1319 Johnston Road

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report (Rev#3)

Prepared for:

2079 Artistic Place Inc
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Prepared by:

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August 2024

PN: 2022-061

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1 Screening

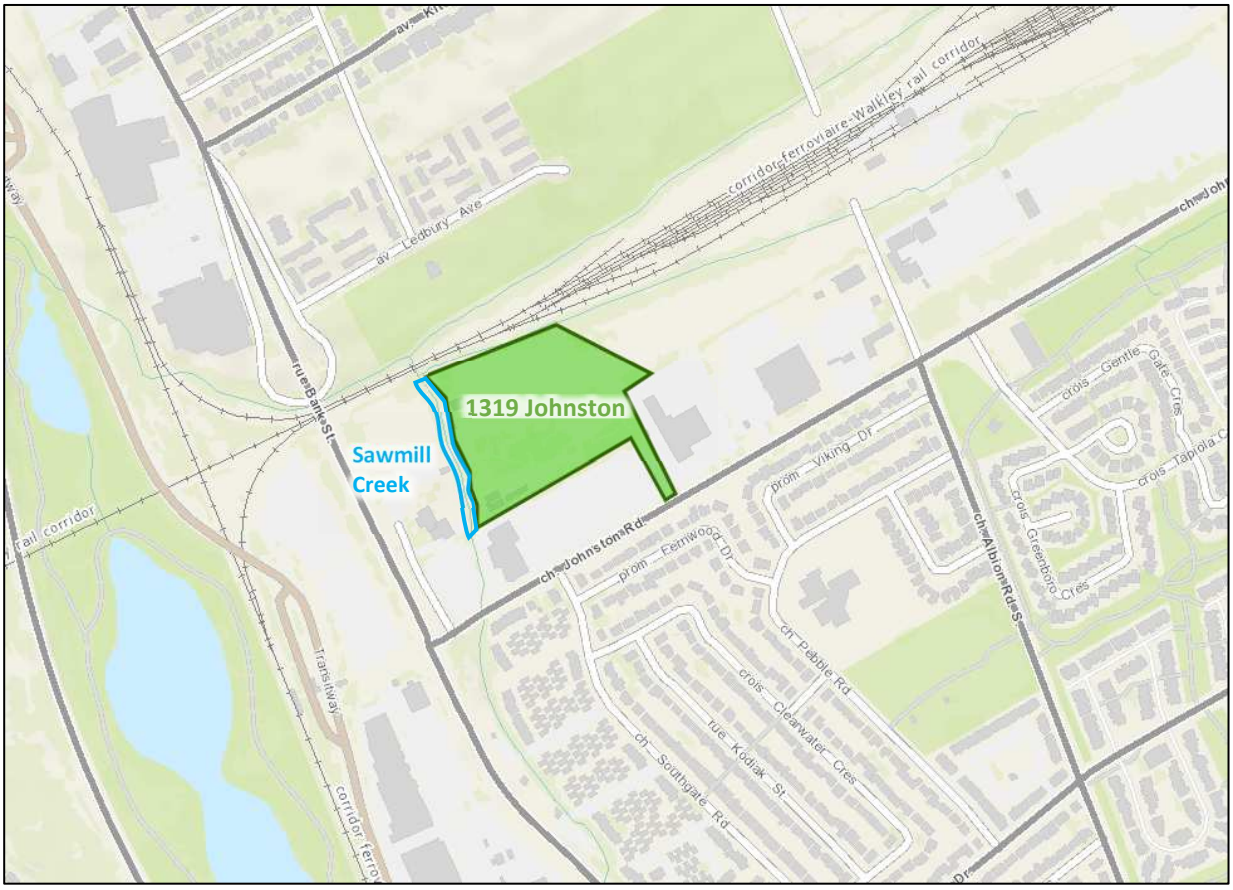
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines, prior to the June 2023 updates. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for the TIA Study PM. As shown in the Screening Form, a TIA is required including the Design Review component and the Network Impact Component. This study has been prepared to support a site plan application.

2 Existing and Planned Conditions

2.1 Proposed Development

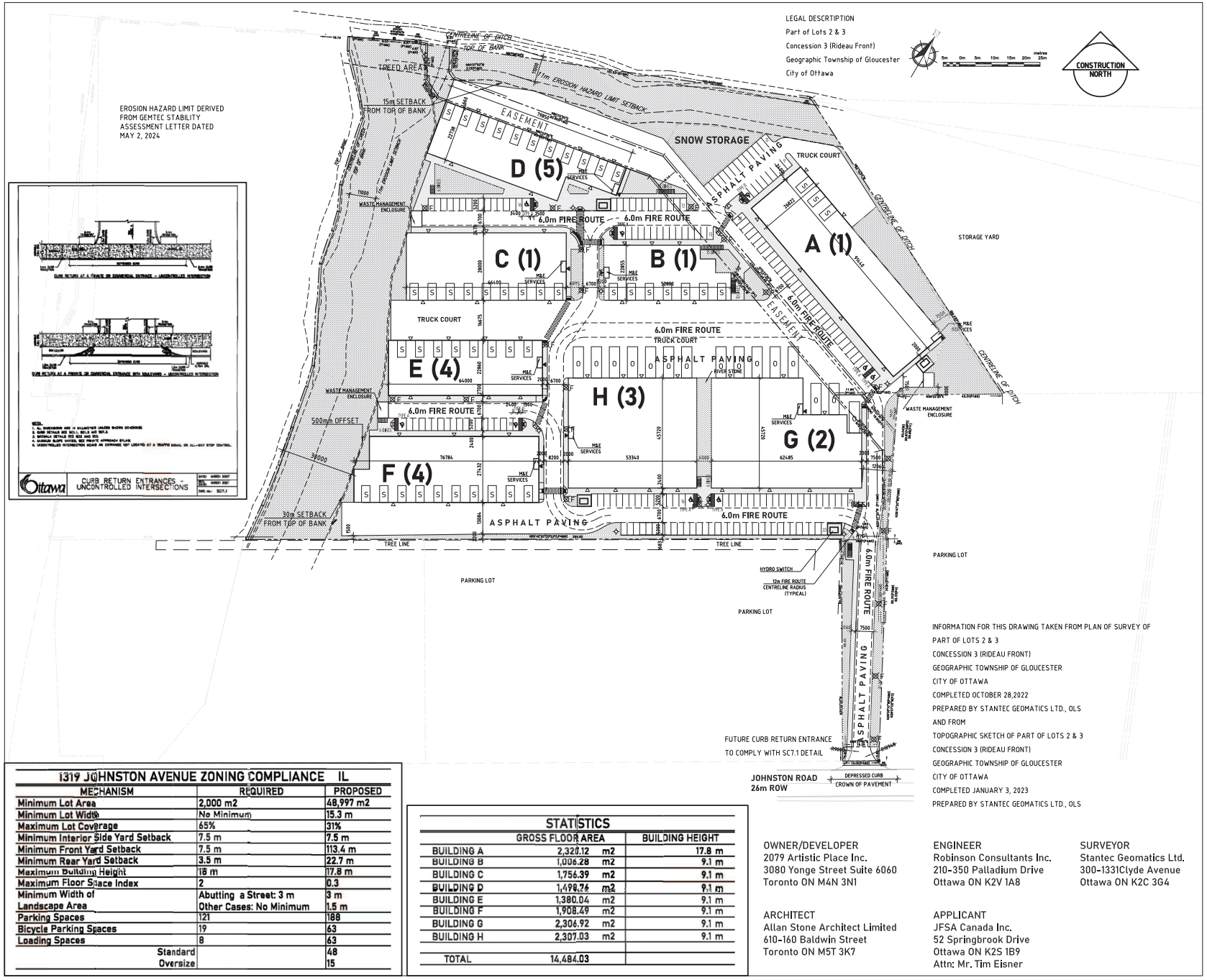
The existing site, located at 1319 Johnston Road, is zoned as a Light Industrial Zone (IL). The site was previously used as storage space by the Artistic Landscape Design Garden Centre, which no longer owns the subject site. The proposed development, which is located east of Sawmill Creek, consists of 155,905 sq. ft gross floor area of industrial buildings, 188 surface parking spaces, and 63 bicycle parking spaces. West of Sawmill Creek is anticipated to remain as existing. An expired servicing easement is located within the site and runs from northwest to southeast. The concept plan includes a new full-movement access on Johnston Road. The anticipated full build-out and occupancy horizon is 2028 with construction occurring in phases. The site is located within the South Keys to Blossom Park, Bank Street Community Design Plan area. Figure 1 illustrates the study area context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: July 18, 2023

Figure 2: Concept Plan



INFORMATION FOR THIS DRAWING TAKEN FROM PLAN OF SURVEY OF
PART OF LOTS 2 & 3
CONCESSION 3 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF GLOUCESTER
CITY OF OTTAWA
COMPLETED OCTOBER 28,2022
PREPARED BY STANTEC GEOMATICS LTD., OLS
AND FROM
TOPOGRAPHIC SKETCH OF PART OF LOTS 2 & 3
CONCESSION 3 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF GLOUCESTER
CITY OF OTTAWA
COMPLETED JANUARY 3, 2023
PREPARED BY STANTEC GEOMATICS LTD., OLS

1319 JOHNSTON AVENUE ZONING COMPLIANCE IL

MECHANISM	REQUIRED	PROPOSED
Minimum Lot Area	2,000 m2	48,997 m2
Minimum Lot Width	No Minimum	15.3 m
Maximum Lot Coverage	65%	31%
Minimum Interior Side Yard Setback	7.5 m	7.5 m
Minimum Front Yard Setback	7.5 m	113.4 m
Minimum Rear Yard Setback	3.5 m	22.7 m
Maximum Building Height	18 m	17.8 m
Maximum Floor Space Index	2	0.3
Minimum Width of Landscape Area	Abutting a Street: 3 m Other Cases: No Minimum	3 m 1.5 m
Parking Spaces	121	188
Bicycle Parking Spaces	19	63
Loading Spaces	8	63
Standard		48
Oversize		15

STATISTICS

	GROSS FLOOR AREA	BUILDING HEIGHT
BUILDING A	2,320.12 m2	17.8 m
BUILDING B	1,006.28 m2	9.1 m
BUILDING C	1,756.39 m2	9.1 m
BUILDING D	1,498.76 m2	9.1 m
BUILDING E	1,380.04 m2	9.1 m
BUILDING F	1,908.49 m2	9.1 m
BUILDING G	2,306.92 m2	9.1 m
BUILDING H	2,307.03 m2	9.1 m
TOTAL	14,484.03	

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SURVEYOR
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REVISIONS AND DISTRIBUTION LOG

No.	Date	Note
01	16 AUG 2023	ISSUED FOR PRECONSULTATION STAGE 3
02	19 MAR 2024	GENERAL REVISION
03	19 MAR 2024	ELECTRICAL SERVICE REVISION
04	26 MAR 2024	FIRE HYDRANTS ADDED
05	06 MAY 2024	EROSION HAZARD NOTE ADDED, PARKING UPDATED
06	25 JUL 2024	LANDSCAPE STRIP REVISED @ BLOCK F, STATS FOR BLDG A REVISED

LEGEND

■	DENOTES	FOUND MONUMENTS
□	"	SET MONUMENTS
IB	"	IRON BAR
IBB	"	ROUND IRON BAR
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
CC	"	CUT CROSS
CP	"	CONCRETE PIN
WIT	"	WITNESS
PIN	"	PROPERTY IDENTIFICATION NUMBER
M/MEAS	"	MEASURED
PROP	"	PROPORTIONED
OU	"	ORIGIN UNKNOWN
SG	"	STANTEC GEOMATICS LTD.
P1	"	REGISTERED PLAN 4M-1566
HYD	"	FIRE HYDRANT
F		FIRE ROUTE SIGN
		CONCRETE SIDEWALK
		SOFT LANDSCAPING
▲		CONFIRMED DOOR LOCATION
△		CONCEPTUAL DOOR LOCATION
O		POTENTIAL OVERSIZED LOADING SPACE 4.3m X 13m
S		POTENTIAL STANDARD LOADING SPACE 3.5m X 7m

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Project
INDUSTRIAL DEVELOPMENT
1319 Johnston Road
Ottawa Ontario

Drawing Title:
PHASING SITE PLAN

Drawn By:	Checked By:	Date Checked:	Project No.
			1319.J.2023

Date Plotted: Aug 12, 2024 - 3:06pm
Scale: 1:750
Drawing No.: A101
Revision No.: 06

ISO A1

2.2 Existing Conditions

2.2.1 Area Road Network

Bank Street: Bank Street is a City of Ottawa arterial road with a four-lane divided urban cross-section. A bike lane is present on the west side of the road south of Johnston Road, and sidewalks are present on both sides of the road. The posted speed limit is 60km/h, and the city-protected right-of-way is 37.5 metres within the study area. Bank Street is designated as a truck route.

Johnston Road: Johnston Road is a City of Ottawa major collector road with a two-lane urban cross-section. A sidewalk is present on the south side of the road west of Albion Road, an asphalt pathway is present on the north side of the road east of Albion Road, and an asphalt pathway is present on the south side of the road between Albion Road and Tapiola Crescent. The posted speed limit is 50km/h. The City-protected right-of-way is 26.0 metres west of Albion Road, and the existing right-of-way is 32.5 metres east of Albion Road.

Albion Road: Albion Road is a City of Ottawa collector road with a two-lane urban cross-section south of Johnston Road and a local road with a two-lane rural cross-section north of Johnston Road. An asphalt pathway is present on the east side of the road south of Johnston Road. The posted speed limit is 50km/h, and the existing right-of-way is 20.0 metres within the study area.

The City of Ottawa requested the additional descriptions of the following roads for contextual purposes of the study area:

Southgate Road: Southgate Road is a City of Ottawa local road with a two-lane urban cross-section. Sidewalks are present on both sides of the road. On-street parking is permitted south of Fernwood Drive. The posted speed limit is 40km/h, and the existing right-of-way is 20.0 metres.

Artistic Place: Artistic Place is a City of Ottawa local road with a two-lane rural cross-section. Gravel shoulders are present on both sides of the road. The unposted speed limit is 50km/h, and the existing right-of-way is shared with the local widening of the Bank Street right-of-way.

2.2.2 Existing Intersections

The key intersections within proximity of the site have been summarized below:

Bank Street at Johnston Road	The intersection of Bank Street at Johnston Road is a signalized intersection. The northbound and southbound approaches each consists of an auxiliary left-turn lane, two through lanes, and an auxiliary right-turn lane, where the southbound approach includes a pocket bike lane between the through and right-turn lanes. The eastbound approach consists of a left-turn lane, a through lane, and a channelized right-turn lane, and the westbound approach consists of an auxiliary left-turn lane, a through lane, and an auxiliary channelized right-turn lane. No turn restrictions were noted.
Albion Road at Johnston Road	The intersection of Albion Road at Johnston Road is an all-way stop-controlled intersection. Each approach consists of a shared all-movement lane. Trucks are restricted from accessing the east and south legs.

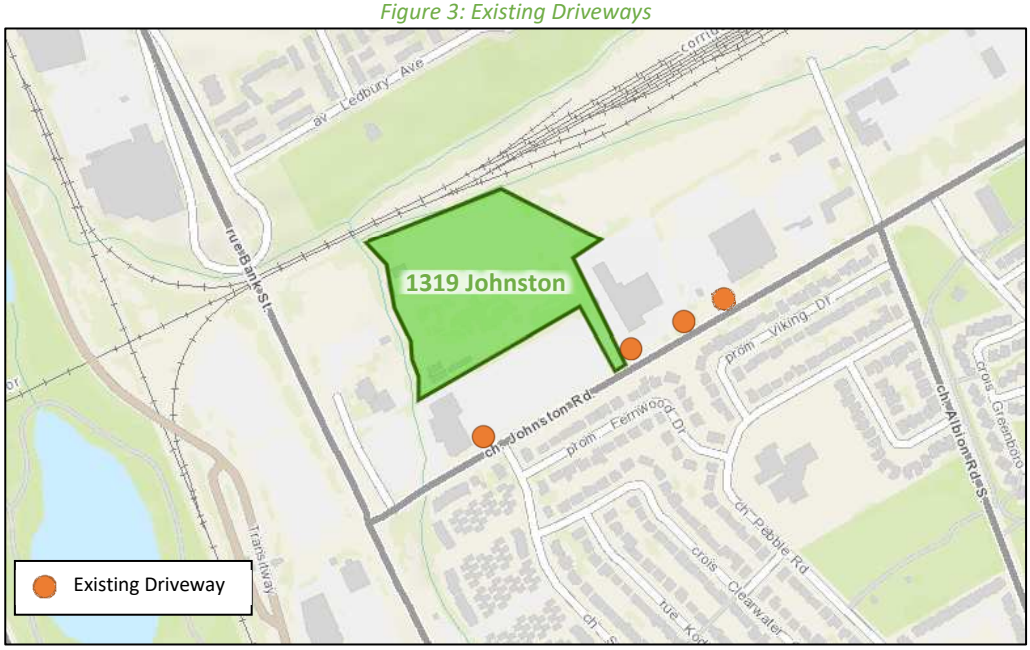
The City of Ottawa requested the additional descriptions of the following intersections for contextual purposes of the study area:

Southgate Road at Johnston Road	The intersection of Southgate Road at Johnston Road is an all-way stop-controlled T-intersection. Each approach consists of a shared all-movement lane. No turn restrictions were noted.
Artistic Place at Johnston Road	The intersection of Artistic Place at Johnston Road is an uncontrolled T-intersection. The southbound and eastbound approaches each consists of a shared all-movement lane. The proximity of the intersection to Bank Street results in the westbound approach consisting of an auxiliary left-turn lane, through lane and an auxiliary channelized right-turn lane all designated for the intersection at Bank Street. No turn restrictions were noted.

2.2.3 Existing Driveways

Within 200 metres of the proposed site access, a driveway to a car dealership, two driveways to an auto repair shop, and a driveway to an industrial site are located on the north side of Johnston Road. Figure 3 illustrates the existing driveways.

Figure 3: Existing Driveways



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: July 18, 2023

2.2.4 Cycling and Pedestrian Facilities

Figure 4 illustrates the pedestrian facilities in the study area and Figure 5 illustrates the cycling facilities.

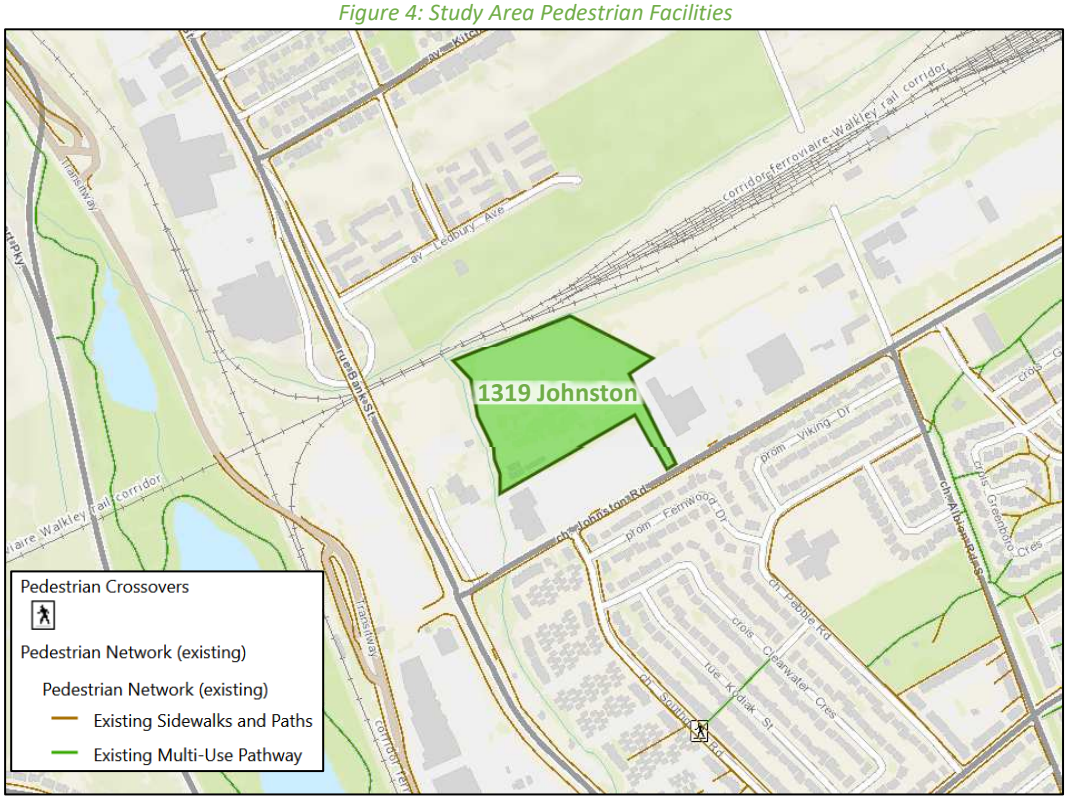
Sidewalks are provided on both sides along Bank Street and on the south side of Johnston Road west of Albion Road. Asphalt pathways are provided on the north side of Johnston Road east of Albion Road, on the south side of Johnston Road between Albion Road and Tapiola Crescent, and on the east side of Albion Road south of Johnston Road.

Cycling facilities include a bike lane on the west side of Bank Street south of Johnston Road and paved shoulders on both sides of Johnston Road east of Albion Road.

In the ultimate cycling network per the Ottawa Cycling Plan (2013), Johnston Road west of Southgate Road is a neighbourhood bikeway and local route, the segment between Southgate Road and Tapiola Crescent is a major pathway, and east of Tapiola Crescent is a local route. Bank Street is a spine route, and Albion Road is a local route in the ultimate cycling network.

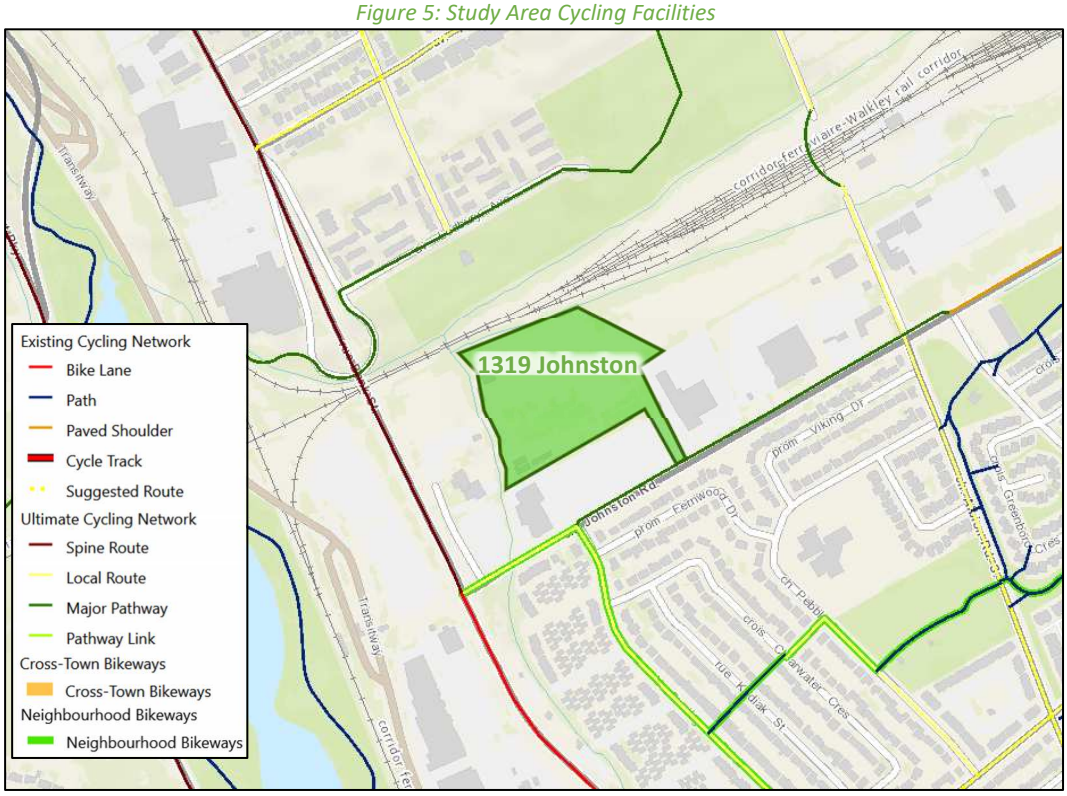
In the Transportation Master Plan – Part 1 (2023), Bank Street north of Johnston Road, Johnston Road, and Albion Road south of Johnston Road are crosstown bikeways.

Figure 4: Study Area Pedestrian Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: July 18, 2023

Figure 5: Study Area Cycling Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: July 18, 2023

Pedestrian and cyclist volumes included in study area intersection counts, presented in Section 2.2.7, have been compiled and are illustrated in Figure 6 and Figure 7, respectively.

Figure 6: Existing Pedestrian Volumes

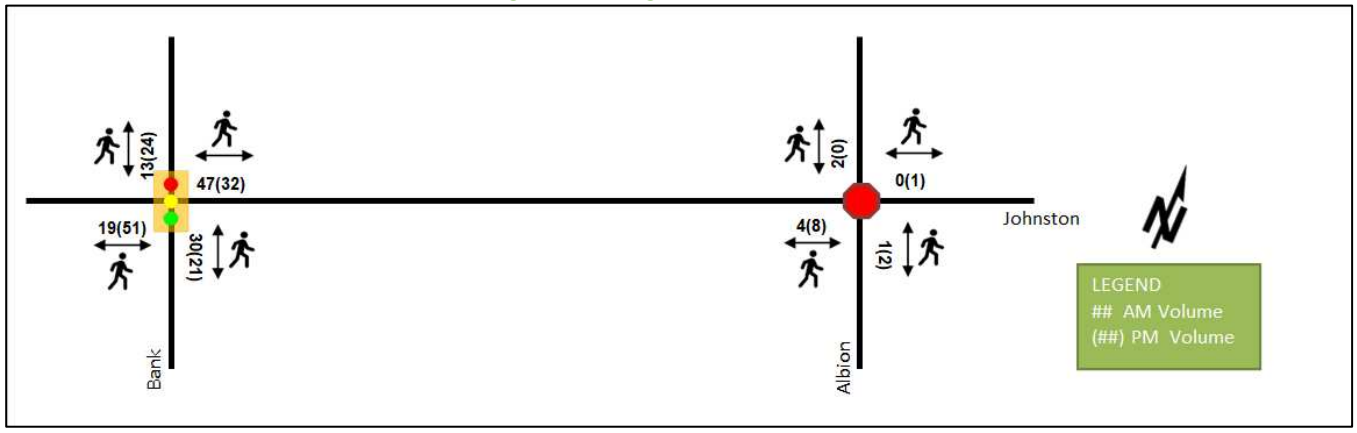
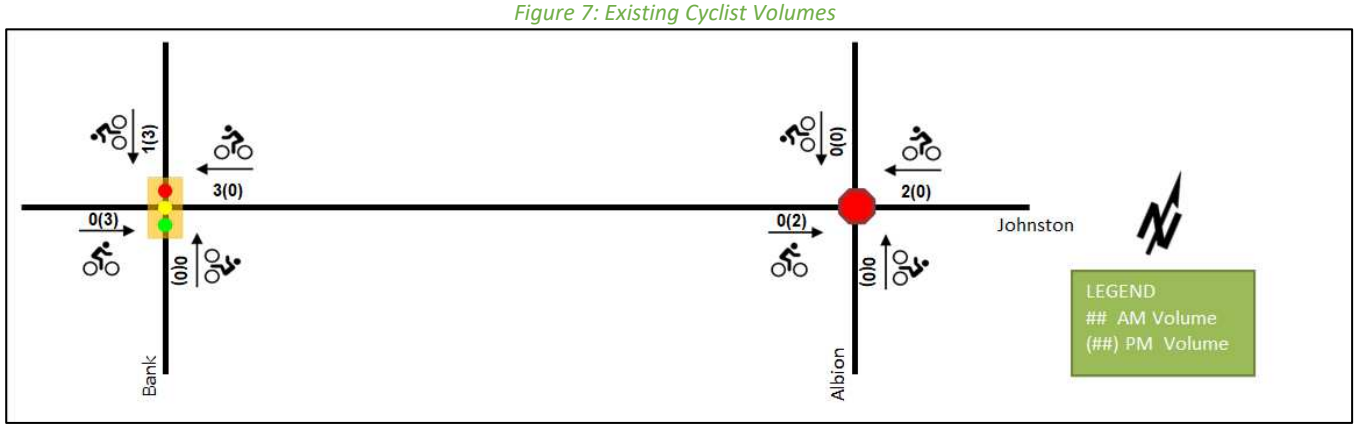


Figure 7: Existing Cyclist Volumes



2.2.5 Existing Transit

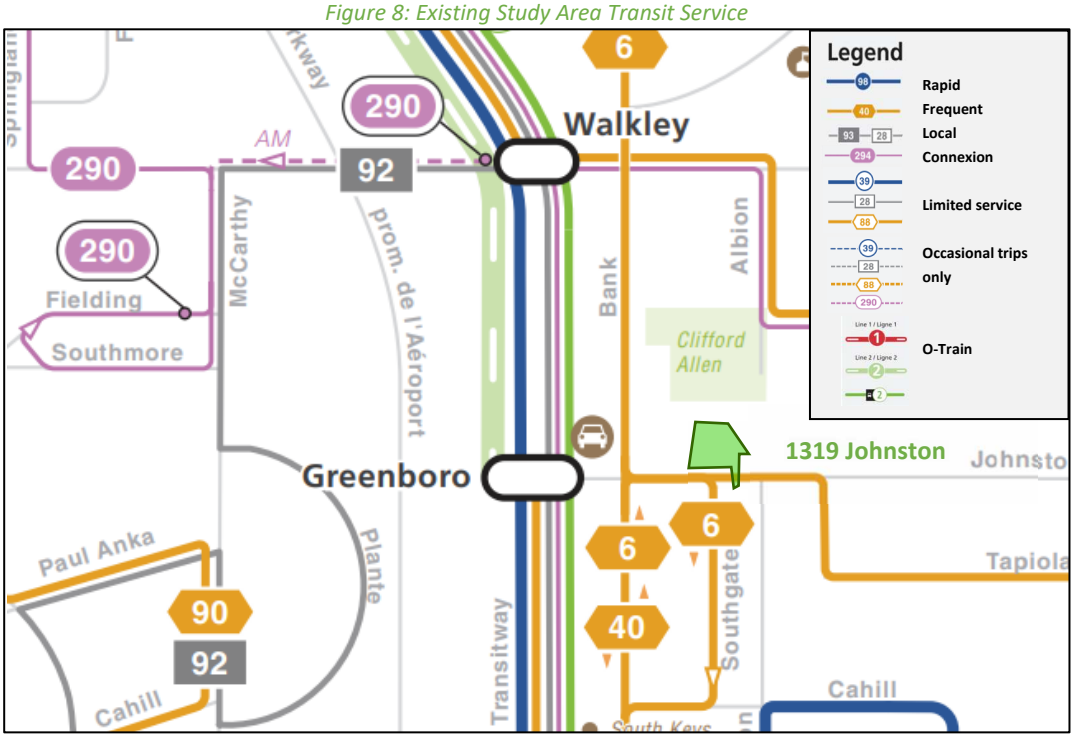
Figure 8 illustrates the transit system map in the study area and Figure 9 illustrates nearby transit stops. All transit information is from November 4, 2022 and is included for general information purposes and context to the surrounding area.

Within the study area, route #6 northbound travels along Bank Street, and southbound travels along Bank Street, Johnston Road, and Southgate Road, and route #40 travels along Bank Street and Johnston Road. The frequency of these routes within proximity of the proposed site based on November 4, 2022, service levels are:

- Route # 6 – 15-minute service all day, 30-minute service after 8:00 PM
- Route # 40 – 15-minute service in the peak period/direction, 30-minute daytime service

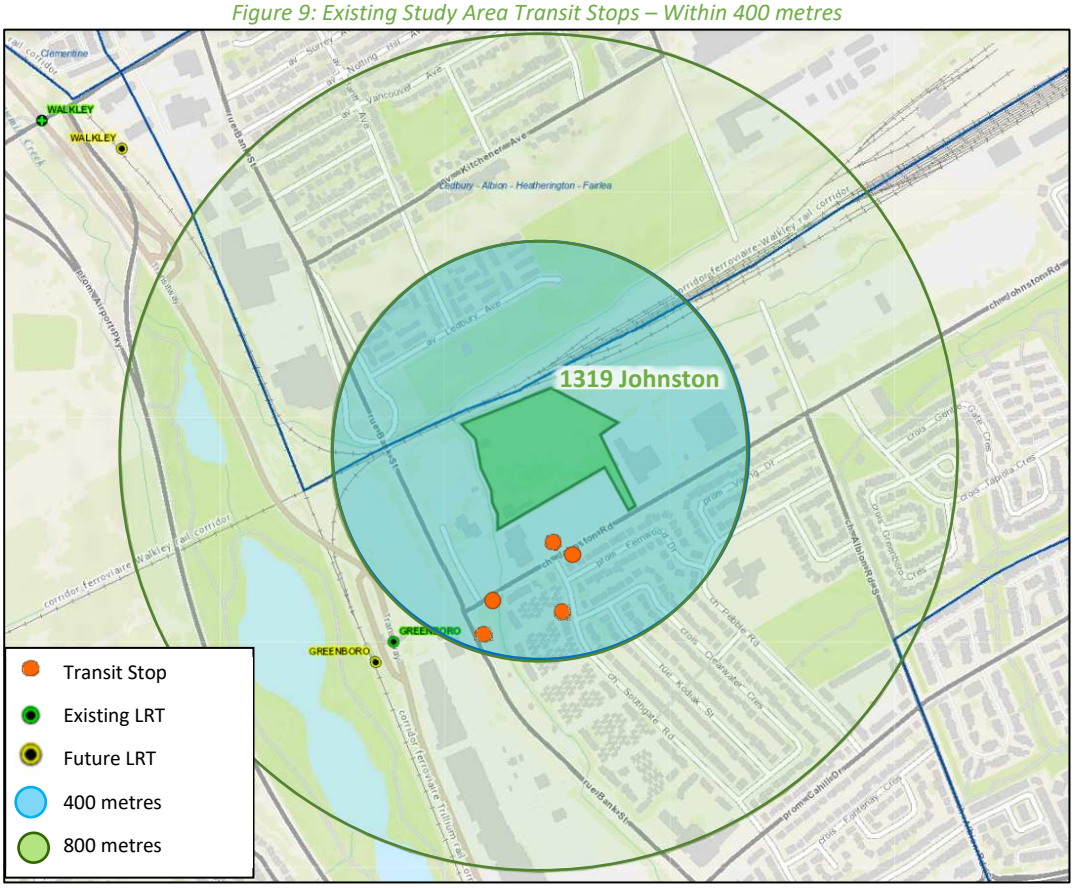
Additionally, Greenboro Light Rail Transit (LRT) station is located approximately 650-metre to one-kilometre walking distance from the site. It is noted that the full length of O-Train Line 2 has been closed for Stage 2 construction since May 2020, and Line 2 buses are currently operating in place of the train.

Figure 8: Existing Study Area Transit Service



Source: http://www.octranspo.com/ Accessed: July 18, 2023

Figure 9: Existing Study Area Transit Stops – Within 400 metres



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: July 18, 2023

2.2.6 Existing Area Traffic Management Measures

There are no existing area traffic management measures within the study area.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from the City of Ottawa for the existing study area key intersections. Table 1 summarizes the intersection count dates. The existing traffic counts were balanced along the roadways and grown to 2022 existing condition. It is noted that subsequent to this study, the City's direction has been to discontinue the prior request for balancing.

Table 1: Intersection Count Date

Intersection	Count Date
Bank St @ Johnston Rd	Tuesday, April 16, 2019
Albion Rd @ Johnston Rd	Wednesday, April 18, 2018

Figure 10 illustrates the existing traffic counts and Table 2 summarizes the existing intersection operations. The level of service for signalized intersections is based on volume to capacity ratio (v/c) calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and average delay for unsignalized intersections. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 10: Existing Traffic Counts

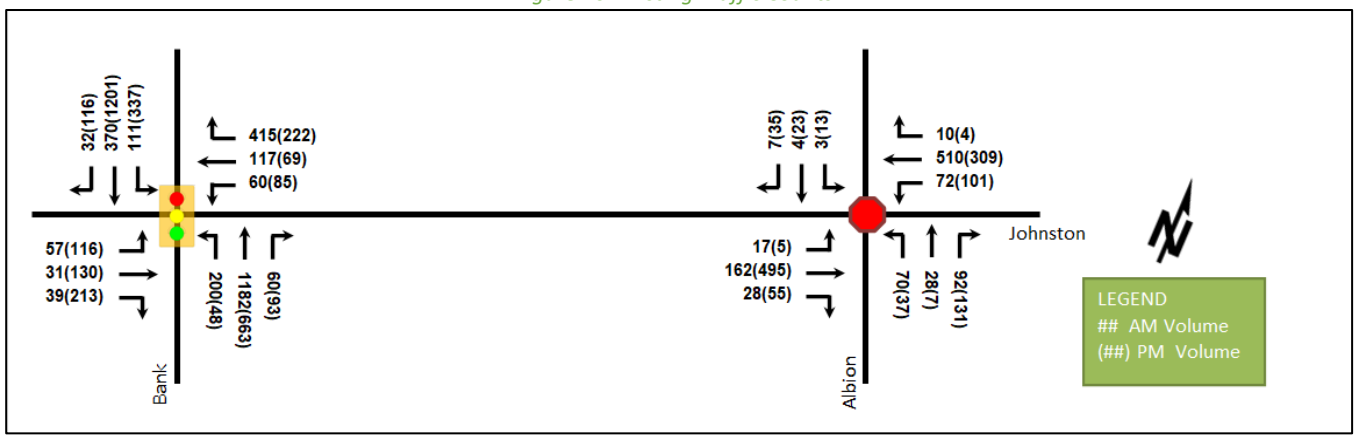


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Bank Street at Johnston Road ***Signalized***	EBL	A	0.23	37.1	23.7	A	0.47	44.1	43.6
	EBT	A	0.08	33.6	14.2	A	0.36	39.7	45.2
	EBR	A	0.11	3.7	4.2	A	0.47	7.7	19.2
	WBL	A	0.24	37.4	24.8	A	0.40	42.4	33.6
	WBT	A	0.30	37.7	41.4	A	0.19	36.0	26.4
	WBR	E	0.95	57.9	**#132.3**	A	0.48	7.6	19.6
	NBL	A	0.38	10.8	31.2	A	0.32	18.2	10.7
	NBT	C	0.75	26.1	158.8	A	0.49	25.4	84.8
	NBR	A	0.09	3.2	6.1	A	0.15	3.3	8.0
	SBL	A	0.56	20.3	21.3	C	0.73	19.9	60.6
	SBT	A	0.25	16.6	38.1	D	0.88	39.3	**#205.7**
	SBR	A	0.05	0.3	0.7	A	0.18	5.4	12.9
	Overall	**C**	**0.79**	**28.2**	-	**C**	**0.78**	**28.0**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Albion Road at Johnston Road *Unsignalized*	EB	B	0.36	11.7	12.0	**F**	**1.19**	**129.5**	**169.5**
	WB	E	0.92	40.9	96.0	D	0.79	26.4	51.0
	NB	B	0.35	12.3	12.0	B	0.38	14.1	12.0
	SB	A	0.03	9.7	0.8	B	0.17	12.2	4.5
	Overall	**D**	-	**29.0**	-	**F**	-	**70.9**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Peak Hour Factor = 0.90
Queue is measured in metres
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

In the existing conditions, the study area intersections generally operate well with the exception of Albion Road at Johnston Road during the PM peak hour.

At the intersection of Bank Street at Johnston Road, extended queuing may be observed on the westbound right-turn movement during the AM peak hour and the southbound through movement during the PM peak hour.

At the intersection of Albion Road at Johnston Road, the eastbound movement and overall intersection may be subject to high delays during the PM peak hour.

Signal warrant analysis of Justifications 1 and 2 were performed for the intersection of Albion Road at Johnston Road for the existing condition. The intersection does not meet the signal warrant and is assumed to remain as an all-way stop controlled intersection. It is noted that the city has previously explored improvements to this intersection and they were not implemented based on community feedback. Signal warrant calculation sheets are provided in Appendix D.

The left-turn warrants are met on the eastbound movement for the intersection of Albion Road at Johnston Road in this horizon. Given the all-way stop-control, the limited access on Albion Road to the north of Johnston Road, and the above commentary on the City's previous review of local improvements suggests that no dedicated turn lane is required for the eastbound approach. The left-turn warrant calculation sheets are provided in Appendix E.

2.2.8 Collision Analysis

Collision data have been acquired from the City of Ottawa open data website (data.ottawa.ca) for five years prior to the commencement of this TIA for the surrounding study area road network. Table 3 summarizes the collision types and conditions in the study area, Figure 11 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data are included in Appendix F.

Table 3: Study Area Collision Summary, 2018-2022

		Number	%
Total Collisions		**84**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	26	31%
	Property Damage Only	58	69%
Initial Impact Type	**Approaching**	2	2%
	Angle	9	11%
	Rear end	33	39%
	Sideswipe	4	5%
	Turning Movement	23	27%
	SMV Unattended	1	1%
	SMV Other	8	10%
	Other	4	5%
Road Surface Condition	**Dry**	57	68%

		Number	%
Total Collisions		**84**	**100%**
	Wet	11	13%
	Loose Snow	2	2%
	Slush	5	6%
	Packed Snow	3	4%
	Ice	6	7%
Pedestrian Involved		4	5%
Cyclists Involved		1	1%

Figure 11: Study Area Collision Records, 2018-2022

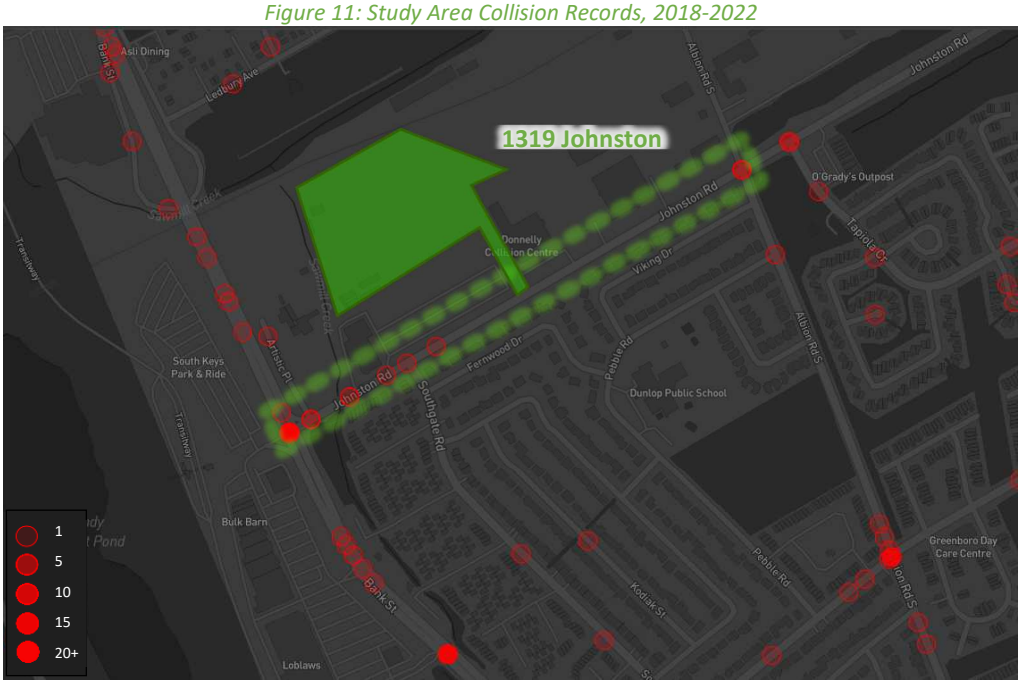


Table 4: Summary of Collision Locations, 2018-2022

	Number	%
Intersections / Segments	**56**	**100%**
Bank St @ Johnston Rd	44	79%
Albion Rd @ Johnston Rd	4	7%
Johnston Rd @ Artistic Pl	3	5%
Johnston Rd btwn Bank St & Southgate Rd	3	5%
Johnston Rd @ Southgate Rd	1	2%
Johnston Rd btwn Southgate Rd & Albion Rd S	1	2%

Within the study area, the intersection of Bank Street at Johnston Road is noted to have experienced higher collisions than other locations. A total of four collisions involved in pedestrian and one collision involved in cyclist are noted within the study area. No collisions are noted at the proposed access location. Table 5 summarizes the collision types and conditions for this location.

Table 5: Bank Street at Johnston Road Collision Summary

		Number	%
Total Collisions		**44**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	12	27%
	Property Damage Only	32	73%
Initial Impact Type	**Angle**	2	5%
	Rear end	19	43%
	Sideswipe	1	2%
	Turning Movement	12	27%
	SMV Other	9	20%
	Other	1	2%
Road Surface Condition	**Dry**	29	66%
	Wet	7	16%
	Loose Snow	2	5%
	Slush	2	5%
	Packed Snow	2	5%
	Ice	2	5%
Pedestrian Involved		4	9%
Cyclists Involved		0	0%

The Bank Street at Johnston Road intersection had a total of 44 collisions during the 2018-2022 time period, with 32 involving property damage only and the remaining twelve having non-fatal injuries. The collision types are most represented by the rear end with 19 collisions, followed by 12 turning movement collisions, nine SMV other collisions, and the remaining collision types as angle, sideswipe, and other. A total of four collisions involved in pedestrian are noted at this intersection. Weather conditions do not affect collisions at this location.

The latest detailed collision records for this intersection were received from the City for the data range of 2017-2021, which is a 5-year period shifted one year earlier than the open data. From this data, a total of 54 collisions were observed A decrease of ten collisions was noted at the intersection moving into 2022. Additionally, a decrease in the number of collisions has been observed, declining from an average of 14 to 15 collisions per year between 2017 and 2019, to eight collisions in 2020, and three collisions in 2021.

The rear end collisions are predominantly collisions generally involved northbound, southbound, or westbound movements and mostly occurred under dry conditions (16 out of 24). All of the vehicles involved rear end collisions occurred on the major movements at the intersection, and this is the typical congested condition. The turning movement collisions are generally involved southbound left-turn movements (7 out of 15), mostly occurred under dry conditions (12 out of 15), and mostly occurred during the PM peak period (8 out of 15). The high existing volumes on the southbound left-turn movement (337 vehicles) during the PM peak hour and the protected/permissive phase of the southbound left-turn movement may contribute to the turning movement collisions at this intersection. City may explore signal timing adjustments, such as fully protected phases or increased red/yellow time, to mitigate these collisions.

Based on the City latest detailed collision records, no pattern has been observed for the collision types of SMV other, angle, sideswipe, and other during the 2017-2021 time period.

Three pedestrian's collisions were noted between 2017 and 2021, occurring as a delivery van made southbound left turn, an automobile made eastbound left turn, and a pickup truck made westbound left turn. The inclusion of advanced pedestrian walk times may mitigate these collisions.

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

2.3.1.1 South Keys to Blossom Park, Bank Street Community Design Plan (CDP)

The subject development is within the South Keys to Blossom Park, Bank Street CDP area. As such, it is subject to the planning policies outlined in the CDP. The CDP proposes a sidewalk along the east side of Albion Road and a pathway along the north side of Johnston Road west of Albion Road, cycle tracks along Bank Street between Johnston Road and Queensdale Avenue, and long-term bicycle parking is proposed to be located close to the transit station. As part of these recommended improvements within the CDP, Bank Street is proposed to be reconstructed to increase the safety of crossings.

2.3.1.2 Transportation Master Plan (TMP) (2013)

Within the Rapid Transit and Transit Priority Network's Network Concept diagram in the Transportation Master Plan (2013), isolated transit priority measures are shown along Bank Street, however, these measures are not included in the Affordable Network.

2.3.1.3 Transportation Master Plan – Part 1 (2023)

Within the Active Transportation Projects in the Transportation Master Plan – Part 1, projects within the study area include cycling crossing of Bank Street, separated cycling facilities on Johnston Road from Bank Street to Southgate Road, bike lanes from Southgate Road to Conroy Road, sidewalks along Albion Road South between Johnston Road and Pebble Road, and a cycling feasibility study on Bank Street between Kitchener Avenue and Johnston Road.

2.3.1.4 Ottawa Cycling Plan (2013)

From the Ottawa Cycling Plan, Hunt Club Neighbourhood Bikeway, which is proposed to include bike lanes, shared use lanes and multi-use pathway facilities, has been included in the Phase One (2014-2019) project, and Hunt Club Neighbourhood Bikeway Extension to Airport Parkway Bridge, which proposed to include a share use lane, has been included in Phase Two (2020-2025) project. From the Ottawa Pedestrian Plan, a future sidewalk on the west side of Albion Road between Johnston Road and Brenda Crescent has been included in the Phase Two (2020-2025) project. None of these active mode facilities have been implemented.

2.3.1.5 Albion Road Traffic Calming Measures

The traffic calming measures along Albion Road are planned to be completed in Fall 2024. The implementation along Albion Road includes a speed table between Aladdin Lane and Baden Avenue, a new raised pedestrian crossover connecting to the Sawmill Creek Pathway, and a new sidewalk along the west side of the road between Johnston Road and Pebble Road and along the east side of the road between Bank Street and 60 metres south of Hunt Club Road. Additionally, curb radii reductions will be made at the northeast and northwest quadrants at the intersection at Albion Road and Lester Road, and two new bus stops with bus pad/shelter pad will be provided between Maple Key Private and Queensdale Avenue.

2.3.2 Other Study Area Developments

2200 Bank Street

The proposed development application includes a site plan for apartment buildings with a total of 481 units and a total of 5,019 ft^2 of commercial space. The development is anticipated to be constructed in four phases with a full build-out of Phase 1 in 2026 and a full build-out in 2041. Phase 1 is predicted to generate 65 new AM and 67 new PM two-way peak-hour auto trips by 2026, 57 new AM and 59 new PM two-way peak-hour auto trips by 2031, 203 new AM and 210 new PM two-way peak-hour auto trips by 2031.

20 Mountain Crescent

The proposed development application includes a site plan for a 12-storey residential building with 151 units. The development is anticipated to be constructed in 2022. The development is predicted to generate 44 new AM and 67 new 46 two-way peak-hour auto trips in 2022, and it will reduce to 39 new AM and 41 new PM two-way peak-hour auto trips in 2027 due to enhanced services provided by an LRT.

1255 Johnston Road

The proposed development application includes a site plan for a new showroom. No increase in traffic flows is anticipated to and from the site, and TIA is not required.

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersections of Bank Street at Johnston Road and Albion Road at Johnston Road, which are within 400 metres of the site access. Other signalized intersections are beyond 600-metre linear distance, or near 1km driving distance, and will not be considered as part of the site impacts.

The boundary road will be Johnston Road and screenline SL13 is present on the north side of the site, which will not be analyzed as part of the subject report.

3.2 Time Periods

As the proposed development is composed entirely of industrial spaces, the AM and PM peak hours will be examined.

3.3 Horizon Years

The anticipated build-out year is 2028. As a result, the full build-out plus five years horizon year is 2033.

4 Exemption Review

Table 6 summarizes the exemptions for this TIA.

Table 6: Exemption Review

Module	Element	Explanation	Exempt/Required
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Required
	4.1.3 New Street Networks	Only required for plans of subdivision	Exempt
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Required
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Exempt
Network Impact Component			
4.5 Transportation Demand Management	All Elements	Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	Required
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	Required

Module	Element	Explanation	Exempt/Required
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of equivalent volume permitted by established zoning	Exempt

5 Development-Generated Travel Demand

5.1 Mode Shares

Examining the mode shares recommended in the TRANS Trip Generation Manual (2020) for the subject district, derived from the most recent National Capital Region Origin-Destination survey (OD Survey), the existing average district mode shares by land use for Hunt Club have been summarized in Table 7.

Table 7: TRANS Trip Generation Manual Recommended Mode Shares – Hunt Club

Travel Mode	Employment Generator
	AM and PM
Auto Driver	83%
Auto Passenger	5%
Transit	10%
Cycling	1%
Walking	1%
Total	**100%**

Being approximately 650-metre to one-kilometre walking distance from the Greenboro LRT station, a higher transit mode is considered achievable at this location. A ten percent shift to transit mode taken from the auto mode is proposed for peak hours. The proposed modified mode share targets are summarized in Table 8.

Table 8: Proposed Development Mode Shares

Travel Mode	Employment Generator
	AM and PM
Auto Driver	73%
Auto Passenger	5%
Transit	20%
Cycling	1%
Walking	1%
Total	**100%**

5.2 Trip Generation

This TIA has been prepared using the vehicle trip rates and derived person trip rates for the employment component from the ITE Trip Generation Manual 11th Edition (2021) using the City-prescribed conversion factor of 1.28. Table 9 summarizes the person trip rates for the proposed general light industrial land use by peak hour.

Table 9: Trip Generation Person Trip Rates

Land Use	Land Use Code	Peak	Peak Hour	
			Vehicle Trip Rate	Person Trip Rates
General Light Industrial	110 (ITE)	AM	0.74	0.95
		PM	0.65	0.83

Using the above person trip rates, the total person trip generation has been estimated. Table 10 summarizes the total person trip generation for the proposed general light industrial land use.

Table 10: Total Person Trip Generation

Land Use	GFA (sq. ft)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
General Light Industrial	155,905	130	18	148	18	111	129

Using the above mode share targets for a LRT area, and the person trip rates, the person trips by mode have been projected. Table 11 summarizes the trip generation by mode and peak hour.

Table 11: Trip Generation by Mode

Travel Mode		AM Peak Hour				PM Peak Hour			
		Mode Share	In	Out	Total	Mode Share	In	Out	Total
General Light Industrial	Auto Driver	**73%**	95	13	108	**73%**	13	81	94
	Auto Passenger	**5%**	7	1	8	**5%**	1	6	7
	Transit	**20%**	26	4	30	**20%**	4	22	26
	Cycling	**1%**	1	0	1	**1%**	0	1	1
	Walking	**1%**	1	0	1	**1%**	0	1	1
	Total	**100%**	**130**	**18**	**148**	**100%**	**18**	**111**	**129**

As shown above, a total of 108 AM and 94 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

5.3 Trip Distribution

To understand the travel patterns of the subject development, the OD Survey has been reviewed to determine the travel, and these patterns were applied based on the build-out of Hunt Club. Table 12 below summarizes the distributions.

Table 12: OD Survey Distribution – Hunt Club

To/From	% of Trips
North	40%
South	15%
East	30%
West	15%
Total	**100%**

5.4 Trip Assignment

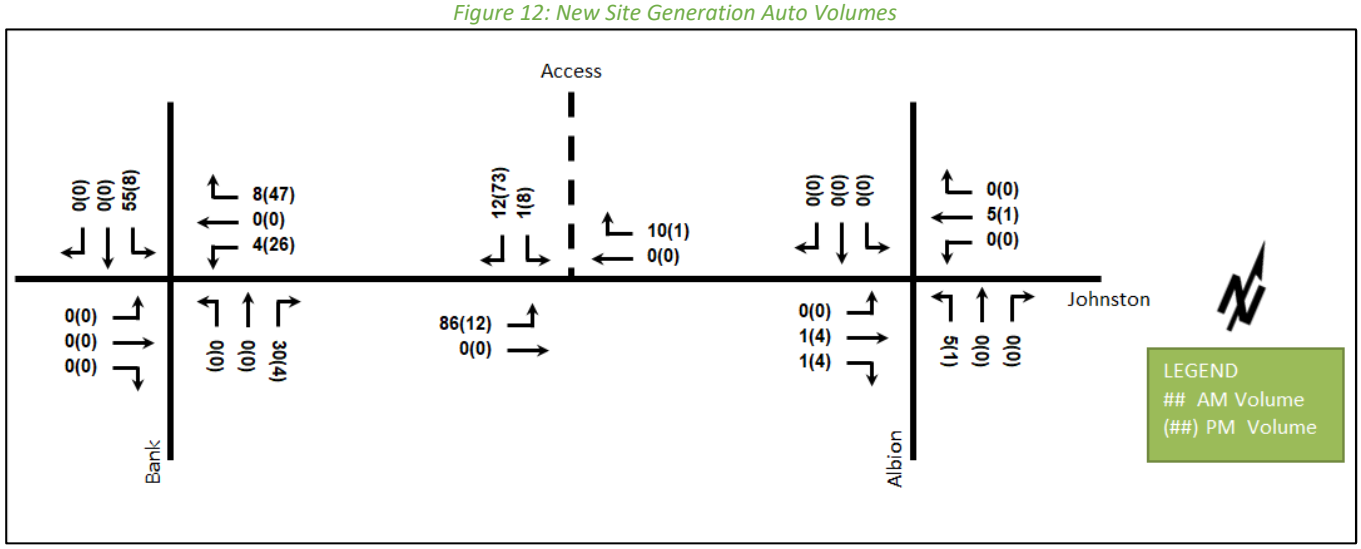
Using the distribution outlined above, turning movement splits, and access to major transportation infrastructure, the trips generated by the site have been assigned to the study area road network. Table 13 summarizes the proportional assignment to the study area roadways, and Figure 12 illustrates the new site generated volumes.

Table 13: Trip Assignment

To/From	Via
North	40% Bank Street (N)
South	15% Bank Street (S)
East	10% Bank Street (N) 5% Albion Road(S) 5% Johnston (E) 10% Bank Street (S)
West	8% Bank Street (N) 7% Bank Street (S)

To/From	Via
Total	100%

Figure 12: New Site Generation Auto Volumes



6 Background Network Travel Demands

6.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3. and none of the projects within the study horizons is considered to have a notable impact on the study area traffic volumes and travel patterns.

6.2 Background Growth

A review of the background projections from the City's TRANS Regional Model for the 2011 and 2031 horizons was completed to determine the background growth for each of the study area roadways. The background TRANS model growth rates are summarized in Table 14 and the TRANS model plots are provided in Appendix G.

Table 14: TRANS Regional Model Projections – Study Area AM Growth Rates

Street	TRANS Rate	
	Eastbound	Westbound
Johnston	-0.26%	-0.72%
	Northbound	Southbound
Bank	-0.37%	-1.19%
Albion	-1.32%	-2.66%

In general, the growth rates in the study area derived from the two TRANS model horizons are projected to be negative for the study area roadways and the existing volumes are noted to exceed the TRANS 2031 model forecasts for the study area roadways. Therefore, a growth rate of 0% has been applied to the area road network.

The explicit developments considered in the area for growth, as summarized in Sections 2.3.2 and 6.3, are included within the TRANS comparisons, and a growth rate of 0% has been applied to the area road network.

6.3 Other Developments

The background developments explicitly considered in the background conditions (Section 6.2) include:

- 2200 Bank Street
- 20 Mountain Crescent

Figure 13 and Figure 14 illustrate the 2028 and 2033 total background development volumes, respectively. It is noted that the background developments have different assignments, per their TIAs, for each horizon. The background development volumes within the study area have been provided in Appendix H.

Figure 13: 2028 Total Background Development Volumes

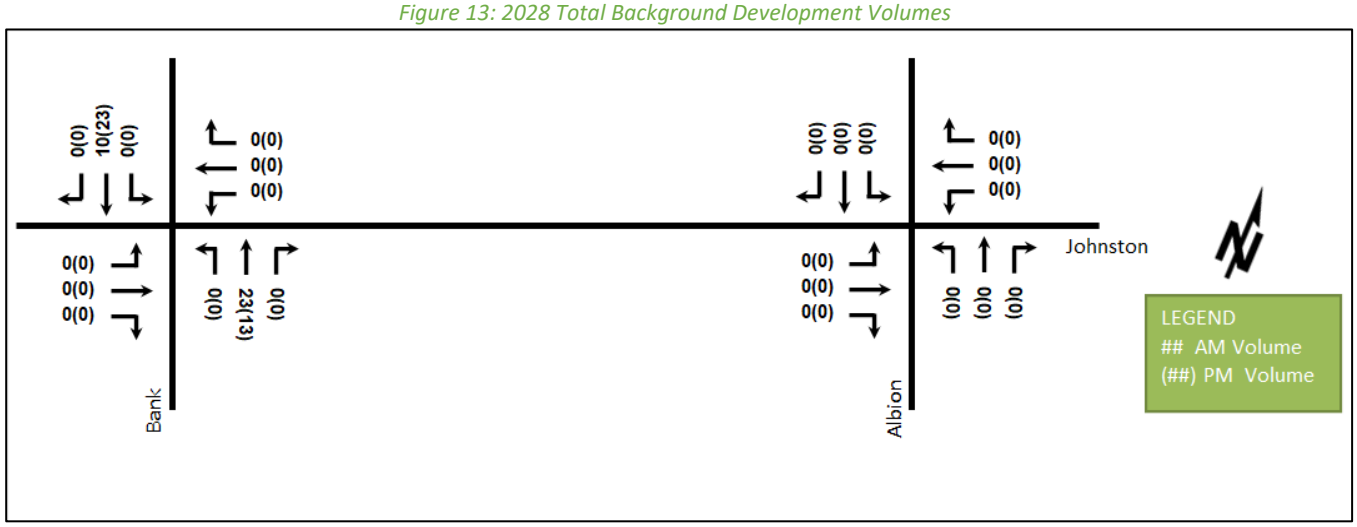
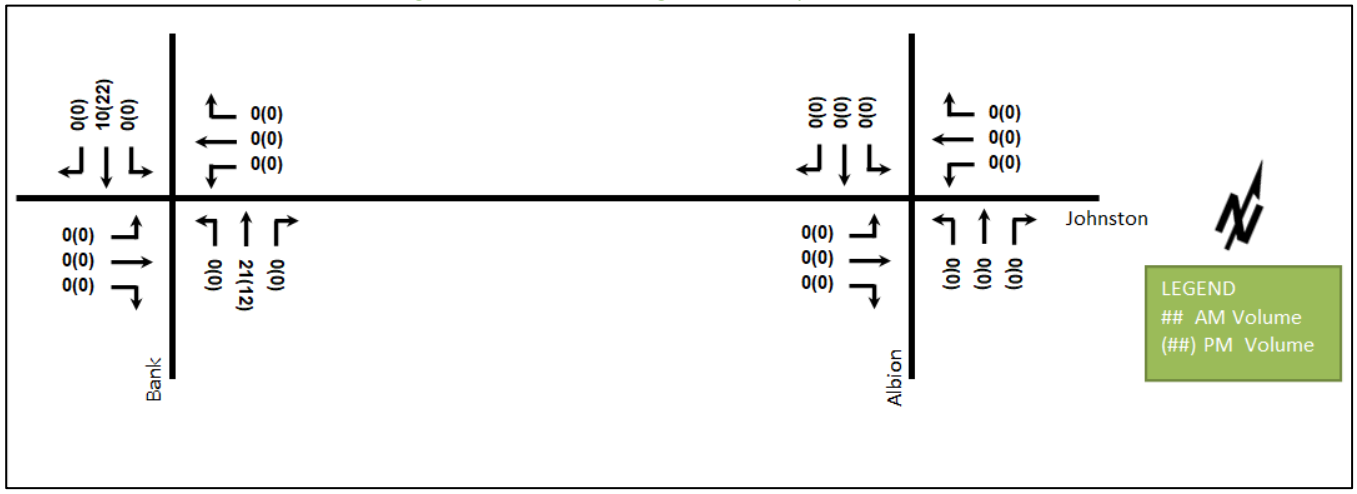


Figure 14: 2033 Total Background Development Volumes



7 Demand Rationalization

7.1 2028 Future Background Operations

Figure 15 illustrates the 2028 background volumes and Table 15 summarizes the 2028 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and average delay for unsignalized intersections. The synchro worksheets for the 2028 future background horizon are provided in Appendix I.

Figure 15: 2028 Future Background Volumes

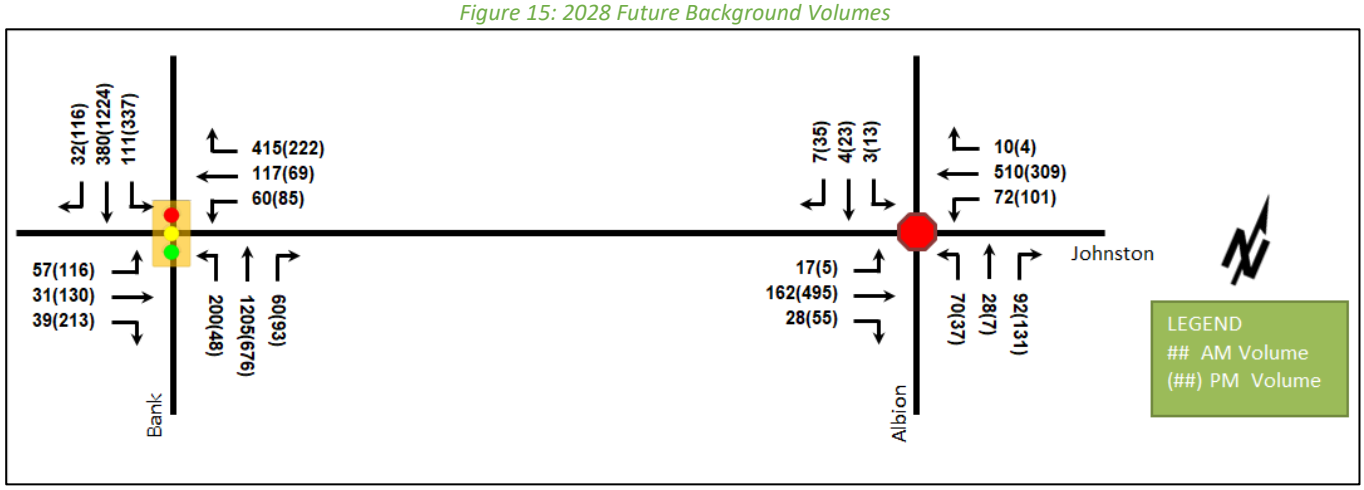


Table 15: 2028 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Bank Street at Johnston Road *Signalized*	EBL	A	0.21	36.7	21.7	A	0.42	42.5	39.6
	EBT	A	0.07	33.6	13.2	A	0.32	39.0	41.4
	EBR	A	0.10	2.9	3.2	A	0.44	7.7	18.2
	WBL	A	0.23	37.1	22.6	A	0.34	40.6	30.4
	WBT	A	0.28	37.8	37.6	A	0.17	35.6	24.3
	WBR	D	0.88	43.0	**#104.5**	A	0.45	7.6	18.3
	NBL	A	0.32	9.9	28.1	A	0.25	13.6	8.3
	NBT	B	0.67	23.0	138.7	A	0.44	24.5	76.6
	NBR	A	0.08	2.5	4.9	A	0.14	2.5	6.1
	SBL	A	0.44	14.0	16.5	B	0.63	15.0	49.0
	SBT	A	0.22	15.9	35.2	C	0.80	34.3	167.6
	SBR	A	0.04	0.1	0.0	A	0.16	4.2	10.5
	Overall	**B**	**0.69**	**24.1**	-	**B**	**0.70**	**25.3**	-
Albion Road at Johnston Road *Unsignalized*	EB	B	0.31	10.7	9.8	**F**	**1.03**	**75.5**	**117.0**
	WB	D	0.81	25.9	65.3	C	0.68	20.5	38.3
	NB	B	0.30	11.3	9.8	B	0.33	12.8	10.5
	SB	A	0.02	9.3	0.8	B	0.14	11.4	3.8
	Overall	**C**	-	**19.8**	-	**E**	-	**44.0**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Peak Hour Factor = 1.00
Queue is measured in metres
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

The network intersection operations for the 2028 future background horizon will operate similarly to the existing condition. Minor improvements are noted on individual movements with the peak hour factor of 1.00 for future conditions. No additional capacity issues are noted.

Signal warrant analysis of Justification 7 was performed for the intersection of Albion Road at Johnston Road for the 2028 future background condition. The intersection does not meet the signal warrant and is assumed to remain as an all-way stop controlled intersection. Signal warrant calculation sheets are provided in Appendix D.

The left-turn warrants are met on the eastbound movement for the intersection of Albion Road at Johnston Road in this horizon. The commentary provided in Section 2.2.7 remains valid and no left-turn lane is recommended. The left-turn warrant calculation sheets are provided in Appendix E.

7.2 2033 Future Background Operations

Figure 16 illustrates the 2033 background volumes and Table 16 summarizes the 2033 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and average delay for unsignalized intersections. The synchro worksheets for the 2033 future background horizon are provided in Appendix J.

Figure 16: 2033 Future Background Volumes

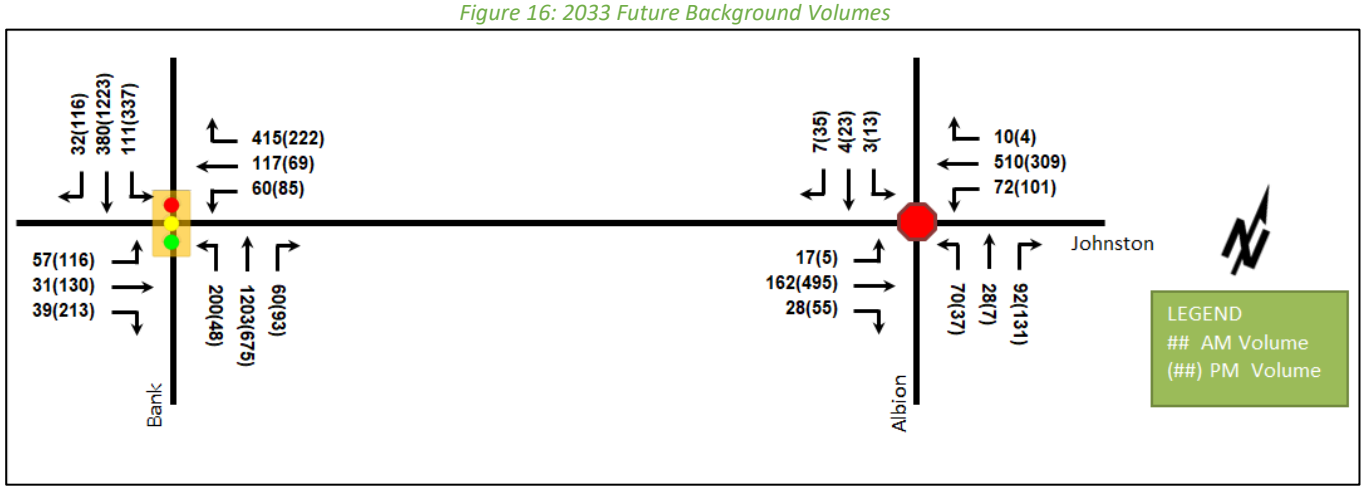


Table 16: 2033 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Bank Street at Johnston Road *Signalized*	EBL	A	0.21	36.7	21.7	A	0.42	42.5	39.6
	EBT	A	0.07	33.6	13.2	A	0.32	39.0	41.4
	EBR	A	0.10	2.9	3.2	A	0.44	7.7	18.2
	WBL	A	0.23	37.1	22.6	A	0.34	40.6	30.4
	WBT	A	0.28	37.8	37.6	A	0.17	35.6	24.3
	WBR	D	0.87	42.7	**#104.1**	A	0.45	7.6	18.3
	NBL	A	0.32	9.9	28.1	A	0.25	13.6	8.3
	NBT	B	0.67	22.9	138.5	A	0.44	24.5	76.5
	NBR	A	0.08	2.5	4.9	A	0.14	2.5	6.1
	SBL	A	0.44	13.9	16.5	B	0.63	15.0	49.0
	SBT	A	0.22	15.9	35.2	C	0.80	34.3	167.5
	SBR	A	0.04	0.1	0.0	A	0.16	4.2	10.5
	Overall	**B**	**0.69**	**24.0**	-	**B**	**0.70**	**25.3**	-
Albion Road at Johnston Road *Unsignalized*	EB	B	0.31	10.7	9.8	**F**	**1.03**	**75.5**	**117.0**
	WB	D	0.81	25.9	65.3	C	0.68	20.5	38.3
	NB	B	0.30	11.3	9.8	B	0.33	12.8	10.5
	SB	A	0.02	9.3	0.8	B	0.14	11.4	3.8
	Overall	**C**	-	**19.8**	-	**E**	-	**44.0**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Peak Hour Factor = 1.00
Queue is measured in metres
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

The network intersection operations for the 2033 future background horizon will operate similarly to the 2028 future background condition. No additional capacity issues are noted.

Signal warrant analysis of Justification 7 was performed for the intersection of Albion Road at Johnston Road for the 2033 future background condition. The intersection does not meet the signal warrant and is assumed to remain as an all-way stop controlled intersection. Signal warrant calculation sheets are provided in Appendix D.

The left-turn warrants are met on the eastbound movement for the intersection of Albion Road at Johnston Road in this horizon. The commentary provided in Section 2.2.7 remains valid and no left-turn lane is recommended. The left-turn warrant calculation sheets are provided in Appendix E.

7.3 2028 Future Total Operations

Figure 17 illustrates the 2028 total volumes and Table 17 summarizes the 2028 total intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection The synchro worksheets for the 2028 total horizon are provided in Appendix K.

Figure 17: 2028 Future Total Volumes

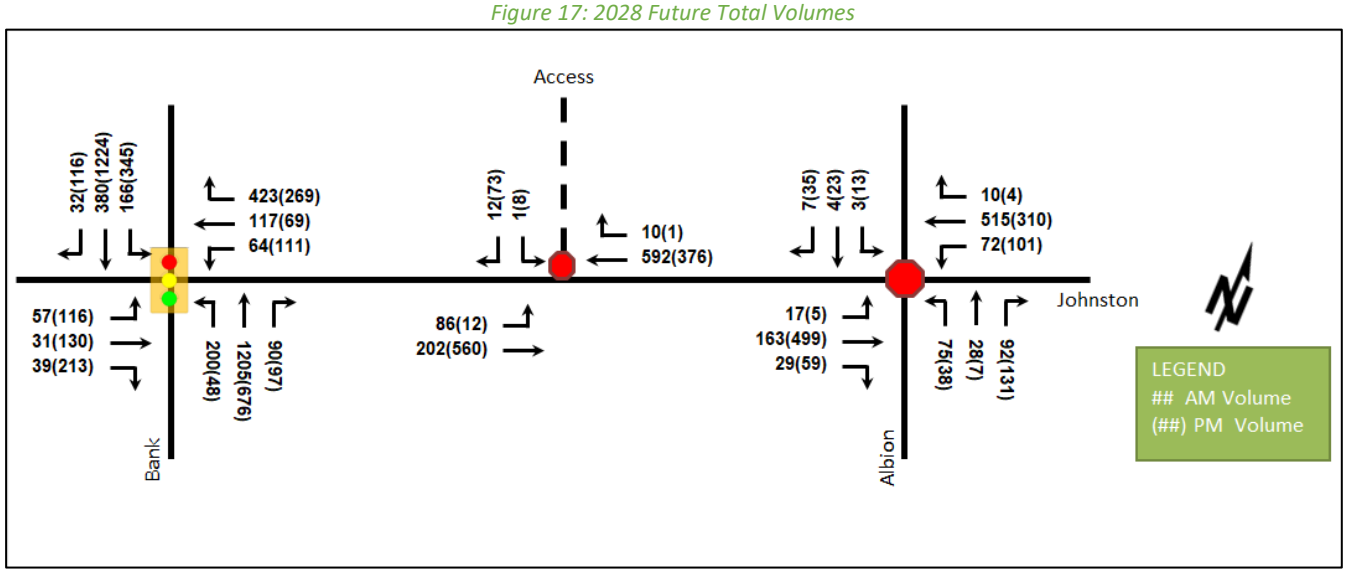


Table 17: 2028 Future Total Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Bank Street at Johnston Road *Signalized*	EBL	A	0.21	36.6	21.7	A	0.42	42.5	39.6
	EBT	A	0.07	33.5	13.2	A	0.32	39.0	41.4
	EBR	A	0.10	2.9	3.2	A	0.44	7.7	18.2
	WBL	A	0.24	37.4	23.7	A	0.45	44.0	38.7
	WBT	A	0.28	37.7	37.6	A	0.17	35.6	24.3
	WBR	D	0.89	45.0	**#108.4**	A	0.51	7.7	20.4
	NBL	A	0.32	10.0	28.1	A	0.26	13.6	8.3
	NBT	B	0.68	23.8	138.7	A	0.44	24.5	76.6
	NBR	A	0.12	5.1	10.0	A	0.14	2.8	6.8
	SBL	B	0.64	22.2	28.2	B	0.64	15.4	50.3
	SBT	A	0.22	16.0	35.2	C	0.80	34.4	167.6
	SBR	A	0.04	0.1	0.0	A	0.16	4.2	10.5
	Overall	**C**	**0.72**	**25.0**	-	**C**	**0.71**	**25.3**	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Albion Road at Johnston Road ***Unsignalized***	EB	B	0.31	10.8	9.8	**F**	**1.04**	**80.3**	**123.0**
	WB	D	0.81	27.0	67.5	C	0.68	20.2	37.5
	NB	B	0.31	11.4	9.8	B	0.33	12.8	10.5
	SB	A	0.02	9.4	0.8	B	0.14	11.4	3.8
	Overall	**C**	**-**	**20.4**	**-**	**E**	**-**	**46.2**	**-**
Access at Johnston Road ***Unsignalized***	EBL/T	A	0.09	9.0	2.3	A	0.01	8.1	0.0
	WBT/R	-	-	-	-	-	-	-	-
	SBL/R	B	0.03	12.9	0.8	B	0.14	12.1	3.8
	Overall	**A**	**-**	**1.0**	**-**	**A**	**-**	**1.1**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
Peak Hour Factor = 1.00
Queue is measured in metres

m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

Capacity issues will remain on the eastbound movement at Albion Road at Johnston Road intersection during the PM peak hour.

Signal warrant analysis of Justification 7 was performed for the intersection of Albion Road at Johnston Road for the 2028 future total condition. The intersection does not meet the signal warrant and is assumed to remain as an all-way stop controlled intersection. Signal warrant calculation sheets are provided in Appendix D.

The left-turn warrants are met on the eastbound movement for the intersection of Albion Road at Johnston Road in this horizon. The commentary provided in Section 2.2.7 remains valid and no left-turn lane is recommended. The left-turn warrant calculation sheets are provided in Appendix E.

The left-turn warrants are met on the eastbound movement at the intersection of Access at Johnston Road during both peak hours. However, the PM peak hour volumes along Johnston Road will cause any eastbound left-turn movements to meet a turn lane warrant, given the proposed site would be representative less than 3% of the eastbound road volumes. During the AM peak, any eastbound left-turn volumes would meet the warrant if they were above 15% (36 vehicles) of the eastbound volumes (238 vehicles). Should the intersections and other accesses along Johnston Road be reviewed by the City, it is expected that they would also meet the warrants for turn lanes in both the eastbound and westbound directions. Given this, it is recommended that the existing condition be maintained without dedicated turn lanes along the corridor until such time that a comprehensive design but completed to integrate additional pedestrian, cycling and possible transit facilities in the corridor and revisit the opportunity to provide the turn lanes in the remaining road space. During the interim, the access is expected to operate well (LOS 'A') with less than 3 seconds delay during the AM peak and no delay during the PM peak. The left-turn warrant calculation sheets are provided in Appendix E.

7.4 2033 Future Total Operations

Figure 18 illustrates the 2033 total volumes and Table 18 summarizes the 2033 total intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. The synchro worksheets for the 2033 future total horizon are provided in Appendix L.

Figure 18: 2033 Future Total Volumes

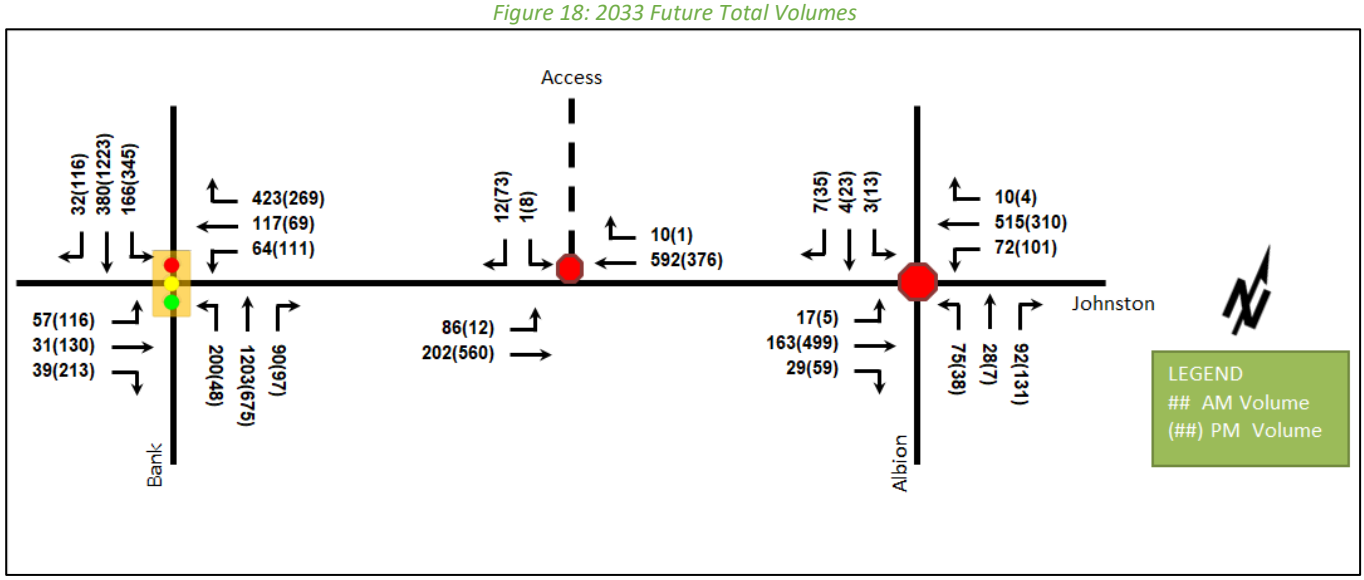


Table 18: 2033 Future Total Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Bank Street at Johnston Road *Signalized*	EBL	A	0.21	36.6	21.7	A	0.42	42.5	39.6
	EBT	A	0.07	33.5	13.2	A	0.32	39.0	41.4
	EBR	A	0.10	2.9	3.2	A	0.44	7.7	18.2
	WBL	A	0.24	37.5	23.7	A	0.45	44.0	38.7
	WBT	A	0.28	37.7	37.6	A	0.17	35.6	24.3
	WBR	D	0.89	44.7	**#108.1**	A	0.51	7.7	20.4
	NBL	A	0.32	10.0	28.1	A	0.26	13.6	8.3
	NBT	B	0.68	23.8	138.5	A	0.44	24.5	76.5
	NBR	A	0.12	5.1	10.0	A	0.14	2.8	6.8
	SBL	B	0.64	22.0	27.9	B	0.64	15.4	50.3
	SBT	A	0.22	16.0	35.2	C	0.80	34.4	167.5
	SBR	A	0.04	0.1	0.0	A	0.16	4.2	10.5
	Overall	**C**	**0.72**	**24.9**	-	**C**	**0.71**	**25.3**	-
Albion Road at Johnston Road *Unsignalized*	EB	B	0.31	10.8	9.8	**F**	**1.04**	**80.3**	**123.0**
	WB	D	0.81	27.0	67.5	C	0.68	20.2	37.5
	NB	B	0.31	11.4	9.8	B	0.33	12.8	10.5
	SB	A	0.02	9.4	0.8	B	0.14	11.4	3.8
	Overall	**C**	-	**20.4**	-	**E**	-	**46.2**	-
Access at Johnston Road *Unsignalized*	EBL/T	A	0.09	9.0	2.3	A	0.01	8.1	0.0
	WBT/R	-	-	-	-	-	-	-	-
	SBL/R	B	0.03	12.9	0.8	B	0.14	12.1	3.8
	Overall	**A**	-	**1.0**	-	**A**	-	**1.1**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Peak Hour Factor = 1.00
Queue is measured in metres
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

Capacity issues will remain on the eastbound movement at Albion Road at Johnston Road intersection during the PM peak hour.

Signal warrant analysis of Justification 7 was performed for the intersection of Albion Road at Johnston Road for the 2033 future total condition. The intersection does not meet the signal warrant and is assumed to remain as an all-way stop controlled intersection. Signal warrant calculation sheets are provided in Appendix D.

The left-turn warrants are met on the eastbound movement at the intersections of Albion Road at Johnston Road and Access at Johnston Road in this horizon. The commentaries provided in Section 2.2.7 for the intersection of Albion Road at Johnston Road and Section 7.3 for the intersection of Access at Johnston Road remain valid, and no left-turn lanes are recommended at both intersections. The left-turn warrant calculation sheets are provided in Appendix E.

7.5 2033 Future Total Operations – Sensitivity with Additional 40% GFA of Mezzanines

A sensitivity analysis of the site build-out is provided for the potential case where mezzanines are ultimately built within each building. The mezzanines are estimated to increase the total GFA by an additional 40% and this has been carried forward to assess the impact of all proposed buildings ultimately having mezzanines. The potential for mezzanines in individual units is being considered and will be subject to specific unit fit-ups. Figure 19 illustrates the 2033 total volumes with mezzanines and Table 19 summarizes the 2033 total intersection operations with mezzanines. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. The synchro worksheets for the 2033 future total horizon with an additional 40% GFA of mezzanines are provided in Appendix M.

Figure 19: 2033 Future Total Volumes– With Additional 40% GFA of Mezzanines

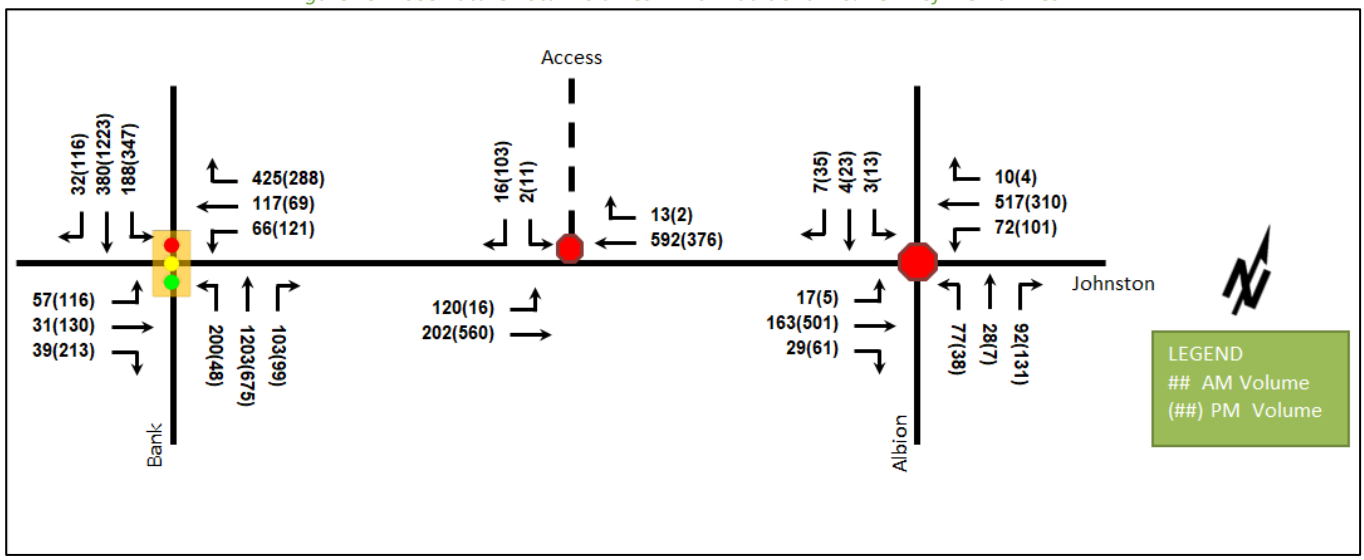


Table 19: 2033 Future Total Intersection Operations– With Additional 40% GFA of Mezzanines

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Bank Street at Johnston Road *Signalized*	EBL	A	0.21	36.6	21.7	A	0.42	42.4	39.6
	EBT	A	0.07	33.5	13.2	A	0.32	38.9	41.4
	EBR	A	0.10	2.9	3.2	A	0.44	7.6	18.2
	WBL	A	0.25	37.6	24.4	A	0.49	45.5	42.0
	WBT	A	0.28	37.7	37.6	A	0.17	35.6	24.3
	WBR	D	0.89	45.3	**#109.6**	A	0.53	7.7	21.2
	NBL	A	0.32	10.0	28.1	A	0.25	13.6	8.3
	NBT	B	0.68	24.0	138.5	A	0.44	24.5	76.5
	NBR	A	0.14	6.0	12.2	A	0.14	3.0	7.3
	SBL	C	0.72	27.8	**#42.1**	B	0.65	15.5	50.8
	SBT	A	0.22	16.0	35.2	C	0.80	34.4	167.5
	SBR	A	0.04	0.1	0.0	A	0.16	4.2	10.5
	Overall	**C**	**0.76**	**25.4**	-	**C**	**0.72**	**25.3**	-
Albion Road at Johnston Road *Unsignalized*	EB	B	0.31	10.9	9.8	**F**	**1.05**	**82.4**	**125.3**
	WB	D	0.82	27.4	69.0	C	0.68	20.2	37.5
	NB	B	0.32	11.5	10.5	B	0.33	12.8	10.5
	SB	A	0.02	9.4	0.8	B	0.14	11.5	3.8
	Overall	**C**	-	**20.7**	-	**E**	-	**47.3**	-
Access at Johnston Road *Unsignalized*	EBL/T	A	0.12	9.2	3.0	A	0.01	8.1	0.0
	WBT/R	-	-	-	-	-	-	-	-
	SBL/R	B	0.04	13.6	0.8	B	0.19	12.6	5.3
	Overall	**A**	-	**1.4**	-	**A**	-	**1.5**	-

Notes: Saturation flow rate of 1800 veh/h/lane
Peak Hour Factor = 1.00
Queue is measured in metres
m = metered queue
# = volume for the 95th %ile cycle exceeds capacity

With mezzanines, capacity issues remain on the eastbound movement at Albion Road at Johnston Road intersection during the PM peak hour with increasing of 2.1 seconds delays and 2.3 metres queues.

With mezzanines, at the intersection of Bank Street at Johnston Road during the AM peak hour, the westbound right-turn movement queue will increase 2.0 metres, and the southbound left-turn movement may exhibit extended queues, which queue will increase 15.6 metres above the build-out without mezzanines.

Signal warrant analysis of Justification 7 was performed for the intersection of Albion Road at Johnston Road for the 2033 future total condition with mezzanines. Similar to the without mezzanines conditions, the intersection does not meet the signal warrant and is assumed to remain as an all-way stop controlled intersection. Signal warrant calculation sheets are provided in Appendix D.

Similar to the without mezzanines conditions, the left-turn warrants are met on the eastbound movement at the intersections of Albion Road at Johnston Road and Access at Johnston Road in this horizon. The commentaries provided in Section 2.2.7 for the intersection of Albion Road at Johnston Road and Section 7.3 for the intersection of Access at Johnston Road remain valid, and no left-turn lanes are recommended at both intersections. The left-turn warrant calculation sheets are provided in Appendix E.

Overall, mezzanines can be supported within the development and are not expected to create undue impacts on the transportation network.

7.6 Demand Rationalization Conclusions

7.6.1 Network Rationalization

Capacity issues have been noted on the eastbound movement at Albion Road at Johnston Road intersection during the PM peak hour in all study horizons. The City may investigate intersection improvements again to look at increasing capacity for this intersection. It is expected that the operations will remain similar to the existing conditions without any significant improvements. It is unknown if the LRT re-opening will reduce volumes along Johnston Road or Albion Road.

7.6.2 Development Rationalization

No capacity issues have been noted due to the site traffic. Being approximately 650-metre to one-kilometre-walking distance to the Greenboro LRT station, the proposed mode shares for the development are appropriate to target, and these targets should be supported through TDM measures. Therefore, no further rationalization for site traffic is required.

8 Development Design

8.1 Design for Sustainable Modes

The proposed development consists of industrial buildings with surface parking. A total of 188 vehicle parking spaces and 63 bicycle parking spaces are proposed. Pedestrian facilities are provided on the frontage of Johnston Street, on the west side of the access driveway aisle, and within the development to connect buildings. The closest local transit stop is located within 160 metres of walking distance at Johnston Road and Southgate Road intersection. Greenboro LRT station is provided approximately 650-metre to one-kilometre-walking distance from the site.

The infrastructure TDM checklist is provided in Appendix N.

8.2 Circulation and Access

Vehicle access is provided via a two-way access onto Johnston Road, and the access width is 7.5 metres. The internal aisle is 6.7 metres. The internal aisle connects to each building and the surface parking. The garbage collections are expected to be at or closer to designated waste management areas. The truck turning movements can be accommodated on site, including garbage vehicles and WB-20 vehicles only for Buildings H and G. The turning templates are provided in Appendix O.

9 Parking

9.1 Parking Supply

The site provides a total of 188 vehicle parking spaces and 63 bicycle parking spaces.

According to the zoning by-law, within Area C on Schedule 1A, the minimum vehicle parking requirement is 0.8 spaces per 100 square metres for the first 5000 square metres of gross floor area, and 0.4 spaces per 100 square metres above 5000 square metres of gross floor area. According to the zoning by-law, within Area C on Schedule 1, the minimum bicycle parking requirement is 1 space per 1000 square metres.

The minimum vehicle parking requirement according to the zoning by-law is 121 spaces, and the minimum bicycle parking requirement according to the zoning by-law is 19 spaces. With mezzanines, the minimum vehicle parking requirement is 170 spaces, and the minimum bicycle parking requirement is 27 spaces.

Under both conditions, the proposed vehicle and bicycle parking spaces exceed the zoning by-law requirements.

Based on the City of Ottawa Accessibility Design Standards (2015), the total number of accessible spaces required is seven spaces with three Type A and four Type B. The site provides seven Type A spaces and two Type B spaces. As Type A is larger than Type B, the proposed accessible spaces meet the City of Ottawa Accessibility Design Standards (2015) requirements.

10 Boundary Street Design

Table 20 summarizes the Multi-Modal Level of Service (MMLOS) analysis for the boundary street of Johnston Road. Bike lanes on Johnston Road from Southgate Road to Conroy Road are identified in the Transportation Master Plan – Part 1 (2023) and were considered in the future condition, and sidewalks along the Johnston Road frontage are proposed. The boundary street targets are based on the land use of "General Urban Area. The MMLOS worksheets have been provided in Appendix P.

Table 20: Boundary Street MMLOS Analysis

Segment	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target
Johnston Road (Existing)	**F**	C	**E**	D	N/A	N/A	N/A	N/A
Johnston Road (Future)	**D**	C	C	D	N/A	N/A	N/A	N/A

The boundary road of Johnston Road does not meet the pedestrian and cycling MMLOS targets.

To meet the theoretical pedestrian LOS (PLOS) target, the sidewalks would need to be at least 2.0 metres and boulevards widened to at least 2.0 metres. A 2.0 metre-sidewalk is proposed along the Johnston Road frontage for the site, and the PLOS is anticipated to improve from F to D. The City may reduce the speed limit (less or equal to 40km/hr) to address the PLOS deficiencies along Johnston Road.

It is anticipated that bike lanes will be provided on Johnston Road from Southgate Road to Conroy Road as per the Transportation Master Plan – Part 1 (2023). The Bicycle LOS (BLOS) is anticipated to improve from E to C, and the cycling MMLOS targets will be met in future conditions.

11 Access Intersections Design

11.1 Location and Design of Access

The access is 15.0 meters wide at the street line due to the curb radii requirements to permit vehicle turning movements into/out of the site. The main drive aisle is 7.5-meter-wide, connecting to 6.7-meter-wide internal site drive aisles leading to each building and the surface parking area. Although the access width exceeds 9 meters, it is recommended that the access be approved by the City for vehicle turning movements, in accordance with the City of Ottawa Private Approach Bylaw.

Site access will have an approximate 99 metres throat length, and it meets the TAC minimum throat length requirement of 15 metres.

A 2.0 metre-sidewalk is proposed along the frontage, and the access will comply with the City of Ottawa standard drawing SC7.1.

11.2 Intersection Control

Based upon the projected volumes, the site access will have stop-control on the minor approaches.

11.3 Access Intersection Design

11.3.1 Future Access Intersection Operations

The operations are noted in Section 7.4 and both 2028 and 2033 future total access intersections operate well with all movements and the overall intersection operating at LOS A.

As discussed in Section 7.3 to 7.5, the left-turn warrants are met on the eastbound movement at the intersection of Access at Johnston Road in all future horizons given the existing volumes along Johnston Road, and no left turn is required on the eastbound movement.

11.3.2 Access Intersection MMLOS

The access is unsignalized and does not require MMLOS review.

11.3.3 Recommended Design Elements

The design elements for the site intersections are consistent with the CDP recommendations, the proposed access will be constructed to comply with the City standard SC7.1.

12 Transportation Demand Management

12.1 Context for TDM

Being approximately 650-metre to one kilometre-walking distance to the Greenboro LRT station, the mode shares used within the TIA represent a shift from auto mode to transit mode. Overall, the modal shares are likely to be achieved and supporting TDM measures should be provided.

12.2 Need and Opportunity

The subject site has been assumed to rely predominantly on auto travel with an increase in transit ridership with the proximity to the Greenboro LRT station, and those assumptions have been carried through the analysis.

12.3 TDM Program

The “suite of post occupancy TDM measures” has been summarized in the TDM checklists for the industrial land use. The checklist is provided in Appendix N. The key TDM measures recommended include:

- Display relevant transit schedules and route maps at entrances
- Provide a multimodal travel option information package to new/relocating employees

13 Neighbourhood Traffic Management

The proposed development will connect to the arterial network via Johnston Road (a major collector road). The TIA guidelines have outlined thresholds for two-way traffic on collector roads and have been found to be too low for the purposes of this analysis. City Staff have noted that these thresholds are under review and will be updated in the future.

The existing volumes along Johnston Road are 794 two-way vehicles in the AM peak hour and 936 two-way vehicles in the PM peak hour.

Without mezzanines, the future total volumes along Johnston Road west of the access are 892 two-way vehicles in the AM peak hour and 1,021 two-way vehicles in the PM peak hour. The future total volumes along Johnston Road east of the access are 805 two-way vehicles in the AM peak hour and 946 two-way vehicles in the PM peak hour.

With mezzanines, the future total volumes along Johnston Road west of the access are 930 two-way vehicles in the AM peak hour and 1,054 two-way vehicles in the PM peak hour. The future total volumes along Johnston Road east of the access are 810 two-way vehicles in the AM peak hour and 950 two-way vehicles in the PM peak hour.

Being closer to Bank Street, the section of Johnston Road will constitute the highest volumes along the roadway as it reaches the end point of travel. The volumes will decrease to the east as local traffic diffuses into the community. No changes to the roadway classifications or proposed road network are required to support the site.

14 Transit

14.1 Route Capacity

In Section 5.1 the trip generation by mode was estimated, including an estimate of the number of transit trips that will be generated by the proposed development. Table 21 summarizes the transit trip generation.

Table 21: Trip Generation by Transit Mode

Travel Mode	Mode Share	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Transit	20%	26	4	30	4	22	26

The proposed development is anticipated to generate an additional 32 AM and 28 PM peak hour two-way transit trips. From the trip distribution found in section 5.3, these values can be further broken down. Table 22 summarizes forecasted site-generated transit ridership trips by direction and the equivalent bus loads.

Table 22: Forecasted Site-Generated Transit Ridership

Direction	AM Peak Hour		PM Peak Hour		Service Type	Approximate Equivalent Peak Hour/Direction Bus Loads
	In	Out	In	Out		
North	10	2	2	9	Bus, LRT	Negligible
South	4	0	0	3	Bus	Negligible
East	8	2	2	6	Bus, LRT	Negligible
West	4	0	0	3	Bus, LRT	Negligible

14.2 Transit Priority

Examining the study area intersection operations, minimal impacts on delay are anticipated on transit movements at the study area intersections. The southbound left-turn movement at the Bank Street and Johnston Road intersection will have an increased delay of eight seconds during the AM peak hour as a result of the development site traffic. Should the site include mezzanines within all of the individual building fit ups, an additional six seconds may occur for this movement. The total delays on the southbound left for both conditions range between 20s and 30s, resulting in a transit LOS of D. Therefore, no difference in general impacts. It is noted that this impact assumes the existing signal timing and no City adjustments have been made during the intermediate timeframe for general operational review.

15 Network Intersection Design

15.1 Network Intersection Control

No change to the existing signalized control is recommended for the network intersections.

15.2 Network Intersection Design

15.2.1 2028 & 2033 Future Total Network Intersection Operations

The operations are noted in Section 7.4 and no mitigation of conditions is required for the subject site traffic.

15.2.2 Network Intersection MMLOS

Table 23 summarizes the MMLOS analysis for the intersection of Bank Street at Johnston Road. A cycling crossing of Bank Street and separated cycling facilities on Johnston Road from Bank Street to Southgate Road are identified in the Transportation Master Plan – Part 1 (2023), and cycle tracks along Bank Street between Johnston Road and Queensdale Avenue are identified in the South Keys to Blossom Park Community Design Plan (CDP). Both improvements were considered in the future conditions. The intersection targets are based on the land use of "General Urban Area". The MMLOS worksheets have been provided in Appendix P.

Table 23: Study Area Intersection MMLOS Analysis

Intersection	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
Bank Street at Johnston Road (Existing)	F	C	F	B	F	D	N/A	N/A	C	D
Bank Street at Johnston Road (Future)	F	C	F	B	F	D	N/A	N/A	C	D

The MMLOS targets will not be met for the PLOS at the intersection of Bank Street at Johnston Road. As typical for arterial roads, the crossing distance does not permit the targets to be met. To meet the PLOS targets, the maximum crossing distance on all pedestrian crossings would need to be reduced to three lane-widths or less.

The BLOS targets will not be met at the intersection of Bank Street at Johnston Road. It is anticipated that the BLOS will be improved in the future on the north, south, and east approaches, however, since no improvements are noted on the west approach, the intersection BLOS will remain at "F".

The transit LOS (TLOS) targets will not be met at the intersection of Bank Street at Johnston Road due to the delay on the southbound approach exceed 30 seconds. To meet transit LOS, the delays on the southbound approach at this intersection would need to be below 30 seconds.

The City of Ottawa will be responsible for exploring options to address the area PLOS, BLOS, and TLOS deficiencies.

15.2.3 Recommended Design Elements

No study area intersection design elements are proposed as part of this study.

16 Summary of Improvements Indicated and Modifications Options

The following summarizes the analysis and results presented in this TIA report:

Proposed Site and Screening

- The proposed development, which located east of Sawmill Creek, consists of industrial buildings totaling gross floor area of 155,905 sq. ft., 188 surface parking spaces, and 63 bicycle parking spaces
- An expired servicing easement is located within the site and runs from northwest to southeast
- The concept plan includes a new full-movement access on Johnston Road
- The anticipated full build-out and occupancy horizon is 2028 with construction occurring in phases
- The trip generation, location, and safety triggers were met for the TIA Screening
- The site is located within the South Keys to Blossom Park, Bank Street Community Design Plan area

Existing Conditions

- Bank Street is an arterial road, and Johnston Road and Albion Road are collector roads in the study area

- Sidewalks are provided on both sides along Bank Street and on the south side of Johnston Road west of Albion Road
- A bike lane is provided on the west side of Bank Street south of Johnston Road, and paved shoulders are provided on both sides of Johnston Road east of Albion Road
- In the Transportation Master Plan – Part 1 (2023), Bank Street north of Johnston Road, Johnston Road, and Albion Road south of Johnston Road are crosstown bikeways
- In the existing conditions, the study area intersections generally operate well with the exception of the eastbound movement at Albion Road at Johnston Road during the PM peak hour
- The intersection of Albion Road at Johnston Road does not meet the Signal Justification 1 and 2 and is assumed to remain as an all-way stop controlled intersection
- The left-turn warrants are met on the eastbound movement at the intersection of Albion Road at Johnston Road in the existing conditions, although the City has previously explored improvements to this intersection, and they were not implemented based on community feedback
- Within the study area, the intersection of Bank Street at Johnston Road is noted to have experienced higher collisions than other locations, including a total of four collisions involving pedestrian during the 2018-2022 time period
- A general decrease in the number of collisions is noted at the Bank Street and Johnston Road intersection from pre 2020 to post 2020
- Detailed collision records were reviewed for the Bank Street and Johnston Road intersection, although they are only available for the period between 2017-2021
- The rear end collisions are typical congested condition at Bank Street and Johnston Road intersection
- High volumes on the southbound left-turn during the PM peak hour and the protected/permissive phase of the southbound left-turn movement may contribute to the turning movement collisions at the Bank Street and Johnston Road intersection, and City signal timing adjustment may mitigate these collisions
- No pattern has been observed at the Bank Street and Johnston Road intersection for the collision types of SMV other, angle, sideswipe, and other based on the City's detailed collision records
- A total of three pedestrian collisions were noted at the Bank Street and Johnston Road intersection between 2017 and 2021, all involving left turn movements. However, no pattern regarding the direction has been observed, and advanced walk time may mitigate these collisions

Development Generated Travel Demand

- The proposed development is forecasted to produce 148 two-way people trips during the AM peak hour and 129 two-way people trips during the PM peak hour
- Of the forecasted people trips, 108 two-way trips will be vehicle trips during the AM peak hour and 94 two-way trips will be vehicle trips during the PM peak hour based on a 73% modal share target
- Of the forecasted trips, 40% are anticipated to travel north, 15% to travel south and west, and 30% to travel east

Background Conditions

- The explicit developments considered in the area for growth are included within the TRANS comparisons and would reduce the growth rates further
- A growth rate of 0% has been applied to the area road network
- The network intersection operations for the future background horizons operate similarly to the existing condition with no additional capacity issues noted

- The intersection of Albion Road at Johnston Road does not meet the Signal Justification 7 in the future background horizons and is assumed to remain as an all-way stop controlled intersection
- The left-turn warrants continue to be met on the eastbound movement at the intersection of Albion Road at Johnston Road in background conditions and it is recommended that no improvements are required as part of this development
- It is expected that the operations will remain similar to the existing conditions with minor improvements

Development Design

- A total of 188 vehicle parking spaces and 63 bicycle parking spaces are proposed
- Pedestrian facilities are provided on the frontage of Johnston Street, on the west side of the access driveway aisle, and within the development to connect buildings
- The closest local transit stop is located within 160 metres of walking distance at Johnston Road and Southgate Road intersection
- Greenboro LRT station is provided approximately 650-metre to one-kilometre-walking distance from the site
- The garbage collections are expected to be at or closer to the waste management area
- The truck turning movements can be accommodated on site

Parking

- The site provides a total of 188 vehicle parking spaces and 63 bicycle parking spaces
- Both proposed vehicle and bicycle parking spaces exceed the zoning by-law requirements, both with and without mezzanine conditions
- The site provides seven Type A spaces and two Type B accessible parking spaces, and it meets the City of Ottawa Accessibility Design Standards (2015) requirements

Boundary Street Design

- The boundary road of Johnston Road does not meet the pedestrian and cycling MMLOS targets in the existing condition
- While a sidewalk of at least 2.0 meters and a boulevard larger than 2.0 meters would be required to meet the theoretical pedestrian LOS targets, a 2.0-meter sidewalk is proposed along the Johnston Road frontage, and the Pedestrian LOS (PLOS) is anticipated to improve from F to D
- Given that bike lanes are planned on Johnston Road from Southgate Road to Conroy Road, as outlined in the Transportation Master Plan – Part 1 (2023), the Bicycle LOS (BLOS) is anticipated to improve from E to C in the future conditions

Access Intersections Design

- The access is 15.0 meters wide at the street line due to the curb radii requirements to permit vehicle turning movements into/out of the site
- The main drive aisle is 7.5-meter-wide, connecting to 6.7-meter-wide internal site drive aisles leading to each building and the surface parking area
- It is recommended that the access be approved by the City for vehicle turning movements, in accordance with the City of Ottawa Private Approach Bylaw
- Site access will have approximately 99 metres of throat length, and it meets the TAC minimum requirement of 15 metres

- The site access will have stop-control on the minor approaches
- Both 2028 and 2033 future total access intersections operate well with all movements and the overall intersection operating at LOS A
- The PM peak hour volumes at left-turn warrants will meet the warrant for any eastbound left-turn movements at the intersection of Access at Johnston Road, given the proposed site would be representative of 2.8% of the eastbound road volumes
- The PM peak hour volumes along Johnston Road will result in any eastbound left-turn movements meeting the turn lane warrant for the proposed access, highlighted by the fact that the site volumes would be representative of 2.1%-2.8% of the eastbound road volumes
- Should the intersections and other access along Johnston Road be reviewed by the City, it is expected that they would also meet the warrants for turn lanes, in both the eastbound and westbound directions
- It is recommended that the existing condition be maintained without dedicated turn lanes along the Johnston Road until such time that a comprehensive design but completed to integrate additional pedestrian, cycling and possible transit facilities in the corridor and revisit the opportunity to provide the turn lanes in the remaining road space

TDM

- Supportive TDM measures to be included within the proposed development should include:
    - Display relevant transit schedules and route maps at entrances
    - Provide a multimodal travel option information package to new/relocating employees

NTM

- The proposed development will connect to the arterial network via Johnston Road
- The existing volumes along Johnston Road are 794 two-way vehicles in the AM peak hour and 936 two-way vehicles in the PM peak hour
- Without mezzanines, the future total volumes along Johnston Road west of the access are 892 two-way vehicles in the AM peak hour and 1,021 two-way vehicles in the PM peak hour, and east of the access are 805 two-way vehicles in the AM peak hour and 946 two-way vehicles in the PM peak hour
- With mezzanines, the future total volumes along Johnston Road west of the access are 930 two-way vehicles in the AM peak hour and 1,054 two-way vehicles in the PM peak hour, and east of the access are 810 two-way vehicles in the AM peak hour and 950 two-way vehicles in the PM peak hour
- Being closer to Bank Street, the section of Johnston Road will constitute the highest volumes along the roadway as it reaches the end point of travel. The volumes will decrease to the east as local traffic diffuses into the community
- No changes to the roadway classifications or proposed road network are required to support the site

Transit

- The proposed development is anticipated to generate an additional 30 AM and 26 PM peak hour two-way transit trips
- Peak hour increases in transit ridership have negligible impact to all directions
  Minimal impacts on delay are anticipated on transit movements at the study area intersections
- The southbound left-turn movement at the Bank Street and Johnston Road intersection will have an increased delay of eight seconds during the AM peak hour as a result of the development site traffic

- Should the site include mezzanines within all of the individual building fit ups, an additional six seconds may occur for this movement
- The total delays on the southbound left for both conditions resulting in a transit LOS of D

Network Intersection Design

- Capacity issues remaining on the eastbound movement at Albion Road at Johnston Road intersection during the PM peak hour
- The southbound shared left-turn movement at the intersection of Bank Street at Johnston Road may exhibit extended queues during the AM peak hour
- The intersection of Albion Road at Johnston Road does not meet the Signal Justification 7 in the future total horizons and is assumed to remain as an all-way stop controlled intersection
- Although the left-turn warrants are met at the intersection of Albion Road at Johnston Road, given the all-way stop-control, the limited access on Albion Road to the north of Johnston Road, and the City's previous review of local improvements suggests that no dedicated turn lane is required for the eastbound approach, no left-turn lane is recommended and no left-turn lane is recommended
- Being approximately 650-metre to one kilometre-walking distance to the Greenboro LRT station, the proposed mode shares for the development are appropriate to target, and these targets should be supported through TDM measures
- No further rationalization for site traffic is required
- A sensitivity analysis of the site build-out is provided for the potential case where mezzanines are ultimately built within buildings/units
- With mezzanines conditions, capacity issues remaining on the eastbound movement at Albion Road at Johnston Road intersection during the PM peak hour with increasing of 2.1 seconds delays and 2.3 metres queues
- With mezzanines conditions, at the intersection of Bank Street at Johnston Road during the AM peak hour, the westbound right-turn movement queue will increase 2.0 metres, and the southbound left-turn movement may exhibit extended queues, which queue will increase 15.6 metres above the build-out without mezzanines
- Similar to the without mezzanines conditions, the intersection of Albion Road at Johnston Road does not meet Signal Justification 7 and the left-turn warrants are met on the eastbound movement with mezzanines.
- Overall, mezzanines can be supported within the development and are not expected to create undue impacts on the transportation network
- The pedestrian LOS targets will not be met at the intersection of Bank Street at Johnston Road, and the maximum crossing distance would need to be reduced to three lane-widths on all pedestrian crossings
- The bicycle LOS targets will not be met at the intersection of Bank Street at Johnston Road, and protected facilities with two-stage or turn box left-turn configurations would be needed on all approaches at the intersection
- Anticipated improvements in BLOS are expected for the north, south, and east approaches, however, as no improvements are planned on the west approach, the overall intersection BLOS will remain at "F"
- The transit LOS targets will not be met at the intersection of Bank Street at Johnston Road, and the delay on the southbound approach at this intersection would need to be reduced to below 30 seconds
- The City of Ottawa will be responsible for exploring options to address the area PLOS, BLOS, and TLOS deficiencies

17 Conclusion

It is recommended that, from a transportation perspective, the proposed development applications proceed.

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Appendix A

TIA Screening Form and PM Certification Form

CGH TRANSPORTATION

6 Plaza Court
Ottawa, ON K2H 7W1

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 21-Aug-23
Project Number: 2022-061
Project Reference: 1319 Johnston

1.1 Description of Proposed Development	
Municipal Address	1319 Johnston Road
Description of Location	Ward 10. East of Bank Road between Walkley Rail Corridor and Johnston Road
Land Use Classification	Light Industrial Zone (IL)
Development Size	165,705 sq ft industrial area
Accesses	One full-movement access on Johnston Road
Phase of Development	Phases
Buildout Year	2028
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Industrial	
Development Size	15,395	G.F.A.
Trip Generation Trigger	Yes	

1.3 Location Triggers		
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?	No	
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?	No	Property within 500m radius of Greenboro Station
Location Trigger	No	

1.4. Safety Triggers		
Are posted speed limits on a boundary street 80 km/hr or greater?	No	
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?	No	
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/ suburban conditions)?	No	
Is the proposed driveway within auxiliary lanes of an intersection?	No	
Does the proposed driveway make use of an existing median break that serves an existing site?	No	
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	Yes	Collisions at Bank Street at Johnston Road
Does the development include a drive-thru facility?	No	
Safety Trigger	Yes	

TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed[1] or registered[2] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering √ or transportation planning □.

[1,2] **License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.**

City Of Ottawa
Infrastructure Services and Community Sustainability
Planning and Growth Management
110 Laurier Avenue West, 4th fl.
Ottawa, ON K1P 1J1
Tel. : 613-580-2424
Fax: 613-560-6006

Ville d'Ottawa
Services d 'infrastructure et Viabilité des collectivités
Urbanisme et Gestion de la croissance
110, avenue Laurier Ouest
Ottawa (Ontario) K1P 1J1
Tél. : 613-580-2424
Télécopieur: 613-560-6006

Dated at ___Ottawa_____ this __20__ day of _____September_____, 2018.
(City)

Name: _____Andrew Harte_____
(Please Print)

Professional Title: _____Professional Engineer_____

_____
Signature of Individual certifier that s/he meets the above four criteria

Office Contact Information (Please Print)
Address: 6 Plaza Court
City / Postal Code: Ottawa / K2H 7W1
Telephone / Extension: (613) 697-3797
E-Mail Address: Andrew.Harte@CGHTransportation.com

Appendix B

Turning Movement Count Data

Transportation Services - Traffic Services

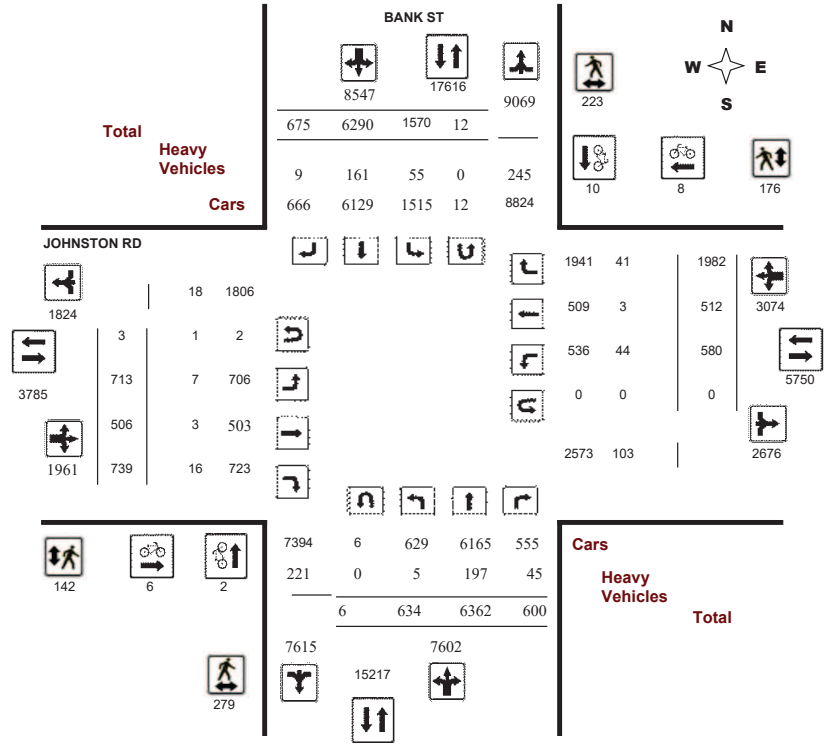
Turning Movement Count - Study Results

BANK ST @ JOHNSTON RD

Survey Date: Tuesday, April 16, 2019 **WO No:** 38536

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



Transportation Services - Traffic Services

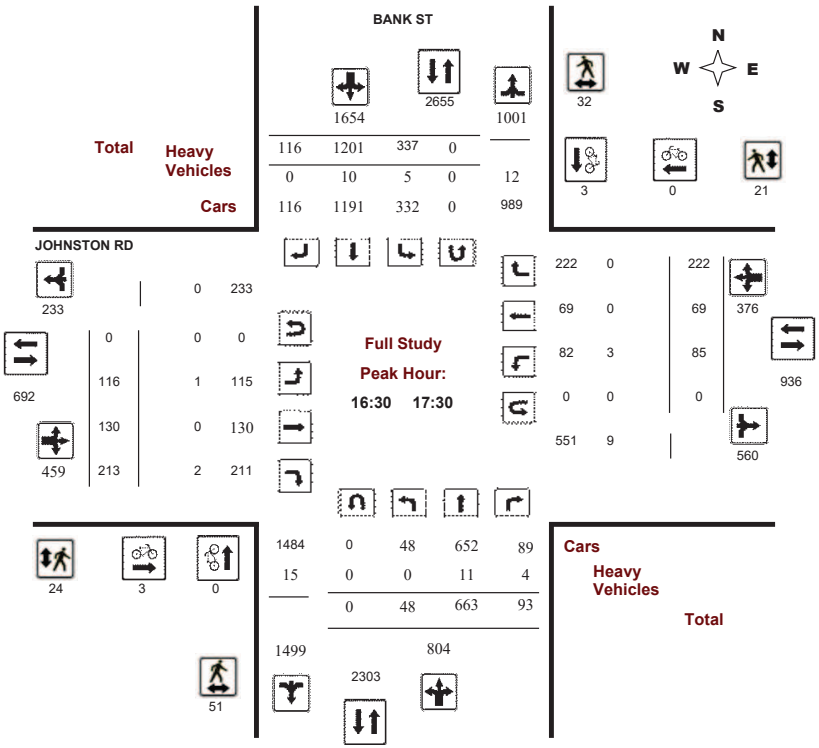
Turning Movement Count - Study Results

BANK ST @ JOHNSTON RD

Survey Date: Tuesday, April 16, 2019 **WO No:** 38536

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



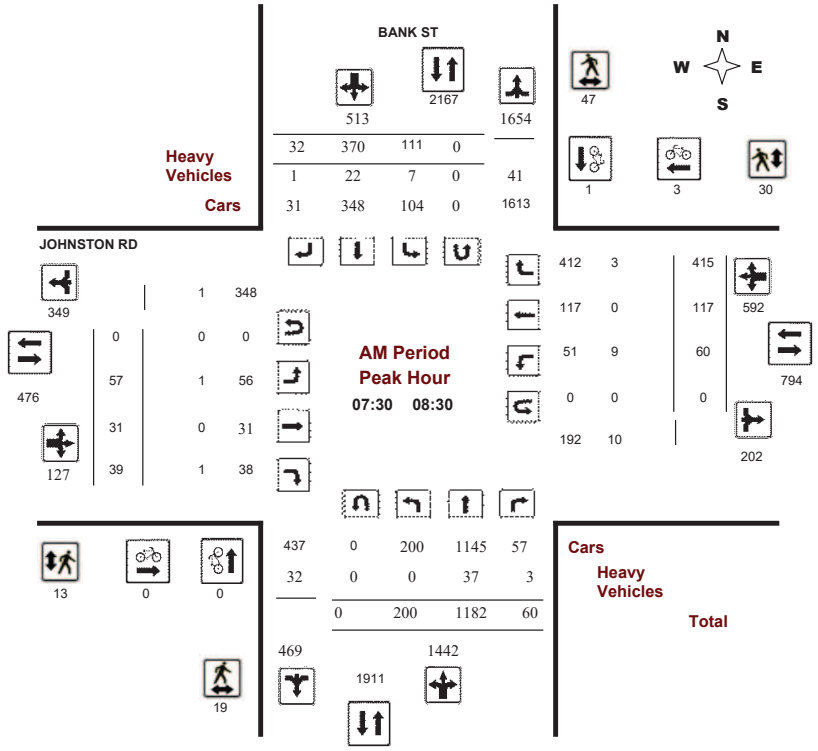
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BANK ST @ JOHNSTON RD

Survey Date: Tuesday, April 16, 2019 **WO No:** 38536

Start Time: 07:00 **Device:** Miovision



Comments

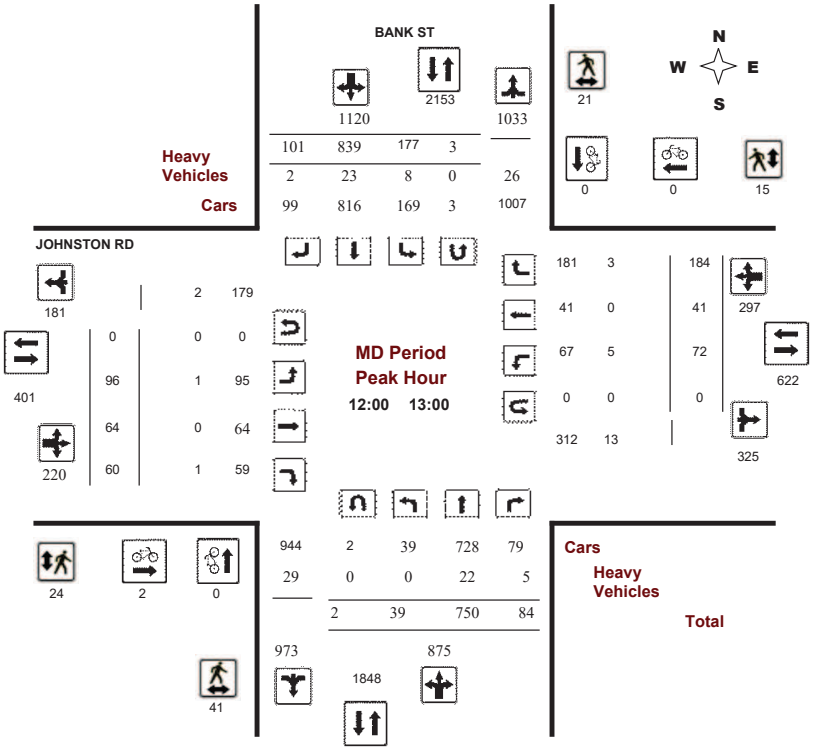
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BANK ST @ JOHNSTON RD

Survey Date: Tuesday, April 16, 2019 **WO No:** 38536

Start Time: 07:00 **Device:** Miovision



Comments

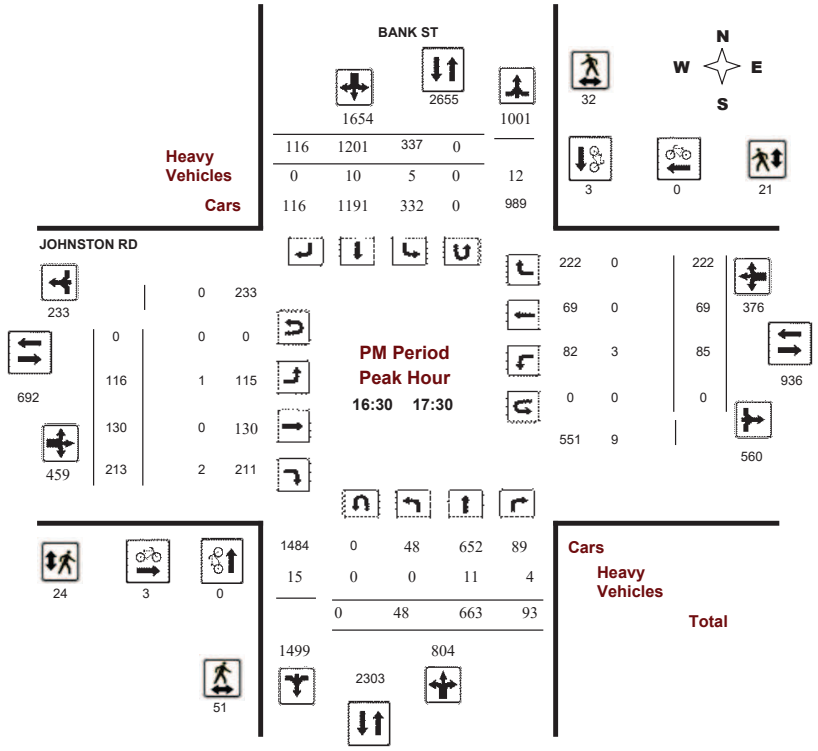
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BANK ST @ JOHNSTON RD

Survey Date: Tuesday, April 16, 2019 **WO No:** 38536

Start Time: 07:00 **Device:** Miovision



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ JOHNSTON RD

Survey Date: Tuesday, April 16, 2019 **WO No:** 38536

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Tuesday, April 16, 2019

Total Observed U-Turns

Northbound: 6 Southbound: 12

Eastbound: 3 Westbound: 0

AADT Factor 1.25

	BANK ST								JOHNSTON RD									
	Northbound				Southbound				Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	255	1004	55	**1314**	96	295	29	**420**	**1734**	49	24	35	**108**	52	129	343	**524**	**632**	**2366**
08:00 09:00	117	1119	42	**1278**	118	412	42	**572**	**1850**	52	28	38	**118**	59	64	410	**533**	**651**	**2501**
09:00 10:00	33	653	63	**749**	128	602	63	**793**	**1542**	60	14	23	**97**	55	43	225	**323**	**420**	**1962**
11:30 12:30	42	731	70	**843**	137	841	115	**1093**	**1936**	128	46	54	**228**	79	39	184	**302**	**530**	**2466**
12:30 13:30	38	703	84	**825**	201	835	102	**1138**	**1963**	87	64	63	**214**	74	53	186	**313**	**527**	**2490**
15:00 16:00	43	765	93	**901**	272	1051	105	**1428**	**2329**	98	85	141	**324**	81	43	204	**328**	**652**	**2981**
16:00 17:00	52	663	100	**815**	310	1181	113	**1604**	**2419**	130	116	217	**463**	94	59	196	**349**	**812**	**3231**
17:00 18:00	54	724	93	**871**	308	1073	106	**1487**	**2358**	109	129	168	**406**	86	82	234	**402**	**808**	**3166**
Sub Total	634	6362	600	**7596**	1570	6290	675	**8535**	**16131**	713	506	739	**1958**	580	512	1982	**3074**	**5032**	**21163**
U Turns				**6**				**12**	**18**				**3**				**0**	**3**	**21**
Total	634	6362	600	**7602**	1570	6290	675	**8547**	**16149**	713	506	739	**1961**	580	512	1982	**3074**	**5035**	**21184**
EQ 12Hr	881	8843	834	**10567**	2182	8743	938	**11880**	**22447**	991	703	1027	**2726**	806	712	2755	**4273**	**6999**	**29446**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	793	7959	751	**9510**	1964	7869	844	**10692**	**20202**	892	633	924	**2453**	726	641	2479	**3846**	**6299**	**26501**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**0.9**					
AVG 24Hr	1039	10426	983	**12458**	2573	10308	1106	**14007**	**26465**	1168	829	1211	**3214**	951	839	3248	**5038**	**8252**	**34717**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														**1.31**					

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ JOHNSTON RD

Survey Date: Tuesday, April 16, 2019 **WO No:** 38536

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

Time Period		BANK ST			JOHNSTON RD			
		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	0	0	0	0	1	1	1
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
07:45	08:00	0	0	0	0	0	0	0
08:00	08:15	0	1	1	0	2	2	3
08:15	08:30	0	0	0	0	1	1	1
08:30	08:45	1	0	1	0	0	0	1
08:45	09:00	0	0	0	0	0	0	0
09:00	09:15	0	2	2	0	1	1	3
09:15	09:30	0	0	0	0	0	0	0
09:30	09:45	0	0	0	0	1	1	1
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	0	0	0	0	0	0	0
11:45	12:00	0	0	0	0	1	1	1
12:00	12:15	0	0	0	0	0	0	0
12:15	12:30	0	0	0	0	0	0	0
12:30	12:45	0	0	0	1	0	1	1
12:45	13:00	0	0	0	1	0	1	1
13:00	13:15	0	0	0	0	0	0	0
13:15	13:30	0	1	1	0	0	0	1
15:00	15:15	0	0	0	0	1	1	1
15:15	15:30	0	0	0	0	0	0	0
15:30	15:45	0	0	0	0	0	0	0
15:45	16:00	1	2	3	0	0	0	3
16:00	16:15	0	0	0	0	0	0	0
16:15	16:30	0	0	0	0	0	0	0
16:30	16:45	0	1	1	2	0	2	3
16:45	17:00	0	1	1	0	0	0	1
17:00	17:15	0	1	1	1	0	1	2
17:15	17:30	0	0	0	0	0	0	0
17:30	17:45	0	0	0	0	0	0	0
17:45	18:00	0	1	1	1	0	1	2
Total		2	10	**12**	6	8	14	26

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ JOHNSTON RD

Survey Date: Tuesday, April 16, 2019 **WO No:** 38536

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

Time Period		BANK ST			JOHNSTON RD			
		NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00	07:15	4	9	**13**	1	8	**9**	**22**
07:15	07:30	5	8	**13**	2	7	**9**	**22**
07:30	07:45	4	6	**10**	1	5	**6**	**16**
07:45	08:00	4	8	**12**	0	4	**4**	**16**
08:00	08:15	7	13	**20**	7	6	**13**	**33**
08:15	08:30	4	20	**24**	5	15	**20**	**44**
08:30	08:45	8	10	**18**	5	7	**12**	**30**
08:45	09:00	5	7	**12**	4	6	**10**	**22**
09:00	09:15	3	0	**3**	3	2	**5**	**8**
09:15	09:30	11	1	**12**	6	3	**9**	**21**
09:30	09:45	2	2	**4**	1	3	**4**	**8**
09:45	10:00	4	3	**7**	2	3	**5**	**12**
11:30	11:45	7	3	**10**	2	8	**10**	**20**
11:45	12:00	5	4	**9**	3	2	**5**	**14**
12:00	12:15	8	8	**16**	6	5	**11**	**27**
12:15	12:30	11	6	**17**	8	4	**12**	**29**
12:30	12:45	8	5	**13**	5	4	**9**	**22**
12:45	13:00	14	2	**16**	5	2	**7**	**23**
13:00	13:15	6	9	**15**	6	6	**12**	**27**
13:15	13:30	10	7	**17**	2	7	**9**	**26**
15:00	15:15	14	8	**22**	6	4	**10**	**32**
15:15	15:30	8	4	**12**	3	3	**6**	**18**
15:30	15:45	18	7	**25**	7	6	**13**	**38**
15:45	16:00	10	10	**20**	4	8	**12**	**32**
16:00	16:15	11	11	**22**	5	10	**15**	**37**
16:15	16:30	10	5	**15**	2	7	**9**	**24**
16:30	16:45	11	5	**16**	2	1	**3**	**19**
16:45	17:00	8	10	**18**	10	7	**17**	**35**
17:00	17:15	16	5	**21**	4	3	**7**	**28**
17:15	17:30	16	12	**28**	8	10	**18**	**46**
17:30	17:45	9	6	**15**	1	3	**4**	**19**
17:45	18:00	18	9	**27**	16	7	**23**	**50**
Total	.....	279	223	**502**	142	176	**318**	**820**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ JOHNSTON RD

Survey Date: Tuesday, April 16, 2019 **WO No:** 38536

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

		BANK ST									JOHNSTON RD									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	1	7	1	**13**	1	1	0	**17**	**30**	2	0	1	**4**	2	0	6	**10**	**14**	**22**
07:15	07:30	1	12	0	**20**	1	4	0	**19**	**39**	0	0	0	**1**	3	0	2	**6**	**7**	**23**
07:30	07:45	0	5	1	**15**	2	6	1	**15**	**30**	0	0	0	**1**	3	0	1	**7**	**8**	**19**
07:45	08:00	0	11	0	**19**	2	8	0	**23**	**42**	1	0	0	**1**	0	0	1	**3**	**4**	**23**
08:00	08:15	0	12	1	**20**	1	4	0	**17**	**37**	0	0	0	**0**	3	0	0	**5**	**5**	**21**
08:15	08:30	0	9	1	**18**	2	4	0	**16**	**34**	0	0	1	**1**	3	0	1	**7**	**8**	**21**
08:30	08:45	0	8	0	**12**	1	3	0	**16**	**28**	0	0	0	**0**	1	0	4	**6**	**6**	**17**
08:45	09:00	0	17	1	**27**	2	6	0	**29**	**56**	0	0	1	**1**	2	0	4	**9**	**10**	**33**
09:00	09:15	0	4	0	**15**	0	8	0	**13**	**28**	0	0	0	**0**	3	0	1	**4**	**4**	**16**
09:15	09:30	0	6	1	**15**	0	6	1	**13**	**28**	0	1	1	**3**	1	0	0	**3**	**6**	**17**
09:30	09:45	0	4	0	**17**	2	13	0	**21**	**38**	1	0	0	**1**	0	0	1	**3**	**4**	**21**
09:45	10:00	0	7	3	**18**	3	7	1	**19**	**37**	0	0	0	**3**	1	0	1	**8**	**11**	**24**
11:30	11:45	0	4	4	**22**	1	9	0	**16**	**38**	0	0	3	**3**	2	0	2	**9**	**12**	**25**
11:45	12:00	0	10	2	**18**	1	3	0	**15**	**33**	0	0	2	**2**	1	0	1	**5**	**7**	**20**
12:00	12:15	0	5	2	**13**	1	3	1	**11**	**24**	0	0	0	**1**	3	0	1	**7**	**8**	**16**
12:15	12:30	0	7	1	**17**	2	8	1	**20**	**37**	1	0	0	**2**	1	0	1	**5**	**7**	**22**
12:30	12:45	0	5	1	**14**	2	6	0	**14**	**28**	0	0	1	**1**	1	0	1	**5**	**6**	**17**
12:45	13:00	0	5	1	**12**	3	6	0	**14**	**26**	0	0	0	**0**	0	0	0	**4**	**4**	**15**
13:00	13:15	0	5	2	**14**	6	6	1	**24**	**38**	0	0	0	**1**	1	0	6	**15**	**16**	**27**
13:15	13:30	0	6	1	**13**	2	4	2	**17**	**30**	1	1	1	**7**	1	2	2	**9**	**16**	**23**
15:00	15:15	0	5	2	**11**	1	2	0	**9**	**20**	0	0	0	**0**	2	0	1	**6**	**6**	**13**
15:15	15:30	1	6	3	**13**	1	2	0	**9**	**22**	0	0	1	**2**	0	0	0	**4**	**6**	**14**
15:30	15:45	0	7	1	**16**	4	5	0	**18**	**34**	0	0	1	**1**	2	0	2	**9**	**10**	**22**
15:45	16:00	0	3	0	**10**	3	5	0	**13**	**23**	0	0	0	**1**	2	1	2	**8**	**9**	**16**
16:00	16:15	0	4	5	**16**	2	7	1	**14**	**30**	0	0	0	**1**	0	0	0	**7**	**8**	**19**
16:15	16:30	1	3	4	**19**	3	10	0	**16**	**35**	0	1	0	**2**	1	0	0	**9**	**11**	**23**
16:30	16:45	0	2	0	**5**	1	2	0	**6**	**11**	1	0	1	**2**	0	0	0	**1**	**3**	**7**
16:45	17:00	0	4	2	**10**	2	3	0	**9**	**19**	0	0	0	**0**	1	0	0	**5**	**5**	**12**
17:00	17:15	0	2	1	**6**	1	1	0	**4**	**10**	0	0	1	**1**	1	0	0	**3**	**4**	**7**
17:15	17:30	0	3	1	**9**	1	4	0	**8**	**17**	0	0	0	**0**	1	0	0	**3**	**3**	**10**
17:30	17:45	0	5	1	**8**	0	1	0	**6**	**14**	0	0	1	**1**	0	0	0	**1**	**2**	**8**
17:45	18:00	1	4	2	**13**	1	4	0	**9**	**22**	0	0	0	**1**	2	0	0	**5**	**6**	**14**
Total:	None	5	197	45	**468**	55	161	9	**470**	**938**	7	3	16	**45**	44	3	41	**191**	**236**	**587**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

BANK ST @ JOHNSTON RD

Survey Date: Tuesday, April 16, 2019 **WO No:** 38536

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

		BANK ST	JOHNSTON RD			
Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	1	0	0	0	1
09:00	09:15	0	0	0	0	0
09:15	09:30	0	1	0	0	1
09:30	09:45	1	0	1	0	2
09:45	10:00	0	0	2	0	2
11:30	11:45	0	0	0	0	0
11:45	12:00	1	1	0	0	2
12:00	12:15	0	0	0	0	0
12:15	12:30	0	2	0	0	2
12:30	12:45	1	0	0	0	1
12:45	13:00	1	1	0	0	2
13:00	13:15	0	2	0	0	2
13:15	13:30	0	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	1	4	0	0	5
16:15	16:30	0	1	0	0	1
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		6	12	3	0	21

Transportation Services - Traffic Services

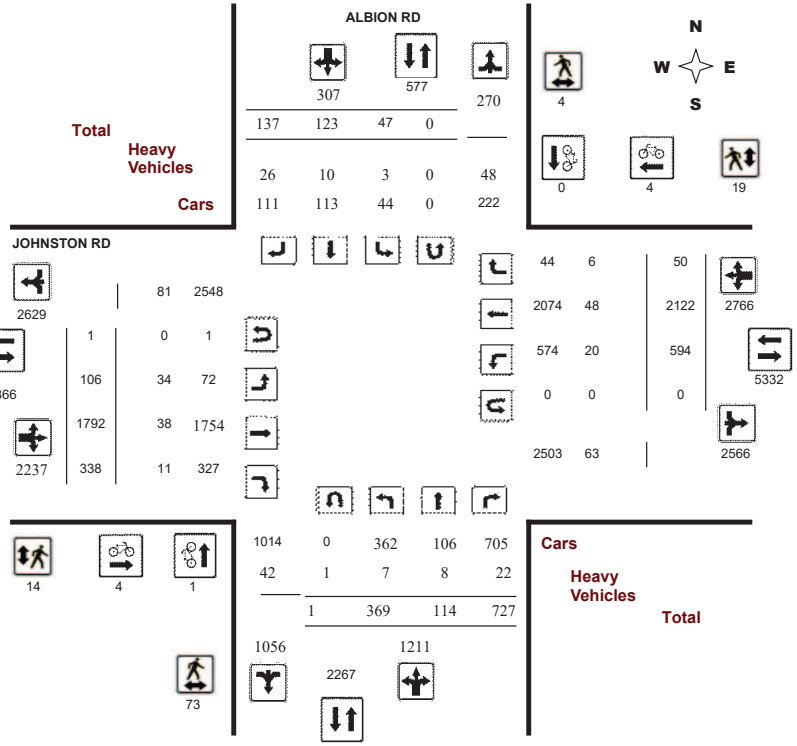
Turning Movement Count - Study Results

ALBION RD @ JOHNSTON RD

Survey Date: Wednesday, April 18, 2018 **WO No:** 37681

Start Time: 07:00 **Device:** Miovision

Full Study Diagram



Transportation Services - Traffic Services

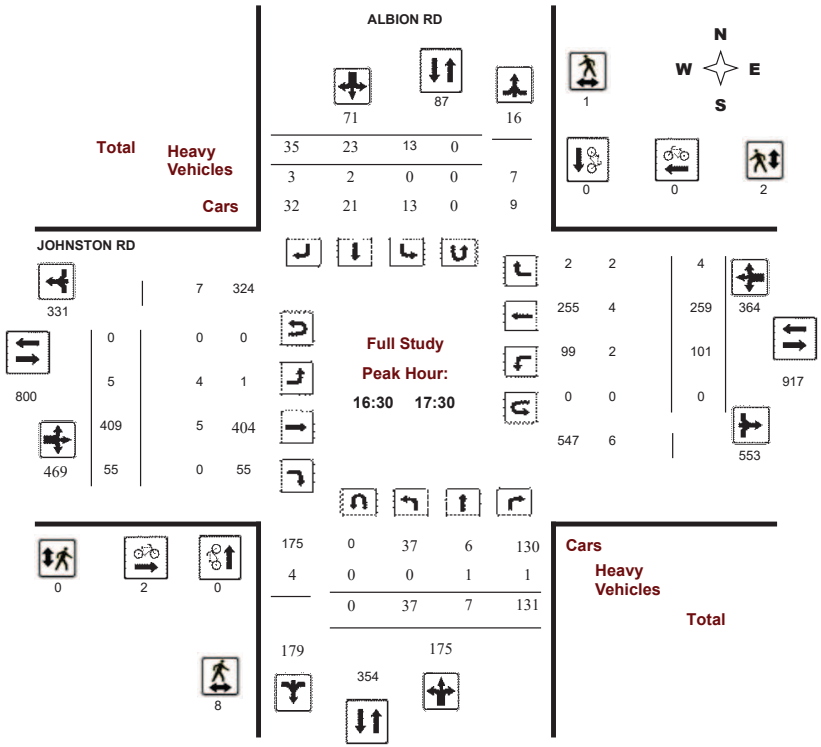
Turning Movement Count - Study Results

ALBION RD @ JOHNSTON RD

Survey Date: Wednesday, April 18, 2018 **WO No:** 37681

Start Time: 07:00 **Device:** Miovision

Full Study Peak Hour Diagram



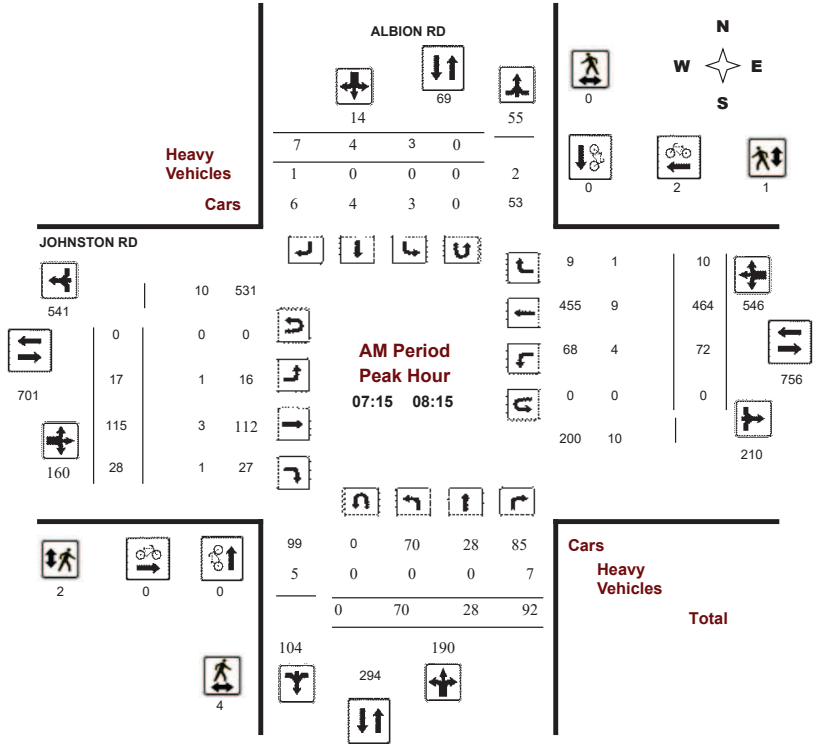
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

ALBION RD @ JOHNSTON RD

Survey Date: Wednesday, April 18, 2018 **WO No:** 37681

Start Time: 07:00 **Device:** Miovision



Comments

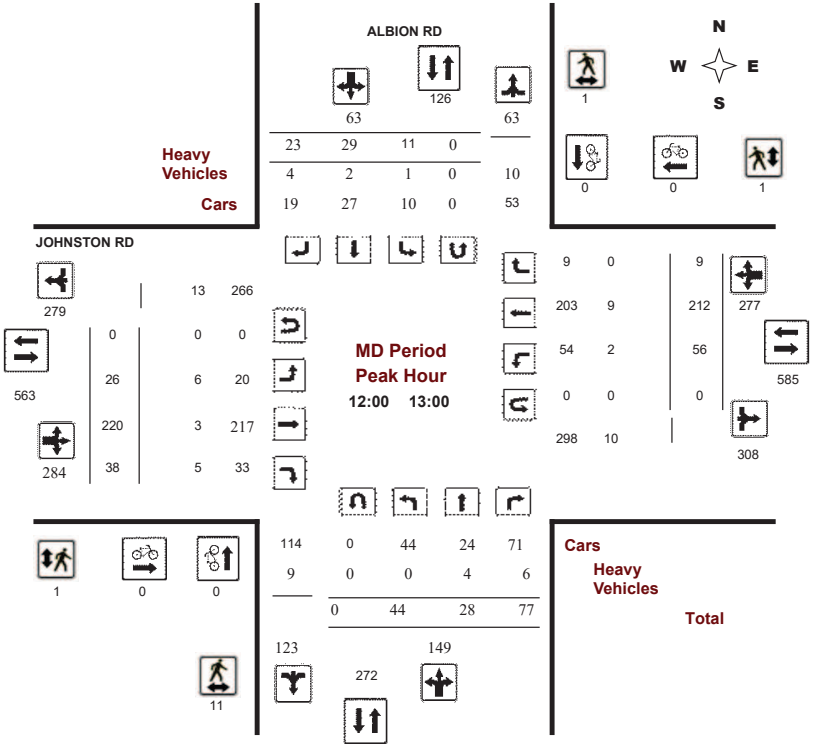
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

ALBION RD @ JOHNSTON RD

Survey Date: Wednesday, April 18, 2018 **WO No:** 37681

Start Time: 07:00 **Device:** Miovision



Comments

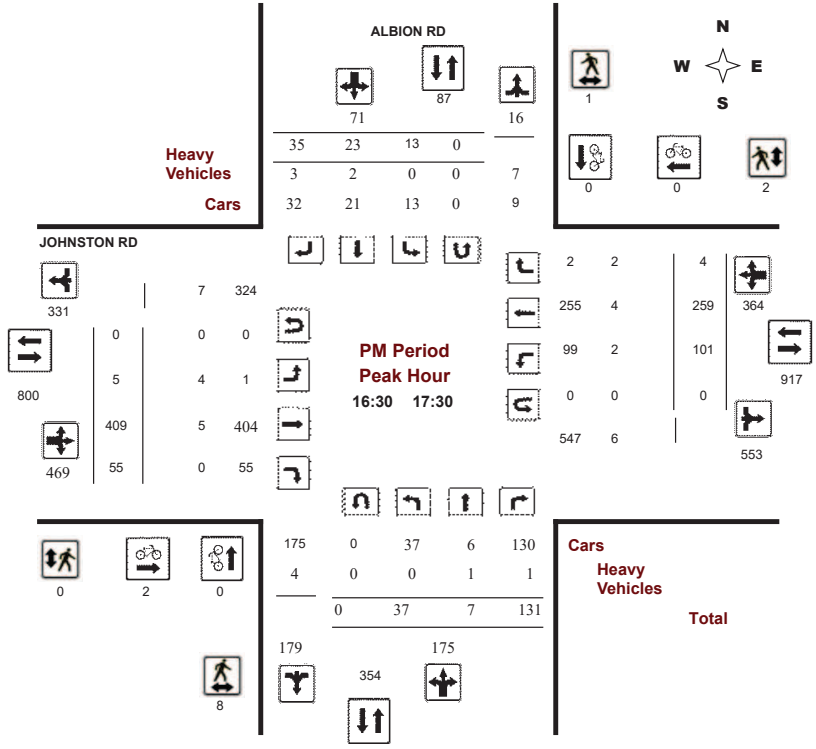
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

ALBION RD @ JOHNSTON RD

Survey Date: Wednesday, April 18, 2018 **WO No:** 37681

Start Time: 07:00 **Device:** Miovision



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

ALBION RD @ JOHNSTON RD

Survey Date: Wednesday, April 18, 2018 **WO No:** 37681

Start Time: 07:00 **Device:** Miovision

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, April 18, 2018

Total Observed U-Turns

Northbound: 1 Southbound: 0

Eastbound: 1 Westbound: 0

AADT Factor .90

	ALBION RD								JOHNSTON RD									
	Northbound				Southbound				Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	75	25	72	**172**	4	3	10	**17**	**189**	15	105	17	**137**	66	407	4	**477**	**614**	**803**
08:00 09:00	50	18	97	**165**	2	4	4	**10**	**175**	15	133	22	**170**	73	406	8	**487**	**657**	**832**
09:00 10:00	38	13	61	**112**	4	7	15	**26**	**138**	15	123	26	**164**	64	199	12	**275**	**439**	**577**
11:30 12:30	40	16	84	**140**	12	27	19	**58**	**198**	14	195	50	**259**	52	215	6	**273**	**532**	**730**
12:30 13:30	38	26	70	**134**	4	26	25	**55**	**189**	29	214	39	**282**	60	185	7	**252**	**534**	**723**
15:00 16:00	51	8	105	**164**	3	17	19	**39**	**203**	8	265	63	**336**	83	216	5	**304**	**640**	**843**
16:00 17:00	41	5	117	**163**	13	26	23	**62**	**225**	8	371	57	**436**	98	246	4	**348**	**784**	**1009**
17:00 18:00	36	3	121	**160**	5	13	22	**40**	**200**	2	386	64	**452**	98	248	4	**350**	**802**	**1002**
Sub Total	369	114	727	**1210**	47	123	137	**307**	**1517**	106	1792	338	**2236**	594	2122	50	**2766**	**5002**	**6519**
U Turns	1			**1**	0			**0**	**1**	1			**1**	0			**0**	**1**	**2**
Total	370	114	727	**1211**	47	123	137	**307**	**1518**	107	1792	338	**2237**	594	2122	50	**2766**	**5003**	**6521**
EQ 12Hr	514	158	1011	**1683**	65	171	190	**426**	**2109**	149	2491	470	**3110**	826	2950	70	**3846**	**6956**	**9065**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	463	142	910	**1515**	58	154	171	**383**	**1898**	134	2242	423	**2799**	743	2655	63	**3461**	**6260**	**8158**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**.90**					
AVG 24Hr	607	186	1192	**1985**	76	202	224	**502**	**2487**	176	2937	554	**3667**	973	3478	83	**4534**	**8201**	**10688**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														**1.31**					

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

ALBION RD @ JOHNSTON RD

Survey Date: Wednesday, April 18, 2018 **WO No:** 37681

Start Time: 07:00 **Device:** Miovision

Full Study Cyclist Volume

Time Period		ALBION RD Northbound	ALBION RD Southbound	ALBION RD Street Total	JOHNSTON RD Eastbound	JOHNSTON RD Westbound	JOHNSTON RD Street Total	Grand Total
07:00	07:15	0	0	**0**	0	0	**0**	**0**
07:15	07:30	0	0	**0**	0	0	**0**	**0**
07:30	07:45	0	0	**0**	0	1	**1**	**1**
07:45	08:00	0	0	**0**	0	0	**0**	**0**
08:00	08:15	0	0	**0**	0	1	**1**	**1**
08:15	08:30	0	0	**0**	0	1	**1**	**1**
08:30	08:45	0	0	**0**	0	0	**0**	**0**
08:45	09:00	0	0	**0**	0	0	**0**	**0**
09:00	09:15	0	0	**0**	0	0	**0**	**0**
09:15	09:30	0	0	**0**	0	0	**0**	**0**
09:30	09:45	0	0	**0**	0	0	**0**	**0**
09:45	10:00	0	0	**0**	0	0	**0**	**0**
11:30	11:45	0	0	**0**	0	0	**0**	**0**
11:45	12:00	0	0	**0**	0	0	**0**	**0**
12:00	12:15	0	0	**0**	0	0	**0**	**0**
12:15	12:30	0	0	**0**	0	0	**0**	**0**
12:30	12:45	0	0	**0**	0	0	**0**	**0**
12:45	13:00	0	0	**0**	0	0	**0**	**0**
13:00	13:15	0	0	**0**	0	0	**0**	**0**
13:15	13:30	0	0	**0**	0	0	**0**	**0**
15:00	15:15	0	0	**0**	0	0	**0**	**0**
15:15	15:30	0	0	**0**	0	0	**0**	**0**
15:30	15:45	0	0	**0**	0	0	**0**	**0**
15:45	16:00	1	0	**1**	2	1	**3**	**4**
16:00	16:15	0	0	**0**	0	0	**0**	**0**
16:15	16:30	0	0	**0**	0	0	**0**	**0**
16:30	16:45	0	0	**0**	0	0	**0**	**0**
16:45	17:00	0	0	**0**	1	0	**1**	**1**
17:00	17:15	0	0	**0**	0	0	**0**	**0**
17:15	17:30	0	0	**0**	1	0	**1**	**1**
17:30	17:45	0	0	**0**	0	0	**0**	**0**
17:45	18:00	0	0	**0**	0	0	**0**	**0**
Total		1	0	**1**	4	4	**8**	**9**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

ALBION RD @ JOHNSTON RD

Survey Date: Wednesday, April 18, 2018 **WO No:** 37681

Start Time: 07:00 **Device:** Miovision

Full Study Pedestrian Volume

Time Period		ALBION RD NB Approach (E or W Crossing)	ALBION RD SB Approach (E or W Crossing)	ALBION RD Total	JOHNSTON RD EB Approach (N or S Crossing)	JOHNSTON RD WB Approach (N or S Crossing)	JOHNSTON RD Total	Grand Total
07:00	07:15	3	0	**3**	0	0	**0**	**3**
07:15	07:30	2	0	**2**	0	1	**1**	**3**
07:30	07:45	0	0	**0**	0	0	**0**	**0**
07:45	08:00	0	0	**0**	2	0	**2**	**2**
08:00	08:15	2	0	**2**	0	0	**0**	**2**
08:15	08:30	6	1	**7**	1	2	**3**	**10**
08:30	08:45	3	0	**3**	0	1	**1**	**4**
08:45	09:00	1	0	**1**	0	0	**0**	**1**
09:00	09:15	3	0	**3**	0	1	**1**	**4**
09:15	09:30	0	0	**0**	0	0	**0**	**0**
09:30	09:45	0	0	**0**	0	3	**3**	**3**
09:45	10:00	1	0	**1**	1	1	**2**	**3**
11:30	11:45	3	0	**3**	0	1	**1**	**4**
11:45	12:00	2	0	**2**	0	0	**0**	**2**
12:00	12:15	4	1	**5**	0	0	**0**	**5**
12:15	12:30	5	0	**5**	0	1	**1**	**6**
12:30	12:45	1	0	**1**	1	0	**1**	**2**
12:45	13:00	1	0	**1**	0	0	**0**	**1**
13:00	13:15	2	0	**2**	0	1	**1**	**3**
13:15	13:30	1	0	**1**	1	0	**1**	**2**
15:00	15:15	3	1	**4**	1	0	**1**	**5**
15:15	15:30	2	0	**2**	0	0	**0**	**2**
15:30	15:45	1	0	**1**	0	1	**1**	**2**
15:45	16:00	4	0	**4**	0	0	**0**	**4**
16:00	16:15	2	0	**2**	1	3	**4**	**6**
16:15	16:30	1	0	**1**	3	0	**3**	**4**
16:30	16:45	2	0	**2**	0	1	**1**	**3**
16:45	17:00	2	0	**2**	0	0	**0**	**2**
17:00	17:15	1	0	**1**	0	0	**0**	**1**
17:15	17:30	3	1	**4**	0	1	**1**	**5**
17:30	17:45	7	0	**7**	3	0	**3**	**10**
17:45	18:00	5	0	**5**	0	1	**1**	**6**
Total	.....	73	4	**77**	14	19	**33**	**110**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

ALBION RD @ JOHNSTON RD

Survey Date: Wednesday, April 18, 2018 **WO No:** 37681

Start Time: 07:00 **Device:** Miovision

Full Study Heavy Vehicles

		ALBION RD									JOHNSTON RD										
		Northbound				Southbound					Eastbound				Westbound						
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	3	0	0		0	0	3		**6**	1	1	0		0	0	0		**2**	**8**
07:15	07:30	0	0	0		0	0	0		**0**	1	1	0		0	1	0		**3**	**3**
07:30	07:45	0	0	2		0	0	0		**2**	0	1	0		2	4	0		**7**	**9**
07:45	08:00	0	0	1		0	0	1		**2**	0	0	0		0	1	0		**1**	**3**
08:00	08:15	0	0	4		0	0	0		**4**	0	1	1		2	3	1		**8**	**12**
08:15	08:30	0	0	0		0	0	0		**0**	0	0	0		0	1	0		**1**	**1**
08:30	08:45	0	1	2		0	1	0		**4**	0	2	0		2	3	0		**7**	**11**
08:45	09:00	0	1	1		0	1	0		**3**	2	3	0		1	4	0		**10**	**13**
09:00	09:15	0	0	0		0	0	0		**0**	3	2	0		1	0	0		**6**	**6**
09:15	09:30	0	0	1		0	0	3		**4**	0	2	0		0	2	1		**5**	**9**
09:30	09:45	0	0	0		0	0	1		**1**	1	1	0		0	1	1		**4**	**5**
09:45	10:00	0	1	0		0	0	1		**2**	0	1	0		1	0	0		**2**	**4**
11:30	11:45	1	0	0		1	0	0		**2**	2	2	0		0	2	0		**6**	**8**
11:45	12:00	0	0	0		1	1	1		**3**	2	0	0		1	1	0		**4**	**7**
12:00	12:15	0	2	5		1	0	1		**9**	2	1	3		2	4	0		**12**	**21**
12:15	12:30	0	0	1		0	2	1		**4**	1	1	1		0	1	0		**4**	**8**
12:30	12:45	0	2	0		0	0	1		**3**	0	0	1		0	3	0		**4**	**7**
12:45	13:00	0	0	0		0	0	1		**1**	3	1	0		0	1	0		**5**	**6**
13:00	13:15	0	0	0		0	1	5		**6**	2	1	0		0	1	1		**5**	**11**
13:15	13:30	0	0	0		0	0	1		**1**	1	3	3		1	1	0		**9**	**11**
15:00	15:15	1	0	1		0	0	0		**2**	4	3	2		1	2	0		**12**	**14**
15:15	15:30	0	0	1		0	1	2		**4**	0	0	0		1	2	0		**3**	**7**
15:30	15:45	0	0	0		0	0	0		**0**	0	1	0		0	1	0		**2**	**2**
15:45	16:00	1	0	1		0	0	0		**2**	1	0	0		1	1	0		**3**	**5**
16:00	16:15	1	0	0		0	0	0		**1**	2	2	0		1	1	0		**6**	**7**
16:15	16:30	0	0	0		0	0	1		**1**	2	0	0		1	2	0		**5**	**6**
16:30	16:45	0	0	1		0	1	2		**4**	1	2	0		1	0	1		**5**	**9**
16:45	17:00	0	0	0		0	0	0		**0**	2	0	0		0	1	1		**4**	**4**
17:00	17:15	0	0	0		0	1	0		**1**	1	2	0		0	2	0		**5**	**6**
17:15	17:30	0	1	0		0	0	1		**2**	0	1	0		1	1	0		**3**	**5**
17:30	17:45	0	0	0		0	1	0		**1**	0	3	0		0	0	0		**3**	**4**
17:45	18:00	0	0	1		0	0	0		**1**	0	0	0		0	1	0		**1**	**2**
Total:	None	7	8	22	**0**	3	10	26	**0**	**76**	34	38	11	**0**	20	48	6	**0**	**157**	**234**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

ALBION RD @ JOHNSTON RD

Survey Date: Wednesday, April 18, 2018 **WO No:** 37681

Start Time: 07:00 **Device:** Miovision

Full Study 15 Minute U-Turn Total

		ALBION RD	JOHNSTON RD			
Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	**0**
07:15	07:30	0	0	0	0	**0**
07:30	07:45	0	0	0	0	**0**
07:45	08:00	0	0	0	0	**0**
08:00	08:15	0	0	0	0	**0**
08:15	08:30	0	0	0	0	**0**
08:30	08:45	0	0	0	0	**0**
08:45	09:00	0	0	0	0	**0**
09:00	09:15	0	0	0	0	**0**
09:15	09:30	0	0	0	0	**0**
09:30	09:45	0	0	0	0	**0**
09:45	10:00	0	0	0	0	**0**
11:30	11:45	0	0	0	0	**0**
11:45	12:00	0	0	0	0	**0**
12:00	12:15	0	0	0	0	**0**
12:15	12:30	0	0	0	0	**0**
12:30	12:45	0	0	0	0	**0**
12:45	13:00	0	0	0	0	**0**
13:00	13:15	0	0	0	0	**0**
13:15	13:30	1	0	0	0	**1**
15:00	15:15	0	0	0	0	**0**
15:15	15:30	0	0	0	0	**0**
15:30	15:45	0	0	0	0	**0**
15:45	16:00	0	0	1	0	**1**
16:00	16:15	0	0	0	0	**0**
16:15	16:30	0	0	0	0	**0**
16:30	16:45	0	0	0	0	**0**
16:45	17:00	0	0	0	0	**0**
17:00	17:15	0	0	0	0	**0**
17:15	17:30	0	0	0	0	**0**
17:30	17:45	0	0	0	0	**0**
17:45	18:00	0	0	0	0	**0**
Total		1	0	1	0	**2**

Appendix C

Synchro Intersection Worksheets – Existing Conditions

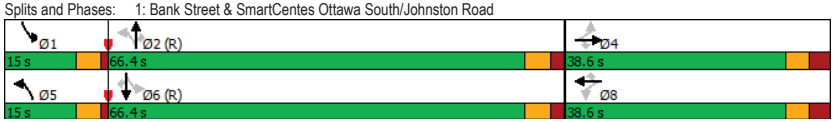
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	31	39	60	117	415	200	1182	60	111	370	32
Future Volume (vph)	57	31	39	60	117	415	200	1182	60	111	370	32
Satd. Flow (prot)	1658	1745	1469	1470	1745	1483	1658	3283	1441	1595	3191	1469
Flt Permitted	0.665			0.735			0.487			0.116		
Satd. Flow (perm)	1109	1745	1421	1114	1745	1385	841	3283	1310	195	3191	1424
Satd. Flow (RTOR)			68			182			75			75
Lane Group Flow (vph)	63	34	43	67	130	461	222	1313	67	123	411	36
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8	9.7	30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	15.0	66.4	66.4	15.0	66.4	66.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	12.5%	55.3%	55.3%	12.5%	55.3%	55.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1	1.0	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8	4.7	5.8	5.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	30.1	30.1	30.1	30.1	30.1	30.1	74.9	64.0	64.0	72.9	63.0	63.0
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.25	0.25	0.62	0.53	0.53	0.61	0.52	0.52
v/c Ratio	0.23	0.08	0.11	0.24	0.30	0.95	0.38	0.75	0.09	0.56	0.25	0.05
Control Delay	37.1	33.6	3.7	37.4	37.7	57.9	10.8	26.1	3.2	20.3	16.6	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.1	33.6	3.7	37.4	37.7	57.9	10.8	26.1	3.2	20.3	16.6	0.3
LOS	D	C	A	D	D	E	B	C	A	C	B	A
Approach Delay		26.0			51.8			23.0			16.4	
Approach LOS		C			D			C			B	
Queue Length 50th (m)	11.6	6.0	0.0	12.4	24.3	68.9	20.2	126.8	0.0	10.5	28.0	0.0
Queue Length 95th (m)	23.7	14.2	4.2	24.8	41.4	#132.3	31.2	158.8	6.1	21.3	38.1	0.7
Internal Link Dist (m)		33.8			732.3			94.0			55.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	295	465	428	297	465	502	598	1750	733	241	1674	782
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.07	0.10	0.23	0.28	0.92	0.37	0.75	0.09	0.51	0.25	0.05

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 45 (38%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95
Intersection Signal Delay: 28.2 — Intersection LOS: C
Intersection Capacity Utilization 89.6% — ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	29
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	162	28	72	510	10	70	28	92	3	4	7
Future Vol, veh/h	17	162	28	72	510	10	70	28	92	3	4	7
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	6	3	4	6	2	10	2	2	8	2	2	14
Mvmt Flow	19	180	31	80	567	11	78	31	102	3	4	8
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.7	40.9	12.3	9.7
HCM LOS	B	E	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	37%	8%	12%	21%
Vol Thru, %	15%	78%	86%	29%
Vol Right, %	48%	14%	2%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	190	207	592	14
LT Vol	70	17	72	3
Through Vol	28	162	510	4
RT Vol	92	28	10	7
Lane Flow Rate	211	230	658	16
Geometry Grp	1	1	1	1
Degree of Util (X)	0.352	0.355	0.928	0.028
Departure Headway (Hd)	5.995	5.563	5.08	6.481
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	597	644	717	549
Service Time	4.048	3.611	3.113	4.559
HCM Lane V/C Ratio	0.353	0.357	0.918	0.029
HCM Control Delay	12.3	11.7	40.9	9.7
HCM Lane LOS	B	B	E	A
HCM 95th-tile Q	1.6	1.6	12.8	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	130	213	85	69	222	48	663	93	337	1201	116
Future Volume (vph)	116	130	213	85	69	222	48	663	93	337	1201	116
Satd. Flow (prot)	1658	1745	1483	1626	1745	1483	1658	3316	1455	1658	3316	1483
Flt Permitted	0.707			0.631			0.073			0.289		
Satd. Flow (perm)	1194	1745	1379	1030	1745	1413	127	3316	1354	498	3316	1413
Satd. Flow (RTOR)			237			247			118			118
Lane Group Flow (vph)	129	144	237	94	77	247	53	737	103	374	1334	129
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		14	2		11 10	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	14	2	2	11 10	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0		10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8		30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	12.0	56.4	56.4		56.4	56.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	10.0%	47.0%	47.0%		47.0%	47.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7		3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8		5.8	5.8
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max		C-Max	C-Max
Act Effct Green (s)	27.7	27.7	27.7	27.7	27.7	27.7	63.6	54.8	54.8	76.3	54.8	54.8
Actuated g/C Ratio	0.23	0.23	0.23	0.23	0.23	0.23	0.53	0.46	0.46	0.64	0.46	0.46
v/c Ratio	0.47	0.36	0.47	0.40	0.19	0.48	0.32	0.49	0.15	0.73	0.88	0.18
Control Delay	44.1	39.7	7.7	42.4	36.0	7.6	18.2	25.4	3.3	19.9	39.3	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.1	39.7	7.7	42.4	36.0	7.6	18.2	25.4	3.3	19.9	39.3	5.4
LOS	D	D	A	D	D	A	B	C	A	B	D	A
Approach Delay		26.0			20.6			22.4			33.0	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	25.1	27.2	0.0	17.9	13.9	0.0	4.3	66.7	0.0	38.1	157.3	1.5
Queue Length 95th (m)	43.6	45.2	19.2	33.6	26.4	19.6	10.7	84.8	8.0	60.6	#205.7	12.9
Internal Link Dist (m)		33.8			732.3			62.8			105.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	318	465	541	274	465	557	166	1513	682	519	1513	709
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.31	0.44	0.34	0.17	0.44	0.32	0.49	0.15	0.72	0.88	0.18

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 105 (88%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated

Lane Group	Ø10	Ø11
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	10	11
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	9.7	9.7
Total Split (s)	12.0	13.0
Total Split (%)	10%	11%
Yellow Time (s)	3.7	3.7
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (m)		
Queue Length 95th (m)		
Internal Link Dist (m)		
Turn Bay Length (m)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

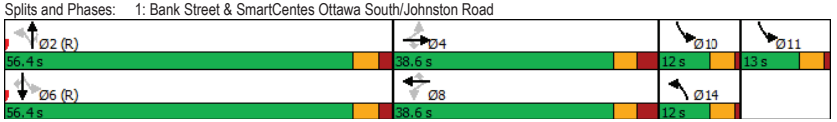
Intersection Summary	

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 28.0	Intersection LOS: C
Intersection Capacity Utilization 91.9%	ICU Level of Service F
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	70.9
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	495	55	101	309	4	37	7	131	13	23	35
Future Vol, veh/h	5	495	55	101	309	4	37	7	131	13	23	35
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	80	2	2	2	2	50	2	14	2	2	9	9
Mvmt Flow	6	550	61	112	343	4	41	8	146	14	26	39
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	129.5	26.4	14.1	12.2
HCM LOS	F	D	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	21%	1%	24%	18%
Vol Thru, %	4%	89%	75%	32%
Vol Right, %	75%	10%	1%	49%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	175	555	414	71
LT Vol	37	5	101	13
Through Vol	7	495	309	23
RT Vol	131	55	4	35
Lane Flow Rate	194	617	460	79
Geometry Grp	1	1	1	1
Degree of Util (X)	0.359	1.195	0.759	0.158
Departure Headway (Hd)	7.122	6.976	6.283	7.787
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	508	518	580	464
Service Time	5.122	5.044	4.283	5.787
HCM Lane V/C Ratio	0.382	1.191	0.793	0.17
HCM Control Delay	14.1	129.5	26.4	12.2
HCM Lane LOS	B	F	D	B
HCM 95th-tile Q	1.6	22.6	6.8	0.6

Appendix D

Signal Warrant Calculation Sheets

Justification 1: Minimum Vehicle Volumes

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☑	FREE FLOW ☐	RESTR. FLOW ☐	7:00	8:00	9:00	10:00	15:00	16:00	17:00	18:00		
1A	480	720	600	900	803	832	577	730	723	843	1,009	1,002		
	COMPLIANCE %				100	100	80	100	100	100	100	100	780	98
1B	120	170	120	170	189	175	138	198	189	203	225	200		
	COMPLIANCE %				100	100	81	100	100	100	100	100	781	98
Restricted Flow					Both 1A and 1B 100% Fulfilled each of 8 hours						Yes ☐		No ☑	
Signal Justification 1:					Lesser of 1A or 1B at least 80% fulfilled each of 8 hours						Yes ☑		No ☐	

Justification 2: Delay to Cross Traffic

Restricted Flow Urban Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☐	RESTR. FLOW ☑	FREE FLOW ☐	RESTR. FLOW ☐	7:00	8:00	9:00	10:00	15:00	16:00	17:00	18:00		
2A	480	720	600	900	614	657	439	532	534	640	784	802		
	COMPLIANCE %				85	91	61	74	74	89	100	100	674	84
2B	50	75	50	75	112	87	65	96	76	84	95	76		
	COMPLIANCE %				100	100	87	100	100	100	100	100	787	98
Restricted Flow					Both 2A and 2B 100% fulfilled each of 8 hours						Yes ☐		No ☑	
Signal Justification 2:					Lesser of 2A or 2B at least 80% fulfilled each of 8 hours						Yes ☑		No ☐	

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	98	%	☐	☑
	B	Crossing Volume	98	%		
2. Delay to Cross Traffic	A	Main Road	84	%	☐	☑
	B	Crossing Road	98	%		

Albion Rd @ Johnston Rd
FB2028

Justification #7

Justification	Description	Minimum Requirement 1 Lane Highway Free Flow	Minimum Requirement 1 Lane Highway Restr. Flow	Minimum Requirement 2 or More Lanes Free Flow	Minimum Requirement 2 or More Lanes Restr. Flow	Compliance Sectional Numerical	Compliance Sectional %	Compliance Entire %	Signal
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	555	77%	66%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	113	66%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	442	61%	53%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	40	53%		

Notes
1. Refer to OTM Book 12, pg 92, Mar 2012
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, AHV = PM/2 or (AM + PM) / 4, including amplifcation factors
4. T-intersection factor corrected, applies only to 1B

Albion Rd @ Johnston Rd
FB2033

Justification #7

Justification	Description	Minimum Requirement 1 Lane Highway		Minimum Requirement 2 or More Lanes		Compliance Sectional		Compliance Entire %	Signal
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	555	77%	66%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	113	66%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	442	61%	53%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	40	53%		

Notes
1. Refer to OTM Book 12, pg 92, Mar 2012
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, AHV = PM/2 or (AM + PM) / 4, including amplifcation factors
4. T-intersection factor corrected, applies only to 1B

Albion Rd @ Johnston Rd
FT2028

Justification #7

Justification	Description	Minimum Requirement 1 Lane Highway		Minimum Requirement 2 or More Lanes		Compliance Sectional		Compliance Entire %	Signal
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	560	78%	67%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	114	67%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	446	62%	55%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	41	55%		

Notes
1. Refer to OTM Book 12, pg 92, Mar 2012
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, AHV = PM/2 or (AM + PM) / 4, including amplifcation factors
4. T-intersection factor corrected, applies only to 1B

Albion Rd @ Johnston Rd
FT2033

Justification #7

Justification	Description	Minimum Requirement 1 Lane Highway		Minimum Requirement 2 or More Lanes		Compliance Sectional		Compliance Entire %	Signal
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	560	78%	67%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	114	67%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	446	62%	55%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	41	55%		

Notes
1. Refer to OTM Book 12, pg 92, Mar 2012
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, AHV = PM/2 or (AM + PM) / 4, including amplifcation factors
4. T-intersection factor corrected, applies only to 1B

Albion Rd @ Johnston Rd
FT2033 - sensitivity

Justification #7

Justification	Description	Minimum Requirement 1 Lane Highway		Minimum Requirement 2 or More Lanes		Compliance Sectional		Compliance Entire %	Signal
		Free Flow	Restr. Flow	Free Flow	Restr. Flow	Numerical	%		
1. Minimum Vehicular Volume	A. Vehicle volume, all approaches (average hour)	480	720	600	900	562	78%	67%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	115	67%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	448	62%	55%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	42	55%		

Notes
1. Refer to OTM Book 12, pg 92, Mar 2012
2. Lowest section percentage governs justification
3. Average hourly volumes estimated from peak hour volumes, AHV = PM/2 or (AM + PM) / 4, including amplifcation factors
4. T-intersection factor corrected, applies only to 1B

Appendix E

Left-turn Warrant Calculation Sheets

Albion Road at Johnston Road

Existing

Design Speed

60 km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM	17	162	28	72	510	10	70	28	92	3	4	7	8.2%	207	592
PM	5	495	55	101	309	4	37	7	131	13	23	35	0.9%	555	414

Future Background 2028

Design Speed

60 km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM	17	162	28	72	510	10	70	28	92	3	4	7	8.2%	207	592
PM	5	495	55	101	309	4	37	7	131	13	23	35	0.9%	555	414

Future Background 2033

Design Speed

60 km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM	17	162	28	72	510	10	70	28	92	3	4	7	8.2%	207	592
PM	5	495	55	101	309	4	37	7	131	13	23	35	0.9%	555	414

Future Total 2028

Design Speed

60 km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM	17	163	29	72	515	10	75	28	92	3	4	7	8.1%	209	597
PM	5	499	59	101	310	4	38	7	131	13	23	35	0.9%	563	415

Future Total 2033

Design Speed

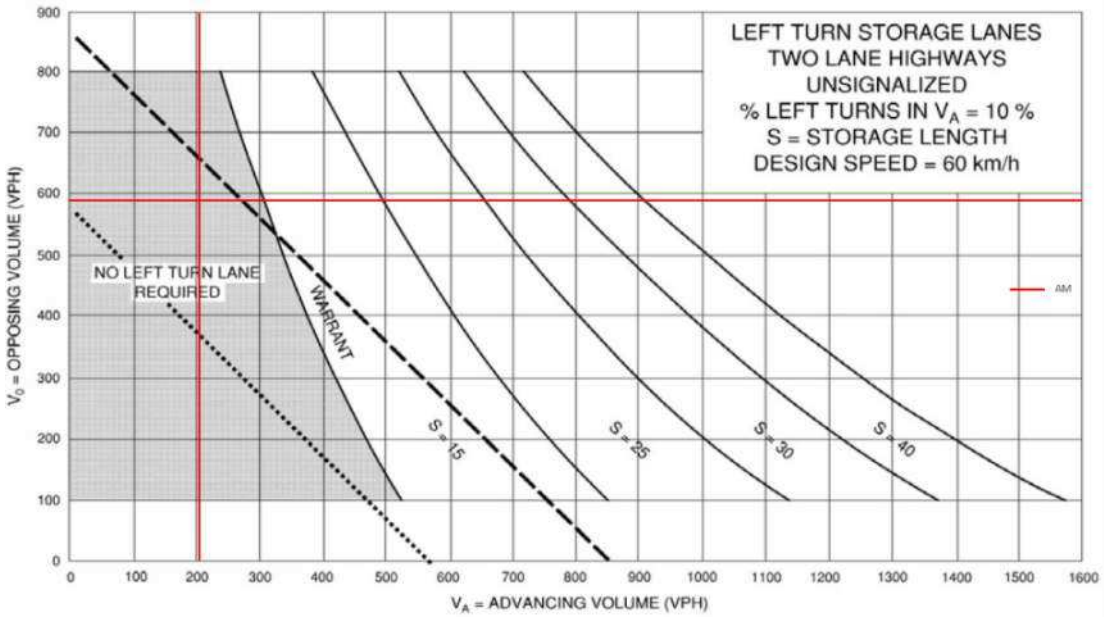
60 km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM	17	163	29	72	515	10	75	28	92	3	4	7	8.1%	209	597
PM	5	499	59	101	310	4	38	7	131	13	23	35	0.9%	563	415

FT2033 - sensitivity

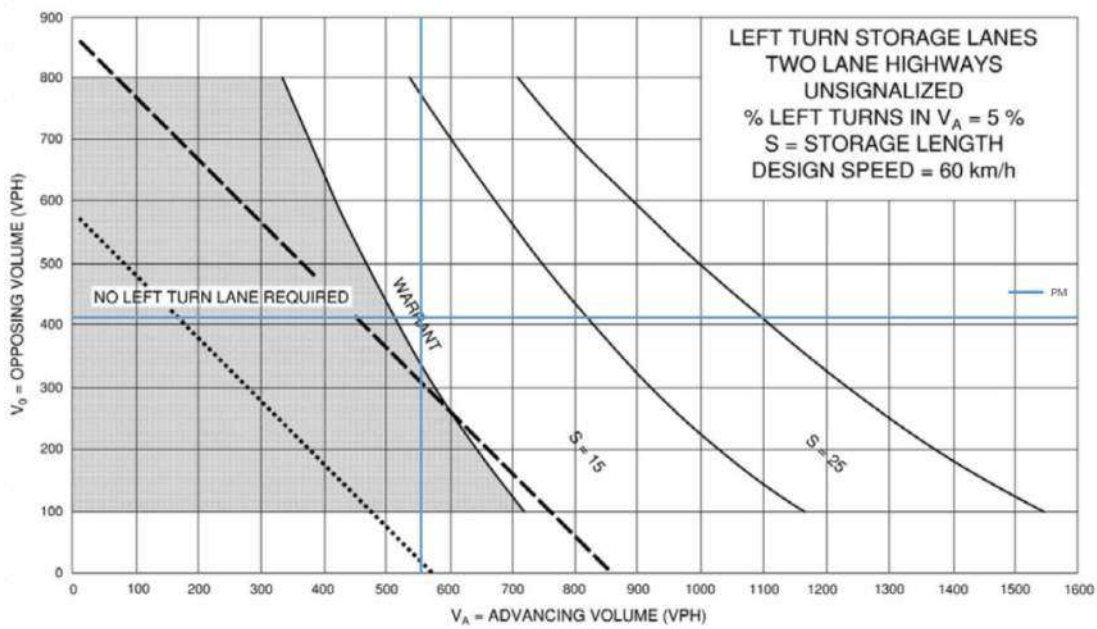
Design Speed

60 km/h	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM	17	163	29	72	517	10	77	28	92	3	4	7	8.1%	209	599
PM	5	501	61	101	310	4	38	7	131	13	23	35	0.9%	567	415

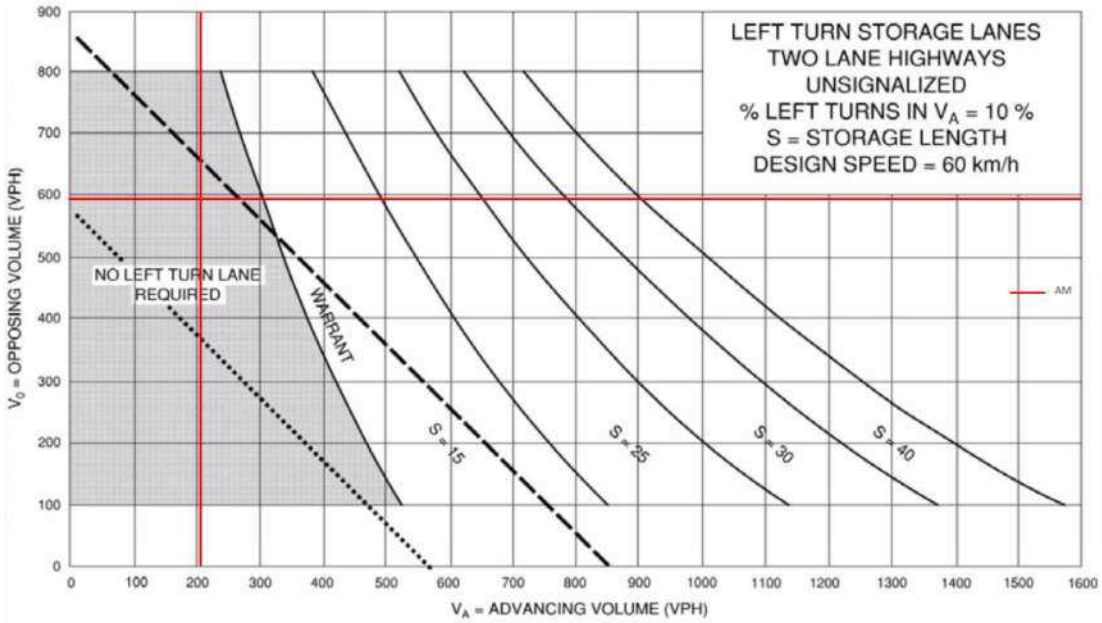
Existing, Future Background 2028, Future Background 2033 - Eastbound Left



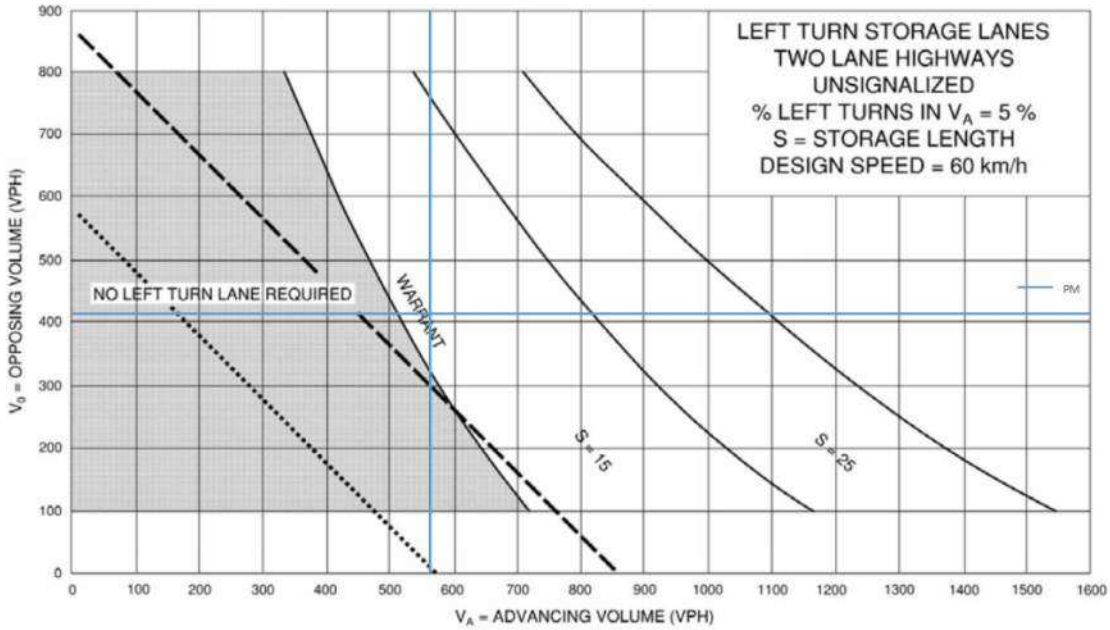
Existing, Future Background 2028, Future Background 2033 - Eastbound Left



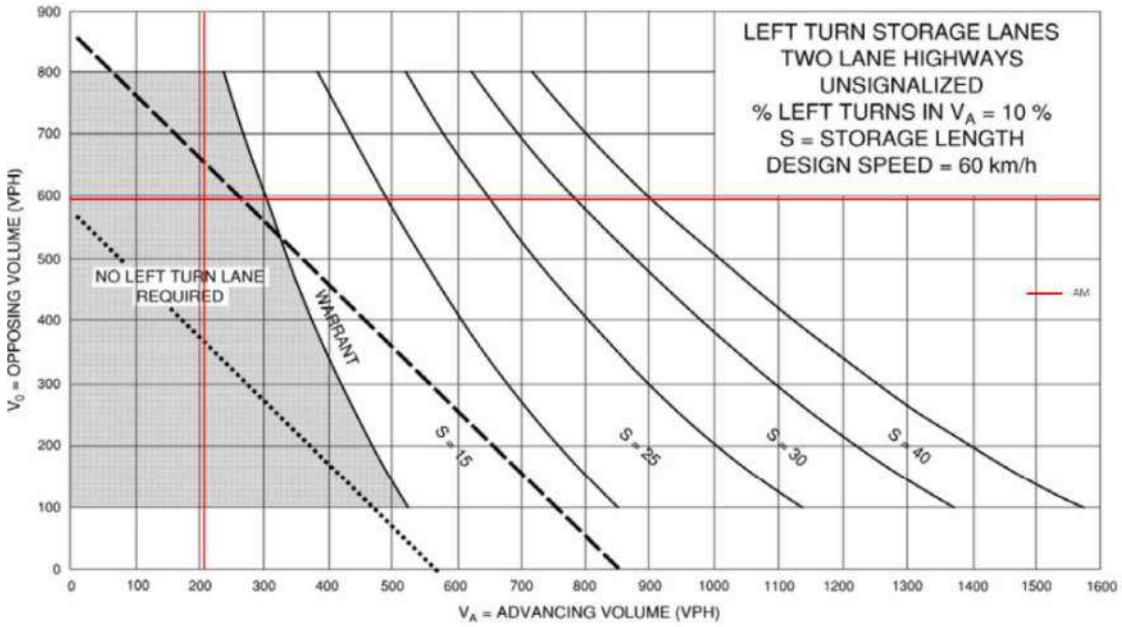
Future Total 2028, Future Total 2033 - Eastbound Left



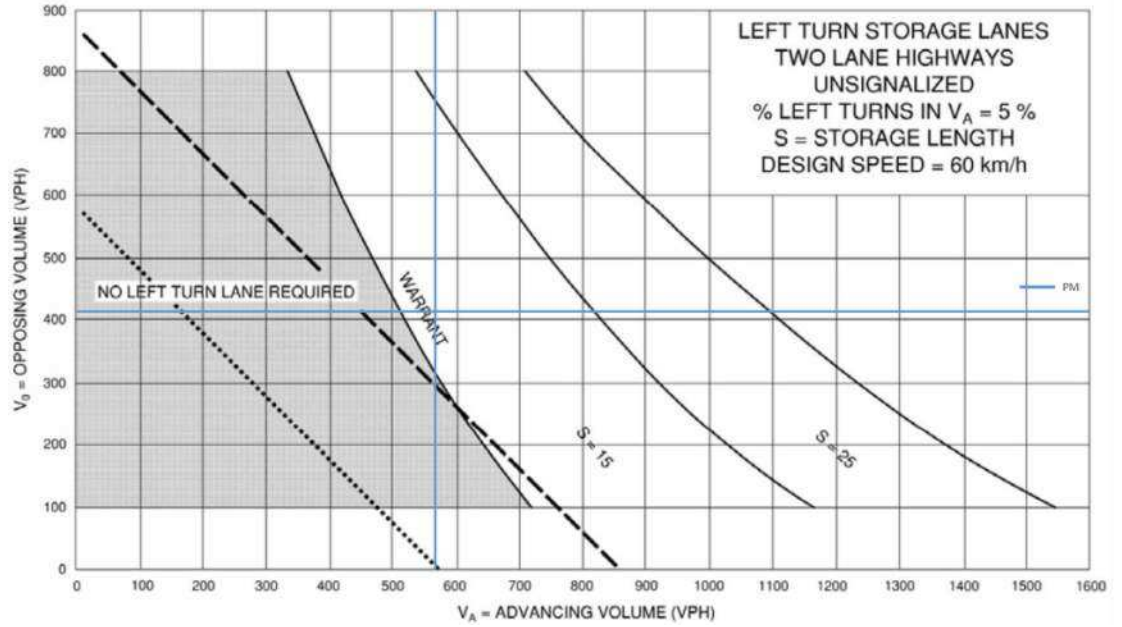
Future Total 2028, Future Total 2033 - Eastbound Left



Future Total 2033 - Sensitivity - Eastbound Left



Future Total 2033 - Sensitivity - Eastbound Left



Access at Johnston Road

Future Total 2028

Design Speed 60 km/h

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM	86	202	0	0	592	10	0	0	0	1	0	12	29.9%	288	602
PM	12	560	0	0	376	1	0	0	0	8	0	73	2.1%	572	377

Future Total 2033

Design Speed 50 km/h

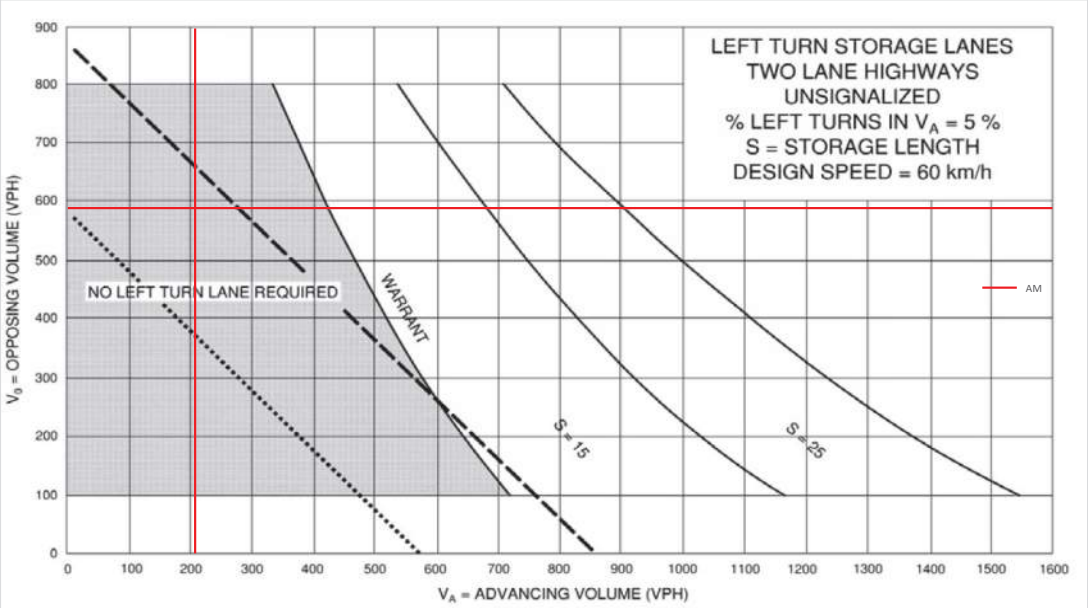
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM	86	202	0	0	592	10	0	0	0	1	0	12	29.9%	288	602
PM	12	560	0	0	376	1	0	0	0	8	0	73	2.1%	572	377

Future Total 2033 - Sensitivity

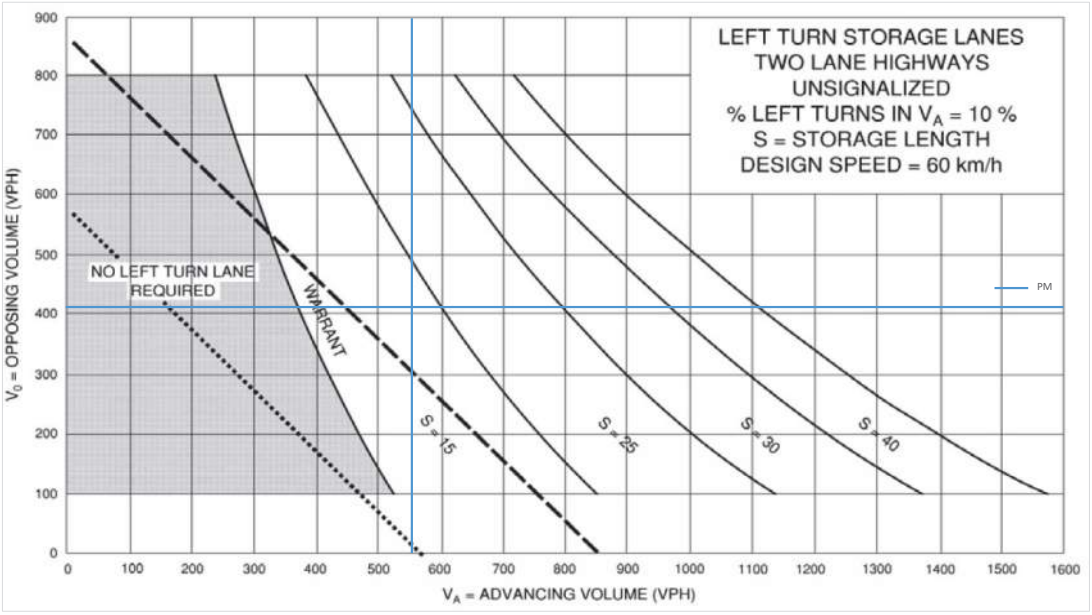
Design Speed 60 km/h

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	%Left Turn	Volume Advancing	Volume Opposing
AM	120	202	0	0	592	13	0	0	0	2	0	16	37.3%	322	605
PM	16	560	0	0	376	2	0	0	0	11	0	103	2.8%	576	378

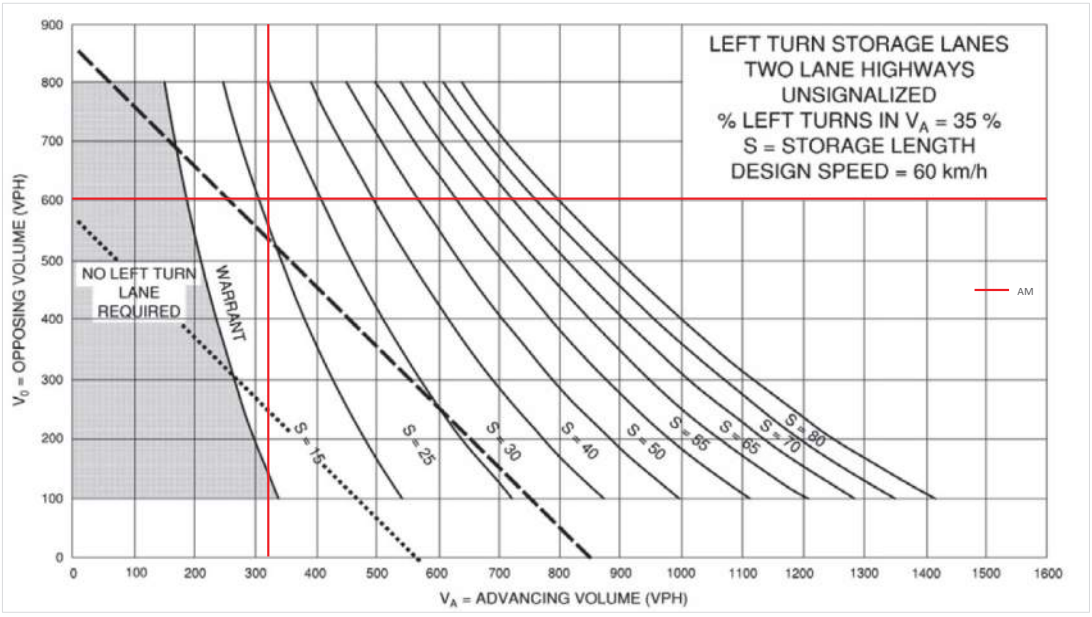
Existing - Eastbound Left



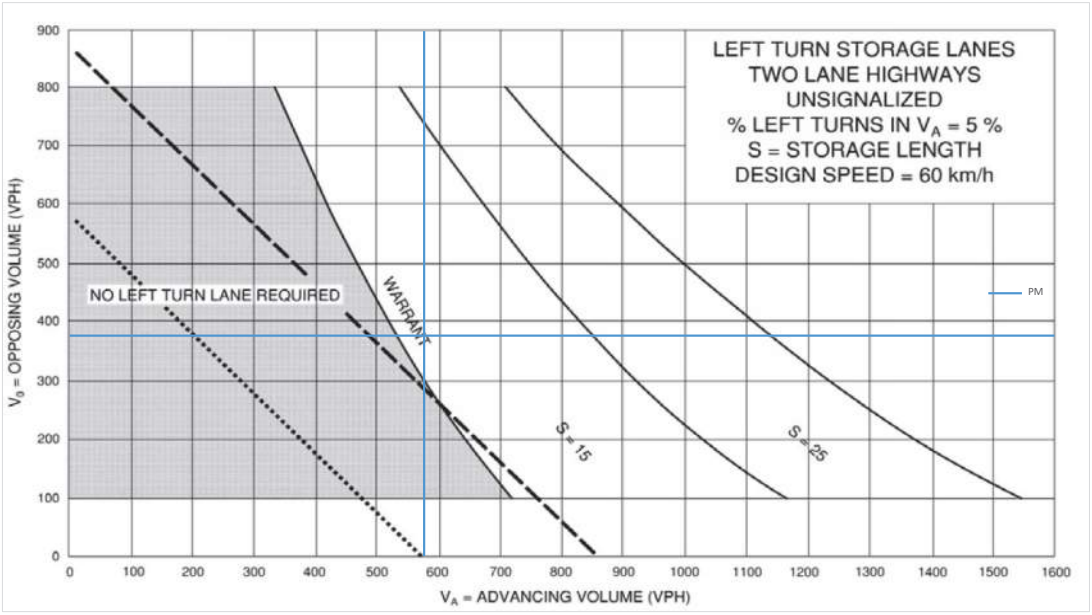
Existing - Eastbound Left



Future Total 2033 - Sensitivity - Eastbound Left



Future Total 2033 - Sensitivity - Eastbound Left



Appendix F

Collision Data

CGH TRANSPORTATION

Accident Date	Accident Year	Accident Time	Location	Environment Condition	Light	Traffic Control	Traffic Control Condition	Classification Of Accident	Initial Impact Type	Road Surface Condition	# Vehicles	# Motorcycles	# Bicycles	# Pedestrians
1/14/2018	2018	10:17	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	05 - Packed snow	0	0	0	0
2/4/2018	2018	18:09	BANK ST @ JOHNSTON RD (0006967)	03 - Snow	07 - Dark	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	03 - Loose snow	0	0	0	0
2/10/2018	2018	8:04	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	02 - Wet	0	0	0	0
2/13/2018	2018	6:36	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	03 - Dawn	01 - Traffic signal	0	03 - P.D. only	07 - SMV other	06 - Ice	0	0	0	0
2/15/2018	2018	16:17	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
3/8/2018	2018	19:00	BANK ST @ JOHNSTON RD (0006967)	03 - Snow	07 - Dark	01 - Traffic signal	0	02 - Non-fatal injury	03 - Rear end	06 - Ice	0	0	0	0
4/11/2018	2018	16:31	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	03 - Rear end	01 - Dry	0	0	0	0
3/27/2018	2018	21:22	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	07 - Dark	01 - Traffic signal	0	03 - P.D. only	04 - Sideswipe	01 - Dry	0	0	0	0
6/1/2018	2018	11:32	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	07 - SMV other	01 - Dry	0	0	0	1
6/28/2018	2018	18:12	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
8/9/2018	2018	21:30	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	07 - Dark	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
8/29/2018	2018	12:48	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	07 - SMV other	01 - Dry	0	0	0	1
10/29/2018	2018	9:39	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	02 - Wet	0	0	0	0
11/30/2018	2018	10:59	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
1/7/2019	2019	17:29	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	05 - Dusk	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
1/29/2019	2019	18:59	BANK ST @ JOHNSTON RD (0006967)	03 - Snow	07 - Dark	01 - Traffic signal	0	02 - Non-fatal injury	07 - SMV other	04 - Slush	0	0	0	0
2/16/2019	2019	14:11	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	03 - Rear end	02 - Wet	0	0	0	0
3/8/2019	2019	15:00	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
4/23/2019	2019	12:55	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
5/29/2019	2019	10:00	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
8/11/2019	2019	13:25	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
8/11/2019	2019	14:50	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	99 - Other	01 - Dry	0	0	0	0
9/9/2019	2019	17:00	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
10/15/2019	2019	7:15	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
11/5/2019	2019	12:45	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
12/1/2019	2019	18:07	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	07 - Dark	01 - Traffic signal	0	03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
11/18/2019	2019	7:44	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	02 - Wet	0	0	0	0
12/21/2019	2019	17:44	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	07 - Dark	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
1/12/2020	2020	14:03	BANK ST @ JOHNSTON RD (0006967)	03 - Snow	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	05 - Turning movement	04 - Slush	0	0	0	0
2/11/2020	2020	14:39	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
3/2/2020	2020	8:48	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2/29/2020	2020	22:20	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	07 - Dark	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
5/19/2020	2020	9:22	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
8/13/2020	2020	17:29	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	03 - Rear end	01 - Dry	0	0	0	0
12/15/2020	2020	16:24	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	05 - Dusk	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	02 - Wet	0	0	0	0
11/22/2020	2020	18:45	BANK ST @ JOHNSTON RD (0006967)	03 - Snow	07 - Dark	01 - Traffic signal	0	03 - P.D. only	07 - SMV other	05 - Packed snow	0	0	0	0
1/1/2021	2021	5:52	BANK ST @ JOHNSTON RD (0006967)	07 - Fog, mist, smoke, dust	07 - Dark	01 - Traffic signal	0	03 - P.D. only	07 - SMV other	02 - Wet	0	0	0	0
9/10/2021	2021	18:37	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
9/10/2021	2021	16:05	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
1/3/2022	2022	14:48	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	07 - SMV other	01 - Dry	0	0	0	1
1/14/2022	2022	15:19	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	07 - SMV other	01 - Dry	0	0	0	1
2/19/2022	2022	2:39	BANK ST @ JOHNSTON RD (0006967)	03 - Snow	07 - Dark	01 - Traffic signal	0	03 - P.D. only	07 - SMV other	03 - Loose snow	0	0	0	0
3/4/2022	2022	12:27	BANK ST @ JOHNSTON RD (0006967)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	05 - Turning movement	01 - Dry	0	0	0	0
8/4/2022	2022	12:13	BANK ST @ JOHNSTON RD (0006967)	02 - Rain	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	05 - Turning movement	02 - Wet	0	0	0	0
2/13/2019	2019	20:16	ALBION RD @ JOHNSTON RD (0006883)	03 - Snow	07 - Dark	02 - Stop sign	0	03 - P.D. only	03 - Rear end	05 - Packed snow	0	0	0	0
4/17/2019	2019	18:00	ALBION RD @ JOHNSTON RD (0006883)	01 - Clear	01 - Daylight	02 - Stop sign	0	03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
12/9/2020	2020	16:43	ALBION RD @ JOHNSTON RD (0006883)	03 - Snow	05 - Dusk	02 - Stop sign	0	03 - P.D. only	02 - Angle	04 - Slush	0	0	0	0
2/15/2022	2022	16:58	ALBION RD @ JOHNSTON RD (0006883)	01 - Clear	01 - Daylight	02 - Stop sign	0	03 - P.D. only	02 - Angle	04 - Slush	0	0	0	0
12/24/2018	2018	9:58	JOHNSTON RD @ SOUTHGATE RD (0007060)	03 - Snow	01 - Daylight	02 - Stop sign	0	03 - P.D. only	05 - Turning movement	02 - Wet	0	0	0	0
5/7/2018	2018	10:54	JOHNSTON RD @ BANK PL (0006886)	01 - Clear	01 - Daylight	02 - Stop sign	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
9/5/2019	2019	16:20	JOHNSTON RD @ BANK PL (0006886)	01 - Clear	01 - Daylight	02 - Stop sign	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
8/23/2021	2021	15:02	JOHNSTON RD @ BANK PL (0006886)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
5/14/2021	2021	16:25	JOHNSTON RD btwn ALBION RD S & SOUTHGATE RD (__3ZA9FX)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
11/14/2019	2019	16:30	JOHNSTON RD btwn BANK PL & SOUTHGATE RD (__3ZA9FK)	03 - Snow	05 - Dusk	10 - No control	0	03 - P.D. only	01 - Approaching	03 - Loose snow	0	0	0	0
4/29/2020	2020	10:40	JOHNSTON RD btwn BANK PL & SOUTHGATE RD (__3ZA9FK)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	99 - Other	01 - Dry	0	0	0	0
7/28/2021	2021	13:37	JOHNSTON RD btwn BANK PL & SOUTHGATE RD (__3ZA9FK)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2017 **To:** December 31, 2021

Location: BANK ST @ JOHNSTON RD

Traffic Control: Traffic signal **Total Collisions:** 60

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-Jan-05, Thu,16:30	Clear	Rear end	P.D. only	Ice	North	Slowing or stopping	Pick-up truck	Skidding/sliding	0
					North	Turning left	Automobile, station wagon	Other motor vehicle	
2017-Jan-27, Fri,16:35	Clear	Other	P.D. only	Dry	East	Reversing	Automobile, station wagon	Other motor vehicle	0
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2017-Jan-31, Tue,18:02	Clear	SMV other	Non-fatal injury	Dry	South	Turning left	Delivery van	Pedestrian	1
2017-Mar-06, Mon,18:16	Freezing Rain	Turning movement	Non-fatal injury	Ice	North	Turning left	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Passenger van	Other motor vehicle	
2017-Mar-09, Thu,16:12	Clear	Rear end	P.D. only	Dry	West	Unknown	Unknown	Other motor vehicle	0
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2017-Apr-29, Sat,17:22	Clear	Angle	Non-fatal injury	Dry	East	Going ahead	Pick-up truck	Other motor vehicle	0
					North	Going ahead	Pick-up truck	Other motor vehicle	
					West	Turning left	Automobile, station wagon	Other motor vehicle	
2017-Jun-21, Wed,11:29	Clear	Turning movement	Non-fatal injury	Dry	South	Turning left	Pick-up truck	Other motor vehicle	0
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Aug-17, Thu,20:34	Clear	Turning movement	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	0
					South	Turning left	Automobile, station wagon	Other motor vehicle	
2017-Oct-11, Wed,17:19	Clear	Rear end	P.D. only	Dry	East	Unknown	Unknown	Other motor vehicle	0
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2017-Oct-31, Tue,09:35	Clear	SMV other	Non-fatal injury	Dry	West	Turning right	Automobile, station wagon	Pole (utility, power)	0
2017-Nov-18, Sat,11:35	Freezing Rain	Sideswipe	P.D. only	Ice	North	Going ahead	Pick-up truck	Other motor vehicle	0
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Nov-24, Fri,09:51	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle	0
					North	Stopped	Pick-up truck	Other motor vehicle	

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2017 **To:** December 31, 2021

Location: BANK ST @ JOHNSTON RD

Traffic Control: Traffic signal **Total Collisions:** 60

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-Nov-24, Fri,17:21	Clear	Turning movement	P.D. only	Dry	South	Going ahead	Pick-up truck	Other motor vehicle	0
					North	Turning left	Pick-up truck	Other motor vehicle	
2017-Dec-03, Sun,18:05	Clear	Turning movement	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Dec-21, Thu,10:29	Clear	Rear end	Non-fatal injury	Dry	West	Turning right	Automobile, station wagon	Other motor vehicle	0
					West	Turning right	Automobile, station wagon	Other motor vehicle	
2018-Jan-14, Sun,10:17	Clear	Rear end	P.D. only	Packed snow	East	Turning left	Automobile, station wagon	Other motor vehicle	0
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2018-Feb-04, Sun,18:09	Snow	Rear end	P.D. only	Loose snow	South	Slowing or stopping	Automobile, station wagon	Skidding/sliding	0
					South	Stopped	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Feb-10, Sat,08:04	Clear	Rear end	P.D. only	Wet	North	Going ahead	Automobile, station wagon	Other motor vehicle	0
					North	Turning left	Pick-up truck	Other motor vehicle	
2018-Feb-13, Tue,06:36	Clear	SMV other	P.D. only	Ice	West	Turning right	Passenger van	Curb	0
2018-Feb-15, Thu,16:17	Clear	Turning movement	P.D. only	Dry	West	Turning left	Truck - tractor	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Mar-08, Thu,19:00	Snow	Rear end	Non-fatal injury	Ice	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	0
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
2018-Mar-27, Tue,21:22	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Unknown	Other motor vehicle	0
					West	Changing lanes	Automobile, station wagon	Other motor vehicle	
2018-Apr-11, Wed,16:31	Clear	Rear end	Non-fatal injury	Dry	West	Turning right	Automobile, station wagon	Other motor vehicle	0
					West	Turning right	Automobile, station wagon	Other motor vehicle	
2018-Jun-01, Fri,11:32	Clear	SMV other	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Pedestrian	1

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2017 **To:** December 31, 2021

Location: BANK ST @ JOHNSTON RD

Traffic Control: Traffic signal **Total Collisions:** 60

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Jun-28, Thu,18:12	Clear	Turning movement	P.D. only	Dry	South	Making "U" turn	Passenger van	Other motor vehicle	0
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Aug-09, Thu,21:30	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	0
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2018-Aug-29, Wed,12:48	Clear	SMV other	Non-fatal injury	Dry	West	Turning left	Pick-up truck	Pedestrian	1
2018-Oct-29, Mon,09:39	Clear	Rear end	P.D. only	Wet	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2018-Nov-30, Fri,10:59	Clear	Angle	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2019-Jan-07, Mon,17:29	Clear	Turning movement	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	0
					North	Turning right	Automobile, station wagon	Other motor vehicle	
2019-Jan-29, Tue,18:59	Snow	SMV other	Non-fatal injury	Slush	North	Going ahead	Automobile, station wagon	Skidding/sliding	0
2019-Feb-16, Sat,14:11	Clear	Rear end	Non-fatal injury	Wet	West	Turning right	Automobile, station wagon	Other motor vehicle	0
					West	Turning right	Automobile, station wagon	Other motor vehicle	
2019-Mar-08, Fri,15:00	Clear	Turning movement	P.D. only	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2019-Apr-23, Tue,12:55	Clear	Rear end	P.D. only	Dry	South	Going ahead	Pick-up truck	Other motor vehicle	0
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2019-May-29, Wed,10:00	Clear	Rear end	P.D. only	Dry	North	Unknown	Unknown	Other motor vehicle	0
					North	Stopped	Automobile, station wagon	Other motor vehicle	
2019-Aug-11, Sun,13:25	Clear	Rear end	P.D. only	Dry	West	Turning right	Automobile, station wagon	Other motor vehicle	0
					West	Turning right	Automobile, station wagon	Other motor vehicle	
2019-Aug-11, Sun,14:50	Clear	Other	P.D. only	Dry	South	Reversing	Tow truck	Other motor vehicle	0
					North	Stopped	Automobile, station wagon	Other motor vehicle	

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2017 **To:** December 31, 2021

Location: BANK ST @ JOHNSTON RD

Traffic Control: Traffic signal **Total Collisions:** 60

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2019-Sep-09, Mon,17:00	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle	0
					East	Turning right	Automobile, station wagon	Other motor vehicle	
2019-Oct-15, Tue,07:15	Clear	Rear end	P.D. only	Dry	North	Going ahead	Truck and trailer	Other motor vehicle	0
					North	Stopped	Automobile, station wagon	Other motor vehicle	
2019-Nov-05, Tue,12:45	Clear	Turning movement	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2019-Nov-18, Mon,07:44	Clear	Rear end	P.D. only	Wet	West	Turning right	Automobile, station wagon	Other motor vehicle	0
					West	Stopped	Unknown	Other motor vehicle	
2019-Dec-01, Sun,18:07	Clear	Angle	P.D. only	Dry	West	Turning right	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Unknown	Other motor vehicle	
2019-Dec-21, Sat,17:44	Clear	Rear end	P.D. only	Dry	West	Turning right	Automobile, station wagon	Other motor vehicle	0
					West	Turning right	Automobile, station wagon	Other motor vehicle	
2020-Jan-12, Sun,14:03	Snow	Turning movement	Non-fatal injury	Slush	North	Turning left	Automobile, station wagon	Other motor vehicle	0
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2020-Feb-11, Tue,14:39	Clear	Rear end	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	0
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2020-Feb-29, Sat,22:20	Clear	Turning movement	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2020-Mar-02, Mon,08:48	Clear	Rear end	P.D. only	Dry	West	Turning right	Police vehicle	Other motor vehicle	0
					West	Turning right	Automobile, station wagon	Other motor vehicle	
2020-May-19, Tue,09:22	Clear	Turning movement	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2020-Aug-13, Thu,17:29	Clear	Rear end	Non-fatal injury	Dry	North	Slowing or stopping	Pick-up truck	Other motor vehicle	0
					North	Stopped	Automobile, station wagon	Other motor vehicle	

Transportation Services - Traffic Services

Collision Details Report - Public Version

From: January 1, 2017 **To:** December 31, 2021

Location: BANK ST @ JOHNSTON RD

Traffic Control: Traffic signal **Total Collisions:** 60

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2020-Nov-22, Sun,18:45	Snow	SMV other	P.D. only	Packed snow	East	Going ahead	Automobile, station wagon	Steel guide rail	0
2020-Dec-15, Tue,16:24	Clear	Turning movement	P.D. only	Wet	South	Turning left	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Pick-up truck	Other motor vehicle	
					West	Stopped	Pick-up truck	Other motor vehicle	
2021-Jan-01, Fri,05:52	Fog, mist, smoke, dust	SMV other	P.D. only	Wet	West	Going ahead	Automobile, station wagon	Ran off road	0
2021-Sep-10, Fri,16:05	Clear	Rear end	P.D. only	Dry	South	Changing lanes	Automobile, station wagon	Other motor vehicle	0
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
2021-Sep-10, Fri,18:37	Clear	Rear end	P.D. only	Dry	South	Going ahead	Municipal transit bus	Other motor vehicle	0
					South	Stopped	Pick-up truck	Other motor vehicle	
2022-Jan-03, Mon,14:48	Clear	SMV other	Non-fatal injury	Dry	West	Turning left	Automobile, station wagon	Pedestrian	1
2022-Jan-14, Fri,15:19	Clear	SMV other	Non-fatal injury	Dry	West	Turning left	Pick-up truck	Pedestrian	1
2022-Feb-19, Sat,02:39	Snow	SMV other	P.D. only	Loose snow	North	Going ahead	Automobile, station wagon	Skidding/sliding	0
2022-Mar-04, Fri,12:27	Clear	Turning movement	Non-fatal injury	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Pick-up truck	Other motor vehicle	
2022-Aug-04, Thu,12:13	Rain	Turning movement	Non-fatal injury	Wet	South	Turning left	Automobile, station wagon	Other motor vehicle	0
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2022-Oct-29, Sat,15:22	Clear	Angle	P.D. only	Dry	South	Turning right	Automobile, station wagon	Other motor vehicle	0
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Appendix G

TRANS Model Plots

CGH TRANSPORTATION

TRANS Regional Model

Version 2.15 - Assigned June 16, 2020

AM Peak Hour Total Traffic Volume

2059 Artistic Place

2011 Model - Basecase

N/A

User Initials: TIMW
Plot Prepared: Dec, 2022
EMME Scenario: 21713

TRANS

Legend

AM Peak Hour Total Traffic Volume

1000 2000 3000 4000 5000

N

Distance (m)

200 400 600 800 1000

TRANS Regional Model

Version 2.15 - Assigned June 16, 2020

AM Peak Hour Total Traffic Volume

2059 Artistic Place

2031 Model - Basecase

N/A

User Initials: TIMW
Plot Prepared: Dec, 2022
EMME Scenario: 21715

TRANS

Legend

AM Peak Hour Total Traffic Volume

1000 2000 3000 4000 5000

N

Distance (m)

200 400 600 800 1000

The TRANS model is continuously refined & maintained, and all information is provided in good faith. However, model outputs are provided "as is", and no warranty or guarantee is provided as to the accuracy, reliability or reasonableness of the results. In using this data, you agree to accept any and all risks arising from any incorrect, incomplete, or misleading information.

Recipients are required to use caution and professional judgement in using and interpreting model outputs. In particular, caution should be used when focusing on a geographically limited area (such as a single road or intersection), as the model is primarily designed to simulate regional-scale phenomena and has been calibrated at a regional level.

As general good practice, it is recommended that the user confirm the network coding within the area of interest, and compare base year forecasts against traffic count data to assess the extent to which the model may be over- or under-estimating the travel demand.

Appendix H

Background Development Volumes

CGH TRANSPORTATION

- Traffic to/from the south:
  - Arriving traffic will use either Riverside Dr or Prince of Wales Dr, travel east on Hunt Club Rd and make a U-turn at the Bank/Hunt Club intersection.
  - Departing traffic will travel west on Hunt Club Rd and use either Riverside Dr or Prince of Wales Dr to travel south.
- Traffic to/from the east:
  - Arriving traffic will be traveling west on Hunt Club Rd.
  - Departing traffic make a U-turn at Dazé/Hunt Club/Bridle Path intersection and travel east on Hunt Club Rd.
- Traffic to/from the west:
  - Arriving traffic will be travelling east on Hunt Club Rd, then make a U-turn at the Bank/Hunt Club intersection.
  - Departing traffic will travel west on Hunt Club Rd.

Figure 12: 2022 Site-Generated Traffic

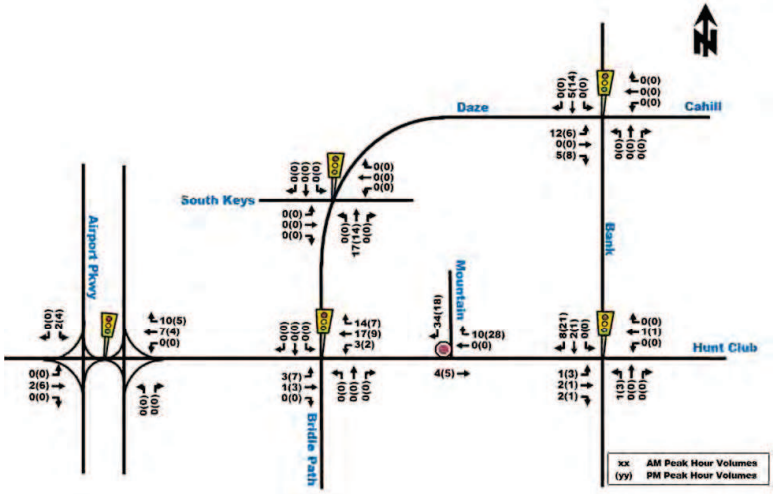
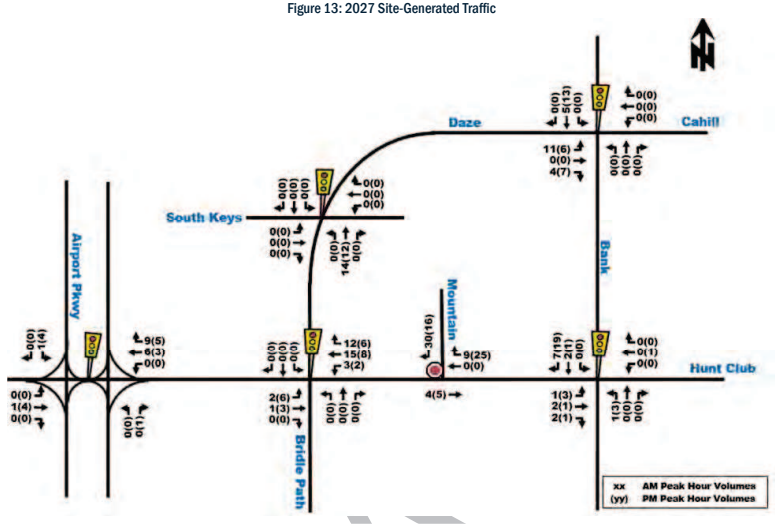
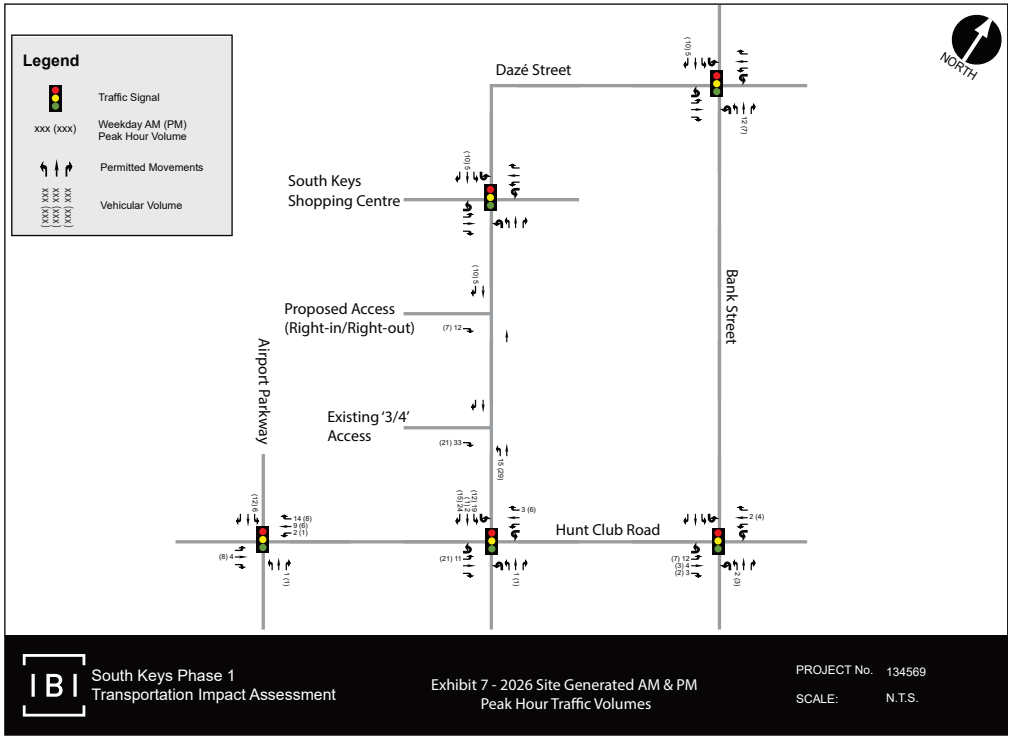


Figure 13: 2027 Site-Generated Traffic

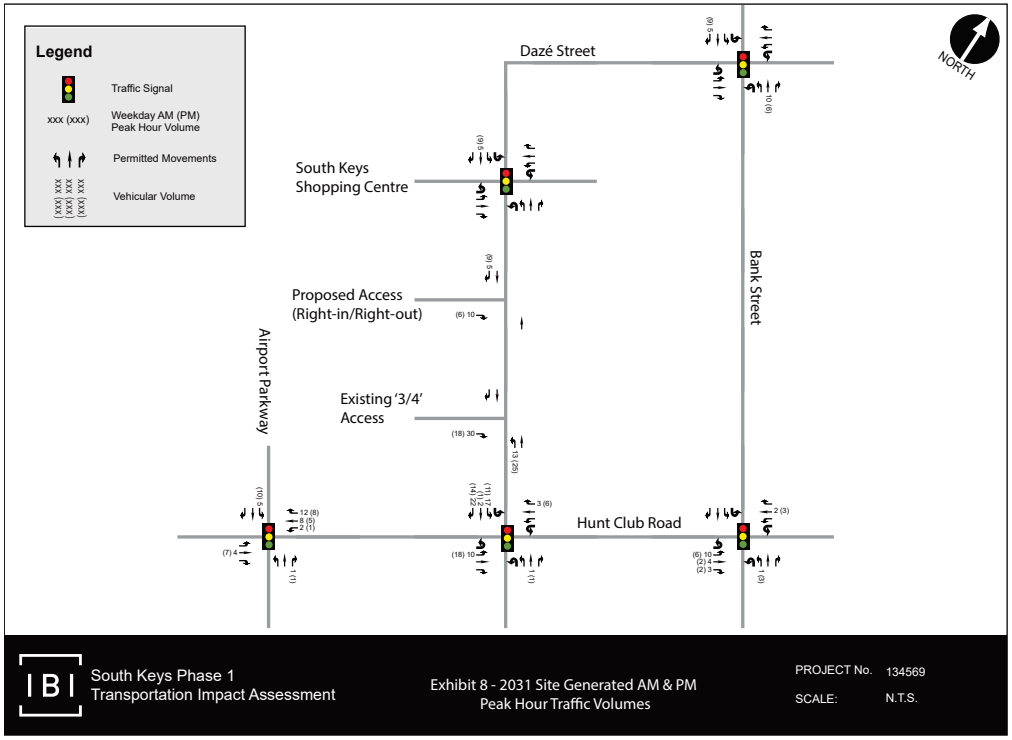




South Keys Phase 1
Transportation Impact Assessment

Exhibit 7 - 2026 Site Generated AM & PM
Peak Hour Traffic Volumes

PROJECT No. 134569
SCALE: N.T.S.



South Keys Phase 1
Transportation Impact Assessment

Exhibit 8 - 2031 Site Generated AM & PM
Peak Hour Traffic Volumes

PROJECT No. 134569
SCALE: N.T.S.

Appendix I

Synchro Intersection Worksheets – 2028 Future Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	31	39	60	117	415	200	1205	60	111	380	32
Future Volume (vph)	57	31	39	60	117	415	200	1205	60	111	380	32
Satd. Flow (prot)	1658	1745	1469	1470	1745	1483	1658	3283	1441	1595	3191	1469
Flt Permitted	0.682			0.737			0.509			0.152		
Satd. Flow (perm)	1137	1745	1421	1117	1745	1385	879	3283	1310	255	3191	1424
Satd. Flow (RTOR)			68			190			75			75
Lane Group Flow (vph)	57	31	39	60	117	415	200	1205	60	111	380	32
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8	9.7	30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	15.0	66.4	66.4	15.0	66.4	66.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	12.5%	55.3%	55.3%	12.5%	55.3%	55.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1	1.0	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8	4.7	5.8	5.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	28.6	28.6	28.6	28.6	28.6	28.6	76.5	65.8	65.8	74.3	64.7	64.7
Actuated g/C Ratio	0.24	0.24	0.24	0.24	0.24	0.24	0.64	0.55	0.55	0.62	0.54	0.54
v/c Ratio	0.21	0.07	0.10	0.23	0.28	0.88	0.32	0.67	0.08	0.44	0.22	0.04
Control Delay	36.7	33.6	2.9	37.1	37.8	43.0	9.9	23.0	2.5	14.0	15.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.7	33.6	2.9	37.1	37.8	43.0	9.9	23.0	2.5	14.0	15.9	0.1
LOS	D	C	A	D	D	D	A	C	A	B	B	A
Approach Delay		25.6			41.4			20.3			14.6	
Approach LOS		C			D			C			B	
Queue Length 50th (m)	10.4	5.5	0.0	11.0	21.7	52.3	17.9	109.7	0.0	9.4	25.6	0.0
Queue Length 95th (m)	21.7	13.2	3.2	22.6	37.6	#104.5	28.1	138.7	4.9	16.5	35.2	0.0
Internal Link Dist (m)		33.8			732.3			94.0			55.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	303	465	428	297	465	508	632	1801	752	277	1721	802
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.07	0.09	0.20	0.25	0.82	0.32	0.67	0.08	0.40	0.22	0.04

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 45 (38%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

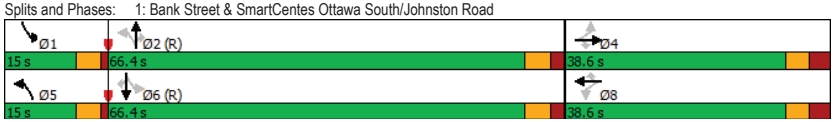
Lanes, Volumes, Timings
1: Bank Street & SmartCentes Ottawa South/Johnston Road
2028 Future Background
AM Peak Hour

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 24.1	Intersection LOS: C
Intersection Capacity Utilization 90.3%	ICU Level of Service E
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	19.8
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	162	28	72	510	10	70	28	92	3	4	7
Future Vol, veh/h	17	162	28	72	510	10	70	28	92	3	4	7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	6	3	4	6	2	10	2	2	8	2	2	14
Mvmt Flow	17	162	28	72	510	10	70	28	92	3	4	7
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.7	25.9	11.3	9.3
HCM LOS	B	D	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	37%	8%	12%	21%
Vol Thru, %	15%	78%	86%	29%
Vol Right, %	48%	14%	2%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	190	207	592	14
LT Vol	70	17	72	3
Through Vol	28	162	510	4
RT Vol	92	28	10	7
Lane Flow Rate	190	207	592	14
Geometry Grp	1	1	1	1
Degree of Util (X)	0.303	0.307	0.815	0.024
Departure Headway (Hd)	5.732	5.337	4.955	6.111
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	625	673	734	584
Service Time	3.778	3.374	2.955	4.171
HCM Lane V/C Ratio	0.304	0.308	0.807	0.024
HCM Control Delay	11.3	10.7	25.9	9.3
HCM Lane LOS	B	B	D	A
HCM 95th-tile Q	1.3	1.3	8.7	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	130	213	85	69	222	48	676	93	337	1224	116
Future Volume (vph)	116	130	213	85	69	222	48	676	93	337	1224	116
Satd. Flow (prot)	1658	1745	1483	1626	1745	1483	1658	3316	1455	1658	3316	1483
Flt Permitted	0.712			0.659			0.104			0.322		
Satd. Flow (perm)	1202	1745	1379	1074	1745	1413	181	3316	1354	553	3316	1413
Satd. Flow (RTOR)			213			222			118			118
Lane Group Flow (vph)	116	130	213	85	69	222	48	676	93	337	1224	116
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		14	2		11 10	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	14	2	2	11 10	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0		10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8		30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	12.0	56.4	56.4		56.4	56.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	10.0%	47.0%	47.0%		47.0%	47.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7		3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8		5.8	5.8
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max		C-Max	C-Max
Act Effct Green (s)	27.6	27.6	27.6	27.6	27.6	27.6	63.9	55.2	55.2	76.4	55.2	55.2
Actuated g/C Ratio	0.23	0.23	0.23	0.23	0.23	0.23	0.53	0.46	0.46	0.64	0.46	0.46
v/c Ratio	0.42	0.32	0.44	0.34	0.17	0.45	0.25	0.44	0.14	0.63	0.80	0.16
Control Delay	42.5	39.0	7.7	40.6	35.6	7.6	13.6	24.5	2.5	15.0	34.3	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.5	39.0	7.7	40.6	35.6	7.6	13.6	24.5	2.5	15.0	34.3	4.2
LOS	D	D	A	D	D	A	B	C	A	B	C	A
Approach Delay		25.3			20.2			21.3			28.4	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	22.2	24.3	0.0	16.0	12.5	0.0	3.9	59.8	0.0	33.3	136.7	0.0
Queue Length 95th (m)	39.6	41.4	18.2	30.4	24.3	18.3	8.3	76.6	6.1	49.0	167.6	10.5
Internal Link Dist (m)		33.8			732.3			62.8			105.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	320	465	523	286	465	539	189	1526	687	543	1526	714
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.28	0.41	0.30	0.15	0.41	0.25	0.44	0.14	0.62	0.80	0.16

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 105 (88%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

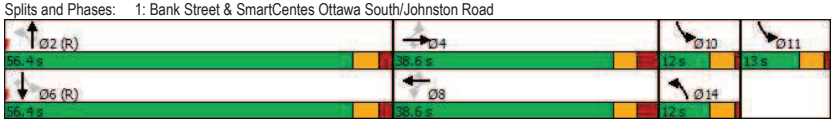
Lane Group	Ø10	Ø11
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	10	11
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	9.7	9.7
Total Split (s)	12.0	13.0
Total Split (%)	10%	11%
Yellow Time (s)	3.7	3.7
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (m)		
Queue Length 95th (m)		
Internal Link Dist (m)		
Turn Bay Length (m)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary	

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 25.3	Intersection LOS: C
Intersection Capacity Utilization 91.9%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	44
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	495	55	101	309	4	37	7	131	13	23	35
Future Vol, veh/h	5	495	55	101	309	4	37	7	131	13	23	35
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	80	2	2	2	2	50	2	14	2	2	9	9
Mvmt Flow	5	495	55	101	309	4	37	7	131	13	23	35
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	75.5	20.5	12.8	11.4
HCM LOS	F	C	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	21%	1%	24%	18%
Vol Thru, %	4%	89%	75%	32%
Vol Right, %	75%	10%	1%	49%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	175	555	414	71
LT Vol	37	5	101	13
Through Vol	7	495	309	23
RT Vol	131	55	4	35
Lane Flow Rate	175	555	414	71
Geometry Grp	1	1	1	1
Degree of Util (X)	0.32	1.038	0.675	0.14
Departure Headway (Hd)	6.705	6.734	5.967	7.262
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	539	538	609	497
Service Time	4.705	4.82	3.967	5.262
HCM Lane V/C Ratio	0.325	1.032	0.68	0.143
HCM Control Delay	12.8	75.5	20.5	11.4
HCM Lane LOS	B	F	C	B
HCM 95th-tile Q	1.4	15.6	5.1	0.5

Appendix J

Synchro Intersection Worksheets – 2033 Future Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	31	39	60	117	415	200	1203	60	111	380	32
Future Volume (vph)	57	31	39	60	117	415	200	1203	60	111	380	32
Satd. Flow (prot)	1658	1745	1469	1470	1745	1483	1658	3283	1441	1595	3191	1469
Flt Permitted	0.682			0.737			0.509			0.153		
Satd. Flow (perm)	1137	1745	1421	1117	1745	1385	879	3283	1310	257	3191	1424
Satd. Flow (RTOR)			68			191			75			75
Lane Group Flow (vph)	57	31	39	60	117	415	200	1203	60	111	380	32
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8	9.7	30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	15.0	66.4	66.4	15.0	66.4	66.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	12.5%	55.3%	55.3%	12.5%	55.3%	55.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1	1.0	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8	4.7	5.8	5.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	28.5	28.5	28.5	28.5	28.5	28.5	76.6	65.9	65.9	74.4	64.8	64.8
Actuated g/C Ratio	0.24	0.24	0.24	0.24	0.24	0.24	0.64	0.55	0.55	0.62	0.54	0.54
v/c Ratio	0.21	0.07	0.10	0.23	0.28	0.87	0.32	0.67	0.08	0.44	0.22	0.04
Control Delay	36.7	33.6	2.9	37.1	37.8	42.7	9.9	22.9	2.5	13.9	15.9	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.7	33.6	2.9	37.1	37.8	42.7	9.9	22.9	2.5	13.9	15.9	0.1
LOS	D	C	A	D	D	D	A	C	A	B	B	A
Approach Delay		25.6			41.2			20.3			14.5	
Approach LOS		C			D			C			B	
Queue Length 50th (m)	10.4	5.5	0.0	11.0	21.7	52.0	17.9	109.4	0.0	9.4	25.6	0.0
Queue Length 95th (m)	21.7	13.2	3.2	22.6	37.6	#104.1	28.1	138.5	4.9	16.5	35.2	0.0
Internal Link Dist (m)		33.8			732.3			94.0			55.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	303	465	428	297	465	509	632	1801	752	278	1722	803
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.07	0.09	0.20	0.25	0.82	0.32	0.67	0.08	0.40	0.22	0.04

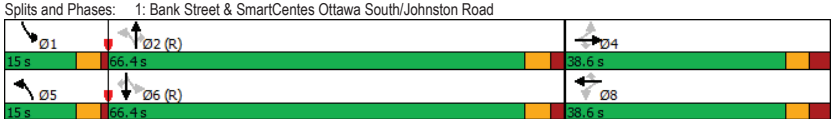
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 45 (38%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.87

Intersection Signal Delay: 24.0	Intersection LOS: C
Intersection Capacity Utilization 90.2%	ICU Level of Service E
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	19.8
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	162	28	72	510	10	70	28	92	3	4	7
Future Vol, veh/h	17	162	28	72	510	10	70	28	92	3	4	7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	6	3	4	6	2	10	2	2	8	2	2	14
Mvmt Flow	17	162	28	72	510	10	70	28	92	3	4	7
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.7	25.9	11.3	9.3
HCM LOS	B	D	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	37%	8%	12%	21%
Vol Thru, %	15%	78%	86%	29%
Vol Right, %	48%	14%	2%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	190	207	592	14
LT Vol	70	17	72	3
Through Vol	28	162	510	4
RT Vol	92	28	10	7
Lane Flow Rate	190	207	592	14
Geometry Grp	1	1	1	1
Degree of Util (X)	0.303	0.307	0.815	0.024
Departure Headway (Hd)	5.732	5.337	4.955	6.111
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	625	673	734	584
Service Time	3.778	3.374	2.955	4.171
HCM Lane V/C Ratio	0.304	0.308	0.807	0.024
HCM Control Delay	11.3	10.7	25.9	9.3
HCM Lane LOS	B	B	D	A
HCM 95th-tile Q	1.3	1.3	8.7	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	130	213	85	69	222	48	675	93	337	1223	116
Future Volume (vph)	116	130	213	85	69	222	48	675	93	337	1223	116
Satd. Flow (prot)	1658	1745	1483	1626	1745	1483	1658	3316	1455	1658	3316	1483
Flt Permitted	0.712			0.659			0.104			0.323		
Satd. Flow (perm)	1202	1745	1379	1074	1745	1413	181	3316	1354	555	3316	1413
Satd. Flow (RTOR)			213			222			118			118
Lane Group Flow (vph)	116	130	213	85	69	222	48	675	93	337	1223	116
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		14	2		11 10	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	14	2	2	11 10	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0		10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8		30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	12.0	56.4	56.4		56.4	56.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	10.0%	47.0%	47.0%		47.0%	47.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7		3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8		5.8	5.8
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max		C-Max	C-Max
Act Effct Green (s)	27.6	27.6	27.6	27.6	27.6	27.6	63.9	55.2	55.2	76.4	55.2	55.2
Actuated g/C Ratio	0.23	0.23	0.23	0.23	0.23	0.23	0.53	0.46	0.46	0.64	0.46	0.46
v/c Ratio	0.42	0.32	0.44	0.34	0.17	0.45	0.25	0.44	0.14	0.63	0.80	0.16
Control Delay	42.5	39.0	7.7	40.6	35.6	7.6	13.6	24.5	2.5	15.0	34.3	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.5	39.0	7.7	40.6	35.6	7.6	13.6	24.5	2.5	15.0	34.3	4.2
LOS	D	D	A	D	D	A	B	C	A	B	C	A
Approach Delay		25.3			20.2			21.3			28.3	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	22.2	24.3	0.0	16.0	12.5	0.0	3.9	59.7	0.0	33.3	136.5	0.0
Queue Length 95th (m)	39.6	41.4	18.2	30.4	24.3	18.3	8.3	76.5	6.1	49.0	167.5	10.5
Internal Link Dist (m)		33.8			732.3			62.8			105.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	320	465	523	286	465	539	189	1526	687	544	1526	714
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.28	0.41	0.30	0.15	0.41	0.25	0.44	0.14	0.62	0.80	0.16

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 105 (88%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

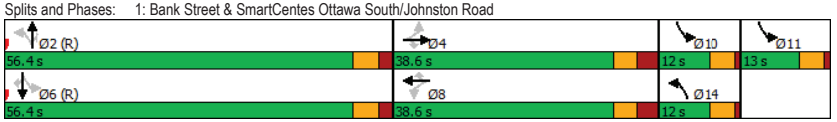
Lane Group	Ø10	Ø11
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	10	11
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	9.7	9.7
Total Split (s)	12.0	13.0
Total Split (%)	10%	11%
Yellow Time (s)	3.7	3.7
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (m)		
Queue Length 95th (m)		
Internal Link Dist (m)		
Turn Bay Length (m)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary	

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 25.3	Intersection LOS: C
Intersection Capacity Utilization 91.9%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	44
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	495	55	101	309	4	37	7	131	13	23	35
Future Vol, veh/h	5	495	55	101	309	4	37	7	131	13	23	35
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	80	2	2	2	2	50	2	14	2	2	9	9
Mvmt Flow	5	495	55	101	309	4	37	7	131	13	23	35
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	75.5	20.5	12.8	11.4
HCM LOS	F	C	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	21%	1%	24%	18%
Vol Thru, %	4%	89%	75%	32%
Vol Right, %	75%	10%	1%	49%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	175	555	414	71
LT Vol	37	5	101	13
Through Vol	7	495	309	23
RT Vol	131	55	4	35
Lane Flow Rate	175	555	414	71
Geometry Grp	1	1	1	1
Degree of Util (X)	0.32	1.038	0.675	0.14
Departure Headway (Hd)	6.705	6.734	5.967	7.262
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	539	538	609	497
Service Time	4.705	4.82	3.967	5.262
HCM Lane V/C Ratio	0.325	1.032	0.68	0.143
HCM Control Delay	12.8	75.5	20.5	11.4
HCM Lane LOS	B	F	C	B
HCM 95th-tile Q	1.4	15.6	5.1	0.5

Appendix K

Synchro Intersection Worksheets – 2028 Future Total Conditions

CGH TRANSPORTATION

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	31	39	64	117	423	200	1205	90	166	380	32
Future Volume (vph)	57	31	39	64	117	423	200	1205	90	166	380	32
Satd. Flow (prot)	1658	1745	1469	1470	1745	1483	1658	3283	1441	1595	3191	1469
Flt Permitted	0.682			0.737			0.516			0.146		
Satd. Flow (perm)	1137	1745	1421	1117	1745	1385	891	3283	1310	245	3191	1424
Satd. Flow (RTOR)			68			190			75			75
Lane Group Flow (vph)	57	31	39	64	117	423	200	1205	90	166	380	32
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8	9.7	30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	15.0	66.4	66.4	15.0	66.4	66.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	12.5%	55.3%	55.3%	12.5%	55.3%	55.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1	1.0	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8	4.7	5.8	5.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	28.8	28.8	28.8	28.8	28.8	28.8	75.4	64.7	64.7	75.1	64.5	64.5
Actuated g/C Ratio	0.24	0.24	0.24	0.24	0.24	0.24	0.63	0.54	0.54	0.63	0.54	0.54
v/c Ratio	0.21	0.07	0.10	0.24	0.28	0.89	0.32	0.68	0.12	0.64	0.22	0.04
Control Delay	36.6	33.5	2.9	37.4	37.7	45.0	10.0	23.8	5.1	22.2	16.0	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.6	33.5	2.9	37.4	37.7	45.0	10.0	23.8	5.1	22.2	16.0	0.1
LOS	D	C	A	D	D	D	B	C	A	C	B	A
Approach Delay		25.5			42.8			20.8			16.9	
Approach LOS		C			D			C			B	
Queue Length 50th (m)	10.4	5.5	0.0	11.8	21.7	54.7	17.9	113.0	1.7	14.6	25.6	0.0
Queue Length 95th (m)	21.7	13.2	3.2	23.7	37.6	#108.4	28.1	138.7	10.0	28.2	35.2	0.0
Internal Link Dist (m)		33.8			355.0			94.0			55.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	303	465	428	297	465	508	630	1769	740	270	1715	800
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.07	0.09	0.22	0.25	0.83	0.32	0.68	0.12	0.61	0.22	0.04

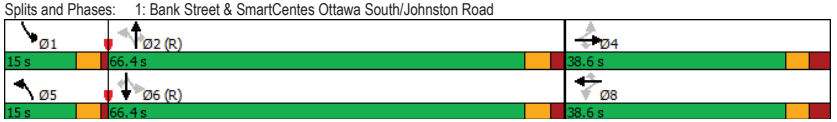
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 45 (38%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89

Intersection Signal Delay: 25.0	Intersection LOS: C
Intersection Capacity Utilization 90.8%	ICU Level of Service E
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	20.4
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	17	163	29	72	515	10	75	28	92	3	4	7
Future Vol, veh/h	17	163	29	72	515	10	75	28	92	3	4	7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	6	3	4	6	2	10	2	2	8	2	2	14
Mvmt Flow	17	163	29	72	515	10	75	28	92	3	4	7
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.8	27	11.4	9.4
HCM LOS	B	D	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	38%	8%	12%	21%
Vol Thru, %	14%	78%	86%	29%
Vol Right, %	47%	14%	2%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	195	209	597	14
LT Vol	75	17	72	3
Through Vol	28	163	515	4
RT Vol	92	29	10	7
Lane Flow Rate	195	209	597	14
Geometry Grp	1	1	1	1
Degree of Util (X)	0.312	0.312	0.826	0.024
Departure Headway (Hd)	5.767	5.366	4.978	6.152
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	622	669	734	579
Service Time	3.815	3.404	2.978	4.216
HCM Lane V/C Ratio	0.314	0.312	0.813	0.024
HCM Control Delay	11.4	10.8	27	9.4
HCM Lane LOS	B	B	D	A
HCM 95th-tile Q	1.3	1.3	9	0.1

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	86	202	592	10	1	12
Future Vol, veh/h	86	202	592	10	1	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	86	202	592	10	1	12

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	602	0	-	0	971	597
Stage 1	-	-	-	-	597	-
Stage 2	-	-	-	-	374	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	975	-	-	-	280	503
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	696	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	975	-	-	-	252	503
Mov Cap-2 Maneuver	-	-	-	-	252	-
Stage 1	-	-	-	-	496	-
Stage 2	-	-	-	-	696	-

Approach	EB	WB	SB
HCM Control Delay, s	2.7	0	12.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	975	-	-	-	467
HCM Lane V/C Ratio	0.088	-	-	-	0.028
HCM Control Delay (s)	9	0	-	-	12.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.3	-	-	-	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	130	213	111	69	269	48	676	97	345	1224	116
Future Volume (vph)	116	130	213	111	69	269	48	676	97	345	1224	116
Satd. Flow (prot)	1658	1745	1483	1626	1745	1483	1658	3316	1455	1658	3316	1483
Flt Permitted	0.712			0.659			0.103			0.322		
Satd. Flow (perm)	1202	1745	1379	1074	1745	1413	180	3316	1354	553	3316	1413
Satd. Flow (RTOR)			213			269			118			118
Lane Group Flow (vph)	116	130	213	111	69	269	48	676	97	345	1224	116
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		14	2		11 10	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	14	2	2	11 10	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0		10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8		30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	12.0	56.4	56.4		56.4	56.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	10.0%	47.0%	47.0%		47.0%	47.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7		3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8		5.8	5.8
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max		C-Max	C-Max
Act Effct Green (s)	27.6	27.6	27.6	27.6	27.6	27.6	63.8	55.2	55.2	76.4	55.2	55.2
Actuated g/C Ratio	0.23	0.23	0.23	0.23	0.23	0.23	0.53	0.46	0.46	0.64	0.46	0.46
v/c Ratio	0.42	0.32	0.44	0.45	0.17	0.51	0.26	0.44	0.14	0.64	0.80	0.16
Control Delay	42.5	39.0	7.7	44.0	35.6	7.7	13.6	24.5	2.8	15.4	34.4	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.5	39.0	7.7	44.0	35.6	7.7	13.6	24.5	2.8	15.4	34.4	4.2
LOS	D	D	A	D	D	A	B	C	A	B	C	A
Approach Delay		25.3			20.9			21.3			28.4	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	22.2	24.3	0.0	21.4	12.5	0.0	3.9	59.8	0.0	34.3	136.7	0.0
Queue Length 95th (m)	39.6	41.4	18.2	38.7	24.3	20.4	8.3	76.6	6.8	50.3	167.6	10.5
Internal Link Dist (m)		33.8			357.9			62.8			105.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	320	465	523	286	465	574	188	1524	686	543	1524	713
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.28	0.41	0.39	0.15	0.47	0.26	0.44	0.14	0.64	0.80	0.16

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 105 (88%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

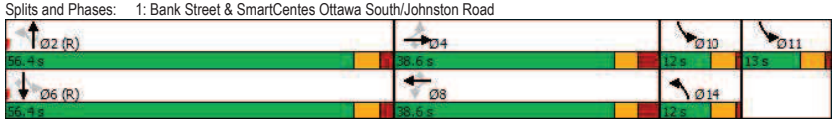
Lane Group	Ø10	Ø11
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	10	11
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	9.7	9.7
Total Split (s)	12.0	13.0
Total Split (%)	10%	11%
Yellow Time (s)	3.7	3.7
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (m)		
Queue Length 95th (m)		
Internal Link Dist (m)		
Turn Bay Length (m)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 25.3	Intersection LOS: C
Intersection Capacity Utilization 92.4%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	46.2
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	499	59	101	310	4	38	7	131	13	23	35
Future Vol, veh/h	5	499	59	101	310	4	38	7	131	13	23	35
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	80	2	2	2	2	50	2	14	2	2	9	9
Mvmt Flow	5	499	59	101	310	4	38	7	131	13	23	35
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	80.3	20.2	12.8	11.4
HCM LOS	F	C	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	1%	24%	18%
Vol Thru, %	4%	89%	75%	32%
Vol Right, %	74%	10%	1%	49%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	176	563	415	71
LT Vol	38	5	101	13
Through Vol	7	499	310	23
RT Vol	131	59	4	35
Lane Flow Rate	176	563	415	71
Geometry Grp	1	1	1	1
Degree of Util (X)	0.317	1.055	0.669	0.138
Departure Headway (Hd)	6.723	6.744	5.972	7.276
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	539	540	610	496
Service Time	4.723	4.799	3.972	5.276
HCM Lane V/C Ratio	0.327	1.043	0.68	0.143
HCM Control Delay	12.8	80.3	20.2	11.4
HCM Lane LOS	B	F	C	B
HCM 95th-tile Q	1.4	16.4	5	0.5

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	12	560	376	1	8	73
Future Vol, veh/h	12	560	376	1	8	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	560	376	1	8	73

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	377	0	-	0	961	377
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	584	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1181	-	-	-	284	670
Stage 1	-	-	-	-	694	-
Stage 2	-	-	-	-	557	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1181	-	-	-	280	670
Mov Cap-2 Maneuver	-	-	-	-	280	-
Stage 1	-	-	-	-	684	-
Stage 2	-	-	-	-	557	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	12.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1181	-	-	-	589
HCM Lane V/C Ratio	0.01	-	-	-	0.138
HCM Control Delay (s)	8.1	0	-	-	12.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Appendix L

Synchro Intersection Worksheets – 2033 Future Total Conditions

CGH TRANSPORTATION

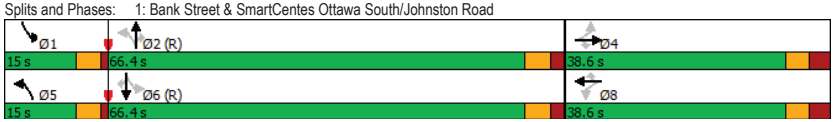
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	31	39	64	117	423	200	1203	90	166	380	32
Future Volume (vph)	57	31	39	64	117	423	200	1203	90	166	380	32
Satd. Flow (prot)	1658	1745	1469	1470	1745	1483	1658	3283	1441	1595	3191	1469
Flt Permitted	0.682			0.737			0.516			0.147		
Satd. Flow (perm)	1137	1745	1421	1117	1745	1385	891	3283	1310	247	3191	1424
Satd. Flow (RTOR)			68			191			75			75
Lane Group Flow (vph)	57	31	39	64	117	423	200	1203	90	166	380	32
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8	9.7	30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	15.0	66.4	66.4	15.0	66.4	66.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	12.5%	55.3%	55.3%	12.5%	55.3%	55.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1	1.0	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8	4.7	5.8	5.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	28.7	28.7	28.7	28.7	28.7	28.7	75.5	64.7	64.7	75.1	64.6	64.6
Actuated g/C Ratio	0.24	0.24	0.24	0.24	0.24	0.24	0.63	0.54	0.54	0.63	0.54	0.54
v/c Ratio	0.21	0.07	0.10	0.24	0.28	0.89	0.32	0.68	0.12	0.64	0.22	0.04
Control Delay	36.6	33.5	2.9	37.5	37.7	44.7	10.0	23.8	5.1	22.0	16.0	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.6	33.5	2.9	37.5	37.7	44.7	10.0	23.8	5.1	22.0	16.0	0.1
LOS	D	C	A	D	D	D	B	C	A	C	B	A
Approach Delay		25.5			42.6			20.8			16.8	
Approach LOS		C			D			C			B	
Queue Length 50th (m)	10.4	5.5	0.0	11.8	21.7	54.4	17.9	112.7	1.7	14.6	25.6	0.0
Queue Length 95th (m)	21.7	13.2	3.2	23.7	37.6	#108.1	28.1	138.5	10.0	27.9	35.2	0.0
Internal Link Dist (m)		33.8			355.0			94.0			55.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	303	465	428	297	465	509	631	1770	741	271	1716	800
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.07	0.09	0.22	0.25	0.83	0.32	0.68	0.12	0.61	0.22	0.04

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 45 (38%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89
Intersection Signal Delay: 24.9 Intersection LOS: C
Intersection Capacity Utilization 90.7% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	20.4
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	163	29	72	515	10	75	28	92	3	4	7
Future Vol, veh/h	17	163	29	72	515	10	75	28	92	3	4	7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	6	3	4	6	2	10	2	2	8	2	2	14
Mvmt Flow	17	163	29	72	515	10	75	28	92	3	4	7
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.8	27	11.4	9.4
HCM LOS	B	D	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	38%	8%	12%	21%
Vol Thru, %	14%	78%	86%	29%
Vol Right, %	47%	14%	2%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	195	209	597	14
LT Vol	75	17	72	3
Through Vol	28	163	515	4
RT Vol	92	29	10	7
Lane Flow Rate	195	209	597	14
Geometry Grp	1	1	1	1
Degree of Util (X)	0.312	0.312	0.826	0.024
Departure Headway (Hd)	5.767	5.366	4.978	6.152
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	622	669	734	579
Service Time	3.815	3.404	2.978	4.216
HCM Lane V/C Ratio	0.314	0.312	0.813	0.024
HCM Control Delay	11.4	10.8	27	9.4
HCM Lane LOS	B	B	D	A
HCM 95th-tile Q	1.3	1.3	9	0.1

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	86	202	592	10	1	12
Future Vol, veh/h	86	202	592	10	1	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	86	202	592	10	1	12

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	602	0	-	0	971	597
Stage 1	-	-	-	-	597	-
Stage 2	-	-	-	-	374	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	975	-	-	-	280	503
Stage 1	-	-	-	-	550	-
Stage 2	-	-	-	-	696	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	975	-	-	-	252	503
Mov Cap-2 Maneuver	-	-	-	-	252	-
Stage 1	-	-	-	-	496	-
Stage 2	-	-	-	-	696	-

Approach	EB	WB	SB
HCM Control Delay, s	2.7	0	12.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	975	-	-	-	467
HCM Lane V/C Ratio	0.088	-	-	-	0.028
HCM Control Delay (s)	9	0	-	-	12.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.3	-	-	-	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	130	213	111	69	269	48	675	97	345	1223	116
Future Volume (vph)	116	130	213	111	69	269	48	675	97	345	1223	116
Satd. Flow (prot)	1658	1745	1483	1626	1745	1483	1658	3316	1455	1658	3316	1483
Flt Permitted	0.712			0.659			0.103			0.322		
Satd. Flow (perm)	1202	1745	1379	1074	1745	1413	180	3316	1354	553	3316	1413
Satd. Flow (RTOR)			213			269			118			118
Lane Group Flow (vph)	116	130	213	111	69	269	48	675	97	345	1223	116
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		14	2		11 10	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	14	2	2	11 10	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0		10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8		30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	12.0	56.4	56.4		56.4	56.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	10.0%	47.0%	47.0%		47.0%	47.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7		3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8		5.8	5.8
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max		C-Max	C-Max
Act Effct Green (s)	27.6	27.6	27.6	27.6	27.6	27.6	63.8	55.2	55.2	76.4	55.2	55.2
Actuated g/C Ratio	0.23	0.23	0.23	0.23	0.23	0.23	0.53	0.46	0.46	0.64	0.46	0.46
v/c Ratio	0.42	0.32	0.44	0.45	0.17	0.51	0.26	0.44	0.14	0.64	0.80	0.16
Control Delay	42.5	39.0	7.7	44.0	35.6	7.7	13.6	24.5	2.8	15.4	34.4	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.5	39.0	7.7	44.0	35.6	7.7	13.6	24.5	2.8	15.4	34.4	4.2
LOS	D	D	A	D	D	A	B	C	A	B	C	A
Approach Delay		25.3			20.9			21.3			28.4	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	22.2	24.3	0.0	21.4	12.5	0.0	3.9	59.7	0.0	34.3	136.5	0.0
Queue Length 95th (m)	39.6	41.4	18.2	38.7	24.3	20.4	8.3	76.5	6.8	50.3	167.5	10.5
Internal Link Dist (m)		33.8			357.9			62.8			105.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	320	465	523	286	465	574	188	1524	686	543	1524	713
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.28	0.41	0.39	0.15	0.47	0.26	0.44	0.14	0.64	0.80	0.16

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 105 (88%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

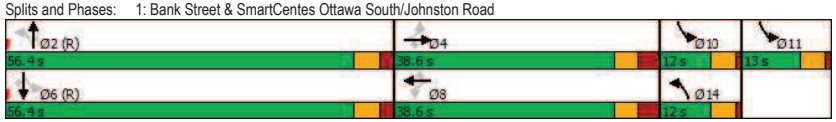
Lane Group	Ø10	Ø11
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	10	11
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	9.7	9.7
Total Split (s)	12.0	13.0
Total Split (%)	10%	11%
Yellow Time (s)	3.7	3.7
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (m)		
Queue Length 95th (m)		
Internal Link Dist (m)		
Turn Bay Length (m)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 25.3	Intersection LOS: C
Intersection Capacity Utilization 92.4%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	46.2
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	499	59	101	310	4	38	7	131	13	23	35
Future Vol, veh/h	5	499	59	101	310	4	38	7	131	13	23	35
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	80	2	2	2	2	50	2	14	2	2	9	9
Mvmt Flow	5	499	59	101	310	4	38	7	131	13	23	35
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	80.3	20.2	12.8	11.4
HCM LOS	F	C	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	1%	24%	18%
Vol Thru, %	4%	89%	75%	32%
Vol Right, %	74%	10%	1%	49%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	176	563	415	71
LT Vol	38	5	101	13
Through Vol	7	499	310	23
RT Vol	131	59	4	35
Lane Flow Rate	176	563	415	71
Geometry Grp	1	1	1	1
Degree of Util (X)	0.317	1.055	0.669	0.138
Departure Headway (Hd)	6.723	6.744	5.972	7.276
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	539	540	610	496
Service Time	4.723	4.799	3.972	5.276
HCM Lane V/C Ratio	0.327	1.043	0.68	0.143
HCM Control Delay	12.8	80.3	20.2	11.4
HCM Lane LOS	B	F	C	B
HCM 95th-tile Q	1.4	16.4	5	0.5

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	12	560	376	1	8	73
Future Vol, veh/h	12	560	376	1	8	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	560	376	1	8	73

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	377	0	-	0	961	377
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	584	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1181	-	-	-	284	670
Stage 1	-	-	-	-	694	-
Stage 2	-	-	-	-	557	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1181	-	-	-	280	670
Mov Cap-2 Maneuver	-	-	-	-	280	-
Stage 1	-	-	-	-	684	-
Stage 2	-	-	-	-	557	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	12.1
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1181	-	-	-	589
HCM Lane V/C Ratio	0.01	-	-	-	0.138
HCM Control Delay (s)	8.1	0	-	-	12.1
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.5

Appendix M

2033 Future Total Operations – Sensitivity with Additional 40% GFA of Mezzanines

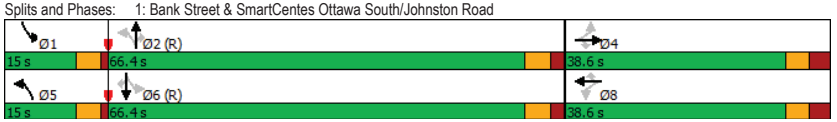
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	57	31	39	66	117	425	200	1203	103	188	380	32
Future Volume (vph)	57	31	39	66	117	425	200	1203	103	188	380	32
Satd. Flow (prot)	1658	1745	1469	1470	1745	1483	1658	3283	1441	1595	3191	1469
Flt Permitted	0.682			0.737			0.519			0.145		
Satd. Flow (perm)	1137	1745	1421	1117	1745	1385	896	3283	1310	243	3191	1424
Satd. Flow (RTOR)			68			191			75			75
Lane Group Flow (vph)	57	31	39	66	117	425	200	1203	103	188	380	32
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8	9.7	30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	15.0	66.4	66.4	15.0	66.4	66.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	12.5%	55.3%	55.3%	12.5%	55.3%	55.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1	1.0	2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8	4.7	5.8	5.8
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max	C-Max
Act Effct Green (s)	28.8	28.8	28.8	28.8	28.8	28.8	75.1	64.3	64.3	75.4	64.5	64.5
Actuated g/C Ratio	0.24	0.24	0.24	0.24	0.24	0.24	0.63	0.54	0.54	0.63	0.54	0.54
v/c Ratio	0.21	0.07	0.10	0.25	0.28	0.89	0.32	0.68	0.14	0.72	0.22	0.04
Control Delay	36.6	33.5	2.9	37.6	37.7	45.3	10.0	24.0	6.0	27.8	16.0	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.6	33.5	2.9	37.6	37.7	45.3	10.0	24.0	6.0	27.8	16.0	0.1
LOS	D	C	A	D	D	D	B	C	A	C	B	A
Approach Delay		25.5			43.0			20.9			18.8	
Approach LOS		C			D			C			B	
Queue Length 50th (m)	10.4	5.5	0.0	12.2	21.7	55.0	17.9	112.7	3.2	16.8	25.6	0.0
Queue Length 95th (m)	21.7	13.2	3.2	24.4	37.6	#109.6	28.1	138.5	12.2	#42.1	35.2	0.0
Internal Link Dist (m)		33.8			355.0			94.0			55.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	303	465	428	297	465	509	631	1759	737	269	1715	800
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.07	0.09	0.22	0.25	0.83	0.32	0.68	0.14	0.70	0.22	0.04

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 45 (38%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.89
Intersection Signal Delay: 25.4 — Intersection LOS: C
Intersection Capacity Utilization 90.8% — ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	20.7
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	17	163	29	72	517	10	77	28	92	3	4	7
Future Vol, veh/h	17	163	29	72	517	10	77	28	92	3	4	7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	6	3	4	6	2	10	2	2	8	2	2	14
Mvmt Flow	17	163	29	72	517	10	77	28	92	3	4	7
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.9	27.4	11.5	9.4
HCM LOS	B	D	B	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	39%	8%	12%	21%
Vol Thru, %	14%	78%	86%	29%
Vol Right, %	47%	14%	2%	50%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	197	209	599	14
LT Vol	77	17	72	3
Through Vol	28	163	517	4
RT Vol	92	29	10	7
Lane Flow Rate	197	209	599	14
Geometry Grp	1	1	1	1
Degree of Util (X)	0.316	0.312	0.83	0.024
Departure Headway (Hd)	5.779	5.379	4.987	6.167
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	621	667	731	578
Service Time	3.826	3.417	2.987	4.23
HCM Lane V/C Ratio	0.317	0.313	0.819	0.024
HCM Control Delay	11.5	10.9	27.4	9.4
HCM Lane LOS	B	B	D	A
HCM 95th-tile Q	1.4	1.3	9.2	0.1

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	120	202	592	13	2	16
Future Vol, veh/h	120	202	592	13	2	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	120	202	592	13	2	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	605	0	-	0	1041	599
Stage 1	-	-	-	-	599	-
Stage 2	-	-	-	-	442	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	973	-	-	-	255	502
Stage 1	-	-	-	-	549	-
Stage 2	-	-	-	-	648	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	973	-	-	-	220	502
Mov Cap-2 Maneuver	-	-	-	-	220	-
Stage 1	-	-	-	-	473	-
Stage 2	-	-	-	-	648	-

Approach	EB	WB	SB
HCM Control Delay, s	3.4	0	13.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	973	-	-	-	439
HCM Lane V/C Ratio	0.123	-	-	-	0.041
HCM Control Delay (s)	9.2	0	-	-	13.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.4	-	-	-	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	130	213	121	69	288	48	675	99	347	1223	116
Future Volume (vph)	116	130	213	121	69	288	48	675	99	347	1223	116
Satd. Flow (prot)	1658	1745	1483	1626	1745	1483	1658	3316	1455	1658	3316	1483
Flt Permitted	0.712			0.659			0.103			0.322		
Satd. Flow (perm)	1202	1745	1379	1074	1745	1413	180	3316	1354	553	3316	1413
Satd. Flow (RTOR)			213			288			118			118
Lane Group Flow (vph)	116	130	213	121	69	288	48	675	99	347	1223	116
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases		4			8		14	2		11 10	6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	14	2	2	11 10	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0		10.0	10.0
Minimum Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	9.7	30.8	30.8		30.8	30.8
Total Split (s)	38.6	38.6	38.6	38.6	38.6	38.6	12.0	56.4	56.4		56.4	56.4
Total Split (%)	32.2%	32.2%	32.2%	32.2%	32.2%	32.2%	10.0%	47.0%	47.0%		47.0%	47.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.7	3.7	3.7		3.7	3.7
All-Red Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	1.0	2.1	2.1		2.1	2.1
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	6.6	6.6	6.6	6.6	6.6	6.6	4.7	5.8	5.8		5.8	5.8
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max		C-Max	C-Max
Act Effct Green (s)	27.6	27.6	27.6	27.6	27.6	27.6	63.8	55.1	55.1	76.4	55.1	55.1
Actuated g/C Ratio	0.23	0.23	0.23	0.23	0.23	0.23	0.53	0.46	0.46	0.64	0.46	0.46
v/c Ratio	0.42	0.32	0.44	0.49	0.17	0.53	0.25	0.44	0.14	0.65	0.80	0.16
Control Delay	42.4	38.9	7.6	45.5	35.6	7.7	13.6	24.5	3.0	15.5	34.4	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.4	38.9	7.6	45.5	35.6	7.7	13.6	24.5	3.0	15.5	34.4	4.2
LOS	D	D	A	D	D	A	B	C	A	B	C	A
Approach Delay		25.3			21.3			21.3			28.5	
Approach LOS		C			C			C			C	
Queue Length 50th (m)	22.2	24.3	0.0	23.6	12.5	0.0	3.9	59.7	0.0	34.6	136.5	0.0
Queue Length 95th (m)	39.6	41.4	18.2	42.0	24.3	21.2	8.3	76.5	7.3	50.8	167.5	10.5
Internal Link Dist (m)		33.8			357.9			62.8			105.3	
Turn Bay Length (m)				28.0		44.0	70.5		33.5	73.6		21.5
Base Capacity (vph)	320	465	523	286	465	588	189	1522	685	543	1522	712
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.36	0.28	0.41	0.42	0.15	0.49	0.25	0.44	0.14	0.64	0.80	0.16

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 105 (88%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

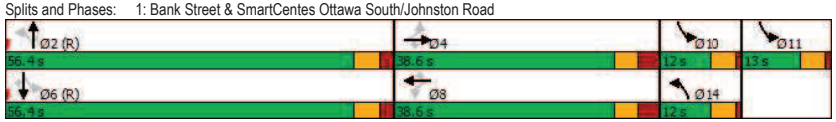
Lane Group	Ø10	Ø11
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Satd. Flow (prot)		
Flt Permitted		
Satd. Flow (perm)		
Satd. Flow (RTOR)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	10	11
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	5.0	5.0
Minimum Split (s)	9.7	9.7
Total Split (s)	12.0	13.0
Total Split (%)	10%	11%
Yellow Time (s)	3.7	3.7
All-Red Time (s)	1.0	1.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		
Lead-Lag Optimize?		
Recall Mode	None	None
Act Effct Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (m)		
Queue Length 95th (m)		
Internal Link Dist (m)		
Turn Bay Length (m)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		

Intersection Summary

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 25.3	Intersection LOS: C
Intersection Capacity Utilization 92.5%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: Bank Street & SmartCentes Ottawa South/Johnston Road



Intersection	
Intersection Delay, s/veh	47.3
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	501	61	101	310	4	38	7	131	13	23	35
Future Vol, veh/h	5	501	61	101	310	4	38	7	131	13	23	35
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	80	2	2	2	2	50	2	14	2	2	9	9
Mvmt Flow	5	501	61	101	310	4	38	7	131	13	23	35
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	82.4	20.2	12.8	11.5
HCM LOS	F	C	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	22%	1%	24%	18%
Vol Thru, %	4%	88%	75%	32%
Vol Right, %	74%	11%	1%	49%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	176	567	415	71
LT Vol	38	5	101	13
Through Vol	7	501	310	23
RT Vol	131	61	4	35
Lane Flow Rate	176	567	415	71
Geometry Grp	1	1	1	1
Degree of Util (X)	0.317	1.062	0.669	0.138
Departure Headway (Hd)	6.735	6.746	5.98	7.289
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	537	539	610	495
Service Time	4.735	4.797	3.98	5.289
HCM Lane V/C Ratio	0.328	1.052	0.68	0.143
HCM Control Delay	12.8	82.4	20.2	11.5
HCM Lane LOS	B	F	C	B
HCM 95th-tile Q	1.4	16.7	5	0.5

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	560	376	2	11	103
Future Vol, veh/h	16	560	376	2	11	103
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	560	376	2	11	103

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	378	0	-	0	969	377
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	592	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1180	-	-	-	281	670
Stage 1	-	-	-	-	694	-
Stage 2	-	-	-	-	553	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1180	-	-	-	275	670
Mov Cap-2 Maneuver	-	-	-	-	275	-
Stage 1	-	-	-	-	680	-
Stage 2	-	-	-	-	553	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1180	-	-	-	588
HCM Lane V/C Ratio	0.014	-	-	-	0.194
HCM Control Delay (s)	8.1	0	-	-	12.6
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.7

Appendix N

TDM Checklist

CGH TRANSPORTATION

TDM-Supportive Development Design and Infrastructure Checklist:
Non-Residential Developments (office, institutional, retail or industrial)

Legend

REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	1.	**WALKING & CYCLING: ROUTES**	
	1.1	**Building location & access points**	
BASIC	1.1.1	Locate building close to the street, and do not locate parking areas between the street and building entrances	☐
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☐
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☐
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	☐
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible *(see Official Plan policy 4.3.12)*	☑

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks *(see Official Plan policy 4.3.10)*	☑
REQUIRED	1.2.4	Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps *(see Official Plan policy 4.3.10)*	☑
REQUIRED	1.2.5	Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians *(see Official Plan policy 4.3.11)*	☑
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☐
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☐
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	☐
	1.3	**Amenities for walking & cycling**	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☐
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☐

	TDM-supportive design & infrastructure measures: *Non-residential developments*		Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☑
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☑
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☑
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met), plus the expected peak number of customer/visitor cyclists	☐
BETTER	2.1.5	Provide bicycle parking spaces equivalent to the expected number of commuter and customer/visitor cyclists, plus an additional buffer (e.g. 25 percent extra) to encourage other cyclists and ensure adequate capacity in peak cycling season	☐
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single office building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☐
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met)	☐
	2.3	**Shower & change facilities**	
BASIC	2.3.1	Provide shower and change facilities for the use of active commuters	☐
BETTER	2.3.2	In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters	☐
	2.4	**Bicycle repair station**	
BETTER	2.4.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐

	TDM-supportive design & infrastructure measures: *Non-residential developments*		Check if completed & add descriptions, explanations or plan/drawing references
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐
	4.	**RIDESHARING**	
	4.1	**Pick-up & drop-off facilities**	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☐
	4.2	**Carpool parking**	
BASIC	4.2.1	Provide signed parking spaces for carpools in a priority location close to a major building entrance, sufficient in number to accommodate the mode share target for carpools	☐
BETTER	4.2.2	At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	☐
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Carshare parking spaces**	
BETTER	5.1.1	Provide carshare parking spaces in permitted non-residential zones, occupying either required or provided parking spaces *(see Zoning By-law Section 94)*	☐
	5.2	**Bikeshare station location**	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☐

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☑
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☐
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Separate short-term and long-term parking areas using signage or physical barriers, to permit access controls and simplify enforcement (i.e. to discourage employees from parking in visitor spaces, and vice versa)	☐
	7.	**OTHER**	
	7.1	**On-site amenities to minimize off-site trips**	
BETTER	7.1.1	Provide on-site amenities to minimize mid-day or mid-commute errands	☐

TDM Measures Checklist:
Non-Residential Developments (office, institutional, retail or industrial)

Legend

BASIC — The measure is generally feasible and effective, and in most cases would benefit the development and its users

BETTER — The measure could maximize support for users of sustainable modes, and optimize development performance

★ — The measure is one of the most dependably effective tools to encourage the use of sustainable modes

			TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		1.	**TDM PROGRAM MANAGEMENT**	
		1.1	**Program coordinator**	
BASIC	★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☐
		1.2	**Travel surveys**	
BETTER		1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
		2.	**WALKING AND CYCLING**	
		2.1	**Information on walking/cycling routes & destinations**	
BASIC		2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances	☐
		2.2	**Bicycle skills training**	
			Commuter travel	
BETTER	★	2.2.1	Offer on-site cycling courses for commuters, or subsidize off-site courses	☐
		2.3	**Valet bike parking**	
			Visitor travel	
BETTER		2.3.1	Offer secure valet bike parking during public events when demand exceeds fixed supply (e.g. for festivals, concerts, games)	☐

		TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		3. TRANSIT	
		3.1 Transit information	
BASIC	3.1.1	Display relevant transit schedules and route maps at entrances	☑
BASIC	3.1.2	Provide online links to OC Transpo and STO information	☐
BETTER	3.1.3	Provide real-time arrival information display at entrances	☐
		3.2 Transit fare incentives	
		Commuter travel	
BETTER	3.2.1	Offer preloaded PRESTO cards to encourage commuters to use transit	☐
BETTER ★	3.2.2	Subsidize or reimburse monthly transit pass purchases by employees	☐
		Visitor travel	
BETTER	3.2.3	Arrange inclusion of same-day transit fare in price of tickets (e.g. for festivals, concerts, games)	☐
		3.3 Enhanced public transit service	
		Commuter travel	
BETTER	3.3.1	Contract with OC Transpo to provide enhanced transit services (e.g. for shift changes, weekends)	☐
		Visitor travel	
BETTER	3.3.2	Contract with OC Transpo to provide enhanced transit services (e.g. for festivals, concerts, games)	☐
		3.4 Private transit service	
		Commuter travel	
BETTER	3.4.1	Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for shift changes, weekends)	☐
		Visitor travel	
BETTER	3.4.2	Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for festivals, concerts, games)	☐

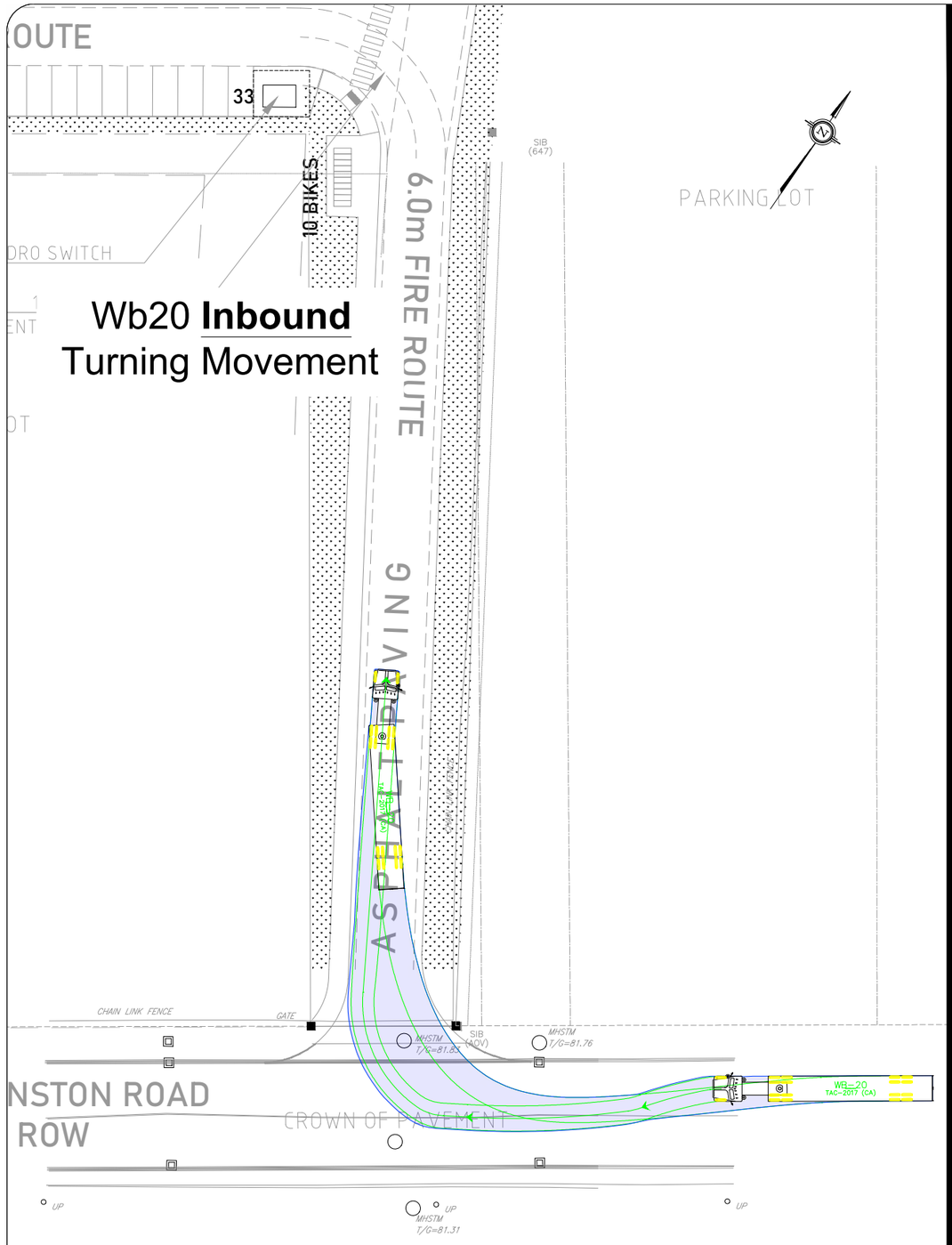
		TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		4. RIDESHARING	
		4.1 Ridematching service	
		Commuter travel	
BASIC ★	4.1.1	Provide a dedicated ridematching portal at OttawaRideMatch.com	☐
		4.2 Carpool parking price incentives	
		Commuter travel	
BETTER	4.2.1	Provide discounts on parking costs for registered carpools	☐
		4.3 Vanpool service	
		Commuter travel	
BETTER	4.3.1	Provide a vanpooling service for long-distance commuters	☐
		5. CARSHARING & BIKESHARING	
		5.1 Bikeshare stations & memberships	
BETTER	5.1.1	Contract with provider to install on-site bikeshare station for use by commuters and visitors	☐
		Commuter travel	
BETTER	5.1.2	Provide employees with bikeshare memberships for local business travel	☐
		5.2 Carshare vehicles & memberships	
		Commuter travel	
BETTER	5.2.1	Contract with provider to install on-site carshare vehicles and promote their use by tenants	☐
BETTER	5.2.2	Provide employees with carshare memberships for local business travel	☐
		6. PARKING	
		6.1 Priced parking	
		Commuter travel	
BASIC ★	6.1.1	Charge for long-term parking (daily, weekly, monthly)	☐
BASIC	6.1.2	Unbundle parking cost from lease rates at multi-tenant sites	☐
		Visitor travel	
BETTER	6.1.3	Charge for short-term parking (hourly)	☐

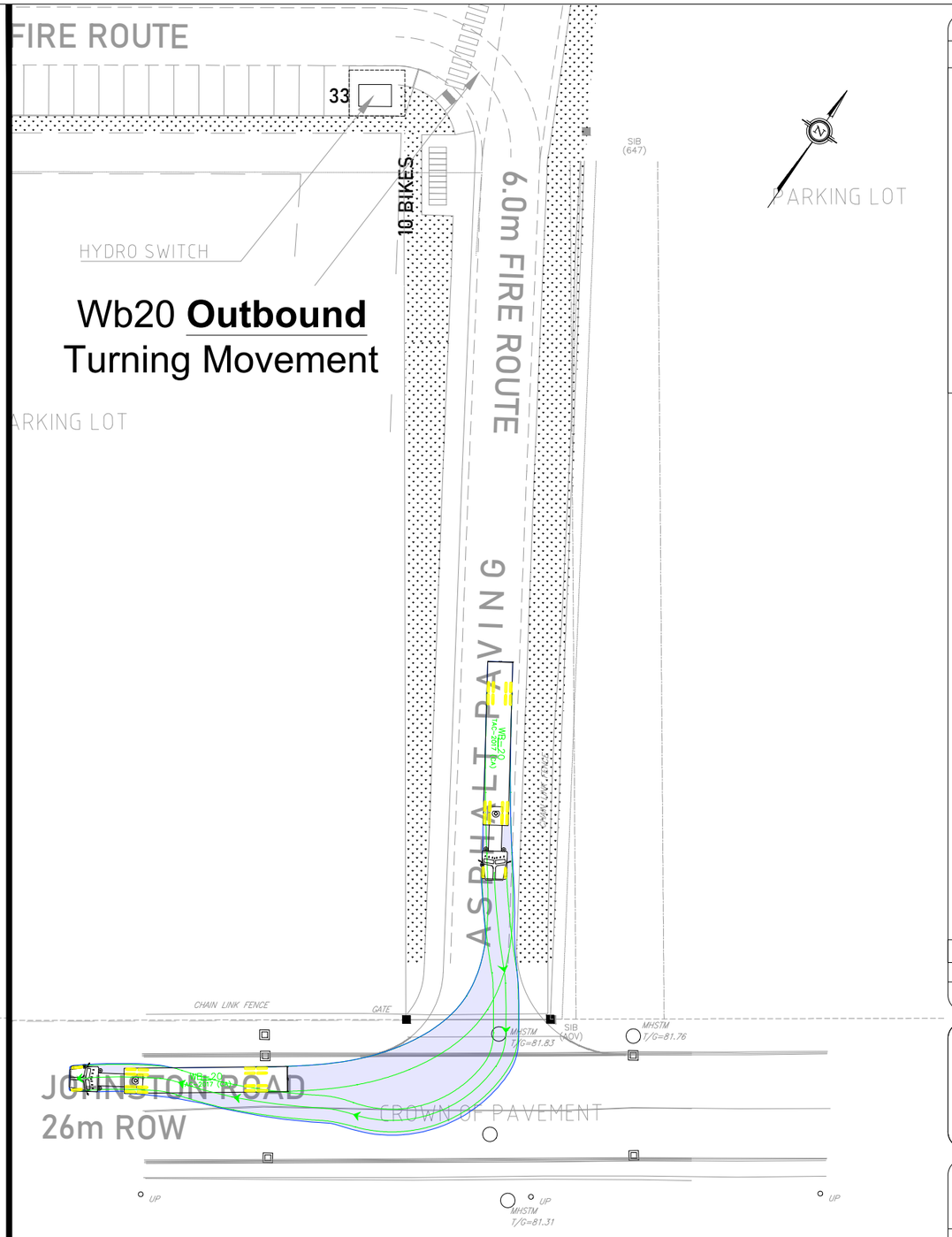
		TDM measures: *Non-residential developments*	Check if proposed & add descriptions
		7. TDM MARKETING & COMMUNICATIONS	
		7.1 Multimodal travel information	
		Commuter travel	
BASIC	★	7.1.1 Provide a multimodal travel option information package to new/relocating employees and students	☑
		Visitor travel	
BETTER	★	7.1.2 Include multimodal travel option information in invitations or advertising that attract visitors or customers (e.g. for festivals, concerts, games)	☐
		7.2 Personalized trip planning	
		Commuter travel	
BETTER	★	7.2.1 Offer personalized trip planning to new/relocating employees	☐
		7.3 Promotions	
		Commuter travel	
BETTER		7.3.1 Deliver promotions and incentives to maintain awareness, build understanding, and encourage trial of sustainable modes	☐
		8. OTHER INCENTIVES & AMENITIES	
		8.1 Emergency ride home	
		Commuter travel	
BETTER	★	8.1.1 Provide emergency ride home service to non-driving commuters	☐
		8.2 Alternative work arrangements	
		Commuter travel	
BASIC	★	8.2.1 Encourage flexible work hours	☐
BETTER		8.2.2 Encourage compressed workweeks	☐
BETTER	★	8.2.3 Encourage telework	☐
		8.3 Local business travel options	
		Commuter travel	
BASIC	★	8.3.1 Provide local business travel options that minimize the need for employees to bring a personal car to work	☐
		8.4 Commuter incentives	
		Commuter travel	
BETTER		8.4.1 Offer employees a taxable, mode-neutral commuting allowance	☐
		8.5 On-site amenities	
		Commuter travel	
BETTER		8.5.1 Provide on-site amenities/services to minimize mid-day or mid-commute errands	☐

Appendix O

Turning Templates

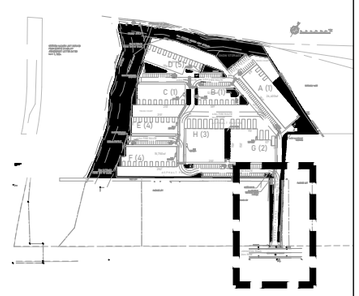
CGH TRANSPORTATION

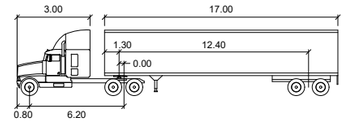




Notes:

Key Map:





WB-20

meters

Tractor Width	: 2.60	Lock to Lock Time	: 6.0
Trailer Width	: 2.60	Steering Angle	: 28.2
Tractor Track	: 2.60	Articulating Angle	: 70.0
Trailer Track	: 2.60		

REV:	DESCRIPTION:	BY:	DATE:
04	Updated Site Plan	AN	2024-08-14

STATUS:

CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

CLIENT: Quaestus

ARCHITECT:

SITE: 1319 Johnston

TITLE: Wb20 Turning Movements
ch. Johnston Road - Access

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
NTS	2024-08-14	AN	AH

PROJECT NO:	DRAWING NO:	REVISION:
2022-061	001	04

C (1)

B (1)

12,175sf

15 BIKES

10 BIKES

A (1)

26,400sf

300'

M&E SERVICES

75'

210'

TRUCK COURT

189'

6.0m FIRE ROUTE

TRUCK COURT

ASPHALT PAVING

RIVER STONE

E (4)

H (3)

95'

150'

G (2)

57'

19'

TYPE A

TYPE B

6.0m FIRE ROUTE

WASTE MANAGEMENT ENCLOSURE

CENTRELINE OF DITCH

6 BIKES

90'

252'

16

22

TYPE A

TYPE A

6.0m FIRE ROUTE

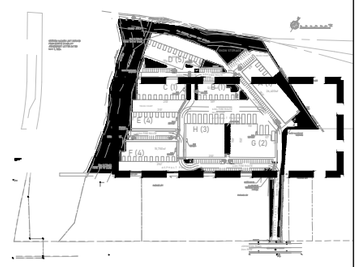
ASPHALT PAVING

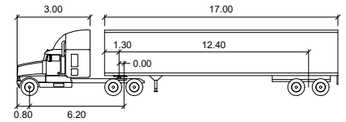
Wb20 Loading Bay
Inbound Turning
Movements

Wb20 Loading Bay
Outbound Turning
Movements
(3-point Turn)

Notes:

Key Map:





WB-20

meters

Tractor Width	: 2.60	Lock to Lock Time	: 6.0
Trailer Width	: 2.60	Steering Angle	: 28.2
Tractor Track	: 2.60	Articulating Angle	: 70.0
Trailer Track	: 2.60		

REV:	DESCRIPTION:	BY:	DATE:
04	Updated Site Plan	AN	2024-08-14

STATUS:

CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

CLIENT: Quaestus

ARCHITECT:

SITE: 1319 Johnston

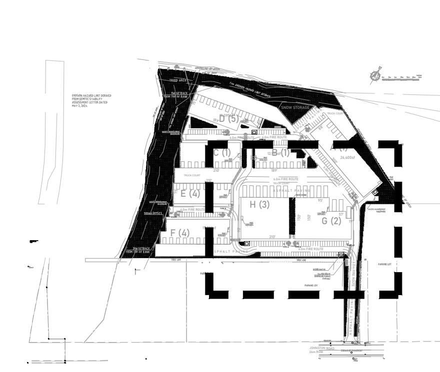
TITLE: Wb20 Turning Movements
Loading Bay Movements

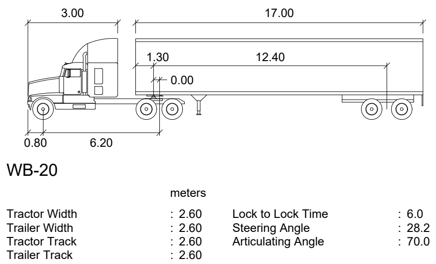
SCALE AT A3:	DATE:	DRAWN:	CHECKED:
NTS	2024-08-14	AN	AH

PROJECT NO:	DRAWING NO:	REVISION:
2022-061	002	04

Notes:

Key Map:





REV:	DESCRIPTION:	BY:	DATE:
04	Updated Site Plan	AN	2024-08-14

STATUS:

CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

CLIENT: Quaestus

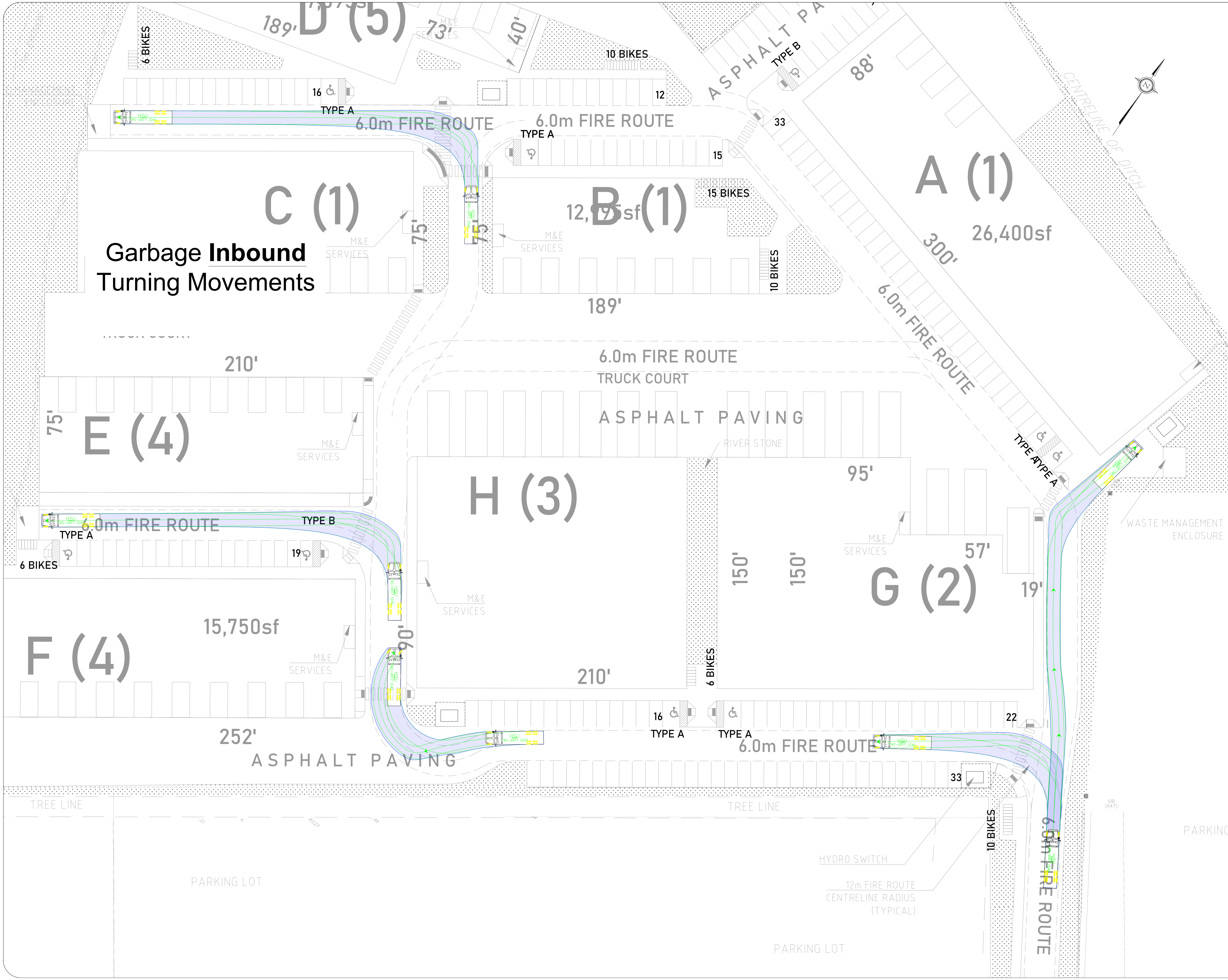
ARCHITECT:

SITE: 1319 Johnston

TITLE: Wb20 Outbound Turning Movements

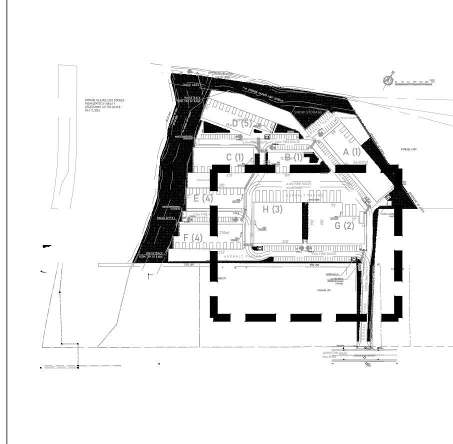
SCALE AT A3:	DATE:	DRAWN:	CHECKED:
NTS	2024-08-14	AN	AH

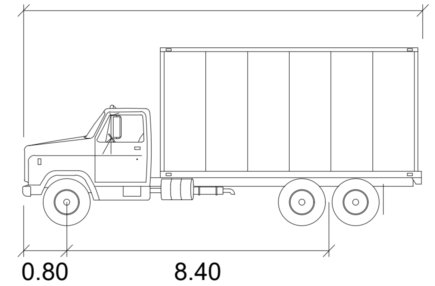
PROJECT NO:	DRAWING NO:	REVISION:
2022-061	003	04



Notes:

Key Map:





HSU

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.0

REV:	DESCRIPTION:	BY:	DATE:
04	Updated Site Plan	AN	2024-08-14

STATUS:

CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

CLIENT: Quaestus

ARCHITECT:

SITE: 1319 Johnston

TITLE: Garbage Turning Movements Inbound Movements

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
NTS	2024-08-14	AN	AH

PROJECT NO:	DRAWING NO:	REVISION:
2022-061	004	04

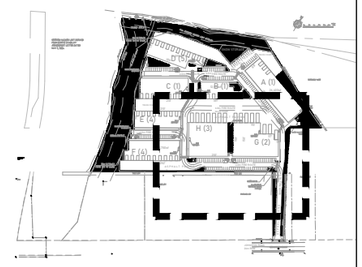
Garbage **Outbound** Turning Movements

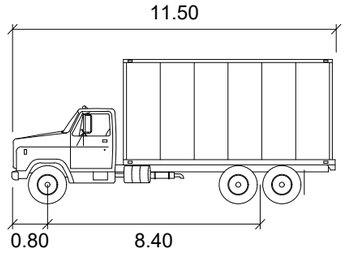
D (5)
C (1)
B (1)
12,195sf
A (1)
26,400sf
E (4)
H (3)
G (2)
F (4)
15,750sf

6.0m FIRE ROUTE
TRUCK COURT
ASPHALT PAVING
RIVER STONE
ASPHALT PAVING
TYPE A
TYPE B
6 BIKES
10 BIKES
15 BIKES
M&E SERVICES
WASTE MANAGEMENT ENCLOSURE
CENTRELINE OF DITCH
TREE LINE
PARKING LOT
HYDRO SWITCH
12m FIRE ROUTE CENTRELINE RADIUS (TYPICAL)

Notes:

Key Map:





HSU

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.0

REV:	DESCRIPTION:	BY:	DATE:
04	Updated Site Plan	AN	2024-08-14

STATUS:

CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

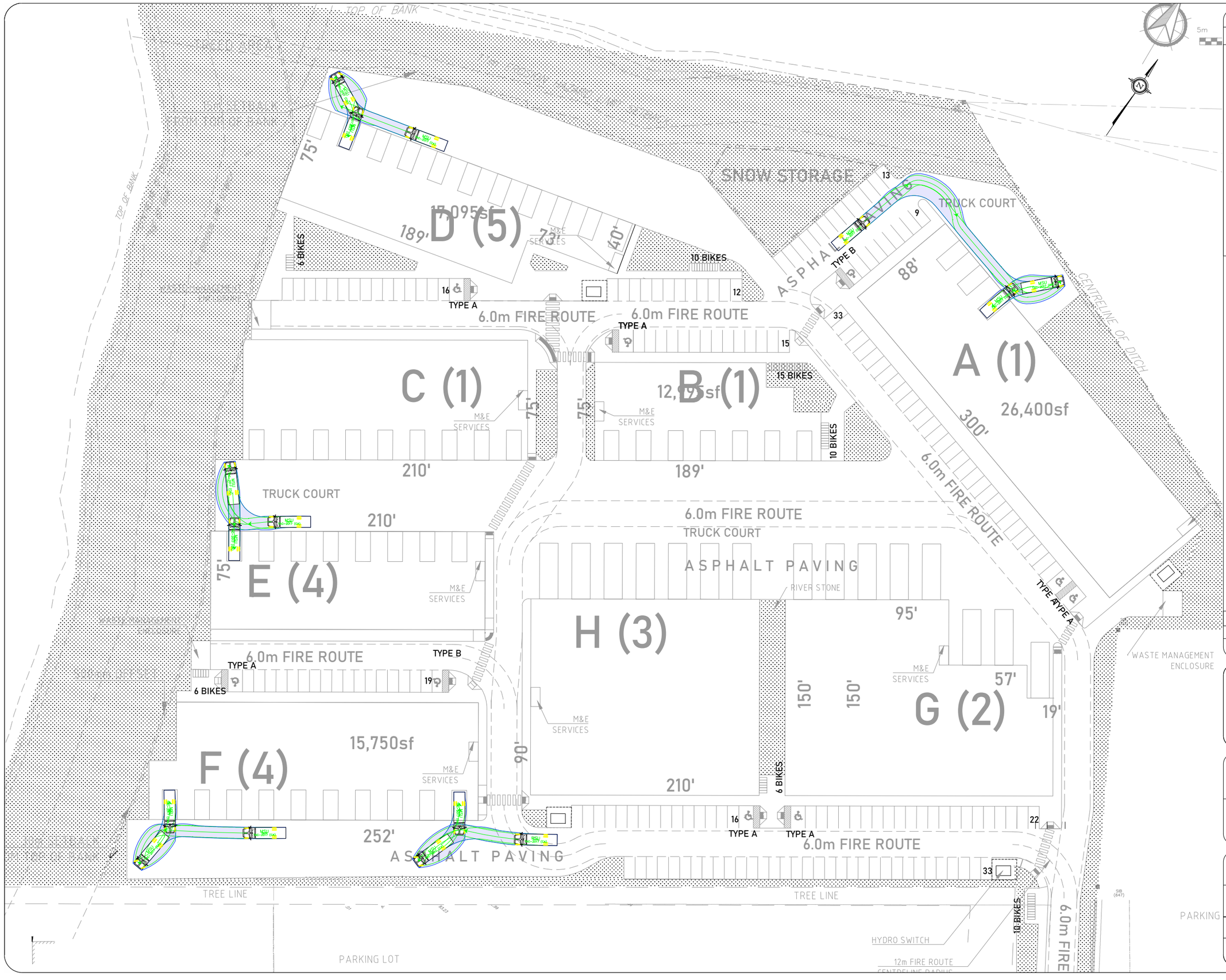
CLIENT: Quaestus

ARCHITECT:

SITE: 1319 Johnston

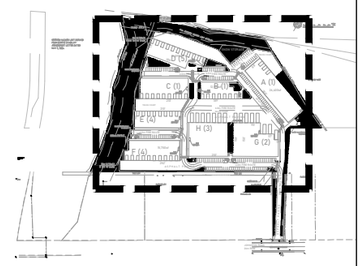
TITLE: Garbage Turning Movements Outbound Movements

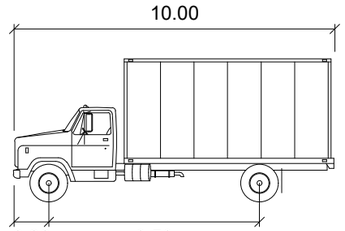
SCALE AT A3:	DATE:	DRAWN:	CHECKED:
NTS	2024-08-14	AN	AH
PROJECT NO:	DRAWING NO:		REVISION:
2022-061	005		04



Notes:

Key Map:





MSU

	meters
Width	: 2.60
Track	: 2.60
Lock to Lock Time	: 6.0
Steering Angle	: 40.2

REV:	DESCRIPTION:	BY:	DATE:
04	Updated Site Plan	AN	2024-08-14

STATUS:

CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

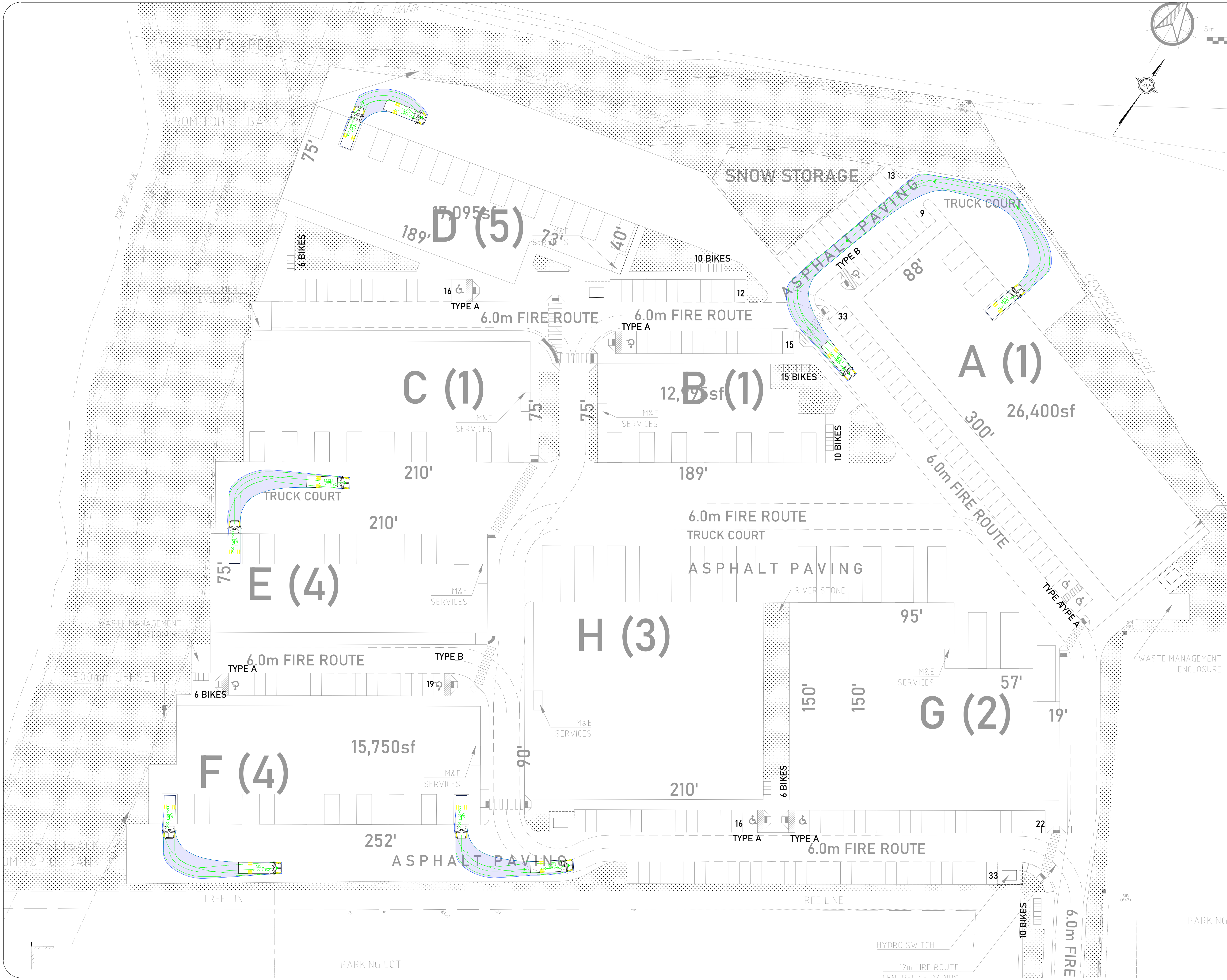
CLIENT: Quaestus

ARCHITECT:

SITE: 1319 Johnston

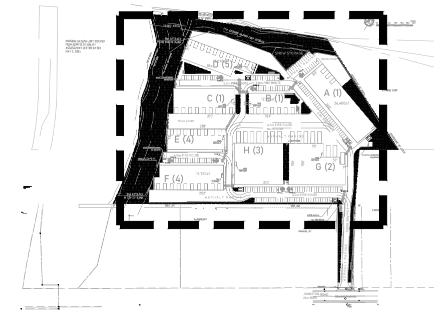
TITLE: MSU Turning Movements
Inbound Movements

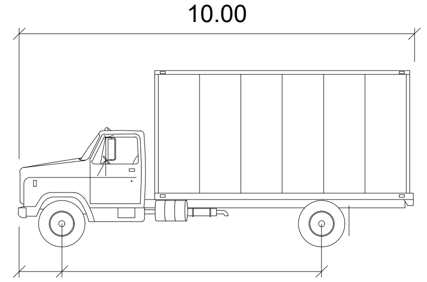
SCALE AT A3:	DATE:	DRAWN:	CHECKED:
NTS	2024-08-14	AN	AH
PROJECT NO:	DRAWING NO:		REVISION:
2022-061	006		04


SNOW STORAGE
TRUCK COURT
ASPHALT PAVING
D (5)
17,095sf
189'
73'
40'
75'
6 BIKES
10 BIKES
16
12
13
9
TYPE A
TYPE B
6.0m FIRE ROUTE
C (1)
210'
B (1)
12,175sf
189'
15
15 BIKES
10 BIKES
A (1)
26,400sf
88'
300'
33
E (4)
210'
TRUCK COURT
F (4)
15,750sf
252'
6 BIKES
19
H (3)
210'
90'
G (2)
95'
57'
19'
150'
16
22
33
6 BIKES
RIVER STONE
M&E SERVICES
WASTE MANAGEMENT ENCLOSURE
TREE LINE
PARKING LOT
PARKING
HYDRO SWITCH
12m FIRE ROUTE
CENTRELINE OF DITCH
TOP OF BANK
5m

Notes:

Key Map:





MSU

meters

Width	:	2.60
Track	:	2.60
Lock to Lock Time	:	6.0
Steering Angle	:	40.2

REV:	DESCRIPTION:	BY:	DATE:
04	Updated Site Plan	AN	2024-08-14

STATUS:

CGH Transportation
6 Plaza Court
Ottawa, ON
K2H 7W1
(343) 999-9117

CLIENT: Quaestus

ARCHITECT:

SITE: 1319 Johnston

TITLE: MSU Turning Movements
Outbound Movements

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
NTS	2024-08-14	AN	AH

PROJECT NO:	DRAWING NO:	REVISION:
2022-061	007	04

Appendix P

MMLOS Worksheets

Multi-Modal Level of Service - Intersections Form

Consultant	**CGH Transportation Inc**	**Project**	**2022-061**
Scenario	**Existing/Future**	**Date**	**3/27/2024**
Comments			

	INTERSECTIONS	**Bank Street at Johnston Road (Existing)**				**Bank Street at Johnston Road (Future)**			
	Crossing Side	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Pedestrian	Lanes	10+	10+	8	9	10+	10+	8	9
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Protected/ Permissive	Protected/ Permissive	Permissive	Permissive	Protected/ Permissive	Protected/ Permissive
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No
	Right Turn Channel	Conventional with Receiving Lane	Conventional with Receiving Lane	No Channel	No Channel	Conventional with Receiving Lane	Conventional with Receiving Lane	No Channel	No Channel
	Corner Radius	10-15m	15-25m	10-15m	10-15m	10-15m	15-25m	10-15m	10-15m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	**-44**	**-46**	**-12**	**-29**	**-44**	**-46**	**-12**	**-29**
	Ped. Exposure to Traffic LoS	**#N/A**	**#N/A**	**F**	**#N/A**	**#N/A**	**#N/A**	**F**	**#N/A**
	Cycle Length	120	120	120	120	120	120	120	120
	Effective Walk Time	37	37	6	6	37	37	6	6
	Average Pedestrian Delay	**29**	**29**	**54**	**54**	**29**	**29**	**54**	**54**
	Pedestrian Delay LoS	**C**	**C**	**E**	**E**	**C**	**C**	**E**	**E**
	Level of Service	**#N/A**	**#N/A**	**F**	**#N/A**	**#N/A**	**#N/A**	**F**	**#N/A**
		#N/A				**#N/A**			
	Approach From	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Bicycle	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Mixed Traffic	Pocket Bike Lane	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic
	Right Turn Lane Configuration	≤ 50 m Introduced right turn lane	≤ 50 m	≤ 50 m	≤ 50 m	≤ 50 m Introduced right turn lane	Not Applicable	Not Applicable	≤ 50 m
	Right Turning Speed	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	>25 km/h	≤ 25 km/h	Not Applicable	Not Applicable	>25 km/h
	Cyclist relative to RT motorists	**B**	**D**	**D**	**E**	**B**	**Not Applicable**	**Not Applicable**	**E**
	Separated or Mixed Traffic	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Separated**	**Separated**	**Separated**	**Mixed Traffic**
	Left Turn Approach	≥ 2 lanes crossed	≥ 2 lanes crossed	≥ 2 lanes crossed	≥ 2 lanes crossed	2-stage, LT box	2-stage, LT box	2-stage, LT box	≥ 2 lanes crossed
	Operating Speed	≥ 60 km/h	≥ 60 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h
	Left Turning Cyclist	**F**	**F**	**F**	**F**	**A**	**A**	**A**	**F**
	Level of Service	**F**	**F**	**F**	**F**	**B**	**A**	**A**	**F**
		F				**F**			
Transit	Average Signal Delay	≤ 40 sec	≤ 30 sec		≤ 10 sec	≤ 40 sec	≤ 30 sec		≤ 10 sec
	Level of Service	**E**	**D**	**-**	**B**	**E**	**D**	**-**	**B**
		E				**E**			
Truck	Effective Corner Radius								
	Number of Receiving Lanes on Departure from Intersection								
	Level of Service	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
		-				**-**			
Auto	Volume to Capacity Ratio	0.71 - 0.80				0.71 - 0.80			
	Level of Service	**C**				**C**			

Multi-Modal Level of Service - Segments Form

Consultant	**CGH Transportation Inc**	**Project**	**2022-061**
Scenario	**Existing/Future**	**Date**	**6/13/2024**
Comments			

SEGMENTS			Johnston Road Existing	Johnston Road Future	Section 3
Pedestrian	Sidewalk Width Boulevard Width		no sidewalk n/a	≥ 2 m 0.5 - 2 m	
	Avg Daily Curb Lane Traffic Volume		> 3000	> 3000	
	Operating Speed On-Street Parking		> 50 to 60 km/h no	> 50 to 60 km/h no	
	Exposure to Traffic PLoS	**-**	**F**	**D**	**-**
	Effective Sidewalk Width				
	Pedestrian Volume				
	Crowding PLoS		**-**	**-**	**-**
	Level of Service		**-**	**-**	**-**
Bicycle	Type of Cycling Facility		Mixed Traffic	Curbside Bike Lane	
	Number of Travel Lanes		2-3 lanes total	2 ea. dir. (no median)	
	Operating Speed		≥ 50 to 60 km/h	>50 to 70 km/h	
	# of Lanes & Operating Speed LoS		**E**	**C**	**-**
	Bike Lane (+ Parking Lane) Width			≥ 1.8 m	
	Bike Lane Width LoS	**E**	**-**	**A**	**-**
	Bike Lane Blockages			Rare	
	Blockage LoS		**-**	**A**	**-**
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge	< 1.8 m refuge	
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes	≤ 3 lanes	
	Sidestreet Operating Speed		>50 to 60 km/h	>50 to 60 km/h	
	Unsignalized Crossing - Lowest LoS		**C**	**B**	**-**
	Level of Service		**E**	**C**	**-**
Transit	Facility Type				
	Friction or Ratio Transit:Posted Speed	**-**			
	Level of Service		**-**	**-**	**-**
Truck	Truck Lane Width				
	Travel Lanes per Direction	**-**			
	Level of Service		**-**	**-**	**-**