3288 & 3300 Borrisokane Road, 4205, 4345 & 4375 McKenna Casey Drive

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Strategy Report (Revision #2)

Prepared for:

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March 2024

PN: 2021-115

Table of Contents

List of Figures

Table of Tables

List of Appendices

1 Screening

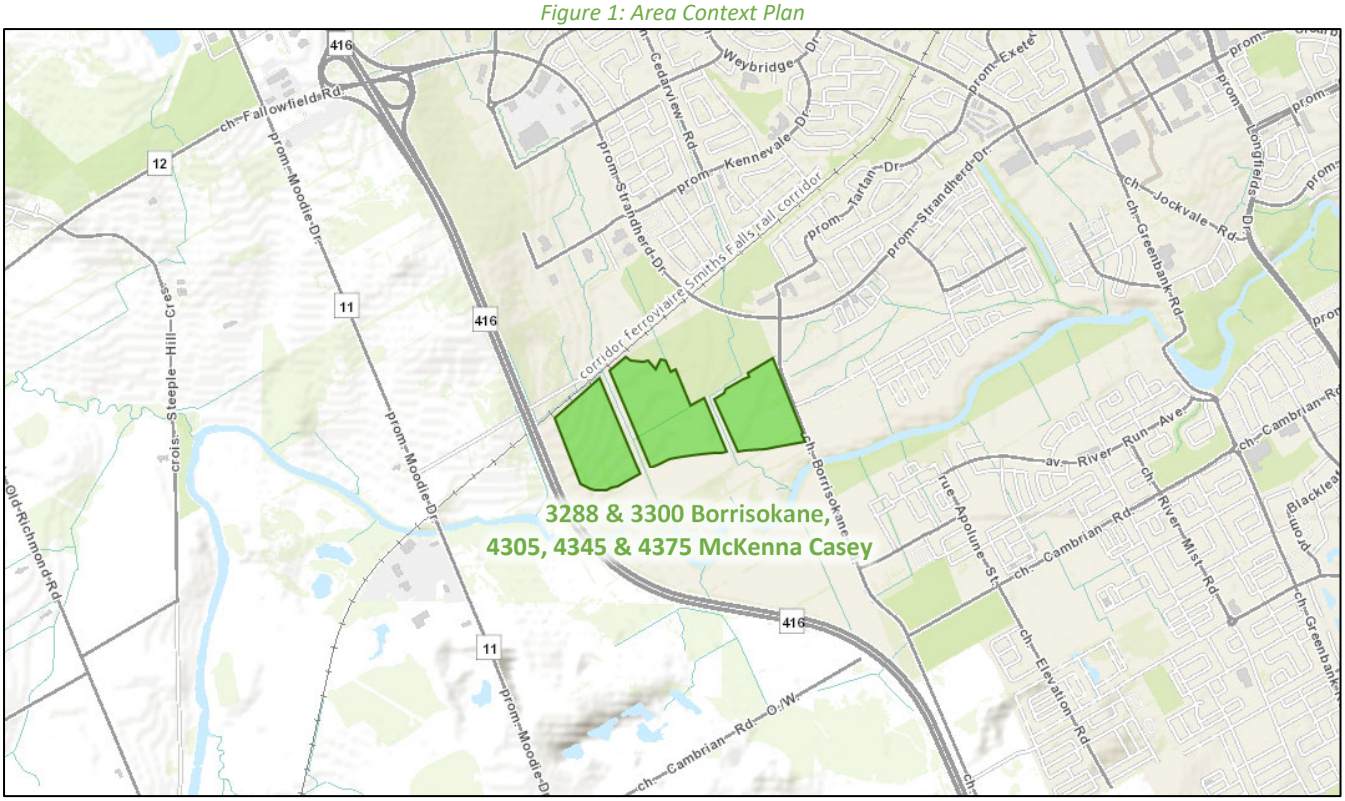
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines, incorporating the 2023 Revision to Transportation Impact Assessment Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for the TIA Study PM. As shown in the Screening Form, a TIA is required, and this study has been prepared to support a zoning and draft plan of subdivision application.

2 Existing and Planned Conditions

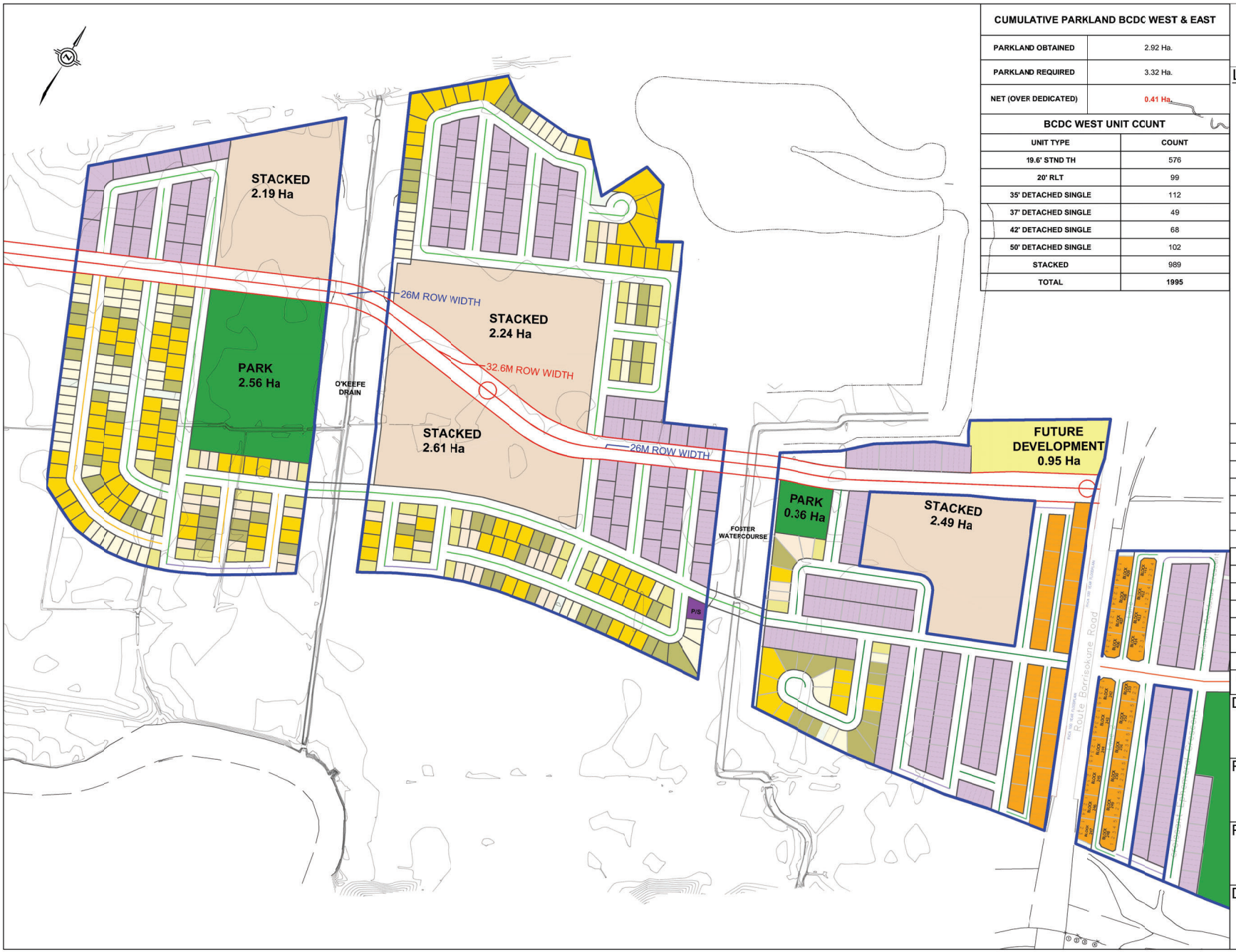
2.1 Proposed Development

The proposed development, located at 3288 and 3300 Borrisokane Road and 4305, 4345 and 4375 McKenna Casey Drive, is zoned as Development Reserve Zone (DR). The proposed development consists of a mix of residential product types, totalling 331 single detached homes and 1664 townhomes. An interim collector road is proposed to connect to Borrisokane Road at the planned intersection of the BRT corridor to the east, with the upgrade of this collector road in the fullness of time to include median BRT lanes. A local road connection to Borrisokane Road at the intersection with Conservancy Drive will also service the development. The anticipated full build-out and occupancy horizon is 2030 with construction occurring in multiple phases. 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: February 12, 2024



CUMULATIVE PARKLAND BCDC WEST & EAST	
PARKLAND OBTAINED	2.92 Ha.
PARKLAND REQUIRED	3.32 Ha.
NET (OVER DEDICATED)	0.41 Ha.

BCDC WEST UNIT COUNT	
UNIT TYPE	COUNT
19.6' STND TH	576
20' RLT	99
35' DETACHED SINGLE	112
37' DETACHED SINGLE	49
42' DETACHED SINGLE	68
50' DETACHED SINGLE	102
STACKED	989
TOTAL	1995

CAIVAN

LEGEND:

- 19.6' STANDARD TOWNHOME
- 20' RLTH
- 35' DETACHED SINGLE
- 37' DETACHED SINGLE
- 42' DETACHED SINGLE
- 50' DETACHED SINGLE
- STACKED CONDO BLOCK
- FUTURE DEVELCPMENT
- PARKS
- PUMP STATION
- WALKWAY/SERVICING BLOCK
- 8.5m LANE
- 14.75m ROW (WINDOW)
- 16.50m ROW
- 18.0m ROW
- PHASE BOUNDARY

LOT COUNT	
UNIT TYPE	COUNT
RLT	99
STND TH	576
DETACHED SINGLE	331
STACKED	989
TOTAL	1995

REV #	DESCRIPTION	DATE
7	Update for pre-con DWG Sk-22 now Sk-22.1	2024-02-21
6	Updated STND TH to new 19.6' TH	2024-01-18
5	Plans updated to incorporate BCDC East	2024-01-12
4	Updated BRT plan W.Stacked Product	2024-01-10
3	Updated BRT Alignment	2023-12-19
2	1st Rev. DP Comments	2022-07-21
1	Revised Jock River Boundary Line	2022-04-18

DATE: 2024-02-23

DRAWN BY: LV

PROJECT NO.: OTL400.3

PROJECT NAME: CONSERVANCY WEST

DRAWING #: SK-22.1_SK-8.3

2.2 Existing Conditions

2.2.1 Area Road Network

Borrisokane Road: Borrisokane Road is a City of Ottawa arterial road with a two-lane rural cross-section including gravel shoulders and a 50 km/h posted speed limit along the frontage of the site. South of the site, the speed limit is 80 km/h, and south Cambrian Road, Borrisokane Road becomes a collector road where the cross section does not change. The City-protected right-of-way is 37.5 metres rights through the subject site.

Strandherd Drive: Strandherd Drive is a City of Ottawa arterial road with a four-lane urban cross-section including cycletracks and sidewalks on both sides of the road. The posted speed limit is 60 km/h, and the City-protected right-of-way is 44.5 metres. Strandherd Drive is a truck route.

Tartan Drive: Tartan Drive is a City of Ottawa collector road with a two-lane urban cross-section with sidewalks on both sides of the road. The posted speed limit is 40 km/h posted speed limit and the existing right-of-way is 26.0 metres.

2.2.2 Existing Intersections

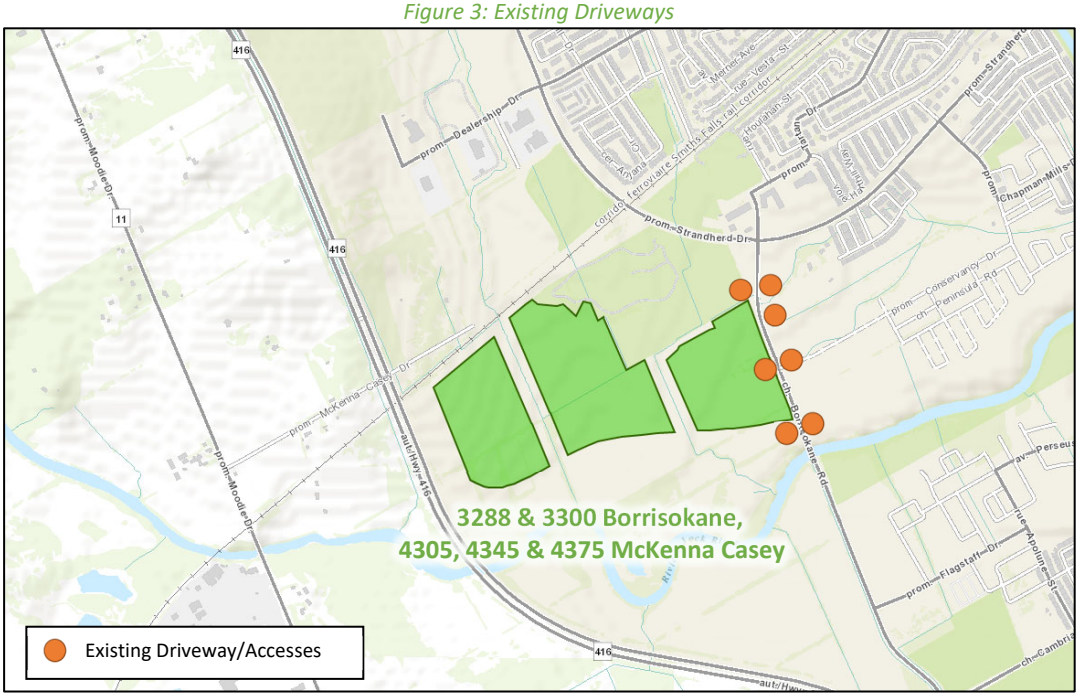
The existing signalized area intersection within one kilometre of the site has been summarized below:

Strandherd Drive at Borrisokane Road/Tartan Drive	The intersection of Strandherd Drive at Borrisokane Road/Tartan Drive is a signalized intersection. The northbound approach consists of two auxiliary left-turn lanes, a through lane, and an auxiliary right-turn lane, and the southbound approach consists of an auxiliary left-turn lane and a shared through/right-turn lane. The eastbound approach consists of an auxiliary left-turn lane, two through lanes, and an auxiliary channelized right-turn lane, and the westbound approach consists of an auxiliary left-turn lane, two through lanes, and an auxiliary left-turn lane. Crossrides are present on all approaches. No turn restrictions were noted.

2.2.3 Existing Driveways

Within 200 metres of the future intersections on Borrisokane Road, construction accesses located at the future intersection locations, field accesses to the south adjacent to the Jock River, a driveway to an existing residential property, and a construction access are all present. None of the driveways within the area of consideration are significant traffic generators. Figure 3 illustrates the existing driveways.

Figure 3: Existing Driveways



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: February 12, 2024

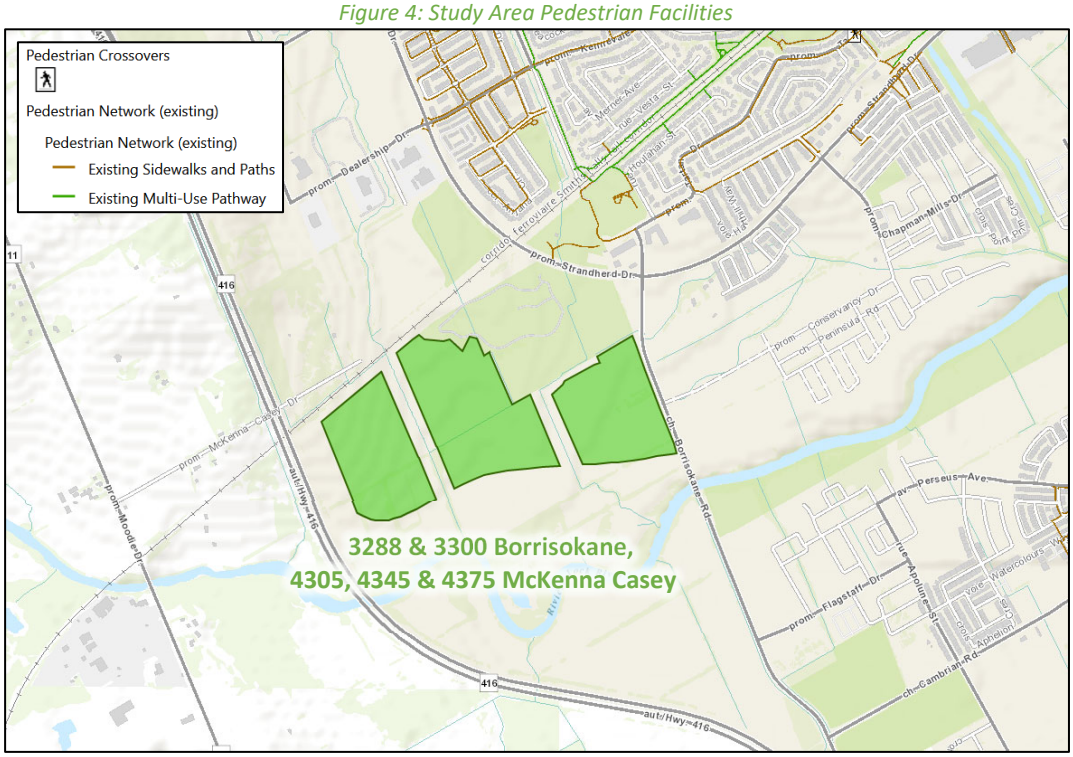
2.2.4 Cycling and Pedestrian Facilities

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

Sidewalks are located along both sides of Strandherd Drive and Tartan Drive. Cycletracks are present along Strandherd Drive. Tartan Drive is a suggested route connecting to recreational paths south of Cedarview Drive and along the Rail Corridor. Strandherd Drive is a Cross-town bikeway.

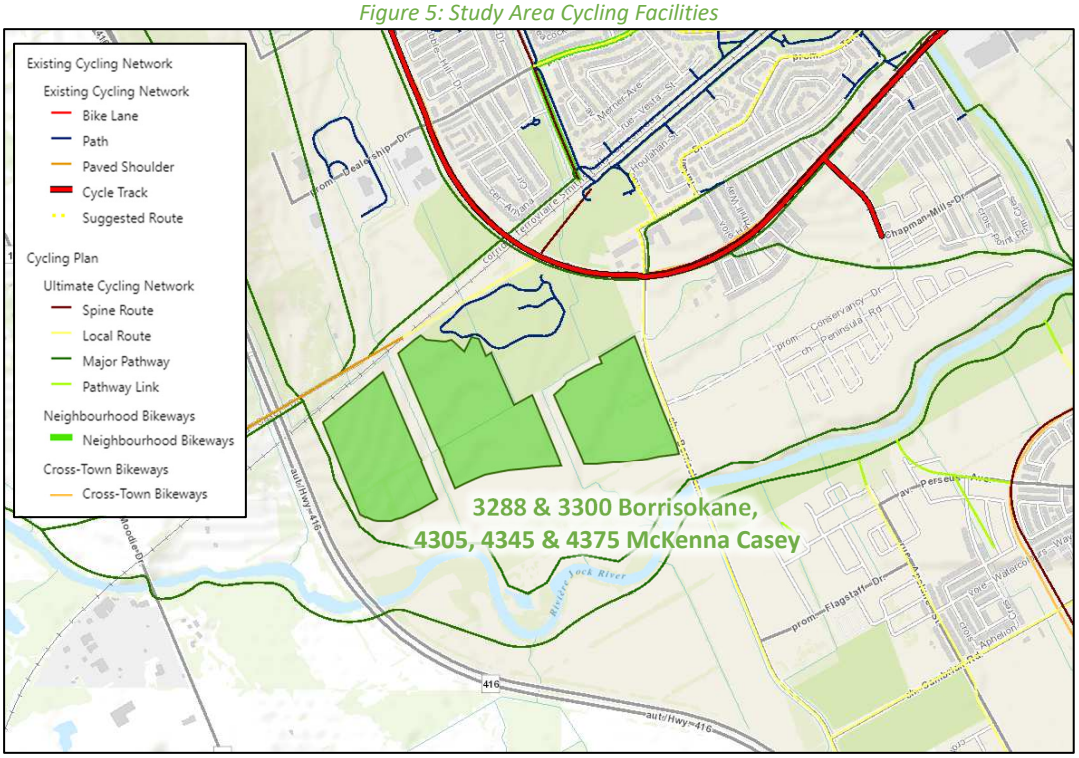
The traffic volume counts, presented in Section 2.2.7, captured no pedestrian or cyclist movements during the peak hours.

Figure 4: Study Area Pedestrian Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: February 12, 2024

Figure 5: Study Area Cycling Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: February 12, 2024

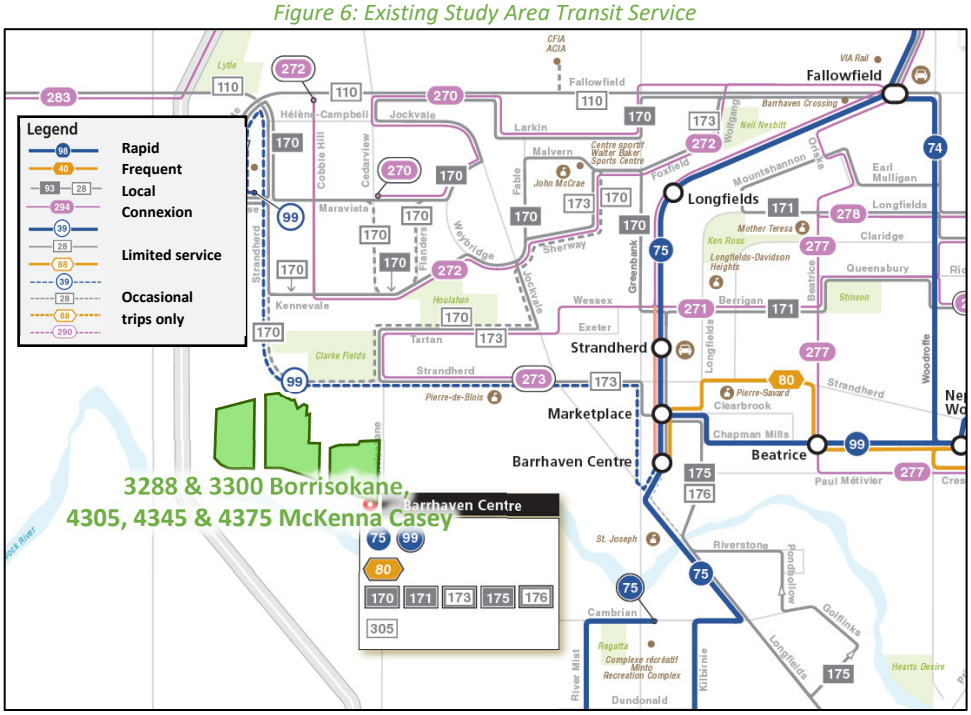
2.2.5 Existing Transit

Figure 6 illustrates the transit system map in the study area and Figure 7 illustrates nearby transit stops. All transit information is from February 28, 2024 and is included for general information purposes and context to the surrounding area.

Within the study area, the routes #99, #170, #173 and #273 provide service within 800 metres of the proposed site. Primary stops are located on Tartan Dive north of Strandherd Drive. The frequency of these routes within proximity of the proposed site based on February 28, 2024 service levels are:

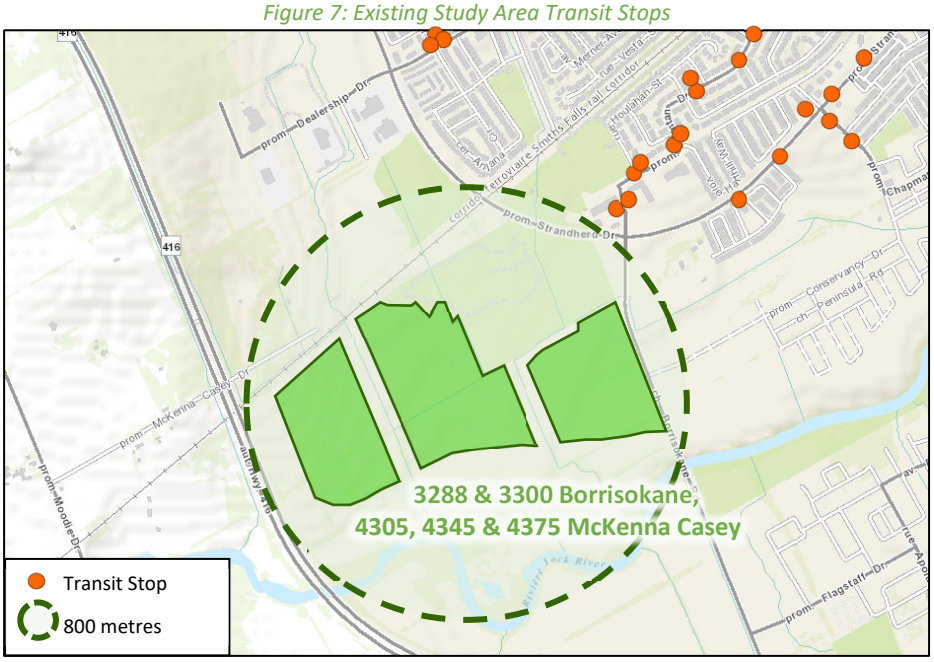
- Route #99 – two buses per peak period in each direction
- Route #170 – eight buses after 7:30 PM in each direction
- Route #173 –30-minute service operating between approximately 6:00 AM and 6:30 PM
- Route #273 – six buses in the peak direction/period only

Figure 6: Existing Study Area Transit Service



Source: http://www.octranspo.com/ Accessed: February 28, 2024

Figure 7: Existing Study Area Transit Stops



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: February 28, 2024

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 intersection. Table 1 summarizes the intersection count dates.

Table 1: Intersection Count Date

Intersection	Count Date
Borrisokane Road at Strandherd Drive	January 18, 2018

Figure 8 illustrates the existing traffic counts and Table 2 summarizes the existing intersection operations. The intersections were also balanced based on other area traffic work, and for the adjacent developments completed shortly after the intersection count was recorded, such as Minto Harmony and Caivan Conservancy Phase 1, which have been included to account for additional volumes along Strandherd Drive. 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 8: Existing Traffic Counts

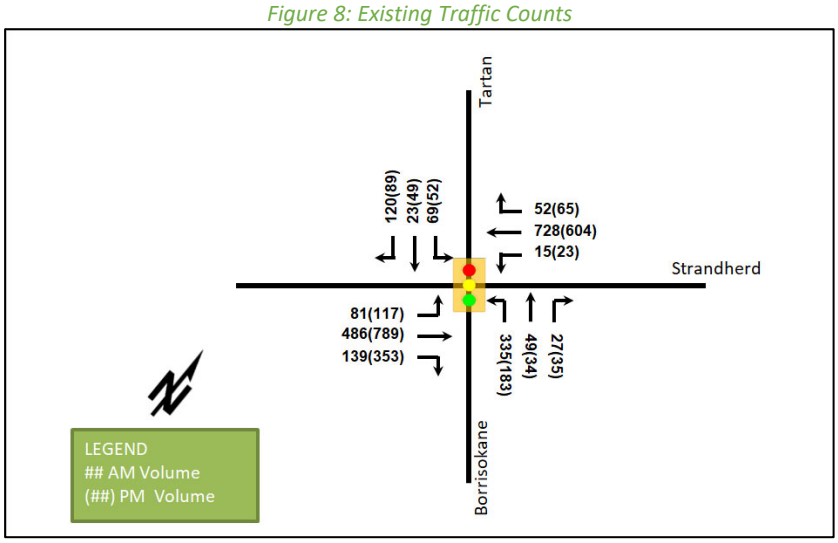


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Borrisokane Road/Tartan Drive *Signalized*	EBL	A	0.40	24.3	24.1	A	0.38	18.0	29.4
	EBT	A	0.38	21.1	62.2	A	0.50	18.8	97.6
	EBR	A	0.25	21.0	40.0	A	0.50	20.8	97.9
	WBL	A	0.06	29.8	8.9	A	0.12	27.6	11.5
	WBT	C	0.73	37.4	**#127.4**	A	0.53	29.9	91.6
	WBR	A	0.12	29.6	20.9	A	0.13	25.8	23.4
	NBL	B	0.69	49.5	57.5	A	0.60	57.4	36.9
	NBT	A	0.12	34.3	19.7	A	0.11	41.3	17.0
	NBR	A	0.08	33.7	12.9	A	0.15	42.3	17.7
	SBL	A	0.48	58.0	32.4	A	0.45	63.7	27.5
	SBT/R	B	0.67	57.9	55.9	B	0.70	64.3	56.8
	Overall	**B**	**0.70**	**35.7**	-	**A**	**0.59**	**29.3**	-

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

The intersection of Strandherd Drive & Borrisokane Road/Tartan Drive may exhibit extended queues on the westbound through movement during the AM peak hour. No other operational issues are noted.

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 9 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data are included in Appendix D.

Table 3: Study Area Collision Summary, 2018-2022

		Number	%
Total Collisions		**73**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	15	21%
	Property Damage Only	58	79%
Initial Impact Type	**Approaching**	1	1%

		Number	%
Total Collisions		**73**	**100%**
	Angle	4	5%
	Rear end	33	45%
	Sideswipe	5	7%
	Turning Movement	9	12%
	SMV Other	21	29%
Road Surface Condition	**Dry**	47	64%
	Wet	10	14%
	Loose Snow	8	11%
	Slush	1	1%
	Packed Snow	2	3%
	Ice	4	5%
	Loose Sand and Gravel	1	1%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

Figure 9: Study Area Collision Records, 2018-2022

Table 4: Summary of Collision Locations, 2018-2022

	Number	%
Intersections / Segments	**73**	**100%**
Borrisokane Rd/Tartan Dr @ Strandherd Dr	42	58%
Borrisokane Rd between Cambrian Rd & Strandherd Dr	22	30%
Strandherd Dr between Cedarview Rd & Madrid Ave	5	7%
Strandherd Dr between Cedarview Rd & Mckenna Casey Dr	4	5%

Within the study area, the intersection of Borrisokane Road/Tartan Drive at Strandherd Drive and the segment of Borrisokane Road between Cambrian Road & Strandherd Drive are noted to have experienced higher collisions than other locations. Table 5 and Table 6 summarize the collision types and conditions for each of these locations, respectively.

Table 5: Borrisokane Rd/Tartan Dr @ Strandherd Dr Collision Summary

		Number	%
Total Collisions		**42**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	7	17%
	Property Damage Only	35	83%
Initial Impact Type	**Angle**	4	10%
	Rear end	23	55%
	Sideswipe	5	12%
	Turning Movement	7	17%
	SMV Other	3	7%
Road Surface Condition	**Dry**	26	62%
	Wet	7	17%
	Loose Snow	4	10%
	Packed Snow	2	5%
	Loose Sand and Gravel	1	2%
	Ice	2	5%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

The Strandherd Drive and Borrisokane Road/Tartan Drive intersection had a total of 42 collisions during the 2018-2022 time period, with 35 involving property damage only and the remaining seven having non-fatal injuries. The collision types are most represented by rear end with 23 collisions, turning movement with seven collisions, sideswipe with five collisions, angle with four collisions, and the remaining three collisions as SMV (other). Rear end collisions are typical of congested conditions. Weather conditions may influence collisions at this location, however the recent reconstruction of the intersection may mitigate these effects. No further collision review is required as part of this study.

Table 6: Borrisokane Rd between Cambrian Rd & Strandherd Dr Collision Summary

		Number	%
Total Collisions		**22**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	4	18%
	Property Damage Only	18	82%
Initial Impact Type	**Approaching**	1	5%
	Rear end	4	18%
	SMV Other	17	77%
Road Surface Condition	**Dry**	14	64%
	Wet	1	5%
	Loose Snow	4	18%
	Slush	1	5%
	Ice	2	9%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

The segment of Borrisokane Road between Cambrian Road and Strandherd Drive had a total of 22 collisions during the 2018-2022 time period, with 18 property damage only and the remaining four having non-fatal injuries. The collision types are most represented by SMV Other with 17 collisions, rear end with four collisions, and a single collision as approaching. The rural nature of the roadway may be the cause of the single motor vehicle collisions, from running off the road or animal strikes. The urbanization of the corridor along the site frontage is anticipated

to mitigate SMV collisions along it. Weather conditions may influence collisions at this location, and alternative paving treatments may be investigated for the segment as part of future City-led improvements. No further collision review is required as part of this study.

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

Strandherd Drive Widening (Maravista Drive to Jockvale Road)

The widening of Strandherd Drive from two to four was recently completed and included the reconstruction of the Borrisokane Road at Strandherd Drive intersection. As part of these works, the McKenna Casey Drive connection to Strandherd Drive was severed.

Chapman Mills Drive Extension

The environmental assessment study was completed in 2016 for the Chapman Mills Drive Extension and Bus Rapid Transit corridor between Strandherd Drive and Longfields Drive, with the BRT corridor continuing separately to Borrisokane Road. As part of the development in the area, Chapman Mills Drive has been completed on the north-south section from Strandherd to Canoe Street, with an interim road east to the Kennedy-Burnett Stormwater Pond. The roadway is included within the Affordable Network for 2031 and the BRT portion is anticipated to be constructed between 2030 and 2035. It is understood that the detailed design has been initiated in 2023 with construction subsequent to this in an interim configuration.

Greenbank Road Re-Alignment

While not within the study area, Greenbank Road is planned to be re-aligned from near the existing Jockvale Road intersection with a new bridge crossing to the north of the existing Jock River crossing, continuing around Mattamy's Half Moon Bay North development and connecting to Cambrian Road approximately 1.1km to the west of the existing alignment. The construction for Greenbank Road has been delayed as to advance the Strandherd Drive widening, likely to beyond 2035.

Barnsdale Road Highway 416 Interchange

A new interchange at Barnsdale Road to Highway 416 is currently being planned by the City with the Ministry of Transportation Ontario to support the existing and future growth within Barrhaven, specifically south of the Jock River and adjacent to the Fallowfield Drive interchange. The interchange is anticipated to be completed post 2035.

Other Area Intersection Modifications

Intersection Control Measures outlined in the 2019 Ottawa Development Charges By-Law are expected to be implemented at the intersection of Cambrian Road at Borrisokane Road – intersection modifications including new lane configurations and signalization planned to begin within 2-3 years per the City's Planned Construction Projects portal.

Borrisokane Road at Flagstaff Drive – intersection modifications including the provision of a southbound left-turn lane planned to begin this year per the City's Planned Construction Projects portal. The detailed design exercise by CGH is ongoing.

2.3.2 Other Study Area Developments

3195 Jockvale Road

The development is proposed to be a mix of 210 stacked townhome units and approximately 200,000 sq. ft. of retail space, located between the Barrhaven Towncentre and the On The Green golf range. The development will extend Jockvale Road south of the Barrhaven Towncentre and include a new signalized intersection on Greenbank Road. It is estimated that the development will be constructed by 2026.

3201 Greenbank Road
Already constructed, approximately 11,000 ft2 of retail and an 8,000 ft2 restaurant space has been incorporated into the existing retail development of the Loblaws and Home Sense.

3288 Greenbank Road
The development is understood to be a mix of 310 apartment units and 602 townhome units, located between the future Chapman Mills Drive alignment to the north and the Claridge development (3370 Greenbank Road) to the south. The townhome units have been built out and the apartment units are yet to be constructed.

3370 Greenbank Road
This development is proposed to include 195 townhomes in Phase 1, which has been constructed, and 225 retirement home units, 235 condominium units, and 20 townhouse units in Phase 2. Originally proposed to be completed by 2020, the construction of Phase 2 has not yet begun.

Riversbend – 3311 Greenbank Road
A residential subdivision has been constructed south of St Joseph High School, in conjunction with the City of Ottawa. A total of 144 townhome units (25 within City lands), and 64 mid-rise units (City) are understood to have been constructed within the lands.

Half Moon Bay South Phase 5
The Mattamy Development of Half Moon Bay South Phase 5 is located east of Re-Aligned Greenbank Road and south of Dundonald Drive and has been constructed. The development is understood to consist of 164 single detached home units and 97 townhouse units. (CGH 2019)

Half Moon Bay West
The Mattamy Development of Half Moon Bay West is located north of Cambrian Road and east of Borrisokane Road and is expected to finish construction during 2024. This development is understood to include 552 single family homes and 464 townhomes. (Stantec 2016)

Half Moon Bay North Phase 9- 2444 Watercolours Way
South of Watercolours Way and west of Seeley's Bay Street development is the Half Moon Bay North Phase 9 development, which is constructed. This development is understood to consist of 60 stacked townhouses. (Stantec 2018)

Quinn's Pointe 2- 3882 Barnsdale and 3960 Greenbank Road
The Minto Development of Quinn's Pointe 2 is located west of Greenbank Road and north of Barnsdale Road. This development has been constructed and is understood to include 536 single-family dwelling units, 493 townhomes, 100 apartment units, and two elementary schools. (Stantec 2018)

The Meadows Phase 5-6
Phase 5-6 (termed Phase 4 during the file circulation) of the Meadows Tamarack Development is located south of Cambrian Road on the east side of Re-Aligned Greenbank Road and has been constructed. The development is understood to include 136 townhouse units and 50 single family units. (IBI 2018)

The Meadows Phase 7-8
Phases 7-8 (termed Phase 5 during the file circulation) of the Meadows Tamarack Development is located south of Cambrian Road on the west side of Re-Aligned Greenbank Road. The concept plan considers a total of 221 townhouses and 125 single family units. Phase 7 has been constructed and Phase 8 is anticipated to be built-out by 2025. (IBI, 2018)

3387 Borrisokane Road
North of Cambrian Road is the Glenview Development of 3387 Borrisokane Road, which has been constructed. The development is understood to include 179 single family units and 109 townhouses. (Stantec 2016)

115 Lusk Street
The development is a self-storage facility with shared office space and ground floor retail space. The development is forecast to be built out in 2025. (CGH, 2023)

Citigate Employment Lands
The proposed development application includes a shopping centre with 350,000 sq. ft of gross floor area (GFA), a hotel, 16.56 hectares of Business Park, 67.65 hectares of Prestige Business Park, and 10.5 hectares of car dealerships. It is noted that dealerships on the east south comer, the Amazon facility, and retail stores on the north side have been constructed. The entire development area was initially forecast to be built out in 2029, and the land area is approximately over half developed. (Novatech, 2012)

4401 Fallowfield Road
This commercial development will not have shared accesses or traffic cross-over but will impact the Study Area intersections. The site trips generated by this site will be accounted for in the traffic projections using the 3285 Borrisokane Road TIS for Phase 1 of the Conservancy Development documenting the 4401 Fallowfield Road traffic volumes.

Harmony Development – 4025 Strandherd Drive
The Minto Communities development of 4025 Strandherd Drive located east of the site has been constructed and included within the existing conditions.

Harmony Phase 5 – 3232 Jockvale Road
This development is understood to include a total of eight detached houses and 188 townhome units and is located on the west side of Greenbank Road, north of the future Chapman Mills Drive corridor. The development has been constructed. (CGH, 2020)

Conservancy Phase 1 – 3285 Borrisokane Road
On the south side of the Chapman Mills Drive corridor is 3285 Borrisokane Road and has been constructed and included within the existing conditions. This development is understood to include 125 single family homes and 75 townhouses. (Parsons 2018)

The Ridge/Brazeau – 3809 Borrisokane Road
The development is understood to include 590 residential units, split between townhouse units and detached houses, and has been constructed. The site is located on the west side of Re-Aligned Greenbank Road. (CGH 2019)

Drummond Subdivision – 3713 Borrisokane Road
Located west of Re-Aligned Greenbank Road is the proposed residential development of 3713 Borrisokane Road. The development will include approximately 123 detached homes and 439 townhouses and is expected to be built-out during 2024. (CGH 2020, 2024)

ABIC Manufacturing – 3713 Borrisokane Road
A light industrial parcel at 3713 Borrisokane Road along Borrisokane Road has been developed and is understood to include approximately 3,250 square metres of general office space and 9,385 square metres of industrial buildings. (CGH 2020)

Conservancy East – 3285, 3288 & 3305 Borrisokane Road
The proposed residential development includes approximately 1,275 units. The anticipated full build-out and occupancy horizon is 2029. (CGH 2021, 2022, 2023, 2024).

4085 Strandherd Drive
The development is understood to be a long-term care home with 192 beds. The anticipated buildout horizon is 2026. (CGH, 2023)

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersection will include:

- Strandherd Drive
  - Tartan Road/Borrisokane Road
- Borrisokane Road
  - Conservancy Drive (Future)
  - New Collector (Future)

Borrisokane Road is a boundary road. No screenlines are present near the proposed site and any screenline analysis would need extend across Barrhaven to capture each of the north/south or east-west corridors. Therefore, no screenline analysis is included within this TIA study.

3.2 Time Periods

As the proposed development is composed of residential units the AM and PM peak hours will be examined.

3.3 Horizon Years

The anticipated build-out year is 2030. As a result, the full build-out plus five years horizon year is 2035.

4 Development-Generated Travel Demand

4.1 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 recommended district mode shares by land use for South Nepean have been summarized in Table 7.

Table 7: TRANS Trip Generation Person Trip Rates – South Nepean

Travel Mode	Single Detached		Multi-Unit (Low-Rise)	
	AM	PM	AM	PM
Auto Driver	51%	53%	49%	49%
Auto Passenger	14%	19%	13%	13%
Transit	25%	18%	26%	24%
Cycling	1%	1%	2%	2%
Walking	9%	10%	9%	12%
Total	**100%**	**100%**	**100%**	**100%**

The subdivision is to include frequent local bus service which will be a direct extension of BRT service in the interim condition considered across both study area horizons, and continuous BRT as part of the ultimate condition beyond these horizons. High quality cycling connections to a high density of commercial and employment land

uses both east and west along Strandherd Drive are present along the Strandherd Drive corridor. As such, modified mode share targets are proposed for the development and are summarized in Table 8.

Table 8: Proposed Development Mode Shares

Travel Mode	Single-Detached		Multi-Unit (Low-Rise)	
	AM	PM	AM	PM
Auto Driver	41%	43%	39%	39%
Auto Passenger	12%	17%	11%	11%
Transit	35%	28%	36%	34%
Cycling	3%	3%	4%	4%
Walking	9%	10%	9%	12%
Total	**100%**	**100%**	**100%**	**100%**

4.2 Trip Generation

This TIA has been prepared using the vehicle and person trip rates for the residential dwellings using the TRANS Trip Generation Manual (2020). Table *9* summarizes the person trip rates for the proposed residential land uses for each peak period.

Table 9: Generation Person Trip Rates by Peak Period

Land Use	Land Use Code	Peak Period	Person Trip Rates
Single-Detached	210 (TRANS)	AM	2.05
		PM	2.48
Multi-Unit (Low-Rise)	220 (TRANS)	AM	1.35
		PM	1.58

Using the above person trip rates, the total person trip generation has been estimated. Table *10* summarizes the total person trip generation for the residential land uses.

Table 10: Total Residential Person Trip Generation by Peak Period

Land Use	Units	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Single-Detached	331	204	475	679	509	312	821
Multi-Unit (Low-Rise)	1664	674	1572	2246	1472	1157	2629

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

Table 11: Trip Generation by Mode

Travel Mode		AM Peak Hour				PM Peak Hour			
		Mode Share	In	Out	Total	Mode Share	In	Out	Total
Single-Detached	Auto Driver	**41%**	40	94	134	**43%**	96	59	155
	Auto Passenger	**12%**	12	27	39	**17%**	38	23	61
	Transit	**35%**	39	91	130	**28%**	67	41	108
	Cycling	**3%**	3	8	11	**3%**	7	4	11
	Walking	**9%**	10	25	35	**10%**	27	16	43
	Total	**100%**	**102**	**238**	**349**	**100%**	**224**	**137**	**378**

Travel Mode		AM Peak Hour				PM Peak Hour			
		Mode Share	In	Out	Total	Mode Share	In	Out	Total
Multi-Unit (Low-Rise)	Auto Driver	**39%**	126	294	420	**39%**	253	198	451
	Auto Passenger	**11%**	36	83	119	**11%**	71	56	127
	Transit	**36%**	134	311	445	**34%**	235	185	420
	Cycling	**4%**	16	37	53	**4%**	28	22	50
	Walking	**9%**	35	82	117	**12%**	92	72	164
	Total	**100%**	**337**	**786**	**1154**	**100%**	**648**	**509**	**1212**
Total	Auto Driver	-	166	388	554	-	349	257	606
	Auto Passenger	-	48	110	158	-	109	79	188
	Transit	-	173	402	575	-	302	226	528
	Cycling	-	19	45	64	-	35	26	61
	Walking	-	45	107	152	-	119	88	207
	Total	-	**439**	**1024**	**1503**	-	**872**	**646**	**1590**

As shown above, a total of 554 AM and 606 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

4.3 Trip Distribution

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

Table 12: OD Survey Distribution – South Nepean

To/From	Residential % of Trips
North	80%
South	5%
East	10%
West	5%
Total	100%

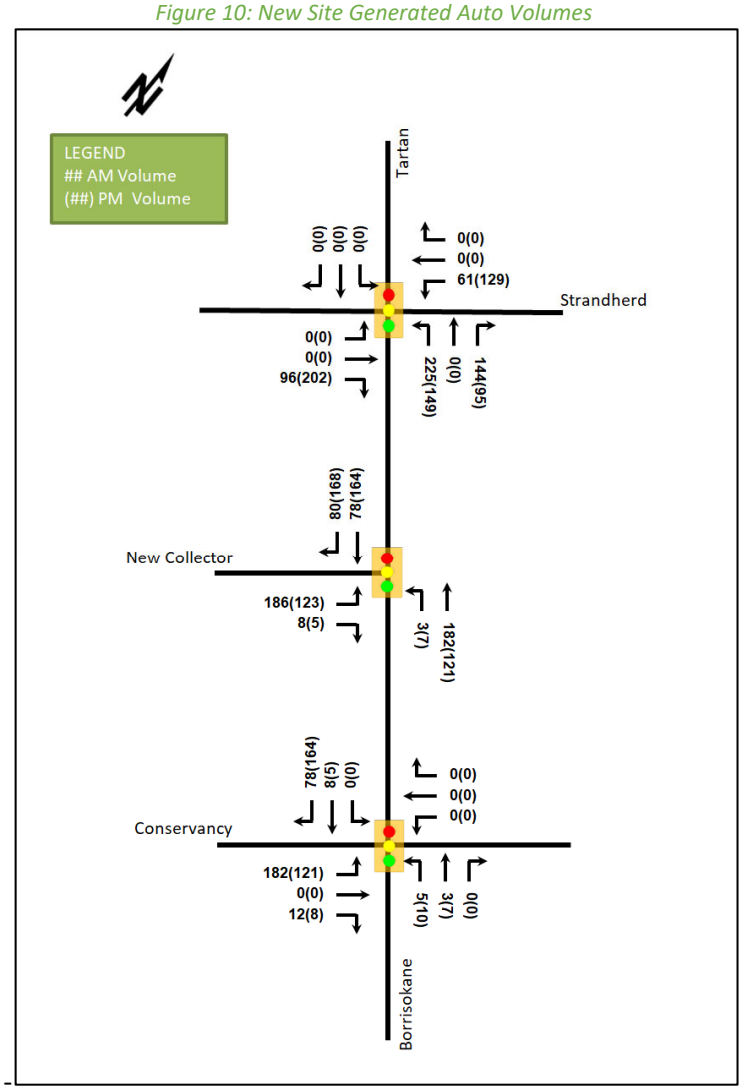
4.4 Trip Assignment

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 10 illustrates the new site generated volumes.

Table 13: Trip Assignment

To/From	Via
North	27% Strandherd (E), 53% Strandherd (N)
South	5% Borrisokane (S)
East	10% Strandherd (E)
West	5% Strandherd (N)
Total	**100%**

Figure 10: New Site Generated Auto Volumes



5 Exemption Review

Table 14 summarizes the exemptions for this TIA.

Table 14: Exemption Review

Module	Element	Explanation	Exempt/Required
Site Design and TDM			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plan and zoning by-law applications	Exempt
	4.1.3 New Street Networks	Only required for plans of subdivision	Required
4.2 Parking	4.2.1 Parking Supply	Only required for site plan and zoning by-law applications	Exempt
4.3 Boundary Street Design		All applications	Required
4.5 Transportation Demand Management	All Elements	Only required when the development generates more than 60 person-trips	Required

Module	Element	Explanation	Exempt/Required
Network Impact			
3.2 Background Network Travel Demand	All Elements	Only required when one or more other Network Impact Modules are triggered	Required
3.3 Demand Rationalization		Only required when one or more other Network Impact Modules are triggered	Required
4.6 Neighbourhood Traffic Calming	4.6.1 Adjacent Neighbourhoods	If the development meets all of the following criteria along the route(s) site generated traffic is expected to utilize between an arterial road and the site's access: 1. Access to Collector or Local; 2. "Significant sensitive land use presence" exists, where there is at least two of the following adjacent to the subject street segment: • School (within 250m walking distance); • Park; • Retirement / Older Adult Facility (i.e. long-term care and retirement homes); • Licenced Child Care Centre; • Community Centre; or • 50%, or greater, of adjacent property along the route(s) is occupied by residential lands and a minimum of 10 occupied residential units are present on the route. 3. Application is for Zoning By-Law Amendment or Draft Plan of Subdivision; 4. At least 75 site-generated auto trips; 5. Site Trip Infiltration is expected. Site traffic will increase peak hour vehicle volumes along the route by 50% or more.	Exempt
4.7 Transit	4.7.1 Transit Route Capacity	Only required when the development generates more than 75 transit trips	Required
	4.7.2 Transit Priority Requirements	Only required when the development generates more than 75 auto trips	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	Required
4.9 Intersection Design	4.9.1 Intersection Control	Only required when the development generates more than 75 auto trips	Required

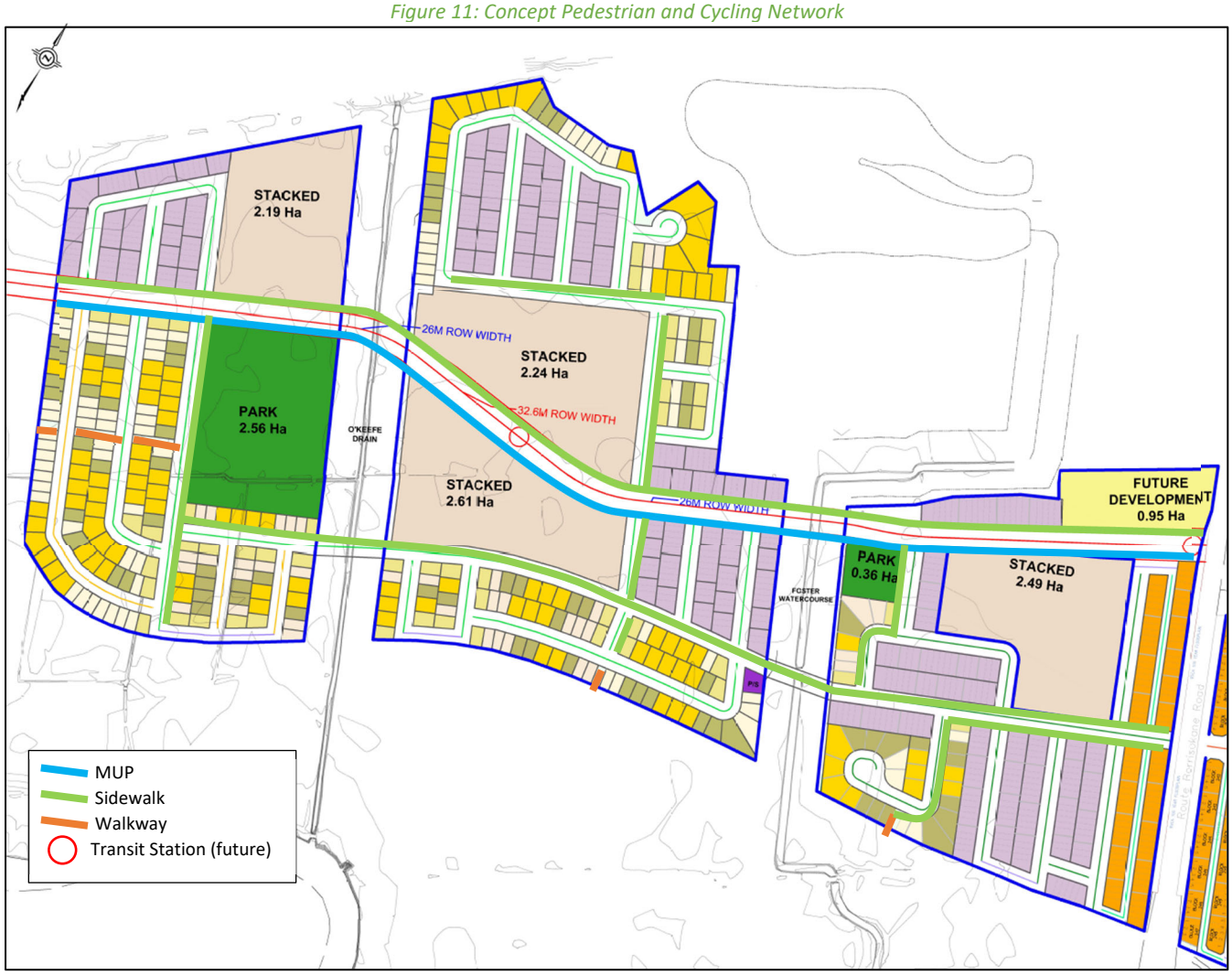
Module	Element	Explanation	Exempt/Required
	4.9.2 Intersection Design	Only required when the development generates more than 75 auto trips	Required

6 Development Design

6.1 Design for Sustainable Modes

The proposed development is a residential subdivision, and the auto parking and bicycle parking will be located within each of the individual units. Figure 11 illustrates the conceptual pedestrian and cycling network. In line with City-provided cross-sections further discussed in Section 6.2, the interim collector road, which will be upgraded in the future to include BRT, is proposed as having a sidewalk on one side of the road and a MUP on the other side. While future station locations are fixed in the locations indicated by red circles in the subdivision plan based on prior discussions with the City, OC Transpo will need to indicate the preferred transit stop locations along the interim collector road.

Figure 11: Concept Pedestrian and Cycling Network



6.2 New Street Networks

The new streets proposed as part of the plan of subdivision include 8.5-metre lanes for rear-lane townhomes, 14.75 window streets, and 16.5 and 18.0 metre local roads. The BRT road's cross-section through the proposed development is to be associated with a 26.0-metre-wide right-of-way between station areas and a 32.6-metre-wide right-of-way at station areas, with a 15:1 taper between these two widths. The ultimate cross-sections for these two rights-of-way, provided by the City, are illustrated in Figure 12 and Figure 13.

Figure 12: 26.0-Metre BRT Road Cross-Section

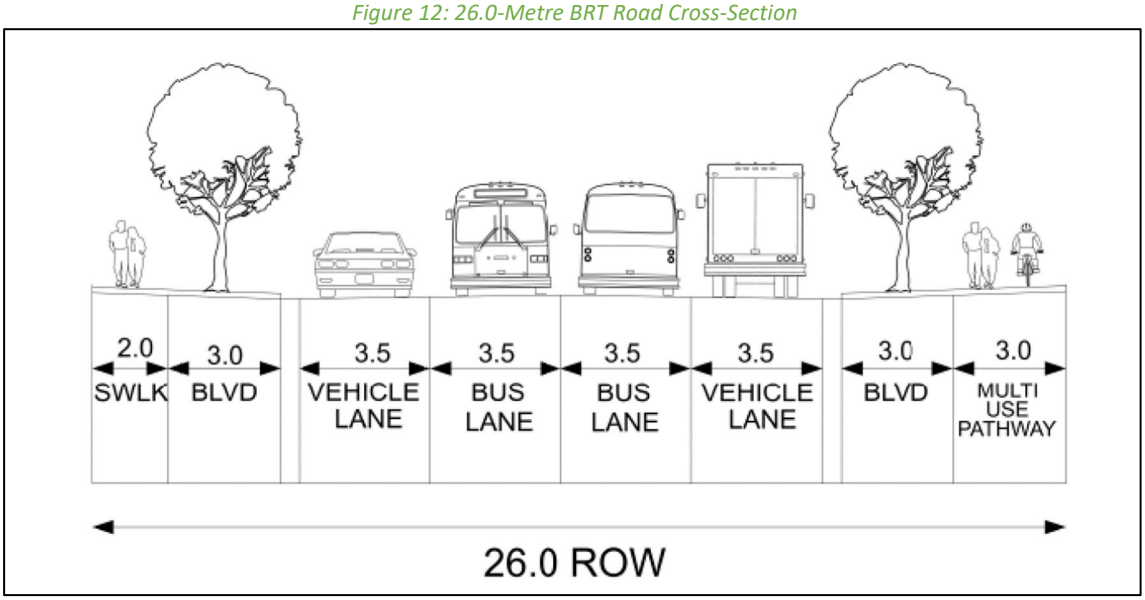
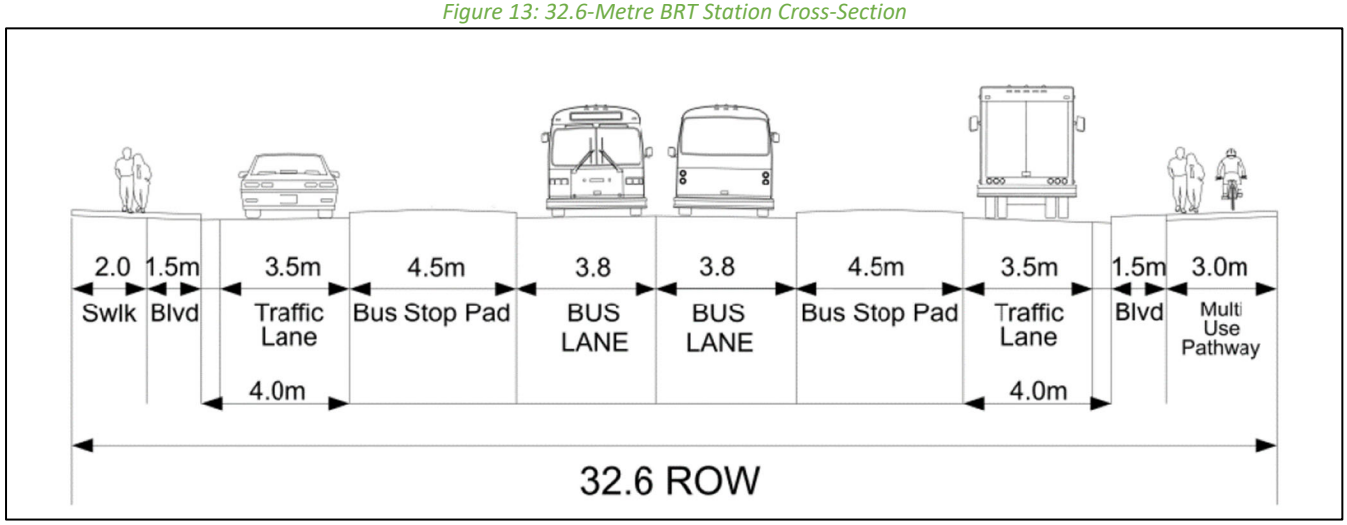


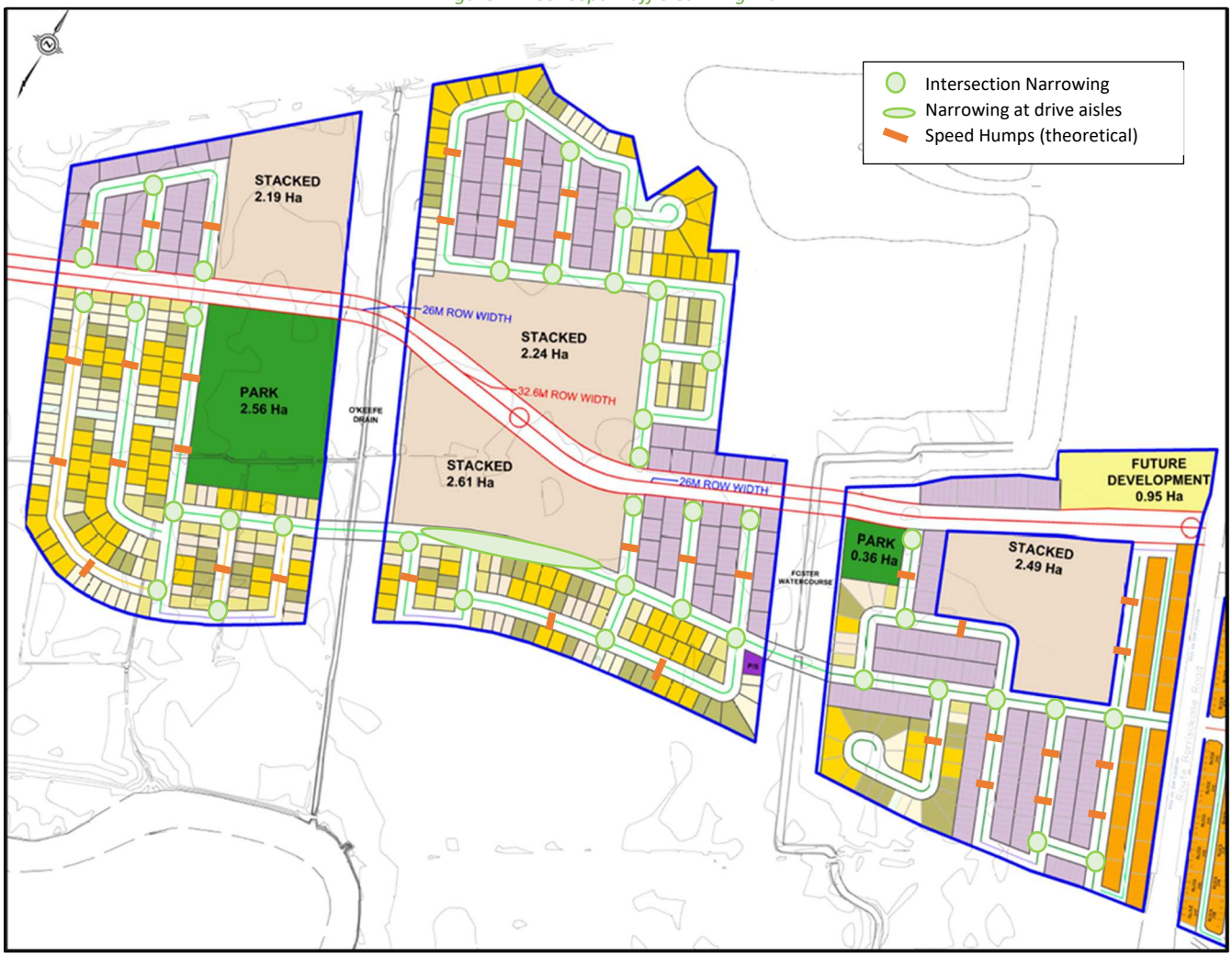
Figure 13: 32.6-Metre BRT Station Cross-Section



In the interim conditions, the collector road is anticipated to include the outside travel lanes, boulevards, and active transportation facilities, with a grass median over the future BRT lane and bus stop pad allocations.

Figure 14 illustrates the conceptual traffic calming elements to be incorporated into the future geometric road design with limited applications within the internal local road intersections. Vertical measures will be explored on the future local roadways, although due to site servicing constraints, cost implications for future City maintenance of underground infrastructure and locations of street elements, such as driveways, fire hydrants, etc., the feasibility of implementation may be restricted.

Figure 14: Concept Traffic Calming Plan



Within the subdivision, no turn lanes are proposed for the internal intersections, which will be stop-controlled on the minor approaches.

Once the internal road network is finalized, including input from all disciplines involved in plan of subdivision approvals, include urban planning and parks, a geometric road design drawing will be prepared to outline the above traffic calming measures. The City should endeavour to confirm all input from the various departments is discussed holistically to reduce competing design commentary when preparing the geometric road design.

7 Boundary Street Design

Table 15 summarizes the MMLOS analysis for the boundary road of Borrisokane Road. The existing and future conditions are the same and are considered in the same row. The targets are based on the policy area of "Within 600m of a rapid transit station." The MMLOS worksheet has been provided in Appendix E.

Table 15: Boundary Street MMLOS Analysis

Segment	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target
Borrisokane Road (within 600m of rapid transit)	F	A	F	B	D	D	B	E

Borrisokane Road corridor does not provide any pedestrian or cycling facilities beyond gravel shoulders and thus fails to meet MMLOS targets.

Even if sidewalks were present, the road would not the pedestrian LOS target of A, as limits to this score are a function of both vehicle speeds and volumes along Borrisokane Road. To meet targets, the City would need to provide a 1.8-metre-wide sidewalk and reduce the speeds to below 30 km/h or provide a 2.0-metre sidewalk with 2.0-metre boulevard and reduce the volumes along Borrisokane Road to less than 3000 vehicles per day. For cycling, a physically separated facility or reducing Borrisokane Road speeds to less than 50 km/h would achieve the MMLOS targets.

8 Transportation Demand Management

8.1 Context for TDM

The mode shares used within the TIA represent this area of the City and typical mode shares for BRT areas. The modal shares are likely to be achieved.

Total bedrooms within the development are subject to the final unit count and product styles selected by purchasers. No age restrictions are noted.

8.2 Need and Opportunity

The subject site has been assumed to rely on a higher transit modal share than typically found within South Nepean, requiring an increase in transit service and rapid adoption of transit ridership. These assumptions have been carried through the analysis. The opportunity for the City to extend transit infrastructure elsewhere within Barrhaven and Barrhaven South exists and will help encourage this modal shift to the greater Barrhaven area than the localized targets for this development. The development can provide the internal connectivity to transit and adjacent non-auto infrastructure, although this will be underutilized until other City infrastructure is constructed to support the development potential in Barrhaven.

8.3 TDM Program

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

- Enhanced connectivity of pedestrians and cyclists to the adjacent network
- Posting of pedestrian and cycling wayfinding signage within the community
- Organize community cycling course for new residents
- Early service agreement with OC Transpo to support higher adoption of transit ridership

9 Background Network Travel Demands

9.1 Transportation Network Plans

The study area transportation network plans were discussed in Section 2.3.1.

For the future horizons, the Chapman Mills Drive extension has been assumed in all horizons and is assumed within the traffic model and background development volumes/assignment. As Re-Aligned Greenbank Road has an undetermined construction date, it has not been explicitly included in the analysis.

9.2 Background Growth

A large amount of background traffic has been accounted for through the other developments that have been documented in Section 2.3.2. This is particularly important for volumes along Borrisokane Road, where most of the developments being built or planned must travel to access Barrhaven or the Highway 416 interchange. This growth around results in over 11% annual growth along Borrisokane Road, or 320% of the existing volumes. Therefore, a nominal amount of additional background growth has been accounted for along Strandherd Drive, Borrisokane Road and Cambrian Road. To account for background growth along this corridor a 1.5%/annum background growth rate has been applied for the primary intersection movements.

9.3 Other Developments

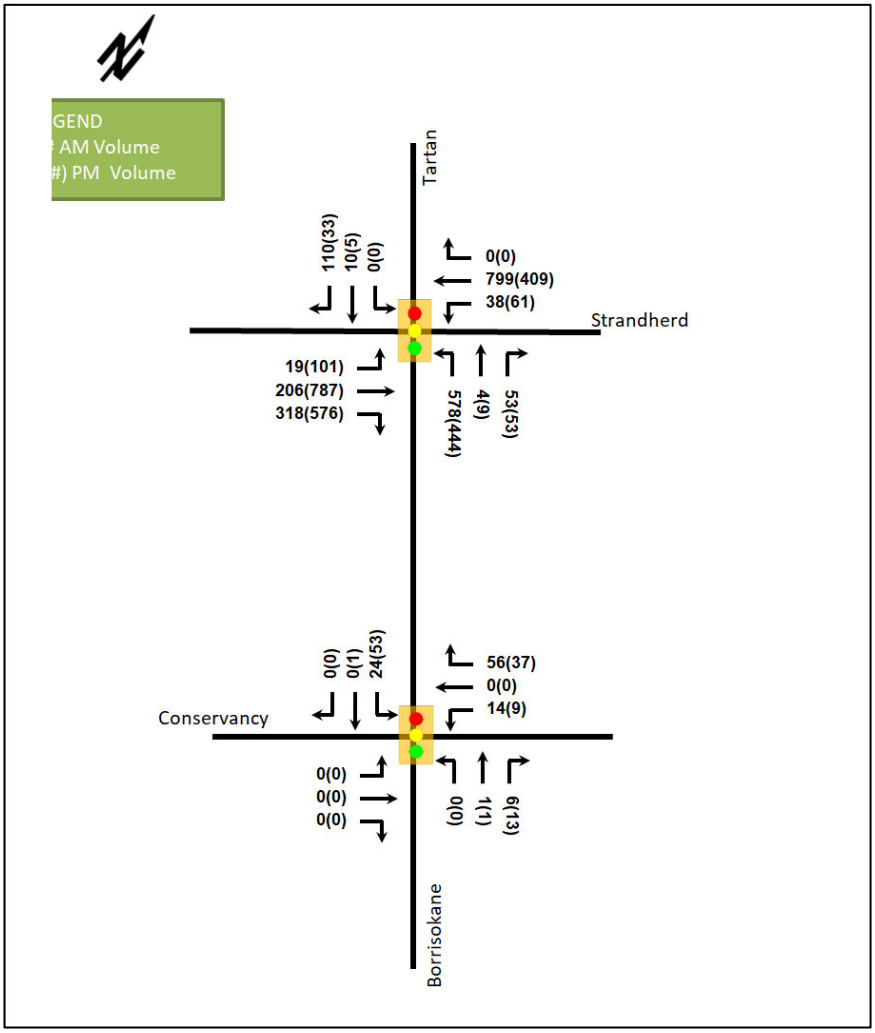
As detailed in Section 2.3.2, in addition to those developments included in the existing horizon, the following developments have been included in the background traffic forecast:

- 3195 Jockvale Road
- Harmony Phase 5 – 3232 Jockvale Road
- 3201 Greenbank Road
- 3288 Greenbank Road
- 3370 Greenbank Road
- Riversbend – 3311 Greenbank Road
- Half Moon Bay South Phase 5
- Half Moon Bay West
- Half Moon Bay North Phase 9
- Quinn's Pointe 2
- The Meadows Phase 5/6
- The Meadows Phase 7/8
- 3387 Borrisokane Road
- Citi-Gate Development
- 4401 Fallowfield Road Development
- Harmony Development – 4025 Strandherd Drive
- Conservancy Phase 1 – 3285 Borrisokane Road
- The Ridge/Brazeau – 3809 Borrisokane Road
- Drummond Subdivision – 3713 Borrisokane Road
- ABIC Manufacturing – 3713 Borrisokane Road
- Conservancy East – Phases 2-5
- 115 Lusk Street
- 4085 Strandherd Drive

A review of the TRANS Trip Generation Manual (2020) has illustrated that the prior methodologies for trip generation over estimated trips within the Ottawa context. Specifically for Barrhaven South and within Barrhaven/Nepean, these trips could be between 49% to 89% of the previously forecasted auto volumes. As such, an overall reduction in forecasted trips has been applied to the subject developments.

Figure 15 illustrates the total background development volumes for the study area, adjusted for the changes in the transportation network and trip generation adjustment.

Figure 15: Total Background Development Traffic



10 Demand Rationalization

The new signalized intersections at the two future development access roads have been assumed to have auxiliary eastbound left-turn lanes from the development, and the intersection of Conservancy Drive at Borrisokane Road has been assumed to include an auxiliary southbound left-turn lane from Borrisokane Road. All signalized intersections have been optimized for new lane arrangements, as approximations of future signal coordination and sequencing. Given the background conditions do not include development of the subject lands, it is assumed no buses will exit the BRT corridor in the background conditions and this intersection will not be modeled.

10.1 2030 Future Background Operations

Figure 16 illustrates the 2030 background volumes and Table 16 summarizes the 2030 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 2030 future background horizon are provided in Appendix G.

Figure 16: 2030 Future Background Volumes

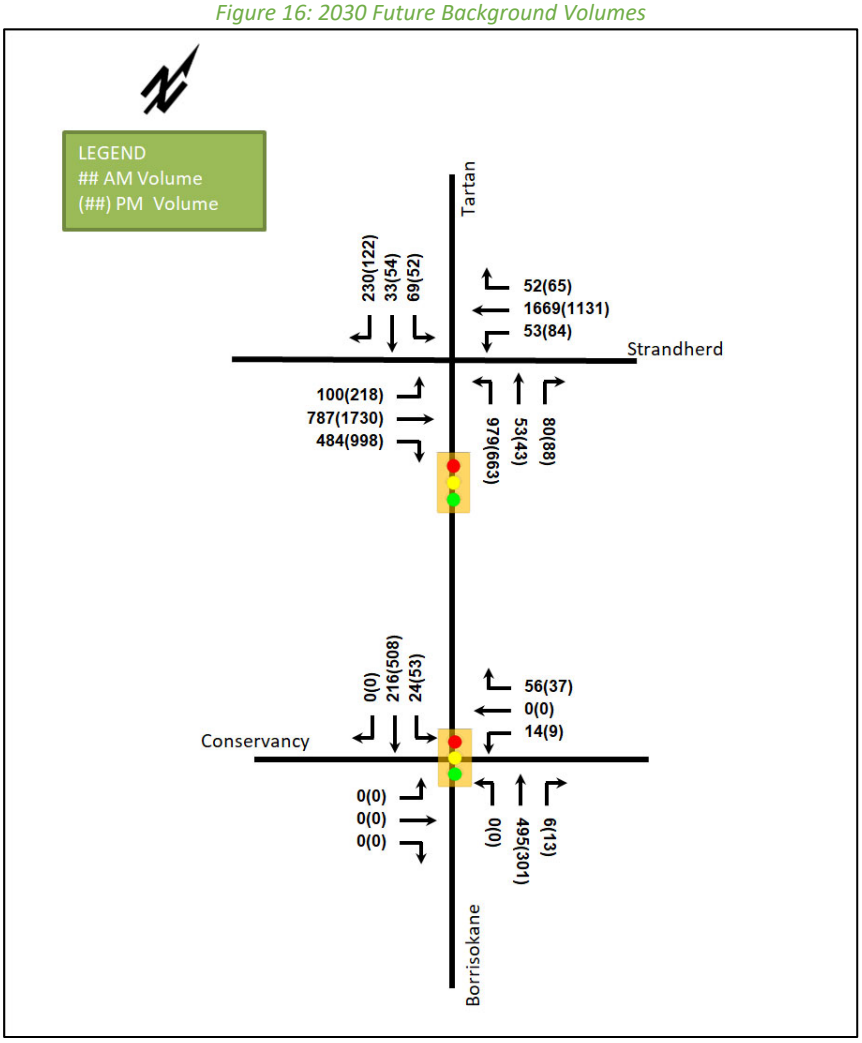


Table 16: 2030 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Borrisokane Road/Tartan Drive *Signalized*	EBL	D	0.81	68.0	**#44.7**	C	0.76	38.6	**#76.7**
	EBT	A	0.54	26.9	93.4	**F**	**1.08**	**77.1**	**#313.0**
	EBR	C	0.78	40.4	150.2	**F**	**1.45**	**239.7**	**#432.9**
	WBL	A	0.25	32.9	20.2	A	0.58	36.5	**#30.8**
	WBT	**F**	**1.43**	**230.0**	**#341.9**	C	0.78	35.8	159.3
	WBR	A	0.11	28.2	17.8	A	0.11	22.6	19.1
	NBL	**F**	**1.82**	**407.2**	**#231.6**	**F**	**1.59**	**308.3**	**#151.3**
	NBT	A	0.10	34.8	20.1	A	0.14	45.4	19.1
	NBR	A	0.18	35.9	28.4	A	0.33	49.8	34.2
	SBL	A	0.57	75.2	32.3	A	0.21	37.7	19.3
	SBT/R	E	0.92	**88.1**	**#112.8**	C	0.76	72.4	64.6
	Overall	**F**	**1.39**	**188.8**	-	**F**	**1.52**	**124.1**	-
Borrisokane Road & Conservancy Drive *Signalized*	WBL/R	A	0.27	13.8	10.7	A	0.19	14.0	8.5
	NBT/R	A	0.39	7.4	76.1	A	0.26	10.5	58.7
	SBL	A	0.04	6.2	5.3	A	0.07	5.6	8.8
	SBT	A	0.17	5.7	29.2	A	0.37	6.6	77.6
	Overall	**A**	-	**7.4**	-	**A**	-	**8.3**	-

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

The 2030 future background operations summarized above identify significant capacity issue along Strandherd Drive. High delays and extended queueing in the peak direction, both along the mainline of Strandherd Drive and on turning movements from Borrisokane Road. The volumes illustrated in Figure 16 outline an unconstrained demand for two to three lanes in each direction east of Borrisokane Road, and four lanes west of Borrisokane Road. As this is not a feasible option for Strandherd Drive and accepted City arterial road policies, alternative solutions for Barrhaven will need to be examined by the City.

A number of solutions have been presented in previous TIA studies and will continue to be reviewed as part of the City's new Transportation Master Plan Part 2. No mitigation will be proposed as part of this TIA as it is beyond the scope of a specific TIA development and requires a regional solution.

10.2 2035 Future Background Operations

Figure 17 illustrates the 2035 background volumes and Table 17 summarizes the 2035 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 2035 future background horizon are provided in Appendix H.

Figure 17: 2035 Future Background Volumes

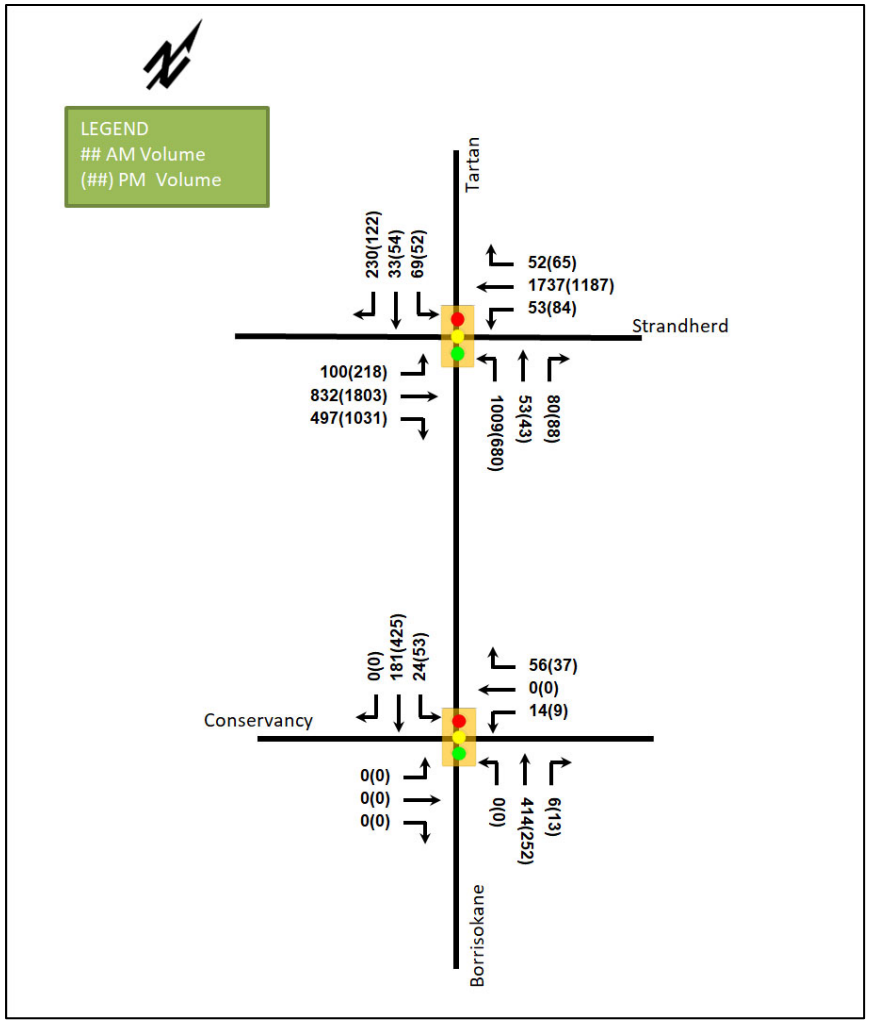


Table 17: 2035 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Borrisokane Road/Tartan Drive *Signalized*	EBL	D	0.81	68.0	**#44.7**	C	0.80	46.7	**#83.7**
	EBT	A	0.57	27.7	100.3	**F**	**1.12**	**94.2**	**#333.2**
	EBR	C	0.80	41.9	**#166.3**	**F**	**1.50**	**260.3**	**#450.8**
	WBL	A	0.27	33.9	20.6	A	0.58	36.5	**#30.8**
	WBT	**F**	**1.48**	**254.8**	**#360.4**	D	0.82	37.7	171.4
	WBR	A	0.11	28.2	17.8	A	0.11	22.6	19.1
	NBL	**F**	**1.88**	**431.2**	**#240.0**	**F**	**1.63**	**325.6**	**#156.2**
	NBT	A	0.10	34.8	20.1	A	0.14	45.4	19.1
	NBR	A	0.18	35.9	28.4	A	0.33	49.8	34.2
	SBL	A	0.57	75.2	32.3	A	0.21	37.7	19.3
	SBT/R	E	0.92	**88.1**	**#112.8**	C	0.76	72.4	64.6
	Overall	**F**	**1.43**	**203.3**	-	**F**	**1.57**	**136.4**	-
Borrisokane Road & Conservancy Drive *Signalized*	WBL/R	A	0.27	13.8	10.7	A	0.19	14.0	8.5
	NBT/R	A	0.33	6.8	60.4	A	0.22	10.1	48.8
	SBL	A	0.04	6.2	5.2	A	0.07	5.6	8.8
	SBT	A	0.14	5.6	24.6	A	0.31	6.1	61.3
	Overall	**A**	-	**7.1**	-	**A**	-	**7.9**	-

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

The 2035 background operations are expected to be similar to the 2030 background operations.

10.3 Modal Share Sensitivity and Demand Rationalization Conclusions

Through the TIA process, the City requires transportation demand measures be considered for each development to ease the burden on the road network. These measures will be included in this development, such as transit ridership, active mode connectivity and supporting programs within the community. Congestion and delays on local and regional roads will also contribute to the competitiveness of transit as an attractive mode choice.

To address the systemic issues noted in the existing and background conditions, the deferral of planned infrastructure, such as the Re-Aligned Greenbank Road corridor being shifted to beyond 2031, will need to be reassessed and additional regional TDM programs or infrastructure will be needed from the City of Ottawa. The minimum needs have been highlighted above with the Chapman Mills BRT corridor, new Barnsdale Road Interchange (which the planning appears to be underway) and transit corridor to Barrhaven South.

11 Transit

11.1 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 18 summarizes the transit trip generation.

Table 18: Trip Generation by Transit Mode

Travel Mode	Mode Share	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Transit	Varies	173	402	575	302	226	528

The proposed development is anticipated to generate an additional 575 AM and 528 PM peak hour two-way transit trips. From the trip distribution found in section 5.3, these values can be further broken down. Table 19 summarizes forecasted site-generated transit ridership trips by direction and the equivalent bus loads.

Table 19: 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	138	322	242	181	Bus/BRT	Six standard buses
South	9	20	15	11	Bus/BRT	Two fifths of a standard bus
East	17	40	30	23	Bus/BRT	Three quarters of a standard bus
West	9	20	15	11	Bus/BRT	Two fifths of a standard bus

11.2 Transit Priority

A transit signal will need to be incorporated into the signalized intersection of the interim collector at Borrisokane Road once the east BRT is extended to Borrisokane Road. It is anticipated that the closely spaced intersection at Conservancy Drive will require balancing of the design requirements, and tie-ins with the newly upgraded intersection at Strandherd Drive.

12 Network Concept

The existing and background volumes forecasted along Strandherd Drive and accessing Strandherd Drive from the south, are exceeding the existing lane capacities and will continue to do so once the widening is completed. Extensive infrastructure projects have been planned for Barrhaven, and overall, a minimum number of these projects have been implemented and many continue to be pushed farther into the future. As identified previously, the following projects are required to support Barrhaven as a whole, and additional projects that would begin to bring the transportation network to the level of other suburban areas of Ottawa are also listed and support the growth potential of Barrhaven:

- Currently required projects:
  - Barnsdale-Highway 417 interchange (interim)
  - Chapman Mills BRT extension to Borrisokane Road
  - Re-Aligned Greenbank Road BRT Corridor, Towncentre to Kilbirnie Drive
- Barrhaven supportive projects:
  - Re-Aligned Greenbank Road, to Cambrian Road and Barnsdale Road
  - LRT extension to the Towncentre

13 Intersection Design

13.1 Intersection Control

Updated signal warrants for the Borrisokane Road intersections are provided in Appendix I. Based on the previous traffic work supporting the East Phase of Conservancy, signalization of the intersections of Borrisokane Road at Conservancy Drive and Borrisokane Road at New Collector intersections have been applied. Although both intersections do not meet signal warrant at all study horizons, both intersections are required to be signalized to support transit movements at the New Collector intersection (per the Chapman Mills Drive and BRT Extension EA) and community connectivity from Conservancy Way. It is noted that the City has confirmed the Development Charge eligibility for the Conservancy Way signalization.

13.2 Intersection Design

13.2.1 2030 Future Total Intersection Operations

Figure 18 illustrates the 2030 future total volumes, and the 2030 future total network intersection operations are summarized below in Table 20. All signalized intersections have been optimized for new lane arrangements, as

approximations of future signal coordination and sequencing. 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 have been provided in Appendix J.

Figure 18: 2030 Future Total Volumes

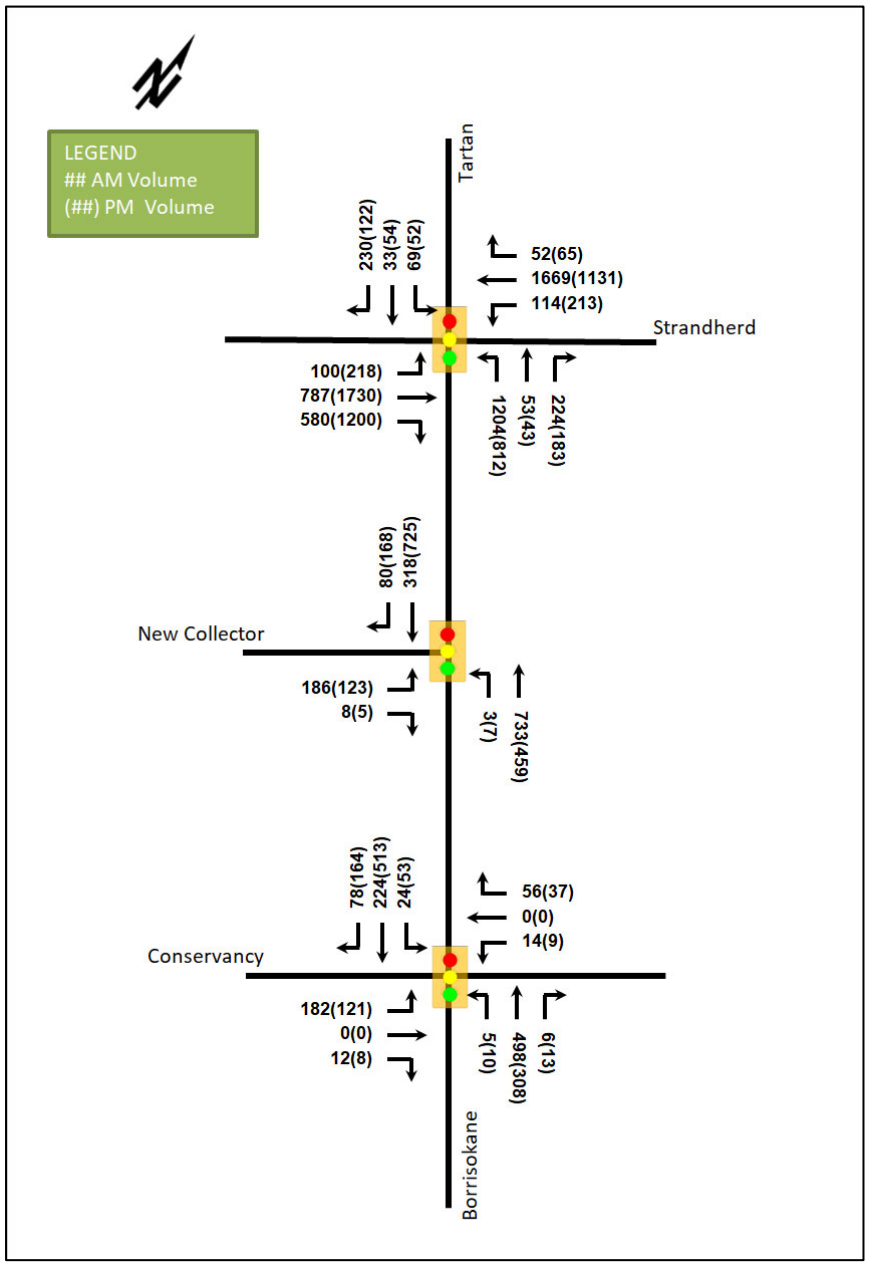


Table 20: 2030 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Borrisokane Road/Tartan Drive *Signalized*	EBL	D	0.81	68.0	**#44.7**	C	0.78	38.2	**#71.0**
	EBT	A	0.54	26.9	93.4	**F**	**1.16**	**110.3**	**#313.0**
	EBR	E	0.94	58.1	**#212.6**	**F**	**1.88**	**425.5**	**#541.2**
	WBL	A	0.54	43.7	43.2	**F**	**1.04**	**110.9**	**#115.3**
	WBT	**F**	**1.43**	**230.0**	**#341.9**	C	0.77	34.8	159.3
	WBR	A	0.11	28.2	17.8	A	0.11	22.3	19.1
	NBL	**F**	**2.24**	**588.6**	**#293.6**	**F**	**1.94**	**460.9**	**#193.6**
	NBT	A	0.10	34.8	20.1	A	0.14	45.4	19.1
	NBR	A	0.50	42.5	74.2	B	0.69	63.9	66.8
	SBL	A	0.57	75.2	32.3	A	0.21	37.7	19.3
	SBT/R	E	0.92	**88.1**	**#112.8**	C	0.76	72.3	64.6
	Overall	**F**	**1.50**	**234.7**	-	**F**	**1.85**	**202.1**	-
Borrisokane Road & Conservancy Drive *Signalized*	EBL	C	0.72	47.7	45.3	A	0.56	42.1	30.5
	EBT	A	0.02	0.0	0.0	A	0.02	0.0	0.0
	WBL	A	0.05	25.2	5.9	A	0.04	26.7	4.4
	WBT	A	0.11	0.4	0.0	A	0.06	0.2	0.0
	NBL	A	0.01	8.0	1.8	A	0.02	7.4	2.8
	NBT/R	A	0.46	10.9	76.8	A	0.32	13.2	60.2
	SBL	A	0.05	3.5	1.4	A	0.08	5.3	m3.6
	SBT	A	0.20	3.4	7.1	A	0.46	7.5	57.6
	SBR	A	0.08	0.4	0.4	A	0.17	1.1	5.4
	Overall	**A**	**0.52**	**14.1**	-	**A**	**0.51**	**11.3**	-
Borrisokane Road & New Collector *Signalized*	EBL	B	0.65	43.9	45.3	A	0.49	40.1	30.9
	EBR	A	0.03	14.9	3.2	A	0.02	16.8	2.5
	NBL	A	0.00	6.3	m0.4	A	0.02	6.7	m1.5
	NBT	B	0.64	9.7	92.4	A	0.39	7.0	61.3
	SBT	A	0.28	7.8	40.8	B	0.61	11.6	127.0
	SBR	A	0.08	2.1	5.3	A	0.17	1.7	7.5
	Overall	**B**	**0.64**	**13.6**	-	**A**	**0.59**	**11.4**	-

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

The study area intersections operate with similar capacity issues, delays, and queuing at the intersection of Strandherd Drive at Borrisokane Road as the 2030 future background conditions. The intersection of the new interim collector road at Borrisokane Road is anticipated to operate well.

As noted in the background conditions, a commitment from the City is required to advance new infrastructure within Barrhaven and continue to look for continual mode shifting to further reduce the auto dependency currently observed.

13.2.2 2035 Future Total Network Intersection Operations

Figure 19 illustrates the 2035 future total volumes, and the 2035 future total network intersection operations are summarized below in Table 21. All signalized intersections have been optimized for new lane arrangements, as approximations of future signal coordination and sequencing. 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 have been provided in Appendix K.

Figure 19: 2035 Future Total Volumes

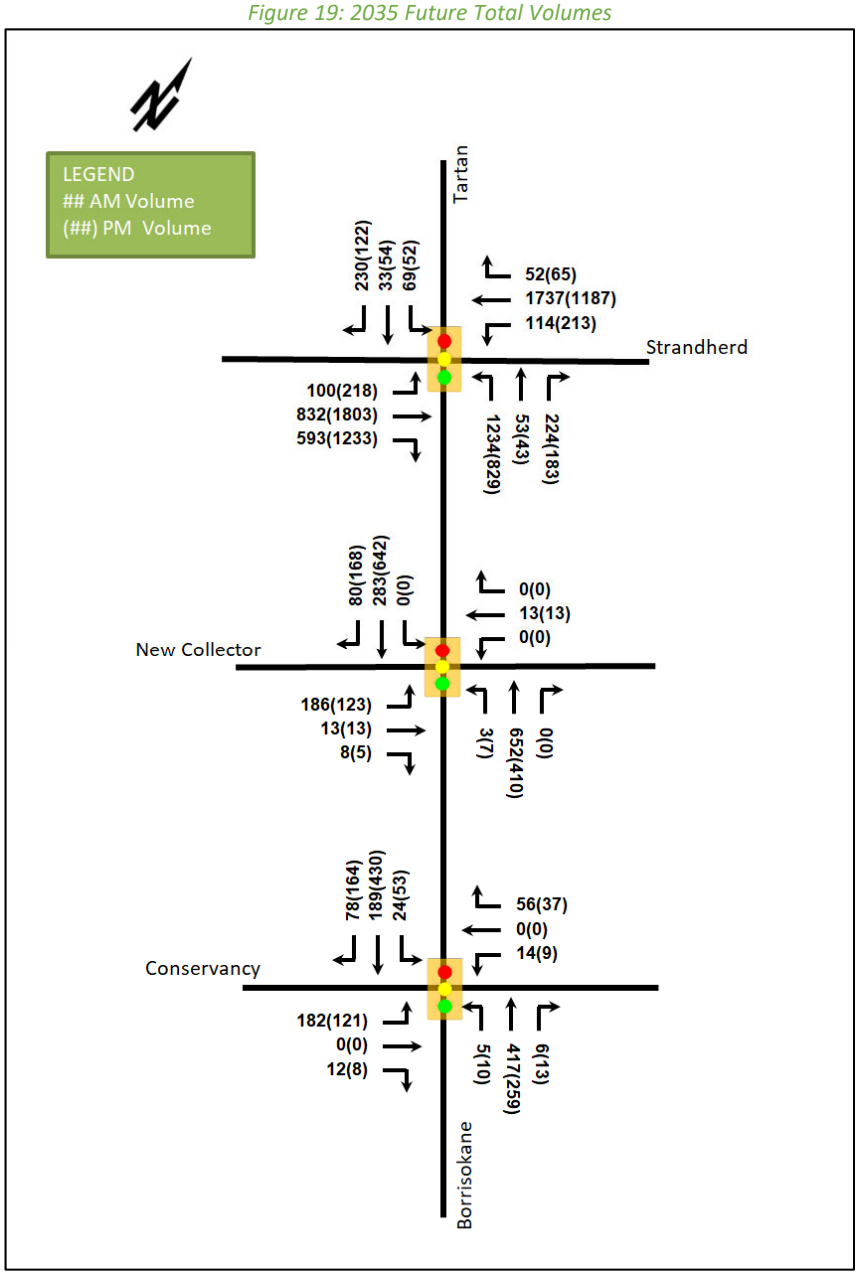


Table 21: 2035 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Strandherd Drive & Borrisokane Road/Tartan Drive *Signalized*	EBL	D	0.81	68.0	**#44.7**	C	0.79	45.4	**#81.4**
	EBT	A	0.57	27.7	100.3	**F**	**1.20**	**130.3**	**#333.2**
	EBR	E	0.96	62.2	**#220.4**	**F**	**1.93**	**448.1**	**#558.5**
	WBL	A	0.58	47.4	44.9	**F**	**1.05**	**112.1**	**#115.1**
	WBT	**F**	**1.48**	**254.8**	**#360.4**	D	0.82	37.9	171.4
	WBR	A	0.11	28.2	17.8	A	0.11	22.6	19.1
	NBL	**F**	**2.29**	**613.0**	**#301.7**	**F**	**1.98**	**478.6**	**#198.1**
	NBT	A	0.10	34.8	20.1	A	0.14	45.4	19.1
	NBR	A	0.50	42.5	74.2	B	0.69	63.9	66.8
	SBL	A	0.57	75.2	32.3	A	0.21	37.7	19.3
	SBT/R	E	0.92	**88.1**	**#112.8**	C	0.76	72.3	64.6
	Overall	**F**	**1.54**	**249.0**	-	**F**	**1.90**	**215.4**	-
Borrisokane Road & Conservancy Drive *Signalized*	EBL	C	0.72	47.7	45.3	A	0.56	42.1	30.5
	EBT	A	0.02	0.0	0.0	A	0.01	0.0	0.0
	WBL	A	0.05	25.2	5.9	A	0.04	26.7	4.4
	WBT	A	0.10	0.4	0.0	A	0.05	0.1	0.0
	NBL	A	0.01	8.0	1.8	A	0.02	7.4	2.8
	NBT/R	A	0.38	9.9	61.0	A	0.27	12.7	50.5
	SBL	A	0.05	3.3	1.3	A	0.08	4.3	m2.8
	SBT	A	0.17	3.3	5.6	A	0.39	5.7	18.1
	SBR	A	0.08	0.4	0.4	A	0.17	0.6	1.8
	Overall	**A**	**0.47**	**14.3**	-	**A**	**0.45**	**10.5**	-
Borrisokane Road & New Collector/BRT *Signalized*	EBL	C	0.73	49.0	47.1	A	0.58	44.2	32.3
	EBT	A	0.04	25.5	5.8	A	0.04	28.1	5.9
	EBR	A	0.02	0.1	0.0	A	0.02	0.2	0.0
	WB	A	0.04	25.5	5.8	A	0.04	28.1	5.9
	NBL	A	0.00	5.7	m0.4	A	0.02	5.3	m1.4
	NBT	A	0.59	9.2	78.6	A	0.35	6.3	50.5
	SBL/T	A	0.26	8.6	37.5	A	0.55	10.9	102.8
	SBR	A	0.09	2.4	5.5	A	0.17	1.7	7.5
	Overall	**B**	**0.62**	**14.8**	-	**A**	**0.56**	**11.6**	-

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

The operations noted are similar to the 2030 future total conditions with a slight decrease in network operations due to background growth. The need for the City to provide wider Barrhaven improvements continues to be the major constraint to decrease the impact on Strandherd Drive.

13.2.3 Intersection MMLOS

Table 22 summarizes the MMLOS analysis for the network intersections. The intersection analysis is based on the land use designation of "Developing Community" in the existing conditions and the policy area of "Within 600m of a rapid transit station" in the future conditions. The MMLOS worksheets has been provided in Appendix E.

Table 22: 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
Strandherd Drive & Borrisokane Road/Tartan Drive (existing)	F	C	A	C	F	D	D	D	B	D
Strandherd Drive & Borrisokane Road/Tartan Drive (future)	F	A	A	C	F	A	D	D	F	E
Borrisokane Road & Conservancy Drive	E	A	A	B	-	-	-	-	A	E
Borrisokane Road & New Collector/BRT	D	A	A	B	D	A	-	-	B	E

The MMLOS targets for the pedestrian and transit LOS are currently not met and will continue to not meet the targets at the network intersections. The pedestrian level of service would require a maximum of three to four lanes at a crossing to meet a LOS C or two lanes to achieve a level of service A. This is a limitation of the MMLOS framework. For example, the protected intersection associated with the recent Strandherd Drive widening is considered comfortable for pedestrians but still results in a level of service F. Due to the traffic congestion in Barrhaven, the intersection delays cannot be reduced to improve the transit level of service. It is assumed that the BRT will pre-empt the signal timing to allow transit to proceed and would operate closer to the targets. It is noted that transit LOS A requires zero seconds average delay for the approach, which is not achievable. A LOS B with less than 10 seconds delay may be a more realistic target for the Chapman Mills Drive corridor.

The bicycle LOS will be met at the new study area intersections with assumed protected intersection design.

The auto level of service will not be met along Strandherd Drive as the area congestion will have high-capacity impacts. The signal timing will require a corridor study along the widened Strandherd Drive to balance the demands of the mainline, turning movements at Borrisokane Road, and side street operations.

Overall, the study area network intersections highlight limitations in the MMLOS framework that require no mitigation as part of this plan of subdivision, illustrate that transit services along Strandherd Drive will result in poor service times, and high congestion is anticipated and reflected in the capacity issues. The auto level of service will require investment in Barrhaven, beyond the transit and interchange options already assumed to be in place, to mitigate the demands on the network, and BRT corridors and park and rides will be required to remove the need for transit to operate on Strandherd Drive.

13.2.4 Recommended Design Elements

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

14 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 consists of a mix of residential product types, totalling approximately 1664 townhomes and 331 single detached homes
- The anticipated full build-out and occupancy horizon is 2030 with construction occurring in a multiple phases
- The trip generation and location triggers were met for the TIA Screening

Existing Conditions

- Borrisokane Road and Strandherd Drive are arterial roads within the study area
- None of the driveways within the area of consideration are significant traffic generators
- Sidewalks and cycling tracks are present along Strandherd Drive, and future pathways are planned along the Jock River and Chapman Mills BRT corridor
- Strandherd Drive is a cross-town bikeway
- The study area intersection of Strandherd Drive at Borrisokane Road/Tartan Drive may exhibit extended queues on the westbound through movement during the AM peak hour in the existing conditions
- The high volumes roadways have produced a high number of collisions at the study area intersections, primarily at Strandherd Drive and Borrisokane Road intersection
- The collisions are predominantly rear end collisions due to the congestion along Strandherd Drive, and no further collision review is required as part of this study

Development Generated Travel Demand

- The forecasted site trip generation is 1503 two-way person trips during the AM peak and 1590 two-way person trips during the PM peak
- Of these trips, 554 two-way AM and 606 two-way PM peak hour auto trips are anticipated
- Of the forecasted trips, 80% are anticipated to travel north, 5% to the south, 10 % to the east, and 5 % to the west

Development Design

- The plan of subdivision includes a new interim collector road that will be upgraded to include BRT beyond the study area horizons with 26.0-metre rights-of-way between station areas and 32.6-metre rights-of-way at stations
- The remaining roadways set at 16.5 or 18.0 metres for the local roads, 14.75 metres for window streets, and 8.5 metres for rear lanes
- Sidewalks will be provided in primary corridors to bisect the community and connect to adjacent open space, and a MUP will be provided along one side of the interim collector road
- Traffic calming elements are conceptually identified throughout the community with intersection narrowings at intersections and speed humps on longer uninterrupted stretches of the road network
- It is noted that this traffic calming measure are conceptual and will need to be implemented in conjunction with other subdivision elements, such as lotting, driveway locations, utilities, etc.

Boundary Street Design

- Borrisokane Road does not meet pedestrian and cycling MMLOS targets for the area
- To meet pedestrian targets, the City would need to provide a 1.8-metre-wide sidewalk and reduce the speeds to below 30 km/h or provide a 2.0-metre sidewalk with 2.0-metre boulevard and reduce the volumes along Borrisokane Road to less than 3000 vehicles per day
- To meet cycling targets, the City would need to provide physically separated facilities

TDM

- Supportive TDM measures to be included within the proposed development should include:
    - Enhanced connectivity of pedestrians and cyclists to the adjacent network
    - Posting of pedestrian and cycling wayfinding signage within the community
    - Organize community cycling course for new residents

- Early service agreement with OC Transpo to support higher adoption of transit ridership

Background Network Travel Demands

- A 1.5%/annum background growth rate has been applied for the primary intersection movements
- Significant capacity issues with high delays and queues are noted along Strandherd Drive, both along the mainline of Strandherd Drive and on peak-direction turning movements from Borrisokane Road
- Alternative solutions for Barrhaven will need to be examined by the City
- No mitigation will be proposed as part of this TIA as it is beyond the scope of a specific TIA development and requires a regional solution

Transit

- The forecasted transit trips will include 575 two-way transit trips during the AM peak and 528 two-way transit trips during the PM peak
- Peak hour increases in transit ridership resulting from the site are anticipated to equate to up to approximately eight standard buses during each peak hour in the peak direction
- A transit signal will need to be incorporated into the signalized intersection of the New Collector and BRT once the BRT is extended to Borrisokane Road

Network Concept

- The existing and background volumes forecasted along Strandherd Drive and accessing Strandherd Drive from the south, are exceeding the existing lane capacities and will continue to do so once the widening is completed
- A minimum number of these projects have been implemented and many continue to be pushed farther into the future

Intersection Design

- Consistent with prior City transportation planning and DC eligibility, the two access intersections will be signalized
- The study area network intersections operate with similar capacity issues, delays, and queuing as the future background conditions
- As noted in the background conditions, the need for the City to provide wider Barrhaven improvements continues to be the major constraint to decrease the impact on Strandherd Drive
- The MMLOS targets for the pedestrian and transit LOS are currently not met and will continue to not meet the targets at the network intersections
- The pedestrian level of service would require a maximum of three or four lanes at a crossing to meet a LOS C or two lanes to achieve a level of service A, and this is a limitation of the MMLOS framework
- BRT is assumed to pre-empt the signal timing to allow transit to proceed and would operate closer to the transit targets
- It is assumed that the City conducted a MMLOS assessment of the Strandherd Drive widening and is providing a balanced solution weighing the trade-offs on all the intersections
- Overall, the study area network intersections highlight limitations in the MMLOS framework that require no mitigation as part of this plan of subdivision

15 Conclusion

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

Prepared By:

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Transportation Engineering-Intern

Reviewed By:

Andrew Harte, P.Eng.
Senior Transportation Engineer

Appendix A

TIA Screening Form and PM Certification Form

6 Plaza Court
Ottawa, ON K2H 7W1

City of Ottawa 2023 Revisions to 2017 TIA Guidelines
Step 1 - Screening Form

Date: 22-Mar-24
Project Number: 2021-115
Project Reference: Conservancy West

1.1 Description of Proposed Development	
Municipal Address	3288 & 3300 Borrisokane Rd, 4205, 4345 & 4375 McKenna Casey Dr
Description of Location	Vacant farm fields
Land Use Classification	Development Reserve (DR)
Development Size	331 Detached single homes, 1664 Townhomes
Accesses	One interim collector road to be upgraded to include BRT in future at Borrisokane Rd at the future Chapman Mills BRT Extension, one local road at the intersection of Borrisokane Rd at Conservancy Dr
Phase of Development	TBD - Zoning and Draft Plan only
Buildout Year	TBD
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Multi-Family (Low-Rise)	
Development Size	1995	Units
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 Transit Priority Network, Rapid Transit network or Cross-Town Bikeways?	Yes	Extension of CMD BRT
Is the development in a Hub, a Protected Major Transit Station Area (PMTSA), or a Design Priority Area (DPA)?	No	
Location Trigger	Yes	

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?	No
Does the development include a drive-thru facility?	No
Safety Trigger	No

Certification Form for TIA Study PM

TIA Plan Reports

On April 14, 2022, the Province's Bill 109 received Royal Assent providing legislative direction to implement the More Homes for Everyone Act, 2022 aiming to increase the supply of a range of housing options to make housing more affordable. Revisions have been made to the TIA guidelines to comply with Bill 109 and streamline the process for applicants and staff.

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 they meet the four criteria listed below.

CERTIFICATION

- ☑ 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; (Update effective July 2023)
- ☑ 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;
- ☑ 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
- ☑ I am either a licensed or registered[1] professional in good standing, whose field of expertise
  - ☑ is either transportation engineering
  - ☐ or transportation planning.

[1] 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
Planning, Real Estate and Economic Development
110 Laurier Avenue West, 4th fl.
Ottawa, ON
K1P 1J1
Tel. : 613-580-2424
Fax: 613-560-6006

Revision Date: June 2023

Dated at Ottawa (City) this 17 day of August , 20 23 .

Name : Andrew Harte

Professional title: Senior Transportation Engineer / Vice-President Ottawa

Signature of individual certifier that s/he/they meet the above criteria

Office Contact Information (Please Print)
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Stamp

Revision Date: June 2023

Appendix B

Turning Movement Counts

Transportation Services - Traffic Services

W.O. 37540

Turning Movement Count - 15 Minute Summary Report

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 2 Westbound: 0

		CEDARVIEW RD/TARTAN DR									STRANDHERD DR									
		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	89	1	3	**93**	9	2	22	**33**	**126**	5	78	23	**106**	1	124	3	**128**	**234**	**360**
07:15	07:30	81	6	6	**93**	1	1	15	**17**	**110**	14	133	24	**171**	3	146	4	**153**	**324**	**434**
07:30	07:45	80	3	5	**88**	11	6	27	**44**	**132**	18	108	22	**148**	1	203	7	**211**	**359**	**491**
07:45	08:00	104	12	7	**123**	9	4	26	**39**	**162**	15	139	25	**179**	2	148	10	**160**	**339**	**501**
08:00	08:15	85	9	3	**97**	12	3	26	**41**	**138**	22	125	34	**181**	0	187	16	**203**	**384**	**522**
08:15	08:30	100	27	3	**130**	37	10	41	**88**	**218**	26	111	33	**170**	1	192	19	**212**	**382**	**600**
08:30	08:45	98	13	4	**115**	10	3	25	**38**	**153**	12	96	28	**136**	0	184	12	**196**	**332**	**485**
08:45	09:00	82	8	4	**94**	15	8	21	**44**	**138**	19	100	20	**139**	2	182	12	**196**	**335**	**473**
09:00	09:15	71	10	5	**86**	6	4	15	**25**	**111**	9	93	25	**127**	2	155	15	**172**	**299**	**410**
09:15	09:30	69	6	1	**76**	6	3	17	**26**	**102**	17	114	20	**151**	0	140	20	**160**	**311**	**413**
09:30	09:45	47	2	6	**55**	8	2	12	**22**	**77**	21	109	20	**150**	5	127	14	**146**	**296**	**373**
09:45	10:00	47	6	2	**55**	14	3	13	**30**	**85**	16	100	18	**134**	4	133	21	**158**	**292**	**377**
11:30	11:45	39	2	3	**44**	17	1	20	**38**	**82**	15	113	36	**165**	1	126	20	**147**	**312**	**394**
11:45	12:00	35	2	0	**37**	7	3	13	**23**	**60**	22	120	35	**177**	0	106	15	**121**	**298**	**358**
12:00	12:15	38	2	2	**42**	14	5	16	**35**	**77**	19	127	35	**181**	1	128	8	**137**	**318**	**395**
12:15	12:30	32	4	3	**39**	11	2	16	**29**	**68**	14	133	29	**176**	2	136	11	**149**	**325**	**393**
12:30	12:45	40	2	3	**45**	12	2	11	**25**	**70**	18	142	30	**190**	4	124	14	**142**	**332**	**402**
12:45	13:00	38	0	5	**43**	13	2	17	**32**	**75**	18	162	43	**223**	0	112	18	**130**	**353**	**428**
13:00	13:15	29	2	1	**32**	17	2	11	**30**	**62**	21	129	37	**187**	4	129	12	**145**	**332**	**394**
13:15	13:30	35	4	3	**42**	14	1	14	**29**	**71**	16	124	42	**182**	2	113	7	**122**	**304**	**375**
15:00	15:15	33	5	1	**39**	13	7	17	**37**	**76**	39	141	57	**237**	2	149	25	**176**	**413**	**489**
15:15	15:30	48	11	2	**61**	28	17	30	**75**	**136**	21	167	66	**254**	4	160	20	**184**	**438**	**574**
15:30	15:45	36	6	2	**44**	22	5	32	**59**	**103**	25	173	71	**269**	2	145	15	**162**	**431**	**534**
15:45	16:00	54	3	3	**60**	15	7	14	**36**	**96**	32	168	76	**276**	2	136	19	**157**	**433**	**529**
16:00	16:15	48	9	5	**62**	11	14	25	**50**	**112**	26	184	79	**289**	8	169	13	**190**	**479**	**591**
16:15	16:30	47	9	7	**63**	14	13	21	**48**	**111**	36	197	93	**327**	3	174	19	**196**	**523**	**634**
16:30	16:45	53	5	5	**63**	13	13	23	**49**	**112**	32	170	87	**289**	3	144	15	**162**	**451**	**563**
16:45	17:00	50	11	7	**68**	14	9	20	**43**	**111**	22	173	99	**294**	3	161	18	**182**	**476**	**587**
17:00	17:15	38	6	3	**47**	21	11	18	**50**	**97**	28	169	87	**284**	4	156	15	**175**	**459**	**556**
17:15	17:30	41	11	6	**58**	17	7	11	**35**	**93**	22	180	100	**302**	5	145	9	**159**	**461**	**554**
17:30	17:45	46	3	2	**51**	19	9	14	**42**	**93**	28	182	92	**302**	1	148	16	**165**	**467**	**560**
17:45	18:00	45	4	1	**50**	10	8	12	**30**	**80**	24	180	87	**291**	3	162	19	**184**	**475**	**555**
TOTAL:		1778	204	113	**2095**	440	187	615	**1242**	**3337**	672	4440	1573	**6687**	75	4744	461	**5280**	**11967**	**15304**

Note: U-Turns are included in Totals.

Comment:

Transportation Services - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order 37540

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Count Date: Thursday, January 18, 2018 **Start Time:** 07:00

	CEDARVIEW RD/TARTAN DR			STRANDHERD DR			
Time Period	Northbound	Southbound	**Street Total**	Eastbound	Westbound	**Street Total**	**Grand Total**
07:00 08:00	0	0	**0**	0	0	**0**	**0**
08:00 09:00	0	0	**0**	0	0	**0**	**0**
09:00 10:00	0	0	**0**	0	0	**0**	**0**
11:30 12:30	0	0	**0**	0	0	**0**	**0**
12:30 13:30	0	0	**0**	0	0	**0**	**0**
15:00 16:00	0	0	**0**	0	0	**0**	**0**
16:00 17:00	0	0	**0**	0	0	**0**	**0**
17:00 18:00	0	0	**0**	0	0	**0**	**0**
Total	0	0	**0**	0	0	**0**	**0**

Comment:

Note: These volumes consists of bicycles only (no mopeds or motorcycles) and ARE NOT included in the Turning Movement Count Summary.

Transportation Services - Traffic Services

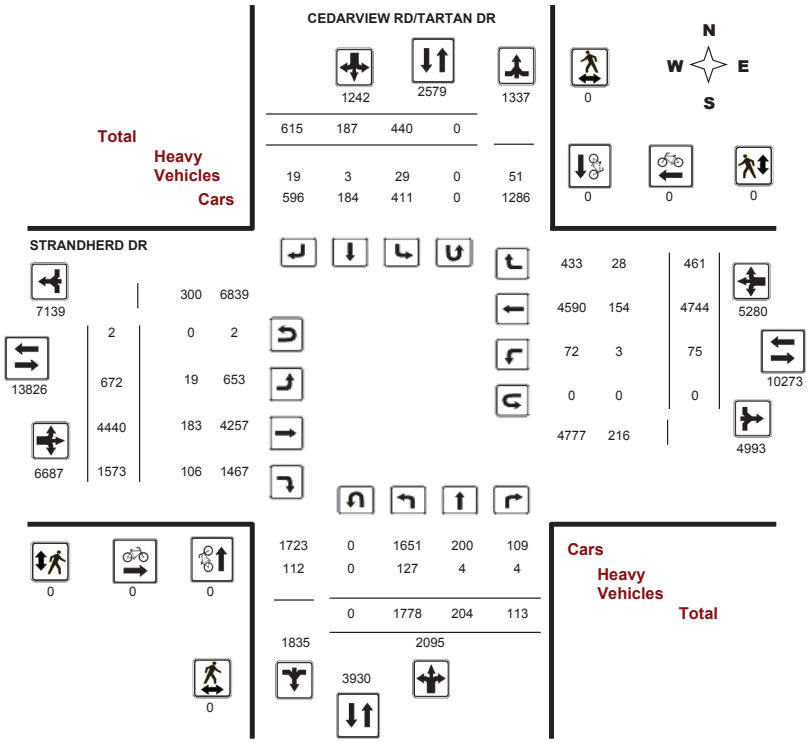
Turning Movement Count - Full Study Diagram

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

WO#: 37540

Device: Miovision



Comments

Transportation Services - Traffic Services

W.O. 37540

Turning Movement Count - Heavy Vehicle Report

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

		CEDARVIEW RD/TARTAN DR								STRANDHERD DR										
		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	08:00	6	1	0	**7**	3	0	1	**4**	**11**	3	30	14	**47**	0	18	8	**26**	**73**	**84**
08:00	09:00	20	2	0	**22**	2	1	5	**8**	**30**	1	32	15	**48**	1	25	3	**29**	**77**	**107**
09:00	10:00	27	0	0	**27**	4	0	1	**5**	**32**	2	32	16	**50**	1	29	4	**34**	**84**	**116**
11:30	12:30	22	0	1	**23**	4	1	3	**8**	**31**	1	24	16	**41**	0	25	3	**28**	**69**	**100**
12:30	13:30	17	0	0	**17**	3	0	1	**4**	**21**	1	33	18	**52**	0	14	2	**16**	**68**	**89**
15:00	16:00	16	1	0	**17**	3	0	2	**5**	**22**	7	10	13	**30**	1	16	4	**21**	**51**	**73**
16:00	17:00	15	0	3	**18**	5	0	6	**11**	**29**	4	13	12	**29**	0	21	2	**23**	**52**	**81**
17:00	18:00	4	0	0	**4**	5	1	0	**6**	**10**	0	9	2	**11**	0	6	2	**8**	**19**	**29**
Sub Total		127	4	4	**135**	29	3	19	**51**	**186**	19	183	106	**308**	3	154	28	**185**	**493**	**679**
U-Turns (Heavy Vehicles)					**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total		127	4	4	**0**	29	3	19	**51**	**186**	19	183	106	**308**	3	154	28	**185**	**493**	**679**

Heavy Vehicles include Buses, Single-Unit Trucks and Articulated Trucks. Further, they ARE included in the Turning Movement Count Summary.

Transportation Services - Traffic Services

Work Order 37540

Turning Movement Count - Pedestrian Volume Report

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Count Date: Thursday, January 18, 2018 **Start Time:** 07:00

Time Period	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	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	0	0	0
07:45 08:00	0	0	0	0	0	0	0
07:00 08:00	0	0	0	0	0	0	0
08:00 08:15	0	0	0	0	0	0	0
08:15 08:30	0	0	0	0	0	0	0
08:30 08:45	0	0	0	0	0	0	0
08:45 09:00	0	0	0	0	0	0	0
08:00 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
09:00 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
11:30 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
12:30 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	0	0	0	0	0	0	0
15:00 16:00	0	0	0	0	0	0	0
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	0	0	0	0
16:00 17:00	0	0	0	0	0	0	0
17:00 17:15	0	0	0	0	0	0	0
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	0	0	0	0	0	0
17:00 18:00	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

Comment:

Transportation Services - Traffic Services

Work Order 37540

Turning Movement Count - Full Study Summary Report

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 2 Westbound: 0

AADT Factor 1.00

Full Study

	CEDARVIEW RD/TARTAN DR									STRANDHERD DR									
	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	354	22	21	**397**	30	13	90	**133**	**530**	52	458	94	**604**	7	621	24	**652**	**1256**	**1786**
08:00 09:00	365	57	14	**436**	74	24	113	**211**	**647**	79	432	115	**626**	3	745	59	**807**	**1433**	**2080**
09:00 10:00	234	24	14	**272**	34	12	57	**103**	**375**	63	416	83	**562**	11	555	70	**636**	**1198**	**1573**
11:30 12:30	144	10	8	**162**	49	11	65	**125**	**287**	70	493	135	**698**	4	496	54	**554**	**1252**	**1539**
12:30 13:30	142	8	12	**162**	56	7	53	**116**	**278**	73	557	152	**782**	10	478	51	**539**	**1321**	**1599**
15:00 16:00	171	25	8	**204**	78	36	93	**207**	**411**	117	649	270	**1036**	10	590	79	**679**	**1715**	**2126**
16:00 17:00	198	34	24	**256**	52	49	89	**190**	**446**	116	724	358	**1198**	17	648	65	**730**	**1928**	**2374**
17:00 18:00	170	24	12	**206**	67	35	55	**157**	**363**	102	711	366	**1179**	13	611	59	**683**	**1862**	**2225**
Sub Total	1778	204	113	**2095**	440	187	615	**1242**	**3337**	672	4440	1573	**6685**	75	4744	461	**5280**	**11965**	**15302**
U Turns				**0**				**0**	**0**				**2**				**0**	**2**	**2**
Total	1778	204	113	**2095**	440	187	615	**1242**	**3337**	672	4440	1573	**6687**	75	4744	461	**5280**	**11967**	**15304**
EQ 12Hr	2471	284	157	**2912**	612	260	855	**1726**	**4638**	934	6172	2186	**9295**	104	6594	641	**7339**	**16634**	**21272**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	2471	284	157	**2912**	612	260	855	**1726**	**4638**	934	6172	2186	**9295**	104	6594	641	**7339**	**16634**	**21272**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**1.00**					
AVG 24Hr	3238	371	206	**3815**	801	341	1120	**2262**	**6077**	1224	8085	2864	**12176**	137	8638	839	**9614**	**21790**	**27867**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														**1.31**					

Comments:

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

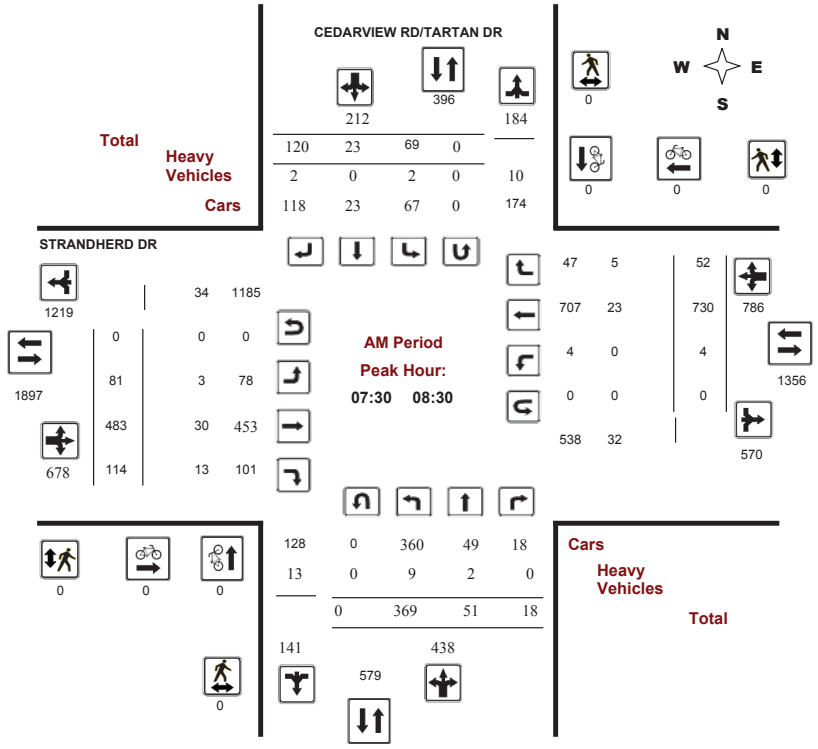
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37540

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



Comments

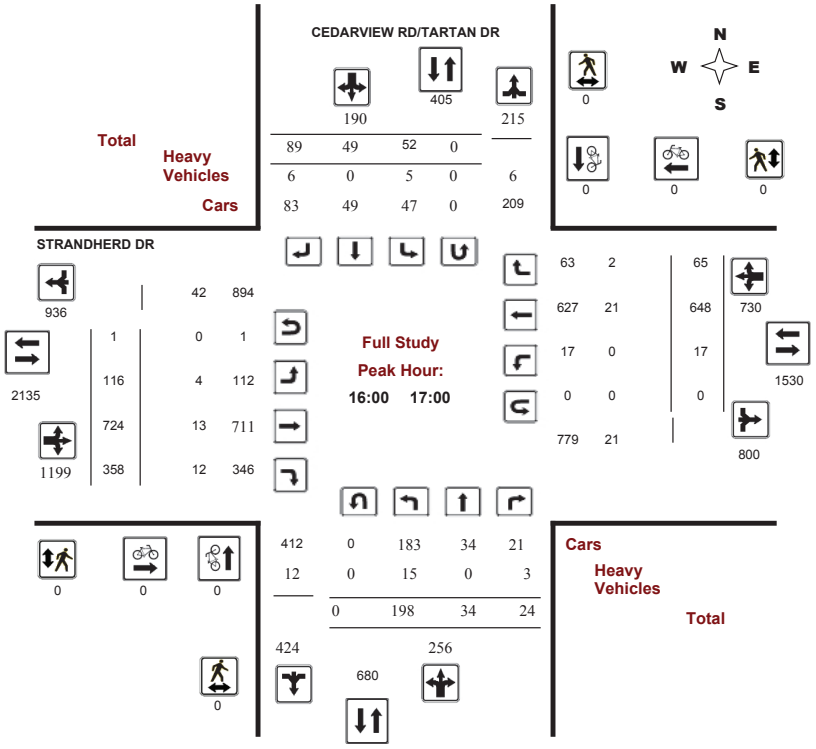
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37540

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



Comments

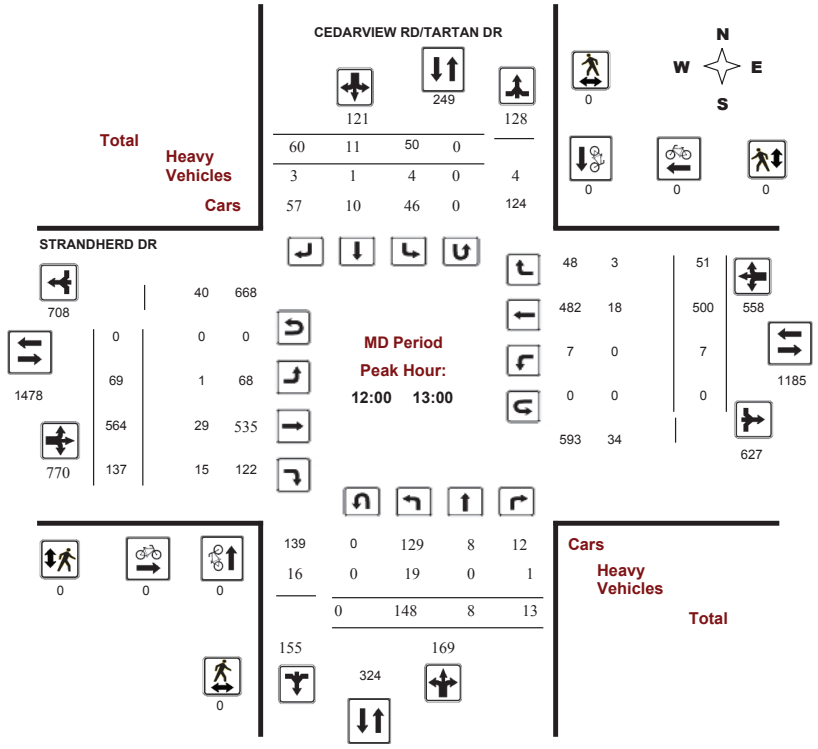
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37540

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



Comments

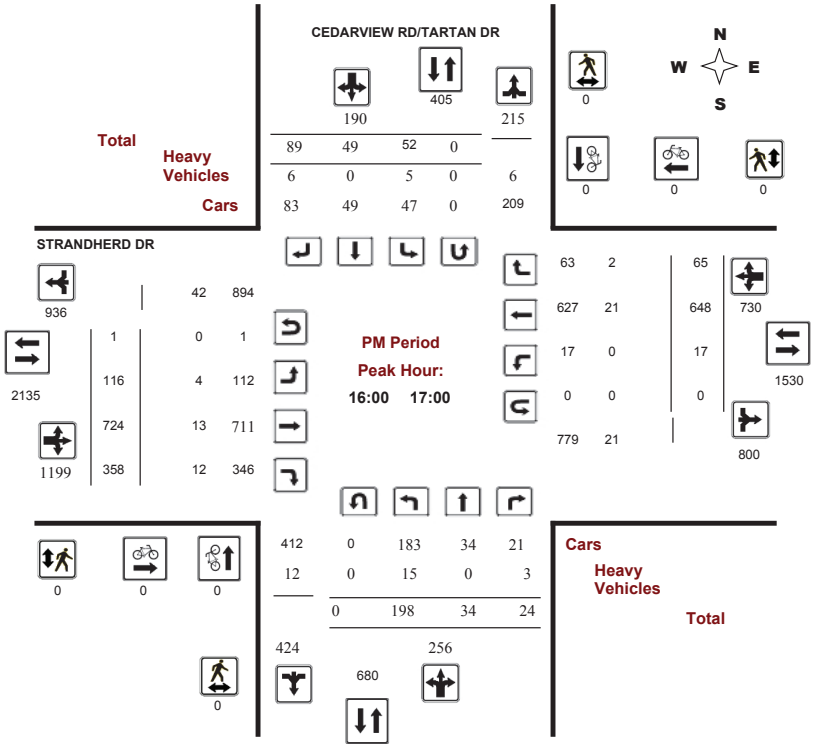
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018 **WO No:** 37540

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



Comments

Transportation Services - Traffic Services

Work Order
37540

Turning Movement Count - 15 Min U-Turn Total Report

STRANDHERD DR @ CEDARVIEW RD/TARTAN DR

Survey Date: Thursday, January 18, 2018

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	1	0	1
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	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	0	0	0	0	0
16:15	16:30	0	0	1	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		0	0	2	0	2

Appendix C

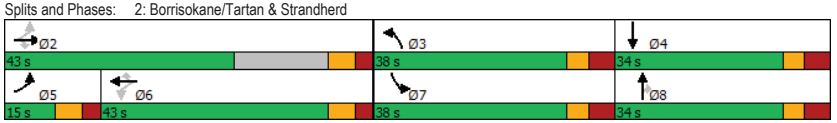
Synchro Intersection Worksheets – Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	486	139	15	728	52	335	49	27	69	23	120
Future Volume (vph)	81	486	139	15	728	52	335	49	27	69	23	120
Satd. Flow (prot)	1589	3119	1332	1621	3210	1345	3113	1673	1450	1605	1493	0
Flt Permitted	0.169			0.451			0.950			0.950		
Satd. Flow (perm)	283	3119	1332	769	3210	1345	3113	1673	1450	1605	1493	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	90	540	154	17	809	58	372	54	30	77	159	0
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2		2	6		6			8			
Detector Phase	5	2	2	6	6	6	3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	42.1	42.1	42.1	42.1	42.1	12.5	33.5	33.5	12.5	33.5	
Total Split (s)	15.0	43.0	43.0	43.0	43.0	43.0	38.0	34.0	34.0	38.0	34.0	
Total Split (%)	11.5%	33.1%	33.1%	33.1%	33.1%	33.1%	29.2%	26.2%	26.2%	29.2%	26.2%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	4.2	4.2	4.2	4.2	4.2	
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)	7.1	7.1	7.1	7.1	7.1	7.1	7.5	7.5	7.5	7.5	7.5	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	Max	Max	Max	Max	Max	None	None	None	None	None	
Act Effct Green (s)	48.0	48.0	48.0	36.6	36.6	36.6	18.3	28.1	28.1	10.6	16.8	
Actuated g/C Ratio	0.45	0.45	0.45	0.35	0.35	0.35	0.17	0.27	0.27	0.10	0.16	
v/c Ratio	0.40	0.38	0.25	0.06	0.73	0.12	0.69	0.12	0.08	0.48	0.67	
Control Delay	24.3	21.1	21.0	29.8	37.4	29.6	49.5	34.3	33.7	58.0	57.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	24.3	21.1	21.0	29.8	37.4	29.6	49.5	34.3	33.7	58.0	57.9	
LOS	C	C	C	C	D	C	D	C	C	E	E	
Approach Delay		21.5			36.7			46.7			57.9	
Approach LOS		C			D			D			E	
Queue Length 50th (m)	10.1	36.5	18.5	2.4	78.2	8.3	37.9	9.0	5.0	15.4	31.6	
Queue Length 95th (m)	24.1	62.2	40.0	8.9	#127.4	20.9	57.5	19.7	12.9	32.4	55.9	
Internal Link Dist (m)		1040.6			357.0			275.6			74.7	
Turn Bay Length (m)	140.0		130.0	80.0		45.0	200.0		80.0	30.0		
Base Capacity (vph)	228	1534	655	266	1113	466	917	470	407	473	382	
Starvation Cap Reductn	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	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.39	0.35	0.24	0.06	0.73	0.12	0.41	0.11	0.07	0.16	0.42	

Intersection Summary
Cycle Length: 130
Actuated Cycle Length: 105.6
Natural Cycle: 105
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.73

Intersection Signal Delay: 35.7 — Intersection LOS: D
Intersection Capacity Utilization 69.5% — ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd

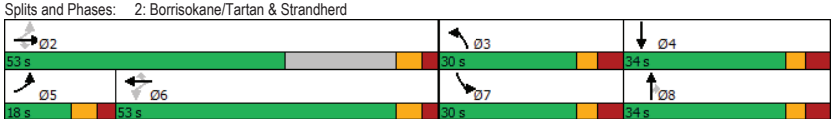


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	789	353	23	604	65	183	34	35	52	49	89
Future Volume (vph)	117	789	353	23	604	65	183	34	35	52	49	89
Satd. Flow (prot)	1605	3241	1436	1621	3210	1436	2969	1706	1309	1503	1493	0
Flt Permitted	0.267			0.324			0.950			0.950		
Satd. Flow (perm)	451	3241	1436	553	3210	1436	2969	1706	1309	1503	1493	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	130	877	392	26	671	72	203	38	39	58	153	0
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2		2	6		6			8			
Detector Phase	5	2	2	6	6	6	3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	42.1	42.1	42.1	42.1	42.1	12.5	33.5	33.5	12.5	33.5	
Total Split (s)	18.0	53.0	53.0	53.0	53.0	53.0	30.0	34.0	34.0	30.0	34.0	
Total Split (%)	13.3%	39.3%	39.3%	39.3%	39.3%	39.3%	22.2%	25.2%	25.2%	22.2%	25.2%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	4.2	4.2	4.2	4.2	4.2	
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)	7.1	7.1	7.1	7.1	7.1	7.1	7.5	7.5	7.5	7.5	7.5	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	Max	Max	Max	Max	Max	None	None	None	None	None	
Act Effct Green (s)	63.3	63.3	63.3	46.2	46.2	46.2	13.3	23.6	23.6	9.9	17.1	
Actuated g/C Ratio	0.55	0.55	0.55	0.40	0.40	0.40	0.11	0.20	0.20	0.09	0.15	
v/c Ratio	0.38	0.50	0.50	0.12	0.53	0.13	0.60	0.11	0.15	0.45	0.70	
Control Delay	18.0	18.8	20.8	27.6	29.9	25.8	57.4	41.3	42.3	63.7	64.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	18.0	18.8	20.8	27.6	29.9	25.8	57.4	41.3	42.3	63.7	64.3	
LOS	B	B	C	C	C	C	E	D	D	E	E	
Approach Delay		19.3			29.4			53.1			64.2	
Approach LOS		B			C			D			E	
Queue Length 50th (m)	13.7	61.3	52.3	3.7	60.0	10.2	22.7	7.3	7.5	12.6	33.1	
Queue Length 95th (m)	29.4	97.6	97.9	11.5	91.6	23.4	36.9	17.0	17.7	27.5	56.8	
Internal Link Dist (m)		1040.6			354.9			275.6			74.7	
Turn Bay Length (m)	140.0		130.0	80.0		45.0	200.0		80.0	30.0		
Base Capacity (vph)	355	1797	796	220	1278	572	579	399	306	293	343	
Starvation Cap Reductn	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	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.37	0.49	0.49	0.12	0.53	0.13	0.35	0.10	0.13	0.20	0.45	

Intersection Summary
Cycle Length: 135
Actuated Cycle Length: 116
Natural Cycle: 105
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.70

Intersection Signal Delay: 29.3 — Intersection LOS: C
Intersection Capacity Utilization 69.7% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



Appendix D

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
2018-03-07	2018	8:37	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	03 - Snow	01 - Daylight	10 - No control	0	03 - P.D. only	07 - SMV other	03 - Loose snow	0	0	0	0
2018-05-15	2018	8:26	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	01 - Daylight	10 - No control	0	02 - Non-fatal injury	07 - SMV other	01 - Dry	0	0	0	0
2018-08-02	2018	16:36	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
2018-08-15	2018	11:11	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
2018-08-24	2018	17:17	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	01 - Daylight	10 - No control	0	02 - Non-fatal injury	07 - SMV other	01 - Dry	0	0	0	0
2018-09-15	2018	17:30	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
2018-10-08	2018	13:45	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	02 - Rain	01 - Daylight	10 - No control	0	03 - P.D. only	07 - SMV other	02 - Wet	0	0	0	0
2018-12-01	2018	22:45	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	07 - Dark	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
2018-12-27	2018	12:27	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	06 - Ice	0	0	0	0
2019-06-04	2019	5:14	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	03 - Dawn	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
2019-10-15	2019	16:11	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2019-12-30	2019	23:15	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	04 - Freezing Rain	07 - Dark	10 - No control	0	03 - P.D. only	07 - SMV other	06 - Ice	0	0	0	0
2020-02-18	2020	8:55	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	03 - Snow	01 - Daylight	10 - No control	0	03 - P.D. only	07 - SMV other	03 - Loose snow	0	0	0	0
2020-02-22	2020	23:49	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	07 - Dark	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
2020-08-23	2020	1:03	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	07 - Dark	10 - No control	0	02 - Non-fatal injury	07 - SMV other	01 - Dry	0	0	0	0
2020-11-21	2020	20:43	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	07 - Dark	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2021-01-26	2021	17:55	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	03 - Snow	07 - Dark	10 - No control	0	03 - P.D. only	01 - Approaching	03 - Loose snow	0	0	0	0
2021-08-18	2021	15:45	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
2021-11-24	2021	15:39	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2021-12-10	2021	22:45	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	07 - Dark	10 - No control	0	03 - P.D. only	07 - SMV other	04 - Slush	0	0	0	0
2022-02-17	2022	18:49	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	03 - Snow	07 - Dark	10 - No control	0	03 - P.D. only	07 - SMV other	03 - Loose snow	0	0	0	0
2022-04-28	2022	23:11	BORRISOKANE RD btwn CAMBRIAN RD & STRANDHERD DR (__3ZA1CC)	01 - Clear	07 - Dark	10 - No control	0	02 - Non-fatal injury	07 - SMV other	01 - Dry	0	0	0	0
2018-04-02	2018	18:22	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	05 - Dusk	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2018-04-07	2018	17:29	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2018-07-05	2018	11:00	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
2018-07-12	2018	10:08	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	04 - Sideswipe	01 - Dry	0	0	0	0
2018-10-11	2018	16:22	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
2018-10-17	2018	7:45	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	02 - Rain	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	02 - Wet	0	0	0	0
2018-10-22	2018	11:58	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	05 - Turning movement	01 - Dry	0	0	0	0
2018-12-25	2018	8:03	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
2018-12-30	2018	18:56	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	07 - Dark	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	02 - Wet	0	0	0	0
2019-01-21	2019	15:46	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	05 - Drifting Snow	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	05 - Packed snow	0	0	0	0
2019-02-04	2019	22:10	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	04 - Freezing Rain	07 - Dark	01 - Traffic signal	0	03 - P.D. only	07 - SMV other	06 - Ice	0	0	0	0
2019-03-22	2019	19:20	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	03 - Snow	07 - Dark	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	02 - Wet	0	0	0	0
2019-03-25	2019	7:20	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	02 - Angle	06 - Ice	0	0	0	0
2019-04-01	2019	12:10	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	03 - Rear end	01 - Dry	0	0	0	0
2019-04-26	2019	17:30	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	02 - Rain	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	04 - Sideswipe	02 - Wet	0	0	0	0
2019-04-29	2019	9:22	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	04 - Sideswipe	01 - Dry	0	0	0	0
2019-05-17	2019	12:00	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	03 - Rear end	01 - Dry	0	0	0	0
2019-07-03	2019	10:43	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	03 - Rear end	01 - Dry	0	0	0	0
2019-07-05	2019	13:50	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	03 - Rear end	01 - Dry	0	0	0	0
2019-07-11	2019	16:38	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	02 - Rain	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	02 - Wet	0	0	0	0
2019-07-29	2019	16:50	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	02 - Rain	01 - Daylight	01 - Traffic signal	0	02 - Non-fatal injury	03 - Rear end	02 - Wet	0	0	0	0
2019-08-12	2019	13:22	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
2019-09-21	2019	19:05	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	1	0	0
2019-11-11	2019	22:27	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	03 - Snow	07 - Dark	01 - Traffic signal	0	03 - P.D. only	02 - Angle	05 - Packed snow	0	0	0	0
2019-11-11	2019	15:35	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	03 - Snow	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	03 - Loose snow	0	0	0	0
2019-12-01	2019	12:15	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2019-12-11	2019	19:00	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	03 - Snow	07 - Dark	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	02 - Wet	0	0	0	0
2019-12-23	2019	14:11	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2020-06-11	2020	16:30	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2020-07-09	2020	14:23	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2020-07-11	2020	19:20	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2020-09-16	2020	10:37	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2021-06-24	2021	17:15	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	08 - Loose sand or gravel	0	0	0	0
2021-09-09	2021	19:37	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	07 - Dark	01 - Traffic signal	0	02 - Non-fatal injury	05 - Turning movement	01 - Dry	0	0	0	0
2021-09-28	2021	17:41	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2021-10-19	2021	11:40	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	02 - Angle	01 - Dry	0	0	0	0
2021-11-06	2021	3:20	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	07 - Dark	01 - Traffic signal	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
2022-01-12	2022	8:06	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	03 - Snow	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	04 - Sideswipe	03 - Loose snow	0	0	0	0
2022-02-25	2022	9:48	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	03 - Snow	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	03 - Loose snow	0	0	0	0
2022-02-25	2022	16:30	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	03 - Rear end	03 - Loose snow	0	0	0	0
2022-03-07	2022	8:11	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
2022-03-22	2022	8:09	BORRISOKANE RD/TARTAN DR @ STRANDHERD DR (0010634)	01 - Clear	01 - Daylight	01 - Traffic signal	0	03 - P.D. only	04 - Sideswipe	01 - Dry	0	0	0	0
2018-05-29	2018	11:00	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE (__6O5O8S)	01 - Clear	01 - Daylight	10 - No control	0	02 - Non-fatal injury	05 - Turning movement	01 - Dry	0	0	0	0
2018-07-08	2018	11:36	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE (__6O5O8S)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2018-12-21	2018	16:40	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE (__6O5O8S)	02 - Rain	05 - Dusk	10 - No control	0	02 - Non-fatal injury	03 - Rear end	02 - Wet	0	0	0	0
2019-01-07	2019	12:55	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE (__6O5O8S)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	05 - Turning movement	01 - Dry	0	0	0	0
2020-02-23	2020	16:30	STRANDHERD DR btwn CEDARVIEW RD & MADRID AVE (__6O5O8S)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	0	0	0	0
2018-08-04	2018	14:19	STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASEY DR (__30IZPQ)	02 - Rain	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	02 - Wet	0	0	0	0
2019-05-30	2019	20:24	STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASEY DR (__30IZPQ)	01 - Clear	05 - Dusk	10 - No control	0	02 - Non-fatal injury	03 - Rear end	01 - Dry	0	0	0	0
2021-01-24	2021	2:04	STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASEY DR (__30IZPQ)	01 - Clear	07 - Dark	10 - No control	0	03 - P.D. only	07 - SMV other	01 - Dry	0	0	0	0
2022-04-22	2022	16:13	STRANDHERD DR btwn CEDARVIEW RD & MCKENNA CASEY DR (__30IZPQ)	01 - Clear	01 - Daylight	10 - No control	0	02 - Non-fatal injury	03 - Rear end	01 - Dry	0	0	0	0

Appendix E

MMLOS Analysis

CGH TRANSPORTATION

Multi-Modal Level of Service - Segments Form

Consultant	**CGH Transportation**	**Project**	**Conservancy**
Scenario	**Existing/Future**	**Date**	**22-Mar-24**
Comments			

SEGMENTS		Street A	Borrisokane (Ex/Fut) 1		
Pedestrian	Sidewalk Width Boulevard Width	-	no sidewalk n/a		
	Avg Daily Curb Lane Traffic Volume		> 3000		
	Operating Speed On-Street Parking		> 60 km/h no		
	Exposure to Traffic PLoS		**F**	-	-
	Effective Sidewalk Width				
	Pedestrian Volume				
	Crowding PLoS		-	-	-
	Level of Service		**-**	**-**	**-**
Bicycle	Type of Cycling Facility	F	Mixed Traffic		
	Number of Travel Lanes		2-3 lanes total		
	Operating Speed		≥ 60 km/h		
	# of Lanes & Operating Speed LoS		**F**	-	-
	Bike Lane (+ Parking Lane) Width				
	Bike Lane Width LoS		-	-	-
	Bike Lane Blockages				
	Blockage LoS		-	-	-
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge		
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes		
	Sidestreet Operating Speed		≤ 40 km/h		
	Unsignalized Crossing - Lowest LoS		**A**	-	-
	Level of Service		**F**	**-**	**-**
Transit	Facility Type	D	Mixed Traffic		
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8		
	Level of Service		**D**	**-**	**-**
Truck	Truck Lane Width	B	> 3.7 m		
	Travel Lanes per Direction		1		
	Level of Service		**B**	**-**	**-**
Auto	**Level of Service**	**Not Applicable**			

Consultant	**CGH Transportation**	**Project**	**Conservancy West**
Scenario	**Existing/Future**	**Date**	**22-Mar-24**
Comments			

INTERSECTIONS		Strandherd-Borrisokane (Existing)				Strandherd-Borrisokane (Future)			
Crossing Side		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	3	4	5	6	3	4	5	6
	Median	Median > 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	Median > 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Protected	Protected	Protected	Protected	Protected	Protected	Protected	Protected
	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	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel
	Corner Radius	5-10m	5-10m	10-15m	10-15m	5-10m	5-10m	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	**79**	**62**	**45**	**28**	**79**	**62**	**45**	**28**
	Ped. Exposure to Traffic LoS	**B**	**C**	**D**	**F**	**B**	**C**	**D**	**F**
	Cycle Length	120	120	120	120	120	120	120	120
	Effective Walk Time	7	9	21	22	7	9	21	22
	Average Pedestrian Delay	**53**	**51**	**41**	**40**	**53**	**51**	**41**	**40**
	Pedestrian Delay LoS	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**
	Level of Service	**E**	**E**	**E**	**F**	**E**	**E**	**E**	**F**
		F				**F**			
Approach From		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
	Right Turn Lane Configuration								
	Right Turning Speed								
	Cyclist relative to RT motorists	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**
	Separated or Mixed Traffic	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**
	Left Turn Approach	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box
	Operating Speed	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h
	Left Turning Cyclist	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
	Level of Service	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
		A				**A**			
Transit	Average Signal Delay	> 40 sec		≤ 40 sec	≤ 30 sec	> 40 sec		> 40 sec	> 40 sec
	Level of Service	**F**	**-**	**E**	**D**	**F**	**-**	**F**	**F**
		F				**F**			
Truck	Effective Corner Radius		< 10 m		10 - 15 m		< 10 m		10 - 15 m
	Number of Receiving Lanes on Departure from Intersection		≥ 2		≥ 2		≥ 2		≥ 2
	Level of Service	**-**	**D**	**-**	**B**	**-**	**D**	**-**	**B**
		D				**D**			
Auto	Volume to Capacity Ratio	0.61 - 0.70				> 1.00			
	Level of Service	**B**				**F**			

New Collector/BRT-Borrisokane (Future)				Conservancy Drive-Borrisokane (Future)			
NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
5	4	4	5	4	4	3	3
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	Median > 2.4 m	No Median - 2.4 m
Permissive	Permissive	Protected	Protected	Permissive	Permissive	No left turn / Prohib.	Permissive
Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	No right turn	Permissive or yield control	No right turn	Permissive or yield control
RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR prohibited	RTOR prohibited	RTOR allowed
No	No	No	No	No	No	No	No
No Channel	No Channel	No Channel	No Channel	No Right Turn	No Channel	No Right Turn	No Channel
10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m	10-15m
Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
37	**53**	**61**	**45**	**62**	**56**	**90**	**70**
E	**D**	**C**	**D**	**C**	**D**	**A**	**C**
90	90	90	90	90	90	90	90
32	32	8	8	26	24	7	7
19	**19**	**37**	**37**	**23**	**24**	**38**	**38**
B	**B**	**D**	**D**	**C**	**C**	**D**	**D**
E	**D**	**D**	**D**	**C**	**D**	**D**	**D**
E				**D**			
NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
Not Applicable	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**	**Not Applicable**
Separated	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**	**Separated**
2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box
> 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	≥ 60 km/h	≥ 60 km/h
A	**A**	**A**	**A**	**A**	**A**	**A**	**A**
A	**A**	**A**	**A**	**A**	**A**	**A**	**A**
A				**A**			
		≤ 30 sec	≤ 30 sec				
-	**-**	**D**	**D**	**-**	**-**	**-**	**-**
D				**-**			
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**
-				**-**			
0.61 - 0.70				0.0 - 0.60			
B				**A**			

Appendix F

TDM Checklist

CGH TRANSPORTATION

TDM Measures Checklist:
Residential Developments (multi-family, condominium or subdivision)

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: *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	☐ Community Association may fulfill this role in future.
		1.2 Travel surveys	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐ Community Association may fulfill this role in future.
		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 *(multi-family, condominium)*	☐ N/A
		2.2 Bicycle skills training	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☑

		TDM measures: *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 *(multi-family, condominium)*	☐ N/A
BETTER	3.1.2	Provide real-time arrival information display at entrances *(multi-family, condominium)*	☐ N/A
		3.2 Transit fare incentives	
BASIC	★ 3.2.1	Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	☐
BETTER	3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	☐
		3.3 Enhanced public transit service	
BETTER	★ 3.3.1	Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels *(subdivision)*	☑
		3.4 Private transit service	
BETTER	3.4.1	Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	☐ N/A
		4. CARSHARING & BIKESHARING	
		4.1 Bikeshare stations & memberships	
BETTER	4.1.1	Contract with provider to install on-site bikeshare station *(multi-family)*	☐
BETTER	4.1.2	Provide residents with bikeshare memberships, either free or subsidized *(multi-family)*	☐
		4.2 Carshare vehicles & memberships	
BETTER	4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	☐
BETTER	4.2.2	Provide residents with carshare memberships, either free or subsidized	☐
		5. PARKING	
		5.1 Priced parking	
BASIC	★ 5.1.1	Unbundle parking cost from purchase price *(condominium)*	☐ N/A
BASIC	★ 5.1.2	Unbundle parking cost from monthly rent *(multi-family)*	☐ N/A

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		6.	**TDM MARKETING & COMMUNICATIONS**	
		6.1	**Multimodal travel information**	
BASIC	★	6.1.1	Provide a multimodal travel option information package to new residents	☑
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐

Appendix G

Synchro Intersection Worksheets – 2030 Future Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	787	484	53	1669	52	979	53	80	69	33	230
Future Volume (vph)	100	787	484	53	1669	52	979	53	80	69	33	230
Satd. Flow (prot)	1589	3119	1332	1621	3210	1345	3113	1673	1450	1605	1482	0
Flt Permitted	0.075			0.344			0.950			0.950		
Satd. Flow (perm)	125	3119	1332	587	3210	1345	3113	1673	1450	1605	1482	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	100	787	484	53	1669	52	979	53	80	69	263	0
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2		2	6		6			8			
Detector Phase	5	2	2	6	6	6	3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	42.1	42.1	42.1	42.1	42.1	12.5	33.5	33.5	12.5	33.5	
Total Split (s)	12.1	66.5	66.5	54.4	54.4	54.4	30.0	44.4	44.4	19.1	33.5	
Total Split (%)	9.3%	51.2%	51.2%	41.8%	41.8%	41.8%	23.1%	34.2%	34.2%	14.7%	25.8%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	4.2	4.2	4.2	4.2	4.2	
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)	7.1	7.1	7.1	7.1	7.1	7.1	7.5	7.5	7.5	7.5	7.5	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	60.3	60.3	60.3	47.4	47.4	47.4	22.5	40.4	40.4	9.9	25.1	
Actuated g/C Ratio	0.46	0.46	0.46	0.36	0.36	0.36	0.17	0.31	0.31	0.08	0.19	
v/c Ratio	0.81	0.54	0.78	0.25	1.43	0.11	1.82	0.10	0.18	0.57	0.92	
Control Delay	68.0	26.9	40.4	32.9	230.0	28.2	407.2	34.8	35.9	75.2	88.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	68.0	26.9	40.4	32.9	230.0	28.2	407.2	34.8	35.9	75.2	88.1	
LOS	E	C	D	C	F	C	F	C	D	E	F	
Approach Delay		34.7			218.2			362.8			85.4	
Approach LOS		C			F			F			F	
Queue Length 50th (m)	14.4	74.6	102.3	9.3	~299.9	8.7	~192.1	9.9	15.2	17.0	65.3	
Queue Length 95th (m)	#44.7	93.4	150.2	20.2	#341.9	17.8	#231.6	20.1	28.4	32.3	#112.8	
Internal Link Dist (m)		1040.6			357.0			275.6			74.7	
Turn Bay Length (m)	140.0		130.0	80.0		45.0	200.0		80.0	30.0		
Base Capacity (vph)	123	1447	618	213	1170	490	538	520	450	143	296	
Starvation Cap Reductn	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	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.81	0.54	0.78	0.25	1.43	0.11	1.82	0.10	0.18	0.48	0.89	

Intersection Summary

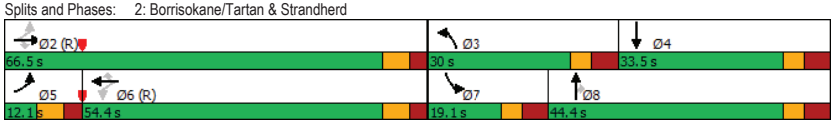
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.82
Intersection Signal Delay: 188.8 — Intersection LOS: F
Intersection Capacity Utilization 125.2% — ICU Level of Service H
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	14	56	495	6	24	216
Future Volume (vph)	14	56	495	6	24	216
Satd. Flow (prot)	1463	0	1702	0	1621	1706
Flt Permitted	0.990				0.459	
Satd. Flow (perm)	1458	0	1702	0	777	1706
Satd. Flow (RTOR)	56		1			
Lane Group Flow (vph)	70	0	501	0	24	216
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	33.3		25.6		25.6	25.6
Total Split (s)	40.0		50.0		50.0	50.0
Total Split (%)	44.4%		55.6%		55.6%	55.6%
Yellow Time (s)	3.3		4.6		4.6	4.6
All-Red Time (s)	3.0		2.0		2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	6.3		6.6		6.6	6.6
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		C-Max		C-Max	C-Max
Act Effct Green (s)	13.4		68.3		68.3	68.3
Actuated g/C Ratio	0.15		0.76		0.76	0.76
v/c Ratio	0.27		0.39		0.04	0.17
Control Delay	13.8		7.4		6.2	5.7
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	13.8		7.4		6.2	5.7
LOS	B		A		A	A
Approach Delay	13.8		7.4			5.8
Approach LOS	B		A			A
Queue Length 50th (m)	2.2		25.0		0.9	8.7
Queue Length 95th (m)	10.7		76.1		5.3	29.2
Internal Link Dist (m)	184.4		650.0			273.4
Turn Bay Length (m)	10.0				85.0	
Base Capacity (vph)	580		1291		589	1294
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.12		0.39		0.04	0.17

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 16 (18%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.39

Intersection Signal Delay: 7.4	Intersection LOS: A
Intersection Capacity Utilization 51.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 9: Borrisokane & Conservancy

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	218	1730	998	84	1131	65	663	43	88	52	54	122
Future Volume (vph)	218	1730	998	84	1131	65	663	43	88	52	54	122
Satd. Flow (prot)	1589	3119	1332	1621	3210	1345	3113	1673	1450	1605	1528	0
Flt Permitted	0.115			0.069			0.462			0.729		
Satd. Flow (perm)	192	3119	1332	118	3210	1345	1514	1673	1450	1232	1528	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	218	1730	998	84	1131	65	663	43	88	52	176	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	42.1	42.1	12.1	42.1	42.1	12.5	33.5	33.5	12.5	33.5	
Total Split (s)	19.6	69.5	69.5	13.0	62.9	62.9	14.0	35.0	35.0	12.5	33.5	
Total Split (%)	15.1%	53.5%	53.5%	10.0%	48.4%	48.4%	10.8%	26.9%	26.9%	9.6%	25.8%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	4.2	4.2	4.2	4.2	4.2	
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)	7.1	7.1	7.1	7.1	7.1	7.1	7.5	7.5	7.5	7.5	7.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	81.2	67.1	67.1	67.2	59.7	59.7	29.0	23.8	23.8	24.8	19.8	
Actuated g/C Ratio	0.62	0.52	0.52	0.52	0.46	0.46	0.22	0.18	0.18	0.19	0.15	
v/c Ratio	0.78	1.08	1.45	0.58	0.77	0.11	1.59	0.14	0.33	0.21	0.76	
Control Delay	40.3	77.1	239.7	36.3	34.6	22.3	308.3	45.4	49.8	37.7	72.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	40.3	77.1	239.7	36.3	34.6	22.3	308.3	45.4	49.8	37.7	72.4	
LOS	D	E	F	D	C	C	F	D	D	D	E	
Approach Delay		129.5			34.1			265.4			64.5	
Approach LOS		F			C			F			E	
Queue Length 50th (m)	26.5	~260.6	~347.7	7.9	130.6	9.7	~124.2	9.4	20.0	10.1	43.0	
Queue Length 95th (m)	#74.6	#313.0	#432.9	#31.1	159.3	19.1	#151.3	19.1	34.2	19.3	64.6	
Internal Link Dist (m)		1040.6			357.0			275.6			103.1	
Turn Bay Length (m)	140.0		130.0	80.0		45.0	200.0		80.0	30.0		
Base Capacity (vph)	278	1608	687	146	1474	618	417	353	306	249	305	
Starvation Cap Reductn	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	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.78	1.08	1.45	0.58	0.77	0.11	1.59	0.12	0.29	0.21	0.58	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.59
Intersection Signal Delay: 123.9 — Intersection LOS: F
Intersection Capacity Utilization 110.6% — ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd

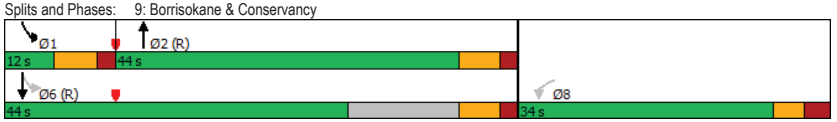
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	9	37	301	13	53	508
Future Volume (vph)	9	37	301	13	53	508
Satd. Flow (prot)	1461	0	1693	0	1621	1706
Flt Permitted	0.990				0.508	
Satd. Flow (perm)	1456	0	1693	0	857	1706
Satd. Flow (RTOR)	37		3			
Lane Group Flow (vph)	46	0	314	0	53	508
Turn Type	Perm		NA		pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8				6	
Detector Phase	8		2		1	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		5.0	10.0
Minimum Split (s)	33.3		25.6		11.6	25.6
Total Split (s)	34.0		44.0		12.0	44.0
Total Split (%)	37.8%		48.9%		13.3%	48.9%
Yellow Time (s)	3.3		4.6		4.6	4.6
All-Red Time (s)	3.0		2.0		2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	6.3		6.6		6.6	6.6
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None		C-Max		None	C-Max
Act Effct Green (s)	13.4		65.1		70.2	72.9
Actuated g/C Ratio	0.15		0.72		0.78	0.81
v/c Ratio	0.19		0.26		0.07	0.37
Control Delay	14.0		10.5		5.6	6.6
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	14.0		10.5		5.6	6.6
LOS	B		B		A	A
Approach Delay	14.0		10.5			6.5
Approach LOS	B		B			A
Queue Length 50th (m)	1.4		23.6		1.9	25.6
Queue Length 95th (m)	8.5		58.7		8.8	77.6
Internal Link Dist (m)	184.4		650.0			273.4
Turn Bay Length (m)	10.0				85.0	
Base Capacity (vph)	473		1226		719	1381
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.10		0.26		0.07	0.37

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 19 (21%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.37

Intersection Signal Delay: 8.3	Intersection LOS: A
Intersection Capacity Utilization 51.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 9: Borrisokane & Conservancy



Appendix H

Synchro Intersection Worksheets – 2035 Future Background Conditions

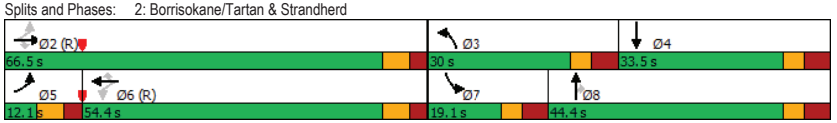
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	832	497	53	1737	52	1009	53	80	69	33	230
Future Volume (vph)	100	832	497	53	1737	52	1009	53	80	69	33	230
Satd. Flow (prot)	1589	3119	1332	1621	3210	1345	3113	1673	1450	1605	1482	0
Flt Permitted	0.075			0.317			0.950			0.950		
Satd. Flow (perm)	125	3119	1332	541	3210	1345	3113	1673	1450	1605	1482	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	100	832	497	53	1737	52	1009	53	80	69	263	0
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2		2	6		6			8			
Detector Phase	5	2	2	6	6	6	3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	42.1	42.1	42.1	42.1	42.1	12.5	33.5	33.5	12.5	33.5	
Total Split (s)	12.1	66.5	66.5	54.4	54.4	54.4	30.0	44.4	44.4	19.1	33.5	
Total Split (%)	9.3%	51.2%	51.2%	41.8%	41.8%	41.8%	23.1%	34.2%	34.2%	14.7%	25.8%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	4.2	4.2	4.2	4.2	4.2	
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)	7.1	7.1	7.1	7.1	7.1	7.1	7.5	7.5	7.5	7.5	7.5	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	60.3	60.3	60.3	47.4	47.4	47.4	22.5	40.4	40.4	9.9	25.1	
Actuated g/C Ratio	0.46	0.46	0.46	0.36	0.36	0.36	0.17	0.31	0.31	0.08	0.19	
v/c Ratio	0.81	0.57	0.80	0.27	1.48	0.11	1.88	0.10	0.18	0.57	0.92	
Control Delay	68.0	27.7	41.9	33.9	254.8	28.2	431.2	34.8	35.9	75.2	88.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	68.0	27.7	41.9	33.9	254.8	28.2	431.2	34.8	35.9	75.2	88.1	
LOS	E	C	D	C	F	C	F	C	D	E	F	
Approach Delay		35.5			242.1			385.1			85.4	
Approach LOS		D			F			F			F	
Queue Length 50th (m)	14.4	80.4	106.8	9.4	~318.7	8.7	~200.2	9.9	15.2	17.0	65.3	
Queue Length 95th (m)	#44.7	100.3	#166.3	20.6	#360.4	17.8	#240.0	20.1	28.4	32.3	#112.8	
Internal Link Dist (m)		1040.6			357.0			275.6			74.7	
Turn Bay Length (m)	140.0		130.0	80.0		45.0	200.0		80.0	30.0		
Base Capacity (vph)	123	1447	618	196	1170	490	538	520	450	143	296	
Starvation Cap Reductn	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	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.81	0.57	0.80	0.27	1.48	0.11	1.88	0.10	0.18	0.48	0.89	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.88
Intersection Signal Delay: 203.3 Intersection LOS: F
Intersection Capacity Utilization 128.1% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	14	56	414	6	24	181
Future Volume (vph)	14	56	414	6	24	181
Satd. Flow (prot)	1463	0	1701	0	1621	1706
Flt Permitted	0.990				0.511	
Satd. Flow (perm)	1458	0	1701	0	862	1706
Satd. Flow (RTOR)	56		1			
Lane Group Flow (vph)	70	0	420	0	24	181
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	33.3		25.6		25.6	25.6
Total Split (s)	40.0		50.0		50.0	50.0
Total Split (%)	44.4%		55.6%		55.6%	55.6%
Yellow Time (s)	3.3		4.6		4.6	4.6
All-Red Time (s)	3.0		2.0		2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	6.3		6.6		6.6	6.6
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		C-Max		C-Max	C-Max
Act Effct Green (s)	13.4		68.3		68.3	68.3
Actuated g/C Ratio	0.15		0.76		0.76	0.76
v/c Ratio	0.27		0.33		0.04	0.14
Control Delay	13.8		6.8		6.2	5.6
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	13.8		6.8		6.2	5.6
LOS	B		A		A	A
Approach Delay	13.8		6.8			5.7
Approach LOS	B		A			A
Queue Length 50th (m)	2.2		19.6		0.9	7.2
Queue Length 95th (m)	10.7		60.4		5.2	24.6
Internal Link Dist (m)	184.4		650.0			273.4
Turn Bay Length (m)	10.0				85.0	
Base Capacity (vph)	580		1290		653	1294
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.12		0.33		0.04	0.14

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 16 (18%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.33

Intersection Signal Delay: 7.1	Intersection LOS: A
Intersection Capacity Utilization 46.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 9: Borrisokane & Conservancy

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	218	1803	1031	84	1187	65	680	43	88	52	54	122
Future Volume (vph)	218	1803	1031	84	1187	65	680	43	88	52	54	122
Satd. Flow (prot)	1589	3119	1332	1621	3210	1345	3113	1673	1450	1605	1528	0
Flt Permitted	0.094			0.070			0.462			0.729		
Satd. Flow (perm)	157	3119	1332	119	3210	1345	1514	1673	1450	1232	1528	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	218	1803	1031	84	1187	65	680	43	88	52	176	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	42.1	42.1	12.1	42.1	42.1	12.5	33.5	33.5	12.5	33.5	
Total Split (s)	19.6	69.5	69.5	13.0	62.9	62.9	14.0	35.0	35.0	12.5	33.5	
Total Split (%)	15.1%	53.5%	53.5%	10.0%	48.4%	48.4%	10.8%	26.9%	26.9%	9.6%	25.8%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	4.2	4.2	4.2	4.2	4.2	
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)	7.1	7.1	7.1	7.1	7.1	7.1	7.5	7.5	7.5	7.5	7.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	81.4	67.1	67.1	65.9	58.5	58.5	29.0	23.8	23.8	24.8	19.8	
Actuated g/C Ratio	0.63	0.52	0.52	0.51	0.45	0.45	0.22	0.18	0.18	0.19	0.15	
v/c Ratio	0.80	1.12	1.50	0.58	0.82	0.11	1.63	0.14	0.33	0.21	0.76	
Control Delay	46.7	94.2	260.3	36.5	37.7	22.6	325.6	45.4	49.8	37.7	72.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	46.7	94.2	260.3	36.5	37.7	22.6	325.6	45.4	49.8	37.7	72.4	
LOS	D	F	F	D	D	C	F	D	D	D	E	
Approach Delay		146.9			36.9			280.8			64.5	
Approach LOS		F			D			F			E	
Queue Length 50th (m)	31.8	~280.8	~365.0	7.9	140.8	9.7	~128.8	9.4	20.0	10.1	43.0	
Queue Length 95th (m)	#83.7	#333.2	#450.8	#30.8	171.4	19.1	#156.2	19.1	34.2	19.3	64.6	
Internal Link Dist (m)		1040.6			357.0			275.6			103.1	
Turn Bay Length (m)	140.0		130.0	80.0		45.0	200.0		80.0	30.0		
Base Capacity (vph)	274	1608	687	146	1444	605	417	353	306	249	305	
Starvation Cap Reductn	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	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.80	1.12	1.50	0.58	0.82	0.11	1.63	0.12	0.29	0.21	0.58	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.63
Intersection Signal Delay: 136.4 Intersection LOS: F
Intersection Capacity Utilization 113.2% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd

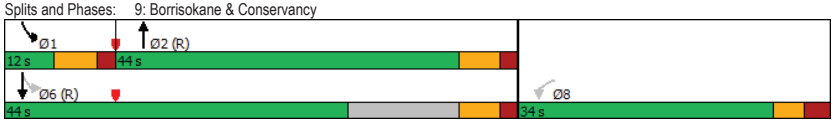
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	9	37	252	13	53	425
Future Volume (vph)	9	37	252	13	53	425
Satd. Flow (prot)	1461	0	1690	0	1621	1706
Flt Permitted	0.990				0.534	
Satd. Flow (perm)	1456	0	1690	0	900	1706
Satd. Flow (RTOR)	37		4			
Lane Group Flow (vph)	46	0	265	0	53	425
Turn Type	Perm		NA		pm+pt	NA
Protected Phases			2		1	6
Permitted Phases	8				6	
Detector Phase	8		2		1	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		5.0	10.0
Minimum Split (s)	33.3		25.6		11.6	25.6
Total Split (s)	34.0		44.0		12.0	44.0
Total Split (%)	37.8%		48.9%		13.3%	48.9%
Yellow Time (s)	3.3		4.6		4.6	4.6
All-Red Time (s)	3.0		2.0		2.0	2.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	6.3		6.6		6.6	6.6
Lead/Lag			Lag		Lead	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None		C-Max		None	C-Max
Act Effct Green (s)	13.4		65.1		70.2	72.9
Actuated g/C Ratio	0.15		0.72		0.78	0.81
v/c Ratio	0.19		0.22		0.07	0.31
Control Delay	14.0		10.1		5.6	6.1
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	14.0		10.1		5.6	6.1
LOS	B		B		A	A
Approach Delay	14.0		10.1			6.0
Approach LOS	B		B			A
Queue Length 50th (m)	1.4		19.1		1.9	20.0
Queue Length 95th (m)	8.5		48.8		8.8	61.3
Internal Link Dist (m)	184.4		650.0			273.4
Turn Bay Length (m)	10.0				85.0	
Base Capacity (vph)	473		1224		750	1381
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.10		0.22		0.07	0.31

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 19 (21%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.31

Intersection Signal Delay: 7.9	Intersection LOS: A
Intersection Capacity Utilization 48.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 9: Borrisokane & Conservancy



Appendix I

Signalization Warrants

Conservancy Drive @ Borrisokane Road
FT 2035

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	522	109%	91%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	110	91%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	412	86%	86%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	82	163%		

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
5. Correction to 2B, as per MTO and City of Ottawa, for '2 or More Lanes' has been applied

New Collector @ Borrisokane
FT 2035

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	655	136%	117%	No
	B. Vehicle volume, along minor streets (average hour)	120	170	120	170	140	117%		
2. Delay to Cross Traffic	A. Vehicle volumes, major street (average hour)	480	720	600	900	561	117%	117%	No
	B. Combined vehicle and pedestrian volume crossing artery from minor streets (average hour)	50	75	50	75	84	168%		

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
5. Correction to 2B, as per MTO and City of Ottawa, for '2 or More Lanes' has been applied

Appendix J

Synchro Intersection Worksheets –2030 Future Total Conditions

CGH TRANSPORTATION

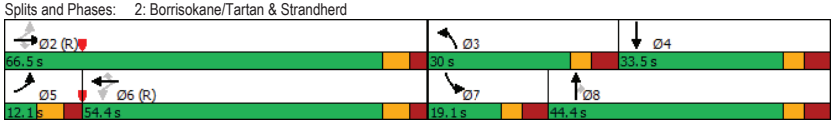
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	787	580	114	1669	52	1204	53	224	69	33	230
Future Volume (vph)	100	787	580	114	1669	52	1204	53	224	69	33	230
Satd. Flow (prot)	1589	3119	1332	1621	3210	1345	3113	1673	1450	1605	1482	0
Flt Permitted	0.075			0.344			0.950			0.950		
Satd. Flow (perm)	125	3119	1332	587	3210	1345	3113	1673	1450	1605	1482	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	100	787	580	114	1669	52	1204	53	224	69	263	0
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2		2	6		6			8			
Detector Phase	5	2	2	6	6	6	3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	42.1	42.1	42.1	42.1	42.1	12.5	33.5	33.5	12.5	33.5	
Total Split (s)	12.1	66.5	66.5	54.4	54.4	54.4	30.0	44.4	44.4	19.1	33.5	
Total Split (%)	9.3%	51.2%	51.2%	41.8%	41.8%	41.8%	23.1%	34.2%	34.2%	14.7%	25.8%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	4.2	4.2	4.2	4.2	4.2	
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)	7.1	7.1	7.1	7.1	7.1	7.1	7.5	7.5	7.5	7.5	7.5	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	60.3	60.3	60.3	47.4	47.4	47.4	22.5	40.4	40.4	9.9	25.1	
Actuated g/C Ratio	0.46	0.46	0.46	0.36	0.36	0.36	0.17	0.31	0.31	0.08	0.19	
v/c Ratio	0.81	0.54	0.94	0.54	1.43	0.11	2.24	0.10	0.50	0.57	0.92	
Control Delay	68.0	26.9	58.1	43.7	230.0	28.2	588.6	34.8	42.5	75.2	88.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	68.0	26.9	58.1	43.7	230.0	28.2	588.6	34.8	42.5	75.2	88.1	
LOS	E	C	E	D	F	C	F	C	D	E	F	
Approach Delay		42.1			212.7			486.2			85.4	
Approach LOS		D			F			F			F	
Queue Length 50th (m)	14.4	74.6	138.3	22.6	~299.9	8.7	~253.0	9.9	47.7	17.0	65.3	
Queue Length 95th (m)	#44.7	93.4	#212.6	43.2	#341.9	17.8	#293.6	20.1	74.2	32.3	#112.8	
Internal Link Dist (m)		1040.6			357.0			275.6			74.7	
Turn Bay Length (m)	140.0		130.0	80.0		45.0	200.0		80.0	30.0		
Base Capacity (vph)	123	1447	618	213	1170	490	538	520	450	143	296	
Starvation Cap Reductn	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	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.81	0.54	0.94	0.54	1.43	0.11	2.24	0.10	0.50	0.48	0.89	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.24
Intersection Signal Delay: 234.7 Intersection LOS: F
Intersection Capacity Utilization 132.0% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



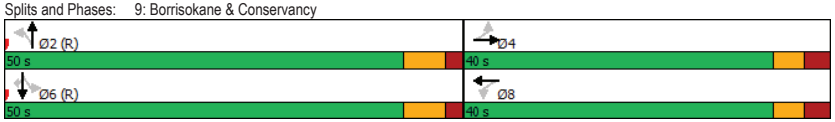
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	182	0	12	14	0	56	5	498	6	24	224	78
Future Volume (vph)	182	0	12	14	0	56	5	498	6	24	224	78
Satd. Flow (prot)	1621	1397	0	1621	1397	0	1621	1702	0	1621	1706	1450
Flt Permitted	0.720			0.750			0.619			0.431		
Satd. Flow (perm)	1209	1397	0	1258	1397	0	1038	1702	0	729	1706	1387
Satd. Flow (RTOR)		570			269			1				78
Lane Group Flow (vph)	182	12	0	14	56	0	5	504	0	24	224	78
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	33.3	33.3		33.3	33.3		25.6	25.6		25.6	25.6	25.6
Total Split (s)	40.0	40.0		40.0	40.0		50.0	50.0		50.0	50.0	50.0
Total Split (%)	44.4%	44.4%		44.4%	44.4%		55.6%	55.6%		55.6%	55.6%	55.6%
Yellow Time (s)	3.3	3.3		3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.0	3.0		3.0	3.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3		6.3	6.3		6.6	6.6		6.6	6.6	6.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	C-Max
Act Effct Green (s)	19.0	19.0		19.0	19.0		58.1	58.1		58.1	58.1	58.1
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.65	0.65		0.65	0.65	0.65
v/c Ratio	0.72	0.02		0.05	0.11		0.01	0.46		0.05	0.20	0.08
Control Delay	47.7	0.0		25.2	0.4		8.0	10.9		3.5	3.4	0.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	47.7	0.0		25.2	0.4		8.0	10.9		3.5	3.4	0.4
LOS	D	A		C	A		A	B		A	A	A
Approach Delay		44.8			5.4			10.9			2.7	
Approach LOS		D			A			B			A	
Queue Length 50th (m)	29.0	0.0		1.9	0.0		0.3	38.5		0.5	4.1	0.0
Queue Length 95th (m)	45.3	0.0		5.9	0.0		1.8	76.8		1.4	7.1	0.4
Internal Link Dist (m)		145.0			184.4			650.0			273.4	
Turn Bay Length (m)	10.0			10.0			84.0			85.0		83.0
Base Capacity (vph)	452	879		471	691		670	1099		471	1101	923
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.40	0.01		0.03	0.08		0.01	0.46		0.05	0.20	0.08

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 16 (18%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 14.1	Intersection LOS: B
Intersection Capacity Utilization 57.6%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 9: Borrisokane & Conservancy



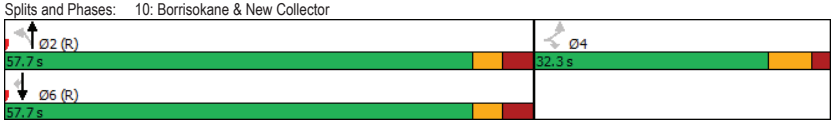
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	186	8	3	733	318	80
Future Volume (vph)	186	8	3	733	318	80
Satd. Flow (prot)	1621	1450	1621	1706	1706	1450
Flt Permitted	0.950		0.568			
Satd. Flow (perm)	1590	1394	958	1706	1706	1395
Satd. Flow (RTOR)		8				80
Lane Group Flow (vph)	186	8	3	733	318	80
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	30.8	30.8	31.8	31.8	31.8	31.8
Total Split (s)	32.3	32.3	57.7	57.7	57.7	57.7
Total Split (%)	35.9%	35.9%	64.1%	64.1%	64.1%	64.1%
Yellow Time (s)	4.6	4.6	3.3	3.3	3.3	3.3
All-Red Time (s)	2.2	2.2	3.5	3.5	3.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	16.3	16.3	60.1	60.1	60.1	60.1
Actuated g/C Ratio	0.18	0.18	0.67	0.67	0.67	0.67
v/c Ratio	0.65	0.03	0.00	0.64	0.28	0.08
Control Delay	43.9	14.9	6.3	9.7	7.8	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.9	14.9	6.3	9.7	7.8	2.1
LOS	D	B	A	A	A	A
Approach Delay	42.7			9.7	6.7	
Approach LOS	D			A	A	
Queue Length 50th (m)	29.9	0.0	0.1	32.1	19.1	0.0
Queue Length 95th (m)	45.3	3.2	m0.4	92.4	40.8	5.3
Internal Link Dist (m)	113.8			273.4	275.6	
Turn Bay Length (m)	38.0	38.0	38.0			
Base Capacity (vph)	450	400	639	1139	1139	958
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.02	0.00	0.64	0.28	0.08

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 89 (99%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.65
Intersection Signal Delay: 13.6 Intersection LOS: B
Intersection Capacity Utilization 65.5% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & New Collector



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	218	1730	1200	213	1131	65	812	43	183	52	54	122
Future Volume (vph)	218	1730	1200	213	1131	65	812	43	183	52	54	122
Satd. Flow (prot)	1589	3119	1332	1621	3210	1345	3113	1673	1450	1605	1528	0
Flt Permitted	0.123			0.069			0.462			0.729		
Satd. Flow (perm)	206	3119	1332	118	3210	1345	1514	1673	1450	1232	1528	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	218	1730	1200	213	1131	65	812	43	183	52	176	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	42.1	42.1	12.1	42.1	42.1	12.5	33.5	33.5	12.5	33.5	
Total Split (s)	19.6	69.5	69.5	13.0	62.9	62.9	14.0	35.0	35.0	12.5	33.5	
Total Split (%)	15.1%	53.5%	53.5%	10.0%	48.4%	48.4%	10.8%	26.9%	26.9%	9.6%	25.8%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	4.2	4.2	4.2	4.2	4.2	
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)	7.1	7.1	7.1	7.1	7.1	7.1	7.5	7.5	7.5	7.5	7.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	77.3	62.4	62.4	71.6	59.6	59.6	29.0	23.8	23.8	24.8	19.8	
Actuated g/C Ratio	0.59	0.48	0.48	0.55	0.46	0.46	0.22	0.18	0.18	0.19	0.15	
v/c Ratio	0.78	1.16	1.88	1.04	0.77	0.11	1.94	0.14	0.69	0.21	0.76	
Control Delay	38.2	110.3	425.5	110.9	34.8	22.3	460.9	45.4	63.9	37.7	72.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	38.2	110.3	425.5	110.9	34.8	22.3	460.9	45.4	63.9	37.7	72.3	
LOS	D	F	F	F	C	C	F	D	E	D	E	
Approach Delay		225.5			45.7			373.7			64.4	
Approach LOS		F			D			F			E	
Queue Length 50th (m)	24.6	~271.3	~462.4	~46.7	130.6	9.7	~164.5	9.4	44.6	10.1	43.0	
Queue Length 95th (m)	#71.0	#313.0	#541.2	#115.3	159.3	19.1	#193.6	19.1	66.8	19.3	64.6	
Internal Link Dist (m)		1040.6			357.0			275.6			103.1	
Turn Bay Length (m)	140.0		130.0	80.0		45.0	200.0		80.0	30.0		
Base Capacity (vph)	280	1497	639	204	1470	616	418	353	306	249	305	
Starvation Cap Reductn	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	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.78	1.16	1.88	1.04	0.77	0.11	1.94	0.12	0.60	0.21	0.58	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.94
Intersection Signal Delay: 202.1 Intersection LOS: F
Intersection Capacity Utilization 122.6% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	0	8	9	0	37	10	308	13	53	513	164
Future Volume (vph)	121	0	8	9	0	37	10	308	13	53	513	164
Satd. Flow (prot)	1621	1397	0	1621	1397	0	1621	1693	0	1621	1706	1450
Flt Permitted	0.733			0.752			0.425			0.517		
Satd. Flow (perm)	1231	1397	0	1262	1397	0	720	1693	0	870	1706	1387
Satd. Flow (RTOR)		315			481			3				164
Lane Group Flow (vph)	121	8	0	9	37	0	10	321	0	53	513	164
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	33.3	33.3		33.3	33.3		11.6	25.6		11.6	25.6	25.6
Total Split (s)	34.0	34.0		34.0	34.0		12.0	44.0		12.0	44.0	44.0
Total Split (%)	37.8%	37.8%		37.8%	37.8%		13.3%	48.9%		13.3%	48.9%	48.9%
Yellow Time (s)	3.3	3.3		3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.0	3.0		3.0	3.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3		6.3	6.3		6.6	6.6		6.6	6.6	6.6
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	15.9	15.9		15.9	15.9		56.8	53.3		59.9	58.6	58.6
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.63	0.59		0.67	0.65	0.65
v/c Ratio	0.56	0.02		0.04	0.06		0.02	0.32		0.08	0.46	0.17
Control Delay	42.1	0.0		26.7	0.2		7.4	13.2		5.3	7.5	1.1
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	42.1	0.0		26.7	0.2		7.4	13.2		5.3	7.5	1.1
LOS	D	A		C	A		A	B		A	A	A
Approach Delay		39.5			5.3			13.1			5.9	
Approach LOS		D			A			B			A	
Queue Length 50th (m)	19.5	0.0		1.3	0.0		0.5	27.8		1.5	14.6	0.0
Queue Length 95th (m)	30.5	0.0		4.4	0.0		2.8	60.2		m3.6	57.6	5.4
Internal Link Dist (m)		145.0			184.4			650.0			273.4	
Turn Bay Length (m)	10.0			10.0			84.0			85.0		83.0
Base Capacity (vph)	378	648		388	762		511	1004		630	1111	960
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.32	0.01		0.02	0.05		0.02	0.32		0.08	0.46	0.17

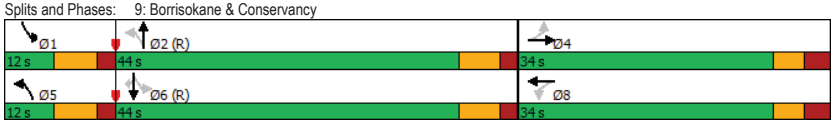
Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 19 (21%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 11.3	Intersection LOS: B
Intersection Capacity Utilization 65.1%	ICU Level of Service C
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Borrisokane & Conservancy



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	123	5	7	459	725	168
Future Volume (vph)	123	5	7	459	725	168
Satd. Flow (prot)	1621	1450	1621	1706	1706	1450
Flt Permitted	0.950		0.315			
Satd. Flow (perm)	1590	1394	535	1706	1706	1395
Satd. Flow (RTOR)		5				168
Lane Group Flow (vph)	123	5	7	459	725	168
Turn Type	Perm	Perm	Perm	NA	NA	Perm
Protected Phases				2	6	
Permitted Phases	4	4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	30.8	30.8	31.8	31.8	31.8	31.8
Total Split (s)	31.0	31.0	59.0	59.0	59.0	59.0
Total Split (%)	34.4%	34.4%	65.6%	65.6%	65.6%	65.6%
Yellow Time (s)	4.6	4.6	3.3	3.3	3.3	3.3
All-Red Time (s)	2.2	2.2	3.5	3.5	3.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	C-Max
Act Effct Green (s)	14.2	14.2	62.2	62.2	62.2	62.2
Actuated g/C Ratio	0.16	0.16	0.69	0.69	0.69	0.69
v/c Ratio	0.49	0.02	0.02	0.39	0.61	0.17
Control Delay	40.1	16.8	6.7	7.0	11.6	1.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.1	16.8	6.7	7.0	11.6	1.7
LOS	D	B	A	A	B	A
Approach Delay	39.2			7.0	9.7	
Approach LOS	D			A	A	
Queue Length 50th (m)	19.9	0.0	0.3	15.8	52.3	0.0
Queue Length 95th (m)	30.9	2.5	m1.5	61.3	127.0	7.5
Internal Link Dist (m)	113.8			273.4	275.6	
Turn Bay Length (m)	38.0	38.0	38.0			
Base Capacity (vph)	427	378	370	1179	1179	1016
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.01	0.02	0.39	0.61	0.17

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.61
Intersection Signal Delay: 11.4 — Intersection LOS: B
Intersection Capacity Utilization 63.3% — ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & New Collector

Appendix K

Synchro Intersection Worksheets – 2035 Future Total Conditions

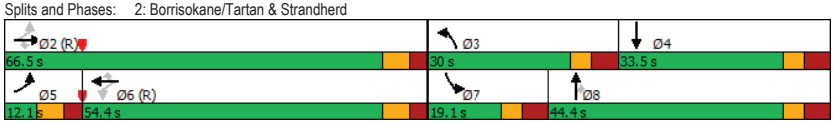
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	832	593	114	1737	52	1234	53	224	69	33	230
Future Volume (vph)	100	832	593	114	1737	52	1234	53	224	69	33	230
Satd. Flow (prot)	1589	3119	1332	1621	3210	1345	3113	1673	1450	1605	1482	0
Flt Permitted	0.075			0.317			0.950			0.950		
Satd. Flow (perm)	125	3119	1332	541	3210	1345	3113	1673	1450	1605	1482	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	100	832	593	114	1737	52	1234	53	224	69	263	0
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	5	2			6		3	8		7	4	
Permitted Phases	2		2	6		6			8			
Detector Phase	5	2	2	6	6	6	3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	42.1	42.1	42.1	42.1	42.1	12.5	33.5	33.5	12.5	33.5	
Total Split (s)	12.1	66.5	66.5	54.4	54.4	54.4	30.0	44.4	44.4	19.1	33.5	
Total Split (%)	9.3%	51.2%	51.2%	41.8%	41.8%	41.8%	23.1%	34.2%	34.2%	14.7%	25.8%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	4.2	4.2	4.2	4.2	4.2	
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)	7.1	7.1	7.1	7.1	7.1	7.1	7.5	7.5	7.5	7.5	7.5	
Lead/Lag	Lead			Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	60.3	60.3	60.3	47.4	47.4	47.4	22.5	40.4	40.4	9.9	25.1	
Actuated g/C Ratio	0.46	0.46	0.46	0.36	0.36	0.36	0.17	0.31	0.31	0.08	0.19	
v/c Ratio	0.81	0.57	0.96	0.58	1.48	0.11	2.29	0.10	0.50	0.57	0.92	
Control Delay	68.0	27.7	62.2	47.4	254.8	28.2	613.0	34.8	42.5	75.2	88.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	68.0	27.7	62.2	47.4	254.8	28.2	613.0	34.8	42.5	75.2	88.1	
LOS	E	C	E	D	F	C	F	C	D	E	F	
Approach Delay		43.8			236.2			508.1			85.4	
Approach LOS		D			F			F			F	
Queue Length 50th (m)	14.4	80.4	143.9	23.1	~318.7	8.7	~261.1	9.9	47.7	17.0	65.3	
Queue Length 95th (m)	#44.7	100.3	#220.4	44.9	#360.4	17.8	#301.7	20.1	74.2	32.3	#112.8	
Internal Link Dist (m)		1040.6			357.0			275.6			74.7	
Turn Bay Length (m)	140.0		130.0	80.0		45.0	200.0		80.0	30.0		
Base Capacity (vph)	123	1447	618	196	1170	490	538	520	450	143	296	
Starvation Cap Reductn	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	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.81	0.57	0.96	0.58	1.48	0.11	2.29	0.10	0.50	0.48	0.89	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 2.29
Intersection Signal Delay: 249.0 Intersection LOS: F
Intersection Capacity Utilization 134.8% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd



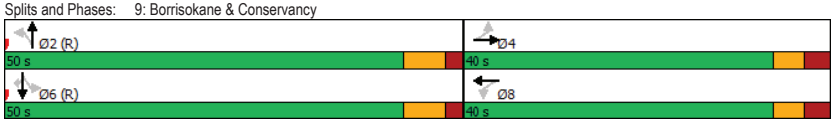
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	182	0	12	14	0	56	5	417	6	24	189	78
Future Volume (vph)	182	0	12	14	0	56	5	417	6	24	189	78
Satd. Flow (prot)	1621	1397	0	1621	1397	0	1621	1701	0	1621	1706	1450
Flt Permitted	0.720			0.750			0.639			0.487		
Satd. Flow (perm)	1209	1397	0	1258	1397	0	1070	1701	0	822	1706	1387
Satd. Flow (RTOR)		626			337			1				78
Lane Group Flow (vph)	182	12	0	14	56	0	5	423	0	24	189	78
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	33.3	33.3		33.3	33.3		25.6	25.6		25.6	25.6	25.6
Total Split (s)	40.0	40.0		40.0	40.0		50.0	50.0		50.0	50.0	50.0
Total Split (%)	44.4%	44.4%		44.4%	44.4%		55.6%	55.6%		55.6%	55.6%	55.6%
Yellow Time (s)	3.3	3.3		3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.0	3.0		3.0	3.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3		6.3	6.3		6.6	6.6		6.6	6.6	6.6
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	C-Max
Act Effct Green (s)	19.0	19.0		19.0	19.0		58.1	58.1		58.1	58.1	58.1
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.65	0.65		0.65	0.65	0.65
v/c Ratio	0.72	0.02		0.05	0.10		0.01	0.38		0.05	0.17	0.08
Control Delay	47.7	0.0		25.2	0.4		8.0	9.9		3.3	3.3	0.4
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	47.7	0.0		25.2	0.4		8.0	9.9		3.3	3.3	0.4
LOS	D	A		C	A		A	A		A	A	A
Approach Delay		44.8			5.3			9.9			2.5	
Approach LOS		D			A			A			A	
Queue Length 50th (m)	29.0	0.0		1.9	0.0		0.3	30.3		0.5	3.5	0.0
Queue Length 95th (m)	45.3	0.0		5.9	0.0		1.8	61.0		1.3	5.6	0.4
Internal Link Dist (m)		145.0			184.4			650.0			273.4	
Turn Bay Length (m)	10.0			10.0			84.0			85.0		83.0
Base Capacity (vph)	452	914		471	733		691	1099		530	1101	923
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.40	0.01		0.03	0.08		0.01	0.38		0.05	0.17	0.08

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 16 (18%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.72

Intersection Signal Delay: 14.3	Intersection LOS: B
Intersection Capacity Utilization 53.1%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 9: Borrisokane & Conservancy



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	186	13	8	0	13	0	3	652	0	0	283	80
Future Volume (vph)	186	13	8	0	13	0	3	652	0	0	283	80
Satd. Flow (prot)	1621	1706	1450	0	1706	0	1621	1706	0	0	1706	1450
Flt Permitted	0.749						0.586					
Satd. Flow (perm)	1254	1706	1394	0	1706	0	988	1706	0	0	1706	1395
Satd. Flow (RTOR)			46									80
Lane Group Flow (vph)	186	13	8	0	13	0	3	652	0	0	283	80
Turn Type	Perm	NA	Perm		NA		Perm	NA			NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		6
Detector Phase	4	4	4	8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	30.8	30.8	30.8	30.8	30.8		31.8	31.8		31.8	31.8	31.8
Total Split (s)	32.3	32.3	32.3	32.3	32.3		57.7	57.7		57.7	57.7	57.7
Total Split (%)	35.9%	35.9%	35.9%	35.9%	35.9%		64.1%	64.1%		64.1%	64.1%	64.1%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2		3.5	3.5		3.5	3.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8		6.8		6.8	6.8			6.8	6.8
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		C-Max	C-Max		C-Max	C-Max	C-Max
Act Effct Green (s)	18.4	18.4	18.4		18.4		58.0	58.0			58.0	58.0
Actuated g/C Ratio	0.20	0.20	0.20		0.20		0.64	0.64			0.64	0.64
v/c Ratio	0.73	0.04	0.02		0.04		0.00	0.59			0.26	0.09
Control Delay	49.0	25.5	0.1		25.5		5.7	9.2			8.6	2.4
Queue Delay	0.0	0.0	0.0		0.0		0.0	0.0			0.0	0.0
Total Delay	49.0	25.5	0.1		25.5		5.7	9.2			8.6	2.4
LOS	D	C	A		C		A	A			A	A
Approach Delay		45.6			25.5			9.1			7.2	
Approach LOS		D			C			A			A	
Queue Length 50th (m)	29.8	1.8	0.0		1.8		0.1	28.8			18.5	0.0
Queue Length 95th (m)	47.1	5.8	0.0		5.8		m0.4	78.6			37.5	5.5
Internal Link Dist (m)		113.8			68.5			273.4			275.6	
Turn Bay Length (m)	38.0		38.0				38.0					
Base Capacity (vph)	355	483	427		483		636	1099			1099	927
Starvation Cap Reductn	0	0	0		0		0	0			0	0
Spillback Cap Reductn	0	0	0		0		0	0			0	0
Storage Cap Reductn	0	0	0		0		0	0			0	0
Reduced v/c Ratio	0.52	0.03	0.02		0.03		0.00	0.59			0.26	0.09

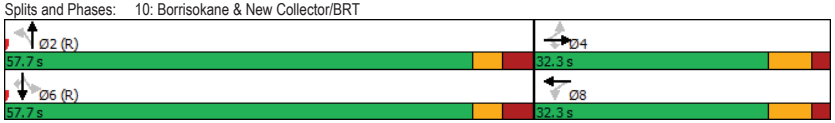
Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 89 (99%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.73

Intersection Signal Delay: 14.8	Intersection LOS: B
Intersection Capacity Utilization 85.7%	ICU Level of Service E
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & New Collector/BRT



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	218	1803	1233	213	1187	65	829	43	183	52	54	122
Future Volume (vph)	218	1803	1233	213	1187	65	829	43	183	52	54	122
Satd. Flow (prot)	1589	3119	1332	1621	3210	1345	3113	1673	1450	1605	1528	0
Flt Permitted	0.099			0.070			0.462			0.729		
Satd. Flow (perm)	166	3119	1332	119	3210	1345	1514	1673	1450	1232	1528	0
Satd. Flow (RTOR)												
Lane Group Flow (vph)	218	1803	1233	213	1187	65	829	43	183	52	176	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2		2	6		6	8		8	4		
Detector Phase	5	2	2	1	6	6	3	8	8	7	4	
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	
Minimum Split (s)	12.1	42.1	42.1	12.1	42.1	42.1	12.5	33.5	33.5	12.5	33.5	
Total Split (s)	19.6	69.5	69.5	13.0	62.9	62.9	14.0	35.0	35.0	12.5	33.5	
Total Split (%)	15.1%	53.5%	53.5%	10.0%	48.4%	48.4%	10.8%	26.9%	26.9%	9.6%	25.8%	
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.3	3.3	3.3	3.3	3.3	
All-Red Time (s)	2.9	2.9	2.9	2.9	2.9	2.9	4.2	4.2	4.2	4.2	4.2	
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)	7.1	7.1	7.1	7.1	7.1	7.1	7.5	7.5	7.5	7.5	7.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	
Act Effct Green (s)	78.4	62.4	62.4	70.5	58.4	58.4	29.0	23.8	23.8	24.8	19.8	
Actuated g/C Ratio	0.60	0.48	0.48	0.54	0.45	0.45	0.22	0.18	0.18	0.19	0.15	
v/c Ratio	0.79	1.20	1.93	1.05	0.82	0.11	1.98	0.14	0.69	0.21	0.76	
Control Delay	45.4	130.3	448.1	112.1	37.9	22.6	478.6	45.4	63.9	37.7	72.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	45.4	130.3	448.1	112.1	37.9	22.6	478.6	45.4	63.9	37.7	72.3	
LOS	D	F	F	F	D	C	F	D	E	D	E	
Approach Delay		245.1			48.0			389.0			64.4	
Approach LOS		F			D			F			E	
Queue Length 50th (m)	30.7	~291.4	~479.7	~46.4	140.8	9.7	~169.1	9.4	44.6	10.1	43.0	
Queue Length 95th (m)	#81.4	#333.2	#558.5	#115.1	171.4	19.1	#198.1	19.1	66.8	19.3	64.6	
Internal Link Dist (m)		1040.6			357.0			275.6			103.1	
Turn Bay Length (m)	140.0		130.0	80.0		45.0	200.0		80.0	30.0		
Base Capacity (vph)	275	1497	639	203	1442	604	418	353	306	249	305	
Starvation Cap Reductn	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	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.79	1.20	1.93	1.05	0.82	0.11	1.98	0.12	0.60	0.21	0.58	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green, Master Intersection
Natural Cycle: 125
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.98
Intersection Signal Delay: 215.4 Intersection LOS: F
Intersection Capacity Utilization 125.3% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Borrisokane/Tartan & Strandherd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	121	0	8	9	0	37	10	259	13	53	430	164
Future Volume (vph)	121	0	8	9	0	37	10	259	13	53	430	164
Satd. Flow (prot)	1621	1397	0	1621	1397	0	1621	1690	0	1621	1706	1450
Flt Permitted	0.733			0.752			0.490			0.558		
Satd. Flow (perm)	1231	1397	0	1262	1397	0	828	1690	0	938	1706	1387
Satd. Flow (RTOR)		370			539			3				164
Lane Group Flow (vph)	121	8	0	9	37	0	10	272	0	53	430	164
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		6
Detector Phase	4	4		8	8		5	2		1	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		5.0	10.0		5.0	10.0	10.0
Minimum Split (s)	33.3	33.3		33.3	33.3		11.6	25.6		11.6	25.6	25.6
Total Split (s)	34.0	34.0		34.0	34.0		12.0	44.0		12.0	44.0	44.0
Total Split (%)	37.8%	37.8%		37.8%	37.8%		13.3%	48.9%		13.3%	48.9%	48.9%
Yellow Time (s)	3.3	3.3		3.3	3.3		4.6	4.6		4.6	4.6	4.6
All-Red Time (s)	3.0	3.0		3.0	3.0		2.0	2.0		2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.3	6.3		6.3	6.3		6.6	6.6		6.6	6.6	6.6
Lead/Lag							Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None		None	None		None	C-Max		None	C-Max	C-Max
Act Effct Green (s)	15.9	15.9		15.9	15.9		56.8	53.3		59.9	58.6	58.6
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.63	0.59		0.67	0.65	0.65
v/c Ratio	0.56	0.01		0.04	0.05		0.02	0.27		0.08	0.39	0.17
Control Delay	42.1	0.0		26.7	0.1		7.4	12.7		4.3	5.7	0.6
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	42.1	0.0		26.7	0.1		7.4	12.7		4.3	5.7	0.6
LOS	D	A		C	A		A	B		A	A	A
Approach Delay		39.5			5.3			12.5			4.3	
Approach LOS		D			A			B			A	
Queue Length 50th (m)	19.5	0.0		1.3	0.0		0.5	22.8		1.5	12.3	0.0
Queue Length 95th (m)	30.5	0.0		4.4	0.0		2.8	50.5		m2.8	18.1	1.8
Internal Link Dist (m)		145.0			184.4			650.0			273.4	
Turn Bay Length (m)	10.0			10.0			84.0			85.0		83.0
Base Capacity (vph)	378	686		388	803		572	1002		670	1111	960
Starvation Cap Reductn	0	0		0	0		0	0		0	0	0
Spillback Cap Reductn	0	0		0	0		0	0		0	0	0
Storage Cap Reductn	0	0		0	0		0	0		0	0	0
Reduced v/c Ratio	0.32	0.01		0.02	0.05		0.02	0.27		0.08	0.39	0.17

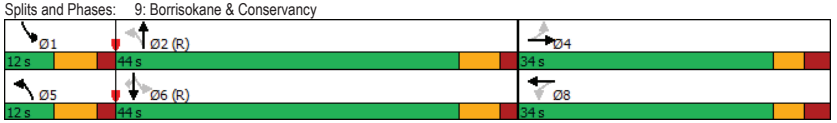
Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 19 (21%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 10.5	Intersection LOS: B
Intersection Capacity Utilization 60.5%	ICU Level of Service B
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Borrisokane & Conservancy



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	123	13	5	0	13	0	7	410	0	0	642	168
Future Volume (vph)	123	13	5	0	13	0	7	410	0	0	642	168
Satd. Flow (prot)	1621	1706	1450	0	1706	0	1621	1706	0	0	1706	1450
Flt Permitted	0.749						0.357					
Satd. Flow (perm)	1254	1706	1394	0	1706	0	606	1706	0	0	1706	1395
Satd. Flow (RTOR)			46									168
Lane Group Flow (vph)	123	13	5	0	13	0	7	410	0	0	642	168
Turn Type	Perm	NA	Perm		NA		Perm	NA			NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		6
Detector Phase	4	4	4	8	8		2	2		6	6	6
Switch Phase												
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0		10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	30.8	30.8	30.8	30.8	30.8		31.8	31.8		31.8	31.8	31.8
Total Split (s)	31.0	31.0	31.0	31.0	31.0		59.0	59.0		59.0	59.0	59.0
Total Split (%)	34.4%	34.4%	34.4%	34.4%	34.4%		65.6%	65.6%		65.6%	65.6%	65.6%
Yellow Time (s)	4.6	4.6	4.6	4.6	4.6		3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.2	2.2	2.2	2.2	2.2		3.5	3.5		3.5	3.5	3.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	6.8	6.8	6.8		6.8		6.8	6.8			6.8	6.8
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None	None	None	None		C-Max	C-Max		C-Max	C-Max	C-Max
Act Effct Green (s)	15.3	15.3	15.3		15.3		61.1	61.1			61.1	61.1
Actuated g/C Ratio	0.17	0.17	0.17		0.17		0.68	0.68			0.68	0.68
v/c Ratio	0.58	0.04	0.02		0.04		0.02	0.35			0.55	0.17
Control Delay	44.2	28.1	0.2		28.1		5.3	6.3			10.9	1.7
Queue Delay	0.0	0.0	0.0		0.0		0.0	0.0			0.0	0.0
Total Delay	44.2	28.1	0.2		28.1		5.3	6.3			10.9	1.7
LOS	D	C	A		C		A	A			B	A
Approach Delay		41.2			28.1			6.3			9.0	
Approach LOS		D			C			A			A	
Queue Length 50th (m)	19.9	1.9	0.0		1.9		0.2	13.7			46.6	0.0
Queue Length 95th (m)	32.3	5.9	0.0		5.9		m1.4	50.5			102.8	7.5
Internal Link Dist (m)		113.8			68.5			273.4			275.6	
Turn Bay Length (m)	38.0		38.0				38.0					
Base Capacity (vph)	337	458	408		458		411	1158			1158	1001
Starvation Cap Reductn	0	0	0		0		0	0			0	0
Spillback Cap Reductn	0	0	0		0		0	0			0	0
Storage Cap Reductn	0	0	0		0		0	0			0	0
Reduced v/c Ratio	0.36	0.03	0.01		0.03		0.02	0.35			0.55	0.17

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.58

Intersection Signal Delay: 11.6	Intersection LOS: B
Intersection Capacity Utilization 75.9%	ICU Level of Service D
Analysis Period (min) 15	

m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 10: Borrisokane & New Collector/BRT