BURNSIDE

1600 Kerns Road
Burlington, ON
Transportation Study

Fieldgate Properties Ltd. O/A FGL Kerns Inc.

1600 Kerns Road
Burlington, ON
Transportation Study

Fieldgate Properties Ltd. O/A FGL Kerns Inc.

R.J. Burnside & Associates Limited
1465 Pickering Parkway Suite 200
Pickering ON L1V 7G7 CANADA

March 2021
300052293.0000

R.J. Burnside & Associates Limited

Report Prepared By:

Benedict Wong, E.I.T.
Transportation Planner
BW/JRH/DWA:bs

Report Reviewed By:

James R. Hollingsworth, P.Eng.
Technical Leader, Solid Waste

David Angelakis, C.E.T.
Senior Project Manager – Transportation

Executive Summary

R.J. Burnside & Associates Limited (Burnside) was retained by Fieldgate Properties Limited O/A FGL Kerns Inc. (the Client) to undertake a Transportation Study for a proposed 4-storey 123-unit retirement building with 100 m^2 (1,076 ft^2) of commercial uses at 1600 Kerns Road in the City Burlington. The site is currently occupied by a small commercial plaza with two existing full movement driveways on Kerns Road and one full movement driveway on Four Seasons Drive. Access to the visitor parking and below grade parking garage for residents and employees is to be provided via a shifted driveway on Four Seasons Drive and by the south driveway on Kerns Road, respectively.

Existing and Future Traffic Operations

The existing plaza currently generates significantly more trips than will be generated by the new use. It is projected that the development will result in 54 and 22 trips being removed from the road network during the AM and PM peak hours, respectively. As a result, total traffic operations will improve over background traffic operations.

Parking Review

The proposed vehicular parking supply is 66 spaces, which will consist of 62 spaces for the retirement home and 4 spaces for commercial use. The proposed vehicular parking supply will not meet the City's Parking Review requirements for the retirement home land use. However, a review of other GTA municipalities' requirements and Burnside's own database of surveys found that the highest of the rates reviewed were 0.50 spaces/unit (Mississauga and Milton). It is recommended that the proposed parking supply for the retirement home land use be based on a minimum parking supply rate of 0.50 spaces/unit. It is our opinion that the proposed parking supply is adequate and will meet future parking demand.

Two Type A spaces accessible spaces are proposed, which will exceed City requirements. The proposed one loading space will meet City requirements. Two or more bicycle spaces will be provided, which will meet or exceed the City requirements.

Site Plan Review

The site is well designed to accommodate all modes of transportation. A maneuvering analysis confirms that a refuse truck can access the proposed refuse pickup/loading space.

Waste Management Plan

A detailed or formal Waste Management Plan will be prepared for the site and will be provided in a future submission. The site will comply with Region's Development Design Guidelines for Source Separation of Solid Waste. See Section 8.0 for more information on the Waste Management Plan.

Transportation Demand Management

To further facilitate other modes of travel and reduce trips and parking demand, internal sidewalks will connect the building entrances to the existing sidewalk network to facilitate pedestrian access and access to nearby transit stops. In addition, bicycle parking will be provided and there is an existing bus stop on Kerns Road, just south of the site.

Table of Contents

1.0 Introduction 1
1.1 Background 1
1.2 Scope of Work 2
1.3 Intersection Analysis Methodology 2
2.0 Existing Site Conditions 3
2.1 Site Context 3
2.2 Existing Road Network 4
2.3 Existing Transit Services 5
2.4 Existing Traffic Volumes 6
3.0 Future Background Conditions 9
3.1 Future Road Network 9
3.2 Future Transit 9
3.3 Future Active Transportation 9
3.4 Background Traffic Growth 10
3.5 Background Development 10
3.6 Background Traffic Volumes 10
4.0 Proposed Development 12
4.1 Trip Generation 12
4.2 Trip Distribution & Assignment 14
5.0 Total Traffic Conditions 16
6.0 Traffic Operations Analysis 19
6.1 North Service Road/Kerns Road 19
6.2 Kerns Road/Winterberry Drive/Four Seasons Drive 20
6.3 Kerns Road/Tyandaga Park Drive 21
6.4 Site Driveways 21
7.0 Site Plan Review 22
8.0 Waste Management Plan 22
9.0 Parking Supply Review 24
9.1 Vehicle Parking 24
9.2 Loading 25
9.3 Bicycle Parking 26
10.0 Transportation Demand Management 26
11.0 Conclusions 27
11.1 Road Network Operations 27
11.2 Site Plan Review 27
11.3 Waste Management 27
11.4 Parking and Loading Review 27
11.5 TDM Plan 28

Tables

Table 1: Transit Routes Summary 6
Table 2: Previous and Current Site Plan Comparison 12
Table 3: Site Trip Generation Changes 14
Table 4: Trip Distribution 14
Table 5: North Service/Kerns Signalized Intersection Operations 19
Table 6: Kerns/Winterberry/Four Seasons Unsignalized Intersection Operations 20
Table 7: Kerns/Tyandaga Park Unsignalized Intersection Operations 21
Table 8: Site Driveways Unsignalized Intersection Operations 21
Table 9: Vehicular Parking Requirements 24
Table 10: Retirement Home Parking Rate Comparison 25

Figures

Figure 1: Site Location 1
Figure 2: Existing Lane Configuration and Traffic Control 5
Figure 3: Transit Routes 6
Figure 4: Existing Traffic Volumes 8
Figure 5: Future Active Transportation Road Network 9
Figure 6: 2027 Background Traffic Volumes 11
Figure 7: Site Plan 13
Figure 8: Site Generated Traffic 15
Figure 9: Existing Site Traffic 17
Figure 10: 2027 Total Traffic Volumes 18
Figure 11: Residential Waste Storage Room 23

Appendices

Appendix A Existing Traffic Counts and Signal Timing Plan
Appendix B Existing Traffic Operations
Appendix C 2027 Background Traffic Operations
Appendix D 2027 Total Traffic Operations
Appendix E Truck Access Analysis
Appendix F City Parking Review Excerpts
Appendix G Zoning By-Law Excerpts

Abbreviations

The following summarizes abbreviations that are utilized within this report:

- Burnside – R.J. Burnside & Associates Limited
- City – City of Burlington
- Directions:
  - EB – Eastbound
  - SB – Southbound
  - NB – Northbound
  - WB – Westbound
- ITE – Institute of Transportation Engineers
- LOS – level of service
- LUC – Land Use Code
- PHF – Peak Hour Factor
- Region – Region of Halton
- TOR – Terms of Reference
- Traffic Movements:
  - LT – shared left-through movement
  - LTR – shared left-through-right movement
  - LR – shared left-right movement
  - TR – shared through-right movement
- v/c – volume to capacity ratio

Disclaimer

Other than by the addressee, copying or distribution of this document, in whole or in part, is not permitted without the express written consent of R.J. Burnside & Associates Limited.

In the preparation of the various instruments of service contained herein, R.J. Burnside & Associates Limited was required to use and rely upon various sources of information (including but not limited to: reports, data, drawings, observations) produced by parties other than R.J. Burnside & Associates Limited. For its part R.J. Burnside & Associates Limited has proceeded based on the belief that the third party/parties in question produced this documentation using accepted industry standards and best practices and that all information was therefore accurate, correct and free of errors at the time of consultation. As such, the comments, recommendations and materials presented in this instrument of service reflect our best judgment in light of the information available at the time of preparation. R.J. Burnside & Associates Limited, its employees, affiliates and subcontractors accept no liability for inaccuracies or errors in the instruments of service provided to the client, arising from deficiencies in the aforementioned third party materials and documents.

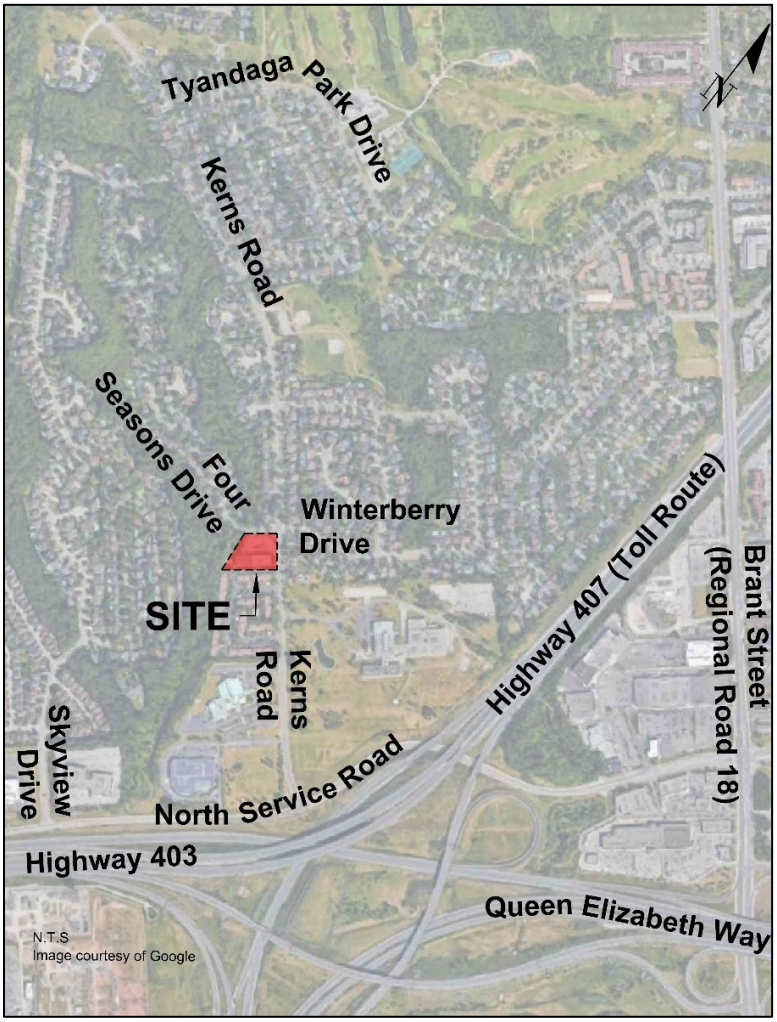
R.J. Burnside & Associates Limited makes no warranties, either express or implied, of merchantability and fitness of the documents and other instruments of service for any purpose other than that specified by the contract.

1.0 Introduction

1.1 Background

R.J. Burnside & Associates Limited (Burnside) was retained by Fieldgate Properties Ltd. O/A FGL Kerns Inc. (the Client) to undertake a Transportation Study for a proposed 4-storey, 123-unit retirement home with 100 m^2 (1,076 ft^2) of commercial uses at 1600 Kerns Road in the City of Burlington. The site is currently occupied by a commercial plaza with two existing full movement driveways on Kerns Road and one full movement driveway on Four Seasons Drive. The location of the development is illustrated in Figure 1.

Figure 1: Site Location



This report is part of a required Zoning By-law Amendment application.

1.2 Scope of Work

The following scope of work was confirmed with the City of Burlington (the City) prior to conducting this study.

Analysis Scenarios	• Existing traffic conditions • 2027 background traffic conditions • 2027 total traffic conditions
Analysis Time Periods	• Weekday AM peak hour (7:00 AM to 9:00 AM) • Weekday PM peak hour (4:00 PM to 6:00 PM)
Analysis Intersections (Study Area)	• Kerns Road/North Service Road • Kerns Road/Winterberry Drive/Four Seasons Drive • Kerns Road/Tyandaga Park Drive • Site Driveways
Site Plan Review	• Vehicle, pedestrian and cyclist access, and circulation • Site geometrics and parking lot layout
Parking Review	• Compliance with City Parking Standards for vehicular, accessible, loading, and bicycle parking requirements
Transportation Demand Management (TDM) Plan	• Recommendations on feasible TDM strategies to discourage single occupant motor vehicle use

1.3 Intersection Analysis Methodology

Signalized and stop controlled intersection operations were assessed for intersections in the study area using the software program Synchro 11, which employs methodology from the *Highway Capacity Manual (HCM 2000, HCM 2010 and HCM 6th)*, published by the Transportation Research Board National Research Council.

Synchro 11 can analyze both signalized and unsignalized intersections in a road corridor or network taking into account the spacing, interaction, queues and operations between intersections. The analysis utilizes the HCM 2000 methodology.

Signalized intersection analysis considers two separate measures of performance:

- The capacity of all intersection movements, which is based on a volume to capacity ratio that measure of the degree of capacity utilized.
- The level of service (LOS) for all intersection movements, which is based on the average control delay per vehicle for the various movements through the intersection and overall. Delay is an indicator of how long a vehicle must wait to complete a movement and is represented by a letter between A and F, with F being the longest

delay. The link between LOS and delay (in seconds) for signalized intersections is summarized below.

Level of Service	Control Delay per Vehicle(s)
A	≤10
B	> 10 – 20
C	> 20 – 35
D	> 35 – 55
E	> 55 – 80
F	> 80

Stop controlled intersection analysis considers two separate measures of performance:

- The capacity of the intersection's critical movements, which is based on a volume to capacity ratio.
- The level of service for the critical movements, which is based on the average control delay per vehicle for the various critical movements within the intersection. The link between LOS and delay (in seconds) for stop-controlled intersections is summarized below.

Level of Service	Control Delay per Vehicle(s)
A	0 – 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

2.0 Existing Site Conditions

2.1 Site Context

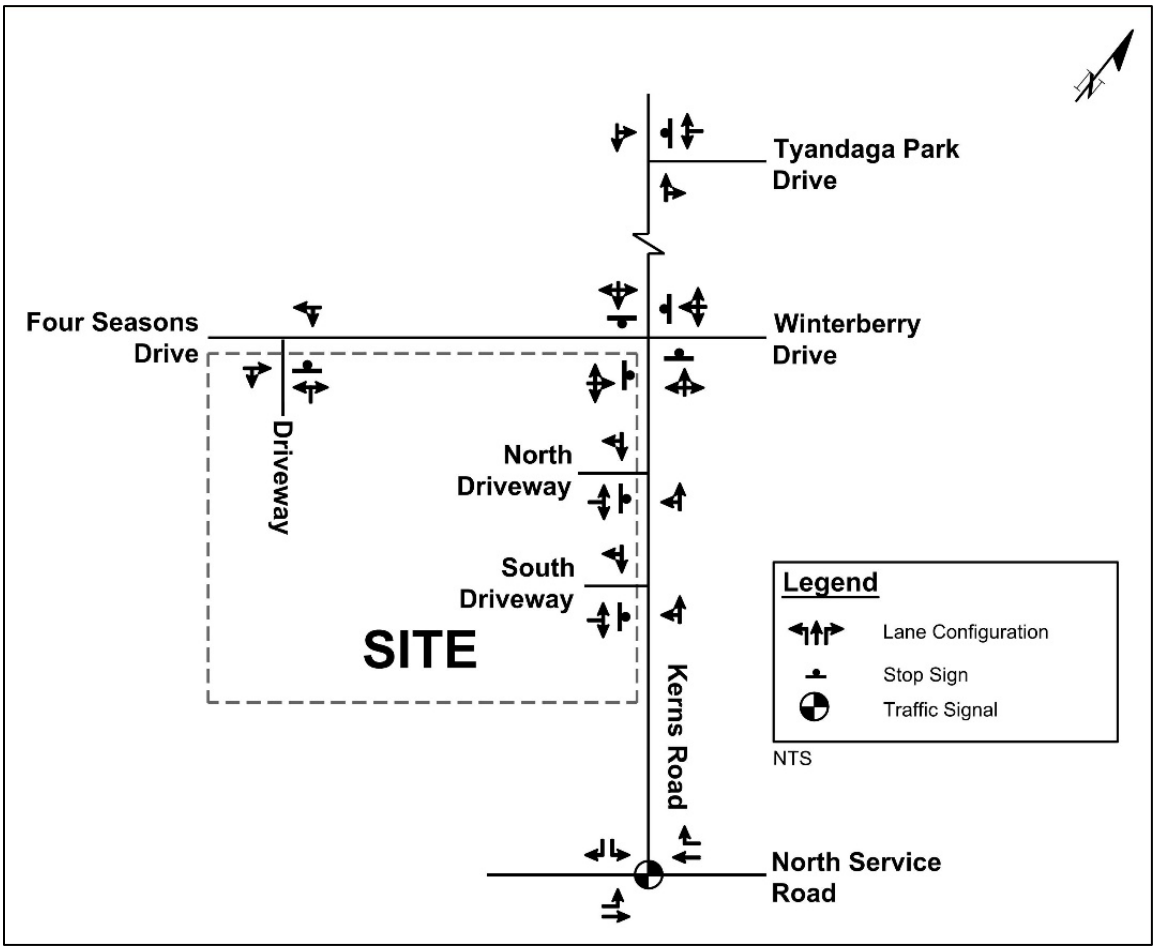
The site is currently occupied by an existing commercial plaza with two bakeries, a daycare, renovation company, and clinical offices. The site is surrounded by low to medium density residential.

2.2 Existing Road Network

The existing road network is described below and is illustrated in Figure 2, including existing traffic control. All roads are under the jurisdiction of the City.

North Service Road	North Service Road is an east-west industrial connector road with a posted speed limit of 60 km/h. The roadway has a 2-lane urban cross-section and has bicycle lanes on both sides and a sidewalk on the north side.
Kerns Road	Kerns Road is a north-south neighborhood connector road that extends from North Service Road to Dundas Street. However, southbound traffic is prohibited from entering the community just south of Dundas Street. The roadway has a 2-lane urban cross-section and has a posted speed limit of 40 km/h, a shared bicycle route, sidewalks on both sides, and a parking prohibition on both sides of the road along most of its length. Within the vicinity of the site parking is prohibited between 8:00 AM to 6:00 PM, except on Sundays or holidays on both sides of the road. Heavy trucks are prohibited from using the roadway.
Four Seasons Drive/ Winterberry Drive	Four Seasons Drive and Winterberry Drive are east-west local streets. They have a 2-lane urban cross-section, a posted speed limit of 40 km/hr, and sidewalks on both sides of the road. Skateboarding is prohibited on the street and parking is prohibited on the south side of Four Seasons Drive within the vicinity of the site. Through traffic from Kearns Road is also prohibited from using Four Seasons Drive.
Tyandaga Park Drive	Tyandaga Park Drive is an east-west neighborhood connector road which extends between Kerns Road and Brant Street. The roadway has a 2-lane urban cross-section, posted speed limit of 40 km/hr, sidewalks on both sides, and parking is prohibited on both sides of the road.

Figure 2: Existing Lane Configuration and Traffic Control



2.3 Existing Transit Services

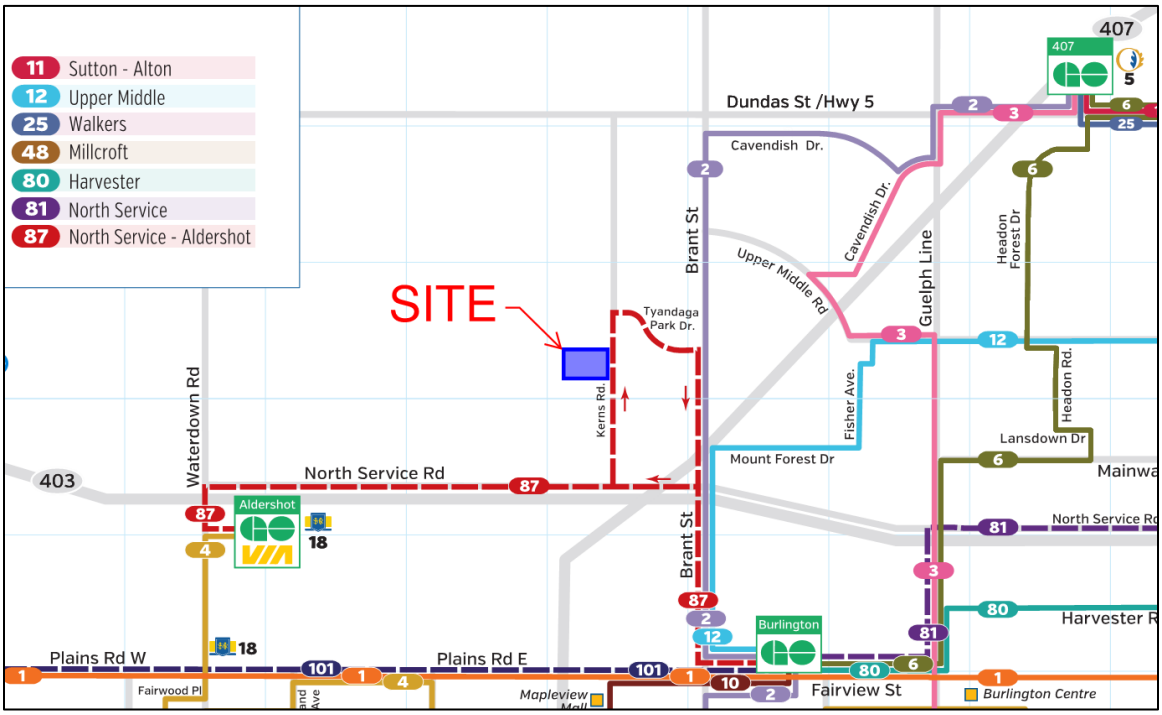
Burlington Transit (BT) operates a single bus route within the vicinity of the site. BT Route 87 (North Service Aldershot) passes by the site via Kerns Road and Tyandaga Park Drive, providing connections to the nearest transit hubs at the Burlington and Aldershot GO Stations. The closest bus stop is located south of the site, on the east side of Kerns Road, which is approximately 160 m (a 2-minute walk) from the site. Burlington GO Station is located less than 3.6 km to the south, which is within a 10 to 15-minute bus ride. Available transit service is summarized in Table 1 and the location of the bus routes nearest to the site are illustrated in Figure 3.

Table 1: Transit Routes Summary

Transit Agency	Route Number (Name)	Frequency (minutes)	Days and Hours of Operations
Burlington Transit	87 (North Service Aldershot)	45 min	5:30 AM to 9:12 AM & 2:30 PM to 6:57 PM Monday to Friday
GO Transit	18 (Lakeshore West)	30 to 40 min	5:03 AM to 1:51 AM Monday to Friday 6:31 AM to 1:51 AM Saturday & Sunday

As shown above, both BT and GO Transit provide excellent transit to the site.

Figure 3: Transit Routes



Reference: Burlington Transit System Map, Sept. 1, 2019

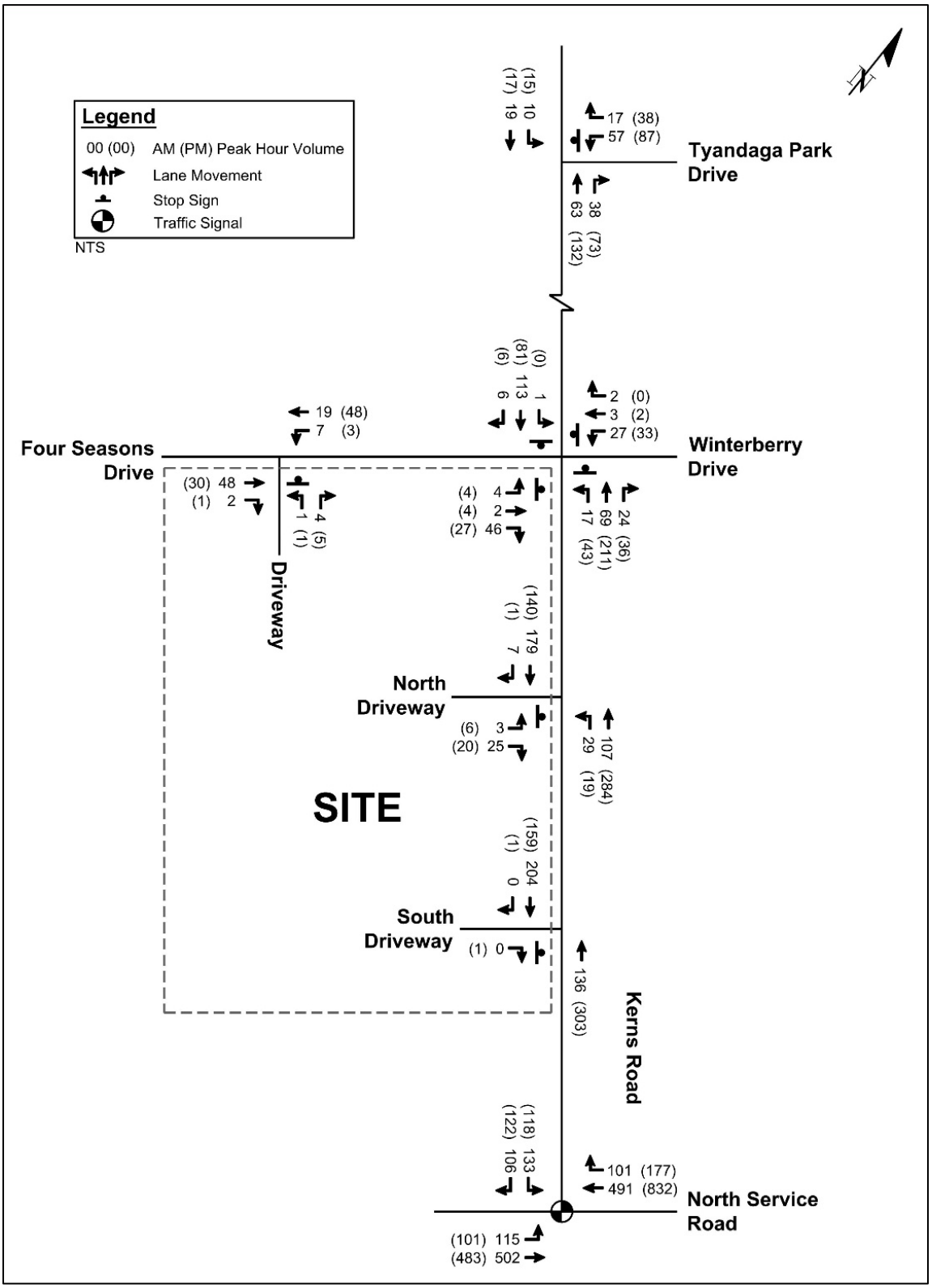
2.4 Existing Traffic Volumes

Existing traffic counts at the study intersections identified in Section 1.2 were undertaken for the weekday morning AM peak period (7:00 AM to 9:00 AM) and afternoon PM peak period (4:00 PM to 6:00 PM). These peak periods were selected as these are typical peak traffic periods for this type of development. The counts at study intersections were undertaken by Accu-Traffic Inc., on behalf of Burnside on Wednesday, October 21, 2020.

The COVID-19 pandemic was ongoing at the time the traffic counts were conducted, with restrictions on social gatherings and the operations of most businesses. Therefore, historical turning movement counts at study and nearby intersections, provided by the City, were used to compare traffic volumes and traffic patterns at all study intersections. For a more conservative analysis the highest turning movement counts, or the highest traffic screenline volumes were assumed for the estimation of 2020 traffic volumes, as discussed with the City. The traffic volumes were also balanced along the Kerns Road corridor, where appropriate.

The existing calibrated peak hour traffic volumes are illustrated in Figure 4 and both the historical and 2020 traffic counts are provided in Appendix A.

Figure 4: Existing Traffic Volumes



3.0 Future Background Conditions

3.1 Future Road Network

There are no planned improvements within the study road network by the study horizon year of 2027 as confirmed by City staff.

3.2 Future Transit

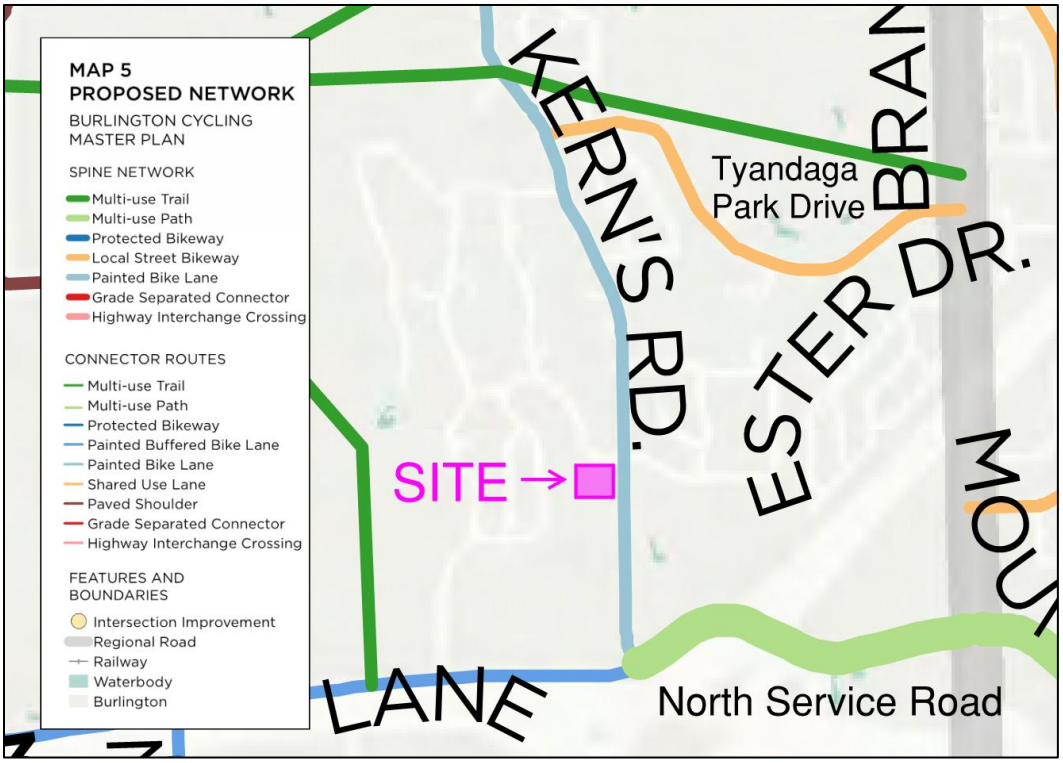
There are no planned transit improvements within the vicinity of the site by 2027.

3.3 Future Active Transportation

According to the *City of Burlington Cycling Draft Plan, dated August 2019*, the following active transportation network improvements are proposed within the vicinity of the site, which are also illustrated in Figure 5:

- A multi-use path on North Service Road east of Kerns Road.
- Addition of bike lanes on Kerns Road.
- Addition of shared use lanes on Tyandaga Park Drive.

Figure 5: Future Active Transportation Road Network



3.4 Background Traffic Growth

Following consultation with the City, a growth rate of 1.0% compounded annually to 2027, was applied to the east-west through movements on North Service Road.

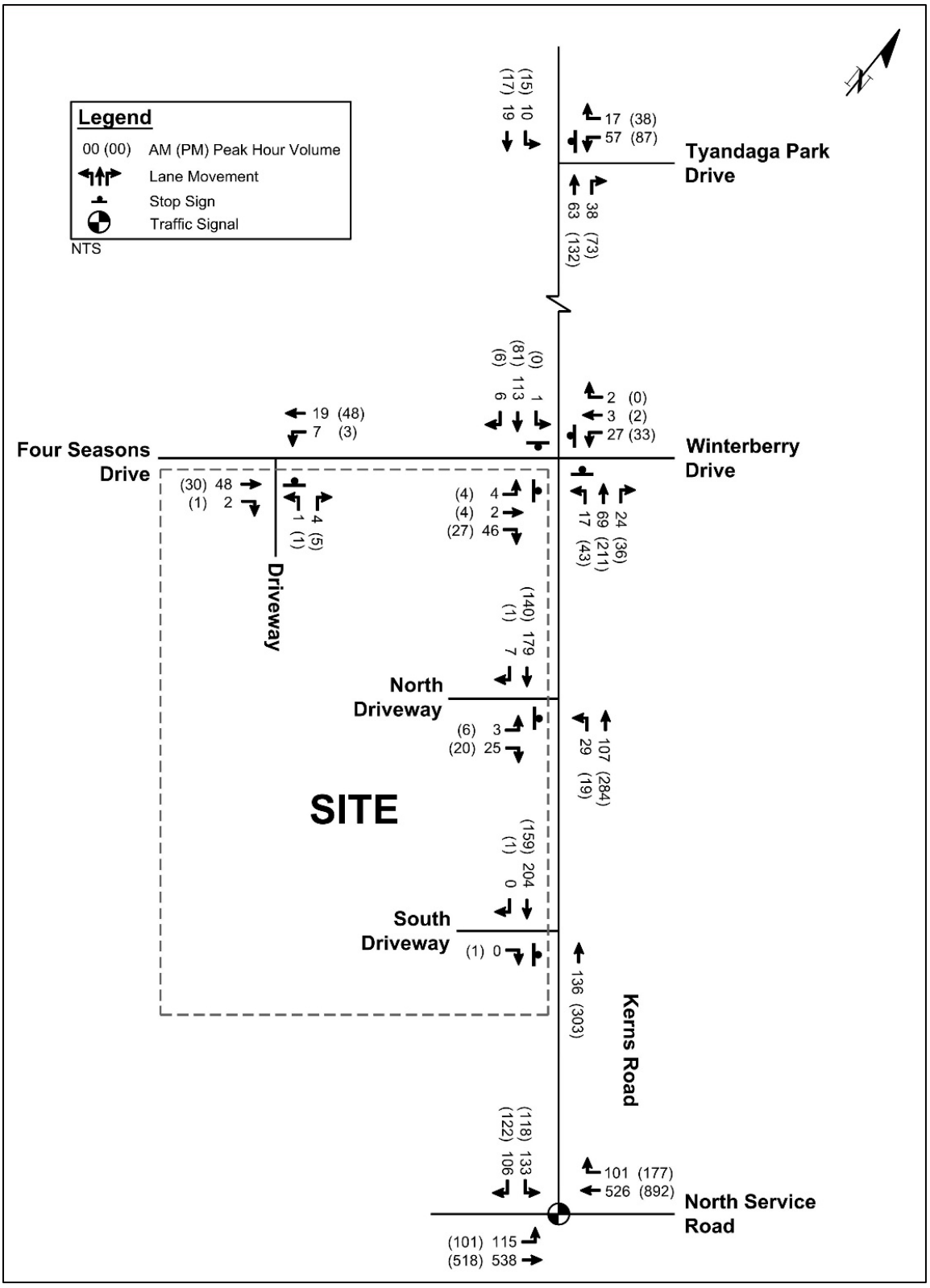
3.5 Background Development

There are no planned background developments within the vicinity of the site up to 2027, as confirmed by City staff.

3.6 Background Traffic Volumes

Background traffic volumes consist of the application of growth per annum (up to 2027) to existing traffic volumes as shown in Figure 4. The resulting background traffic volumes are illustrated in Figure 6.

Figure 6: 2027 Background Traffic Volumes



4.0 Proposed Development

According to the site plan by Kirkor Architects Inc., dated March 22, 2021, (shown in Figure 7), a 123-unit four storey retirement home with 123 beds and 100 m^2 (1,076 ft^2) of commercial uses are proposed. The existing commercial plaza will be removed and the north driveway on Kerns Road will be closed. The driveway on Four Seasons Drive will be shifted east to the middle of the property. Access to the visitor parking will be via the driveway on Four Seasons Drive and access to the below grade parking garage for residents and employees is to be provided by the south driveway on Kerns Road.

The analysis in this report was based on an earlier site plan with 127 retirement home units and no commercial uses. Additional commercial area is proposed in the current site plan to comply with the Official Plan and to increase the waste room truck vertical clearance, which resulted in the reduction of proposed retirement home units from 127 to 123 units and the addition of 100 m^2 (1,076 ft^2) commercial area.

The changes between the previous and current site plans are summarized in Table 2.

Table 2: Previous and Current Site Plan Comparison

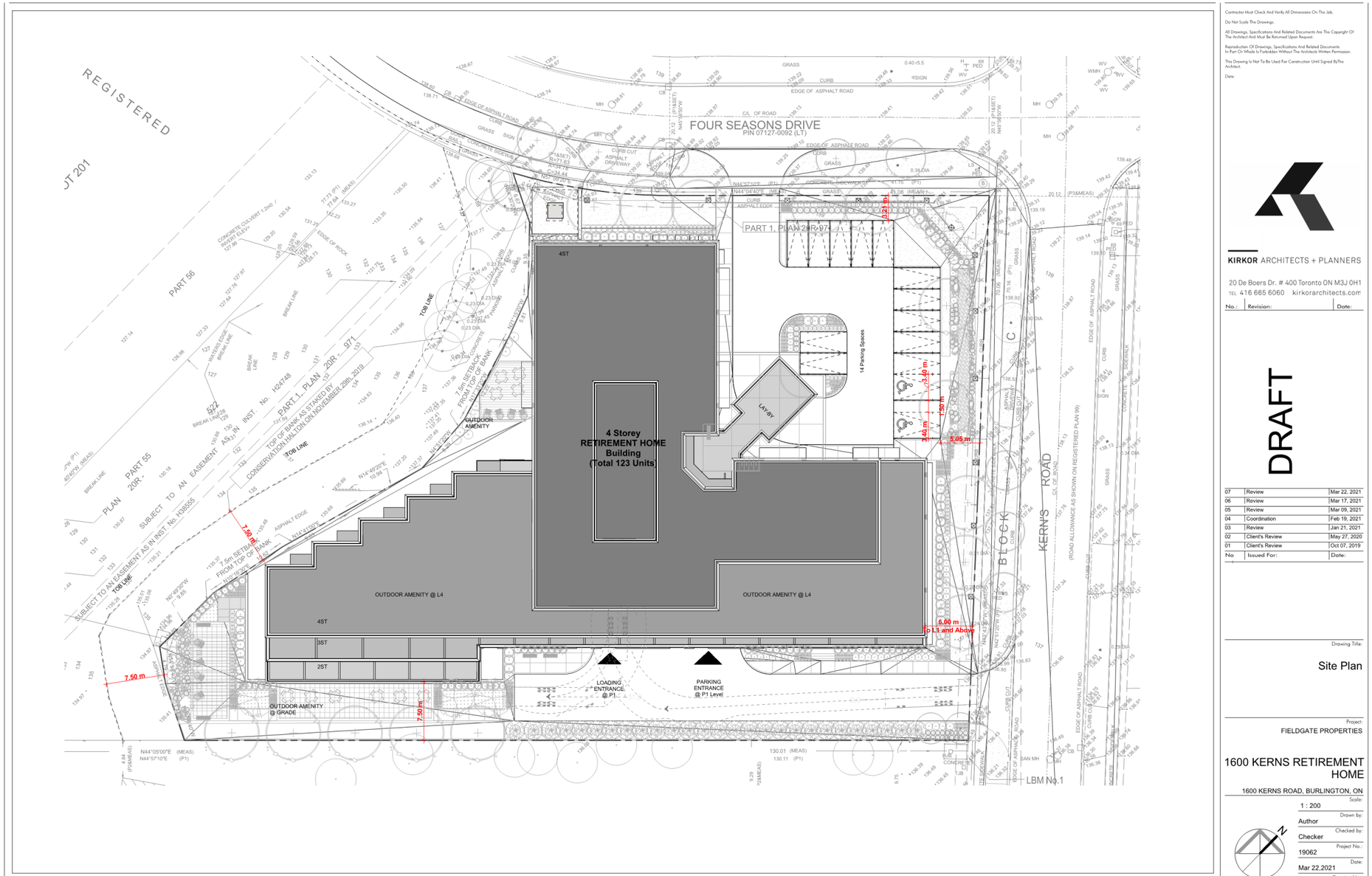
Land Use	Previous Proposal	Current Proposal	Difference
Retirement Home Units	127	123	-4
Beds	132	123	-9
Commercial	0 ft^2	1,076 ft^2	+1,076 ft^2

4.1 Trip Generation

Trip generation for the proposed development was based upon information contained in the publication *Trip Generation Manual, 10th Edition,* published by the Institute of Transportation Engineers. Land Use Code (LUC) 254 (Assisted Living) was assumed for the retirement units and LUC 820 (Shopping Centre) was assumed for the commercial uses. A modal split was not applied to be conservative. As the site trip generation was based on the previous proposal, a site trip generation comparison with the new proposal was conducted.

The resulting site trip generation is summarized in Table 3 along with a comparison to the existing trips that are currently being generated by the existing commercial plaza as captured by existing counts.

Figure 7: Site Plan



Site Plan
Scale: 1 : 200

1
dA1.03

Contractor Must Check And Verify All Dimensions On The Job.

Do Not Scale The Drawings.

All Drawings, Specifications And Related Documents Are The Copyright Of The Architect And Must Be Returned Upon Request.

Reproduction Of Drawings, Specifications And Related Documents In Part Or Whole Is Forbidden Without The Architects Written Permission.

This Drawing Is Not To Be Used For Construction Until Signed ByThe Architect.

Date:

KIRKOR ARCHITECTS + PLANNERS

20 De Boers Dr. # 400 Toronto ON M3J 0H1
TEL 416 665 6060 kirkorarchitects.com

No.:	Revision:	Date:
07	Review	Mar 22, 2021
06	Review	Mar 17, 2021
05	Review	Mar 09, 2021
04	Coordination	Feb 19, 2021
03	Review	Jan 21, 2021
02	Client's Review	May 27, 2020
01	Client's Review	Oct 07, 2019
No.	Issued For:	Date:

Drawing Title:
Site Plan

Project:
FIELDGATE PROPERTIES

1600 KERNS RETIREMENT HOME

1600 KERNS ROAD, BURLINGTON, ON

Scale: 1 : 200
Drawn by: Author
Checked by: Checker
Project No.: 19062
Date: Mar 22,2021
Drawing No.: dA1.03

Table 3: Site Trip Generation Changes

Land Use	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Previous Proposal (127 units and 132 beds)						
Assisted Living (LUC 254)/132 beds	16	9	25	13	21	34
Current Proposal (123 units, 123 beds, 100 m^2 of commercial)						
Assisted Living (LUC 254)/123 beds	14	9	23	12	20	32
Shopping Centre (LUC 820)/1,076 ft^2)	1	0	1	2	2	4
Total Trips	**15**	**9**	**24**	**14**	**22**	**36**
Total Trip Change (between Previous and Current Proposal)	**-1**	**0**	**-1**	**+1**	**+1**	**+2**
Existing Commercial Plaza	-45	-33	-78	-25	-33	-58
Overall New Trips	**-30**	**-24**	**-54**	**-11**	**-11**	**-22**

Since the projected trips from the current proposal are only 1 less and 2 trips more than what was previously forecasted from the previous proposal during the weekday AM and PM peak hours, respectively, the traffic operations analysis was not updated and is based on the previous proposal.

The existing plaza currently generates significantly more trips than will be generated by the new use. Therefore, the development will result in less trips on the road network. Regardless, at the request of the City, a full traffic operations analysis was conducted.

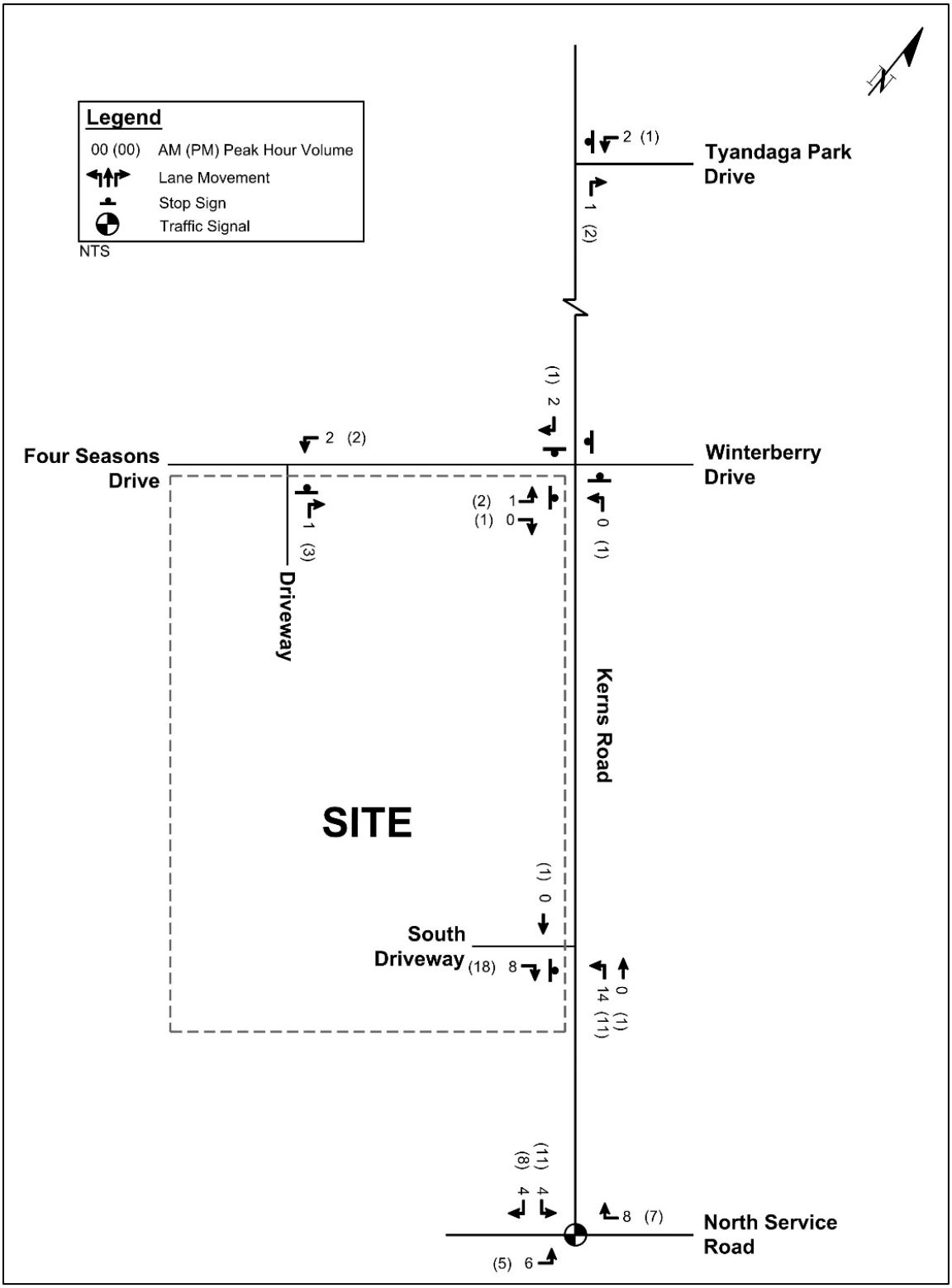
4.2 Trip Distribution & Assignment

Trip distribution and assignment were based upon existing traffic patterns and the expected origin of employees and destination of residents. The estimated distribution of site trips is illustrated in Table 4 and the site generated trips are illustrated in Figure 8.

Table 4: Trip Distribution

To/From	Via	Distribution
West	North Service Road	40%
East	North Service Road	50%
	Tyandaga Park Drive	10%
	Total	**100%**

Figure 8: Site Generated Traffic



5.0 Total Traffic Conditions

The existing plaza will be removed and the north driveway on Kerns Road will be closed with the addition of the proposed development. As a result, the existing commercial plaza traffic of 78 and 58 trips during the AM and PM peak hour at the existing site driveways would also disappear as shown in Figure 9.

As noted in Section 4.1, a total of 24 and 36 site trips are forecast to be added to the road network from the proposed retirement home during AM and PM peak hours, respectively. This will result in an overall reduction of 54 and 22 trips during AM and PM peak hours, respectively, from the site and the road network.

Total traffic volumes consist of background traffic for the horizon year 2027 plus the site traffic illustrated in Figure 8 less the existing trips removed from the existing site driveways shown in Figure 9. The resulting 2027 total traffic volumes are shown in Figure 10, which are less than background traffic.

Figure 9: Existing Site Traffic

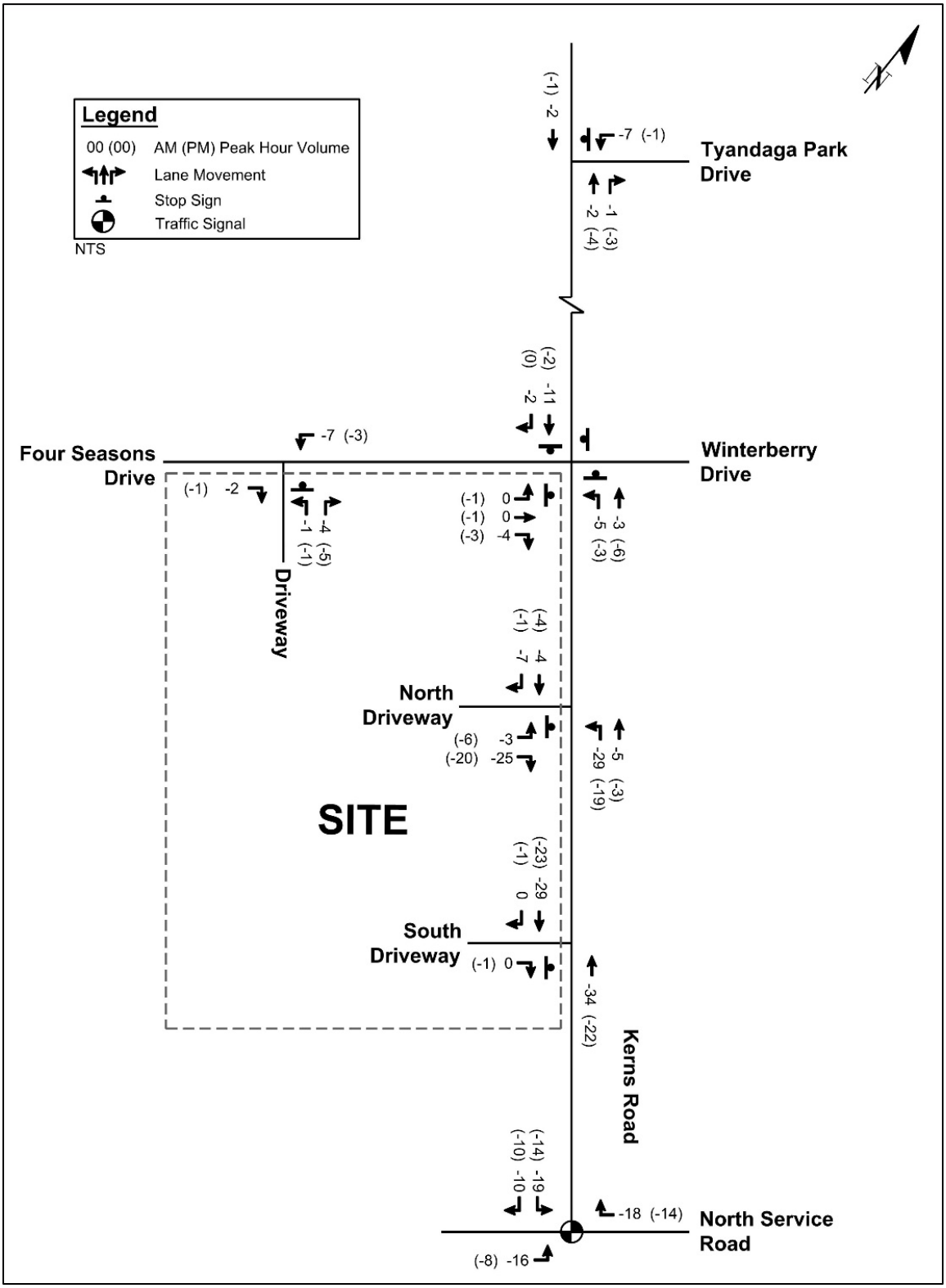
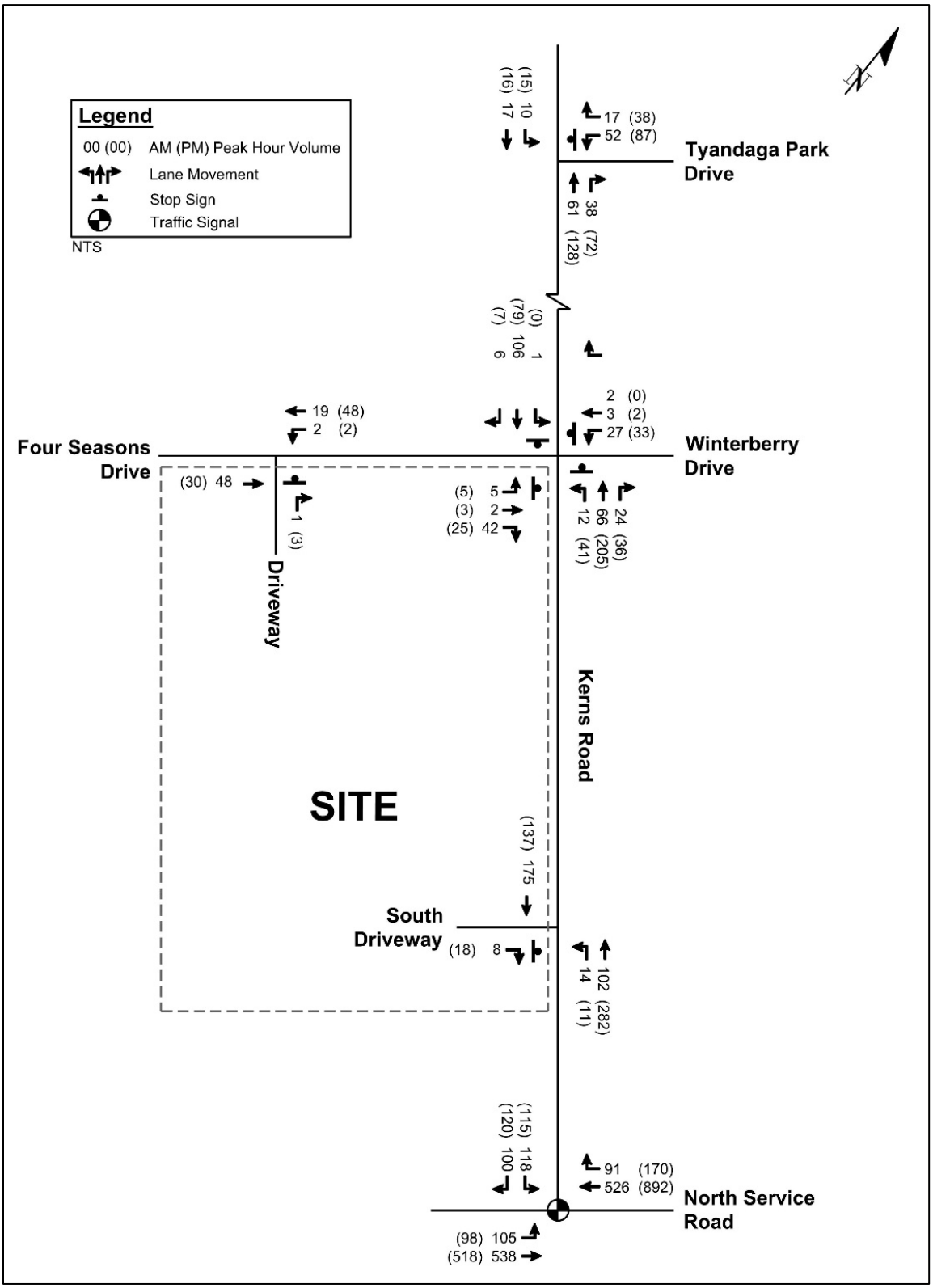


Figure 10: 2027 Total Traffic Volumes



6.0 Traffic Operations Analysis

Traffic operations analyses were conducted under existing and future traffic conditions for the weekday AM and PM peak hours at all study intersections. Queueing was reviewed using Synchro's 95th percentile queue. A comparison of the existing storage and projected queues are summarized for all movements. Detailed Synchro and queue reports are provided in Appendices B to D.

6.1 North Service Road/Kerns Road

Existing and future traffic operations at the North Service Road/Kerns Road intersection are summarized in Table 5.

Table 5: North Service/Kerns Signalized Intersection Operations

Movement	Existing Storage/ Link Distance (m)	Weekday AM Peak Hour			Weekday PM Peak Hour		
		v/c	LOS	95th % Queue (m)	v/c	LOS	95th % Queue (m)
Existing Conditions							
Overall	-	0.59	C	-	0.76	C	-
EBL	150	0.48	B	15	0.44	B	15
EBT	200+	0.62	B	76	0.47	A	65
WBT	500+	0.87	C	114	1.00	D	251
WBR	40	0.11	B	12	0.17	B	20
SBL	75	0.26	B	32	0.32	C	35
SBR	100	0.08	B	11	0.08	C	14
Background 2027 Conditions (Signal Timings Optimized)							
Overall	-	0.63	B	-	0.78	C	-
EBL	150	0.43	A	10	0.47	B	11
EBT	200+	0.60	B	60	0.44	A	42
WBT	500+	0.78	C	86	0.89	C	169
WBR	40	0.08	B	7	0.14	A	11
SBL	75	0.36	C	35	0.49	D	44
SBR	100+	0.08	B	12	0.08	C	16
Total 2027 Conditions (Signal Timings Optimized)							
Overall	-	0.62	B	-	0.78	B	-
EBL	150	0.41	A	10	0.46	B	10
EBT	200+	0.60	B	60	0.44	A	42
WBT	500+	0.80	C	86	0.89	C	166
WBR	40	0.07	B	6	0.13	A	11
SBL	75	0.32	C	32	0.47	C	42
SBR	100+	0.07	B	12	0.08	C	16

Under existing conditions, during both peak hours, all movements are operating and will operate with excess capacity and a level of service C or better, with the exception of the westbound through during the PM peak hour. This movement will be at capacity and experience a level of service of D under the existing signal timing plan. Optimizing the existing timing plan would improve this movement's performance.

Under future conditions during both peak hours, all movements are projected to operate with excess capacity and a level of service D or better with optimized signal timings.

None of the existing or projected queues will exceed their respective storage or link distances.

6.2 Kerns Road/Winterberry Drive/Four Seasons Drive

Existing and future traffic operations are summarized in Table 6 for the Kerns Road/Winterberry Drive/Four Seasons Drive Intersection. This intersection is under all-way stop control and Synchro does not calculate queues for this type of control.

Table 6: Kerns/Winterberry/Four Seasons Unsignalized Intersection Operations

Movement	Existing Storage/Link Distance (m)	Weekday AM Peak Hour		Weekday PM Peak Hour	
		v/c	LOS	v/c	LOS
Existing Conditions					
EBLTR	40+	0.06	A	0.05	A
WBLTR	100+	0.04	A	0.05	A
NBLTR	100+	0.14	A	0.36	A
SBLTR	200+	0.16	A	0.11	A
Background 2027 Conditions					
EBLTR	40+	0.06	A	0.05	A
WBLTR	202	0.04	A	0.05	A
NBLTR	100+	0.14	A	0.36	A
SBLTR	200+	0.16	A	0.11	A
Total 2027 Conditions					
EBLTR	40+	0.06	A	0.04	A
WBLTR	100+	0.04	A	0.05	A
NBLTR	100+	0.13	A	0.35	A
SBLTR	200+	0.15	A	0.11	A

Under existing and future conditions, during both peak hours, all movements are operating and will operate with excess capacity and a level of service A or better.

6.3 Kerns Road/Tyandaga Park Drive

Existing and future traffic operations for the Kerns Road/Tyandaga Park Drive intersection are summarized in Table 7.

Table 7: Kerns/Tyandaga Park Unsignalized Intersection Operations

Movement	Existing Storage/ Link Distance (m)	Weekday AM Peak Hour			Weekday PM Peak Hour		
		v/c	LOS	95th % Queue (m)	v/c	LOS	95th % Queue (m)
Existing Conditions							
WBLR	100+	0.11	A	3	0.19	B	6
SBLT	200+	0.01	A	1	0.01	A	1
Background 2027 Conditions							
WBLR	100+	0.11	A	3	0.19	B	6
SBLT	200+	0.01	A	1	0.01	A	1
Total 2027 Conditions							
WBLR	100+	0.10	A	3	0.19	B	6
SBLT	200+	0.01	A	1	0.01	A	1

Under existing and future conditions, during both peak hours, all movements are operating and will operate with excess capacity and a level of service A or better. None of the existing or projected queues will exceed their respective storage or link distances.

6.4 Site Driveways

Future 2027 traffic operations are summarized in Table 8 for the site driveways.

Table 8: Site Driveways Unsignalized Intersection Operations

Movement	Existing Storage/ Link Distance (m)	Weekday AM Peak Hour			Weekday PM Peak Hour		
		v/c	LOS	95th % Queue (m)	v/c	LOS	95th % Queue (m)
Kerns Road/Site Driveway							
EBLR	30+	0.01	A	1	0.02	A	1
NBLT	100+	0.01	A	1	0.01	A	1
Four Seasons Drive/Site Driveway							
WBLT	40+	0.00	A	0	0.00	A	0
NBLR	10+	0.00	A	0	0.00	A	1

Under existing and future conditions, during both peak hours, all movements will operate with excess capacity and a level of service A or better at both driveways.

7.0 Site Plan Review

A high-level review was conducted of the proposed site plan for multi-modal circulation, access and parking lot layout. The site is well designed to accommodate pedestrians, cyclists and vehicles. Sidewalks will connect the building entrances to the existing external sidewalk network on Four Seasons Drive and Kearns Road. Cyclist can access the site via both driveways.

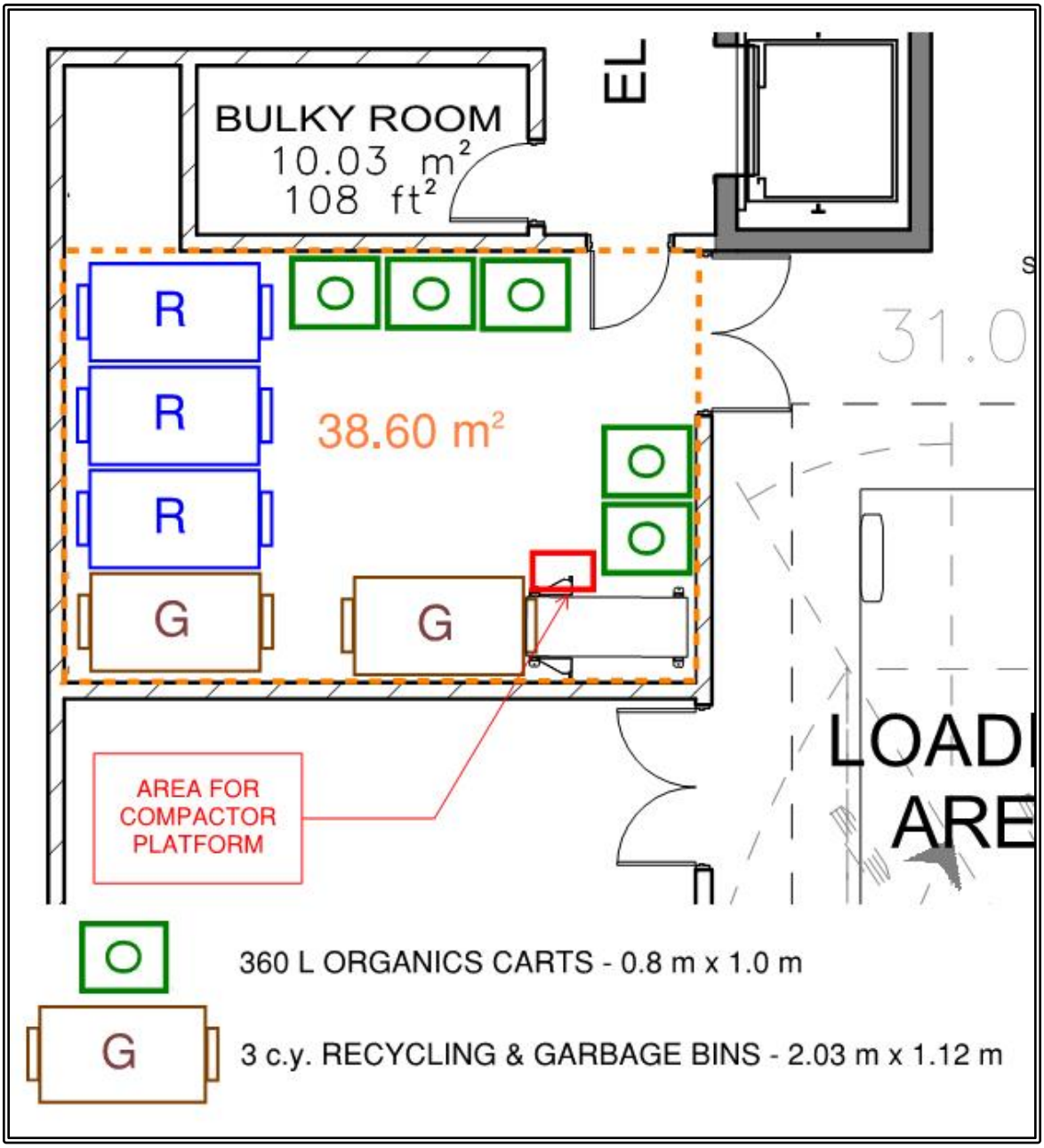
An analysis of access to the proposed refuse pickup/loading space was conducted for a refuse truck design vehicle utilizing AutoTurn and is shown in Appendix E. The analysis confirms that the proposed geometrics will accommodate the expected design vehicle.

8.0 Waste Management Plan

A Waste Management Plan will be prepared for the site and will be provided in a future submission. It will incorporate and address Halton Region's *Development Design Guidelines for Source Separation of Solid Waste* (Guidelines). We note:

- The Developer will be seeking Regional approval for a 6.5 m clearance in the loading area with a 4.2 m clearance for any areas where the truck must pass. Please refer to the included Architectural drawings.
- The Developer intends to utilize, to the maximum extent possible, the Region's waste collection services for the residential waste stream:
  - Per Figure 11, the residential waste room will need to provide about 39 m^2 of space for:
    - a garbage compaction unit,
    - two 3 yd^3 front-lift garbage bins,
    - three 3 yd^3 front-lift recycling bins,
    - five 360 L automated carts for organic waste, and
    - space to jockey bins or carts as they are filled.
  - The bulky waste storage, be it separate or within the residential waste storage room, will provide at least 10 m^2 of storage area.
- Operations staff are expected to deliver waste generated in resident units and from common areas directly to the waste storage room. Each stream will be manually placed into the appropriate waste bin or cart (garbage placed into the compactor).
- Though anticipated to be minimal, commercial wastes will be collected by a private contractor – not mixing with the residential waste streams or relying upon the Region's waste collection services:
  - The private waste storage room will only need to hold up to three 360 L carts (0.8 m x 1.0 m, one cart per waste stream) and provide cart jockeying space.

Figure 11: Residential Waste Storage Room



9.0 Parking Supply Review

9.1 Vehicle Parking

The proposed parking supply will consist of 14 visitor spaces (consisting of 10 spaces for residential visitors and 4 spaces for the commercial use) in a surface parking lot and 52 spaces for residents and employees of the retirement home in an underground parking garage, for a total of 66 spaces. The City conducted a comprehensive City-wide review of their parking requirements in the study entitled *Burlington City-Wide Parking Standards Review, dated July 21, 2017, by the IBI Group* (the City's Parking Review). City staff directed that the parking supply requirements for this development be based on the recommended rates in the City's Parking Review.

The minimum vehicular parking requirements based on the City's Parking Review are summarized in Table 9. Excerpts from the City's Parking Review are provided in Appendix F.

Table 9: Vehicular Parking Requirements

Use	Parking Space Type	Rate (spaces/ unit or 100 m^2)	Units or Gross Floor Area (m^2)	Required Spaces [1]	Provided Spaces	Surplus/ Deficit
Retirement Home	Resident/ Employee	0.60	123	74	52	-22
	Visitor	0.25		31	10	-21
Subtotal Residential				**105**	**62**	**-43**
Retail Store	Retail Employee or Commercial Patron	3.5	100	4	4	0
Total				**109**	**66**	**-43**

Notes: 1. According to City staff, rounding rules are to round up for any fraction

Based on the City's Parking Review parking rates there will be an overall deficit of 43 spaces.

A review was conducted of the parking requirements of municipalities within the Region, other municipalities within the Greater Toronto Area (GTA), the publication *Parking Generation Manual 5th Edition* by ITE, and parking surveys conducted by Burnside for retirement home land uses. The results of this review are summarized in Table 10.

Table 10: Retirement Home Parking Rate Comparison

Source (Zoning By-Law)	By-law Use or Land Use	Minimum Parking Supply Rate or Parking Demand
Oakville (2014-014)	Retirement Home	0.33 spaces/unit
Mississauga (0225-2007)	Retirement Building	0.50 spaces/unit
Oshawa (60-94)	Retirement Home	0.38 spaces/unit
Toronto (569-2013)	Retirement Home	0.30 spaces/unit
Milton (016-2014)	Dwelling, Retirement	0.50 spaces/bed
Whitchurch-Stouffville (2010-001)	Senior Citizens Home	0.33 spaces/bed
Hamilton (05-200)	Retirement Home	0.33 spaces/person
ITE Parking Generation Manual 5th Edition	LUC 254 – Assisted Living	0.41 spaces/unit 0.39 space/bed
980 Elgin Mills Road, Richmond Hill Burnside Survey	Retirement Home	0.33 spaces/unit
38 Swansea Road, Markham Burnside Survey	Retirement Home	0.27 spaces/unit
Lowest Rate		0.27 spaces/unit
Highest Rate		0.50 spaces/bed
Average Rate		0.37 spaces/unit

The highest of the rates reviewed was 0.50 spaces/unit (Mississauga and Milton) with the lowest at 0.27 (a Burnside Survey in Markham) and the average at 0.37 spaces/unit.

It is recommended that the proposed parking supply for retirement home use be based on a minimum parking supply rate of 0.50 spaces/unit. It is our opinion that the proposed parking supply is adequate and will meet the future parking demand.

The City's Parking review recommends accessible vehicle parking requirements be based on the Province's AODA guidelines. According to the AODA Guidelines, the required minimum number of accessible spaces for multi-unit residential developments only apply to parking spaces intended for public use. Based on the proposed parking supply of 14 spaces for visitor use (commercial patrons and residential visitors), One Type B space is required to be provided for a parking supply between 13 to 25 spaces. Two Type A spaces are proposed for visitor use which exceeds the requirement.

9.2 Loading

The City's Zoning By-law (ZBL) 2020 requires one loading space per principal building. One loading space is proposed which meets the City's requirements. Excerpts from the ZBL are provided in Appendix G.

9.3 Bicycle Parking

The City's Parking Review does not have bicycle parking requirements for retirement home uses; however, it does require a minimum of two short-term spaces plus one short-term space per 1,000 m^2 for the proposed retail use. This would result in a requirement of two spaces. Two or more bicycle spaces will be provided which will meet or exceed the City's requirements.

10.0 Transportation Demand Management

The proposed site plan incorporates pedestrian and cyclist friendly design elements to discourage dependency on the single-occupant motor vehicle. This compliments the City's overall transportation vision to achieve a greater sustainable transportation system by promoting and encouraging alternative modes of travel, including walking, cycling and transit.

As noted in Section 2.3, the site has good access to transit and there is an existing sidewalk along both frontages of the site. Also mentioned in Section 3.3, the existing bicycle route on Kerns Road will be replaced by bicycle lanes.

The following additional TDM measures are proposed:

- Internal sidewalks will connect building entrances to the existing sidewalk network.
- There is an existing bus stop on Kerns Road, just south of the site.
- Bicycle parking will be provided.

11.0 Conclusions

11.1 Road Network Operations

Under existing, background and total conditions, during the morning and afternoon peak hours, all study intersections are operating and will operate with excess capacity and a level of service D or better, with the exception of the westbound through movement during the PM peak hour at the intersection of North Service Road/Kerns Road. This movement is currently at capacity and experiences a level of service of D. Optimizing the existing timing plan would improve this movement's performance resulting in excess capacity. It is recommended that the City monitor this intersection for future improvement.

The existing plaza currently generates significantly more trips than will be generated by the proposed development. It is projected that the development will result in 54 and 22 trips being removed from the road network during the AM and PM peak hours, respectively. Therefore, future total traffic operations will improve over background conditions.

11.2 Site Plan Review

The site is well designed to provide easy access for pedestrians and cyclists to/from area sidewalks, bike routes and transit, thus encouraging choices in modes of travel. A maneuvering analysis confirms that a refuse truck can access the proposed refuse pickup/loading space, via the existing south driveway.

11.3 Waste Management

A Waste Management Plan will be prepared for the site and will be provided in a future submission. The site will comply with Region's Development Design Guidelines for Source Separation of Solid Waste.

11.4 Parking and Loading Review

The proposed vehicular parking supply for the retirement home land use will not meet the City's Parking Review requirements. However, a review of seven other GTA municipalities' (with two in the Region) requirements found that the highest of the rates reviewed were 0.50 spaces/unit (Mississauga and Milton) with the lowest at 0.27 (a Burnside Survey in Markham). It is recommended that the proposed parking supply for the retirement home land use be based on a supply rate of 0.50 spaces/unit.

A minimum of one Type B accessible parking space is required, while two Type A spaces are proposed, which will exceed City requirements.

The proposed one loading space will be adequate for the development.

Two or more bicycle spaces will be provided, which will meet or exceed City requirements.

11.5 TDM Plan

The following additional TDM measures are proposed:

- Internal sidewalks will connect building entrances to the existing sidewalk network.
- There is an existing bus stop on Kerns Road, just south of the site.
- Bicycle parking will be provided.

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

Existing Traffic Counts and Signal Timing Plan

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis

Accu-Traffic Inc.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

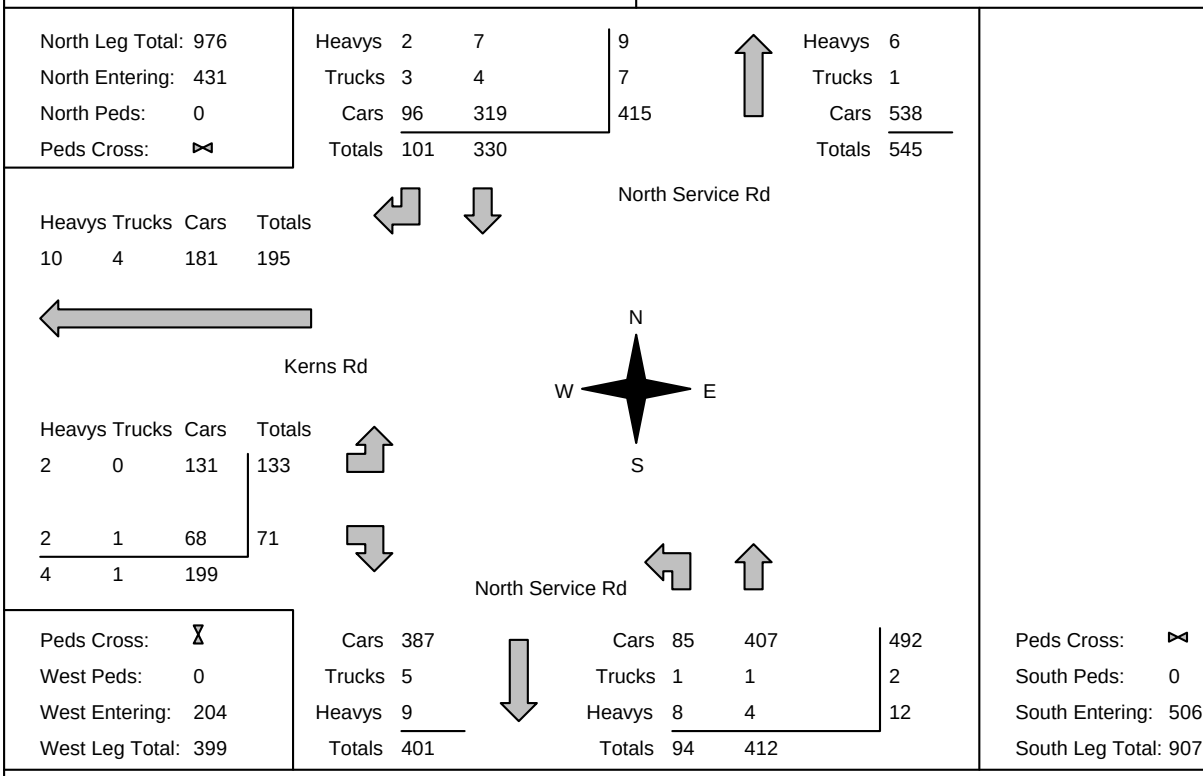
Municipality: Burlington
Site #: 2008200001
Intersection: North Service Rd & Kerns Rd
TFR File #: 1
Count date: 21-Oct-20

Weather conditions:

Person counted:
Person prepared:
Person checked:

**** Signalized Intersection ****

Major Road: North Service Rd runs N/S



Comments

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis

Accu-Traffic Inc.

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 18:00:00

One Hour Peak
From: 16:15:00
To: 17:15:00

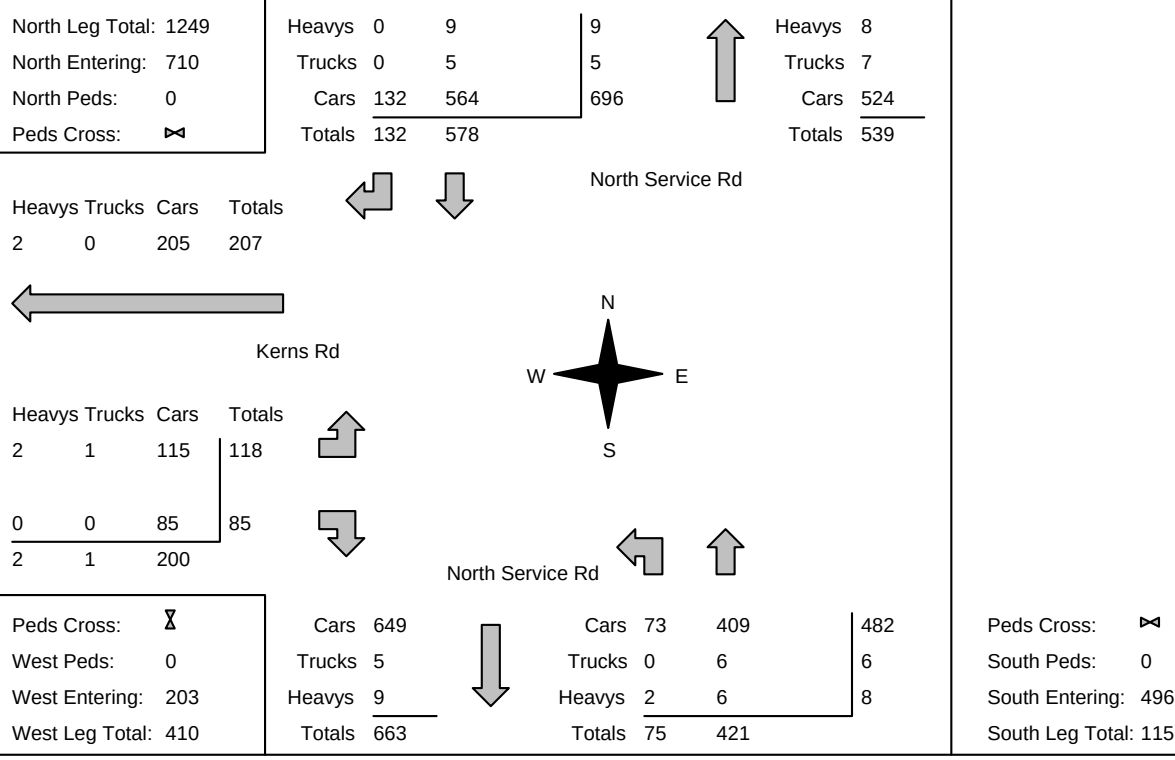
Municipality: Burlington
Site #: 2008200001
Intersection: North Service Rd & Kerns Rd
TFR File #: 1
Count date: 21-Oct-20

Weather conditions:

Person counted:
Person prepared:
Person checked:

**** Signalized Intersection ****

Major Road: North Service Rd runs N/S



Comments

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis

Accu-Traffic Inc.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

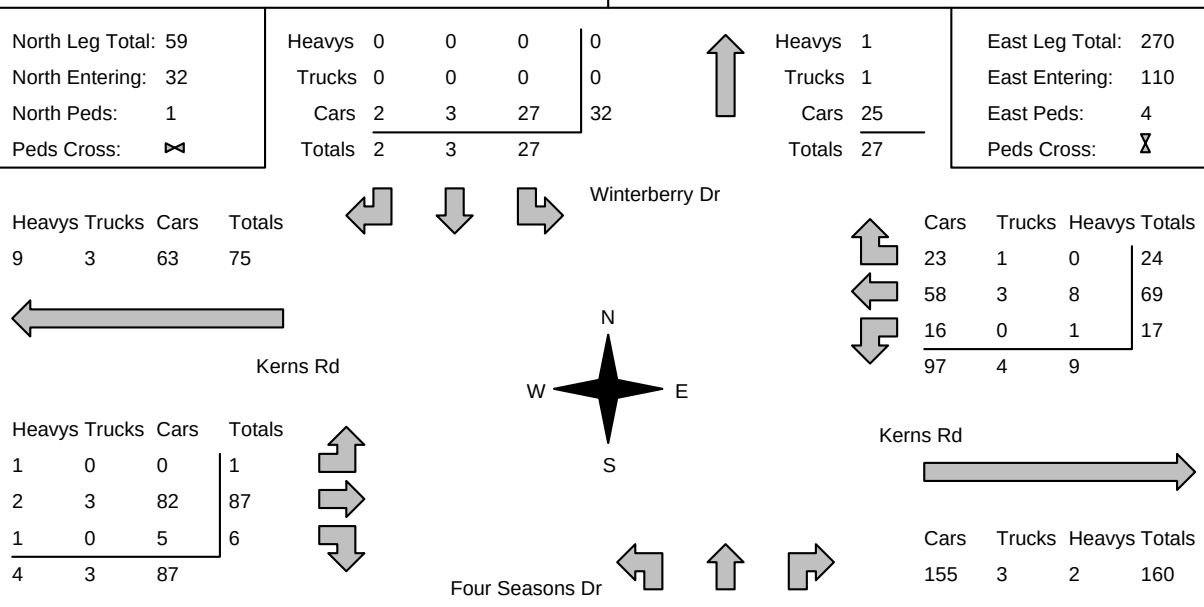
Municipality: Burlington
Site #: 2008200002
Intersection: Kerns Rd & Four Seasons Dr
TFR File #: 1
Count date: 21-Oct-20

Weather conditions:

Person counted:
Person prepared:
Person checked:

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

Major Road: Kerns Rd runs W/E



Comments

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis

Accu-Traffic Inc.

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

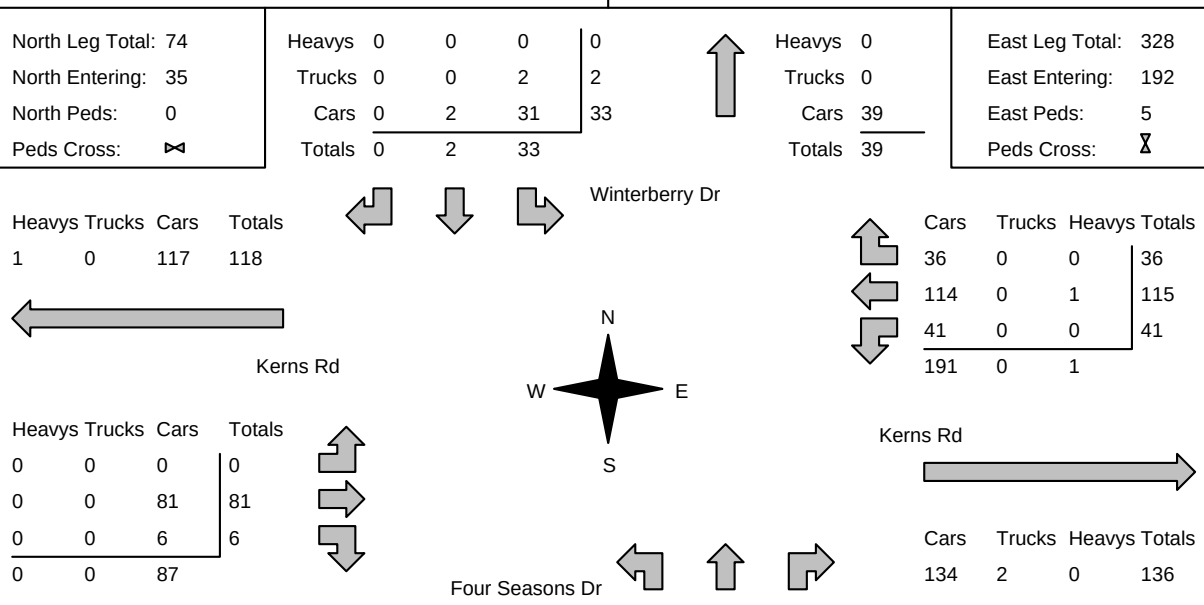
Municipality: Burlington
Site #: 2008200002
Intersection: Kerns Rd & Four Seasons Dr
TFR File #: 1
Count date: 21-Oct-20

Weather conditions:

Person counted:
Person prepared:
Person checked:

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

Major Road: Kerns Rd runs W/E



Comments

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis

Accu-Traffic Inc.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

Municipality: Burlington
Site #: 2008200003
Intersection: Kerns Rd & Tyandaga Park Dr
TFR File #: 1
Count date: 21-Oct-20

Weather conditions:

Person counted:
Person prepared:
Person checked:

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

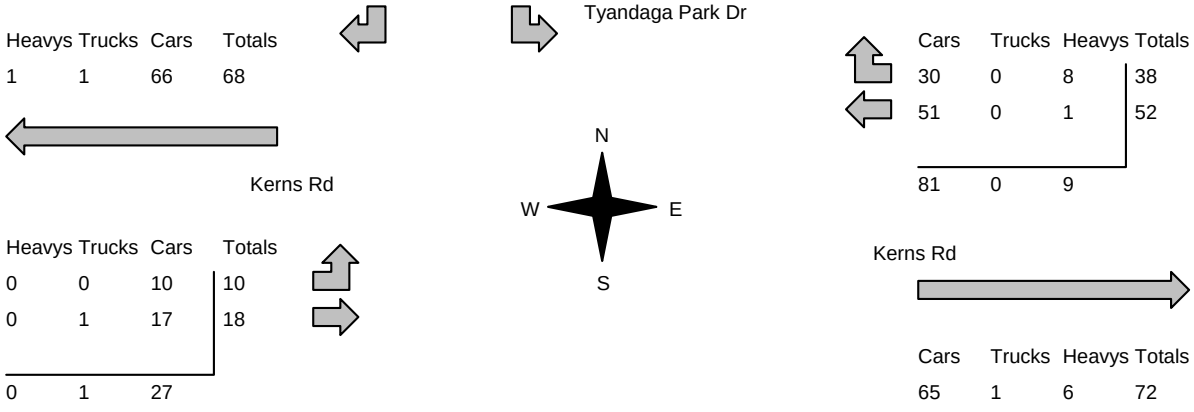
Major Road: Kerns Rd runs W/E

North Leg Total: 118
North Entering: 70
North Peds: 8
Peds Cross: ⋈

Heavys	0	6	6
Trucks	1	0	1
Cars	15	48	63
Totals	16	54	

Heavys	8
Trucks	0
Cars	40
Totals	48

East Leg Total: 162
East Entering: 90
East Peds: 8
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 2
West Entering: 28
West Leg Total: 96

Comments

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis

Accu-Traffic Inc.

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 18:00:00

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

Municipality: Burlington
Site #: 2008200003
Intersection: Kerns Rd & Tyandaga Park Dr
TFR File #: 1
Count date: 21-Oct-20

Weather conditions:

Person counted:
Person prepared:
Person checked:

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

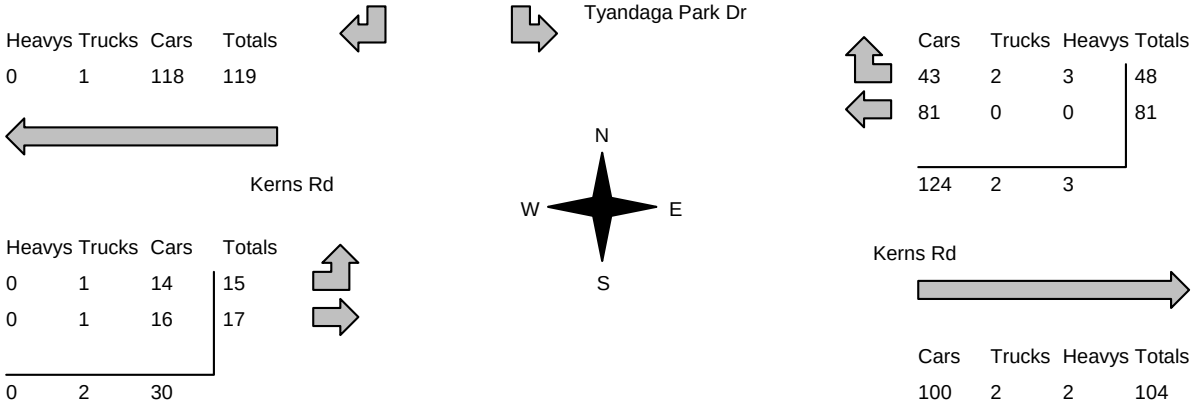
Major Road: Kerns Rd runs W/E

North Leg Total: 188
North Entering: 125
North Peds: 6
Peds Cross: ⋈

Heavys	0	2	2
Trucks	1	1	2
Cars	37	84	121
Totals	38	87	

Heavys	3
Trucks	3
Cars	57
Totals	63

East Leg Total: 233
East Entering: 129
East Peds: 2
Peds Cross: ⧖



Peds Cross: ⧖
West Peds: 1
West Entering: 32
West Leg Total: 151

Comments

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis

Accu-Traffic Inc.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Burlington
Site #: 2008200004
Intersection: Kerns Rd & North Site Driveway
TFR File #: 1
Count date: 21-Oct-20

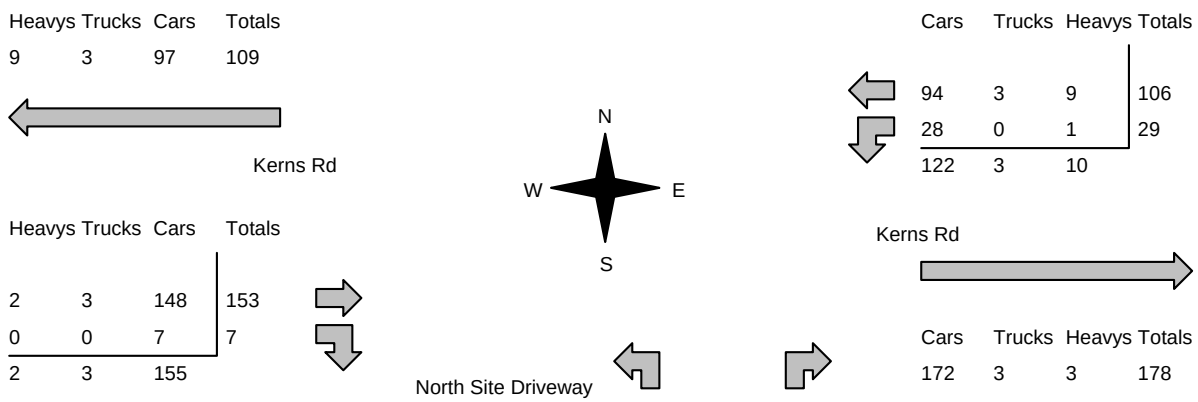
Weather conditions:

Person counted:
Person prepared:
Person checked:

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

Major Road: Kerns Rd runs W/E

East Leg Total: 313
East Entering: 135
East Peds: 0
Peds Cross: ⧗



Peds Cross: ⧗
West Peds: 0
West Entering: 160
West Leg Total: 269

Cars 35
Trucks 0
Heavys 1
Totals 36

Cars 3 24 27
Trucks 0 0 0
Heavys 0 1 1
Totals 3 25

Peds Cross: ⋈
South Peds: 3
South Entering: 28
South Leg Total: 64

Comments

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis

Accu-Traffic Inc.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Burlington
Site #: 2008200005
Intersection: Kerns Rd & South Site Driveway
TFR File #: 1
Count date: 21-Oct-20

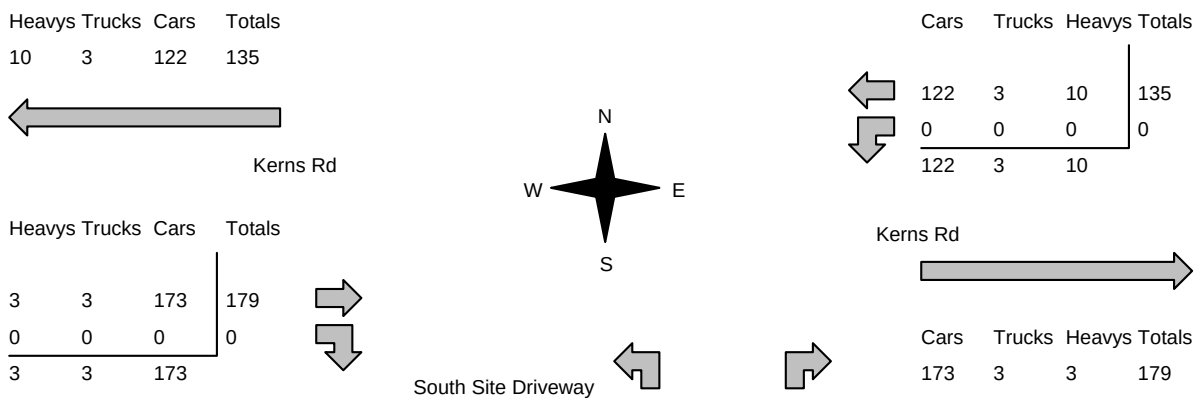
Weather conditions:

Person counted:
Person prepared:
Person checked:

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

Major Road: Kerns Rd runs W/E

East Leg Total: 314
East Entering: 135
East Peds: 0
Peds Cross: ⧗



Peds Cross: ⧗
West Peds: 0
West Entering: 179
West Leg Total: 314

Cars 0
Trucks 0
Heavys 0
Totals 0

Cars 0 0 0
Trucks 0 0 0
Heavys 0 0 0
Totals 0 0

Peds Cross: ⋈
South Peds: 3
South Entering: 0
South Leg Total: 0

Comments

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis

Accu-Traffic Inc.

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

Municipality: Burlington
Site #: 2008200005
Intersection: Kerns Rd & South Site Driveway
TFR File #: 1
Count date: 21-Oct-20

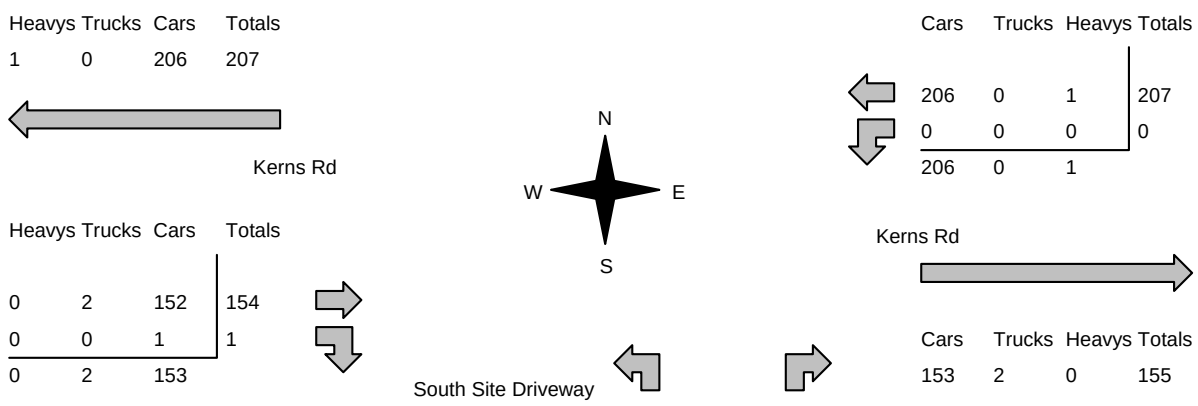
Weather conditions:

Person counted:
Person prepared:
Person checked:

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

Major Road: Kerns Rd runs W/E

East Leg Total: 362
East Entering: 207
East Peds: 0
Peds Cross: ⧗



Peds Cross: ⧗
West Peds: 0
West Entering: 155
West Leg Total: 362

Cars 1
Trucks 0
Heavys 0
Totals 1

Cars 0 1 1
Trucks 0 0 0
Heavys 0 0 0
Totals 0 1

Peds Cross: ⋈
South Peds: 8
South Entering: 1
South Leg Total: 2

Comments

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis

Accu-Traffic Inc.

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 8:00:00
To: 9:00:00

Municipality: Burlington
Site #: 2008200006
Intersection: Four Seasons Dr & Site Driveway
TFR File #: 1
Count date: 21-Oct-20

Weather conditions:

Person counted:
Person prepared:
Person checked:

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

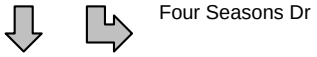
Major Road: Four Seasons Dr runs N/S

North Leg Total: 78
North Entering: 26
North Peds: 0
Peds Cross: ⋈

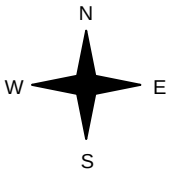
Buses	2	0	2
Trucks	0	0	0
Cars	17	7	24
Totals	19	7	

Buses	1
Trucks	0
Cars	51
Totals	52

East Leg Total: 14
East Entering: 5
East Peds: 3
Peds Cross: ⋈



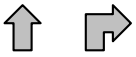
	Cars	Trucks	Buses	Totals
	4	0	0	4
	1	0	0	1
	5	0	0	



Site Driveway



	Cars	Trucks	Buses	Totals
	9	0	0	9



Cars	18		
Trucks	0		
Buses	2		
Totals	20		

Cars	47	2	49
Trucks	0	0	0
Buses	1	0	1
Totals	48	2	

Peds Cross: ⋈
South Peds: 0
South Entering: 50
South Leg Total: 70

Comments

Accu-Traffic Inc.
Traffic Monitoring & Data Analysis

Accu-Traffic Inc.

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 18:00:00

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

Municipality: Burlington
Site #: 2008200006
Intersection: Four Seasons Dr & Site Driveway
TFR File #: 1
Count date: 21-Oct-20

Weather conditions:

Person counted:
Person prepared:
Person checked:

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

Major Road: Four Seasons Dr runs N/S

North Leg Total: 86
North Entering: 51
North Peds: 0
Peds Cross: ⋈

Buses	0	0	0
Trucks	0	0	0
Cars	48	3	51
Totals	48	3	

Buses	0
Trucks	0
Cars	35
Totals	35

East Leg Total: 10
East Entering: 6
East Peds: 10
Peds Cross: ⋈

Four Seasons Dr

	Cars	Trucks	Buses	Totals
	5	0	0	5
	1	0	0	1
	6	0	0	

N
W E
S

Site Driveway

Cars	Trucks	Buses	Totals
4	0	0	4

Four Seasons Dr

Cars	49	Cars	30	1	31
Trucks	0	Trucks	0	0	0
Buses	0	Buses	0	0	0
Totals	49	Totals	30	1	

Peds Cross: ⋈
South Peds: 0
South Entering: 31
South Leg Total: 80

Comments

Intersection Name:	TS ID:	Line No:	Model:	IP address:	Controller Make:
NSR @ Kerns Dr	173	1	ACS/3	172.22.29.2	Econolite

Type of Operation: 8 Phase Semi-Actuated

*-Start from Main Menu

No	Date			Description	Prepared by
	Y	M	D		EN
3	2017	11	29	Updated timings for coordination purposes	

PHASE DESCRIPTION

Ph1		Ph5	EBLT - NSR
Ph2	EB - NSR	Ph6	WB - NSR
Ph3		Ph7	
Ph4		Ph8	SB - Kerns Rd

PHASE IN USE/EXCLUSIVE PED (MM) *- 1 - 2

Phase:	1	2	3	4	5	6	7	8
Phase in Use		X			X	X		X
Exclusive PED								

CONTROLLER TIMING DATA - VEHICLE TIMING * - 2 - 1

Timing Plan: 1

	Phase: 1	2	3	4	5	6	7	8
Minimum Green		8			6	8		8
Walk		8				8		
Ped. Clearance		14				14		
Pedestrian Carry Over								
Vehicle Extension		3			3	3		3
MAX 1		35			12	35		30
MAX 2		35			12	35		30
Yellow Change		4			3	4		4
Red Clearance		2				2		3
Phase Minimum:	**1**	**29**	**1**	**1**	**10**	**29**	**1**	**16**

PHASE DATA - VEHICLE AND PEDESTRIAN RECALLS * - 2 - 8

Phase:	1	2	3	4	5	6	7	8
Lock Detector								
Vehicle Recall		X				X		
Pedestrian Recall		X				X		
MAX Recall								
Min Recall								

COORDINATION: COORDINATOR PATTERN, SPLIT PATTERN * - 3 - 2, - 3 - 3

Coordinator Pattern (CP)	Cycle Length	Offset (sec)	Timing Plan	Split Pattern	Phases (sec)							
					1	2	3	4	5	6	7	8
1	80	3	1	1		50			14	36		30
2	80	0	1	2		50			14	36		30
3	90	83	1	3		64			14	50		26
10	0	0	1	10		0			0	0		0

TIME BASE: ACTION PLAN, DAY PLAN *** - 5 - 2, - 5 - 3, -5 - 4**

Day Plan	Sched. #	Action Plan	Time Period	Pattern	Timing Plan
1	1	1	07:00	1	1
1	1	2	09:00	2	1
1	1	3	15:30	3	1
1	1	10	19:00	254	1
2	2	10	6:00	254	1
3	3	1	11:00	1	1
3	3	10	12:00	254	1

Schedule 1 = Day Plan 1
Schedule 2 = Day Plan 2
Schedule 3 = Day Plan 3

Day Plan 1 (Weekday)
Day Plan 2 (Saturday)
Day Plan 3 (Sunday, Holidays)

Action Plan 10 = free (254)

Special Programming:

TIME BASE DATA - TIME OF YEAR EVENTS *** - 5 - 5**

Events	Exception Day		MON/ MON	DOW/ DOM	WOM/ Year	Day Plan
New Year's Day	1	Fixed	01	1	0	3
Family Day	2	Float	2	2	3	3
Good Friday	3	Float	04	6	1	3
Victoria Day	4	Float	05	2	3	3
Canada Day	5	Fixed	07	1	0	3
Civic Day	6	Float	08	2	1	3
Labour Day	7	Float	09	2	1	3
Thanksgiving	8	Float	10	2	2	3
Christmas Day	9	Fixed	12	25	0	3

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

Existing Traffic Operations

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	115	502	491	101	133	106
Future Volume (vph)	115	502	491	101	133	106
Lane Group Flow (vph)	134	584	571	117	155	123
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Detector Phase	5	2	6	6	8	8
Switch Phase						
Minimum Initial (s)	6.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	10.0	29.0	29.0	29.0	16.0	16.0
Total Split (s)	14.0	50.0	36.0	36.0	30.0	30.0
Total Split (%)	17.5%	62.5%	45.0%	45.0%	37.5%	37.5%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	None	None	None	Max	Max
v/c Ratio	0.42	0.63	0.87	0.19	0.26	0.21
Control Delay	11.8	16.3	38.1	6.8	22.6	5.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.8	16.3	38.1	6.8	22.6	5.7
Queue Length 50th (m)	8.3	53.5	74.6	2.3	17.4	0.0
Queue Length 95th (m)	14.8	75.5	#113.3	11.1	31.4	10.1
Internal Link Dist (m)		124.2	176.3		484.8	
Turn Bay Length (m)	150.0			40.0	75.0	
Base Capacity (vph)	361	1191	796	716	591	597
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.49	0.72	0.16	0.26	0.21

Intersection Summary
Cycle Length: 80
Actuated Cycle Length: 72.1
Natural Cycle: 60
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: North Service Road & Kerns Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	115	502	491	101	133	106
Future Volume (vph)	115	502	491	101	133	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1674	1902	1865	1555	1807	1570
Flt Permitted	0.15	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	266	1902	1865	1555	1807	1570
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	134	584	571	117	155	123
RTOR Reduction (vph)	0	0	0	60	0	83
Lane Group Flow (vph)	134	584	571	57	155	40
Heavy Vehicles (%)	9%	1%	3%	5%	1%	4%
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Actuated Green, G (s)	35.9	35.9	25.4	25.4	23.6	23.6
Effective Green, g (s)	35.9	35.9	25.4	25.4	23.6	23.6
Actuated g/C Ratio	0.50	0.50	0.35	0.35	0.33	0.33
Clearance Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	277	941	653	544	588	511
v/s Ratio Prot	0.05	c0.31	c0.31		c0.09	
v/s Ratio Perm	0.19			0.04		0.03
v/c Ratio	0.48	0.62	0.87	0.11	0.26	0.08
Uniform Delay, d1	13.0	13.3	22.1	15.9	18.0	16.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	1.3	12.5	0.1	1.1	0.3
Delay (s)	14.3	14.6	34.5	16.0	19.1	17.2
Level of Service	B	B	C	B	B	B
Approach Delay (s)		14.6	31.4		18.3	
Approach LOS		B	C		B	

Intersection Summary				
HCM 2000 Control Delay	22.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	72.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	136	204	0
Future Volume (Veh/h)	0	0	0	136	204	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	143	215	0
Pedestrians	3					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	361	218	218			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	361	218	218			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	640	824	1360			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	0	143	215
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1360	1700
Volume to Capacity	0.00	0.00	0.13
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

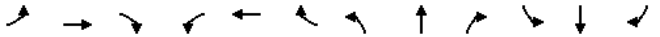
Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	14.3%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	25	29	107	179	7
Future Volume (Veh/h)	3	25	29	107	179	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	3	26	30	110	185	7
Pedestrians	3					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	362	192	195			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	362	192	195			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	98			
cM capacity (veh/h)	626	843	1368			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	140	192
Volume Left	3	30	0
Volume Right	26	0	7
cSH	814	1368	1700
Volume to Capacity	0.04	0.02	0.11
Queue Length 95th (m)	0.8	0.5	0.0
Control Delay (s)	9.6	1.8	0.0
Lane LOS	A	A	
Approach Delay (s)	9.6	1.8	0.0
Approach LOS	A		

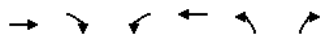
Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	30.8%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	4	2	46	27	3	2	17	69	24	1	113	6
Future Volume (vph)	4	2	46	27	3	2	17	69	24	1	113	6
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)	4	2	50	29	3	2	18	75	26	1	123	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	56	34	119	131
Volume Left (vph)	4	29	18	1
Volume Right (vph)	50	2	26	7
Hadj (s)	-0.49	0.14	0.10	0.09
Departure Headway (s)	4.0	4.7	4.3	4.3
Degree Utilization, x	0.06	0.04	0.14	0.16
Capacity (veh/h)	840	718	801	811
Control Delay (s)	7.3	7.9	8.1	8.1
Approach Delay (s)	7.3	7.9	8.1	8.1
Approach LOS	A	A	A	A

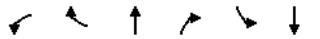
Intersection Summary				
Delay			7.9	
Level of Service			A	
Intersection Capacity Utilization			28.0%	ICU Level of Service
Analysis Period (min)			15	A



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	48	2	7	19	1	4
Future Volume (Veh/h)	48	2	7	19	1	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	57	2	8	23	1	5
Pedestrians					3	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			62		100	61
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			62		100	61
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1550		896	1007

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	59	31	6
Volume Left	0	8	1
Volume Right	2	0	5
cSH	1700	1550	987
Volume to Capacity	0.03	0.01	0.01
Queue Length 95th (m)	0.0	0.1	0.1
Control Delay (s)	0.0	1.9	8.7
Lane LOS		A	A
Approach Delay (s)	0.0	1.9	8.7
Approach LOS			A

Intersection Summary				
Average Delay			1.2	
Intersection Capacity Utilization			17.1%	ICU Level of Service
Analysis Period (min)			15	A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	57	17	63	38	10	19
Future Volume (Veh/h)	57	17	63	38	10	19
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	67	20	74	45	12	22
Pedestrians	8		8			2
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.1		1.1			1.1
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	158	106			127	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	158	106			127	
tC, single (s)	6.5	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.2	
p0 queue free %	92	98			99	
cM capacity (veh/h)	793	928			1461	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	87	119	34
Volume Left	67	0	12
Volume Right	20	45	0
cSH	821	1700	1461
Volume to Capacity	0.11	0.07	0.01
Queue Length 95th (m)	2.7	0.0	0.2
Control Delay (s)	9.9	0.0	2.7
Lane LOS	A		A
Approach Delay (s)	9.9	0.0	2.7
Approach LOS	A		

Intersection Summary				
Average Delay	4.0			
Intersection Capacity Utilization	19.7%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	101	483	832	177	118	122
Future Volume (vph)	101	483	832	177	118	122
Lane Group Flow (vph)	107	555	956	188	126	130
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Detector Phase	5	2	6	6	8	8
Switch Phase						
Minimum Initial (s)	6.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	10.0	29.0	29.0	29.0	16.0	16.0
Total Split (s)	14.0	64.0	50.0	50.0	26.0	26.0
Total Split (%)	15.6%	71.1%	55.6%	55.6%	28.9%	28.9%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	None	None	None	Max	Max
v/c Ratio	0.39	0.47	0.99	0.21	0.32	0.28
Control Delay	11.2	10.0	51.0	7.1	32.3	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.2	10.0	51.0	7.1	32.3	7.5
Queue Length 50th (m)	5.5	43.4	~164.9	7.9	18.2	0.0
Queue Length 95th (m)	14.7	64.4	#250.6	19.5	34.3	13.7
Internal Link Dist (m)		124.2	176.3		484.8	
Turn Bay Length (m)	150.0			40.0	75.0	
Base Capacity (vph)	311	1258	964	882	391	462
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.34	0.44	0.99	0.21	0.32	0.28

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 86.3
Natural Cycle: 70
Control Type: Semi Act-Uncoord
~ 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: 1: North Service Road & Kerns Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	101	483	832	177	118	122
Future Volume (vph)	101	483	832	177	118	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1772	1865	1883	1633	1772	1633
Flt Permitted	0.08	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	158	1865	1883	1633	1772	1633
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Growth Factor (vph)	100%	108%	108%	100%	100%	100%
Adj. Flow (vph)	107	555	956	188	126	130
RTOR Reduction (vph)	0	0	0	47	0	101
Lane Group Flow (vph)	107	555	956	141	126	29
Heavy Vehicles (%)	3%	3%	2%	0%	3%	0%
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Actuated Green, G (s)	54.9	54.9	44.2	44.2	19.1	19.1
Effective Green, g (s)	54.9	54.9	44.2	44.2	19.1	19.1
Actuated g/C Ratio	0.63	0.63	0.51	0.51	0.22	0.22
Clearance Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	242	1176	956	829	389	358
v/s Ratio Prot	0.04	c0.30	c0.51		c0.07	
v/s Ratio Perm	0.24			0.09		0.02
v/c Ratio	0.44	0.47	1.00	0.17	0.32	0.08
Uniform Delay, d1	17.7	8.4	21.4	11.5	28.5	27.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.3	0.3	29.1	0.1	2.2	0.4
Delay (s)	19.0	8.7	50.5	11.6	30.7	27.4
Level of Service	B	A	D	B	C	C
Approach Delay (s)		10.4	44.1		29.0	
Approach LOS		B	D		C	

Intersection Summary				
HCM 2000 Control Delay	31.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	87.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1	0	303	159	1
Future Volume (Veh/h)	0	1	0	303	159	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	1	0	333	175	1
Pedestrians	8					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	516	184	184			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	516	184	184			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	518	858	1393			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	1	333	176
Volume Left	0	0	0
Volume Right	1	0	1
cSH	858	1393	1700
Volume to Capacity	0.00	0.00	0.10
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

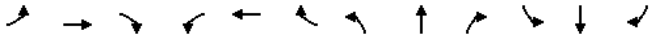
Intersection Summary			
Average Delay		0.0	
Intersection Capacity Utilization		25.9%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	20	19	284	140	1
Future Volume (Veh/h)	6	20	19	284	140	1
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)	7	22	21	309	152	1
Pedestrians	8					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	512	160	161			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	512	160	161			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	98	99			
cM capacity (veh/h)	514	883	1420			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	330	153
Volume Left	7	21	0
Volume Right	22	0	1
cSH	753	1420	1700
Volume to Capacity	0.04	0.01	0.09
Queue Length 95th (m)	0.9	0.3	0.0
Control Delay (s)	10.0	0.6	0.0
Lane LOS	A	A	
Approach Delay (s)	10.0	0.6	0.0
Approach LOS	A		

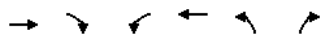
Intersection Summary			
Average Delay		1.0	
Intersection Capacity Utilization		38.1%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	4	4	27	33	2	0	43	211	36	0	81	6
Future Volume (vph)	4	4	27	33	2	0	43	211	36	0	81	6
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	4	4	29	35	2	0	46	227	39	0	87	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	37	37	312	93
Volume Left (vph)	4	35	46	0
Volume Right (vph)	29	0	39	6
Hadj (s)	-0.45	0.29	-0.03	-0.04
Departure Headway (s)	4.4	5.1	4.2	4.4
Degree Utilization, x	0.05	0.05	0.36	0.11
Capacity (veh/h)	739	642	848	789
Control Delay (s)	7.6	8.4	9.5	7.9
Approach Delay (s)	7.6	8.4	9.5	7.9
Approach LOS	A	A	A	A

Intersection Summary				
Delay			8.9	
Level of Service			A	
Intersection Capacity Utilization			38.5%	ICU Level of Service
Analysis Period (min)			15	A



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	30	1	3	48	1	5
Future Volume (Veh/h)	30	1	3	48	1	5
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)	33	1	3	52	1	5
Pedestrians					10	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			44		102	44
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			44		102	44
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	100
cM capacity (veh/h)			1563		892	1023

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	34	55	6
Volume Left	0	3	1
Volume Right	1	0	5
cSH	1700	1563	998
Volume to Capacity	0.02	0.00	0.01
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.4	8.6
Lane LOS		A	A
Approach Delay (s)	0.0	0.4	8.6
Approach LOS			A

Intersection Summary				
Average Delay			0.8	
Intersection Capacity Utilization			16.2%	ICU Level of Service
Analysis Period (min)			15	A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	87	38	132	73	15	17
Future Volume (Veh/h)	87	38	132	73	15	17
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	98	43	148	82	17	19
Pedestrians	6		2			1
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.1		1.1			1.1
Percent Blockage	1		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	250	196			236	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	250	196			236	
tC, single (s)	6.4	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	86	95			99	
cM capacity (veh/h)	721	837			1295	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	141	230	36
Volume Left	98	0	17
Volume Right	43	82	0
cSH	753	1700	1295
Volume to Capacity	0.19	0.14	0.01
Queue Length 95th (m)	5.2	0.0	0.3
Control Delay (s)	10.9	0.0	3.7
Lane LOS	B		A
Approach Delay (s)	10.9	0.0	3.7
Approach LOS	B		

Intersection Summary				
Average Delay		4.1		
Intersection Capacity Utilization		28.3%	ICU Level of Service	A
Analysis Period (min)		15		

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix C

2027 Background Traffic Operations

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	115	538	526	101	133	106
Future Volume (vph)	115	538	526	101	133	106
Lane Group Flow (vph)	134	626	612	117	155	123
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Detector Phase	5	2	6	6	8	8
Switch Phase						
Minimum Initial (s)	6.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	10.0	29.0	29.0	29.0	16.0	16.0
Total Split (s)	10.0	59.0	49.0	49.0	21.0	21.0
Total Split (%)	12.5%	73.8%	61.3%	61.3%	26.3%	26.3%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	None	None	None	Max	Max
v/c Ratio	0.37	0.61	0.78	0.16	0.36	0.26
Control Delay	7.7	11.5	23.3	2.9	26.5	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.7	11.5	23.3	2.9	26.5	7.5
Queue Length 50th (m)	5.5	41.4	59.6	0.0	15.3	0.0
Queue Length 95th (m)	10.0	59.1	85.3	6.2	35.0	11.4
Internal Link Dist (m)		124.2	176.3		484.8	
Turn Bay Length (m)	150.0			40.0	75.0	
Base Capacity (vph)	366	1616	1356	1162	428	465
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.39	0.45	0.10	0.36	0.26

Intersection Summary
Cycle Length: 80
Actuated Cycle Length: 61.3
Natural Cycle: 60
Control Type: Semi Act-Uncoord

Splits and Phases: 1: North Service Road & Kerns Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	115	538	526	101	133	106
Future Volume (vph)	115	538	526	101	133	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1674	1902	1865	1555	1807	1570
Flt Permitted	0.20	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	354	1902	1865	1555	1807	1570
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	134	626	612	117	155	123
RTOR Reduction (vph)	0	0	0	68	0	94
Lane Group Flow (vph)	134	626	612	49	155	29
Heavy Vehicles (%)	9%	1%	3%	5%	1%	4%
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Actuated Green, G (s)	34.1	34.1	25.8	25.8	14.5	14.5
Effective Green, g (s)	34.1	34.1	25.8	25.8	14.5	14.5
Actuated g/C Ratio	0.55	0.55	0.42	0.42	0.24	0.24
Clearance Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	309	1052	781	651	425	369
v/s Ratio Prot	0.04	c0.33	c0.33		c0.09	
v/s Ratio Perm	0.20			0.03		0.02
v/c Ratio	0.43	0.60	0.78	0.08	0.36	0.08
Uniform Delay, d1	9.0	9.2	15.5	10.7	19.7	18.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.9	5.2	0.0	2.4	0.4
Delay (s)	10.0	10.1	20.7	10.8	22.1	18.8
Level of Service	A	B	C	B	C	B
Approach Delay (s)		10.1	19.1		20.6	
Approach LOS		B	B		C	

Intersection Summary				
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	61.6	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	55.6%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	136	204	0
Future Volume (Veh/h)	0	0	0	136	204	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	0	0	143	215	0
Pedestrians	3					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	361	218	218			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	361	218	218			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	640	824	1360			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	0	143	215
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1360	1700
Volume to Capacity	0.00	0.00	0.13
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

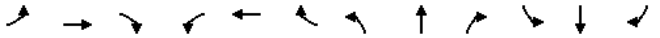
Intersection Summary				
Average Delay		0.0		
Intersection Capacity Utilization		14.3%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	25	29	107	179	7
Future Volume (Veh/h)	3	25	29	107	179	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	3	26	30	110	185	7
Pedestrians	3					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	362	192	195			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	362	192	195			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	98			
cM capacity (veh/h)	626	843	1368			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	140	192
Volume Left	3	30	0
Volume Right	26	0	7
cSH	814	1368	1700
Volume to Capacity	0.04	0.02	0.11
Queue Length 95th (m)	0.8	0.5	0.0
Control Delay (s)	9.6	1.8	0.0
Lane LOS	A	A	
Approach Delay (s)	9.6	1.8	0.0
Approach LOS	A		

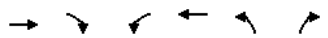
Intersection Summary				
Average Delay		1.5		
Intersection Capacity Utilization		30.8%	ICU Level of Service	A
Analysis Period (min)		15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	4	2	46	27	3	2	17	69	24	1	113	6
Future Volume (vph)	4	2	46	27	3	2	17	69	24	1	113	6
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)	4	2	50	29	3	2	18	75	26	1	123	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	56	34	119	131
Volume Left (vph)	4	29	18	1
Volume Right (vph)	50	2	26	7
Hadj (s)	-0.49	0.14	0.10	0.09
Departure Headway (s)	4.0	4.7	4.3	4.3
Degree Utilization, x	0.06	0.04	0.14	0.16
Capacity (veh/h)	840	718	801	811
Control Delay (s)	7.3	7.9	8.1	8.1
Approach Delay (s)	7.3	7.9	8.1	8.1
Approach LOS	A	A	A	A

Intersection Summary				
Delay			7.9	
Level of Service			A	
Intersection Capacity Utilization			28.0%	ICU Level of Service
Analysis Period (min)			15	A



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	48	2	7	19	1	4
Future Volume (Veh/h)	48	2	7	19	1	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	57	2	8	23	1	5
Pedestrians					3	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			62		100	61
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			62		100	61
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1550		896	1007

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	59	31	6
Volume Left	0	8	1
Volume Right	2	0	5
cSH	1700	1550	987
Volume to Capacity	0.03	0.01	0.01
Queue Length 95th (m)	0.0	0.1	0.1
Control Delay (s)	0.0	1.9	8.7
Lane LOS		A	A
Approach Delay (s)	0.0	1.9	8.7
Approach LOS			A

Intersection Summary				
Average Delay			1.2	
Intersection Capacity Utilization			17.1%	ICU Level of Service
Analysis Period (min)			15	A



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	57	17	63	38	10	19
Future Volume (Veh/h)	57	17	63	38	10	19
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	67	20	74	45	12	22
Pedestrians	8		8			2
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.1		1.1			1.1
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	158	106			127	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	158	106			127	
tC, single (s)	6.5	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.2	
p0 queue free %	92	98			99	
cM capacity (veh/h)	793	928			1461	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	87	119	34
Volume Left	67	0	12
Volume Right	20	45	0
cSH	821	1700	1461
Volume to Capacity	0.11	0.07	0.01
Queue Length 95th (m)	2.7	0.0	0.2
Control Delay (s)	9.9	0.0	2.7
Lane LOS	A		A
Approach Delay (s)	9.9	0.0	2.7
Approach LOS	A		

Intersection Summary				
Average Delay	4.0			
Intersection Capacity Utilization	19.7%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	101	518	892	177	118	122
Future Volume (vph)	101	518	892	177	118	122
Lane Group Flow (vph)	107	551	949	188	126	130
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Detector Phase	5	2	6	6	8	8
Switch Phase						
Minimum Initial (s)	6.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	10.0	29.0	29.0	29.0	16.0	16.0
Total Split (s)	10.0	73.0	63.0	63.0	17.0	17.0
Total Split (%)	11.1%	81.1%	70.0%	70.0%	18.9%	18.9%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	None	None	None	Max	Max
v/c Ratio	0.39	0.44	0.89	0.19	0.49	0.37
Control Delay	8.5	6.2	25.5	2.9	42.7	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.5	6.2	25.5	2.9	42.7	11.0
Queue Length 50th (m)	3.4	28.1	109.1	3.1	17.3	0.0
Queue Length 95th (m)	10.3	41.8	165.9	10.3	#43.8	15.6
Internal Link Dist (m)		124.2	176.3		484.8	
Turn Bay Length (m)	150.0			40.0	75.0	
Base Capacity (vph)	282	1628	1454	1292	257	348
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.34	0.65	0.15	0.49	0.37

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 73.3
Natural Cycle: 70
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: North Service Road & Kerns Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	101	518	892	177	118	122
Future Volume (vph)	101	518	892	177	118	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1772	1865	1883	1633	1772	1633
Flt Permitted	0.09	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	168	1865	1883	1633	1772	1633
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	107	551	949	188	126	130
RTOR Reduction (vph)	0	0	0	59	0	111
Lane Group Flow (vph)	107	551	949	129	126	19
Heavy Vehicles (%)	3%	3%	2%	0%	3%	0%
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Actuated Green, G (s)	49.6	49.6	41.4	41.4	10.7	10.7
Effective Green, g (s)	49.6	49.6	41.4	41.4	10.7	10.7
Actuated g/C Ratio	0.68	0.68	0.56	0.56	0.15	0.15
Clearance Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	227	1261	1063	922	258	238
v/s Ratio Prot	0.03	c0.30	c0.50		c0.07	
v/s Ratio Perm	0.28			0.08		0.01
v/c Ratio	0.47	0.44	0.89	0.14	0.49	0.08
Uniform Delay, d1	12.8	5.4	14.0	7.5	28.8	27.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	0.2	9.7	0.1	6.5	0.7
Delay (s)	14.3	5.7	23.7	7.6	35.3	27.7
Level of Service	B	A	C	A	D	C
Approach Delay (s)		7.1	21.0		31.4	
Approach LOS		A	C		C	

Intersection Summary

HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	73.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	1	0	303	159	1
Future Volume (Veh/h)	0	1	0	303	159	1
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	1	0	333	175	1
Pedestrians	8					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	516	184	184			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	516	184	184			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	518	858	1393			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	1	333	176
Volume Left	0	0	0
Volume Right	1	0	1
cSH	858	1393	1700
Volume to Capacity	0.00	0.00	0.10
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

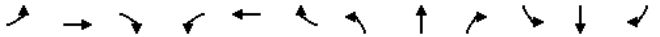
Intersection Summary			
Average Delay		0.0	
Intersection Capacity Utilization		25.9%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	20	19	284	140	1
Future Volume (Veh/h)	6	20	19	284	140	1
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)	7	22	21	309	152	1
Pedestrians	8					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	512	160	161			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	512	160	161			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	98	99			
cM capacity (veh/h)	514	883	1420			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	330	153
Volume Left	7	21	0
Volume Right	22	0	1
cSH	753	1420	1700
Volume to Capacity	0.04	0.01	0.09
Queue Length 95th (m)	0.9	0.3	0.0
Control Delay (s)	10.0	0.6	0.0
Lane LOS	A	A	
Approach Delay (s)	10.0	0.6	0.0
Approach LOS	A		

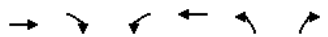
Intersection Summary			
Average Delay		1.0	
Intersection Capacity Utilization		38.1%	ICU Level of Service A
Analysis Period (min)		15	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	4	4	27	33	2	0	43	211	36	0	81	6
Future Volume (vph)	4	4	27	33	2	0	43	211	36	0	81	6
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	4	4	29	35	2	0	46	227	39	0	87	6

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	37	37	312	93
Volume Left (vph)	4	35	46	0
Volume Right (vph)	29	0	39	6
Hadj (s)	-0.45	0.29	-0.03	-0.04
Departure Headway (s)	4.4	5.1	4.2	4.4
Degree Utilization, x	0.05	0.05	0.36	0.11
Capacity (veh/h)	739	642	848	789
Control Delay (s)	7.6	8.4	9.5	7.9
Approach Delay (s)	7.6	8.4	9.5	7.9
Approach LOS	A	A	A	A

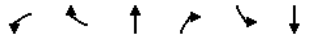
Intersection Summary			
Delay		8.9	
Level of Service		A	
Intersection Capacity Utilization	38.5%	ICU Level of Service	A
Analysis Period (min)		15	



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	30	1	3	48	1	5
Future Volume (Veh/h)	30	1	3	48	1	5
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)	33	1	3	52	1	5
Pedestrians					10	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			44		102	44
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			44		102	44
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	100
cM capacity (veh/h)			1563		892	1023

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	34	55	6
Volume Left	0	3	1
Volume Right	1	0	5
cSH	1700	1563	998
Volume to Capacity	0.02	0.00	0.01
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.4	8.6
Lane LOS		A	A
Approach Delay (s)	0.0	0.4	8.6
Approach LOS			A

Intersection Summary			
Average Delay		0.8	
Intersection Capacity Utilization	16.2%	ICU Level of Service	A
Analysis Period (min)		15	



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	87	38	132	73	15	17
Future Volume (Veh/h)	87	38	132	73	15	17
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	98	43	148	82	17	19
Pedestrians	6		2			1
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.1		1.1			1.1
Percent Blockage	1		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	250	196			236	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	250	196			236	
tC, single (s)	6.4	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	86	95			99	
cM capacity (veh/h)	721	837			1295	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	141	230	36
Volume Left	98	0	17
Volume Right	43	82	0
cSH	753	1700	1295
Volume to Capacity	0.19	0.14	0.01
Queue Length 95th (m)	5.2	0.0	0.3
Control Delay (s)	10.9	0.0	3.7
Lane LOS	B		A
Approach Delay (s)	10.9	0.0	3.7
Approach LOS	B		

Intersection Summary				
Average Delay		4.1		
Intersection Capacity Utilization		28.3%	ICU Level of Service	A
Analysis Period (min)		15		

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix D

2027 Total Traffic Operations

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	115	538	526	101	133	106
Future Volume (vph)	115	538	526	101	133	106
Lane Group Flow (vph)	134	626	612	117	155	123
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Detector Phase	5	2	6	6	8	8
Switch Phase						
Minimum Initial (s)	6.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	10.0	29.0	29.0	29.0	16.0	16.0
Total Split (s)	10.0	59.0	49.0	49.0	21.0	21.0
Total Split (%)	12.5%	73.8%	61.3%	61.3%	26.3%	26.3%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	None	None	None	Max	Max
v/c Ratio	0.37	0.61	0.78	0.16	0.36	0.26
Control Delay	7.7	11.5	23.3	2.9	26.5	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.7	11.5	23.3	2.9	26.5	7.5
Queue Length 50th (m)	5.5	41.4	59.6	0.0	15.3	0.0
Queue Length 95th (m)	10.0	59.1	85.3	6.2	35.0	11.4
Internal Link Dist (m)		124.2	176.3		484.8	
Turn Bay Length (m)	150.0			40.0	75.0	
Base Capacity (vph)	366	1616	1356	1162	428	465
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.39	0.45	0.10	0.36	0.26

Intersection Summary
Cycle Length: 80
Actuated Cycle Length: 61.3
Natural Cycle: 60
Control Type: Semi Act-Uncoord

Splits and Phases: 1: North Service Road & Kerns Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	115	538	526	101	133	106
Future Volume (vph)	115	538	526	101	133	106
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1674	1902	1865	1555	1807	1570
Flt Permitted	0.20	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	354	1902	1865	1555	1807	1570
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	134	626	612	117	155	123
RTOR Reduction (vph)	0	0	0	68	0	94
Lane Group Flow (vph)	134	626	612	49	155	29
Heavy Vehicles (%)	9%	1%	3%	5%	1%	4%
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Actuated Green, G (s)	34.1	34.1	25.8	25.8	14.5	14.5
Effective Green, g (s)	34.1	34.1	25.8	25.8	14.5	14.5
Actuated g/C Ratio	0.55	0.55	0.42	0.42	0.24	0.24
Clearance Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	309	1052	781	651	425	369
v/s Ratio Prot	0.04	c0.33	c0.33		c0.09	
v/s Ratio Perm	0.20			0.03		0.02
v/c Ratio	0.43	0.60	0.78	0.08	0.36	0.08
Uniform Delay, d1	9.0	9.2	15.5	10.7	19.7	18.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.9	5.2	0.0	2.4	0.4
Delay (s)	10.0	10.1	20.7	10.8	22.1	18.8
Level of Service	A	B	C	B	C	B
Approach Delay (s)		10.1	19.1		20.6	
Approach LOS		B	B		C	

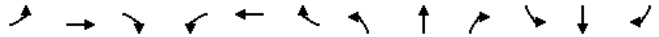
Intersection Summary				
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	61.6	Sum of lost time (s)	16.0	
Intersection Capacity Utilization	55.6%	ICU Level of Service	B	
Analysis Period (min)	15			
c Critical Lane Group				



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	8	14	102	175	0
Future Volume (Veh/h)	0	8	14	102	175	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	0	8	15	107	184	0
Pedestrians	3					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	324	187	187			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	324	187	187			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	99			
cM capacity (veh/h)	665	858	1396			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	8	122	184
Volume Left	0	15	0
Volume Right	8	0	0
cSH	858	1396	1700
Volume to Capacity	0.01	0.01	0.11
Queue Length 95th (m)	0.2	0.2	0.0
Control Delay (s)	9.2	1.0	0.0
Lane LOS	A	A	
Approach Delay (s)	9.2	1.0	0.0
Approach LOS	A		

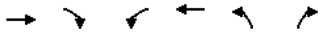
Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	27.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	2	42	27	3	2	12	66	24	1	106	6
Future Volume (vph)	5	2	42	27	3	2	12	66	24	1	106	6
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)	5	2	46	29	3	2	13	72	26	1	115	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	53	34	111	123
Volume Left (vph)	5	29	13	1
Volume Right (vph)	46	2	26	7
Hadj (s)	-0.46	0.14	0.09	0.09
Departure Headway (s)	4.0	4.6	4.3	4.3
Degree Utilization, x	0.06	0.04	0.13	0.15
Capacity (veh/h)	844	727	807	815
Control Delay (s)	7.3	7.8	8.0	8.0
Approach Delay (s)	7.3	7.8	8.0	8.0
Approach LOS	A	A	A	A

Intersection Summary			
Delay	7.9		
Level of Service	A		
Intersection Capacity Utilization	27.6%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	48	0	2	19	0	1
Future Volume (Veh/h)	48	0	2	19	0	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	57	0	2	23	0	1
Pedestrians					3	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			60		87	60
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			60		87	60
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	100
cM capacity (veh/h)			1552		915	1008

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	57	25	1
Volume Left	0	2	0
Volume Right	0	0	1
cSH	1700	1552	1008
Volume to Capacity	0.03	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.0
Control Delay (s)	0.0	0.6	8.6
Lane LOS		A	A
Approach Delay (s)	0.0	0.6	8.6
Approach LOS			A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	14.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	52	17	61	38	10	17
Future Volume (Veh/h)	52	17	61	38	10	17
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	61	20	72	45	12	20
Pedestrians	8		8			2
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.1		1.1			1.1
Percent Blockage	1		1			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	154	104			125	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	154	104			125	
tC, single (s)	6.5	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.4			2.2	
p0 queue free %	92	98			99	
cM capacity (veh/h)	798	931			1463	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	81	117	32
Volume Left	61	0	12
Volume Right	20	45	0
cSH	827	1700	1463
Volume to Capacity	0.10	0.07	0.01
Queue Length 95th (m)	2.5	0.0	0.2
Control Delay (s)	9.8	0.0	2.8
Lane LOS	A		A
Approach Delay (s)	9.8	0.0	2.8
Approach LOS	A		

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	19.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	98	518	892	170	115	120
Future Volume (vph)	98	518	892	170	115	120
Lane Group Flow (vph)	104	551	949	181	122	128
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Detector Phase	5	2	6	6	8	8
Switch Phase						
Minimum Initial (s)	6.0	8.0	8.0	8.0	8.0	8.0
Minimum Split (s)	10.0	29.0	29.0	29.0	16.0	16.0
Total Split (s)	10.0	73.0	63.0	63.0	17.0	17.0
Total Split (%)	11.1%	81.1%	70.0%	70.0%	18.9%	18.9%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Recall Mode	None	None	None	None	Max	Max
v/c Ratio	0.38	0.44	0.89	0.18	0.47	0.37
Control Delay	8.0	6.2	25.5	2.9	42.1	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.0	6.2	25.5	2.9	42.1	11.0
Queue Length 50th (m)	3.3	28.1	109.1	3.0	16.7	0.0
Queue Length 95th (m)	9.4	41.8	165.9	10.1	#41.6	15.4
Internal Link Dist (m)		124.2	176.3		484.8	
Turn Bay Length (m)	150.0			40.0	75.0	
Base Capacity (vph)	282	1628	1454	1291	257	346
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.34	0.65	0.14	0.47	0.37

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 73.3
Natural Cycle: 70
Control Type: Semi Act-Uncoord
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: North Service Road & Kerns Road



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	98	518	892	170	115	120
Future Volume (vph)	98	518	892	170	115	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1772	1865	1883	1633	1772	1633
Flt Permitted	0.09	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	168	1865	1883	1633	1772	1633
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	104	551	949	181	122	128
RTOR Reduction (vph)	0	0	0	57	0	109
Lane Group Flow (vph)	104	551	949	124	122	19
Heavy Vehicles (%)	3%	3%	2%	0%	3%	0%
Turn Type	pm+pt	NA	NA	Perm	Prot	Perm
Protected Phases	5	2	6		8	
Permitted Phases	2			6		8
Actuated Green, G (s)	49.6	49.6	41.4	41.4	10.7	10.7
Effective Green, g (s)	49.6	49.6	41.4	41.4	10.7	10.7
Actuated g/C Ratio	0.68	0.68	0.56	0.56	0.15	0.15
Clearance Time (s)	3.0	6.0	6.0	6.0	7.0	7.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	227	1261	1063	922	258	238
v/s Ratio Prot	0.03	c0.30	c0.50		c0.07	
v/s Ratio Perm	0.28			0.08		0.01
v/c Ratio	0.46	0.44	0.89	0.13	0.47	0.08
Uniform Delay, d1	12.7	5.4	14.0	7.5	28.7	27.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	0.2	9.7	0.1	6.1	0.6
Delay (s)	14.2	5.7	23.7	7.6	34.8	27.7
Level of Service	B	A	C	A	C	C
Approach Delay (s)		7.0	21.1		31.2	
Approach LOS		A	C		C	

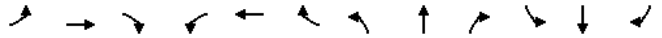
Intersection Summary				
HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	73.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	18	11	282	137	0
Future Volume (Veh/h)	0	18	11	282	137	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	0	20	12	310	151	0
Pedestrians	8					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	493	159	159			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	493	159	159			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	98	99			
cM capacity (veh/h)	530	885	1422			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	20	322	151
Volume Left	0	12	0
Volume Right	20	0	0
cSH	885	1422	1700
Volume to Capacity	0.02	0.01	0.09
Queue Length 95th (m)	0.5	0.2	0.0
Control Delay (s)	9.2	0.4	0.0
Lane LOS	A	A	
Approach Delay (s)	9.2	0.4	0.0
Approach LOS	A		

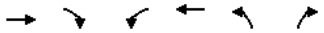
Intersection Summary				
Average Delay	0.6			
Intersection Capacity Utilization	33.8%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	5	3	25	33	2	0	41	205	36	0	79	7
Future Volume (vph)	5	3	25	33	2	0	41	205	36	0	79	7
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	5	3	27	35	2	0	44	220	39	0	85	8

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	35	37	303	93
Volume Left (vph)	5	35	44	0
Volume Right (vph)	27	0	39	8
Hadj (s)	-0.43	0.29	-0.04	-0.05
Departure Headway (s)	4.4	5.1	4.1	4.3
Degree Utilization, x	0.04	0.05	0.35	0.11
Capacity (veh/h)	742	646	849	795
Control Delay (s)	7.6	8.4	9.3	7.9
Approach Delay (s)	7.6	8.4	9.3	7.9
Approach LOS	A	A	A	A

Intersection Summary				
Delay	8.8			
Level of Service	A			
Intersection Capacity Utilization	37.9%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	30	0	2	48	0	3
Future Volume (Veh/h)	30	0	2	48	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)	33	0	2	52	0	3
Pedestrians					10	
Lane Width (m)					3.7	
Walking Speed (m/s)					1.1	
Percent Blockage					1	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			43		99	43
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			43		99	43
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	100
cM capacity (veh/h)			1564		895	1023

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	33	54	3
Volume Left	0	2	0
Volume Right	0	0	3
cSH	1700	1564	1023
Volume to Capacity	0.02	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.3	8.5
Lane LOS		A	A
Approach Delay (s)	0.0	0.3	8.5
Approach LOS			A

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	16.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	87	38	128	72	15	16
Future Volume (Veh/h)	87	38	128	72	15	16
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Hourly flow rate (vph)	98	43	144	81	17	18
Pedestrians	6		2			1
Lane Width (m)	3.7		3.7			3.7
Walking Speed (m/s)	1.1		1.1			1.1
Percent Blockage	1		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	244	192			231	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	244	192			231	
tC, single (s)	6.4	6.2			4.2	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.3	
p0 queue free %	87	95			99	
cM capacity (veh/h)	727	842			1301	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	141	225	35
Volume Left	98	0	17
Volume Right	43	81	0
cSH	758	1700	1301
Volume to Capacity	0.19	0.13	0.01
Queue Length 95th (m)	5.2	0.0	0.3
Control Delay (s)	10.8	0.0	3.8
Lane LOS	B		A
Approach Delay (s)	10.8	0.0	3.8
Approach LOS	B		

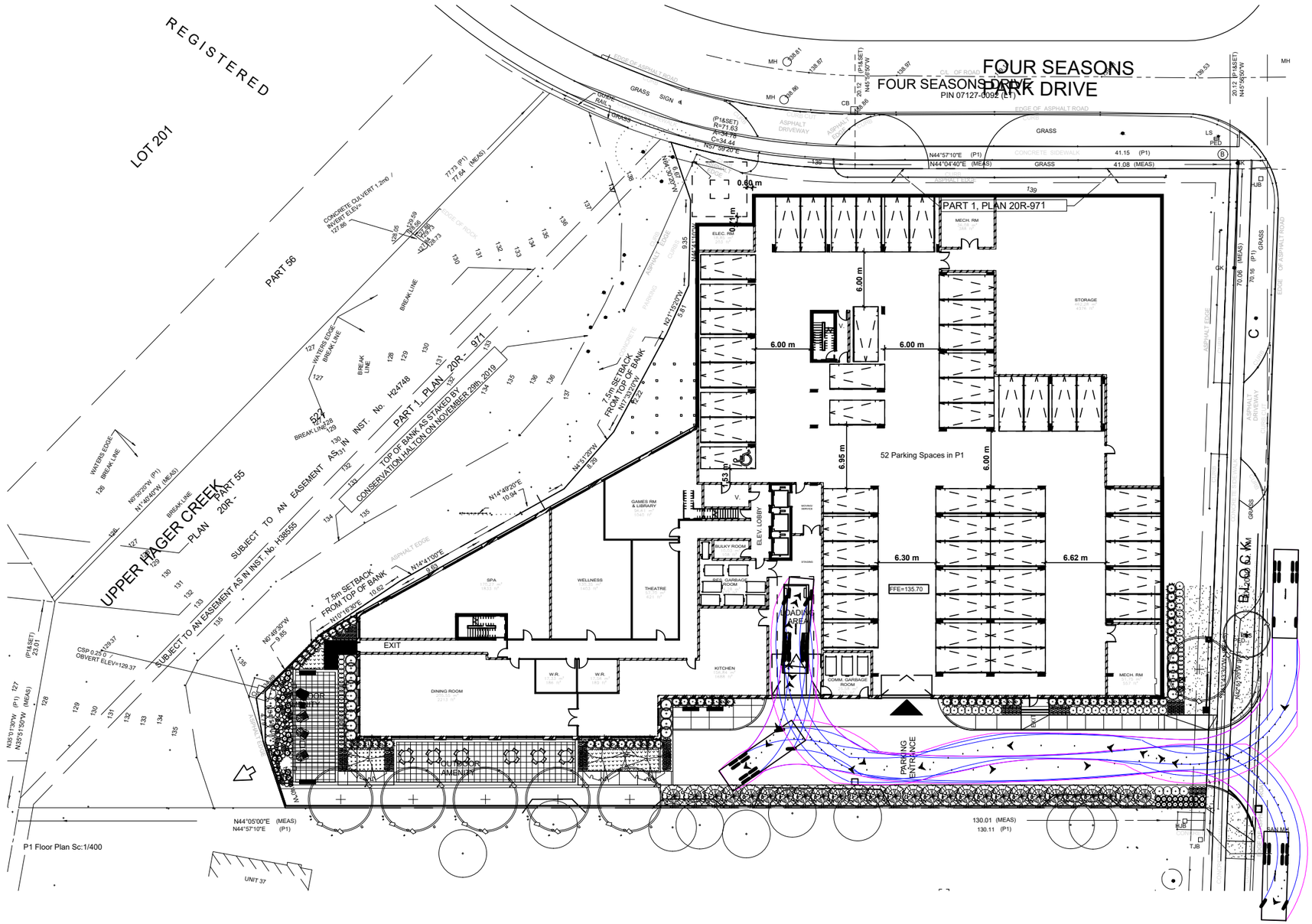
Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	28.3%	ICU Level of Service	A
Analysis Period (min)	15		

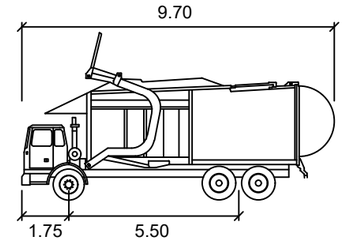
BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix E

Truck Access Analysis





Halton Region - FL Refuse Truck

	meters
Width	: 2.70
Track	: 2.70
Lock to Lock Time	: 6.0
Steering Angle	: 28.6

LEGEND

- VEHICLE TIRE PATH
- VEHICLE BODY PATH

BURNSIDE

1600 KERNS ROAD
BURLINGTON, ONTARIO

TRUCK ACCESS ANALYSIS
REFUSE TRUCK

R.J Burnside & Associates Limited
BW/ DWA
MARCH 23, 2021 N.T.S

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix F

City Parking Review Excerpts

Land Use	Existing Parking Standard Minimum	Change	Intensification Areas: Maximum	Intensification Areas: Minimum	Other Areas
Apartment Building	O: 1.25-1.75 spaces/unit V: 0.35 spaces/unit	Updated	O: 1.5 spaces/unit V: 0.25 spaces/unit	O: 1 spaces/unit V: 0.25 spaces/unit	1BR: 1 space/unit 2BR: 1.25 spaces/unit 3BR: 1.5 spaces/unit V: 0.2 spaces/unit
Accessory Dwelling Unit	N/A	New	1 spaces/unit	0	1 spaces/unit
Dwelling Units on the 2nd or 3rd floor of a commercial building	1.25 spaces/unit	Updated	1.5 space/unit	1 space/unit	1.25 spaces/unit
Bed & Breakfast Home **Boarding House**	1 space/room	Keep Existing	1 space/room	1 space/room	1 space/room
Retail & Service Commercial Uses					
Service Commercial Uses	4 spaces/100 m^2 GFA	Keep Existing	4 spaces/100 m^2 GFA	4 spaces/100 m^2 GFA	4 spaces/100 m^2 GFA
Retail Store	4 spaces/100 m^2 GFA	Updated	3 spaces/100 m^2 GFA	1.5 spaces/100 m^2 GFA	3.5 spaces/100 m^2 GFA
Retail Centre	5.25 spaces/100 m^2 GFA	Updated	4.5 spaces/100 m^2 GFA	3.5 spaces/100 m^2 GFA	5 spaces/100 m^2 GFA
Supermarket	10 spaces/100 m^2 GFA	Updated	5.5 spaces/100 m^2 GFA	4.0 spaces/100 m^2 GFA	6.0 spaces/100 m^2 GFA

Land Use	Existing Parking Standard Minimum	Change	Intensification Areas: Maximum	Intensification Areas: Minimum	Other Areas
Home Day Care	None required	Keep Existing	None required	None required	None required
Hospital, Health Care Facility	0.65 spaces/patient bed	Keep Existing	0.65 spaces/patient bed	0.65 spaces/patient bed	0.65 spaces/patient bed
Library, Museum, Post Office	0.75 spaces/employee + 1.5 spaces/100 m^2 GFA	Keep Existing	0.75 spaces/employee + 1.5 spaces/100 m^2 GFA	0.75 spaces/employee + 1.5 spaces/100 m^2 GFA	0.75 spaces/employee + 1.5 spaces/100 m^2 GFA
Lodge, Fraternity, Private Club	1 space/4 persons capacity	Keep Existing	1 space/4 persons capacity	1 space/4 persons capacity	1 space/4 persons capacity
Long-Term Care Facility	0.85 spaces/emp + 0.25 spaces/bed	Updated	No max	0.35 spaces/bed	0.35 spaces/bed
Place of Worship	6 spaces/100 m^2 GFA	New	0.2 spaces per seat or prayer space OR 7.5 spaces/100 m2 GFA Whichever is higher	0.15 spaces per seat or prayer space OR 5.0 spaces/100 m2 GFA Whichever is higher	0.2 spaces per seat or prayer space OR 6.0 spaces/100 m2 GFA Whichever is higher
Residential Social Service	0.85 spaces/employee V: 0.25 spaces/resident	Keep Existing	0.85 spaces/employee V: 0.25 spaces/resident	0.85 spaces/employee V: 0.25 spaces/resident	0.85 spaces/employee V: 0.25 spaces/resident
Retirement Home	0.85 spaces/employee Occupant: 0.5 spaces/unit V: 0.25 spaces/unit	Updated	No Max	O/E: 0.5 spaces/unit V: 0.2 spaces/unit	O/E: 0.6 spaces/unit V: 0.25 spaces/unit

and similarly, easy for developers to predict what would be required of their projects. Such codes also tend to be comprehensible to a broader audience since they directly reference the built form. Form-based codes are thus easier to understand, enforce, and represent graphically.

In terms of parking requirements, the minimum and/or maximum standards might be specifically defined for various building envelope or street section characterizations, but across broad land-use categories (such as those used in the SmartCode: residential, lodging, office, retail, civic, and other[10]). Given the nature of form-based standards, parking requirements would also likely include details related to their design. It would be very challenging, however, to integrate a form-based approach to parking standards within a traditional zoning by-law, as presently exists within the City of Burlington, and the resulting by-law would be quite complicated.

4.2 Defining a Parking Structure for Burlington

Burlington Zoning By-law 2020 currently uses a combination of general provisions (Generic Standards), area stratification, and some reduction factors. The structure for the updated standards will follow Burlington's existing structure, with some slight modifications, which are defined below. This structure is a hybrid structure which takes advantage of the benefits of the various structure types described in Section 4.1

4.2.1 Adjusting Existing Land Use Categories

One of the updates to the existing structure will include reconciling the existing land use categories. There are opportunities to introduce new categories, as well as opportunities to group separate categories into the same standard. The justification for these adjustments is based on results from the parking survey that was conducted as part of this study. The full list of categories and suggested changes can be found in Appendix E.

4.2.2 Updating the Area Stratification

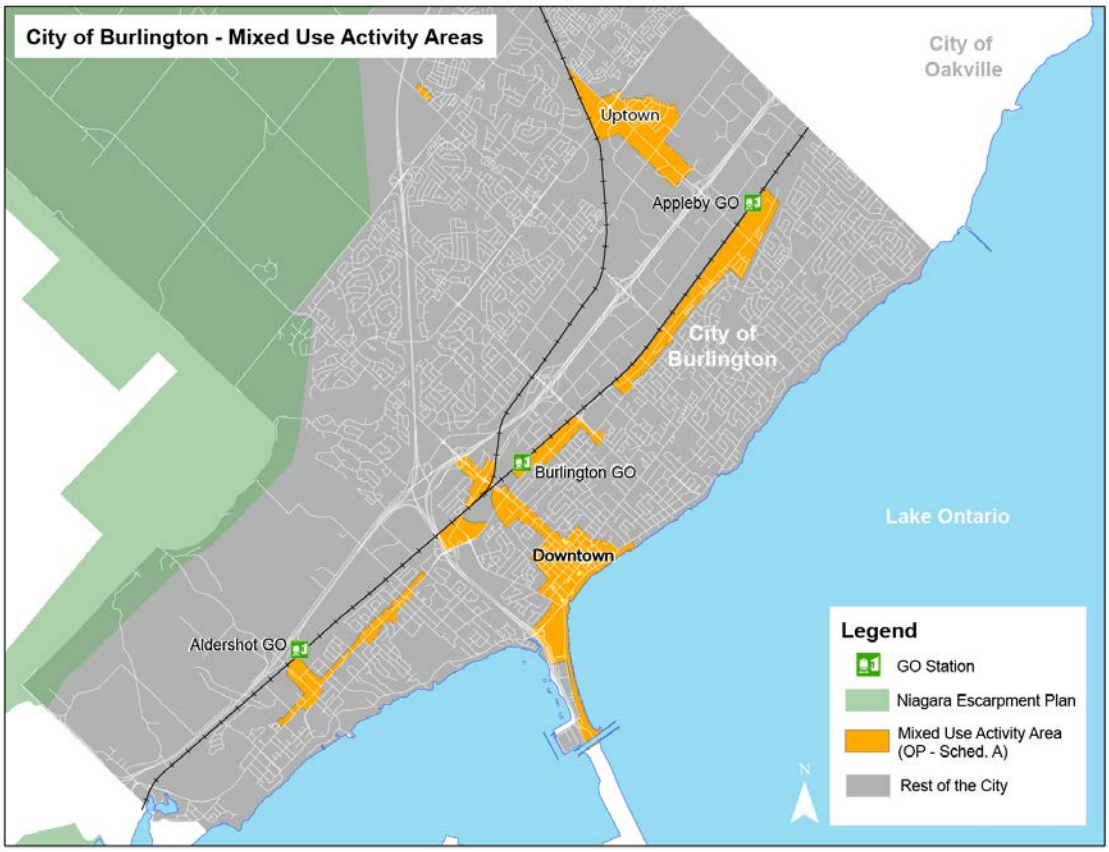
As identified in the Background Section of this report, there are several special planning areas in Burlington which have a different set of city building objectives. Burlington currently applies area specific standards in the Downtown Mixed Use Centre Zones, in Uptown Mixed Use Centre Zones, and in Mixed-Use Corridor Zones.

These reductions are somewhat inconsistent and there is an opportunity to apply them to a greater and more generic growth area.

The Mixed Use Activity Areas are a special policy area, which are identified in Schedule A of the Official Plan. These areas will undergo redevelopment which will profile a mixture of land uses, intensification, and a transit and pedestrian oriented urban form. The draft urban structure, which will be considered for inclusion in the update of the City's official plan includes an expansion of these areas and therefore should be considered as an update to the Mixed Use Activity areas for the purpose of area stratification of the parking standards. The existing Mixed Use Activity Areas are mapped in Exhibit 4.1. For the purpose of this document, the expanded Mixed Use Activity Area will be referred to "Intensification Areas."

[10] Duany, Sorlien, & Wright (2007) SmartCode Version 9.0.

Exhibit 4.1: Mixed Use Activity Areas



Intensification Areas

For the purpose of these parking standards, which were written prior to the new Official Plan, the term Intensification Areas is used. This area will be represented by all intensification related land uses that will be designated in the new official plan.

Other Areas

These “Other Areas” are areas that are not included in Intensification areas, for which parking standards not included in the Intensification Areas will be applied, and are referred to as Other Areas in the tables later in this document.

Downtown Exemption Area

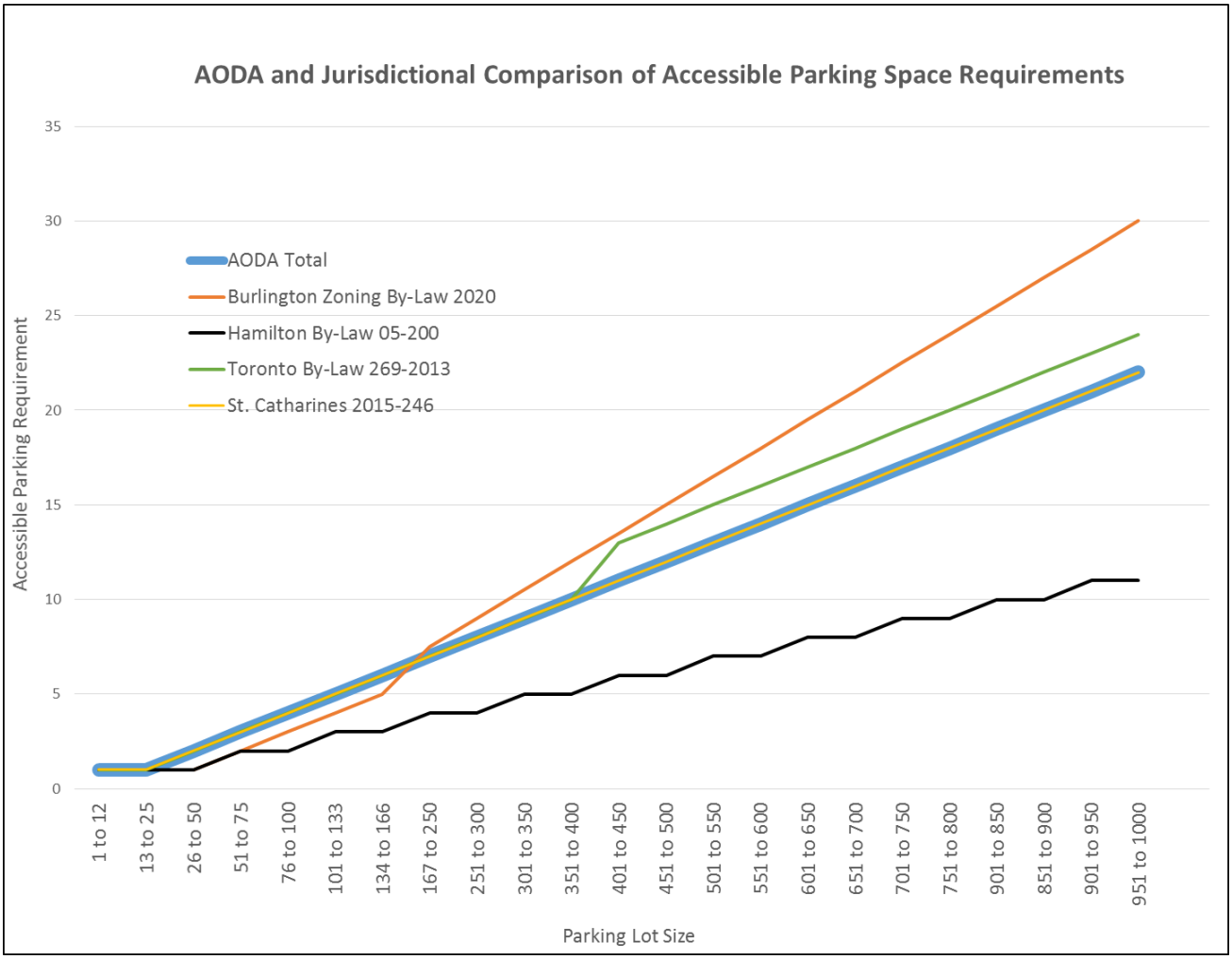
The downtown exemption area should be maintained in the updated parking standards. This area is illustrated in Exhibit 4.2.

7 Additional Considerations

7.1 Accessible Parking

A review was completed to compare Burlington's current accessible parking requirements to AODA guidelines, and three other municipalities (Hamilton, St. Catharines, and Toronto). This comparison is summarized in Exhibit 7.1.

Exhibit 7.1: Comparison of Burlington's Accessible Parking Standards



Based on the review, Burlington's current accessible parking standards require more accessible parking in larger parking lots and less accessible parking for smaller parking lots compared to AODA guidelines, and standards in St. Catharines and Toronto.

It is recommended that Burlington's accessible parking standards be amended to match the requirements outlined in the AODA guidelines. These standards are outlined in Exhibit 7.2.

Exhibit 7.2: AODA Guidelines

	Accessible Spaces Requirement					Jurisdictional Comaprison			
Parking Lot Size	AODA Type A (van)	AODA Type B	AODA Total	Burlington Zoning By-Law 2020	Burlington Compared to AODA	Hamilton By-Law 05-200	St. Catharines 2015-246	Toronto By-Law 269-2013	Difference
1 to 12	1	0	1	1	=AODA	1	1	1	Burlington requires more accessible parking than Hamilton but less than Toronto. St. Catharines matches AODA
13 to 25	0	1	1	1		1	1	1	
26 to 50	1	1	2	1	<AODA	1	2	2	
51 to 75	1	2	3	2		2	3	3	
76 to 100	2	2	4	3		2	4	4	
101 to 133	2	3	5	4		3	5	5	
134 to 166	3	3	6	5		3	6	6	
167 to 250	3	4	7	8	>AODA	4	7	7	
251 to 300	4	4	8	9		4	8	8	
301 to 350	4	5	9	11		5	9	9	
351 to 400	5	5	10	12		5	10	10	
401 to 450	5	6	11	14		6	11	13	
451 to 500	6	6	12	15		6	12	14	
501 to 550	6	7	13	17		7	13	15	
551 to 600	7	7	14	18		7	14	16	
601 to 650	7	8	15	20		8	15	17	
651 to 700	8	8	16	21		8	16	18	
701 to 750	8	9	17	23		9	17	19	
751 to 800	9	9	18	24		9	18	20	
901 to 850	9	10	19	26		10	19	21	
851 to 900	10	10	20	27		10	20	22	
901 to 950	10	11	21	29		11	21	23	
951 to 1000	11	11	22	30		11	22	24	

7.2 Bicycle Parking Standards

7.2.1 Existing Standards

The existing standards for bicycle parking state the following:

> *Required Bicycle Parking Per Use*
>
> *Retail, Retail Centre, Service Commercial Office, Institutional: 2 spaces plus 1 space / 1000* m^2 *GFA*
>
> *Industrial: 2 spaces plus 0.25 spaces / 1000* m^2 *GFA*
>
> *Elementary & Secondary School: 1 space / 10 students & 1 space / 35 employees*
>
> *Post-Secondary School: 1 space / 20 students*
>
> *a) Each bicycle parking space shall be 60 cm x 1.8 m in size.*

7.2.2 Peer Review

Bicycle parking is an essential component of a comprehensive active transportation network. To effectively implement adequate parking that is both abundant and effectively designed is an important part of ensuring a quality user experience.

7.2.3 Recommendations

It is recommended that the following changes be made:

- That all land uses be required to provide bicycle parking
- In Intensification Areas, showers for cyclists should be required for employment land uses
- Provisions for long term as well as short term parking should in included in the standards for employment, residential, and school uses. All other uses will require short term parking.
- Design of parking facilities follow the guidelines for bicycle parking design outlined in the
- These peak occupancy periods should be applied the same way that the current by-law applies the peak demand period chart to determine marking supply for a mixed uses.
- Design Guidelines Section of this report.

The implications of the above recommendations are summarized for each land use in Exhibit 7.4.

Exhibit 7.4: Recommended Bicycle Parking Standards

Land Use	Existing (All Areas)	Intensification Areas	Other Areas
Residential – Apartments	0	.5 long term bicycle parking spaces per unit .05 short term bicycle parking spaces per unit	
Retail	2 spaces + 1 space/1000 m^2 GFA	3 short term spaces + 1 space/1000 m^2 GFA 2 long term spaces plus 1 space/1000 m^2 GFA	2 short term spaces + 1 space/1000 m^2 GFA
Industrial	2 spaces plus 0.25 spaces/1000 m^2 GFA	2 short term spaces + 1 space/1000 m^2 GFA 2 long term spaces + 0.5 space/1000 m^2 GFA	2 short term spaces + 1 space/1000 m^2 GFA
Entertainment	0	2 short term spaces + 1 space/1000 m^2 GFA 2 long term spaces plus 1 space/1000 m^2 GFA	2 short term spaces + 1 space/1000 m^2 GFA
Recreational	0	4 short term spaces + 1 space/1000 m^2 GFA	2 short term spaces + 1 space/1000 m^2 GFA
Employment Uses	2 spaces + 1 space/1000 m^2 GFA	2 short term spaces + 1 space/1000 m^2 GFA 2 long term spaces plus 1.0 space/1000 m^2 GFA For every 30 long-term bicycle parking spaces required 1 male and 1	2 short term spaces + 1 space/1000 m^2 GFA 1 space/1000 m^2 GFA

BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix G

Zoning By-Law Excerpts

2.25 OFF STREET PARKING AND LOADING REQUIREMENTS

2.25.1 Whenever new development occurs or whenever an existing development is enlarged, extended or increased in capacity, in accordance with this By-Law, off street vehicle parking spaces shall be provided and maintained on the property and within the zone designation for all uses, except, within the “Downtown Parking Exemption Area” shown on Diagram 1A, Subsection 2.25 shall only apply to residential uses.

2.25.2 Off-Street parking shall be in accordance with Subsection 2.26, "General Parking Provisions"

2.25.3 At least one off-street loading space shall be provided in conjunction with every principal building, including mixed use buildings, but excluding residential buildings less than 4 storeys high.

2.25.4 The number of parking spaces required for permitted uses in all zones shall be in accordance with Table 1.2.6, unless otherwise specified in the respective zones.

R.J. Burnside & Associates Limited