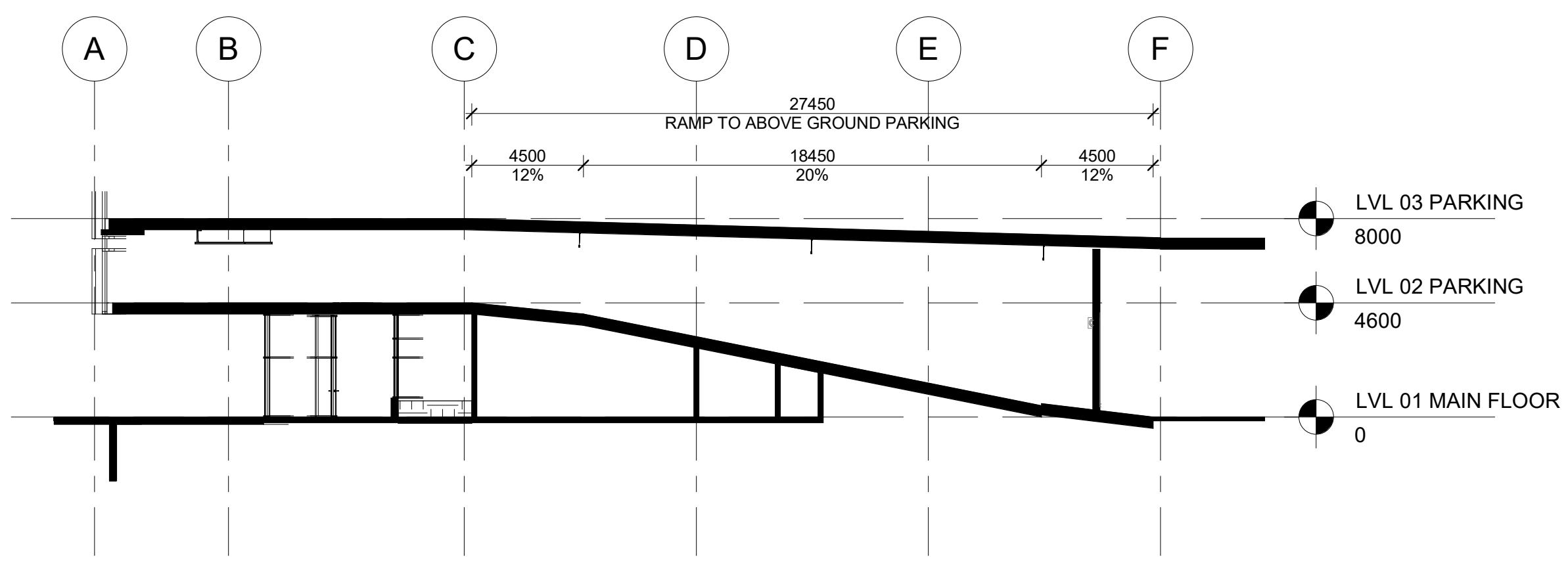
Drawing Number: A201



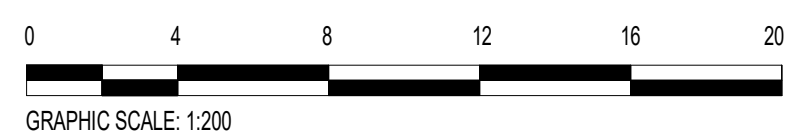
2 RAMP TO ABOVE - PLAN
A203 1 : 200



1 LVL 02 PARKING
A203 1 : 200



3 RAMP TO ABOVE - SECTION
A203 1 : 200



PARKING LEVEL KEYNOTES

- 01 DUCT SHAFTS FOR BELOW GROUND VENTILATION.
- 02 HERRINGBONE TRACTION AND DRAINAGE PATTERN ON RAMP.
- 03 APPROXIMATE LOCATION OF MAIN ELECTRICAL FEED INTO BUILDING. REFERENCE CIVIL.
- 04 APPROXIMATE LOCATION OF MAIN WATER FEED INTO BUILDING. REFERENCE CIVIL.
- 05 OVERHEAD DOORS INTO MAIN MECHANICAL ROOM.

- 06 KEYCARD ACCESS OPEN AIR BIKE COMPOUND.
- 07 PERFORATED METAL SCREEN WITH PLANTERS AND IRRIGATION SYSTEM.
- 08 PRELIMINARY LOCATION AND SIZE OF MECHANICAL AREAS. PENDING ENGINEERING.

PARKING LEVEL GENERAL NOTES

- A. MECHANICAL AND ELECTRICAL EQUIPMENT ALLOWANCES ARE ESTIMATED. PENDING ENGINEERING.
- B. PARKING LEVEL 02, 03, AND 04 ABOVE GRADE OPEN AIR PARKING. PARKING LEVEL P01 AND P02 BELOW GROUND CLIMATIZED INTERIOR PARKING.

C	FOR ZBA	23JUN2023	MT
B	FOR OWNER REVIEW	31MAY2023	MT
A	FOR COORDINATION	19JUL2022	MT
Issue	Issued for	Date	Int.

Do not scale drawings. Report any discrepancies to Quartek Group Inc. before proceeding.
 Drawings must be sealed by the Architect and / or Engineer prior to the use for any building permit applications and / or government approval. Seals must be signed by the Architect and / or Engineer before drawings are used for any construction.
 All construction to be in accordance with the current Ontario Building Code and all applicable Ontario regulations.
 All drawings and related documents remain the property of Quartek Group Inc., all drawings are protected under copyright and under contract.

Quartek
 Architects • Planners
 Engineers • Project Managers
 T: 905.984.8676
 89 - 91 St. Paul Street, Suite 100,
 St. Catharines, ON, L2R 3M3
 www.quartekgroup.com

Project Title

FERRY STREET RESIDENTIAL TOWER

5438 FERRY ST. NIAGARA FALLS

Drawing Title

LEVEL 02 PARKING PLAN

Drawn: MT, Designed by: MT

Scale: 1 : 200, Date Created: 03/28/11

Job Number: 21171, Issue: C

Drawing Number: A203

APPENDIX B - CITY CORRESPONDENCE



Sabrina Chan

From: David Booker
Sent: August 2, 2022 9:06 AM
To: Domenic Di Flavio; Sabrina Chan
Subject: FW: [EXTERNAL]-2022-5685-00 - Traffic Impact Study and Parking Study for 5438 Ferry Street in Niagara Falls, ON

Please see below.

David Booker, CET, TSOS
Discipline Lead - Traffic Systems
Associated Engineering (Ont.) Ltd.

Suite 300 - 101 Lampman Court, Niagara-on-the-Lake, ON L0S 1J0
Tel: 905.346.0990 | Cel: 905.868.4716 | Dir: 289.974.0373

Please note that our location remains the same, but our street has been renamed from Glendale Avenue East to Lampman Court.



From: John Grubich <jgrubich@niagarafalls.ca>
Sent: July 29, 2022 3:07 PM
To: David Booker <bookerd@ae.ca>
Subject: RE: [EXTERNAL]-2022-5685-00 - Traffic Impact Study and Parking Study for 5438 Ferry Street in Niagara Falls, ON

David;

Thank you for providing the terms of reference for the traffic/parking study for this redevelopment.

The study area is fine. The most recent counts we have are from summer 2019, pre-Covid. However, I'd like your study to build upon the approved Fallsview EA. A 1% annual growth rate will be accepted, instead of 2%. Please include the development at the SW corner of Stanley/Ferry in the background traffic analysis. That site is under construction.

The Niagara Region maintains signal timing data. Requests to acquire timing plans can be made through the Regional website using the following link: <https://www.niagararegion.ca/living/roads/permits/traffic-data-requests.aspx>.

Please provide comments in your report on the two driveways (one on Ferry and one on Fallsview) – setbacks, queue lengths from intersections, etc. and identify if they can both operate safely and efficiently as all-moves accesses.

For parking, the City is looking to see a strong TDM strategies for the development (such as offering subsidized transit passes to residents, bike parking/lockers, car share parking spaces, etc.) to provide residents with alternate forms of transportation. There are some proposed developments in the tourist core scheduled at the August 9th Council meeting asking for the same consideration. I will circle back with you on the parking after the Council meeting.

I trust this information is helpful.

From: David Booker <bookerd@ae.ca>
Sent: Monday, July 25, 2022 2:38 PM
To: John Grubich <jgrubich@niagarafalls.ca>
Subject: [EXTERNAL]-2022-5685-00 - Traffic Impact Study and Parking Study for 5438 Ferry Street in Niagara Falls, ON

Good Afternoon John,

In reference to the proposed development site at 5438 Ferry St., please see the attached Terms of Reference for your approval to perform a Traffic Impact and Parking Study. I welcome your comments.

Kindest Regards,

David Booker, CET, TSO
Discipline Lead - Traffic Systems
Associated Engineering (Ont.) Ltd.
Suite 300 - 101 Lampman Court, Niagara-on-the-Lake, ON L0S 1J0
Tel: 905.346.0990 | Cel: 905.868.4716 | Dir: 289.974.0373

Please note that our location remains the same, but our street has been renamed from Glendale Avenue East to Lampman Court.



You may [unsubscribe from Associated's electronic communications](#) at any time.

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

APPENDIX C - TRAFFIC DATA



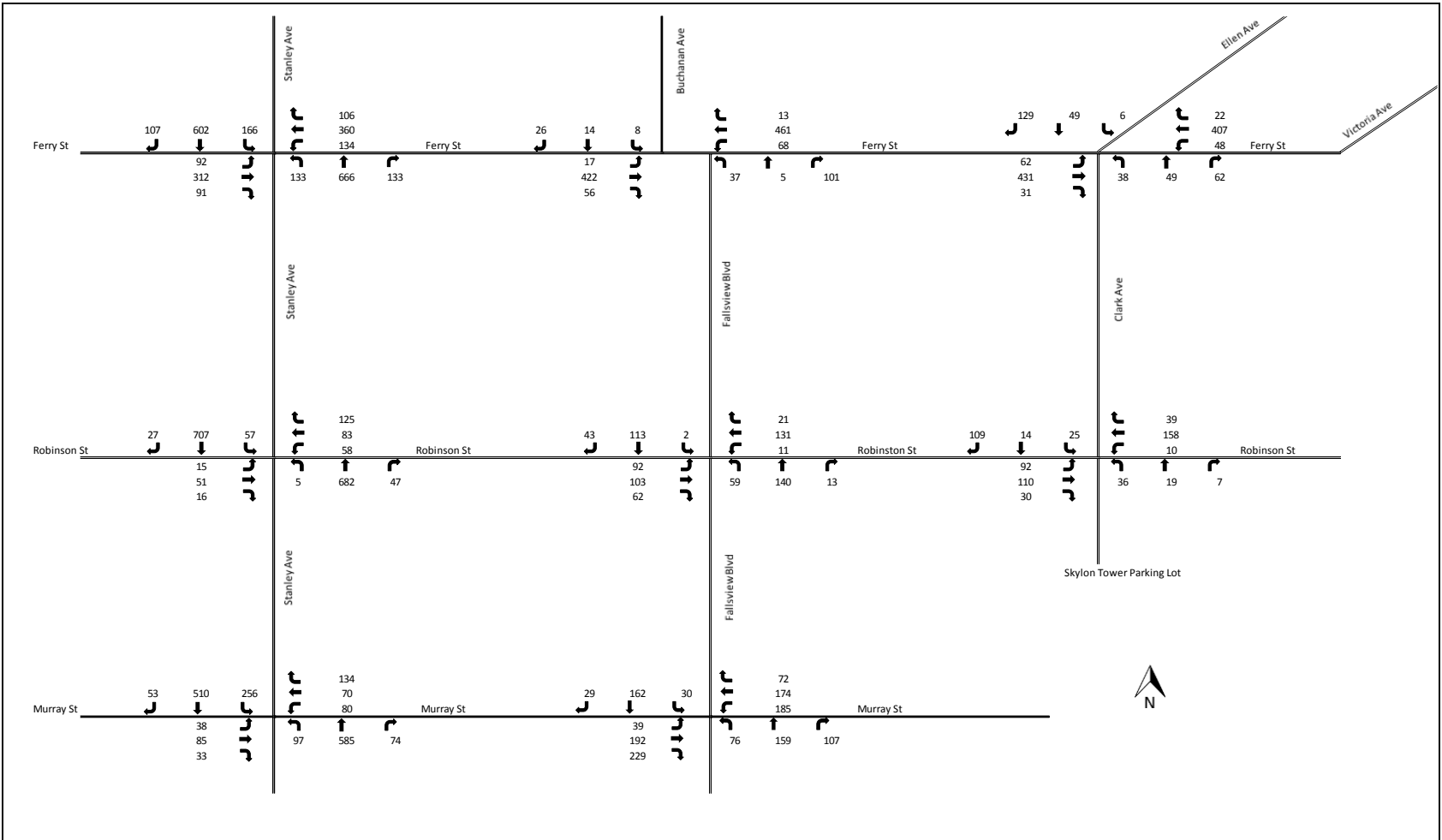


Figure 6: Existing Traffic Volumes

APPENDIX D - EXISTING SYNCHRO OUTPUTS



Lanes, Volumes, Timings

150: Stanley Avenue & Ferry Street

Existing 2022

Weekday PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	100	338	99	145	390	115	144	721	144	180	652	116
Future Volume (vph)	100	338	99	145	390	115	144	721	144	180	652	116
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0	45.0	35.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Storage Lanes	1	1	1	1	1	1	1	1	0	1	1	0
Taper Length (m)	7.5		15.0			30.0		7.5				
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	0.96		0.86	0.94		0.90	0.99	0.97	0.98	0.99		
Frt			0.850		0.850		0.975		0.977			
Flt Protected	0.950		0.950		0.950		0.950		0.950			
Satd. Flow (prot)	1630	1716	1458	1630	1716	1458	1630	3093	0	1630	3141	0
Flt Permitted	0.242		0.278		0.213		0.119					
Satd. Flow (perm)	400	1716	1261	449	1716	1310	360	3093	0	200	3141	0
Right Turn on Red			Yes		Yes		Yes			Yes		Yes
Satd. Flow (RTOR)			100		125		21			18		
Link Speed (k/h)		50		50		50		50		50		50
Link Distance (m)		132.9		61.1		360.0		89.4				
Travel Time (s)		9.6		4.4		25.9		6.4				
Confl. Peds. (#/hr)	75		103	103		75	36		71	71		36
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
Adj. Flow (vph)	109	367	108	158	424	125	157	784	157	196	709	126
Shared Lane Traffic (%)												
Lane Group Flow (vph)	109	367	108	158	424	125	157	941	0	196	835	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA		
Protected Phases	7	4		3	8		5	2	1	6		
Permitted Phases	4		4	8		8	2		6			
Detector Phase	7	4	4	3	8	8	5	2	1	6		
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0	8.0	6.0	8.0	6.0	8.0		
Minimum Split (s)	9.0	33.5	33.5	9.0	33.5	33.5	9.0	33.5	9.0	33.5		
Total Split (s)	15.0	46.5	46.5	15.0	46.5	46.5	13.0	35.5	13.0	35.5		
Total Split (%)	13.6%	42.3%	42.3%	13.6%	42.3%	42.3%	11.8%	32.3%	11.8%	32.3%		
Maximum Green (s)	12.0	40.0	40.0	12.0	40.0	40.0	10.0	29.0	10.0	29.0		
Yellow Time (s)	3.0	4.1	4.1	3.0	4.1	4.1	3.0	4.1	3.0	4.1		
All-Red Time (s)	0.0	2.4	2.4	0.0	2.4	2.4	0.0	2.4	0.0	2.4		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5	3.0	6.5		
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.2	2.2	2.5	2.2	2.2	2.5	2.2	2.5	2.2		
Recall Mode	None	Min	Min	None	Min	Min	None	C-Min	None	C-Min		
Walk Time (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0		
Flash Dont Walk (s)	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0		
Pedestrian Calls (#/hr)	0	0	0	0	0	0	0	0	0	0		
Act Efect Green (s)	43.1	30.2	30.2	46.3	31.8	31.8	50.7	36.9	55.5	39.5		
Actuated g/C Ratio	0.39	0.27	0.27	0.42	0.29	0.29	0.46	0.34	0.50	0.36		
v/c Ratio	0.42	0.78	0.26	0.51	0.85	0.27	0.55	0.90	0.73	0.73		
Control Delay	22.0	48.0	7.6	24.1	53.3	5.9	25.3	48.2	38.5	36.9		

Lanes, Volumes, Timings

150: Stanley Avenue & Ferry Street

Existing 2022

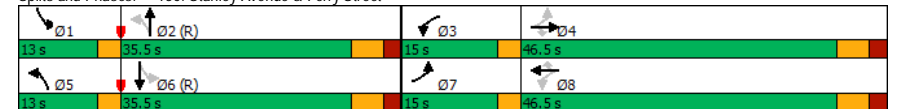
Weekday PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	48.0	7.6	24.1	53.3	5.9	25.3	48.2	38.5	36.9		
LOS	C	D	A	C	D	A	C	D	D	D		
Approach Delay		35.7		38.4		44.9						37.2
Approach LOS		D		D		D						D
Queue Length 50th (m)	14.5	77.1	1.3	21.7	89.8	0.0	18.6	108.3	23.9	85.7		
Queue Length 95th (m)	21.2	98.1	13.0	29.6	116.9	12.5	38.1	#170.8	#76.5	#141.7		
Internal Link Dist (m)		108.9		37.1		336.0						65.4
Turn Bay Length (m)			45.0	35.0		25.0						
Base Capacity (vph)	300	624	522	319	624	555	294	1050	269	1139		
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio	0.36	0.59	0.21	0.50	0.68	0.23	0.53	0.90	0.73	0.73		

Intersection Summary

Area Type: Other
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 6 (5%), Referenced to phase 2:NBL and 6:SBTL, Start of Green
 Natural Cycle: 85
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.90
 Intersection Signal Delay: 39.7
 Intersection LOS: D
 Intersection Capacity Utilization 86.9%
 ICU Level of Service E
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 150: Stanley Avenue & Ferry Street



HCM Signalized Intersection Capacity Analysis
150: Stanley Avenue & Ferry Street

Existing 2022
Weekday PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↗	↘	↔	↗	↘	↔	↗	↘	↔	↗	↘
Traffic Volume (vph)	100	338	99	145	390	115	144	721	144	180	652	116
Future Volume (vph)	100	338	99	145	390	115	144	721	144	180	652	116
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5	3.0	6.5	3.0	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Frpb, ped/bikes	1.00	1.00	0.86	1.00	1.00	0.90	1.00	0.97	1.00	0.99	1.00	0.99
Flpb, ped/bikes	0.99	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	1.00	0.98	1.00	0.98
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1618	1716	1261	1609	1716	1310	1625	3092	1627	3142	1627	3142
Flt Permitted	0.24	1.00	1.00	0.28	1.00	1.00	0.21	1.00	0.12	1.00	0.12	1.00
Satd. Flow (perm)	413	1716	1261	470	1716	1310	364	3092	204	3142	204	3142
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	367	108	158	424	125	157	784	157	196	709	126
RTOR Reduction (vph)	0	0	73	0	0	89	0	14	0	0	12	0
Lane Group Flow (vph)	109	367	35	158	424	36	157	927	0	196	823	0
Confl. Peds. (#/hr)	75		103	103		75	36		71	71		36
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	4	3	8	8	5	2	1	6	1	6
Permitted Phases	4		4	8		8	2		6		6	
Actuated Green, G (s)	39.6	30.2	30.2	42.8	31.8	31.8	47.1	36.8	52.5	39.5	39.5	39.5
Effective Green, g (s)	39.6	30.2	30.2	42.8	31.8	31.8	47.1	36.8	52.5	39.5	39.5	39.5
Actuated g/C Ratio	0.36	0.27	0.27	0.39	0.29	0.29	0.43	0.33	0.48	0.36	0.36	0.36
Clearance Time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5	3.0	6.5	3.0	6.5
Vehicle Extension (s)	2.5	2.2	2.2	2.5	2.2	2.2	2.5	2.2	2.5	2.2	2.5	2.2
Lane Grp Cap (vph)	251	471	346	296	496	378	273	1034	265	1128	265	1128
v/s Ratio Prot	0.04	0.21		c0.05	c0.25		0.05	c0.30	c0.09	0.26	c0.09	0.26
v/s Ratio Perm	0.12		0.03	0.15		0.03	0.19		0.26		0.26	
v/c Ratio	0.43	0.78	0.10	0.53	0.85	0.10	0.58	0.90	0.74	0.73	0.74	0.73
Uniform Delay, d1	25.5	36.8	29.8	24.1	36.9	28.6	21.1	34.8	21.3	30.6	21.3	30.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	7.4	0.1	1.4	13.1	0.1	2.4	12.0	9.8	4.2	9.8	4.2
Delay (s)	26.4	44.3	29.9	25.5	50.1	28.6	23.5	46.8	31.0	34.8	31.0	34.8
Level of Service	C	D	C	C	D	C	C	D	C	C	C	C
Approach Delay (s)		38.3			40.8			43.4		34.1		34.1
Approach LOS		D			D			D		C		C

Intersection Summary			
HCM 2000 Control Delay	39.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
250: Fallsview Boulevard/Buchanan Avenue & Ferry Street

Existing 2022
Weekday PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↗	↘	↔	↗	↘	↔	↗	↘	↔	↗	↘
Traffic Volume (vph)	18	457	61	74	499	14	40	5	109	9	15	28
Future Volume (vph)	18	457	61	74	499	14	40	5	109	9	15	28
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	30.0		0.0	45.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	15.0			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		0.982			0.996			0.904			0.928	
Frt		0.982			0.996			0.904			0.928	
Flt Protected	0.950			0.950				0.987			0.991	
Satd. Flow (prot)	1630	1685	0	1630	1709	0	0	1531	0	0	1578	0
Flt Permitted	0.950			0.950				0.987			0.991	
Satd. Flow (perm)	1630	1685	0	1630	1709	0	0	1531	0	0	1578	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		63.9			136.9			63.4			118.9	
Travel Time (s)		4.6			9.9			4.6			8.6	
Confl. Peds. (#/hr)	75		103	103		75						
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
Adj. Flow (vph)	20	497	66	80	542	15	43	5	118	10	16	30
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	563	0	80	557	0	0	166	0	0	56	0
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	61.0%
ICU Level of Service	B
Analysis Period (min)	15

HCM Unsignalized Intersection Capacity Analysis

Existing 2022

250: Fallsview Boulevard/Buchanan Avenue & Ferry Street

Weekday PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	457	61	74	499	14	40	5	109	9	15	28
Future Volume (Veh/h)	18	457	61	74	499	14	40	5	109	9	15	28
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)	20	497	66	80	542	15	43	5	118	10	16	30
Pedestrians	103											
Lane Width (m)	3.6			3.6			3.6			3.6		
Walking Speed (m/s)	1.2											
Percent Blockage	9											
Right turn flare (veh)	6											
Median type	None			None								
Median storage (veh)												
Upstream signal (m)	125											
pX, platoon unblocked												
vC, conflicting volume	632			666			1413			1465		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	632			666			1413			1465		
tC, single (s)	4.1			4.1			7.1			6.5		
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5			4.0		
p0 queue free %	98			91			39			95		
cM capacity (veh/h)	891			844			70			97		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	20	563	80	557	166	56						
Volume Left	20	0	80	0	43	10						
Volume Right	0	66	0	15	118	30						
cSH	891	1700	844	1700	178	138						
Volume to Capacity	0.02	0.33	0.09	0.33	0.93	0.41						
Queue Length 95th (m)	0.6	0.0	2.5	0.0	57.5	14.0						
Control Delay (s)	9.1	0.0	9.7	0.0	103.9	47.8						
Lane LOS	A		A		F	E						
Approach Delay (s)	0.3		1.2		103.9		47.8					
Approach LOS	F		E		F		E					
Intersection Summary												
Average Delay	14.5											
Intersection Capacity Utilization	61.0%			ICU Level of Service			B					
Analysis Period (min)	15											

Lanes, Volumes, Timings

Existing 2022

350: Fallsview Boulevard & Robinson Street

Weekday PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	112	67	12	142	23	64	152	14	2	122	47
Future Volume (vph)	100	112	67	12	142	23	64	152	14	2	122	47
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt	0.968			0.982			0.992			0.963		
Flt Protected	0.982			0.997			0.986			0.999		
Satd. Flow (prot)	0	1631	0	0	1680	0	0	1678	0	0	1651	0
Flt Permitted	0.982			0.997			0.986			0.999		
Satd. Flow (perm)	0	1631	0	0	1680	0	0	1678	0	0	1651	0
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	125.4			133.0			52.4			289.1		
Travel Time (s)	9.0			9.6			3.8			20.8		
Confl. Peds. (#/hr)	20		9	9		20	15		15	15		15
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
Adj. Flow (vph)	109	122	73	13	154	25	70	165	15	2	133	51
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	304	0	0	192	0	0	250	0	0	186	0
Sign Control	Stop			Stop			Stop			Stop		
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	67.6%			ICU Level of Service			C					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
350: Fallsview Boulevard & Robinson Street

Existing 2022
Weekday PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	100	112	67	12	142	23	64	152	14	2	122	47
Future Volume (vph)	100	112	67	12	142	23	64	152	14	2	122	47
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)	109	122	73	13	154	25	70	165	15	2	133	51
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	304	192	250	186								
Volume Left (vph)	109	13	70	2								
Volume Right (vph)	73	25	15	51								
Hadj (s)	-0.04	-0.03	0.05	-0.13								
Departure Headway (s)	5.5	5.7	5.7	5.7								
Degree Utilization, x	0.46	0.30	0.40	0.29								
Capacity (veh/h)	611	570	575	568								
Control Delay (s)	13.1	11.1	12.4	11.0								
Approach Delay (s)	13.1	11.1	12.4	11.0								
Approach LOS	B	B	B	B								
Intersection Summary												
Delay			12.1									
Level of Service			B									
Intersection Capacity Utilization			67.6%		ICU Level of Service							C
Analysis Period (min)			15									

Lanes, Volumes, Timings
450: Stanley Avenue & Robinson Street

Existing 2022
Weekday PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↕	↕			↕			↕			↕	
Traffic Volume (vph)	16	55	17	63	90	135	5	739	51	62	766	29
Future Volume (vph)	16	55	17	63	90	135	5	739	51	62	766	29
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	40.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	15.0			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Ped Bike Factor	0.99	1.00			0.98			1.00				1.00
Frt		0.965			0.937			0.990				0.995
Flt Protected	0.950				0.989							0.996
Satd. Flow (prot)	1630	1648	0	0	1567	0	0	3217	0	0	3223	0
Flt Permitted	0.469				0.903			0.950			0.815	
Satd. Flow (perm)	796	1648	0	0	1428	0	0	3056	0	0	2636	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		18			65			15			7	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		130.3			125.4			90.2			360.0	
Travel Time (s)		9.4			9.0			6.5			25.9	
Confl. Peds. (#/hr)	20		9	9		20	30		18	18		30
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
Adj. Flow (vph)	17	60	18	68	98	147	5	803	55	67	833	32
Shared Lane Traffic (%)												
Lane Group Flow (vph)	17	78	0	0	313	0	0	863	0	0	932	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4				8			2			6	
Detector Phase	4	4			8			2	2		6	6
Switch Phase												
Minimum Initial (s)	8.0	8.0			8.0	8.0		8.0	8.0		8.0	8.0
Minimum Split (s)	28.0	28.0			28.0	28.0		28.0	28.0		28.0	28.0
Total Split (s)	27.0	27.0			27.0	27.0		42.0	42.0		42.0	42.0
Total Split (%)	39.1%	39.1%			39.1%	39.1%		60.9%	60.9%		60.9%	60.9%
Maximum Green (s)	20.0	20.0			20.0	20.0		35.0	35.0		35.0	35.0
Yellow Time (s)	4.0	4.0			4.0	4.0		4.0	4.0		4.0	4.0
All-Red Time (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	3.0
Lost Time Adjust (s)	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	7.0	7.0			7.0	7.0		7.0	7.0		7.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.1	2.1			2.1	2.1		2.2	2.2		2.2	2.2
Recall Mode	Min	Min			Min	Min		C-Min	C-Min		C-Min	C-Min
Walk Time (s)	8.0	8.0			8.0	8.0		8.0	8.0		8.0	8.0
Flash Dont Walk (s)	13.0	13.0			13.0	13.0		13.0	13.0		13.0	13.0
Pedestrian Calls (#/hr)	0	0			0	0		0	0		0	0
Act Effct Green (s)	16.0	16.0			16.0	16.0		39.0	39.0		39.0	39.0
Actuated g/C Ratio	0.23	0.23			0.23	0.23		0.57	0.57		0.57	0.57
v/c Ratio	0.09	0.20			0.82	0.82		0.50	0.50		0.62	0.62
Control Delay	19.7	16.9			37.4	37.4		11.0	11.0		13.4	13.4

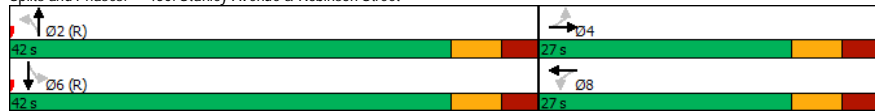
Lanes, Volumes, Timings
450: Stanley Avenue & Robinson Street

Existing 2022
Weekday PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	19.7	16.9			37.4			11.0			13.4	
LOS	B	B			D			B			B	
Approach Delay		17.4			37.4			11.0			13.4	
Approach LOS		B			D			B			B	
Queue Length 50th (m)	1.8	6.4			31.3			34.5			41.8	
Queue Length 95th (m)	6.1	15.5			#59.1			54.7			68.1	
Internal Link Dist (m)		106.3			101.4			66.2			336.0	
Turn Bay Length (m)	40.0											
Base Capacity (vph)	231	491			461			1735			1494	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.07	0.16			0.68			0.50			0.62	

Intersection Summary
 Area Type: Other
 Cycle Length: 69
 Actuated Cycle Length: 69
 Offset: 29 (42%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 60
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.82
 Intersection Signal Delay: 16.0 Intersection LOS: B
 Intersection Capacity Utilization 93.2% ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 450: Stanley Avenue & Robinson Street



HCM Signalized Intersection Capacity Analysis
450: Stanley Avenue & Robinson Street

Existing 2022
Weekday PM

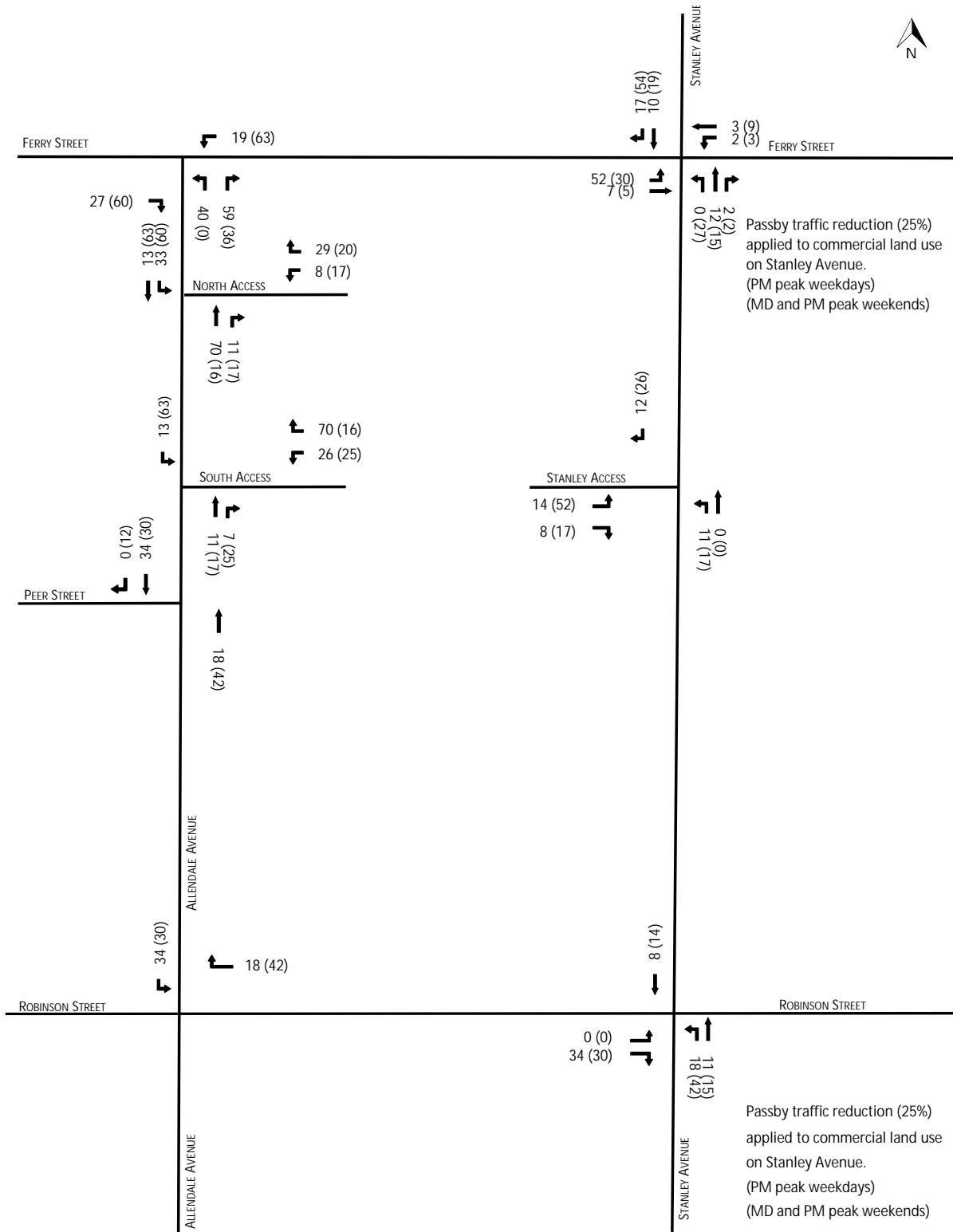
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔			↔			↔			↔	
Traffic Volume (vph)	16	55	17	63	90	135	5	739	51	62	766	29
Future Volume (vph)	16	55	17	63	90	135	5	739	51	62	766	29
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	7.0	7.0			7.0			7.0			7.0	
Lane Util. Factor	1.00	1.00			1.00			0.95			0.95	
Frpb, ped/bikes	1.00	1.00			0.99			1.00			1.00	
Flpb, ped/bikes	0.99	1.00			1.00			1.00			1.00	
Frpt	1.00	0.97			0.94			0.99			0.99	
Flpt Protected	0.95	1.00			0.99			1.00			1.00	
Satd. Flow (prot)	1613	1648			1564			3217			3222	
Flpt Permitted	0.47	1.00			0.90			0.95			0.81	
Satd. Flow (perm)	796	1648			1427			3056			2635	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	60	18	68	98	147	5	803	55	67	833	32
RTOR Reduction (vph)	0	14	0	0	50	0	0	7	0	0	3	0
Lane Group Flow (vph)	17	64	0	0	263	0	0	856	0	0	929	0
Confl. Peds. (#/hr)	20		9	9		20	30		18	18		30
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)	16.0	16.0			16.0			39.0			39.0	
Effective Green, g (s)	16.0	16.0			16.0			39.0			39.0	
Actuated g/C Ratio	0.23	0.23			0.23			0.57			0.57	
Clearance Time (s)	7.0	7.0			7.0			7.0			7.0	
Vehicle Extension (s)	2.1	2.1			2.1			2.2			2.2	
Lane Grp Cap (vph)	184	382			330			1727			1489	
v/s Ratio Prot		0.04										
v/s Ratio Perm	0.02				c0.18			0.28			c0.35	
v/c Ratio	0.09	0.17			0.80			0.50			0.62	
Uniform Delay, d1	20.8	21.2			25.0			9.1			10.1	
Progression Factor	1.00	1.00			1.00			1.00			1.00	
Incremental Delay, d2	0.1	0.1			11.9			1.0			2.0	
Delay (s)	20.9	21.3			36.8			10.1			12.1	
Level of Service	C	C			D			B			B	
Approach Delay (s)		21.2			36.8			10.1			12.1	
Approach LOS		C			D			B			B	

Intersection Summary
 HCM 2000 Control Delay 15.2 HCM 2000 Level of Service B
 HCM 2000 Volume to Capacity ratio 0.67
 Actuated Cycle Length (s) 69.0 Sum of lost time (s) 14.0
 Intersection Capacity Utilization 93.2% ICU Level of Service F
 Analysis Period (min) 15
 c Critical Lane Group

APPENDIX E - BACKGROUND DEVELOPMENT AND FALLSVIEW EA EXCERPTS



Base Year (2028) Development Traffic
 Summer Weekday Peak Hour (AM/PM)



By 2024 Horizon Year:

- + Implement Intersection Alternative 2 at Ferry Street & Fallsview Boulevard/Buchanan Avenue: close Buchanan Avenue and signalize intersection;
- + Install traffic signals at the intersections of Fallsview Boulevard & Robinson Street and Clark Avenue & Robinson Street (both currently stop-controlled); and
- + Convert the through/right lane in the eastbound direction of Murray Street & Fallsview Boulevard into an exclusive right turn lane.

By 2034 Horizon Year:

- + Add an exclusive right-turn lane in the westbound direction of Murray Street & Stanley Avenue;
- + Add an exclusive left-turn lane in the westbound and southbound directions of Robinson & Stanley;
- + Add exclusive left-turn lanes in the eastbound and westbound directions of Robinson Street & Fallsview Boulevard (mostly pavement markings, minor widening);
- + Add exclusive left-turn lanes in the northbound and southbound directions of Fallsview Boulevard and Robinson Street; and
- + Add exclusive left-turn lane in the eastbound direction of Robinson & Clark (mostly pavement markings).



APPENDIX F - FUTURE BACKGROUND SYNCHRO OUTPUTS

Lanes, Volumes, Timings

Future Background 2032

150: Stanley Avenue & Ferry Street

Weekday PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	[Diagrammatic arrows for lane configurations]											
Traffic Volume (vph)	140	378	109	163	440	127	186	811	161	199	739	182
Future Volume (vph)	140	378	109	163	440	127	186	811	161	199	739	182
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0	45.0	35.0		0.0	25.0		0.0	0.0		0.0	0.0
Storage Lanes	1	1	1		1	1		0	1		0	0
Taper Length (m)	7.5		15.0				30.0			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	0.97		0.86	0.95		0.90		0.97			0.98	
Frt			0.850		0.850		0.975				0.970	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	1716	1458	1630	1716	1458	1630	3093	0	1630	3105	0
Flt Permitted	0.198			0.270			0.124			0.119		
Satd. Flow (perm)	329	1716	1261	439	1716	1310	213	3093	0	204	3105	0
Right Turn on Red			Yes		Yes			Yes			Yes	
Satd. Flow (RTOR)			98		138		20			27		
Link Speed (k/h)		50		50		50		50		50		
Link Distance (m)		132.9		61.1		360.0		89.4				
Travel Time (s)		9.6		4.4		25.9		6.4				
Confl. Peds. (#/hr)	75		103	103		75	36		71	71		36
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
Adj. Flow (vph)	152	411	118	177	478	138	202	882	175	216	803	198
Shared Lane Traffic (%)												
Lane Group Flow (vph)	152	411	118	177	478	138	202	1057	0	216	1001	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA		
Protected Phases	7	4		3	8		5	2	1	6		
Permitted Phases	4		4	8		8	2		6			
Detector Phase	7	4	4	3	8	8	5	2	1	6		
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0	8.0	6.0	8.0	6.0	8.0		
Minimum Split (s)	9.0	33.5	33.5	9.0	33.5	33.5	9.0	33.5	9.0	33.5		
Total Split (s)	15.0	46.5	46.5	15.0	46.5	46.5	13.0	35.5	13.0	35.5		
Total Split (%)	13.6%	42.3%	42.3%	13.6%	42.3%	42.3%	11.8%	32.3%	11.8%	32.3%		
Maximum Green (s)	12.0	40.0	40.0	12.0	40.0	40.0	10.0	29.0	10.0	29.0		
Yellow Time (s)	3.0	4.1	4.1	3.0	4.1	4.1	3.0	4.1	3.0	4.1		
All-Red Time (s)	0.0	2.4	2.4	0.0	2.4	2.4	0.0	2.4	0.0	2.4		
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5	3.0	6.5		
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag		
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.2	2.2	2.5	2.2	2.2	2.5	2.2	2.5	2.2		
Recall Mode	None	Min	Min	None	Min	Min	None	C-Min	None	C-Min		
Walk Time (s)		10.0	10.0		10.0	10.0		10.0		10.0		
Flash Dont Walk (s)		17.0	17.0		17.0	17.0		17.0		17.0		
Pedestrian Calls (#/hr)		0	0		0	0		0		0		
Act Effct Green (s)	48.1	33.9	33.9	49.1	34.5	34.5	48.1	32.3	50.5	33.6		
Actuated g/C Ratio	0.44	0.31	0.31	0.45	0.31	0.31	0.44	0.29	0.46	0.31		
v/c Ratio	0.57	0.78	0.26	0.56	0.89	0.27	0.80	1.15	0.80	1.04		
Control Delay	24.4	44.7	8.5	23.3	55.0	5.5	48.2	114.8	48.6	76.7		

Lanes, Volumes, Timings

Future Background 2032

150: Stanley Avenue & Ferry Street

Weekday PM

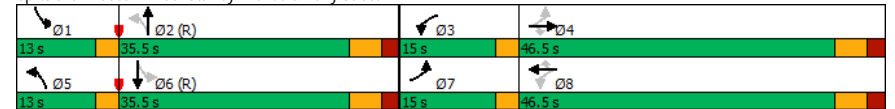
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.4	44.7	8.5	23.3	55.0	5.5	48.2	114.8	48.6	76.7		
LOS	C	D	A	C	E	A	D	F	D	E		
Approach Delay		33.9			39.3			104.1				71.7
Approach LOS		C			D			F				E
Queue Length 50th (m)	18.8	82.9	3.1	22.3	100.5	0.0	28.0	-158.4	32.3	-142.5		
Queue Length 95th (m)	28.6	112.8	15.4	33.0	136.8	13.1	#78.0	#201.3	#87.5	#184.9		
Internal Link Dist (m)		108.9			37.1			336.0				65.4
Turn Bay Length (m)			45.0	35.0			25.0					
Base Capacity (vph)	289	624	520	328	624	564	252	922	269	966		
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio	0.53	0.66	0.23	0.54	0.77	0.24	0.80	1.15	0.80	1.04		

Intersection Summary

Area Type: Other
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 6 (5%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 85
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.15
 Intersection Signal Delay: 69.0
 Intersection Capacity Utilization 93.8%
 Analysis Period (min) 15
 Intersection LOS: E
 ICU Level of Service F

- Volume exceeds capacity, queue is theoretically infinite.
 # 95th percentile volume exceeds capacity, queue may be longer.

Splits and Phases: 150: Stanley Avenue & Ferry Street



HCM Signalized Intersection Capacity Analysis
150: Stanley Avenue & Ferry Street

Future Background 2032
Weekday PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↗	↘	↔	↗	↘	↔	↗	↘	↔	↗	↘
Traffic Volume (vph)	140	378	109	163	440	127	186	811	161	199	739	182
Future Volume (vph)	140	378	109	163	440	127	186	811	161	199	739	182
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5	3.0	6.5	3.0	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Frpb, ped/bikes	1.00	1.00	0.86	1.00	1.00	0.90	1.00	0.97	1.00	0.98	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	1.00	0.97	1.00	0.97
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1622	1716	1261	1611	1716	1310	1629	3094	1630	3106	1630	3106
Flt Permitted	0.20	1.00	1.00	0.27	1.00	1.00	0.12	1.00	0.12	1.00	0.12	1.00
Satd. Flow (perm)	338	1716	1261	458	1716	1310	212	3094	204	3106	204	3106
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	411	118	177	478	138	202	882	175	216	803	198
RTOR Reduction (vph)	0	0	68	0	0	95	0	14	0	0	19	0
Lane Group Flow (vph)	152	411	50	177	478	43	202	1043	0	216	982	0
Confl. Peds. (#/hr)	75		103	103		75	36		71	71		36
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	4	3	8	8	5	2	1	6	6	6
Permitted Phases	4		4	8		8	2		6		6	
Actuated Green, G (s)	44.5	33.9	33.9	45.7	34.5	34.5	44.6	32.3	47.2	33.6	47.2	33.6
Effective Green, g (s)	44.5	33.9	33.9	45.7	34.5	34.5	44.6	32.3	47.2	33.6	47.2	33.6
Actuated g/C Ratio	0.40	0.31	0.31	0.42	0.31	0.31	0.41	0.29	0.43	0.31	0.43	0.31
Clearance Time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5	3.0	6.5	3.0	6.5
Vehicle Extension (s)	2.5	2.2	2.2	2.5	2.2	2.2	2.5	2.2	2.5	2.2	2.5	2.2
Lane Grp Cap (vph)	260	528	388	307	538	410	244	908	263	948	263	948
v/s Ratio Prot	0.06	0.24		c0.06	c0.28		0.09	c0.34		c0.10	0.32	
v/s Ratio Perm	0.18		0.04	0.18		0.03	0.24		0.25		0.25	
v/c Ratio	0.58	0.78	0.13	0.58	0.89	0.11	0.83	1.15	0.82	1.04	0.82	1.04
Uniform Delay, d1	23.8	34.6	27.4	22.7	35.9	26.8	25.6	38.9	26.4	38.2	26.4	38.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.8	6.7	0.1	2.1	16.0	0.1	19.7	79.7	17.9	39.0	17.9	39.0
Delay (s)	26.5	41.3	27.5	24.8	51.9	26.9	45.3	118.5	44.3	77.2	44.3	77.2
Level of Service	C	D	C	C	D	C	D	F	D	E	D	E
Approach Delay (s)		35.6			41.5			106.8		71.3		
Approach LOS		D			D			F		E		

Intersection Summary			
HCM 2000 Control Delay	70.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings

250: Fallsview Boulevard/Buchanan Avenue & Ferry Street

Future Background 2032
Weekday PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↗	↘	↔	↗	↘	↔	↗	↘	↔	↗	↘
Traffic Volume (vph)	20	512	67	82	563	15	44	6	120	10	17	31
Future Volume (vph)	20	512	67	82	563	15	44	6	120	10	17	31
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	30.0		0.0	45.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (m)	15.0			20.0			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.983			0.996			0.905				0.927
Flt Protected	0.950			0.950				0.987				0.991
Satd. Flow (prot)	1630	1687	0	1630	1709	0	0	1533	0	0	1576	0
Flt Permitted	0.950			0.950				0.987				0.991
Satd. Flow (perm)	1630	1687	0	1630	1709	0	0	1533	0	0	1576	0
Link Speed (k/h)		50			50			50				50
Link Distance (m)		63.9			136.9			63.4				118.9
Travel Time (s)		4.6			9.9			4.6				8.6
Confl. Peds. (#/hr)	75		103	103		75						
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
Adj. Flow (vph)	22	557	73	89	612	16	48	7	130	11	18	34
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	630	0	89	628	0	0	185	0	0	63	0
Sign Control		Free			Free			Stop				Stop

Intersection Summary			
Area Type:	Other		
Control Type:	Unsignalized		
Intersection Capacity Utilization	66.6%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis Future Background 2032
 250: Fallsview Boulevard/Buchanan Avenue & Ferry Street Weekday PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	20	512	67	82	563	15	44	6	120	10	17	31
Future Volume (Veh/h)	20	512	67	82	563	15	44	6	120	10	17	31
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)	22	557	73	89	612	16	48	7	130	11	18	34
Pedestrians							103			75		
Lane Width (m)							3.6			3.6		
Walking Speed (m/s)							1.2			1.2		
Percent Blockage							9			6		
Right turn flare (veh)												
Median type	None			None								
Median storage (veh)												
Upstream signal (m)	125											
pX, platoon unblocked				0.74			0.74			0.74		
vC, conflicting volume	703			733			1574			1622		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	703			459			1600			1665		
tC, single (s)	4.1			4.1			7.1			6.5		
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5			4.0		
p0 queue free %	97			88			0			87		
cM capacity (veh/h)	839			742			31			52		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	22	630	89	628	185	63						
Volume Left	22	0	89	0	48	11						
Volume Right	0	73	0	16	130	34						
cSH	839	1700	742	1700	92	75						
Volume to Capacity	0.03	0.37	0.12	0.37	2.00	0.85						
Queue Length 95th (m)	0.6	0.0	3.3	0.0	127.4	33.5						
Control Delay (s)	9.4	0.0	10.5	0.0	562.3	158.5						
Lane LOS	A	B		F		F						
Approach Delay (s)	0.3		1.3		562.3		158.5					
Approach LOS	F		F		F		F					
Intersection Summary												
Average Delay	71.2											
Intersection Capacity Utilization	66.6%			ICU Level of Service			C					
Analysis Period (min)	15											

Lanes, Volumes, Timings Future Background 2032
 350: Fallsview Boulevard & Robinson Street Weekday PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	124	74	13	157	25	71	168	15	2	135	52
Future Volume (vph)	110	124	74	13	157	25	71	168	15	2	135	52
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt	0.968			0.983			0.992			0.963		
Flt Protected	0.982			0.997			0.986					
Satd. Flow (prot)	0	1631	0	0	1681	0	0	1678	0	0	1652	0
Flt Permitted	0.982			0.997			0.986					
Satd. Flow (perm)	0	1631	0	0	1681	0	0	1678	0	0	1652	0
Link Speed (k/h)	50			50			50			50		
Link Distance (m)	125.4			133.0			52.4			289.1		
Travel Time (s)	9.0			9.6			3.8			20.8		
Confl. Peds. (#/hr)	20		9		9		20		15		15	
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
Adj. Flow (vph)	120	135	80	14	171	27	77	183	16	2	147	57
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	335	0	0	212	0	0	276	0	0	206	0
Sign Control	Stop			Stop			Stop			Stop		
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	71.9%			ICU Level of Service			C					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis
350: Fallsview Boulevard & Robinson Street

Future Background 2032
Weekday PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	110	124	74	13	157	25	71	168	15	2	135	52
Future Volume (vph)	110	124	74	13	157	25	71	168	15	2	135	52
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)	120	135	80	14	171	27	77	183	16	2	147	57
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	335	212	276	206								
Volume Left (vph)	120	14	77	2								
Volume Right (vph)	80	27	16	57								
Hadj (s)	-0.04	-0.03	0.06	-0.13								
Departure Headway (s)	5.8	6.0	6.0	6.0								
Degree Utilization, x	0.54	0.35	0.46	0.34								
Capacity (veh/h)	581	526	545	523								
Control Delay (s)	15.2	12.3	14.0	12.1								
Approach Delay (s)	15.2	12.3	14.0	12.1								
Approach LOS	C	B	B	B								
Intersection Summary												
Delay			13.6									
Level of Service			B									
Intersection Capacity Utilization			71.9%		ICU Level of Service							C
Analysis Period (min)			15									

Lanes, Volumes, Timings
450: Stanley Avenue & Robinson Street

Future Background 2032
Weekday PM

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↕	↕			↕			↕			↕	
Traffic Volume (vph)	18	61	49	70	99	149	48	831	56	68	860	32
Future Volume (vph)	18	61	49	70	99	149	48	831	56	68	860	32
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	40.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	15.0			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Ped Bike Factor	0.99	0.99			0.98			1.00				1.00
Frt		0.933			0.937			0.991				0.995
Flt Protected	0.950				0.989			0.997				0.996
Satd. Flow (prot)	1630	1586	0	0	1567	0	0	3211	0	0	3223	0
Flt Permitted	0.450				0.890			0.834				0.773
Satd. Flow (perm)	764	1586	0	0	1407	0	0	2685	0	0	2500	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		53			65			14				7
Link Speed (k/h)		50			50			50				50
Link Distance (m)		130.3			125.4			90.2				360.0
Travel Time (s)		9.4			9.0			6.5				25.9
Confl. Peds. (#/hr)	20		9	9		20	30		18	18		30
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
Adj. Flow (vph)	20	66	53	76	108	162	52	903	61	74	935	35
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	119	0	0	346	0	0	1016	0	0	1044	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4				8			2			6	
Detector Phase	4	4			8			2	2		6	6
Switch Phase												
Minimum Initial (s)	8.0	8.0			8.0			8.0	8.0		8.0	8.0
Minimum Split (s)	28.0	28.0			28.0			28.0	28.0		28.0	28.0
Total Split (s)	27.0	27.0			27.0			27.0	27.0		27.0	27.0
Total Split (%)	39.1%	39.1%			39.1%			39.1%	39.1%		39.1%	39.1%
Maximum Green (s)	20.0	20.0			20.0			20.0	20.0		20.0	20.0
Yellow Time (s)	4.0	4.0			4.0			4.0	4.0		4.0	4.0
All-Red Time (s)	3.0	3.0			3.0			3.0	3.0		3.0	3.0
Lost Time Adjust (s)	0.0	0.0			0.0			0.0	0.0		0.0	0.0
Total Lost Time (s)	7.0	7.0			7.0			7.0	7.0		7.0	7.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.1	2.1			2.1			2.2	2.2		2.2	2.2
Recall Mode	Min	Min			Min			C-Min	C-Min		C-Min	C-Min
Walk Time (s)	8.0	8.0			8.0			8.0	8.0		8.0	8.0
Flash Dont Walk (s)	13.0	13.0			13.0			13.0	13.0		13.0	13.0
Pedestrian Calls (#/hr)	0	0			0			0	0		0	0
Act Effct Green (s)	17.3	17.3			17.3			17.3	17.3		17.3	17.3
Actuated g/C Ratio	0.25	0.25			0.25			0.25	0.25		0.25	0.25
v/c Ratio	0.10	0.27			0.27			0.10	0.27		0.27	0.10
Control Delay	19.7	13.3			13.3			13.3	13.3		13.3	13.3

Lanes, Volumes, Timings

Future Background 2032

450: Stanley Avenue & Robinson Street

Weekday PM

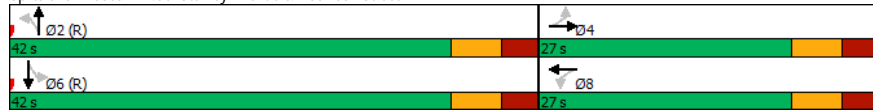


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	19.7	13.3			42.0			15.1			17.9	
LOS	B	B			D			B			B	
Approach Delay		14.2			42.0			15.1			17.9	
Approach LOS		B			D			B			B	
Queue Length 50th (m)	2.0	6.7			34.9			51.7			57.3	
Queue Length 95th (m)	6.9	18.3			#75.2			76.3			#88.3	
Internal Link Dist (m)		106.3			101.4			66.2			336.0	
Turn Bay Length (m)	40.0											
Base Capacity (vph)	221	497			453			1474			1369	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.09	0.24			0.76			0.69			0.76	

Intersection Summary

Area Type:	Other
Cycle Length:	69
Actuated Cycle Length:	69
Offset:	29 (42%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle:	65
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.86
Intersection Signal Delay:	19.9
Intersection Capacity Utilization:	102.5%
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 450: Stanley Avenue & Robinson Street



HCM Signalized Intersection Capacity Analysis

Future Background 2032

450: Stanley Avenue & Robinson Street

Weekday PM



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔			↔			↔			↔	
Traffic Volume (vph)	18	61	49	70	99	149	48	831	56	68	860	32
Future Volume (vph)	18	61	49	70	99	149	48	831	56	68	860	32
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	7.0	7.0			7.0			7.0			7.0	
Lane Util. Factor	1.00	1.00			1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99			0.99			1.00			1.00	
Flpb, ped/bikes	0.99	1.00			1.00			1.00			1.00	
Frpt	1.00	0.93			0.94			0.99			0.99	
Flt Protected	0.95	1.00			0.99			1.00			1.00	
Satd. Flow (prot)	1614	1586			1564			3211			3223	
Flt Permitted	0.45	1.00			0.89			0.83			0.77	
Satd. Flow (perm)	764	1586			1408			2685			2499	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	66	53	76	108	162	52	903	61	74	935	35
RTOR Reduction (vph)	0	40	0	0	49	0	0	6	0	0	3	0
Lane Group Flow (vph)	20	79	0	0	297	0	0	1010	0	0	1041	0
Confl. Peds. (#/hr)	20		9	9		20	30		18	18		30
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)	17.3	17.3			17.3			37.7			37.7	
Effective Green, g (s)	17.3	17.3			17.3			37.7			37.7	
Actuated g/C Ratio	0.25	0.25			0.25			0.55			0.55	
Clearance Time (s)	7.0	7.0			7.0			7.0			7.0	
Vehicle Extension (s)	2.1	2.1			2.1			2.2			2.2	
Lane Grp Cap (vph)	191	397			353			1467			1365	
v/s Ratio Prot		0.05										
v/s Ratio Perm	0.03				c0.21			0.38			c0.42	
v/c Ratio	0.10	0.20			0.84			0.69			0.76	
Uniform Delay, d1	19.9	20.4			24.6			11.4			12.2	
Progression Factor	1.00	1.00			1.00			1.00			1.00	
Incremental Delay, d2	0.1	0.1			15.9			2.7			4.1	
Delay (s)	20.0	20.5			40.5			14.0			16.2	
Level of Service	B	C			D			B			B	
Approach Delay (s)		20.4			40.5			14.0			16.2	
Approach LOS		C			D			B			B	

Intersection Summary

HCM 2000 Control Delay	18.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	102.5%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings

Future Background 2032

150: Stanley Avenue & Ferry Street

Buchanan Ave Closure + Signal

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	160	358	109	156	421	122	186	811	161	199	763	201
Future Volume (vph)	160	358	109	156	421	122	186	811	161	199	763	201
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0	45.0	35.0		0.0	25.0		0.0	0.0			0.0
Storage Lanes	1	1	1		1	1		0	1			0
Taper Length (m)	7.5		15.0				30.0			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	0.97		0.86	0.94		0.90	0.99	0.97			0.98	
Frt			0.850		0.850		0.975				0.969	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1630	1716	1458	1630	1716	1458	1630	3093	0	1630	3098	0
Flt Permitted	0.180			0.304			0.124			0.096		
Satd. Flow (perm)	299	1716	1261	493	1716	1310	210	3093	0	165	3098	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			124			133						34
Link Speed (k/h)		50			50			50				50
Link Distance (m)		132.9			61.1			360.0				89.4
Travel Time (s)		9.6			4.4			25.9				6.4
Confl. Peds. (#/hr)	75		103	103		75	36		71	71		36
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
Adj. Flow (vph)	174	389	118	170	458	133	202	882	175	216	829	218
Shared Lane Traffic (%)												
Lane Group Flow (vph)	174	389	118	170	458	133	202	1057	0	216	1047	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	7	4	4	3	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0	8.0	6.0	8.0		6.0	8.0	
Minimum Split (s)	9.0	33.5	33.5	9.0	33.5	33.5	9.0	33.5		9.0	33.5	
Total Split (s)	10.0	42.0	42.0	9.0	41.0	41.0	11.0	43.0		16.0	48.0	
Total Split (%)	9.1%	38.2%	38.2%	8.2%	37.3%	37.3%	10.0%	39.1%		14.5%	43.6%	
Maximum Green (s)	7.0	35.5	35.5	6.0	34.5	34.5	8.0	36.5		13.0	41.5	
Yellow Time (s)	3.0	4.1	4.1	3.0	4.1	4.1	3.0	4.1		3.0	4.1	
All-Red Time (s)	0.0	2.4	2.4	0.0	2.4	2.4	0.0	2.4		0.0	2.4	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5		3.0	6.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.2	2.2	2.5	2.2	2.2	2.5	2.2		2.5	2.2	
Recall Mode	None	Min	Min	None	Min	Min	None	C-Min		None	C-Min	
Walk Time (s)		10.0	10.0		10.0	10.0		10.0			10.0	
Flash Dont Walk (s)		17.0	17.0		17.0	17.0		17.0			17.0	
Pedestrian Calls (#/hr)		0	0		0	0		0			0	
Act Effct Green (s)	43.5	33.0	33.0	41.5	32.0	32.0	52.8	39.7		56.4	41.8	
Actuated g/C Ratio	0.40	0.30	0.30	0.38	0.29	0.29	0.48	0.36		0.51	0.38	
v/c Ratio	0.86	0.76	0.25	0.69	0.92	0.28	0.87	0.94		0.87	0.88	
Control Delay	60.3	44.9	5.9	38.3	62.5	6.4	57.6	49.9		56.6	40.4	

Lanes, Volumes, Timings

Future Background 2032

150: Stanley Avenue & Ferry Street

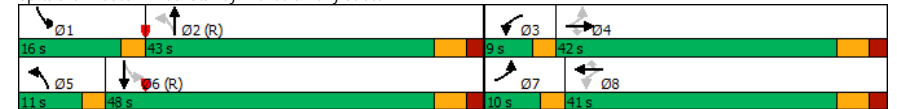
Buchanan Ave Closure + Signal

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0	0.0	0.0	32.8	0.0	0.0	0.0		0.0	0.0	
Total Delay	60.3	44.9	5.9	38.3	95.3	6.4	57.6	49.9		56.6	40.4	
LOS	E	D	A	D	F	A	E	D		E	D	
Approach Delay			42.1			67.0				51.1		43.1
Approach LOS			D			E				D		D
Queue Length 50th (m)	24.3	76.6	0.0	23.6	96.4	0.0	-30.4	-127.0		32.2	111.5	
Queue Length 95th (m)	#55.4	113.0	12.0	#40.5	#152.7	14.0	#78.7	#174.2		#74.5	#151.7	
Internal Link Dist (m)			108.9			37.1				336.0		65.4
Turn Bay Length (m)			45.0	35.0			25.0					
Base Capacity (vph)	202	553	490	247	538	502	233	1130		259	1196	
Starvation Cap Reductn	0	0	0	0	102	0	0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0		0	0	
Reduced v/c Ratio	0.86	0.70	0.24	0.69	1.05	0.26	0.87	0.94		0.83	0.88	

Intersection Summary

Area Type: Other
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 6 (5%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 85
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.94
 Intersection Signal Delay: 50.1
 Intersection LOS: D
 Intersection Capacity Utilization 93.9%
 ICU Level of Service F
 Analysis Period (min) 15
 - Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 150: Stanley Avenue & Ferry Street



HCM Signalized Intersection Capacity Analysis
150: Stanley Avenue & Ferry Street

Future Background 2032
Buchanan Ave Closure + Signal

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↗	↘	↔	↗	↘	↔	↗	↘	↔	↗	↘
Traffic Volume (vph)	160	358	109	156	421	122	186	811	161	199	763	201
Future Volume (vph)	160	358	109	156	421	122	186	811	161	199	763	201
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5	3.0	6.5	3.0	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Frpb, ped/bikes	1.00	1.00	0.86	1.00	1.00	0.90	1.00	0.97	1.00	0.98	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	1.00	0.97	1.00	0.97
Fl t Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1623	1716	1261	1606	1716	1310	1629	3094	1629	3098	1629	3098
Fl t Permitted	0.18	1.00	1.00	0.30	1.00	1.00	0.12	1.00	0.10	1.00	0.10	1.00
Satd. Flow (perm)	307	1716	1261	513	1716	1310	213	3094	164	3098	164	3098
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	389	118	170	458	133	202	882	175	216	829	218
RTOR Reduction (vph)	0	0	83	0	0	94	0	14	0	0	21	0
Lane Group Flow (vph)	174	389	35	170	458	39	202	1043	0	216	1026	0
Confl. Peds. (#/hr)	75		103	103		75	36		71	71		36
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8		5	2		1		6
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)	40.0	33.0	33.0	38.0	32.0	32.0	50.0	39.7		54.0		41.7
Effective Green, g (s)	40.0	33.0	33.0	38.0	32.0	32.0	50.0	39.7		54.0		41.7
Actuated g/C Ratio	0.36	0.30	0.30	0.35	0.29	0.29	0.45	0.36		0.49		0.38
Clearance Time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5		3.0		6.5
Vehicle Extension (s)	2.5	2.2	2.2	2.5	2.2	2.2	2.5	2.2		2.5		2.2
Lane Grp Cap (vph)	195	514	378	236	499	381	229	1116		244		1174
v/s Ratio Prot	c0.06	0.23		0.04	0.27		0.08	c0.34		c0.10		0.33
v/s Ratio Perm	c0.27		0.03	0.21		0.03	0.32			0.33		
v/c Ratio	0.89	0.76	0.09	0.72	0.92	0.10	0.88	0.93		0.89		0.87
Uniform Delay, d1	30.4	34.9	27.7	30.9	37.7	28.5	22.4	33.9		28.1		31.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00		1.00
Incremental Delay, d2	36.1	5.8	0.1	9.7	21.5	0.1	30.1	15.2		29.2		9.1
Delay (s)	66.5	40.6	27.8	40.6	59.3	28.6	52.6	49.1		57.3		40.9
Level of Service	E	D	C	D	E	C	D	D		E		D
Approach Delay (s)		45.0			49.7			49.6				43.7
Approach LOS		D			D			D				D
Intersection Summary												
HCM 2000 Control Delay		47.0			HCM 2000 Level of Service			D				
HCM 2000 Volume to Capacity ratio		0.92										
Actuated Cycle Length (s)		110.0			Sum of lost time (s)			19.0				
Intersection Capacity Utilization		93.9%			ICU Level of Service			F				
Analysis Period (min)		15										
c Critical Lane Group												

Lanes, Volumes, Timings
250: Fallsview Boulevard & Ferry Street

Future Background 2032
Buchanan Ave Closure + Signal

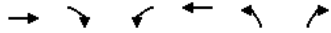
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↗	↘	↔	↗	↘
Traffic Volume (vph)	512	67	82	563	44	126
Future Volume (vph)	512	67	82	563	44	126
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)		0.0	45.0		0.0	0.0
Storage Lanes		0	1		1	0
Taper Length (m)			20.0		7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.98		0.95		0.95	
Fr t	0.984				0.900	
Fl t Protected			0.950		0.987	
Satd. Flow (prot)	1656	0	1630	1716	1458	0
Fl t Permitted			0.273		0.987	
Satd. Flow (perm)	1656	0	444	1716	1443	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	19				137	
Link Speed (k/h)	50			50	50	
Link Distance (m)	63.9			136.9	63.4	
Travel Time (s)	4.6			9.9	4.6	
Confl. Peds. (#/hr)		103	103		15	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	557	73	89	612	48	137
Shared Lane Traffic (%)						
Lane Group Flow (vph)	630	0	89	612	185	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	8.0		8.0	8.0	8.0	
Minimum Split (s)	27.5		27.5	27.5	14.5	
Total Split (s)	42.0		42.0	42.0	18.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Maximum Green (s)	35.5		35.5	35.5	11.5	
Yellow Time (s)	4.1		4.1	4.1	4.1	
All-Red Time (s)	2.4		2.4	2.4	2.4	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.5		6.5	6.5	6.5	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	Min		Min	Min	C-Min	
Walk Time (s)	8.0		8.0	8.0	8.0	
Flash Dont Walk (s)	13.0		13.0	13.0	13.0	
Pedestrian Calls (#/hr)	0		0	0	0	
Act Effct Green (s)	28.8		28.8	28.8	18.2	
Actuated g/C Ratio	0.48		0.48	0.48	0.30	
v/c Ratio	0.78		0.42	0.74	0.35	
Control Delay	19.3		14.8	17.8	9.3	

Lanes, Volumes, Timings

Future Background 2032

250: Fallsview Boulevard & Ferry Street

Buchanan Ave Closure + Signal



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Delay	0.4		0.0	0.0	0.0	
Total Delay	19.7		14.8	17.8	9.3	
LOS	B		B	B	A	
Approach Delay	19.7		17.5	9.3		
Approach LOS	B		B	A		
Queue Length 50th (m)	52.4		6.0	50.9	4.1	
Queue Length 95th (m)	70.7		13.4	66.8	20.1	
Internal Link Dist (m)	39.9		112.9	39.4		
Turn Bay Length (m)			45.0			
Base Capacity (vph)	987		262	1015	536	
Starvation Cap Reductn	84		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.70		0.34	0.60	0.35	

Intersection Summary

Area Type:	Other
Cycle Length:	60
Actuated Cycle Length:	60
Offset:	0 (0%), Referenced to phase 2:NBL and 6.: Start of Green
Natural Cycle:	55
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.78
Intersection Signal Delay:	17.4
Intersection Capacity Utilization:	69.5%
Analysis Period (min):	15
Intersection LOS:	B
ICU Level of Service:	C

Splits and Phases: 250: Fallsview Boulevard & Ferry Street



HCM Signalized Intersection Capacity Analysis

Future Background 2032

250: Fallsview Boulevard & Ferry Street

Buchanan Ave Closure + Signal



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	512	67	82	563	44	126
Future Volume (vph)	512	67	82	563	44	126
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	6.5		6.5	6.5	6.5	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frpb, ped/bikes	0.98		1.00	1.00	0.97	
Flpb, ped/bikes	1.00		0.95	1.00	1.00	
Fr t	0.98		1.00	1.00	0.90	
Fl t Protected	1.00		0.95	1.00	0.99	
Satd. Flow (prot)	1657		1554	1716	1474	
Fl t Permitted	1.00		0.27	1.00	0.99	
Satd. Flow (perm)	1657		447	1716	1474	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	557	73	89	612	48	137
RTOR Reduction (vph)	10	0	0	0	95	0
Lane Group Flow (vph)	620	0	89	612	90	0
Confl. Peds. (#/hr)		103	103		15	15
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Actuated Green, G (s)	28.8		28.8	28.8	18.2	
Effective Green, g (s)	28.8		28.8	28.8	18.2	
Actuated g/C Ratio	0.48		0.48	0.48	0.30	
Clearance Time (s)	6.5		6.5	6.5	6.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	795		214	823	447	
v/s Ratio Prot	c0.37			0.36	c0.06	
v/s Ratio Perm			0.20			
v/c Ratio	0.78		0.42	0.74	0.20	
Uniform Delay, d1	13.0		10.1	12.6	15.5	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	5.0		1.3	3.7	1.0	
Delay (s)	18.0		11.4	16.3	16.5	
Level of Service	B		B	B	B	
Approach Delay (s)	18.0			15.7	16.5	
Approach LOS	B			B	B	

Intersection Summary

HCM 2000 Control Delay	16.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

APPENDIX G - ITE PLOT AND TTS CALCULATIONS

Multifamily Housing (High-Rise) Not Close to Rail Transit (222)

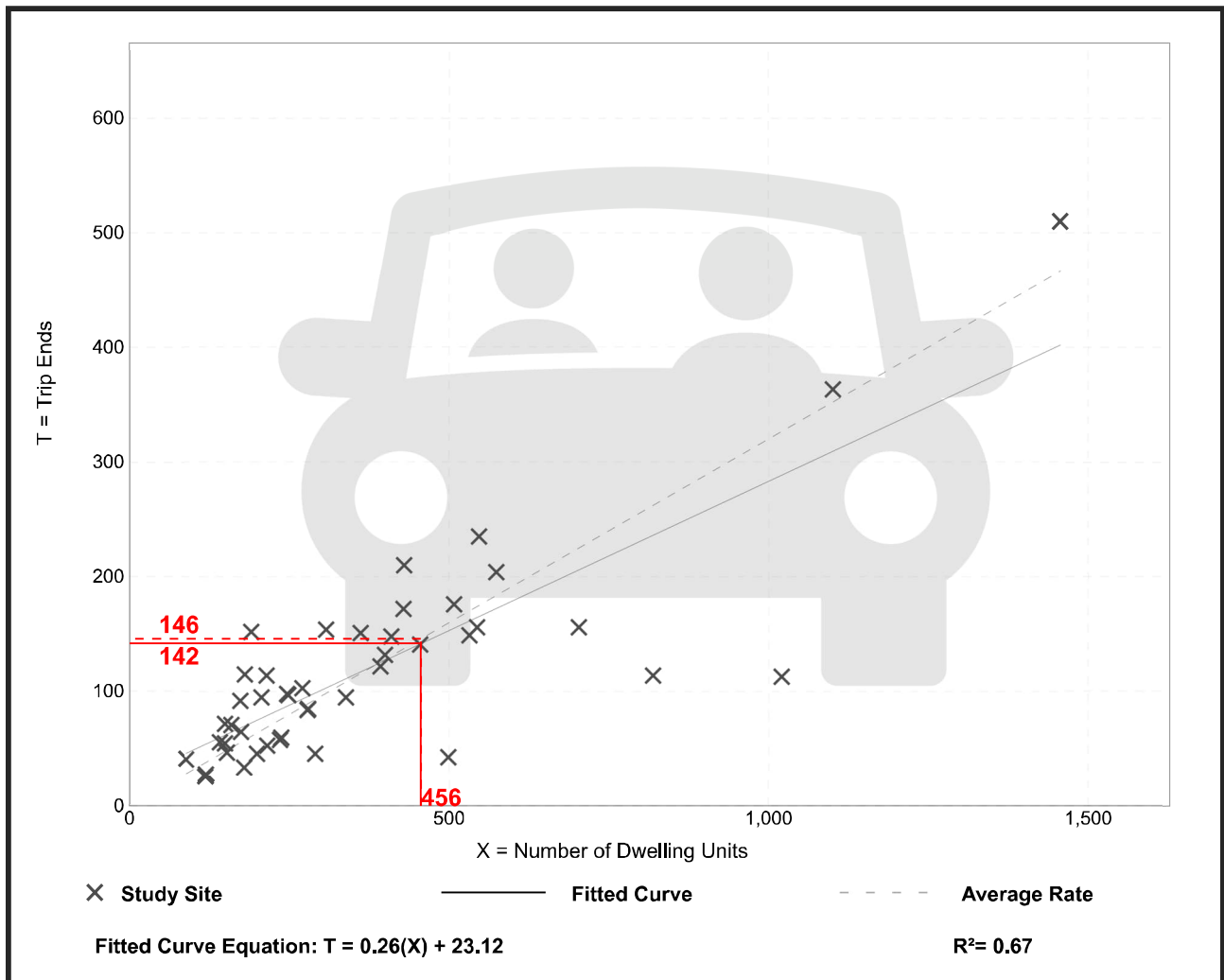
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban
Number of Studies: 45
Avg. Num. of Dwelling Units: 372
Directional Distribution: 62% entering, 38% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.32	0.09 - 0.80	0.13

Data Plot and Equation



Outbound

Wed Oct 12 2022 17:33:06 GMT-0400 (Eastern Daylight Time) - Run Time: 2893ms

Wed Oct 12 2022 17:34:52 GMT-0400 (Eastern Daylight Time) - Run Time: 3085ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of destination - pd_dest
 Column: 2006 GTA zone of origin - gta06_orig

Row: 2006 GTA zone of destination - gta06_dest
 Column: 2006 GTA zone of origin - gta06_orig

Filters:

Primary travel mode of trip - mode_prime In d, m
 and
 Trip purpose - trip_purp In 1-3
 and
 Start time of trip - start_time In 1600-1900
 and
 2006 GTA zone of origin - gta06_orig In 6208, 6212-6216

Filters:

Primary travel mode of trip - mode_prime In d, m
 and
 Trip purpose - trip_purp In 1-3
 and
 Start time of trip - start_time In 1600-1900
 and
 2006 GTA zone of origin - gta06_orig In 6208, 6212-6216
 and
 Planning district of destination - pd_dest In 57

Trip 2016

	6208	6212	6213	6214	6215	6216	Sum	Distribution	Direction	Route
PD 4 of Toronto	0	14	0	0	0	0	14	1%	North	Stanley, 420, QEW
PD 7 of Toronto	0	0	25	0	0	0	25	1%	North	Stanley, 420, QEW
PD 13 of Toronto	0	13	0	0	0	0	13	1%	North	Stanley, 420, QEW
Ajax	0	17	0	0	0	0	17	1%	North	Stanley, 420, QEW
Markham	0	32	0	0	0	0	32	1%	North	Stanley, 420, QEW
Vaughan	0	19	0	0	0	0	19	1%	North	Stanley, 420, QEW
Mississauga	0	26	21	0	0	0	47	2%	North	Stanley, 420, QEW
Milton	0	17	0	0	0	0	17	1%	North	Stanley, 420, QEW
Burlington	0	0	29	0	0	27	56	2%	North	Stanley, 420, QEW
Stoney Creek	0	0	0	37	0	0	37	1%	West	Stanley, 420, QEW
Hamilton	19	21	0	0	0	0	40	2%	West	Stanley, 420, QEW
Grimsby	0	0	0	0	0	27	27	1%	West	Stanley, 420, QEW
Lincoln	0	35	0	25	0	0	60	2%	West	Stanley, 420, QEW
Pelham	0	0	0	0	0	35	35	1%	West	Ferry WB
Niagara-on-the-Lake	0	54	0	0	0	107	161	6%	North	Stanley NB
St. Catharines	15	231	31	11	0	107	395	15%	West	Stanley, 420, QEW
Thorold	70	43	0	0	0	20	133	5%	West	Stanley, 420, QEW
Niagara Falls	93	377	68	82	26	480	1126	43%	See Table on right	
Welland	43	96	30	0	0	51	220	8%	Southwest	Ferry WB
Fort Erie	0	17	0	0	0	12	29	1%	South	Fallsview SB or Stanley SB
West Lincoln	0	16	0	0	0	0	16	1%	West	Stanley, 420, QEW
North Dumfries	0	15	0	0	0	0	15	1%	West	Stanley, 420, QEW
Springwater	0	0	36	0	0	0	36	1%	North	Stanley, 420, QEW
External	0	0	25	0	0	0	25	1%	North	Stanley, 420, QEW
							2595			

Trip 2016

	6208	6212	6213	6214	6215	6216	Sum	Distribution	Direction	Route
	6194	0	0	12	0	0	12	0%	North	Stanley NB or Ferry WB
	6196	0	0	0	30	0	30	1%	North	Stanley NB or Ferry WB
	6198	0	11	0	0	0	16	1%	Northwest	Stanley NB or Ferry WB
	6199	46	0	0	0	0	23	69%	North	Stanley NB or Ferry WB
	6200	0	0	12	0	0	12	0%	North	Stanley NB
	6203	0	19	0	0	0	19	1%	Northeast	Ferry EB
	6205	0	0	0	30	0	30	1%	Northeast	Ferry EB
	6206	0	0	0	0	0	27	27%	Northeast	Ferry EB
	6209	47	0	0	0	0	47	2%	Northeast	Ferry EB
	6210	0	0	0	0	0	39	39%	Northeast	Ferry EB
	6213	0	0	0	22	0	9	31%	Southwest	Fallsview SB, Robinson WB
	6214	0	0	22	0	0	22	1%	West	Ferry WB
	6217	0	0	0	0	103	103	4%	Northwest	Stanley NB or Ferry WB
	6218	0	0	0	0	25	25	1%	North	Stanley NB
	6219	0	0	0	0	13	13	1%	Northwest	Stanley NB or Ferry WB
	6222	0	55	13	0	0	68	3%	Northwest	Stanley NB or Ferry WB
	6223	0	0	0	0	17	17	1%	West	Stanley NB or Ferry WB
	6225	0	54	0	0	0	54	2%	West	Ferry WB
	6226	0	36	0	0	0	36	1%	West	Ferry WB
	6228	0	0	0	0	21	21	1%	West	Stanley NB or Ferry WB
	6230	0	48	0	0	0	48	2%	West	Ferry WB
	6232	0	0	0	0	89	89	3%	West	Ferry WB
	6233	0	25	0	0	9	59	93%	West	Ferry WB or Robinson WB
	6235	0	14	11	0	0	20	45%	Southwest	Stanley SB
	6244	0	29	0	0	0	29	1%	Southwest	Ferry WB or Stanley SB
	6248	0	0	0	0	25	25	1%	Southwest	Fallsview SB
	6252	0	82	0	0	9	91	4%	Southeast	Fallsview SB
	6256	0	4	0	0	0	4	0%	Southwest	Stanley SB
	93	377	70	82	26	478	1126			

Inbound

Wed Oct 12 2022 17:37:58 GMT-0400 (Eastern Daylight Time) - Run Time: 3523ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of origin - pd_orig
 Column: 2006 GTA zone of destination - gta06_dest

Filters:
 Primary travel mode of trip - mode_prime In d, m
 and
 Trip purpose - trip_purp In 1-3
 and
 Start time of trip - start_time In 1600-1900
 and
 2006 GTA zone of destination - gta06_dest In 6208, 6212-6216

Trip 2016

	6208	6212	6213	6214	6215	6216	Sum	Distribution	Direction	Route
PD 2 of Toronto	0	0	16	0	0	0	16	100%	1% North	QEW, 420, Stanley SB
PD 11 of Toronto	0	8	0	0	0	0	8	100%	0% North	QEW, 420, Stanley SB
Mississauga	0	26	0	0	0	0	26	100%	2% North	QEW, 420, Stanley SB
Pelham	0	0	0	0	0	16	16	100%	1% West	20, Ferry EB
Niagara-on-the-Lake	0	0	15	9	0	28	52	100%	3% North	55, QEW or 100, Stanley SB or Ferry EB
St. Catharines	0	26	22	37	15	29	129	100%	8% West	QEW, 420, Stanley SB
Thorold	0	53	18	0	0	31	102	100%	6% West	QEW, 420, Stanley SB
Niagara Falls	104	250	285	95	60	354	1148	67%	See Table on right	
Welland	0	62	0	0	0	26	88	100%	5% South	27, QEW or 20, Stanley NB or Ferry EB
Fort Erie	0	12	0	30	0	0	42	100%	2% South	QEW, Stanley NB
Wainfleet	0	23	0	0	0	0	23	100%	1% South	58, QEW or 20, Stanley NB or Ferry EB
Kitchener	0	32	0	0	0	0	32	100%	2% West	QEW, 420, Stanley SB
External	0	0	25	0	0	0	25	100%	1% North	QEW, 420, Stanley SB
							1707			

Wed Oct 12 2022 17:39:40 GMT-0400 (Eastern Daylight Time) - Run Time: 3503ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of origin - gta06_orig
 Column: 2006 GTA zone of destination - gta06_dest

Filters:
 Primary travel mode of trip - mode_prime In d, m
 and
 Trip purpose - trip_purp In 1-3
 and
 Start time of trip - start_time In 1600-1900
 and
 2006 GTA zone of destination - gta06_dest In 6208, 6212-6216
 and
 Planning district of origin - pd_orig In 57

Trip 2016

	6208	6212	6213	6214	6215	6216	Sum	Distribution	Direction	Route
6194	0	0	12	0	0	0	12	100%	1% North	Stanley SB or Ferry EB
6198	0	0	26	0	0	0	26	100%	2% Northwest	Stanley SB or Ferry EB
6199	0	27	0	28	0	23	78	100%	5% North	Stanley SB or Ferry EB
6200	0	0	28	0	0	0	28	100%	2% North	Stanley SB
6206	0	0	0	22	0	28	50	100%	3% East	Ferry WB
6207	0	69	0	0	0	0	69	100%	4% North	Stanley SB or Buchanan SB
6210	0	0	0	0	0	14	14	100%	1% East	Ferry WB
6213	0	0	0	22	0	0	22	100%	1% Southwest	Stanley NB or Fallsview NB
6214	0	0	22	0	0	0	22	100%	1% West	Ferry EB
6216	0	0	9	0	0	0	9	100%	1% Northwest	Stanley SB or Ferry EB
6217	0	0	15	0	0	11	26	100%	2% North	Stanley SB
6218	0	70	13	0	0	0	83	100%	5% North	Stanley SB or Ferry WB
6219	0	0	32	0	0	6	38	100%	2% Northwest	Stanley SB or Ferry EB
6220	0	0	44	0	0	0	44	100%	3% Northwest	Stanley SB or Ferry EB
6221	0	0	0	0	0	89	89	100%	5% West	Stanley SB or Ferry EB
6222	0	64	0	0	0	0	64	100%	4% West	Stanley SB or Ferry EB
6225	0	0	0	23	0	0	23	100%	1% West	Ferry EB
6226	0	0	0	0	0	31	31	100%	2% West	Ferry EB
6227	57	0	0	0	0	0	57	100%	3% West	Ferry EB
6231	0	0	0	0	0	18	18	100%	1% West	Ferry EB
6232	0	0	17	0	47	89	153	100%	9% West	Ferry EB
6233	0	0	0	0	13	0	13	100%	1% West	Ferry EB or Robinson EB
6234	47	0	0	0	0	0	47	100%	3% Southwest	Ferry EB or Stanley NB
6235	0	14	30	0	0	31	75	100%	4% Southwest	Ferry EB or Stanley NB
6243	0	0	18	0	0	0	18	100%	1% Southwest	Ferry EB or Stanley NB
6245	0	0	20	0	0	0	20	100%	1% Southwest	Ferry EB or Stanley NB
6254	0	0	0	0	0	14	14	100%	1% South	Fallsview NB
6256	0	6	0	0	0	0	6	100%	0% Southwest	Stanley NB
	104	250	286	95	60	354	1149	67.31%		

APPENDIX H - FUTURE TOTAL SYNCHRO OUTPUTS

Lanes, Volumes, Timings

Future Total 2032

150: Stanley Avenue & Ferry Street

Buchanan Ave Closure + Signal

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	160	393	109	156	437	152	186	811	161	235	763	201
Future Volume (vph)	160	393	109	156	437	152	186	811	161	235	763	201
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	0.0	45.0	35.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Storage Lanes	1	1	1	1	1	1	1	0	1	0	1	0
Taper Length (m)	7.5		15.0				30.0			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	1.00	0.95	0.95
Ped Bike Factor	0.97		0.86	0.95		0.90	0.99	0.97		0.98		
Frt			0.850		0.850		0.975			0.969		
Flt Protected	0.950		0.950		0.950		0.950		0.950			
Satd. Flow (prot)	1630	1716	1458	1630	1716	1458	1630	3093	0	1630	3098	0
Flt Permitted	0.166		0.257		0.130		0.099			0.099		
Satd. Flow (perm)	277	1716	1261	419	1716	1310	221	3093	0	170	3098	0
Right Turn on Red			Yes		Yes		Yes			Yes		Yes
Satd. Flow (RTOR)			124		165		22			34		
Link Speed (k/h)		50		50		50		50		50		50
Link Distance (m)		132.9		61.1		360.0		89.4		89.4		
Travel Time (s)		9.6		4.4		25.9		6.4		6.4		
Confl. Peds. (#/hr)	75		103	103		75	36		71	71		36
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
Adj. Flow (vph)	174	427	118	170	475	165	202	882	175	255	829	218
Shared Lane Traffic (%)												
Lane Group Flow (vph)	174	427	118	170	475	165	202	1057	0	255	1047	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	7	4	4	3	8	8	5	2		1	6	
Switch Phase												
Minimum Initial (s)	6.0	8.0	8.0	6.0	8.0	8.0	6.0	8.0		6.0	8.0	
Minimum Split (s)	9.0	33.5	33.5	9.0	33.5	33.5	9.0	33.5		9.0	33.5	
Total Split (s)	10.0	42.0	42.0	9.0	41.0	41.0	11.0	43.0		16.0	48.0	
Total Split (%)	9.1%	38.2%	38.2%	8.2%	37.3%	37.3%	10.0%	39.1%		14.5%	43.6%	
Maximum Green (s)	7.0	35.5	35.5	6.0	34.5	34.5	8.0	36.5		13.0	41.5	
Yellow Time (s)	3.0	4.1	4.1	3.0	4.1	4.1	3.0	4.1		3.0	4.1	
All-Red Time (s)	0.0	2.4	2.4	0.0	2.4	2.4	0.0	2.4		0.0	2.4	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5		3.0	6.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.5	2.2	2.2	2.5	2.2	2.2	2.5	2.2		2.5	2.2	
Recall Mode	None	Min	Min	None	Min	Min	None	C-Min		None	C-Min	
Walk Time (s)		10.0	10.0		10.0	10.0		10.0		10.0		10.0
Flash Dont Walk (s)		17.0	17.0		17.0	17.0		17.0		17.0		17.0
Pedestrian Calls (#/hr)		0	0		0	0		0		0		0
Act Effct Green (s)	44.1	33.6	33.6	42.1	32.6	32.6	50.7	37.3		57.4	41.5	
Actuated g/C Ratio	0.40	0.31	0.31	0.38	0.30	0.30	0.46	0.34		0.52	0.38	
v/c Ratio	0.88	0.81	0.25	0.75	0.93	0.33	0.89	0.99		0.93	0.88	
Control Delay	65.1	48.7	5.8	44.9	64.3	6.2	60.6	62.4		66.9	40.9	

Lanes, Volumes, Timings

Future Total 2032

150: Stanley Avenue & Ferry Street

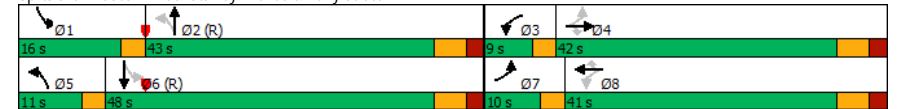
Buchanan Ave Closure + Signal

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0	0.0	0.0	43.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.1	48.7	5.8	44.9	107.6	6.2	60.6	62.4	66.9	40.9		
LOS	E	D	A	D	F	A	E	E	E	D		
Approach Delay		45.6			73.8			62.1		46.0		
Approach LOS		D			E			E		D		
Queue Length 50th (m)	24.3	86.5	0.0	23.6	101.4	0.0	-27.4	-127.0	41.9	111.5		
Queue Length 95th (m)	#54.4	#128.1	12.0	#47.2	#161.6	15.3	#76.7	#174.2	#95.7	#151.7		
Internal Link Dist (m)		108.9			37.1			336.0		65.4		
Turn Bay Length (m)			45.0	35.0			25.0					
Base Capacity (vph)	197	553	490	226	538	524	227	1064	275	1189		
Starvation Cap Reductn	0	0	0	0	100	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0		
Reduced v/c Ratio	0.88	0.77	0.24	0.75	1.08	0.31	0.89	0.99	0.93	0.88		

Intersection Summary

Area Type: Other
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 6 (5%), Referenced to phase 2:NBL and 6:SBTL, Start of Green
 Natural Cycle: 85
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.99
 Intersection Signal Delay: 56.4
 Intersection LOS: E
 Intersection Capacity Utilization 97.0%
 ICU Level of Service F
 Analysis Period (min) 15
 - Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 150: Stanley Avenue & Ferry Street



HCM Signalized Intersection Capacity Analysis
150: Stanley Avenue & Ferry Street

Future Total 2032
Buchanan Ave Closure + Signal

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↗	↘	↔	↗	↘	↔	↗	↘	↔	↗	↘
Traffic Volume (vph)	160	393	109	156	437	152	186	811	161	235	763	201
Future Volume (vph)	160	393	109	156	437	152	186	811	161	235	763	201
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5	3.0	6.5	3.0	6.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.95	1.00	0.95
Frpb, ped/bikes	1.00	1.00	0.86	1.00	1.00	0.90	1.00	0.97	1.00	0.98	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr t	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98	1.00	0.97	1.00	0.97
Fl t Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1624	1716	1261	1613	1716	1310	1628	3094	1630	3098	1630	3098
Fl t Permitted	0.17	1.00	1.00	0.26	1.00	1.00	0.13	1.00	0.10	1.00	0.10	1.00
Satd. Flow (perm)	284	1716	1261	437	1716	1310	223	3094	170	3098	170	3098
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	427	118	170	475	165	202	882	175	255	829	218
RTOR Reduction (vph)	0	0	82	0	0	116	0	15	0	0	21	0
Lane Group Flow (vph)	174	427	36	170	475	49	202	1042	0	255	1026	0
Confl. Peds. (#/hr)	75		103	103		75	36		71	71		36
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8		5	2	1		6	6
Permitted Phases	4		4	8		8	2		6		6	
Actuated Green, G (s)	40.6	33.6	33.6	38.6	32.6	32.6	47.3	37.4	54.4	41.5	54.4	41.5
Effective Green, g (s)	40.6	33.6	33.6	38.6	32.6	32.6	47.3	37.4	54.4	41.5	54.4	41.5
Actuated g/C Ratio	0.37	0.31	0.31	0.35	0.30	0.30	0.43	0.34	0.49	0.38	0.49	0.38
Clearance Time (s)	3.0	6.5	6.5	3.0	6.5	6.5	3.0	6.5	3.0	6.5	3.0	6.5
Vehicle Extension (s)	2.5	2.2	2.2	2.5	2.2	2.2	2.5	2.2	2.5	2.2	2.5	2.2
Lane Grp Cap (vph)	190	524	385	217	508	388	222	1051	269	1168	269	1168
v/s Ratio Prot	c0.06	0.25		0.04	0.28		0.08	0.34	c0.12	0.33	c0.12	0.33
v/s Ratio Perm	c0.28		0.03	0.23		0.04	0.31		c0.35		c0.35	
v/c Ratio	0.92	0.81	0.09	0.78	0.94	0.13	0.91	0.99	0.95	0.88	0.95	0.88
Uniform Delay, d1	30.3	35.3	27.3	31.4	37.7	28.3	23.5	36.1	30.9	31.9	30.9	31.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	41.9	9.1	0.1	16.2	24.4	0.1	36.3	25.9	40.4	9.5	40.4	9.5
Delay (s)	72.1	44.4	27.4	47.6	62.1	28.4	59.8	62.0	71.3	41.4	71.3	41.4
Level of Service	E	D	C	D	E	C	E	E	E	D	E	D
Approach Delay (s)		48.3			52.2			61.7		47.2		47.2
Approach LOS		D			D			E		D		D

Intersection Summary			
HCM 2000 Control Delay	52.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	97.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
250: Fallsview Boulevard & Ferry Street

Future Total 2032
Buchanan Ave Closure + Signal

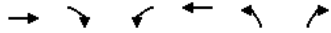
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↗	↘	↔	↗	↘
Traffic Volume (vph)	515	67	89	563	90	126
Future Volume (vph)	515	67	89	563	90	126
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Storage Length (m)		0.0	45.0		0.0	0.0
Storage Lanes		0	1		1	0
Taper Length (m)			20.0		7.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.98		0.95		0.95	
Fr t	0.984				0.921	
Fl t Protected			0.950		0.980	
Satd. Flow (prot)	1656	0	1630	1716	1496	0
Fl t Permitted			0.272		0.980	
Satd. Flow (perm)	1656	0	443	1716	1471	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	19				104	
Link Speed (k/h)	50			50	50	
Link Distance (m)	63.9			136.9	63.4	
Travel Time (s)	4.6			9.9	4.6	
Confl. Peds. (#/hr)		103	103		15	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	560	73	97	612	98	137
Shared Lane Traffic (%)						
Lane Group Flow (vph)	633	0	97	612	235	0
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	8.0		8.0	8.0	8.0	
Minimum Split (s)	27.5		27.5	27.5	14.5	
Total Split (s)	42.0		42.0	42.0	18.0	
Total Split (%)	70.0%		70.0%	70.0%	30.0%	
Maximum Green (s)	35.5		35.5	35.5	11.5	
Yellow Time (s)	4.1		4.1	4.1	4.1	
All-Red Time (s)	2.4		2.4	2.4	2.4	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	6.5		6.5	6.5	6.5	
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	Min		Min	Min	C-Min	
Walk Time (s)	8.0		8.0	8.0	8.0	
Flash Dont Walk (s)	13.0		13.0	13.0	13.0	
Pedestrian Calls (#/hr)	0		0	0	0	
Act Effct Green (s)	28.9		28.9	28.9	18.1	
Actuated g/C Ratio	0.48		0.48	0.48	0.30	
v/c Ratio	0.79		0.46	0.74	0.45	
Control Delay	19.4		16.1	17.8	15.2	

Lanes, Volumes, Timings

250: Fallsview Boulevard & Ferry Street

Future Total 2032

Buchanan Ave Closure + Signal



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Queue Delay	0.4		0.0	0.0	0.0	
Total Delay	19.8		16.1	17.8	15.2	
LOS	B		B	B	B	
Approach Delay	19.8		17.6	15.2		
Approach LOS	B		B	B		
Queue Length 50th (m)	53.0		6.7	50.9	11.8	
Queue Length 95th (m)	71.4		15.0	66.8	#39.2	
Internal Link Dist (m)	39.9		112.9	39.4		
Turn Bay Length (m)			45.0			
Base Capacity (vph)	987		262	1015	524	
Starvation Cap Reductn	83		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.70		0.37	0.60	0.45	

Intersection Summary

Area Type: Other
 Cycle Length: 60
 Actuated Cycle Length: 60
 Offset: 0 (0%), Referenced to phase 2:NBL and 6.: Start of Green
 Natural Cycle: 50
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.79
 Intersection Signal Delay: 18.1 Intersection LOS: B
 Intersection Capacity Utilization 72.1% ICU Level of Service C
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 250: Fallsview Boulevard & Ferry Street



HCM Signalized Intersection Capacity Analysis

250: Fallsview Boulevard & Ferry Street

Future Total 2032

Buchanan Ave Closure + Signal



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	515	67	89	563	90	126
Future Volume (vph)	515	67	89	563	90	126
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Total Lost time (s)	6.5		6.5	6.5	6.5	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frpb, ped/bikes	0.98		1.00	1.00	0.97	
Flpb, ped/bikes	1.00		0.95	1.00	1.00	
Fr t	0.98		1.00	1.00	0.92	
Fl t Protected	1.00		0.95	1.00	0.98	
Satd. Flow (prot)	1657		1555	1716	1508	
Fl t Permitted	1.00		0.27	1.00	0.98	
Satd. Flow (perm)	1657		446	1716	1508	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	560	73	97	612	98	137
RTOR Reduction (vph)	10	0	0	0	73	0
Lane Group Flow (vph)	623	0	97	612	162	0
Confl. Peds. (#/hr)		103	103		15	15
Turn Type	NA		Perm	NA	Prot	
Protected Phases	4			8	2	
Permitted Phases			8			
Actuated Green, G (s)	28.9		28.9	28.9	18.1	
Effective Green, g (s)	28.9		28.9	28.9	18.1	
Actuated g/C Ratio	0.48		0.48	0.48	0.30	
Clearance Time (s)	6.5		6.5	6.5	6.5	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	798		214	826	454	
v/s Ratio Prot	c0.38			0.36	c0.11	
v/s Ratio Perm			0.22			
v/c Ratio	0.78		0.45	0.74	0.36	
Uniform Delay, d1	12.9		10.3	12.5	16.4	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	5.0		1.5	3.6	2.2	
Delay (s)	17.9		11.8	16.1	18.6	
Level of Service	B		B	B	B	
Approach Delay (s)	17.9			15.5	18.6	
Approach LOS	B			B	B	

Intersection Summary

HCM 2000 Control Delay 16.9 HCM 2000 Level of Service B
 HCM 2000 Volume to Capacity ratio 0.62
 Actuated Cycle Length (s) 60.0 Sum of lost time (s) 13.0
 Intersection Capacity Utilization 72.1% ICU Level of Service C
 Analysis Period (min) 15
 c Critical Lane Group

Lanes, Volumes, Timings

350: Fallsview Boulevard & Robinson Street

Future Total 2032

Buchanan Ave Closure + Signal

	↖	→	↘	↙	←	↖	↙	↑	↘	↙	↓	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	121	124	74	13	157	25	71	169	15	2	138	55
Future Volume (vph)	121	124	74	13	157	25	71	169	15	2	138	55
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.969			0.983			0.992			0.962	
Flt Protected		0.981			0.997			0.986				
Satd. Flow (prot)	0	1631	0	0	1681	0	0	1678	0	0	1650	0
Flt Permitted		0.981			0.997			0.986				
Satd. Flow (perm)	0	1631	0	0	1681	0	0	1678	0	0	1650	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		125.4			133.0			52.4			289.1	
Travel Time (s)		9.0			9.6			3.8			20.8	
Confl. Peds. (#/hr)	20		9	9		20	15		15	15		15
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
Adj. Flow (vph)	132	135	80	14	171	27	77	184	16	2	150	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	347	0	0	212	0	0	277	0	0	212	0
Sign Control		Stop			Stop			Stop			Stop	
Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	72.8%											
Analysis Period (min)	15											
ICU Level of Service	C											

HCM Unsignalized Intersection Capacity Analysis

350: Fallsview Boulevard & Robinson Street

Future Total 2032

Buchanan Ave Closure + Signal

	↖	→	↘	↙	←	↖	↙	↑	↘	↙	↓	↘
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	121	124	74	13	157	25	71	169	15	2	138	55
Future Volume (vph)	121	124	74	13	157	25	71	169	15	2	138	55
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)	132	135	80	14	171	27	77	184	16	2	150	60
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	347	212	277	212								
Volume Left (vph)	132	14	77	2								
Volume Right (vph)	80	27	16	60								
Hadj (s)	-0.03	-0.03	0.05	-0.13								
Departure Headway (s)	5.8	6.1	6.1	6.1								
Degree Utilization, x	0.56	0.36	0.47	0.36								
Capacity (veh/h)	576	519	538	518								
Control Delay (s)	16.1	12.5	14.4	12.4								
Approach Delay (s)	16.1	12.5	14.4	12.4								
Approach LOS	C	B	B	B								
Intersection Summary												
Delay	14.2											
Level of Service	B											
Intersection Capacity Utilization	72.8%											
ICU Level of Service	C											
Analysis Period (min)	15											

Lanes, Volumes, Timings

Future Total 2032

450: Stanley Avenue & Robinson Street

Buchanan Ave Closure + Signal

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	[Diagrammatic Lane Configurations]											
Traffic Volume (vph)	18	62	49	72	100	149	48	831	66	68	860	32
Future Volume (vph)	18	62	49	72	100	149	48	831	66	68	860	32
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Storage Length (m)	40.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Storage Lanes	1		0	0		0	0		0	0		0
Taper Length (m)	15.0			7.5			7.5			7.5		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	0.95
Ped Bike Factor	0.99	0.99			0.98		1.00			1.00		
Frt		0.934			0.937		0.989			0.995		
Flt Protected	0.950				0.989		0.997			0.996		
Satd. Flow (prot)	1630	1588	0	0	1567	0	0	3203	0	0	3223	0
Flt Permitted	0.449				0.888		0.835			0.768		
Satd. Flow (perm)	763	1588	0	0	1404	0	0	2681	0	0	2484	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		53			64			16			7	
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		130.3			125.4			90.2			360.0	
Travel Time (s)		9.4			9.0			6.5			25.9	
Confl. Peds. (#/hr)	20		9	9		20	30		18	18		30
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
Adj. Flow (vph)	20	67	53	78	109	162	52	903	72	74	935	35
Shared Lane Traffic (%)												
Lane Group Flow (vph)	20	120	0	0	349	0	0	1027	0	0	1044	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	8.0	8.0		8.0	8.0		8.0	8.0		8.0	8.0	
Minimum Split (s)	28.0	28.0		28.0	28.0		28.0	28.0		28.0	28.0	
Total Split (s)	27.0	27.0		27.0	27.0		42.0	42.0		42.0	42.0	
Total Split (%)	39.1%	39.1%		39.1%	39.1%		60.9%	60.9%		60.9%	60.9%	
Maximum Green (s)	20.0	20.0		20.0	20.0		35.0	35.0		35.0	35.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	2.1	2.1		2.1	2.1		2.2	2.2		2.2	2.2	
Recall Mode	Min	Min		Min	Min		C-Min	C-Min		C-Min	C-Min	
Walk Time (s)	8.0	8.0		8.0	8.0		8.0	8.0		8.0	8.0	
Flash Dont Walk (s)	13.0	13.0		13.0	13.0		13.0	13.0		13.0	13.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	17.4	17.4		17.4	17.4		37.6	37.6		37.6	37.6	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.54	0.54		0.54	0.54	
v/c Ratio	0.10	0.27		0.27	0.27		0.70	0.70		0.70	0.77	
Control Delay	19.7	13.3		42.6	42.6		15.4	15.4		18.3	18.3	

Lanes, Volumes, Timings

Future Total 2032

450: Stanley Avenue & Robinson Street

Buchanan Ave Closure + Signal

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Queue Delay	0.0	0.0			0.0			0.0			0.0	
Total Delay	19.7	13.3			42.6			15.4			18.3	
LOS	B	B			D			B			B	
Approach Delay			14.2		42.6			15.4			18.3	
Approach LOS			B		D			B			B	
Queue Length 50th (m)	2.0	6.7			35.4			52.8			57.8	
Queue Length 95th (m)	6.9	18.4			#76.8			77.5			#90.3	
Internal Link Dist (m)		106.3			101.4			66.2			336.0	
Turn Bay Length (m)	40.0											
Base Capacity (vph)	221	497			452			1467			1356	
Starvation Cap Reductn	0	0			0			0			0	
Spillback Cap Reductn	0	0			0			0			0	
Storage Cap Reductn	0	0			0			0			0	
Reduced v/c Ratio	0.09	0.24			0.77			0.70			0.77	

Intersection Summary

Area Type:	Other
Cycle Length:	69
Actuated Cycle Length:	69
Offset:	29 (42%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle:	65
Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.87
Intersection Signal Delay:	20.3
Intersection LOS:	C
Intersection Capacity Utilization:	103.0%
ICU Level of Service:	G
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 450: Stanley Avenue & Robinson Street



HCM Signalized Intersection Capacity Analysis
450: Stanley Avenue & Robinson Street

Future Total 2032
Buchanan Ave Closure + Signal

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↕		↔	↕		↔	↕		↔	↕	
Traffic Volume (vph)	18	62	49	72	100	149	48	831	66	68	860	32
Future Volume (vph)	18	62	49	72	100	149	48	831	66	68	860	32
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750	1750
Total Lost time (s)	7.0	7.0			7.0			7.0			7.0	
Lane Util. Factor	1.00	1.00			1.00			0.95			0.95	
Frpb, ped/bikes	1.00	0.99			0.99			1.00			1.00	
Flpb, ped/bikes	0.99	1.00			1.00			1.00			1.00	
Frpt	1.00	0.93			0.94			0.99			0.99	
Flt Protected	0.95	1.00			0.99			1.00			1.00	
Satd. Flow (prot)	1614	1587			1565			3205			3223	
Flt Permitted	0.45	1.00			0.89			0.83			0.77	
Satd. Flow (perm)	763	1587			1405			2682			2484	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	67	53	78	109	162	52	903	72	74	935	35
RTOR Reduction (vph)	0	40	0	0	48	0	0	7	0	0	3	0
Lane Group Flow (vph)	20	80	0	0	301	0	0	1020	0	0	1041	0
Confl. Peds. (#/hr)	20		9	9		20	30		18	18		30
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)	17.4	17.4			17.4			37.6			37.6	
Effective Green, g (s)	17.4	17.4			17.4			37.6			37.6	
Actuated g/C Ratio	0.25	0.25			0.25			0.54			0.54	
Clearance Time (s)	7.0	7.0			7.0			7.0			7.0	
Vehicle Extension (s)	2.1	2.1			2.1			2.2			2.2	
Lane Grp Cap (vph)	192	400			354			1461			1353	
v/s Ratio Prot		0.05										
v/s Ratio Perm	0.03				c0.21			0.38			c0.42	
v/c Ratio	0.10	0.20			0.85			0.70			0.77	
Uniform Delay, d1	19.8	20.3			24.6			11.5			12.3	
Progression Factor	1.00	1.00			1.00			1.00			1.00	
Incremental Delay, d2	0.1	0.1			17.0			2.8			4.3	
Delay (s)	19.9	20.4			41.5			14.3			16.6	
Level of Service	B	C			D			B			B	
Approach Delay (s)		20.4			41.5			14.3			16.6	
Approach LOS		C			D			B			B	
Intersection Summary												
HCM 2000 Control Delay		19.3			HCM 2000 Level of Service			B				
HCM 2000 Volume to Capacity ratio		0.79										
Actuated Cycle Length (s)		69.0			Sum of lost time (s)			14.0				
Intersection Capacity Utilization		103.0%			ICU Level of Service			G				
Analysis Period (min)		15										
c	Critical Lane Group											

Lanes, Volumes, Timings
550: North Access & Ferry Street

Future Total 2032
Buchanan Ave Closure + Signal

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↕		↕
Traffic Volume (vph)	718	71	0	653	0	3
Future Volume (vph)	718	71	0	653	0	3
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpt	0.988					0.865
Flt Protected						
Satd. Flow (prot)	1695	0	0	1716	0	1484
Flt Permitted						
Satd. Flow (perm)	1695	0	0	1716	0	1484
Link Speed (k/h)	50			50		50
Link Distance (m)	61.1			63.9		33.0
Travel Time (s)	4.4			4.6		2.4
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	780	77	0	710	0	3
Shared Lane Traffic (%)						
Lane Group Flow (vph)	857	0	0	710	0	3
Sign Control	Free			Free		Stop
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	62.4%			ICU Level of Service B		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
550: North Access & Ferry Street

Future Total 2032
Buchanan Ave Closure + Signal

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↘			↖		↗
Traffic Volume (veh/h)	718	71	0	653	0	3
Future Volume (Veh/h)	718	71	0	653	0	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	780	77	0	710	0	3
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (m)	61			64		
pX, platoon unblocked			0.66	0.81	0.66	
vC, conflicting volume			857	1528	818	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			527	720	468	
tC, single (s)			4.1	6.4	6.2	
tC, 2 stage (s)						
tF (s)			2.2	3.5	3.3	
p0 queue free %			100	100	99	
cM capacity (veh/h)			687	318	393	
Direction, Lane #						
	EB 1	WB 1	NB 1			
Volume Total	857	710	3			
Volume Left	0	0	0			
Volume Right	77	0	3			
cSH	1700	1700	393			
Volume to Capacity	0.50	0.42	0.01			
Queue Length 95th (m)	0.0	0.0	0.2			
Control Delay (s)	0.0	0.0	14.2			
Lane LOS			B			
Approach Delay (s)	0.0	0.0	14.2			
Approach LOS			B			
Intersection Summary						
Average Delay			0.0			
Intersection Capacity Utilization			62.4%		ICU Level of Service	B
Analysis Period (min)			15			

Lanes, Volumes, Timings
650: Fallsview Boulevard & East Access

Future Total 2032
Buchanan Ave Closure + Signal

	↖	↘	↙	↑	↓	↗
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↖	↘		↑	↓	↗
Traffic Volume (vph)	46	6	12	170	166	7
Future Volume (vph)	46	6	12	170	166	7
Ideal Flow (vphpl)	1750	1750	1750	1750	1750	1750
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.983				0.994	
Flt Protected	0.958			0.997		
Satd. Flow (prot)	1616	0	0	1711	1705	0
Flt Permitted	0.958			0.997		
Satd. Flow (perm)	1616	0	0	1711	1705	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	31.7			289.1	63.4	
Travel Time (s)	2.3			20.8	4.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	50	7	13	185	180	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	57	0	0	198	188	0
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	37.1%			ICU Level of Service A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis
 650: Fallsview Boulevard & East Access

Future Total 2032
 Buchanan Ave Closure + Signal



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			Y	Y	
Traffic Volume (veh/h)	46	6	12	170	166	7
Future Volume (Veh/h)	46	6	12	170	166	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	50	7	13	185	180	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (m)				63		
pX, platoon unblocked						
vC, conflicting volume	395	184	188			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	395	184	188			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	92	99	99			
cM capacity (veh/h)	604	858	1386			
Direction, Lane #	EB 1	NB 1	SB 1			
Volume Total	57	198	188			
Volume Left	50	13	0			
Volume Right	7	0	8			
cSH	627	1386	1700			
Volume to Capacity	0.09	0.01	0.11			
Queue Length 95th (m)	2.4	0.2	0.0			
Control Delay (s)	11.3	0.6	0.0			
Lane LOS	B	A				
Approach Delay (s)	11.3	0.6	0.0			
Approach LOS	B					
Intersection Summary						
Average Delay	1.7					
Intersection Capacity Utilization	37.1%			ICU Level of Service	A	
Analysis Period (min)	15					

APPENDIX I - PARKING DEMAND SURVEY RESULTS



Parking Study

Location: 15 Towering Heights Blvd. St. Catharines
 Observer: CK
 Weather: Clear

Date: February 28th - March 1st
 Time: 22:00 - 01:00

Vehicles Parked at Start Inside: 49 Visitor: 6
 Outside: 57 TOTAL: 112

Time	Vehicles at End of Period
22:00 - 22:15	112
22:16 - 22:30	113
22:31 - 22:45	113
22:46 - 23:00	112
23:01 - 23:15	113
23:16 - 23:30	114
23:31 - 23:45	114
23:46 - 00:00	114
00:01 - 00:15	114
00:16 - 00:30	114
00:31 - 00:45	115
00:46 - 01:00	116
MAXIMUM VEHICLES:	116

Parking Study

Location: 15 Towering Heights Blvd. St. Catharines
 Observer: CK
 Weather: Clear

Date: March 2nd - 3rd, 2019
 Time: 22:00 - 01:00

Vehicles Parked at Start
 Inside: 45 Visitor: 8
 Outside: 56 TOTAL: 109

Time	Vehicles at End of Period
22:00 - 22:15	109
22:16 - 22:30	109
22:31 - 22:45	110
22:46 - 23:00	110
23:01 - 23:15	111
23:16 - 23:30	112
23:31 - 23:45	111
23:46 - 00:00	113
00:01 - 00:15	114
00:16 - 00:30	116
00:31 - 00:45	117
00:46 - 01:00	118
MAXIMUM VEHICLES:	118

APPENDIX J - TDM IMPLEMENTATION CHECKLIST





Case Study: 5438 Ferry Street **Site Context:** UGC (Niagara Falls Tourist Core)
Date: July 2023 **Reduction Worksheet No:** 1

*Urban Growth Centres - (UGC) area classification includes the Downtown / Uptown and RT Station Areas of Kitchener, Waterloo and Cambridge.
 Intensification Corridor (IC) classification is applied to sites within 800 metres of the future CTC line
 Other classification applies to all other sites

Please highlight the cell percentages applicable to your development under the appropriate classification. Please note that the Parking Management Worksheet and the Transportation Demand Management (TDM) Checklist are not designed for residential properties, but can be used for mixed-use developments. Local municipalities are the decision-making bodies with respect to consideration of parking reductions below Zoning By-law requirements.

TABLE A Pedestrian and Cyclist Orientation					
In creating an environment that supports pedestrian and cycling activity, the public realm must be accessible, safe, and comfortable to encourage movement on the street and in the surrounding area(s). These facilities and features should encourage walking and cycling.					
	Features	UGC	IC	Other	Notes
A1	Development incorporates functional building entrances that are oriented to public space or to locations where pedestrians and transit users arrive from such as a street, square, park or plaza.	1%	1%	1%	Front door to residential lobby faces main pedestrian corner (Ferry and Fallsview). Back lobby provided for additional access from drive lane at back of site. Commercial spaces face main pedestrian streets.
A2	Continuous sidewalks (1.5m min. width) are provided along both sides of all adjacent public streets and pedestrian walkways (1.5m min width) are provided through large parking areas to link the building with the public street sidewalk system	0%	0%	1%	
A3	Non-Residential: Development provides secure bike storage for 4% of the building occupants	2%	2%	1%	Main floor commercial tenants are provided access to main floor indoor bike parking areas which can accommodate 45 bikes. Additional secure bike storage provided on parking levels (230 private). Additional exterior bike storage provided (60 public).
A4	Shower and change facilities provided on-site consistent with LEED requirements.	1%	1%	1%	Yes. Shower and change room provided on the main floor adjacent to bike storage area.
A5	Provision of active uses at-grade along street frontages.	1%	1%	1%	Outdoor public bicycle parking areas provided for people visiting building or customers visiting commercial spaces (60 stalls).
Category Maximum		4%	4%	4%	
Available Parking Reduction		4%			

TABLE B Public Transportation Access					
The availability and proximity of convenient public transit service with direct pedestrian linkages to the building will provide viable travel options for employees, visitors and residents.					
	Features	UGC	IC	Other	Other
B1	Bus shelters with seating are provided at the transit stop immediately adjacent to the development, in consultation with Transportation Planning at the Region of Waterloo	0%	0%	1%	
B2	Information regarding public transit routes, schedules and fares are provided in an accessible and visible location on site and in adjacent bus stops	0%	0%	1%	
B3a	Located in an UGC or within 800 m of a future Rapid Transit Station	24%	12%	0%	
B3b	Located within 600m a transit route with 15 minute headways (or less) or is located in a designated mixed use corridor or node. Note: Points are awarded for either B3a, B3b or B3c only. Please choose whichever represents the highest order of transit.	24%	-	3%	Route 104 and 204 within 22m. WeGo within 27m. At least 5 routes within a couple hundred meters.
B3c	Located within 400 metres of a bus service with headways of 15 min to 30 min. Note: Points are awarded for either B3a, B3b or B3c only. Please choose whichever represents the highest order of transit.	-	-	1%	
Category Maximum		24%	12%	5%	
Available Parking Reduction		24%			

TABLE C Parking					
Vehicle parking facilities can affect the character, travel mode and cost of a development. Reducing parking supply to match expected demand can have a positive influence on the selection of alternative travel modes.					
	Features	UGC	IC	Other	Other
C1	Provides priority parking for carpooling/vanpooling participants equivalent to 5% of employee spaces	0%	0%	5%	
C2	Commercial Uses: Provide car-share spaces equivalent to 2% of building occupants	2%	2%	0%	9 carshare spaces for residential and commercial use.
C3	Implements paid parking system on all or part of the site (e.g. parking permits, paid parking zones near main entrances)	2%	2%	1%	
C4	Parking is not located on major street frontage.	0%	0%	1%	
C5	25% to 50% of parking is located underground or in a structure	2%	1%	0%	
C6	50% to 75% of parking is located underground or in a structure	4%	2%	0%	
C7	75% of parking or more is located underground or in a structure	5%	3%	0%	96% of parking is located within structure, both under and above ground.
Category Maximum		6%	4%	6%	
Available Parking Reduction		6%			



Case Study: 5438 Ferry Street
Date: July 2023

Site Context: UGC (Niagara Falls Tourist Core)
Worksheet No: 1

TABLE D Trip Reduction Incentives					
A formal TDM plan will identify specific initiatives that will be initiated in order to encourage reduced single occupant vehicle travel.					
	Features	UGC	IC	Other	Notes
D1	The building owner/occupant will provide a ride matching service for car/vanpooling	0%	0%	1%	
D2	The building owner/occupant will provide emergency ride home options	3%	2%	1%	
D3	The building owner/occupant will provide subsidized transit passes for all occupants for a period of two years	10%	4%	2%	Owner will provide subsidized transit passes.
D4	The building owner/occupant agrees to charge for parking as a separate cost to occupants	10%	5%	2%	
D5	The building owner/occupant agrees to provide reduced cost for users of car/van pool, bicycle, moped/motorcycle spaces	0%	0%	1%	
D6	The development agrees to join Travelwise (TMA) that provides the same services outlined under items D1 and D2	9%	6%	4%	
Category Maximum		23%	11%	7%	
Available Parking Reduction		10%			

TABLE E Parking Reduction Summary					
Please indicate the total reduction available based upon Tables A through D above.					
Category	Reduction Achieved	Maximum Achievable Reduction			Comments
		UGC	IC	Other	
Pedestrian & Cyclist Orientation	4%	4%	4%	4%	
Public Transit Access	24%	24%	12%	5%	
Parking	6%	6%	4%	6%	
Trip Reduction Incentives	10%	23%	11%	7%	
TOTAL	44%	57%	31%	22%	

TABLE F	TOTAL REDUCTION ACHIEVED	44%
----------------	---------------------------------	------------

Comments:
