770 Brookfield Road

TIA Strategy Report

prepared for:
Hobin Architecture
63 Pamilla Street
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prepared by:
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February 5, 2018

476552 – 01000

TIA Plan Reports

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

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

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

CERTIFICATION

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

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

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Dated at Ottawa this 5 day of February, 20 18 .
(City)

Name: Christopher Gordon
(Please Print)

Professional Title: Senior Project Manager

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

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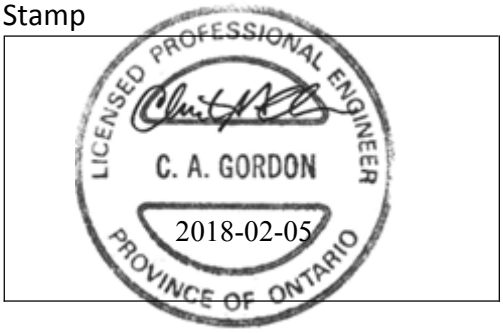
Stamp



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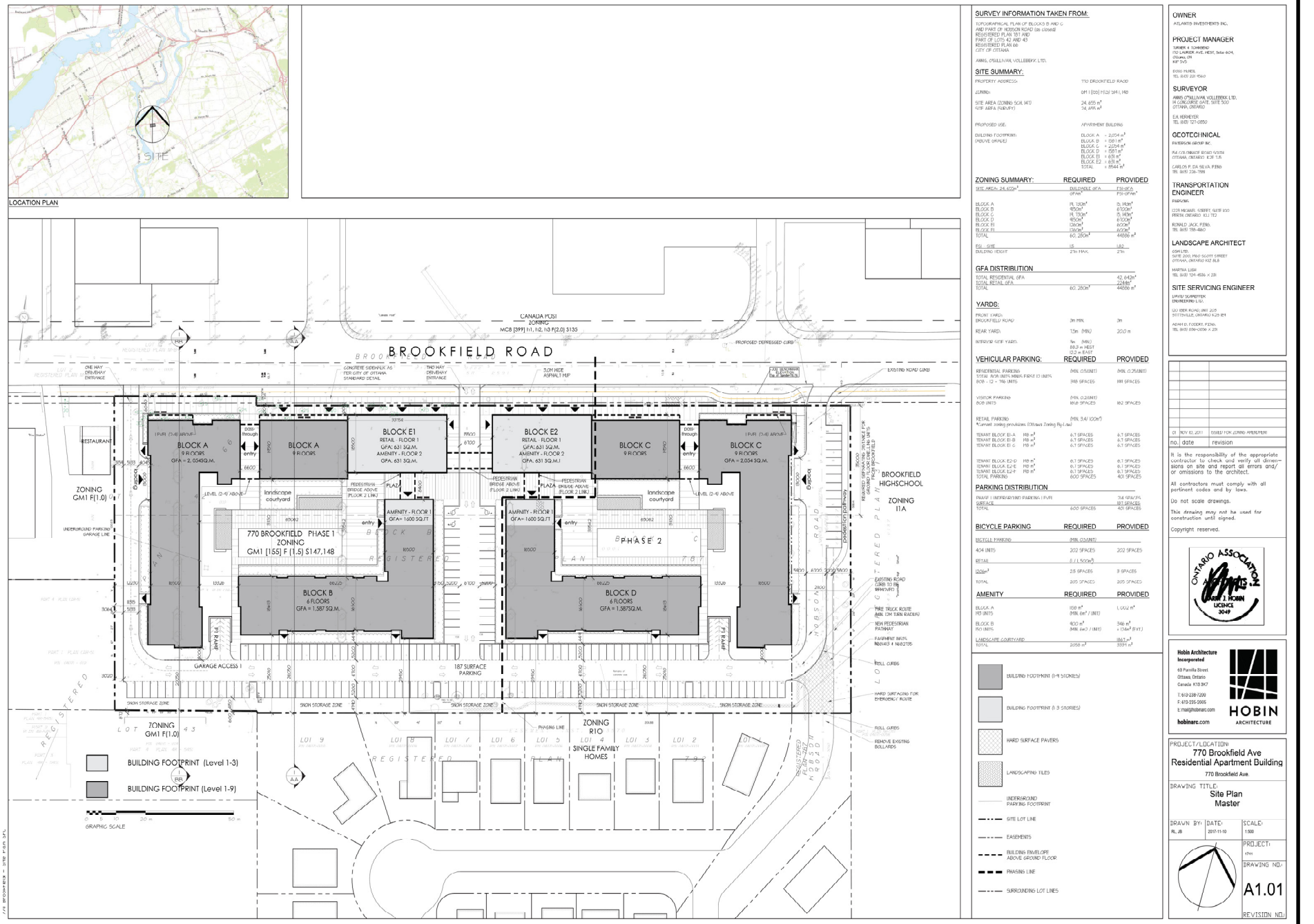
TIA Forecasting Report

1. INTRODUCTION

From the information provided, it is our understanding that the proponent is proposing to construct a residential development located at 770 Brookfield Road. The development will be constructed in two phases, Phase 1 consisting of 404 apartments and approximately 13,600 ft^2 of ground floor retail; Phase 2 will consist of approximately 404 apartment units. The Site Plan Application is for Phase 1 only. The western part of the site is currently occupied by a surface pay-and-display parking lot. Surface and underground parking is proposed for the site. The local context of the site is provided as Figure 1 and the proposed Site Plan is provided as Figure 2.

Figure 1: Local Context

As part of the Site Plan Approval process, the City of Ottawa requires a submission of a formal Transportation Impact Assessment (TIA) consistent with their updated 2017 guidelines. With respect to these guidelines, this Strategy Report has been prepared.



SURVEY INFORMATION TAKEN FROM:

TOPOGRAPHICAL PLAN OF BLOCKS B AND C AND PART OF HOBSON ROAD (as closed) REGISTERED PLAN 151 AND PART OF LOTS 42 AND 43 REGISTERED PLAN 66 CITY OF OTTAWA

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

SITE SUMMARY:

PROPERTY ADDRESS:	770 BROOKFIELD ROAD
ZONING:	GM 1 [155] F(1.5) SH 1, H9
SITE AREA (ZONING SOR, 141)	24, 655 m²
SITE AREA (SURVEY)	24, 695 m²
PROPOSED USE:	APARTMENT BUILDING
BUILDING FOOTPRINT: (ABOVE GRADE)	BLOCK A = 2,034 m² BLOCK B = 591 m² BLOCK C = 2,034 m² BLOCK D = 591 m² BLOCK E1 = 631 m² BLOCK E2 = 631 m² TOTAL = 8644 m²

ZONING SUMMARY:

	REQUIRED	PROVIDED
SITE AREA: 24, 670m²	BUILDABLE GFA: GFAm²	FSI-GFA: FSI-GFAm²
BLOCK A	FL 130m²	FL 140m²
BLOCK B	450m²	670Om²
BLOCK C	FL 130m²	FL 140m²
BLOCK D	450m²	670Om²
BLOCK E1	126Om²	670m²
BLOCK E2	126Om²	670m²
TOTAL	60, 280m²	44656 m²
FSI - SITE	1.5	1.82
BUILDING HEIGHT	21m MAX.	21m

GFA DISTRIBUTION

TOTAL RESIDENTIAL GFA	42, 640m²
TOTAL RETAIL GFA	224m²
TOTAL	60, 280m² / 44656 m²

YARDS:

FRONT YARD: BROOKFIELD ROAD	3m MIN.	3m
REAR YARD:	7.5m (MIN.)	20.0 m
INTERIOR SIDE YARD:	9m (MIN.) 86.3 m WEST 0.2 m EAST	

VEHICULAR PARKING:

	REQUIRED	PROVIDED
RESIDENTIAL PARKING TOTAL 308 UNITS MINUS FIRST 12 UNITS: 308 - 12 = 296 UNITS	(MIN. 0.5UNIT) 148 SPACES	(MIN. 0.5UNIT) 181 SPACES
VISITOR PARKING 308 UNITS	(MIN. 0.2UNIT) 62 SPACES	62 SPACES
RETAIL PARKING *Current zoning provisions (Ottawa Zoning By-Law)	(MIN. 3.4/ 100m²)	
TENANT BLOCK E1-A 118 m²	6.7 SPACES	6.7 SPACES
TENANT BLOCK E1-B 118 m²	6.7 SPACES	6.7 SPACES
TENANT BLOCK E1 G 118 m²	6.7 SPACES	6.7 SPACES
TENANT BLOCK E2-D 118 m²	6.7 SPACES	6.7 SPACES
TENANT BLOCK E2-E 118 m²	6.7 SPACES	6.7 SPACES
TENANT BLOCK E2-F 118 m²	6.7 SPACES	6.7 SPACES
TOTAL PARKING	600 SPACES	401 SPACES

PARKING DISTRIBUTION

PHASE I UNDERGROUND PARKING I FVR		314 SPACES
SURFACE		187 SPACES
TOTAL	600 SPACES	401 SPACES

BICYCLE PARKING

	REQUIRED	PROVIDED
BICYCLE PARKING	(MIN. 0.5UNIT)	
404 UNITS	202 SPACES	202 SPACES
RETAIL	8 / 1,500m²	
1206m²	2.5 SPACES	3 SPACES
TOTAL	205 SPACES	205 SPACES

AMENITY

	REQUIRED	PROVIDED
BLOCK A 113 UNITS	113 m² (MIN. 6m² / UNIT)	1,002 m²
BLOCK B 150 UNITS	900 m² (MIN. 6m² / UNIT)	346 m² + 134m² (EXT.)
LANDSCAPE COURTYARD TOTAL	2058 m²	1867 m² 3391 m²

BUILDING FOOTPRINT (1-9 STORIES)
BUILDING FOOTPRINT (1-3 STORIES)
HARD SURFACE PAVERS
LANDSCAPING TILES
UNDERGROUND PARKING FOOTPRINT
SITE LOT LINE
EASEMENTS
BUILDING ENVELOPE ABOVE GROUND FLOOR
PHASING LINE
SURROUNDING LOT LINES

OWNER
ATLANTIS INVESTMENTS INC.

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ADAM D. FOCHT, P.ENG.
TEL (613) 836-0934 X 231

no.	date	revision
01	NOV 10, 2017	BOARD FOR ZONING AMENDMENT

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and/or omissions to the architect.

All contractors must comply with all pertinent codes and by laws.

Do not scale drawings.

This drawing may not be used for construction until signed.

ONTARIO ASSOCIATION OF ARCHITECTS
GARY J. HOBIN
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HOBIN ARCHITECTURE

PROJECT/LOCATION:
770 Brookfield Ave
Residential Apartment Building
770 Brookfield Ave.

DRAWING TITLE:
Site Plan
Master

DRAWN BY:	DATE:	SCALE:
RL, JB	2017-11-10	1:500

PROJECT: 1741

DRAWING NO.: A1.01

REVISION NO.:

2. SCOPING

2.1. EXISTING AND PLANNED CONDITIONS

2.1.1. PROPOSED DEVELOPMENT

The proponent is proposing to construct a residential development located at 770 Brookfield Road. The development will be constructed in two phases, Phase 1 consisting of 404 apartments and approximately 13,600 ft^2 of ground floor retail; Phase 2 will consist of approximately 404 apartment units. The Site Plan Application is for Phase 1 only. The western part of the site is currently occupied by a surface pay-and-display parking lot. Surface and underground parking is proposed for the site.

2.1.2. EXISTING CONDITIONS

Area Road Network

Brookfield Road is a major collector roadway with a four-lane cross section east of Riverside Drive which continues west as Hogsback Road with a two-lane cross section. Within the study area, auxiliary turn lanes are provided at major intersections and the posted speed limit is 50 km/h.

Airport Parkway is a north-south arterial, which extends from the Ottawa International Airport in the south to Heron Road in the north, where it continues north as Bronson Avenue. The Airport Parkway has a two-lane cross section south of Brookfield Road. North of Brookfield Road, the Airport Parkway transitions into a four-lane cross section, where it continues as Bronson Avenue. Access to/from the Airport Parkway/Brookfield Road interchange is provided by a series of on/off-ramps. The posted speed limit along the Airport Parkway is 80 km/h.

Riverside Drive is a north-south arterial which extends from HWY 417 in the north (where it continues north as the Vanier Parkway) to River Road in the south (where is continues south as Limebank Road). North of Heron Road and south of Brookfield Road, Riverside Drive has a four-lane cross section. South of Heron Road and north of Brookfield Road, the cross section of Riverside Drive is six-lanes. Within the study area, auxiliary turn lanes are provided at major intersections and the posted speed limit is 60 km/h.

Flannery Drive is a north-south collector roadway with a two-lane cross section and a posted speed limit of 50 km/h.

Canada Post Access/Egress is a north-south local roadway with a 2-lane undivided cross-section and a posted speed limit of 35 km/h.

Pedestrian/Cycling Network

With respect to pedestrians, sidewalk facilities in the vicinity of the site are provided along both sides of Riverside Drive, Brookfield Road, Canada Post Access/Egress and Flannery Drive.

With respect to cyclists, according to the Ottawa Cycling Plan, Riverside Drive, Brookfield Road and the Airport Parkway are classified as “spine” cycling routes and Flannery Drive is classified as a “local” cycling route. Bicycle lanes are currently provided along both sides of Bronson Avenue/Airport Parkway, north of Brookfield Road and a MUP is currently provided along the east side of Airport Parkway south of Heron Road. Bicycle lanes are also provided along both sides of Riverside Drive from Heron Road to Brookfield Road. Off-road multi-use pathways are currently provided east of the site (under the Airport Parkway) connecting Brookfield Road West to Brookfield Road East and connecting Brookfield Road West to Heron Road (west of the Airport Parkway).

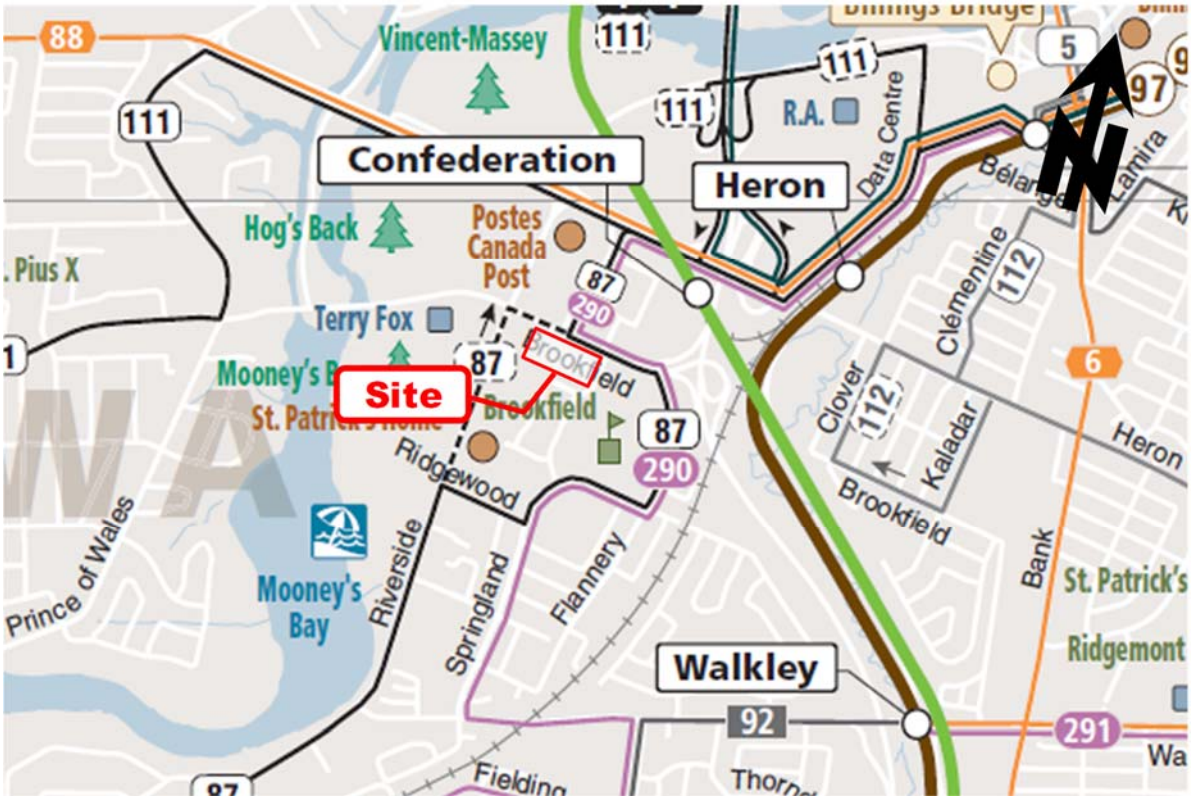
According to the Cycling Plan, cycling facilities (MUP) are planned for Brookfield Road and Hog's Back Road as part of a Phase 1 (2014-2019) City Project.

Transit Network

Transit service within the vicinity of the site is currently provided by OC Transpo Routes #87 and 290. Bus stops for these routes are adjacent to the site along Brookfield Road. Regular Route #87 provides frequent all-day service and Peak Hour Route #290 provides weekday morning and afternoon peak hour service only.

Access to the O-Train is provided by the Mooney's Bay Trillium Line Station located south of Heron Road approximately 500 m northeast of the site. Access to the Transitway is provided by the Heron Station located north of Heron Road, approximately 1.25 km northeast of the site. As the site is located within 600 m radius of the Mooney's Bay Station, the development is considered a Transit-Oriented Development (TOD).

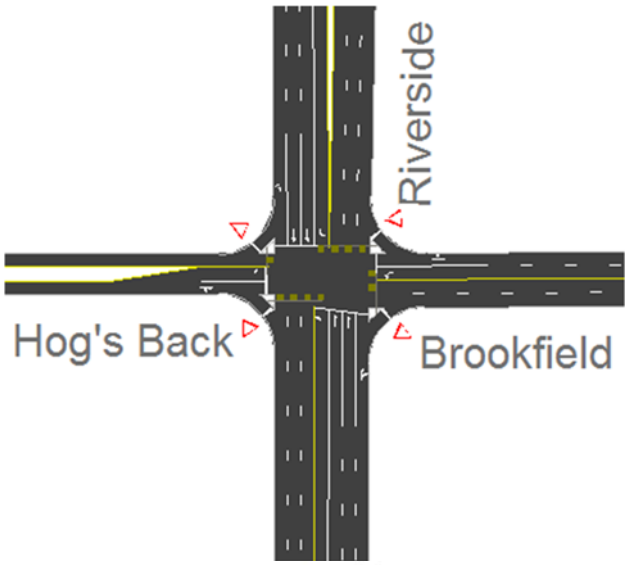
Figure 3: Area Transit Network



Existing Study Area Intersection

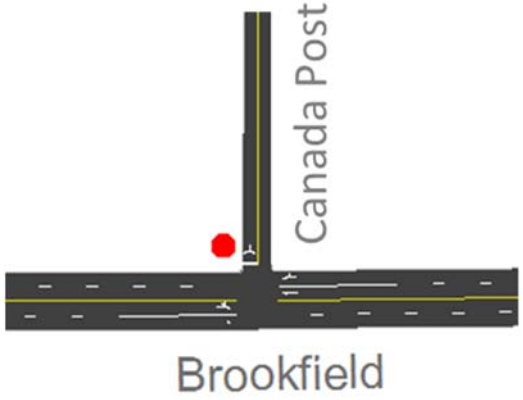
Riverside/Brookfield & Hog's Back

The Riverside/Brookfield & Hog's Back intersection to the west is a signalized four-legged intersection. The east and westbound approaches consist of single left-turn lanes and shared through/channelized right-turn lanes. The north and southbound approaches consist of single left-turn lanes, two through lanes and a shared through/channelized right-turn lane. All movements are permitted at this location.



Brookfield W/Canada Post @ 190m east of Riverside

The Brookfield W/Canada Post intersection, located 190 m east of the Riverside intersection, is an unsignalized 'T' intersection with STOP control on the minor southbound approach only. The westbound approach consists of a through lane and a shared through/right-turn lane. The eastbound approach consists of a through lane and a shared through/left-turn lane. The southbound approach consists of a single full movement lane. All movements are permitted at this location.

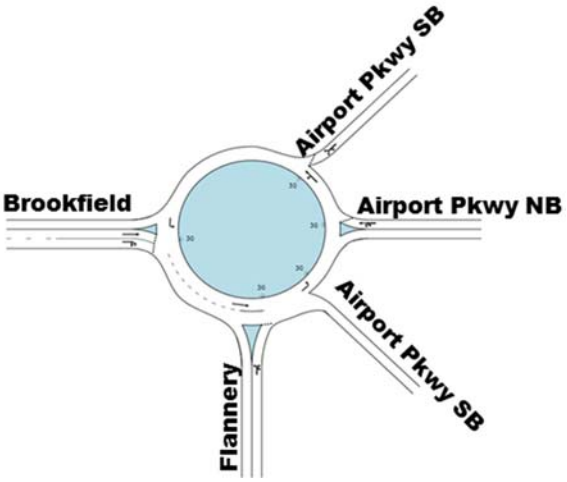


Brookfield E/Canada Post @ 20m west of Hobson

The Brookfield E/Canada Post intersection, located 20m west of the Hobson intersection is a signalized 'T' intersection. The westbound approach consists of a through lane and a shared through/right-turn lane. The eastbound approach consists of a through lane and a shared through/left-turn lane. The southbound approach consists of a single full movement lane. All movements are permitted at this location.

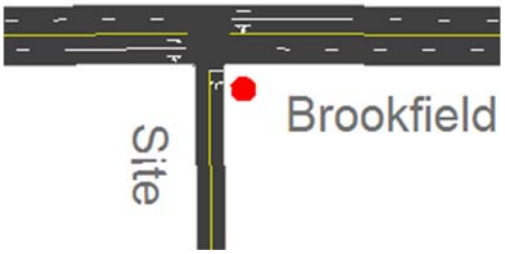
Brookfield/Airport Parkway/Flannery

The Brookfield/Airport Parkway/Flannery intersection is a five-legged multi-lane roundabout intersection. The eastbound approach consists of a through lane and a right-turn lane. The west, south and northbound approaches consist of single full movement lanes. The southeast leg of the roundabout is an exit lane only and the northeast leg of the roundabout is an approach lane only. All movements are permitted at this location.



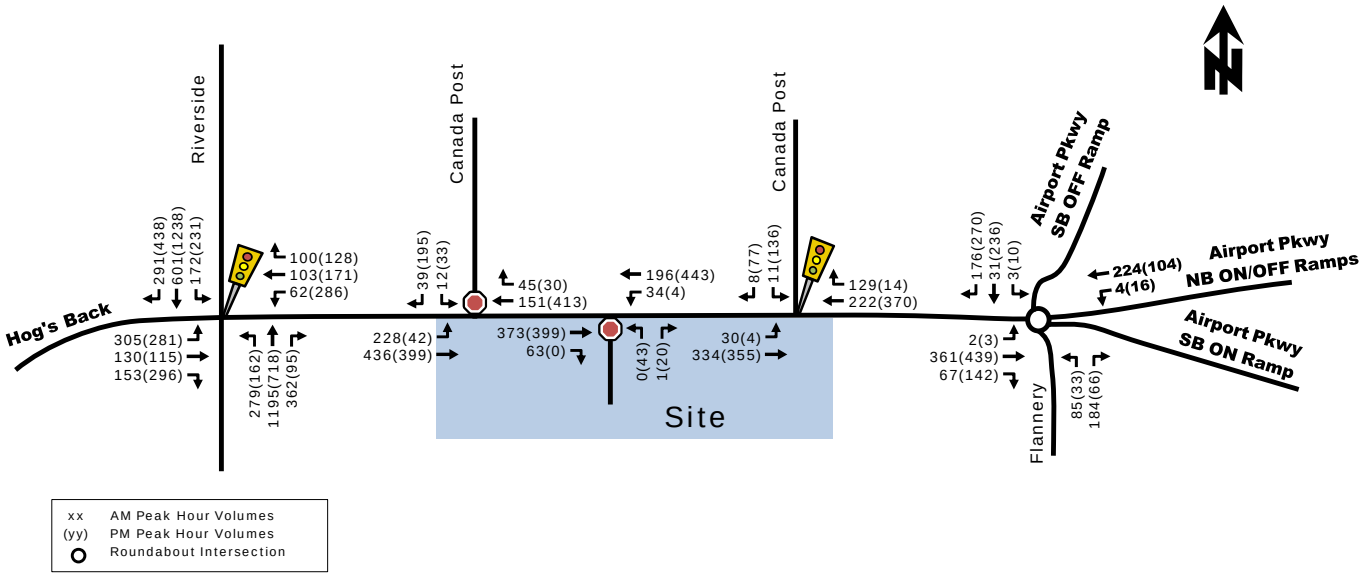
Brookfield/Existing Site Driveway

This intersection, which serves the site's 390 surface parking spaces, is located 240 m east of the Riverside intersection. It is an unsignalized 'T' intersection with STOP control on the minor northbound approach only. The westbound approach consists of a through lane and a shared through/left-turn lane. The eastbound approach consists of a through lane and a shared through/right-turn lane. The northbound approach consists of a single full movement lane. All movements are permitted at this location.



Illustrated as Figure 4, are the most recent weekday morning and afternoon peak hour traffic volumes obtained from the City of Ottawa at the study area intersections. These peak hour traffic volumes are included as Appendix A.

Figure 4: Existing Peak Hour Traffic Volumes



Existing Road Safety Conditions

Collision history for the study area intersections (2012 to 2016, inclusive) was obtained from the City of Ottawa and most collisions (79%) involved only property damage, indicating low impact speeds, and 21% involved personal injuries. The

primary causes of collisions cited by police include; rear end (46%), turning movement (16%), sideswipe (15%) and angle (12%) type collisions.

A standard unit of measure for assessing collisions at an intersection is based on the number collisions per million entering vehicles (MEV). At intersections within the study area, reported collisions have historically take place at a rate of:

- 0.71/MEV at the Brookfield/Riverside intersection;
- 0.63/MEV at the Brookfield/Flannery intersection; and
- 0.25/MEV at the Brookfield/200m W of Flannery (Canada Post E) intersection.

It is noteworthy that within the 5-years of recorded collision data there were 2 collisions involving pedestrians and 2 collisions involving cyclists. Both collisions involving pedestrians occurred along Brookfield Road, one at the Brookfield/Canada Post E intersection and one along the roadway mid-block. The collisions involving cyclists occurred at the Riverside/Brookfield intersection and at the Airport Parkway/Brookfield/Flannery intersection. All accidents involving pedestrian or cyclists resulted in non-fatal injuries. It is noteworthy that a significant number of pedestrians were observed crossing Brookfield Road during the peak hours (approximately 50 peds/hr). These pedestrians were crossing from the surface parking lot (770 Brookfield) to the Canada Post Complex. With the construction of the proposed development, surface parking will no longer be available at this location and the number of pedestrians crossing Brookfield Road to access parking/Canada Post is expected to be reduced.

The source collision data as provided by the City of Ottawa and related analysis is provided as Appendix B.

2.1.3. PLANNED CONDITIONS

Planned Study Area Transportation Network Changes

Transit Priority Projects
Identified as part of the 2031 Network Concept Plan is a Transit Priority Corridor (isolated measures) along Riverside Drive between Hunt Club Road and Carling/Heron BRT corridor. However, this Transit Priority Corridor is not identified on the 2031 Affordable Network.

Road Projects
A notable road network change is the Phase 1 widening of the Airport Parkway. The Airport Parkway is planned to be widened from two to four lanes between Brookfield Road and Hunt Club Road. This will accommodate increasing traffic volume and improve connectivity to and from the MacDonald-Cartier International Airport.

Other Area Development

According to the City's development application search tool, the following developments are planned within the vicinity of the subject site.

2785 Riverside Drive
Canada Post Campus is proposing the expand a parking lot located on their campus. The expansion will include a net increase of 145 parking spaces. The Transportation Brief (prepared by Novatech) projected an increase in vehicle trips of approximately 100 to 120 veh/h during the morning and afternoon peak hours.

2887 Riverside Drive
Youth Services Bureau of Ottawa is proposing the construction of a youth housing project at the above-noted address, which is located approximately 400 m southwest of the subject development. The Transportation Brief (prepared by WSP) projected fewer than 75 veh/h during the peak hours, however, a parking review was undertaken.

3071 Riverside Drive
Canoe Bay Retirement Community is proposing the construction of a retirement residential complex consisting of approximately 600 units, located at the above-noted address, which is located approximately 1 km south of the subject development. The Community Transportation Study/Transportation Impact Study (prepared by Parsons) projected an increase in vehicle traffic of approximately 200 veh/h during the morning and afternoon peak hours.

740 Springland Drive
Greatwise Developments is proposing the construction of an additional 225 residential units to the existing 760 unit development at the above-noted address, which is located approximately 500 m south of the subject development. The Transportation Impact Study (prepared by Castleglenn Consultants) projected an increase in vehicle traffic of approximately 60 to 75 veh/h during the morning and afternoon peak hours.

Traffic associated with these recently constructed developments will be added to the study area intersections as background traffic in the ensuing section.

2.2. STUDY AREA AND TIME PERIODS

2.2.1. STUDY AREA

Transit – As mentioned previously, Transit is well served within the area with bus stops for Regular and Peak Hour Routes #87 and 290 located adjacent to the site. In addition, access to the O-Train/Trillium Line is provided by the Mooney's Bay Station located south of Heron Road approximately 500 m northeast of the site. Access to the Transitway is provided by the Heron Station located north of Heron Road, approximately 1.25 km northeast of the site.

Network Concept – The nearest Screenline is SL20 (Rideau River South). Given the proposed land use is mixed-use, including residential and ground floor retail, the development is understood to fit into the zoning for this area and is not projected to generate 200 person-per-hour trips more than permitted by the established zoning.

Intersection Design – The study area is planned to consist of the signalized Brookfield & Hog's Back/Riverside and Brookfield/Canada Post East intersections, the Flannery/Airport Parkway/Brookfield roundabout and the unsignalized Brookfield/Canada Post West intersection.

2.2.2. TIME PERIODS

Given the majority of trips expected to be generated by this development will be residential trips, the time periods to be assessed are the weekday morning and afternoon commuter peak hours.

2.2.3. HORIZON YEARS

The expected build-out date for the proposed development is assumed to be 2019 for Phase 1 and 2022 for Phase 2. Depending on the growth rate of the study area, the horizon year 2027 will be assessed for 5-years beyond site build out.

2.3. EXEMPTION REVIEW

Based on the City's TIA guidelines and the subject site, the following sections of the TIA process will be exempt, unless otherwise directed.

Module	Element	Exemption Consideration
4.1 Development Design	4.1.3 New Street Networks	Not required for applications involving site plans.

4.2 Parking	4.2.2 Spillover Parking	The site's residential parking rate is noted to be 0.5 spaces per dwelling unit plus 0.2 for unit for visitor parking, which meets the City's minimum By-Law requirements. As such, parking is not expected to spill out of the site. In addition, there is no on-street parking within the vicinity of the site for spillover parking.
4.6 Neighbourhood Traffic Management	All elements	Access is provided along a major collector roadway in close proximity to Riverside Drive and the Airport Parkway (both arterials). Comment will be provided regarding Flannery Road existing cut-through traffic.
4.8 Review of Network Concept	All elements	This development is not expected to generate 200 person trips more than the permitted zoning for the site.

3. FORECASTING

3.1. DEVELOPMENT GENERATED TRAVEL DEMAND

3.1.1. TRIP GENERATION AND MODE SHARES

Phase 1

Phase 1 of the development consists of 404 apartment units and 13,600 ft² of ground floor retail. Appropriate trip generation rates for the proposed Phase 1 development were obtained from the 9th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual, which are summarized in Table 1.

Table 1: ITE Trip Generation Rates

Land Use	Data Source	Trip Rates	
		AM Peak	PM Peak
Mid-Rise Apartment	ITE 223	T = 0.30(du); T = 0.41(du) – 13.06	T = 0.39(du); T = 0.48(du) – 11.07
Specialty Retail	ITE 826	T = 1.36(X) T = 1.20(X) + 10.74	T = 2.71(X); T = 2.40(X) + 21.48

Notes: *T = Average Vehicle Trip Ends*
X = 1000 ft² Gross Floor Area
du = Dwelling unit
Specialty Retail AM Peak is assumed to be 50% of the PM Peak

As ITE trip generation surveys only record vehicle trips and typically reflect highly suburban locations (with little to no access by travel modes other than private automobiles), adjustment factors appropriate to the more urban study area context were applied to attain estimates of person trips for the proposed development. This approach is considered appropriate within the industry for urban infill developments.

To convert ITE vehicle trip rates to person trips, an auto occupancy factor and a non-auto trip factor were applied to the ITE vehicle trip rates. Our review of available literature suggests that a combined factor of approximately 1.28 is considered reasonable to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%. The person trip generation for the proposed development is summarized in Table 2.

Table 2: Phase 1 Modified Person Trip Generation

Land Use	Area	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Mid-Rise Apartment	404 units	61	137	198	138	100	238
Specialty Retail	13,563 ft²	19	16	35	30	40	70
Total Person Trips		**80**	**153**	**233**	**168**	**140**	**308**
Note: 1.28 factor to account for typical North American auto occupancy values of approximately 1.15 and combined transit and non-motorized modal shares of less than 10%							

The person trips shown in Table 2 for the proposed site were then reduced by modal share values. Given the development's planned tenants will be majority students of Carleton University, the National Capital Region Special Generator Survey – Public Post-Secondary Students' report, prepared for TRANS Committee was referenced to calculate appropriate mode shares. Based on this report, the existing mode shares for Carleton University students are summarized below, and can be reference in Table 4-9 of the TRANS report.

Table 3: Mode Shares for Carleton University Students

Mode	Car driver	Car passenger	Urban Transit	Bicycle	Walk	Other
Carleton University	21.7%	6.7%	61.4%	2.0%	7.5%	0.8%

Based on the mode shares outlined in Table 3 from the TRANS report, appropriate modal splits were applied to the person trip generation. Given the site is in close proximity to the Trillium LRT Line (less than 600 m) and given full time students of Carleton University receive a OC Transpo pass as part of their tuition, transit ridership at this location is expected to be higher than the average for all Carleton University students, which is 61.4% as shown in Table 3. As the Trillium Line provides direct and convenient access to Carleton University, the transit mode share for this development is estimated to be 65%. The following Table 4 provides the mode shares for residential trips and Table 5 provides mode shares for retail trips.

Table 4: Mid-Rise Apartment Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	20%	13	28	41	28	20	48
Auto Passenger	5%	3	7	10	7	5	12
Transit	65%	39	89	128	90	65	155
Non-motorized	10%	6	13	19	13	10	23
Total Person Trips	100%	61	137	198	138	100	238
Total 'New' Auto Trips		**13**	**28**	**41**	**28**	**20**	**48**

Given the retail associated with this development will mainly serve the residents of the development, a high non-motorized mode split was applied.

Table 5: Specialty Retail Modal Site Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	45%	9	8	17	14	18	32
Auto Passenger	10%	2	1	3	3	4	7
Transit	25%	5	4	9	7	10	17
Non-motorized	20%	3	3	6	6	8	14
Total Person Trips	100%	19	16	35	30	40	70
Less Retail 30% Pass-By		-3	-3	-6	-6	-6	-12
Total 'New' Auto Trips		**6**	**5**	**11**	**9**	**13**	**22**

Table 6: Total Site Vehicle Trip Generation

Land Use	AM Peak (veh/h)			PM Peak (veh/h)		
	In	Out	Total	In	Out	Total
Mid-Rise Apartment	13	28	41	28	20	48
Specialty Retail	9	8	17	14	18	32
Retail Pass-By (30%)	-3	-3	-6	-6	-6	-12
Total 'New' Auto Trips	**19**	**33**	**52**	**37**	**33**	**70**

As shown in Table 6, the resulting number of potential 'new' two-way vehicle trips for the proposed development is approximately 52 and 70 veh/h during the weekday morning and afternoon peak hours, respectively.

Mode Shares

As mentioned previously, the mode shares were calculated based on data provided in the National Capital Region Special Generator Survey – Public Post-Secondary Students' report, prepared for TRANS Committee. The existing transit mode share for Carleton University students is 61.4%. As the site is located within 600 m of the Trillium Line, this existing mode split is expected to be higher than the average for all students. As such it is assumed to be 65% transit mode from build out and into Phase 2.

The City's targets for Transit Oriented Developments (TODs) is 65% transit mode. As this site is expected to achieve this transit rate from built-out year, there are minimal changes to the mode splits for future years. As such, the modal splits developed and summarized in Tables 4 and 5 are applied for Phase 2 and 5-years beyond.

Phase 2 – Trip Generation

Phase 2 of the proposed development consists of an additional 404 apartment units. Trip generation rates outlined in Table 1 were used to calculate the total person trip-generation for Phase 2 of the development. Using the mode shares summarized above, the person trip break-down for Phases 1 and 2 of the development is summarized in Tables 7, 8 and 9.

Table 7: Phases 1 and 2 Residential Person Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	20%	26	58	84	57	42	99
Auto Passenger	5%	7	15	22	15	11	26
Transit	65%	83	185	268	184	133	317
Non-motorized	20%	12	28	40	28	20	48
Total Person Trips	**100%**	128	286	414	284	206	490
Total 'New' Auto Trips		**26**	**58**	**84**	**57**	**42**	**99**

Table 8: Phases 1 and 2 Retail Person Trip Generation

Travel Mode	Mode Share	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
		In	Out	Total	In	Out	Total
Auto Driver	35%	9	8	17	14	18	32
Auto Passenger	5%	2	1	3	3	4	7
Transit	45%	5	4	9	7	10	17
Non-motorized	15%	3	3	6	6	8	14
Total Person Trips	**100%**	19	16	35	30	40	70
Less Retail 30% Pass-By		-3	-3	-6	-5	-5	-10
Total 'New' Auto Trips		**6**	**5**	**11**	**9**	**13**	**22**

Table 9: Phases 1 and 2 Vehicle Trip Generation

Travel Mode	AM Peak (Person Trips/h)			PM Peak (Person Trips/h)		
	In	Out	Total	In	Out	Total
Mid-Rise Apartment Trip Generation	26	58	84	57	42	99
Specialty Retail Trip Generation	9	8	17	14	18	32
Specialty Retail Pass-by (30%)	-3	-3	-6	-5	-5	-10
Total 'New' Auto Trips	**32**	**63**	**95**	**66**	**55**	**121**

As shown in Table 9, the resulting number of potential 'new' two-way vehicle trips for the proposed Phases 1 and 2 of the development is approximately 95 and 120 veh/h during the weekday morning and afternoon peak hours, respectively. With respect to transit ridership, an increase of approximately 270 to 320 person trip/h is projected for Phases 1 and 2 of the subject development.

3.1.2. TRIP DISTRIBUTION

Based on the existing traffic volume counts and the location of adjacent arterial roadways and neighbourhoods, the distribution of site-generated traffic volumes is as follows:

Residential:

- 50% to/from the east toward Airport Parkway/Bronson Avenue; and
- 50% to/from the west towards Riverside Drive, Colonel By Drive, and Baseline Road.

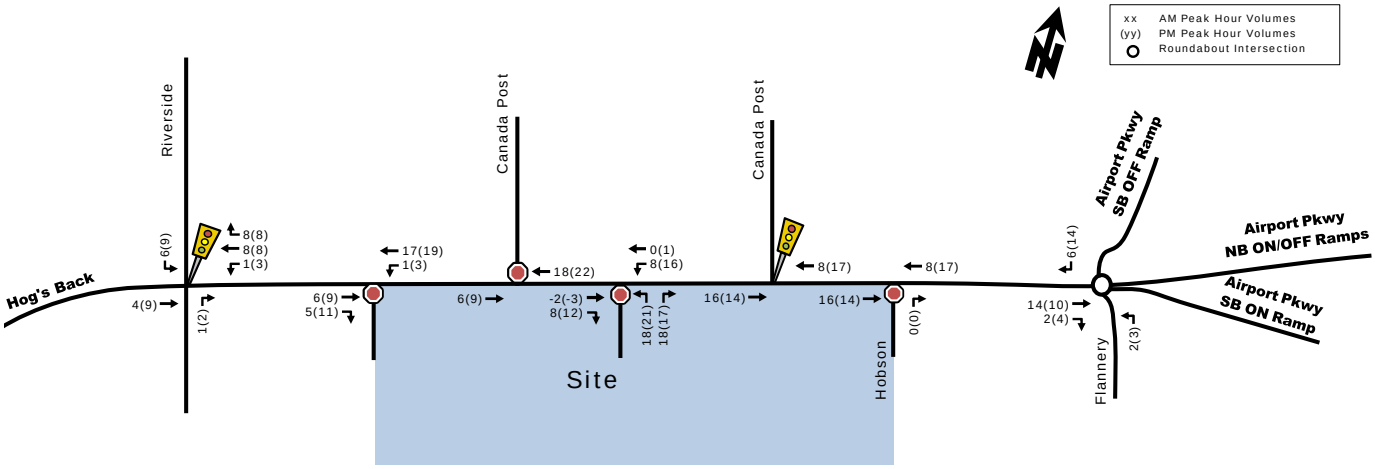
Retail:

- 70% to/from the west via the Riverside/Brookfield intersection;
- 30% to/from the south via Flannery Drive; and
- Pass-by distribution is assumed to be 50% to/from the east and 50% to/from the west.

3.1.3. TRIP ASSIGNMENT

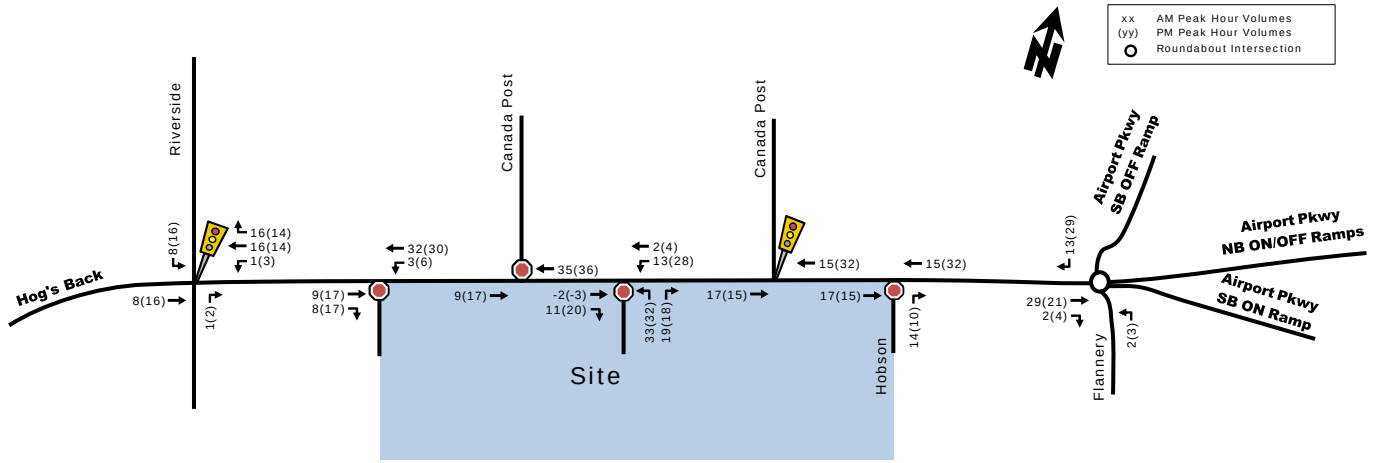
A full movement driveway connection and a one-way-in driveway connection are proposed to Brookfield Road for Phase 1, located approximately 110m west and 220m west of Hobson Road, respectively. Given these driveway configurations, 'new' and 'pass-by' site-generated vehicle trips for Phase 1 are assigned to the study area network and illustrated as Figure 5.

Figure 5: Phase 1 'New' and 'Pass-by' Site-Generated Traffic



An additional right-out only driveway is proposed for Phase 2 along Brookfield Road at the existing Hobson/Brookfield intersection. The 'new' and 'pass-by' site-generated vehicle trips associated with both Phases 1 and 2 were assigned to the study area network and are illustrated as Figure 6.

Figure 6: Phases 1 and 2 'New' and 'Pass-by' Site-Generated Traffic



3.2. BACKGROUND NETWORK TRAVEL DEMANDS

3.2.1. TRANSPORTATION NETWORK PLANS

Transit Priority Projects

Identified as part of the 2031 Network Concept Plan is a Transit Priority Corridor (isolated measures) along Riverside Drive between Hunt Club Road and Carling/Heron BRT corridor. However, this Transit Priority Corridor is not identified on the 2031 Affordable Network.

Road Projects

A notable road network change is the Phase 1 widening of the Airport Parkway. The Airport Parkway is planned to be widened from two to four lanes between Brookfield Road and Hunt Club Road. This will accommodate increasing traffic volume and improve connectivity to and from the MacDonald-Cartier International Airport.

3.2.2. BACKGROUND GROWTH

The following background traffic growth through the immediate study area (summarized in Table 10) was calculated based on historical traffic count data (years 2006, 2012, and 2016) provided by the City of Ottawa at the Riverside/Brookfield intersection. Detailed background traffic growth analysis is included as Appendix C.

Table 10: Riverside/Brookfield Historical Background Growth (2007 – 2016)

Time Period	Percent Annual Change				
	North Leg	South Leg	East Leg	West Leg	Overall
8 hrs	0.05%	-0.24%	0.45%	0.55%	**0.09%**
AM Peak	0.39%	0.13%	1.48%	-0.02%	**0.37%**
PM Peak	-0.26%	-1.33%	0.54%	0.14%	**-0.41%**

As shown in Table 10, the Riverside/Brookfield intersection has experienced approximately 0% to 0.50% annual growth within recent years (calculated as a weighted average). To account for the historic and future increases in traffic volumes and to account for the traffic generated by the previously identified area developments, a 1% per annum growth factor was applied to existing traffic volumes along Riverside Drive and Brookfield Road to obtain background traffic volumes for the 2019 built-out horizon year for Phase 1, the 2022 build-out horizon year for Phase 2 and 2027 (5-years beyond site build-out). The resultant 2019, 2022 and 2027 background traffic volumes are depicted as Figures 7, 8 and 9, respectively.

Figure 7: 2019 Background Traffic Volumes

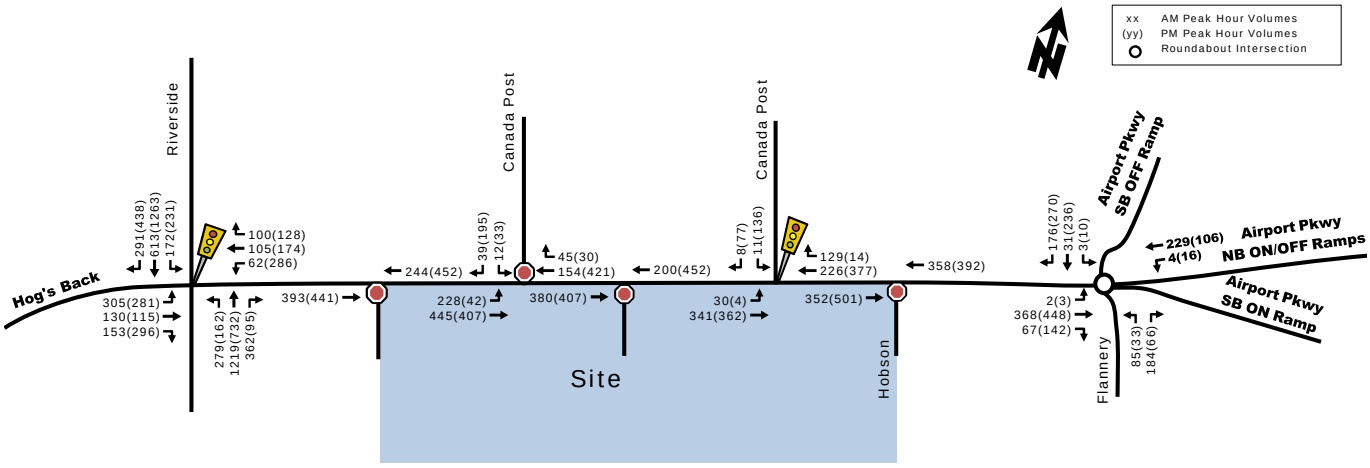


Figure 8: 2022 Background Traffic Volumes

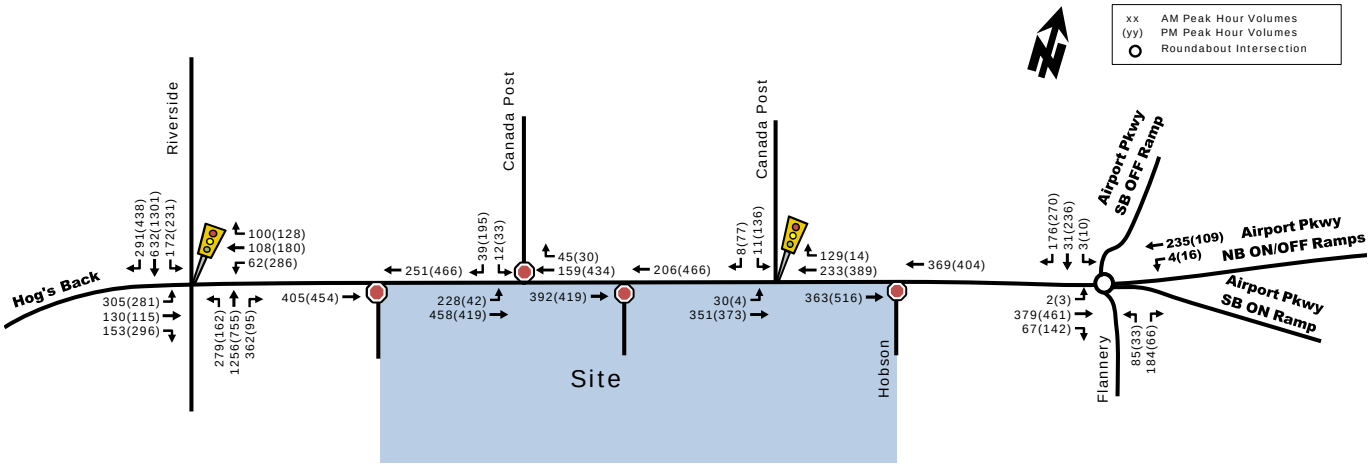
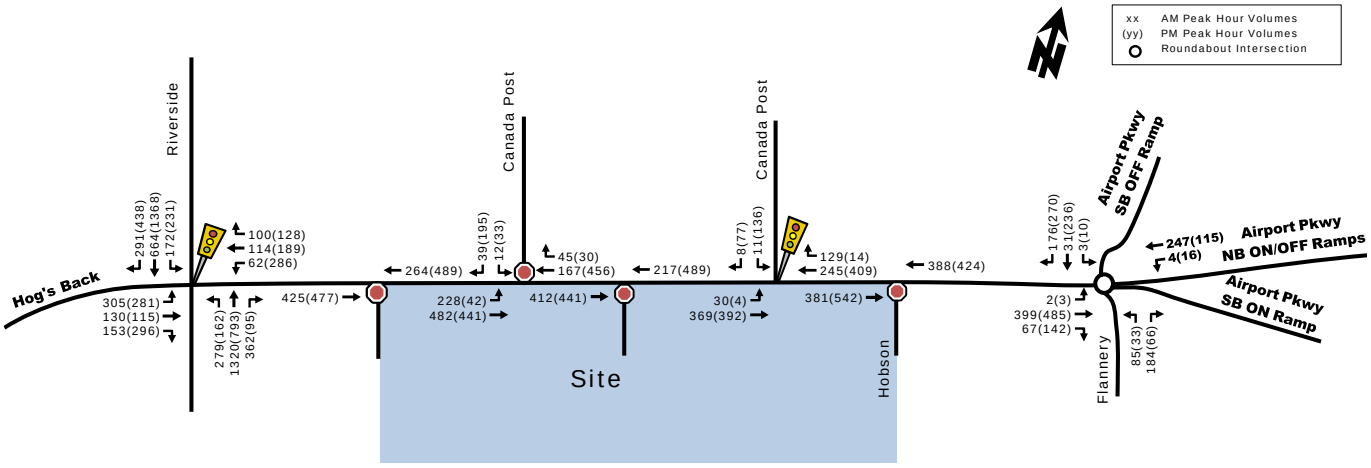


Figure 9: 2027 Background Traffic Volumes



3.2.3. OTHER DEVELOPMENTS

Refer to section 2.1.3 Planned Conditions – Other Area Developments.

3.3. DEMAND RATIONALIZATION

Based on the existing traffic volumes and site visits, there is an apparent capacity issue on the west leg of the Riverside/Brookfield & Hog's Back intersection (Hog's Back Road). In the critical afternoon peak hour, the westbound queue on the west leg of the intersection prevents southbound right-turn vehicles on Riverside and westbound through vehicles on Brookfield to proceed through the intersection. This issue will be further explored in a more detailed review of the existing traffic conditions compared to the future traffic conditions in the ensuing Strategy report.

4. ANALYSIS

4.1. DEVELOPMENT DESIGN

4.1.1. DESIGN FOR SUSTAINABLE MODES

Vehicle and Bicycle Parking

Vehicle parking is proposed in an underground parking lot and a surface parking lot. For Phase 1 of the proposed development, the amount of vehicle parking meets the City's By-Law minimum requirements and does not exceed the maximum parking requirement for developments within 600 m of an LRT station.

For Phase 2 of the development, the proposed amount of residential parking does not meet the minimum By-Law requirement. As the development is planned to serve Carleton University students and the LRT Trillium line is located within 600 m radius of the development, the reduced amount of parking will help promote the use of transit and other non-auto modes.

With regard to bicycle parking, a total of 205 bicycle parking space are proposed to serve Phase 1 of the development, which meets the City's By-Law minimum requirements. Bicycle parking should be located in well-lit areas and close to main entrances. For Phase 2, an additional 205 bicycle parking spaces are proposed.

Sidewalks are provided along both sides of Brookfield Road and Riverside Drive, and a MUP is provided along the east side of the Airport Parking, connecting to the Mooney's Bay Trillium Line Station. A courtyard is provided in the centre of the site, with pedestrian connections to Brookfield Road and the surface parking lots. An 8.4 m wide crosswalk is provided across the main vehicle driveway, connecting Phase 1 buildings to Phase 2 buildings. For Phase 2, a north-south pedestrian pathway is proposed along the western boundary of the site, connecting the neighbourhood south of the site to Brookfield Road.

Cyclists can use the vehicle roadway to access the MUP along Brookfield Road, or they can walk their bike through the courtyard to Brookfield Road. The bi-directional MUP is located adjacent to the proposed development along the south side of Brookfield and as such, cyclists do not have to cross Brookfield Road to access it.

Transit

Transit service within the vicinity of the site is currently provided by OC Transpo Routes #87 and 290. Bus stops for these routes are adjacent to the site along Brookfield Road. Regular Route #87 provides frequent all-day service and Peak Hour Route #290 provides weekday morning and afternoon peak hour service only.

Access to the Trillium LRT line is provided by the Mooney's Bay Station located south of Heron Road approximately 500 m northeast of the site. In terms of walking distance, the Station is approximately 600 m from the site. Access to the Transitway is provided via the Heron Station located north of Heron Road, approximately 1.25 km northeast of the site. The majority of residents of the subject development are anticipated to be students of Carleton University. The Carleton University Trillium Line Transit Station is adjacent to the north of the Mooney's Bay Station. In addition, it is our understanding that Carleton University students receive a transit pass included in their tuition (U-Pass).

4.1.2. CIRCULATION AND ACCESS

The proposed Phase 1 development has a one-way driveway connection to Brookfield Road that is identified to be 5 m wide. A 13 m wide loading area is provided approximately 22 m south of Brookfield Road along the one-way access. Similarly, for Phase 2, the loading bay is provided along the eastern one-way site egress road.

4.2. PARKING

4.2.1. PARKING SUPPLY

Vehicle Parking

A total of 318 vehicle parking spaces are proposed to serve Phase 1 of the subject development. This amount of parking meets the City's By-Law requirements for the residential, visitor and retail minimum amount of parking. 135 parking spaces are proposed to the underground parking level, with access provided on site (south of the Block A), and 183 parking spaces are proposed to the surface parking lot, with two vehicle driveway connections to Brookfield Road. The parking space dimensions are noted to be 5.2 m in length and 2.6 m in width, which meets the City's By-Law requirements.

For Phase 2 of the development, a total of 199 spaces are proposed to serve the residents, 162 visitor parking spaces are planned, and 40 retail parking spaces are proposed. This equates to a total of 401 parking spaces for the entire development (Phases 1 and 2). The amount of visitor and retail parking meets the City's By-Law requirements, however, the total amount of residential parking is deficient by approximately 200 spaces. The proponent will be seeking a By-Law variance for this reduced amount of parking. Given the residential development is planned to serve Carleton University students and given the site's close proximity to the Trillium LRT line, this reduction is parking for Phase 2 is appropriate and will help achieve the transit modal splits included herein, which reflect the City's ultimate targets.

Bicycle Parking

A total of 205 bicycle parking spaces are proposed for Phase 1 of the development, which meets the City's By-Law requirements. For Phase 2, 205 bicycle parking spaces are proposed. To meet the City's By-Law requirements and promote non-auto modes, bicycle parking should be located in a well-lit area close to the main entrances.

4.3. BOUNDARY STREET DESIGN

The boundary street for the development is Brookfield Road. At this time, there has not been any complete street concepts prepared for Brookfield Road. The existing roadway's geometry consists of the following features:

- 2 vehicle travel lanes in each direction;
- 1.8 m concrete sidewalk on the north side of the roadway;
- 2.0 m asphalt sidewalk on the south side of the roadway;
- More than 3,000 vehicles per day along Brookfield Road;
- Posted speed limit of 50 km/h, assumed operating speed of 50 to 60 km/h;
- 3.0 m wide centre lanes and 3.7 m wide curb lanes;
- No dedicated cycling facilities;
- No dedicated transit facilities; and
- No on-street parking.

As part of the proposed development, the following facilities are planned along the site's frontage to Brookfield Road:

- 3.0 m wide Multi-Use Pathway (MUP) along the south side of Brookfield;
- 2.0 m wide sidewalk adjacent to the MUP; and
- Reduction in vehicle travel lane width to provide space of MUP.

The multi-modal level of service analysis for the road segment along Brookfield Road adjacent to the site is summarized in Table 11, with detail analysis provided in Appendix D.

Table 11: MMLOS – Projected 2019 Brookfield Road Segment (South Side of Roadway)

Road Segment	Level of Service							
	Pedestrian (PLoS)		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)	
	PLoS	Target	BLoS	Target	TLoS	Target	TkLoS	Target
Brookfield Rd.	C	A	A	B	D	No target	A	Not a truck route/no target

Given the development's location within 600 m of an existing Rapid Transit Station, the target levels of service for pedestrians and cyclists are high ('A' to 'B'). There are no transit priority plans for Brookfield Road and as such there is no TLoS target. Brookfield Road does not form part of the truck route, and as such, has no truck level of service (TkLoS) target.

With regard to pedestrians, the high traffic volumes on Brookfield Road and relatively high speeds (estimated to be 50 to 60 km/h), results in a lower level of service for pedestrians (PLoS 'C'). To achieve the target level of service, the operating speed would have to be reduced to 30 km/h along Brookfield Road. If the operating speed is between 30 to 50 km/h, the pedestrian level of service would increase to PLoS 'B'. As mentioned previously, the operating speed is assumed to be 50 to 60 km/h, with the posted speed of 50 km/h. Apart from lowering the current speeds of vehicles along Brookfield Road, there are no other options to improve the PLoS.

With regard to cyclists, there are currently no dedicated cycling facilities along Brookfield Road, however, a 3.0 m MUP is planned to be constructed along the site's frontage. The resulting bicycle level of service (BLoS 'A') exceeds the target of BLoS 'B'.

4.4. ACCESS INTERSECTION DESIGN

4.4.1. LOCATION AND DESIGN OF ACCESS

There are two proposed driveway connections to Brookfield Road to serve Phase 1 of the subject development; a full-movement driveway and an 'in-only' driveway. The one-way 'in-only' driveway is located approximately 3 m from the site's western boundary, approximately 55 m west of the Canada Post unsignalized driveway (along the north side of Brookfield Road) and approximately 110 m west of the site's full movement driveway. The full-movement driveway is located approximately 40 m east of the Canada Post unsignalized driveway and approximately 85 m west of the signalized Canada Post/Brookfield intersection. These locations meet the City's Private Approach By-Law requirements in terms of location.

The 'in-only' driveway width is identified as 5.1 m wide and the two-way full-movement driveway is noted to be 6.7 m wide. These widths meet the City's By-Law requirements and are sufficient to accommodate the one-way and two-way vehicle movements. The throat lengths are sufficient for a residential development of this size to a collector road.

The access to the underground parking lot is provided at the southwest corner of the site and the ramp width is noted to be 6.7 m. Surface parking is provided with drive aisle widths of 6.7 m, sufficient for two-way vehicle movement and 90 degree parking.

For Phase 2 of the development, an additional right-out only driveway connection to Brookfield Road is proposed. This driveway will replace the existing Hobson Road and is located approximately 10 m east of the signalized Canada Post/Brookfield intersection. Given its close proximity to the existing signal, the proponent is proposing right-out only to minimize vehicle conflicts between the driveway and the signalized intersection.

4.4.2. INTERSECTION CONTROL AND DESIGN

Based on the projected volumes, the full-movement driveway and right-out only driveway should be controlled with STOP signs on-site only. The in-only access does not require any control. The SYNCHRO analysis shows minimal queues and delays at all three site driveways for the horizon years. The SYNCHRO model output for all three horizon years are included in Appendices G, H and I.

All three access intersections are unsignalized, as such no MMLoS analysis can be provided for these intersections (MMLoS intersection analysis is for signalized intersections).

4.5. TRANSPORTATION DEMAND MANAGEMENT

The TDM checklist is attached as Appendix E. Some of the TDM measures that the proponent is providing/considering are as follows:

- Direct and safe sidewalks provided between buildings to Brookfield Road;
- New 3.0 m MUP along Brookfield Road adjacent to site;
- Pedestrian pathway along the eastern edge of the site;
- The tenants of the development are expected to be Carleton University students, which are provided a transit pass (U-Pass) with their tuition;
- Minimum required parking for Phase 1 and reduced amount of parking for Phase 2; and
- Over 200 bicycle parking spaces.

4.6. NEIGHBOURHOOD TRAFFIC MANAGEMENT

Exempt – See Section 2.3.

We have been advised that there is an existing concern for residents to the southeast of the site that cut-through traffic along Flannery Drive exists today. It is understood that this traffic is commuter traffic from the Airport Parkway destined to the Walkley Road area. The majority of vehicles generated by the proposed development will be destined to Carleton University or downtown. As such, Flannery Drive does not represent an efficient route for the future residents of this development to get to their destination and this development is not expected to increase the amount of cut-through traffic on Flannery Drive.

4.7. TRANSIT

The location of the existing Trillium LRT Line within 600 m of the proposed development will be able to accommodate the increase in transit ridership associated with this development. As shown in Section 3.1, the two-way transit people trips generated by Phase 1 of the development is 140 and 170 persons/h during the weekday morning and afternoon peak hours, respectively. At full build-out, the two-way transit trips are projected to be 280 to 335 persons/h during the peak hours.

4.8. REVIEW OF NETWORK CONCEPT

Exempt – See Section 2.3.

4.9. INTERSECTION DESIGN

4.9.1. EXISTING CONDITIONS

The following Table 12 provides a summary of the existing traffic operations at the study area intersections based on the SYNCHRO (V9) and SIDRA traffic analysis softwares and the existing traffic volumes (Figure 4). The subject signalized intersections were assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for the critical movement(s). The subject signalized intersections 'as a whole' were assessed based on weighted v/c ratio. The unsignalized study area intersections were assessed based on delay of the critical movement and the overall intersection delay. The roundabout intersection was assessed based on delay using SIDRA capacity analysis software. The SYNCHRO and SIDRA model output of existing conditions is provided within Appendix F.

Table 12: Existing Intersection Performance

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Riverside/Hog's Back/Brookfield	F(F)	1.19(1.23)	EBL(WBL)	50.7(66.9)	D(F)	0.90(1.02)
Brookfield/20 m W of Hobson	A(A)	0.14(0.47)	EBT(SBL)	2.7(8.1)	A(A)	0.14(0.30)
Brookfield/Flannery	A(B)	8.0(11.2)	NBL(SBT)	6.5(9.0)	A(A)	-
Brookfield/Canada Post W	B(B)	12.4(13.8)	SBL(SBL)	3.0(3.2)	-	-
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

As shown in Table 12, the Riverside/Brookfield intersection 'as a whole' is currently operating above capacity (LoS 'F') during the afternoon peak hour and close to capacity (LoS 'D', v/c = 0.90) during the morning peak hour. The critical eastbound and westbound left-turn movements are both operating above capacity (LoS 'F') during the morning and afternoon peak hours. 95th percentile queues at the Riverside/Brookfield intersection extend 160 m south in the morning and 190 m north in the afternoon along Riverside Drive and these queues are noted to be problematic which may not clear the signal during one cycle. 95th percentile queues along Brookfield Road extend 125 m east in the westbound left-turn

lane during the afternoon peak hour and 120 m west along Hog's Back Road during the morning peak hour. These queues are noted to be problematic and may not clear during one signal cycle.

The Brookfield/Canada Post (20m West of Hobson) signalized intersection, Brookfield/Flannery roundabout intersection, and Brookfield/Canada Post West unsignalized intersection are currently operating acceptably (LoS 'B' or better) with significant space capacity during the morning and afternoon peak hours.

Multi-Modal Level of Service – Existing Conditions

The MMLOS analysis for the two signalized intersections within the study area, Riverside/Brookfield and Brookfield/Canada Post, is summarized in Table 13. The existing detailed MMLoS analysis is provided as Appendix F.

Table 13: MMLOS – Signalized Study Area Intersections

Intersection	Level of Service									
	Pedestrian (PLoS)		Bicycle (BLoS)		Transit (TLoS)		Truck (TkLoS)		Vehicle (LoS)	
	PLoS	Target	BLoS	Target	TkLoS	TkLoS	TkLoS	Target	LoS	Target
Riverside/Brookfield	F	C	F	C	F	No target	C	D	F	D
Brookfield/Canada Post	C	A	E	B	C	No target	F	No target	A	E

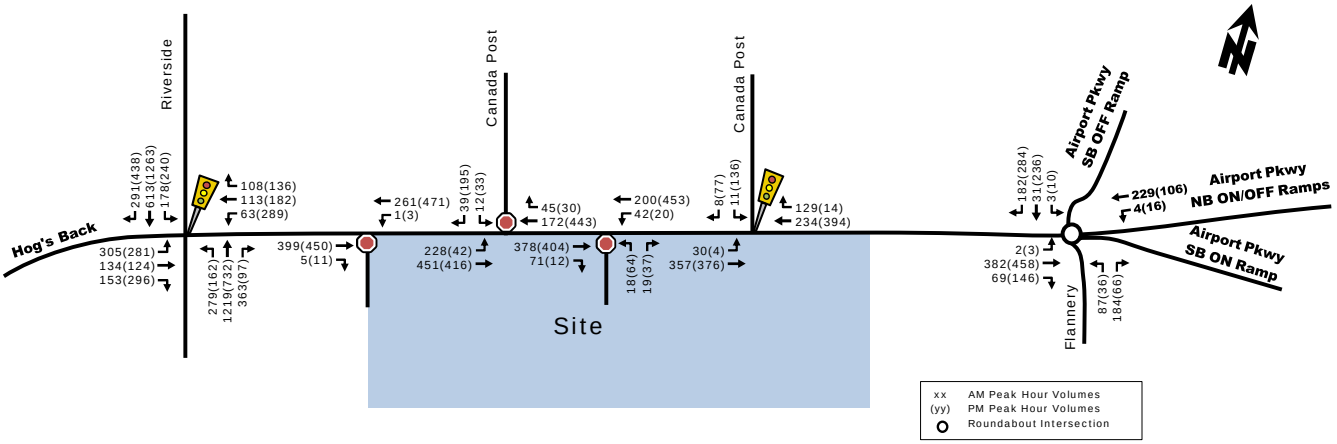
The letters identified in red text in Table 13 do not meet the MMLoS Targets for their designated area. At the Riverside/Brookfield intersection, the pedestrian, bicycle and vehicle target levels of service are not met. At the Brookfield/Canada Post intersection, the pedestrian and bicycle target levels of service are not met. The following discussion regarding these modes is provided:

- Riverside/Brookfield intersection:
  - Pedestrian – High pedestrian level of service is difficult to achieve (PLoS 'A' is impossible to achieve) at signalized intersections. At the Riverside/Brookfield intersection, pedestrians cross 5 to 9 lanes of traffic depending on which leg they are crossing. Removing the channelized right-turn lanes, or providing 'smart channel' right-turn lanes will increase the level of service. Providing high-vis crosswalk markings or advance pedestrian walk phases will also help to improve the PLoS, but may decrease the transit and vehicle levels of service. The best PLoS achievable at this intersection, without narrowing Riverside Drive, is PLoS 'E'.
  - Bicycles – Bike lanes are provided along the north leg of this intersection only. Providing two-way left-turn boxes along Riverside Drive and extending the bicycle lanes south of Brookfield Road, could improve the BLoS to B along Riverside Drive. Along Brookfield Road, no cycling facilities are currently provided, however an MUP is planned along the south side of Brookfield Road.
  - Vehicles – Given the high traffic volumes along both Riverside Drive and Brookfield Road/Hog's Back Road, the delays and queues at this intersection are significant, with multiple movement operating at or above capacity. To improve operations of the Riverside/Brookfield intersection in terms of vehicle operation, a shift to more sustainable modes is required. This development is transit-oriented and is projected to generate a high amount of transit/non-auto modes (75% transit/non-auto).
- Brookfield/Canada Post intersection:
  - Pedestrian – To improve the pedestrian level of service at this intersection, advance pedestrian phases, raised crosswalks and no-right-turn-on-red prohibition can be considered. However, as mentioned previously, the target PLoS 'A' cannot be achieved at a signalized intersection.
  - Bicycles - The planned MUP along the south side of Brookfield Road will help improve the BLoS at this intersection.

4.9.2. TOTAL PROJECTED 2019 CONDITIONS – PHASE 1 BUILD OUT

The total projected 2019 traffic volumes were derived by superimposing the Phase 1 site-generated traffic volumes (Figure 5) onto projected 2019 background traffic volumes (Figure 7). The resulting total projected traffic volumes are illustrated in Figure 10.

Figure 10: Total Projected 2019 Traffic Volumes



The following Table 14 provides a summary of the total projected operations at the study area intersection based on the SYNCHRO (V9) and SIDRA traffic analysis softwares. The SYNCHRO and SIDRA model output of total projected conditions is provided within Appendix G.

Table 14: Total Projected 2019 Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Riverside/Hog's Back/Brookfield	F(F)	1.21(1.25)	EBL(WBL)	52.1(71.1)	E(F)	0.92(1.03)
Brookfield/20 m W of Hobson	A(A)	0.15(0.47)	EBT(SBL)	2.6(8.1)	A(A)	0.15(0.30)
Brookfield/Flannery	A(B)	8.3(11.7)	NBL(SBT)	6.6(9.3)	A(A)	-
Brookfield/Canada Post W	B(B)	12.7(14.3)	SBL(SBL)	2.9(3.2)	-	-
Brookfield/Site (full movement)	B(B)	12.4(14.7)	NBL(NBL)	1.1(1.7)	-	-
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

Similar to the existing conditions, the Riverside/Brookfield intersection 'as a whole' is projected to operate at or above capacity (LoS 'E' and 'F') during the peak hours. The critical movements are projected to operate above capacity (LoS 'F') during both peak hours. The signalized Brookfield/Canada Post intersection is projected to operate with significant spare capacity (LoS 'A'). The Brookfield/Flannery roundabout and the site driveways along Brookfield Road are all projected to operate with acceptable levels of service of LoS 'B' or 'A'.

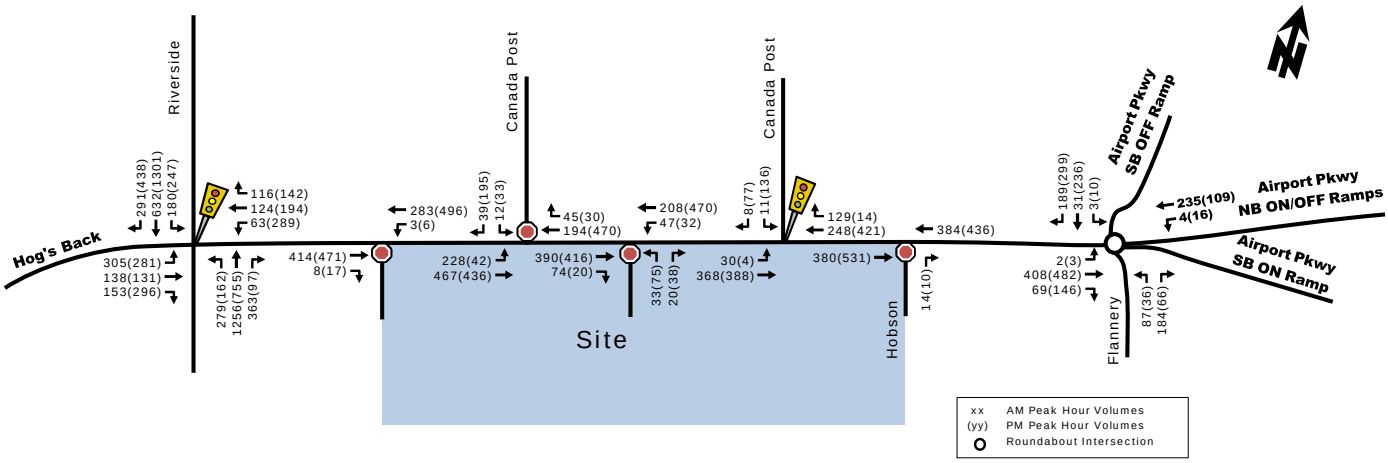
Multi-Modal Level of Service – Projected Conditions

Given there are no proposed changes to the Brookfield/Riverside intersection for the 2019 conditions, the multi-model level of service for the Riverside/Brookfield intersection is the same as existing, outlined in Table 13. At the Brookfield/Canada Post intersection, the only notable change is the proposed MUP along the south side of Brookfield. This additional facility will improve the bicycle level of service for east-west cyclists, but will not improve the level of service for cyclists travelling to/from the north leg of the intersection. The resulting projected bicycle level of service is BLoS 'D' for the intersection. All other modes will operate similar to the existing MMLoS (Table 13). The projected 2019 MMLoS analysis is provided as Appendix G.

4.9.3. TOTAL PROJECTED 2022 CONDITIONS – FULL SITE BUILD-OUT

The total projected 2022 traffic volumes were derived by superimposing the Phase 1 and 2 site-generated traffic volumes (Figure 6) onto projected 2022 background traffic volumes (Figure 8). The resulting total projected 2022 traffic volumes are illustrated in Figure 11.

Figure 11: Total Projected 2022 Traffic Volumes



The following Table 15 provides a summary of the total projected operations at the study area intersection based on the SYNCHRO (V9) and SIDRA traffic analysis softwares. The SIDRA and SYNCHRO model outputs of total projected 2022 conditions is provided within Appendix H.

Table 15: Total Projected 2022 Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Riverside/Hog's Back/Brookfield	F(F)	1.22(1.25)	EBL(WBL)	54.1(76.1)	E(F)	0.93(1.05)
Brookfield/20 m W of Hobson	A(A)	0.15(0.47)	EBT(SBL)	2.6(8.1)	A(A)	0.15(0.27)
Brookfield/Flannery	A(B)	8.5(12.2)	NBL(SBT)	6.8(9.6)	A(A)	-
Brookfield/Canada Post W	B(B)	13.0(14.8)	SBL(SBL)	2.9(3.1)	-	-
Brookfield/Site (full movement)	B(C)	13.8(16.2)	NBL(NBL)	1.5(2.0)	-	-
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

Similar to the existing conditions, the Riverside/Brookfield intersection 'as a whole' is projected to operate at or above capacity (LoS 'E' and 'F') during the peak hours. The critical movements are projected to operate above capacity (LoS 'F') during both peak hours. The signalized Brookfield/Canada Post intersection is projected to operate with significant spare capacity (LoS 'A'). The Brookfield/Flannery roundabout and the site driveways along Brookfield Road are all projected to operate with acceptable levels of service of LoS 'B' or 'A'.

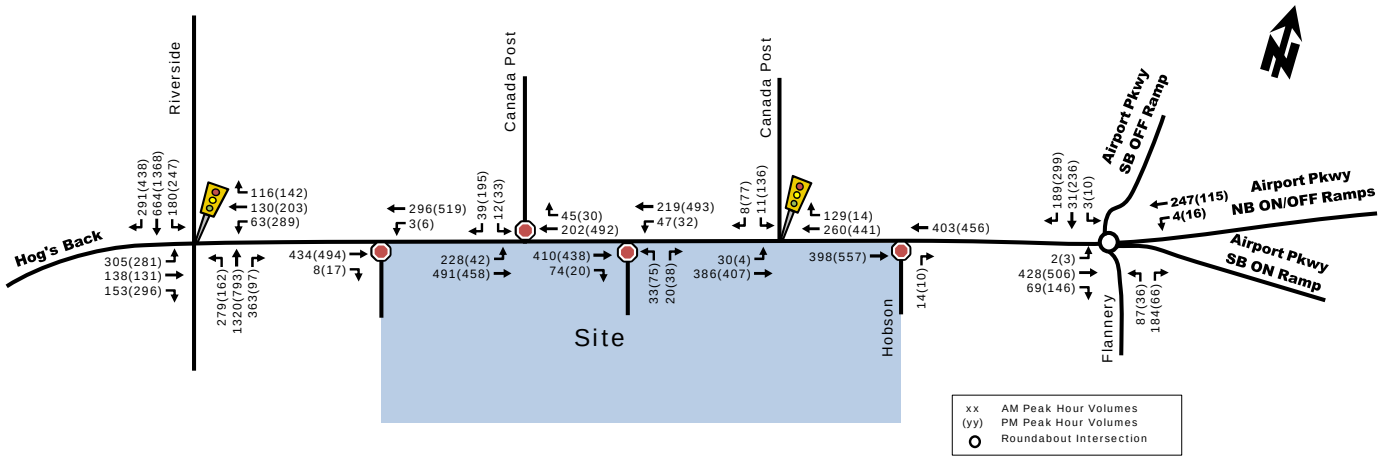
Multi-Modal Level of Service – Projected Conditions

The projected 2022 MMLoS analysis is the same as the projected 2019 conditions, outlined in Section 4.9.2.

4.9.4. TOTAL PROJECTED 2027 CONDITIONS – 5-YEARS BEYOND FULL SITE BUILD-OUT

The total projected 2027 traffic volumes were derived by superimposing the Phase 1 and 2 site-generated traffic volumes (Figure 6) onto projected 2027 background traffic volumes (Figure 9). The resulting total projected 2027 traffic volumes are illustrated in Figure 12.

Figure 12: Total Projected 2027 Traffic Volumes



The following Table 16 provides a summary of the total projected operations at the study area intersection based on the SYNCHRO (V9) and SIDRA traffic analysis softwares. The SYNCHRO and SIDRA model output of total projected 2027 conditions is provided within Appendix I.

Table 16: Total Projected 2027 Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Riverside/Hog's Back/Brookfield	F(F)	1.22(1.25)	EBL(WBL)	57.7(82.8)	E(F)	0.96(1.08)
Brookfield/20 m W of Hobson	A(A)	0.16(0.47)	EBT(SBL)	2.6(8.1)	A(A)	0.16(0.28)
Brookfield/Flannery	A(B)	8.6(12.3)	NBL(SBT)	6.9(9.7)	A(A)	-
Brookfield/Canada Post W	B(C)	13.2(15.3)	SBL(SBL)	2.8(3.1)	-	-
Brookfield/Site (full movement)	B(C)	14.1(16.8)	NBL(NBL)	1.5(2.0)	-	-
Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.						

Similar to the existing conditions, the Riverside/Brookfield intersection 'as a whole' is projected to operate at or above capacity (LoS 'E' and 'F') during the peak hours. The critical movements are projected to operate above capacity (LoS 'F') during both peak hours. The signalized Brookfield/Canada Post intersection is projected to operate with significant spare capacity (LoS 'A'). The Brookfield/Flannery roundabout and the site driveways along Brookfield Road are all projected to operate with acceptable levels of service of LoS 'B' or 'A'.

Multi-Modal Level of Service – Projected Conditions

The projected 2027 MMLoS analysis is the same as the projected 2019 conditions, outlined in Section 4.9.2.

5. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Based on the results summarized herein the following transportation related conclusions are offered:

- The transportation network surrounding the site includes sidewalks and pedestrian pathways connecting to the surrounding areas, including the Mooney's Bay Trillium Line LRT Station that is located within 600 m radius of the site. No cycling facilities are currently provided along Brookfield Road;
- The existing study area intersection are currently operating acceptably, with the exception of the Brookfield/Riverside intersection that currently experiences long queues and delays along all legs. The intersection overall is operating close to or above capacity (LoS 'D' and LoS' F') during the weekday morning and afternoon peak hours;
- The existing MMLoS analysis at the signalized Brookfield/Riverside and Brookfield/Canada Post intersections indicates that the pedestrian and cycling levels of service at both intersections is not meeting the City's target levels of service for the area. The vehicle level of service target is not met at the Brookfield/Riverside intersection;
    - An MUP is proposed along the south side of Brookfield Drive and will help improve the east-west BLoS at the Brookfield/Canada Post intersection;
    - Minimal improvements can be made to improve the pedestrian or vehicle levels of service;
- The net increase in vehicle demand generated by the proposed Phase 1 development is approximately 52 and 70 veh/h during the morning and afternoon peak hours, respectively;
- The net increase in vehicle demand generated by the proposed Phases 1 and 2 of the development is approximately 95 and 120 veh/h during the morning and afternoon peak hours, respectively. With respect to transit ridership, an increase of approximately 270 to 320 person trip/h is projected for Phases 1 and 2 of the subject development;
- The student-oriented development is expected to achieve a high transit mode split given its close proximity to Mooney's Bay Trillium Line Station;
- Based on local area developments and the historic traffic data, a 1% per annum growth rate was applied to the study area roadways and intersections;
- Based on the forecasted traffic volumes for Phase 1 build-out year (2019), Phase 2 build-out year (2022); and 5-years beyond full build-out (2027), the study area intersections are projected to operate similar to existing conditions. The Brookfield/Riverside intersection continues to operate at or above capacity with long queues and delays and all other study area intersections are projected to operate at acceptable levels of service (LoS 'B' or better);
    - There are limited mitigative measures to improve the performance of the Brookfield/Riverside intersection. The City is investing in shifting the modes of travel away from passenger vehicles which will ultimately improve traffic operations at busy intersections. The site's close proximity to the Trillium LRT Line and the type of tenants it will attract (Carleton University students) will help to achieve higher transit and non-auto mode splits within this area;
- The adjacent Brookfield Road meets the target multi-modal levels of service for bicycles, trucks (no target) and transit (no target), however, it does not meet the target LoS for pedestrians;
    - With regard to pedestrians, the high traffic volumes and relatively high speeds (estimated to be 50 to 60 km/h), results in a PLoS 'C' for this roadway. As it is in close proximity to an LRT station, the target is PLoS 'A', however this is only achievable with a reduced operating speed to 30 km/h. Given the context of the transportation network in this area, this speed reduction is not recommended;
- The site has good pedestrian connections to Brookfield Road, which connects to a MUP that provides access to the Mooney's Bay Station;

- A 3.0 m MUP is proposed along the south side of Brookfield Road to connect cyclists to from the site;
- Two site driveways are proposed for Phase 1 of the development; one existing full-movement driveway and one 'in-only' driveway along the western boundary of the site. Both site driveways meet the City's By-Law requirements in terms of location and dimensions, and both are projected to operate with minimal queues and delays for the Horizon years;
- For Phase 2 of the development, an additional 'right-out' only driveway connection to Brookfield Road is proposed. This intersection will replace the existing Hobson Road and is located within 10 m of the adjacent Brookfield/Canada Post signalized intersection. Given the close proximity of the site driveway to a signalized intersection, the proponent is proposing a right-out only to minimize vehicle conflicts. The SYNCHRO model projects that this configuration will operate acceptably;
- A total of 318 vehicle parking spaces are proposed to serve the Phase 1 of the development, which meets the City's minimum By-Law requirement. For Phase 2 of the development, a total of 401 parking spaces are proposed, which does not meet the City's minimums. Given the site context, the close proximity to the LRT and the student-oriented residential development, a reduced number of residential parking spaces is appropriate. We are advised that the proponent will be seeking a By-Law variance for this reduction in parking; and
- Bicycle parking is planned to be provided to meet the City's By-Law requirements.

Based on the foregoing, the proposed development fits well into the context of the surrounding area, and its location and design serves to promote use of walking, cycling, and transit modes, thus supporting City of Ottawa policies, goals and objectives with respect to redevelopment, intensification and modal share. As such, the proposed residential development of 770 Brookfield Road is recommended from a transportation perspective.

Prepared By:

André Jane Sponder, B.A.Sc.
Transportation Analyst

Reviewed By:

Christopher Gordon, P.Eng.
Senior Project Manager

Appendix A

Existing Traffic Count Data

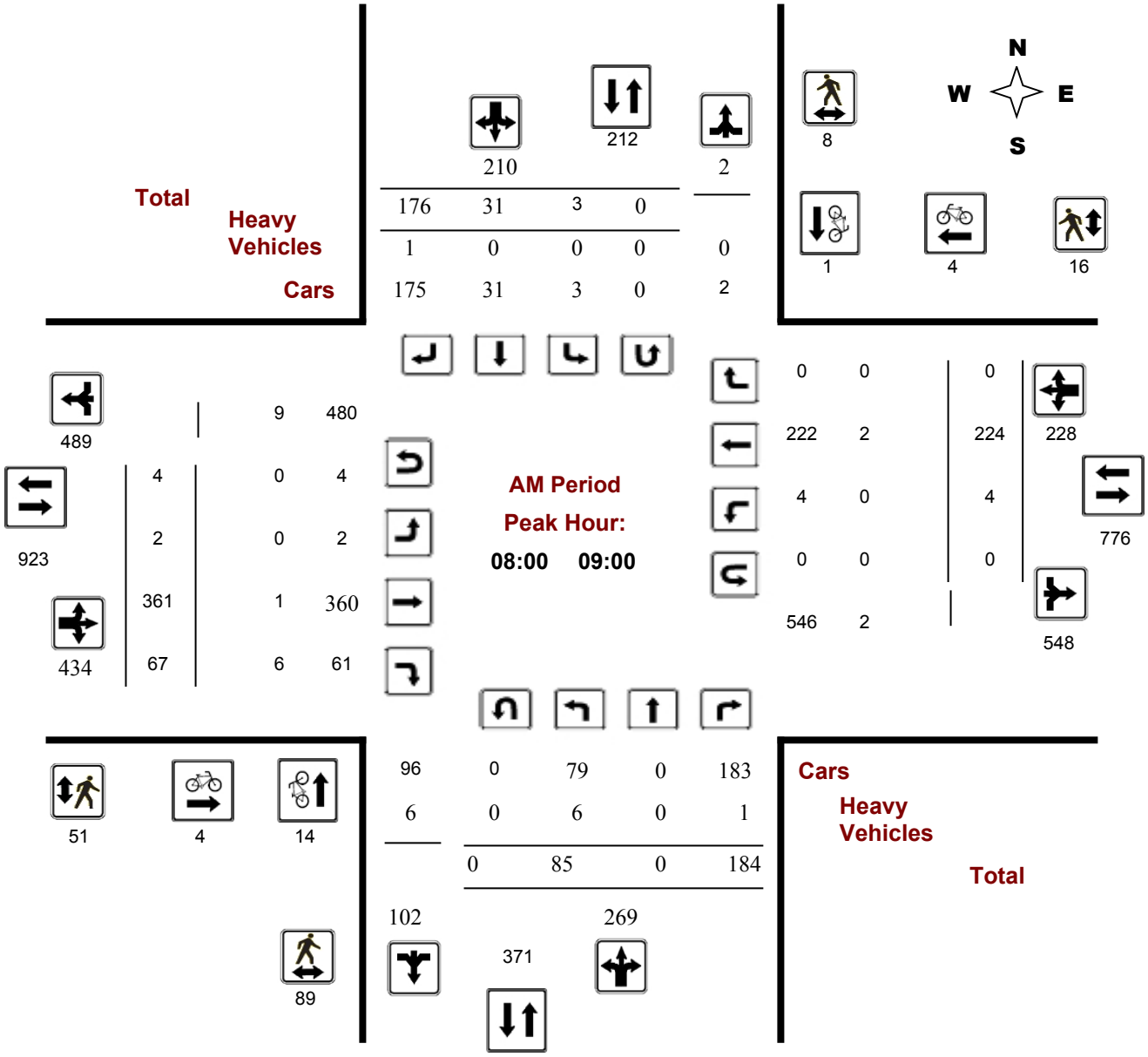
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

AIRPORT PKWY/BROOKFIELD RD @ FLANNERY DR/AIRPORT PKWY RAMPS 52A/53

Survey Date: Thursday, September 22, 2016 **WO No:** 36342

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



Comments

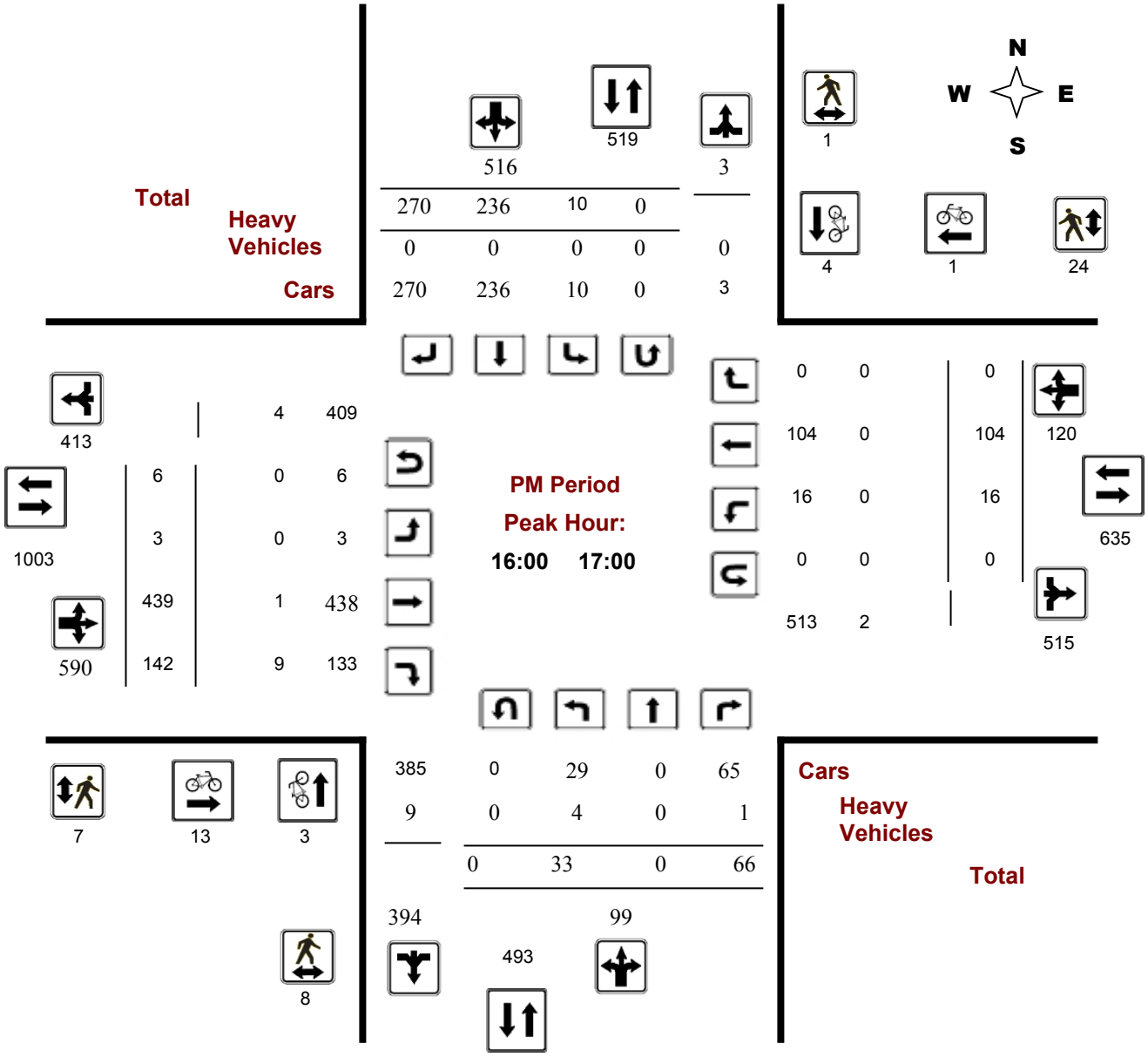
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

AIRPORT PKWY/BROOKFIELD RD @ FLANNERY DR/AIRPORT PKWY RAMPS 52A/53

Survey Date: Thursday, September 22, 2016 **WO No:** 36342

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



Comments

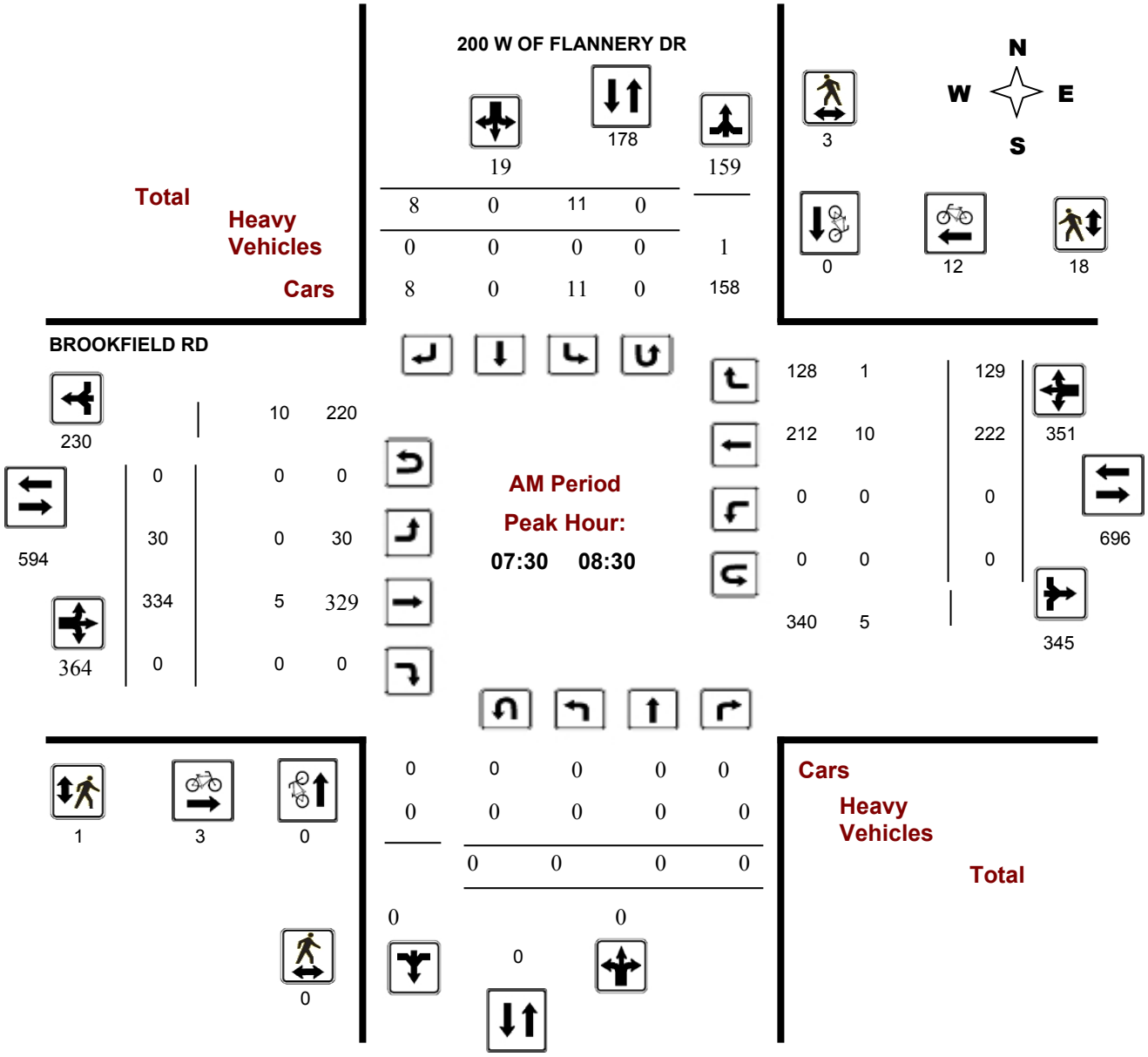
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

BROOKFIELD RD @ 200 W OF FLANNERY DR

Survey Date: Thursday, August 06, 2015 **WO No:** 35214

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



Comments

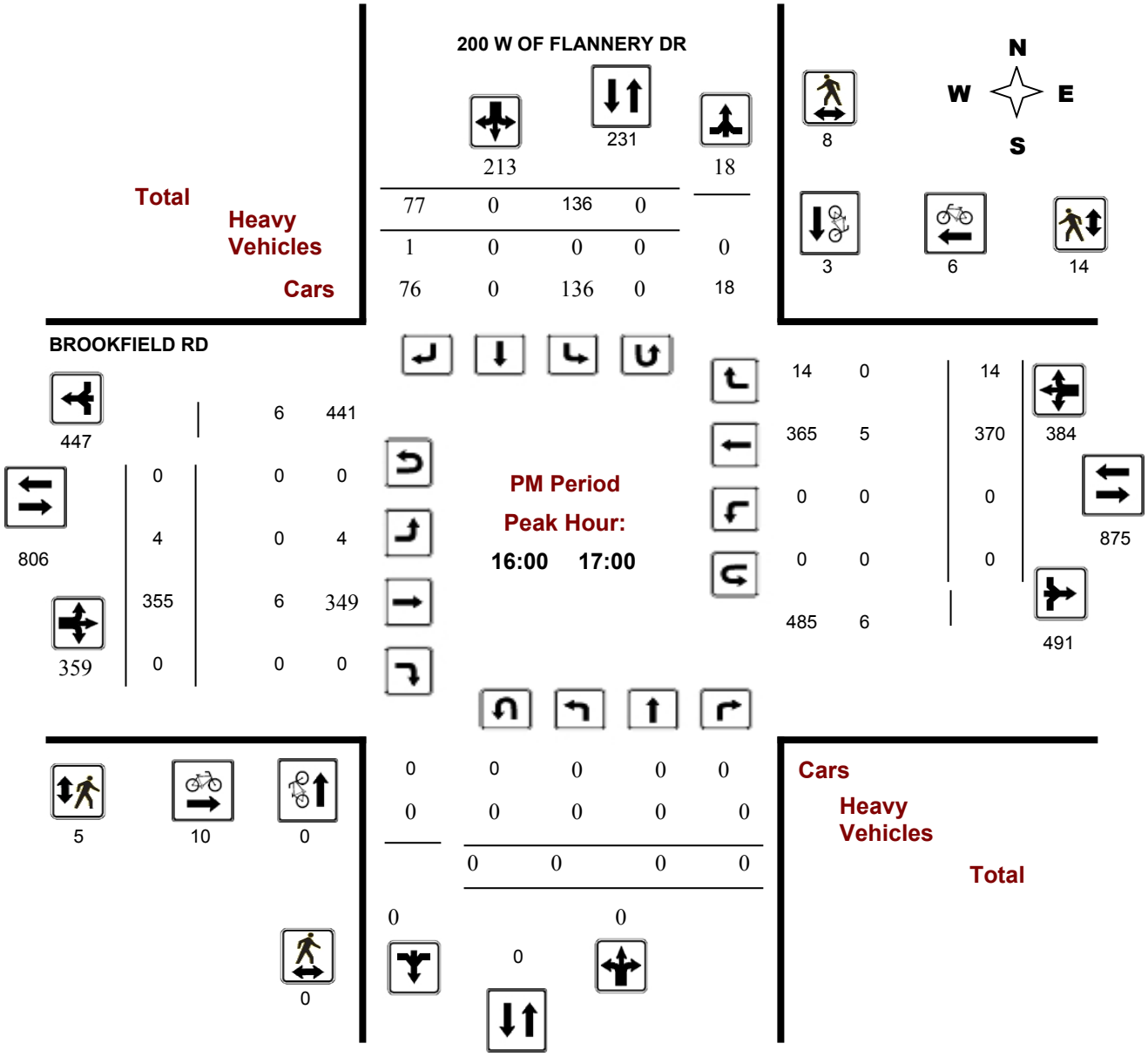
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

BROOKFIELD RD @ 200 W OF FLANNERY DR

Survey Date: Thursday, August 06, 2015 **WO No:** 35214

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



Comments

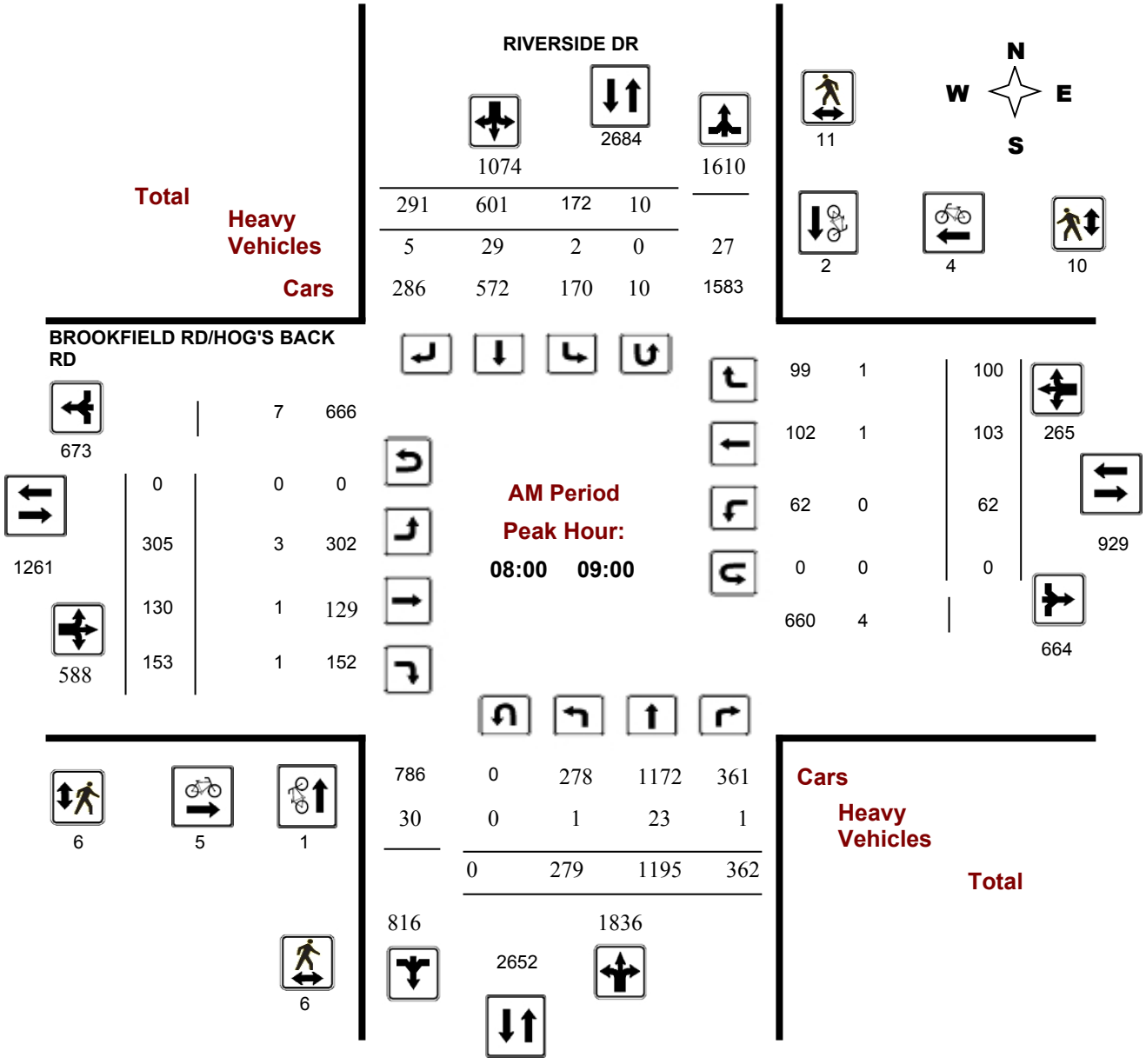
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

RIVERSIDE DR @ BROOKFIELD RD/HOG'S BACK RD

Survey Date: Wednesday, July 20, 2016 **WO No:** 36056

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



Comments

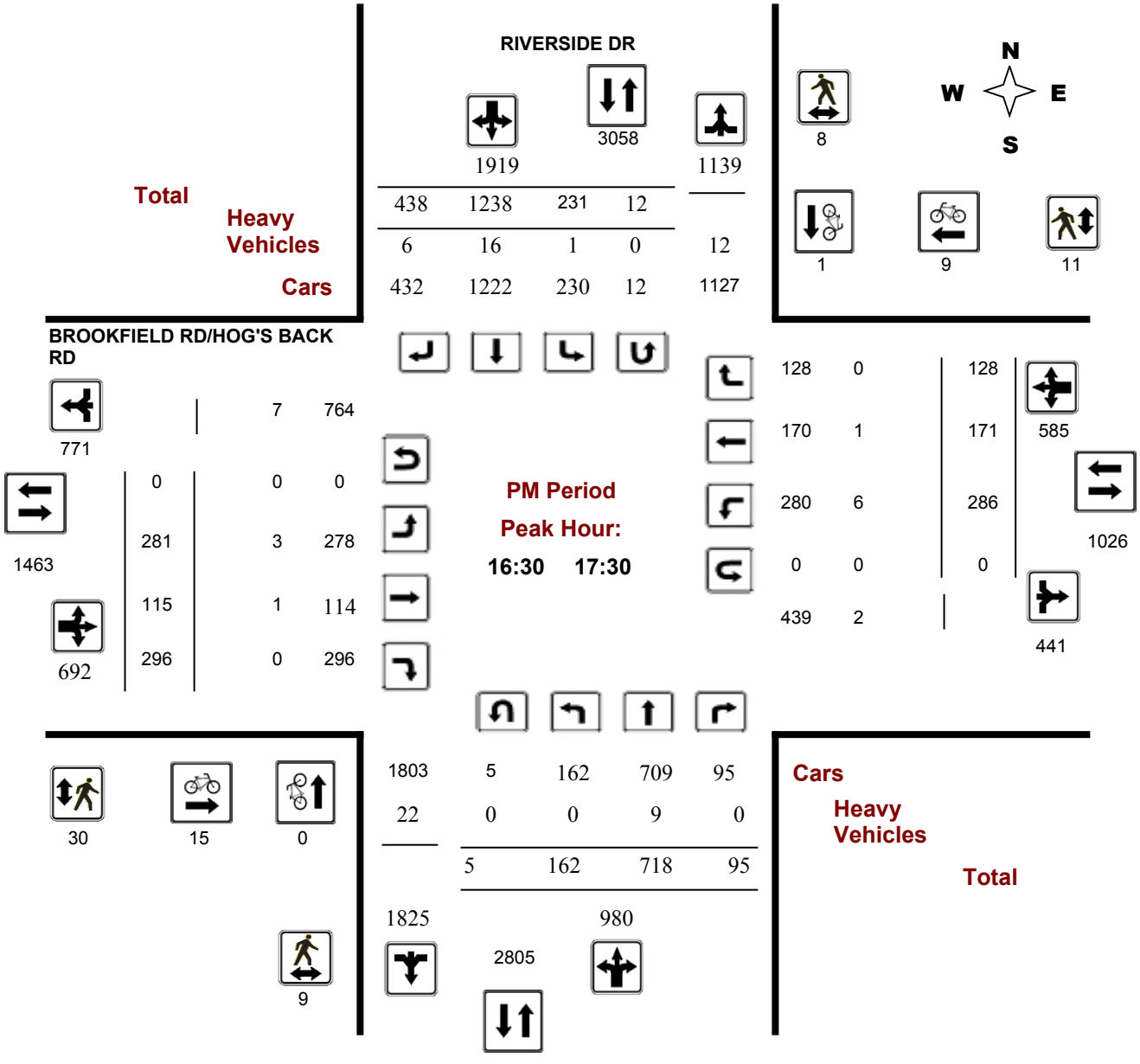
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

RIVERSIDE DR @ BROOKFIELD RD/HOG'S BACK RD

Survey Date: Wednesday, July 20, 2016 **WO No:** 36056

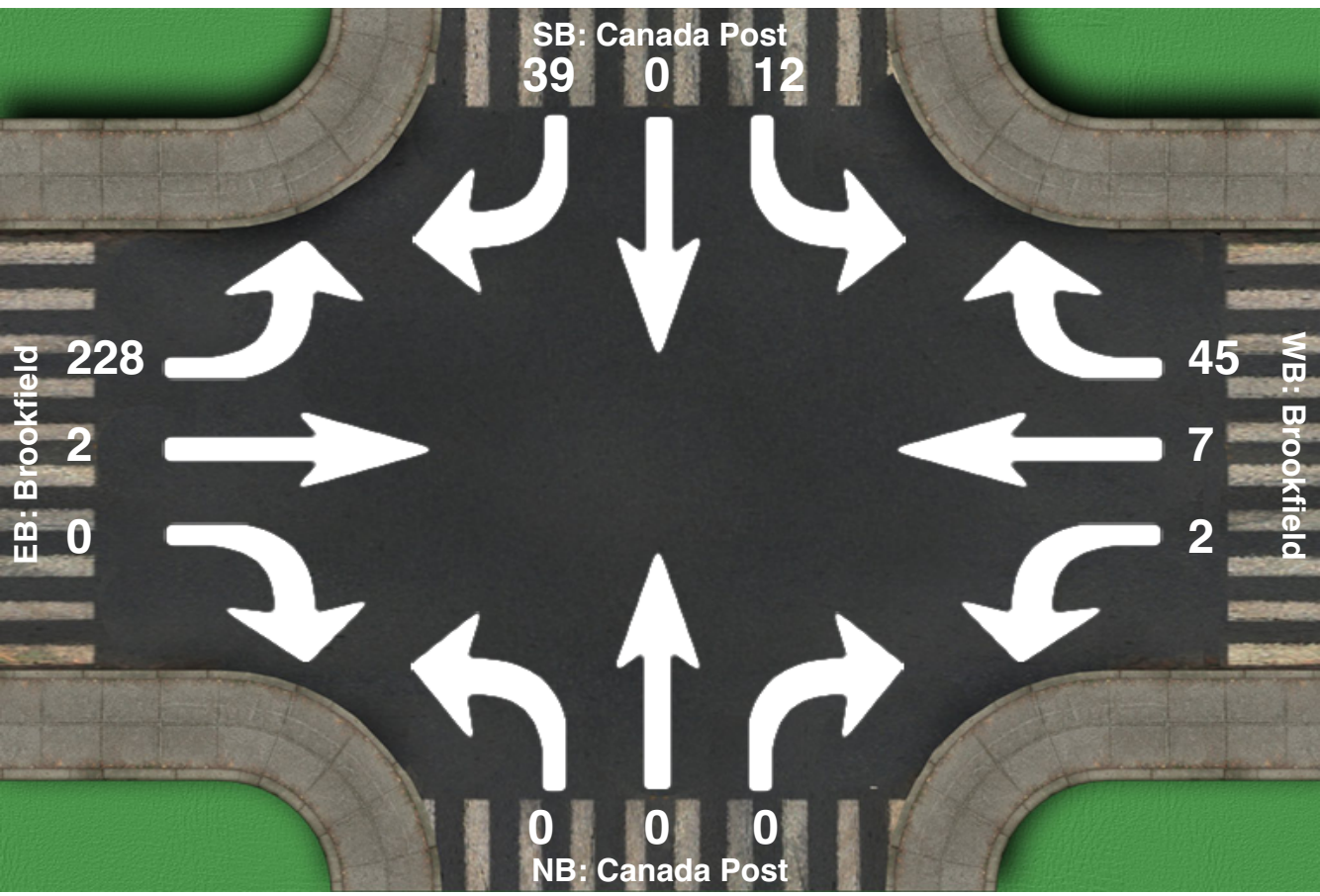
Start Time: 07:00 **Device:** Miovision



Comments

Intersection Peak Hour

Location: Canada Post at Brookfield , Ottawa
GPS Coordinates:
Date: 2017-11-08
Day of week: Wednesday
Weather: Overcast
Analyst: Rani Nahas



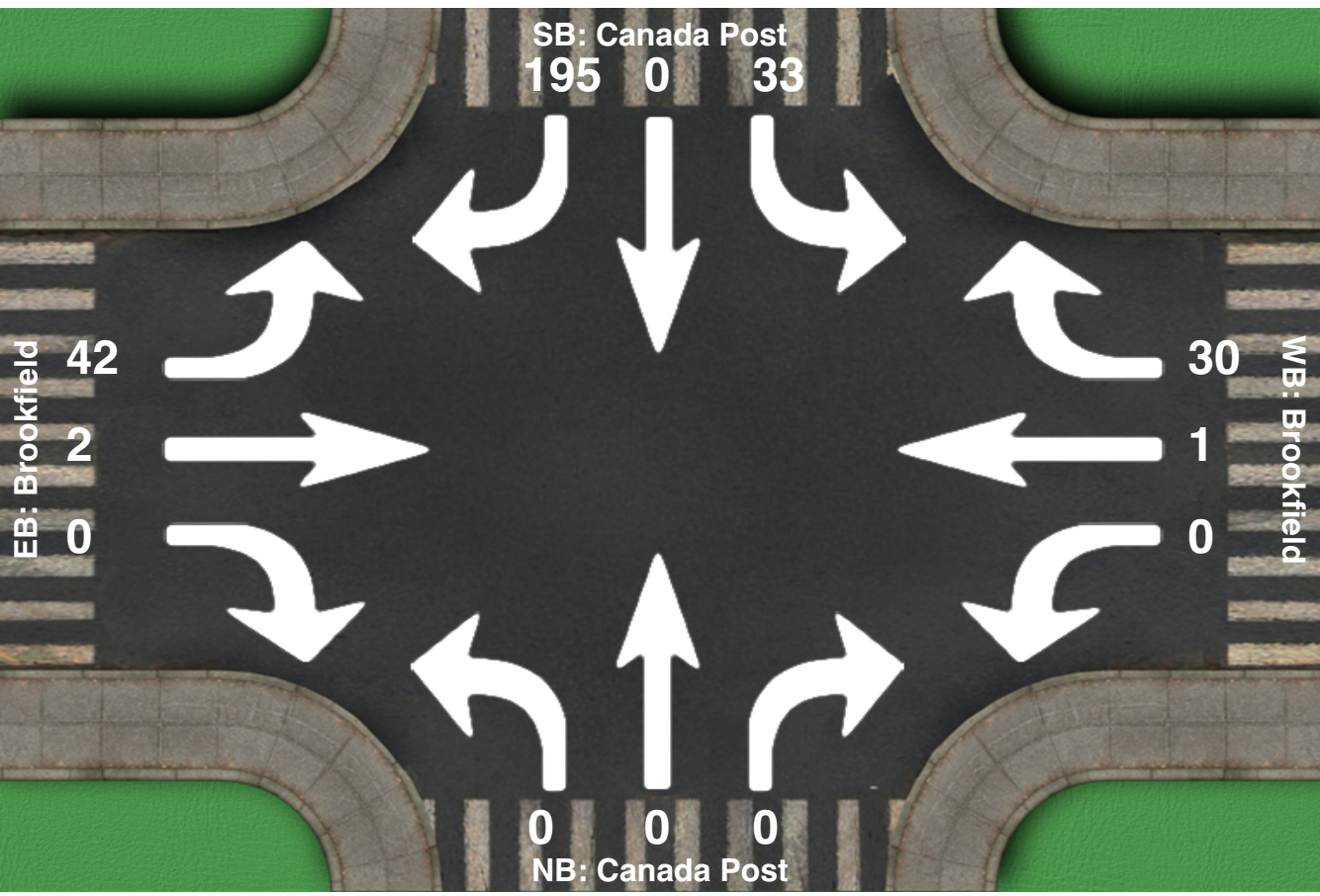
Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	12	0	39	2	7	45	0	0	0	228	2	0	335
Factor	0.33	0.00	0.46	0.17	0.29	0.62	0.00	0.00	0.00	0.59	0.08	0.00	0.68
Approach Factor	0.61			0.56			0.00			0.60			

Intersection Peak Hour

Location: Canada Post at Brookfield, Ottawa
GPS Coordinates:
Date: 2017-11-07
Day of week: Tuesday
Weather: Sunny
Analyst: Rani Nahas



Intersection Peak Hour

16:05 - 17:05

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	33	0	195	0	1	30	0	0	0	42	2	0	303
Factor	0.39	0.00	0.60	0.00	0.08	0.42	0.00	0.00	0.00	0.50	0.08	0.00	0.65
Approach Factor	0.63			0.43			0.00			0.52			

Appendix B

Collision Data and Analysis

Total Area

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	34	11	11	6	0	5	0	2	69	79%
Non-fatal injury	6	3	2	4	0	3	0	0	18	21%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**40**	**14**	**13**	**10**	**0**	**8**	**0**	**2**	**87**	100%
	#1 or 46%	#2 or 16%	#3 or 15%	#4 or 12%	#7 or 0%	#5 or 9%	#7 or 0%	#6 or 2%		

BROOKFIELD RD / RIVERSIDE DR

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2012-2016	57	43,852	1825	**0.71**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	28	9	5	0	0	3	0	2	47	82%
Non-fatal injury	5	3	1	1	0	0	0	0	10	18%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**33**	**12**	**6**	**1**	**0**	**3**	**0**	**2**	**57**	100%
	58%	21%	11%	2%	0%	5%	0%	4%		

AIRPORT PKWY / FLANNERY DR

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2012-2016	16	13,965	1825	**0.63**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	6	0	4	4	0	1	0	0	15	94%
Non-fatal injury	0	0	0	1	0	0	0	0	1	6%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**6**	**0**	**4**	**5**	**0**	**1**	**0**	**0**	**16**	100%
	38%	0%	25%	31%	0%	6%	0%	0%		

BROOKFIELD RD / 200 W OF FLANNERY DR

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2012-2016	4	8,679	1825	**0.25**

Classification of Accident	Rear End	Turning Movement	Sideswipe	Angle	Approaching	Single Vehicle (other)	Single vehicle (Unattended vehicle)	Other	Total	
P.D. only	0	0	0	1	0	0	0	0	1	25%
Non-fatal injury	0	0	0	1	0	2	0	0	3	75%
Non reportable	0	0	0	0	0	0	0	0	0	0%
Total	**0**	**0**	**0**	**2**	**0**	**2**	**0**	**0**	**4**	100%
	0%	0%	0%	50%	0%	50%	0%	0%		

City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2014 **To:** January 1, 2017

Location: AIRPORT PKWY/BROOKFIELD RD @ FLANNERY DR/AIRPORT PKWY RAMPS 52A/53

Traffic Control: Yield sign

Total Collisions: 13

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jan-26, Sun,14:16	Clear	Angle	P.D. only	Dry	East	Merging	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Mar-31, Mon,10:43	Clear	Rear end	P.D. only	Dry	South	Going ahead	Pick-up truck	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2014-Apr-14, Mon,10:45	Rain	Rear end	P.D. only	Wet	East	Going ahead	Pick-up truck	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2014-May-26, Mon,08:17	Rain	SMV other	P.D. only	Wet	East	Going ahead	Automobile, station wagon	Skidding/sliding	
2014-Sep-15, Mon,08:25	Clear	Sideswipe	P.D. only	Wet	South	Going ahead	Truck and trailer	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Sep-02, Tue,21:33	Clear	Angle	Non-fatal injury	Wet	South	Going ahead	Bicycle	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Cyclist	

2014-Sep-21, Sun,18:30	Rain	Rear end	P.D. only	Wet	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2014-Nov-09, Sun,11:02	Clear	Angle	P.D. only	Dry	East	Merging	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Feb-23, Mon,15:52	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Pick-up truck	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle
2016-Oct-22, Sat,19:18	Rain	Rear end	P.D. only	Wet	East	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2016-May-24, Tue,11:29	Clear	Sideswipe	P.D. only	Dry	South	Other	Automobile, station wagon	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Jul-12, Tue,13:07	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Dec-09, Fri,07:45	Clear	Sideswipe	P.D. only	Ice	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle

Location: BROOKFIELD RD @ 200 W OF FLANNERY DR

Traffic Control: Traffic signal **Total Collisions:** 4

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Nov-03, Mon,13:29	Clear	Angle	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Turning left	Pick-up truck	Other motor vehicle	
2015-Apr-10, Fri,01:13	Rain	SMV other	Non-fatal injury	Wet	East	Going ahead	Unknown	Pedestrian	1
2015-Dec-22, Tue,16:21	Rain	SMV other	Non-fatal injury	Wet	South	Turning left	Automobile, station wagon	Pole (utility, power)	
2016-Oct-12, Wed,17:23	Clear	Angle	P.D. only	Dry	South	Turning left	Pick-up truck	Other motor vehicle	
					East	Going ahead	Motorcycle	Other motor vehicle	

Location: BROOKFIELD RD btwn RIVERSIDE DR/HOG'S BACK RD & 200 W OF FLANNERY DR

Traffic Control: No control **Total Collisions:** 6

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Oct-01, Wed,16:37	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Jun-29, Mon,17:52	Clear	SMV other	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Pole (utility, power)	
2016-May-05, Thu,12:15	Clear	SMV other	Non-fatal injury	Dry	South	Slowing or stopping	Automobile, station wagon	Pedestrian	1
2015-Oct-22, Thu,07:23	Rain	Sideswipe	Non-fatal injury	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle	

					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Nov-26, Thu,13:03	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Unknown	Other motor vehicle	
					East	Going ahead	Pick-up truck	Other motor vehicle	
2016-Jul-13, Wed,06:30	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Pick-up truck	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: RIVERSIDE DR @ BROOKFIELD RD/HOG'S BACK RD

Traffic Control: Traffic signal **Total Collisions:** 44

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jan-11, Sat,07:17	Freezing Rain	Rear end	P.D. only	Ice	South	Going ahead	Automobile, station wagon	Skidding/sliding	
					South	Stopped	Automobile, station wagon	Other motor vehicle	
2014-Feb-12, Wed,09:32	Clear	Turning movement	P.D. only	Dry	East	Turning left	Passenger van	Other motor vehicle	
					West	Going ahead	Pick-up truck	Other motor vehicle	
2014-Aug-01, Fri,16:00	Clear	Rear end	P.D. only	Dry	West	Going ahead	Pick-up truck	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2014-Jul-02, Wed,15:40	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle	
					East	Turning right	Automobile, station wagon	Other motor vehicle	

2014-Sep-01, Mon,15:30	Clear	Other	P.D. only	Dry	West	Reversing	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2014-Jul-28, Mon,21:00	Clear	Other	P.D. only	Dry	North	Reversing	Passenger van	Other motor vehicle
					South	Stopped	Motorcycle	Other motor vehicle
2014-Sep-03, Wed,15:51	Clear	Rear end	P.D. only	Dry	West	Turning right	Automobile, station wagon	Other motor vehicle
					West	Turning right	Truck and trailer	Other motor vehicle
2014-Dec-05, Fri,17:00	Clear	Rear end	P.D. only	Ice	East	Slowing or stopping	Pick-up truck	Other motor vehicle
					East	Stopped	Pick-up truck	Other motor vehicle
2014-Dec-12, Fri,16:35	Clear	Rear end	P.D. only	Wet	West	Going ahead	Pick-up truck	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle
2015-Feb-19, Thu,08:49	Clear	Rear end	P.D. only	Wet	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2014-Dec-16, Tue,20:29	Freezing Rain	Turning movement	P.D. only	Ice	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2014-Sep-07, Sun,12:24	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle

					North	Stopped	Automobile, station wagon	Other motor vehicle
					North	Stopped	Automobile, station wagon	Other motor vehicle
2014-Nov-25, Tue,00:08	Clear	Angle	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2014-Dec-01, Mon,17:35	Clear	Rear end	P.D. only	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2014-Nov-04, Tue,17:30	Rain	Sideswipe	P.D. only	Wet	North	Changing lanes	Automobile, station wagon	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
2015-Apr-21, Tue,16:16	Clear	Rear end	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle
2015-Jan-18, Sun,00:42	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Mar-22, Sun,15:35	Clear	Rear end	P.D. only	Dry	South	Turning right	Pick-up truck	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2015-Feb-04, Wed,13:47	Snow	Rear end	P.D. only	Ice	North	Turning left	Automobile, station wagon	Other motor vehicle

					North	Turning left	Passenger van	Other motor vehicle
2015-Jan-30, Fri,20:20	Clear	Turning movement	P.D. only	Dry	East	Turning left	Unknown	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2015-Jan-22, Thu,08:00	Clear	Rear end	P.D. only	Ice	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Passenger van	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2015-Mar-23, Mon,19:06	Clear	SMV other	P.D. only	Dry	West	Turning right	Automobile, station wagon	Pole (sign, parking meter)
2015-Feb-05, Thu,07:20	Clear	Rear end	P.D. only	Wet	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Stopped	Delivery van	Other motor vehicle
2015-May-01, Fri,16:11	Clear	Rear end	P.D. only	Dry	North	Turning right	Automobile, station wagon	Other motor vehicle
					North	Turning right	Delivery van	Other motor vehicle
2016-Aug-02, Tue,17:44	Clear	Rear end	P.D. only	Dry	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2016-Jun-07, Tue,17:15	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Pick-up truck	Other motor vehicle
					East	Changing lanes	Automobile, station wagon	Other motor vehicle

2016-Sep-24, Sat,12:55	Clear	Rear end	Non-fatal injury	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2016-Oct-18, Tue,08:56	Clear	Rear end	P.D. only	Dry	South	Going ahead	Tow truck	Other motor vehicle
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
2015-Oct-09, Fri,07:28	Rain	Sideswipe	Non-fatal injury	Wet	North	Going ahead	Pick-up truck	Other motor vehicle
					North	Turning left	Pick-up truck	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
2015-Oct-14, Wed,14:37	Clear	Rear end	P.D. only	Dry	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Pick-up truck	Other motor vehicle
2016-Jan-06, Wed,21:48	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Jan-02, Sat,16:24	Clear	Rear end	P.D. only	Wet	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Stopped	Pick-up truck	Other motor vehicle
2015-Dec-12, Sat,14:30	Clear	Rear end	Non-fatal injury	Dry	East	Turning right	Passenger van	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle

2016-Mar-30, Wed,21:16	Clear	Turning movement	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Turning left	Automobile, station wagon	Other motor vehicle
2016-Mar-30, Wed,15:30	Clear	Rear end	P.D. only	Dry	South	Turning right	Pick-up truck	Other motor vehicle
					South	Turning right	Pick-up truck	Other motor vehicle
2016-Sep-15, Thu,17:58	Clear	Sideswipe	P.D. only	Dry	West	Changing lanes	Pick-up truck	Other motor vehicle
					West	Going ahead	Pick-up truck	Other motor vehicle
2016-Mar-27, Sun,20:55	Clear	Rear end	P.D. only	Dry	East	Turning right	Pick-up truck	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2016-Jul-19, Tue,16:58	Clear	Rear end	Non-fatal injury	Dry	East	Turning right	Automobile, station wagon	Other motor vehicle
					East	Turning right	Automobile, station wagon	Other motor vehicle
2016-May-20, Fri,08:00	Clear	Rear end	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Stopped	Pick-up truck	Other motor vehicle
2016-Sep-09, Fri,22:37	Clear	Turning movement	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle

2016-Jun-17, Fri,21:28	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Cyclist
					West	Going ahead	Bicycle	Other motor vehicle
2016-Sep-29, Thu,16:30	Clear	Rear end	Non-fatal injury	Dry	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Fire vehicle	Other
2016-Dec-23, Fri,12:40	Clear	Sideswipe	P.D. only	Dry	South	Changing lanes	Pick-up truck	Other motor vehicle
					South	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Dec-05, Mon,08:52	Clear	SMV other	P.D. only	Packed snow	East	Turning right	Automobile, station wagon	Skidding/sliding

Collision Main Detail Summary

OnTRAC Reporting System

FROM: 2012-01-01 TO: 2014-01-01

AIRPORT PKWY & FLANNERY DR

Former Municipality: **Ottawa** Traffic Control: **Yield sign** Number of Collisions: **3**

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
1	2012-02-19	Sun	16:30	Clear	Daylight	Sideswipe	P.D. only	V1 E	Dry	Changing lanes	Automobile, station	Other motor vehicle	0
								V2 E	Dry	Going ahead	Automobile, station	Other motor vehicle	
2	2012-04-26	Thu	20:02	Rain	Dark	Angle	P.D. only	V1 E	Wet	Merging	Pick-up truck	Other motor vehicle	0
								V2 S	Wet	Going ahead	Pick-up truck	Other motor vehicle	
3	2012-05-08	Tue	15:46	Rain	Daylight	Rear end	P.D. only	V1 E	Wet	Going ahead	Automobile, station	Other motor vehicle	0
								V2 E	Wet	Going ahead	Pick-up truck	Other motor vehicle	

BROOKFIELD RD, 200 W OF FLANNERY DR to RIVERSIDE DR

Former Municipality: **Ottawa** Traffic Control: **No control** Number of Collisions: **4**

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
4	2012-05-10	Thu	17:38	Clear	Daylight	Angle	Non-fatal	V1 S	Dry	Turning left	Automobile, station	Other motor vehicle	0
								V2 W	Dry	Going ahead	Automobile, station	Other motor vehicle	
5	2012-09-06	Thu	17:06	Clear	Daylight	Angle	P.D. only	V1 S	Dry	Turning left	Automobile, station	Other motor vehicle	0
								V2 W	Dry	Going ahead	Pick-up truck	Other motor vehicle	
6	2012-09-10	Mo	06:30	Clear	Dawn	Rear end	Non-fatal	V1 W	Dry	Going ahead	Automobile, station	Other motor vehicle	0
								V2 W	Dry	Turning left	Automobile, station	Other motor vehicle	
7	2012-09-27	Thu	16:37	Clear	Daylight	Turning	P.D. only	V1 E	Dry	Turning left	Pick-up truck	Other motor vehicle	0
								V2 W	Dry	Going ahead	Pick-up truck	Other motor vehicle	

BROOKFIELD RD & RIVERSIDE DR

Former Municipality: **Ottawa** Traffic Control: **Traffic signal** Number of Collisions: **13**

	DATE	DAY	TIME	ENV	LIGHT	IMPACT TYPE	CLASS	DIR	SURFACE COND'N	VEHICLE MANOEUVRE	VEHICLE TYPE	FIRST EVENT	No. PED
8	2012-01-03	Tue	04:05	Snow	Dark	Rear end	P.D. only	V1 S	Loose snow	Turning right	Automobile, station	Other motor vehicle	0
								V2 S	Loose snow	Turning right	Pick-up truck	Other motor vehicle	
9	2012-01-20	Fri	15:00	Clear	Daylight	Rear end	P.D. only	V1 S	Ice	Turning right	Pick-up truck	Other motor vehicle	0
								V2 S	Ice	Turning right	Automobile, station	Other motor vehicle	

(Note: Time of Day = "00:00" represents unknown collision time

10	2012-01-25	We	16:00	Clear	Daylight	Rear end	P.D. only	V1	E	Wet	Turning right	Automobile, station	Other motor vehicle	0
								V2	E	Wet	Turning right	Automobile, station	Other motor vehicle	
								V3	E	Wet	Turning right	Automobile, station	Other motor vehicle	
11	2012-03-03	Sat	04:00	Clear	Dark	Single vehicle	P.D. only	V1	E	Wet	Turning right	Pick-up truck	Skidding/Sliding	0
12	2012-03-04	Sun	16:21	Clear	Daylight	Rear end	P.D. only	V1	S	Spilled liquid	Turning left	Automobile, station	Other motor vehicle	0
								V2	S	Other	Turning left	Automobile, station	Other motor vehicle	
13	2012-04-19	Thu	20:43	Clear	Dark	Turning	Non-fatal	V1	N	Dry	Going ahead	Pick-up truck	Other motor vehicle	0
								V2	S	Dry	Turning left	Pick-up truck	Other motor vehicle	
14	2012-05-08	Tue	11:32	Rain	Daylight	Turning	Non-fatal	V1	E	Wet	Turning left	Passenger van	Other motor vehicle	0
								V2	W	Wet	Going ahead	Automobile, station	Other motor vehicle	
15	2012-07-14	Sat	15:41	Clear	Daylight	Sideswipe	P.D. only	V1	S	Dry	Changing lanes	Pick-up truck	Other motor vehicle	0
								V2	S	Dry	Turning left	Passenger van	Other motor vehicle	
16	2012-08-09	Thu	20:20	Rain	Dusk	Rear end	P.D. only	V1	E	Wet	Turning right	Pick-up truck	Other motor vehicle	0
								V2	E	Wet	Turning right	Automobile, station	Other motor vehicle	
17	2012-09-15	Sat	15:35	Clear	Daylight	Rear end	P.D. only	V1	S	Dry	Turning right	Pick-up truck	Other motor vehicle	0
								V2	S	Dry	Turning right	Automobile, station	Other motor vehicle	
18	2012-09-17	Mo	12:53	Clear	Daylight	Turning	P.D. only	V1	E	Dry	Turning left	Automobile, station	Other motor vehicle	0
								V2	W	Dry	Going ahead	Automobile, station	Other motor vehicle	
19	2012-10-04	Thu	08:30	Clear	Daylight	Rear end	P.D. only	V1	E	Dry	Turning right	Automobile, station	Other motor vehicle	0
								V2	E	Dry	Turning right	Automobile, station	Other motor vehicle	
20	2012-10-13	Sat	22:13	Rain	Dark	Turning	P.D. only	V1	S	Wet	Turning left	Automobile, station	Other motor vehicle	0
								V2	N	Wet	Going ahead	Passenger van	Other motor vehicle	

(Note: Time of Day = "00:00" represents unknown collision time

Appendix C

Background Traffic Growth

Brookfield / Riverside
8 hrs

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2006	Friday May 12	9599	9543	9095	9462	2940	3156	4704	4177	52676
2012	Friday August 17	9182	9278	9162	7742	2927	3436	4559	3744	50030
2016	Wednesday July 20	10182	9159	9113	9209	2881	3484	4583	4907	53518

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	9543	9599	19142	52676				
2012	9278	9182	18460	50030	-2.8%	-4.3%	-3.6%	-5.0%
2016	9159	10182	19341	53518	-1.3%	10.9%	4.8%	7.0%

Regression Estimate	2006	9534	9397	18931
Regression Estimate	2016	9145	9879	19025
Average Annual Change		**-0.42%**	**0.50%**	**0.05%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	4704	4177	8881	52676				
2012	4559	3744	8303	50030	-3.1%	-10.4%	-6.5%	-5.0%
2016	4583	4907	9490	53518	0.5%	31.1%	14.3%	7.0%

Regression Estimate	2006	4685	3948	8633
Regression Estimate	2016	4554	4563	9118
Average Annual Change		**-0.28%**	**1.46%**	**0.55%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	3156	2940	6096	52676				
2012	3436	2927	6363	50030	8.9%	-0.4%	4.4%	-5.0%
2016	3484	2881	6365	53518	1.4%	-1.6%	0.0%	7.0%

Regression Estimate	2006	3178	2946	6124
Regression Estimate	2016	3517	2890	6407
Average Annual Change		**1.02%**	**-0.19%**	**0.45%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	9095	9462	18557	52676				
2012	9162	7742	16904	50030	0.7%	-18.2%	-8.9%	-5.0%
2016	9113	9209	18322	53518	-0.5%	18.9%	8.4%	7.0%

Regression Estimate	2006	9110	9049	18159
Regression Estimate	2016	9135	8590	17725
Average Annual Change		**0.03%**	**-0.52%**	**-0.24%**

Brookfield / Riverside
AM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2006	Friday May 12	1107	1503	1630	1012	274	537	641	600	7304
2012	Friday August 17	1388	1515	1830	1013	220	781	476	605	7828
2016	Wednesday July 20	1074	1610	1836	816	265	664	588	673	7526

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	1503	1107	2610	7304				
2012	1515	1388	2903	7828	0.8%	25.4%	11.2%	7.2%
2016	1610	1074	2684	7526	6.3%	-22.6%	-7.5%	-3.9%

Regression Estimate	2006	1489	1186	2675
Regression Estimate	2016	1589	1193	2782
Average Annual Change		**0.65%**	**0.06%**	**0.39%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	641	600	1241	7304				
2012	476	605	1081	7828	-25.7%	0.8%	-12.9%	7.2%
2016	588	673	1261	7526	23.5%	11.2%	16.7%	-3.9%

Regression Estimate	2006	606	590	1196
Regression Estimate	2016	535	658	1193
Average Annual Change		**-1.23%**	**1.10%**	**-0.02%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	537	274	811	7304				
2012	781	220	1001	7828	45.4%	-19.7%	23.4%	7.2%
2016	664	265	929	7526	-15.0%	20.5%	-7.2%	-3.9%

Regression Estimate	2006	581	261	842
Regression Estimate	2016	730	246	976
Average Annual Change		**2.31%**	**-0.61%**	**1.48%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	1630	1012	2642	7304				
2012	1830	1013	2843	7828	12.3%	0.1%	7.6%	7.2%
2016	1836	816	2652	7526	0.3%	-19.4%	-6.7%	-3.9%

Regression Estimate	2006	1650	1043	2693
Regression Estimate	2016	1866	863	2729
Average Annual Change		**1.24%**	**-1.88%**	**0.13%**

Brookfield / Riverside
PM Peak

Year	Date	North Leg		South Leg		East Leg		West Leg		Total
		SB	NB	NB	SB	WB	EB	EB	WB	
2006	Friday May 12	1626	1429	1224	1849	777	419	749	679	8752
2012	Friday August 17	1447	1018	858	1343	622	320	545	791	6944
2016	Wednesday July 20	1919	1139	980	1825	858	441	692	771	8625

North Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	1429	1626	3055	8752				
2012	1018	1447	2465	6944	-28.8%	-11.0%	-19.3%	-20.7%
2016	1139	1919	3058	8625	11.9%	32.6%	24.1%	24.2%

Regression Estimate	2006	1367	1533	2899
Regression Estimate	2016	1045	1779	2824
Average Annual Change		**-2.64%**	**1.50%**	**-0.26%**

West Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	749	679	1428	8752				
2012	545	791	1336	6944	-27.2%	16.5%	-6.4%	-20.7%
2016	692	771	1463	8625	27.0%	-2.5%	9.5%	24.2%

Regression Estimate	2006	704	694	1398
Regression Estimate	2016	625	793	1418
Average Annual Change		**-1.19%**	**1.35%**	**0.14%**

East Leg

Year	Counts				% Change			
	EB	*WB*	*EB+WB*	*INT*	*EB*	*WB*	*EB+WB*	*INT*
2006	419	777	1196	8752				
2012	320	622	942	6944	-23.6%	-19.9%	-21.2%	-20.7%
2016	441	858	1299	8625	37.8%	37.9%	37.9%	24.2%

Regression Estimate	2006	389	723	1113
Regression Estimate	2016	397	778	1174
Average Annual Change		**0.18%**	**0.73%**	**0.54%**

South Leg

Year	Counts				% Change			
	NB	*SB*	*NB+SB*	*INT*	*NB*	*SB*	*NB+SB*	*INT*
2006	1224	1849	3073	8752				
2012	858	1343	2201	6944	-29.9%	-27.4%	-28.4%	-20.7%
2016	980	1825	2805	8625	14.2%	35.9%	27.4%	24.2%

Regression Estimate	2006	1166	1720	2886
Regression Estimate	2016	893	1631	2524
Average Annual Change		**-2.63%**	**-0.53%**	**-1.33%**

Appendix D

Road Segment MMLoS Analysis

Multi-Modal Level of Service - Segments Form

Consultant	**Parsons**	**Project**	**770 Brookfield**
Scenario	**Future Proposed**	**Date**	**Jan-17**
Comments			

SEGMENTS		Street A	Section North Side	Section South Side	Section 3	Section 4	Section 5	Section 6	Section 7	Section 8
Pedestrian	Sidewalk Width Boulevard Width	F	1.8 m < 0.5 m	≥ 2 m > 2 m						
	Avg Daily Curb Lane Traffic Volume		> 3000	> 3000						
	Operating Speed On-Street Parking		> 50 to 60 km/h no	> 50 to 60 km/h no						
	Exposure to Traffic PLoS		**F**	**C**	-	-	-	-	-	-
	Effective Sidewalk Width		1.2 m	1.2 m						
	Pedestrian Volume		500 ped /hr	500 ped /hr						
	Crowding PLoS		**B**	**B**	-	-	-	-	-	-
	Level of Service		**F**	**C**	-	-	-	-	-	-
Bicycle	Type of Cycling Facility	D	Mixed Traffic	Physically Separated						
	Number of Travel Lanes		≤ 2 (no centreline)							
	Operating Speed		≥ 50 to 60 km/h							
	# of Lanes & Operating Speed LoS		**D**	-	-	-	-	-	-	-
	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		4-5 lanes							
	Sidestreet Operating Speed		>50 to 60 km/h							
	Unsignalized Crossing - Lowest LoS		**D**	**A**	-	-	-	-	-	-
	Level of Service		**D**	**A**	-	-	-	-	-	-
Transit	Facility Type	D	Mixed Traffic	Mixed Traffic						
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8						
	Level of Service		**D**	**D**	-	-	-	-	-	-
Truck	Truck Lane Width	A	≤ 3.5 m	≤ 3.5 m						
	Travel Lanes per Direction		> 1	> 1						
	Level of Service		**A**	**A**	-	-	-	-	-	-
Auto	**Level of Service**	**Not Applicable**								

Appendix E

Transportation Demand Management

TDM-Supportive Development Design and Infrastructure Checklist:
Residential Developments (multi-family or condominium)

Legend

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

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

TDM-supportive design & infrastructure measures: *Residential developments*			Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks *(see Official Plan policy 4.3.10)*	☑
REQUIRED	1.2.4	Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps *(see Official Plan policy 4.3.10)*	☑
REQUIRED	1.2.5	Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians *(see Official Plan policy 4.3.11)*	☑
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☑
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☑
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	☐ On site speeds are unposted, however, like likely operate between 20 to 30 km/h
	1.3	**Amenities for walking & cycling**	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☑ Landscaped courtyard
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☐

		TDM-supportive design & infrastructure measures: *Residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☑
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☑
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☑
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists	☑
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☑
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	☐
	2.3	**Bicycle repair station**	
BETTER	2.3.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐ N/A
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☑
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐

	TDM-supportive design & infrastructure measures: *Residential developments*		Check if completed & add descriptions, explanations or plan/drawing references
	4.	**RIDESHARING**	
	4.1	**Pick-up & drop-off facilities**	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☐
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Carshare parking spaces**	
BETTER	5.1.1	Provide up to three carshare parking spaces in an R3, R4 or R5 Zone for specified residential uses *(see Zoning By-law Section 94)*	☐
	5.2	**Bikeshare station location**	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☐
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☑
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☑
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☑
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☑ Showers are provided within the residential units. Number of parking spaces is reduced from the By-Law requirements for Phase 2
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Provide separate areas for short-term and long-term parking (using signage or physical barriers) to permit access controls and simplify enforcement (i.e. to discourage residents from parking in visitor spaces, and vice versa)	☐

Appendix F

Existing Conditions: SYNCHRO and SIDRA Capacity Analysis and MMLoS

Multi-Modal Level of Service - Intersections Form

Consultant	**Parsons**	**Project**	**770 Brookfield**
Scenario	**Existing**	**Date**	**Jan-18**
Comments			

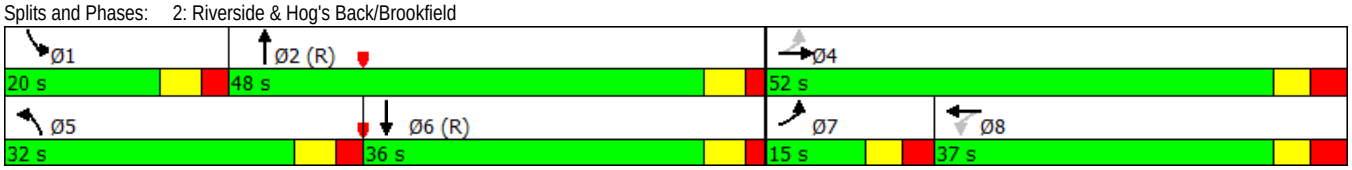
	INTERSECTIONS	**Brookfield/Riverside**				**Brookfield/Canada Post**			
	Crossing Side	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Pedestrian	Lanes	9	9	5	5	0 - 2		4	4
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m		No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Protected/ Permissive	Protected/ Permissive	Protected	Protected	Permissive		Permissive	No left turn / Prohib.
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control		No right turn	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed		RTOR prohibited	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No		No	No
	Right Turn Channel	Conv'tl without Receiving Lane	Conventional with Receiving Lane	Smart Channel	Conv'tl without Receiving Lane	No Channel		No Channel	No Channel
	Corner Radius	15-25m	10-15m	10-15m	15-25m	5-10m		0-3m	5-10m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings		Std transverse markings	Std transverse markings
	PETSI Score	**-27**	**-28**	**51**	**47**	**86**		**64**	**62**
	Ped. Exposure to Traffic LoS	**F**	**F**	**D**	**D**	**B**	**-**	**C**	**C**
	Cycle Length	120	120	120	120	55		55	55
	Effective Walk Time	7	7	32	32	15		7	7
	Average Pedestrian Delay	**53**	**53**	**32**	**32**	**15**		**21**	**21**
	Pedestrian Delay LoS	**E**	**E**	**D**	**D**	**B**	**-**	**C**	**C**
	Level of Service	**F**	**F**	**D**	**D**	**B**	**-**	**C**	**C**
		F				**C**			
	Approach From	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Bicycle	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic		Mixed Traffic	Mixed Traffic
	Right Turn Lane Configuration	≤ 50 m Introduced right turn lane	≤ 50 m	≤ 50 m	≤ 50 m				
	Right Turning Speed	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h				
	Cyclist relative to RT motorists	**B**	**D**	**D**	**D**	**#N/A**	**-**	**#N/A**	**#N/A**
	Separated or Mixed Traffic	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**-**	**Mixed Traffic**	**Mixed Traffic**
	Left Turn Approach	≥ 2 lanes crossed	≥ 2 lanes crossed	One lane crossed	One lane crossed	No lane crossed		One lane crossed	One lane crossed
	Operating Speed	> 50 to < 60 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	> 40 to ≤ 50 km/h		> 50 to < 60 km/h	> 50 to < 60 km/h
	Left Turning Cyclist	**F**	**F**	**E**	**E**	**B**	**-**	**E**	**E**
	Level of Service	**F**	**F**	**E**	**E**	**#N/A**	**-**	**#N/A**	**#N/A**
		F				**#N/A**			
Transit	Average Signal Delay	> 40 sec	> 40 sec	> 40 sec	> 40 sec	≤ 10 sec		≤ 20 sec	≤ 20 sec
	Level of Service	**F**	**F**	**F**	**F**	**B**	**-**	**C**	**C**
		F				**C**			
Truck	Effective Corner Radius	> 15 m	10 - 15 m	10 - 15 m	> 15 m	< 10 m		< 10 m	
	Number of Receiving Lanes on Departure from Intersection	1	≥ 2	≥ 2	≥ 2	≥ 2		1	
	Level of Service	**C**	**B**	**B**	**A**	**D**	**-**	**F**	**-**
		C				**F**			
Auto	Volume to Capacity Ratio	> 1.00				0.0 - 0.60			
	Level of Service	**F**				**A**			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	305	130	62	103	279	1195	172	601
Future Volume (vph)	305	130	62	103	279	1195	172	601
Lane Group Flow (vph)	321	298	65	213	294	1639	181	939
Turn Type	pm+pt	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases	7	4		8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	7	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.2	36.7	36.7	36.7	11.1	22.6	11.1	22.6
Total Split (s)	15.0	52.0	37.0	37.0	32.0	48.0	20.0	36.0
Total Split (%)	12.5%	43.3%	30.8%	30.8%	26.7%	40.0%	16.7%	30.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	3.4	3.4	3.4	2.4	1.9	2.4	1.9
Lost Time Adjust (s)	-2.2	-2.7	-2.7	-2.7	-2.1	-1.6	-2.1	-1.6
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	C-Max	Max	C-Max
Act Effct Green (s)	36.8	36.8	21.8	21.8	39.2	44.0	27.2	32.0
Actuated g/C Ratio	0.31	0.31	0.18	0.18	0.33	0.37	0.23	0.27
v/c Ratio	1.19	0.55	0.35	0.65	0.53	0.93	0.47	0.73
Control Delay	150.2	30.5	44.9	44.0	39.2	45.0	47.3	39.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	150.2	30.5	44.9	44.0	39.2	45.0	47.3	39.4
LOS	F	C	D	D	D	D	D	D
Approach Delay		92.6		44.2		44.1		40.7
Approach LOS		F		D		D		D
Queue Length 50th (m)	~81.1	47.3	13.8	38.6	55.6	129.6	36.8	66.4
Queue Length 95th (m)	#117.8	64.5	22.8	57.0	#96.7	#160.8	#76.9	82.3
Internal Link Dist (m)		152.7		170.0		209.7		156.3
Turn Bay Length (m)	18.0				140.0		135.0	
Base Capacity (vph)	270	685	282	480	553	1769	384	1291
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	1.19	0.44	0.23	0.44	0.53	0.93	0.47	0.73

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 91 (76%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 105	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.19	
Intersection Signal Delay: 50.7	Intersection LOS: D
Intersection Capacity Utilization 86.8%	ICU Level of Service E
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: Riverside & Hog's Back/Brookfield



Lane Group	EBL	EBT	WBT	SBL
Lane Configurations				
Traffic Volume (vph)	30	334	222	11
Future Volume (vph)	30	334	222	11
Lane Group Flow (vph)	0	384	370	20
Turn Type	Perm	NA	NA	Prot
Protected Phases		2	6	4
Permitted Phases	2			
Detector Phase	2	2	6	4
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	26.2	26.2	26.2	25.5
Total Split (s)	34.0	34.0	34.0	26.0
Total Split (%)	56.7%	56.7%	56.7%	43.3%
Yellow Time (s)	3.3	3.3	3.3	3.3
All-Red Time (s)	1.9	1.9	1.9	2.2
Lost Time Adjust (s)		-1.2	-1.2	-1.5
Total Lost Time (s)		4.0	4.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	C-Max	None
Act Effct Green (s)		54.1	54.1	13.5
Actuated g/C Ratio		0.90	0.90	0.22
v/c Ratio		0.14	0.13	0.05
Control Delay		2.7	2.0	12.8
Queue Delay		0.0	0.0	0.0
Total Delay		2.7	2.0	12.8
LOS		A	A	B
Approach Delay		2.7	2.0	12.8
Approach LOS		A	A	B
Queue Length 50th (m)		0.0	0.0	1.1
Queue Length 95th (m)		m21.5	12.6	4.4
Internal Link Dist (m)		65.5	266.3	50.6
Turn Bay Length (m)				
Base Capacity (vph)		2784	2876	603
Starvation Cap Reductn		0	0	0
Spillback Cap Reductn		0	0	0
Storage Cap Reductn		0	0	0
Reduced v/c Ratio		0.14	0.13	0.03

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.14	
Intersection Signal Delay: 2.7	Intersection LOS: A
Intersection Capacity Utilization 46.8%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 3: Brookfield & 20 m W of Hobson

MOVEMENT SUMMARY

Site: Brookfield/Airport Parkway/Flannery

AM Peak Hour
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Flannery											
3	L2	85	3.0	0.330	8.0	LOS A	1.0	8.0	0.40	0.38	46.8
18	R2	100	3.0	0.330	8.0	LOS A	1.0	8.0	0.40	0.38	44.9
18b	R3	91	3.0	0.330	8.0	LOS A	1.0	8.0	0.40	0.38	48.4
Approach		276	3.0	0.330	8.0	LOS A	1.0	8.0	0.40	0.38	46.6
East: Airport Parkway Northbound											
1b	L3	1	3.0	0.228	5.8	LOS A	0.9	7.2	0.23	0.12	51.9
1	L2	4	3.0	0.228	5.8	LOS A	0.9	7.2	0.23	0.12	47.6
6	T1	224	3.0	0.228	5.8	LOS A	0.9	7.2	0.23	0.12	47.0
Approach		229	3.0	0.228	5.8	LOS A	0.9	7.2	0.23	0.12	47.1
NorthEast: Airport Parkway Southbound											
1bx	L3	3	3.0	0.265	7.5	LOS A	1.0	8.1	0.46	0.40	46.9
1ax	L1	31	3.0	0.265	7.5	LOS A	1.0	8.1	0.46	0.40	45.7
16ax	R1	176	3.0	0.265	7.5	LOS A	1.0	8.1	0.46	0.40	45.3
Approach		210	3.0	0.265	7.5	LOS A	1.0	8.1	0.46	0.40	45.4
West: Brookfield											
2	T1	261	3.0	0.248	5.8	LOS A	1.1	8.2	0.15	0.06	47.1
12a	R1	109	3.0	0.167	4.9	LOS A	0.6	5.0	0.14	0.05	55.1
12	R2	67	3.0	0.167	4.9	LOS A	0.6	5.0	0.14	0.05	49.0
Approach		437	3.0	0.248	5.4	LOS A	1.1	8.2	0.15	0.06	49.1
All Vehicles		1152	3.0	0.330	6.5	LOS A	1.1	8.2	0.28	0.21	47.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	373	63	34	196	0	1
Future Volume (Veh/h)	373	63	34	196	0	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	393	66	36	206	0	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	249			90		
pX, platoon unblocked						
vC, conflicting volume			459		601	230
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			459		601	230
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		100	100
cM capacity (veh/h)			1098		418	773

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	262	197	105	137	1
Volume Left	0	0	36	0	0
Volume Right	0	66	0	0	1
cSH	1700	1700	1098	1700	773
Volume to Capacity	0.15	0.12	0.03	0.08	0.00
Queue Length 95th (m)	0.0	0.0	0.8	0.0	0.0
Control Delay (s)	0.0	0.0	3.1	0.0	9.7
Lane LOS			A		A
Approach Delay (s)	0.0		1.3		9.7
Approach LOS					A

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	33.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	228	436	151	45	12	39
Future Volume (Veh/h)	228	436	151	45	12	39
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	240	459	159	47	13	41
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		194	144			
pX, platoon unblocked						
vC, conflicting volume	206				892	103
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	206				892	103
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	82				94	96
cM capacity (veh/h)	1363				232	932

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	393	306	106	100	54
Volume Left	240	0	0	0	13
Volume Right	0	0	0	47	41
cSH	1363	1700	1700	1700	540
Volume to Capacity	0.18	0.18	0.06	0.06	0.10
Queue Length 95th (m)	4.9	0.0	0.0	0.0	2.5
Control Delay (s)	5.6	0.0	0.0	0.0	12.4
Lane LOS	A				B
Approach Delay (s)	3.2		0.0		12.4
Approach LOS					B

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	39.0%	ICU Level of Service	A
Analysis Period (min)	15		

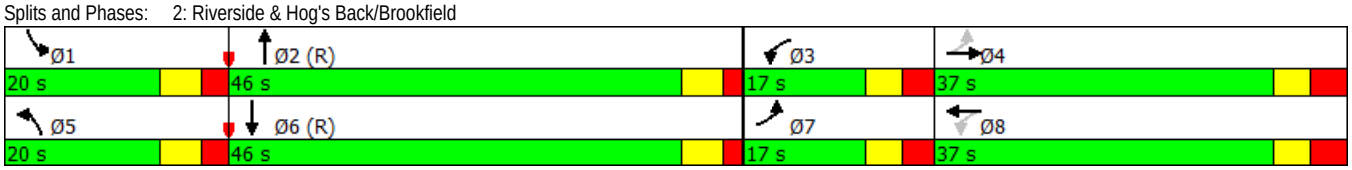
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	281	115	286	171	162	718	231	1238
Future Volume (vph)	281	115	286	171	162	718	231	1238
Lane Group Flow (vph)	296	433	301	315	171	856	243	1764
Turn Type	pm+pt	NA	pm+pt	NA	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.2	36.7	11.2	36.7	11.1	22.6	11.1	22.6
Total Split (s)	17.0	37.0	17.0	37.0	20.0	46.0	20.0	46.0
Total Split (%)	14.2%	30.8%	14.2%	30.8%	16.7%	38.3%	16.7%	38.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	3.4	2.9	3.4	2.4	1.9	2.4	1.9
Lost Time Adjust (s)	-2.2	-2.7	-2.2	-2.7	-2.1	-1.6	-2.1	-1.6
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	C-Max	Max	C-Max
Act Effct Green (s)	43.9	30.9	43.9	30.9	18.1	42.0	18.1	42.0
Actuated g/C Ratio	0.37	0.26	0.37	0.26	0.15	0.35	0.15	0.35
v/c Ratio	0.94	0.90	1.23	0.70	0.67	0.51	0.95	1.04
Control Delay	66.5	54.5	165.2	45.0	63.0	31.3	96.6	70.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.5	54.5	165.2	45.0	63.0	31.3	96.6	70.6
LOS	E	D	F	D	E	C	F	E
Approach Delay		59.4		103.7		36.6		73.8
Approach LOS		E		F		D		E
Queue Length 50th (m)	48.5	75.2	~70.8	59.5	39.3	56.4	~63.7	~160.0
Queue Length 95th (m)	#83.0	#129.7	#125.6	91.0	#72.0	69.4	#113.7	#190.0
Internal Link Dist (m)		152.7		168.1		209.7		156.3
Turn Bay Length (m)	18.0				140.0		135.0	
Base Capacity (vph)	316	508	244	479	256	1683	256	1691
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	0.94	0.85	1.23	0.66	0.67	0.51	0.95	1.04

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 84 (70%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.23	
Intersection Signal Delay: 66.9	Intersection LOS: E
Intersection Capacity Utilization 101.4%	ICU Level of Service G
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.

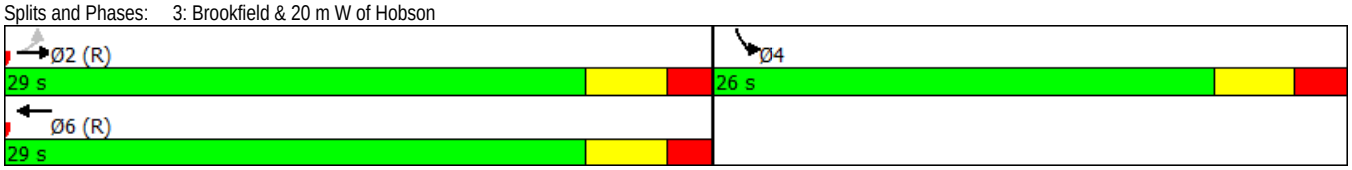
Splits and Phases: 2: Riverside & Hog's Back/Brookfield



Lane Group	EBL	EBT	WBT	SBL
Lane Configurations				
Traffic Volume (vph)	4	355	370	136
Future Volume (vph)	4	355	370	136
Lane Group Flow (vph)	0	378	404	224
Turn Type	Perm	NA	NA	Prot
Protected Phases		2	6	4
Permitted Phases	2			
Detector Phase	2	2	6	4
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	26.2	26.2	26.2	25.5
Total Split (s)	29.0	29.0	29.0	26.0
Total Split (%)	52.7%	52.7%	52.7%	47.3%
Yellow Time (s)	3.3	3.3	3.3	3.3
All-Red Time (s)	1.9	1.9	1.9	2.2
Lost Time Adjust (s)		-1.2	-1.2	-1.5
Total Lost Time (s)		4.0	4.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	C-Max	None
Act Effct Green (s)		32.7	32.7	14.3
Actuated g/C Ratio		0.59	0.59	0.26
v/c Ratio		0.20	0.20	0.48
Control Delay		6.3	6.1	14.9
Queue Delay		0.0	0.0	0.0
Total Delay		6.3	6.1	14.9
LOS		A	A	B
Approach Delay		6.3	6.1	14.9
Approach LOS		A	A	B
Queue Length 50th (m)		6.8	7.2	13.9
Queue Length 95th (m)		18.1	18.8	23.2
Internal Link Dist (m)		73.1	266.3	50.6
Turn Bay Length (m)				
Base Capacity (vph)		1918	2004	691
Starvation Cap Reductn		0	0	0
Spillback Cap Reductn		0	0	0
Storage Cap Reductn		0	0	0
Reduced v/c Ratio		0.20	0.20	0.32

Intersection Summary	
Cycle Length: 55	
Actuated Cycle Length: 55	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.48	
Intersection Signal Delay: 8.1	Intersection LOS: A
Intersection Capacity Utilization 37.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Brookfield & 20 m W of Hobson



MOVEMENT SUMMARY

Site: Brookfield/Airport Parkway/Flannery

PM Peak Hour - Existing Condition
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Flannery											
3	L2	33	3.0	0.128	5.9	LOS A	0.3	2.6	0.37	0.34	47.6
18	R2	44	3.0	0.128	5.9	LOS A	0.3	2.6	0.37	0.34	45.7
18b	R3	24	3.0	0.128	5.9	LOS A	0.3	2.6	0.37	0.34	49.3
Approach		101	3.0	0.128	5.9	LOS A	0.3	2.6	0.37	0.34	47.1
East: Airport Parkway Northbound											
1b	L3	1	3.0	0.114	4.4	LOS A	0.4	3.3	0.12	0.04	52.5
1	L2	16	3.0	0.114	4.4	LOS A	0.4	3.3	0.12	0.04	48.1
6	T1	104	3.0	0.114	4.4	LOS A	0.4	3.3	0.12	0.04	47.5
Approach		121	3.0	0.114	4.4	LOS A	0.4	3.3	0.12	0.04	47.6
NorthEast: Airport Parkway Southbound											
1bx	L3	10	3.0	0.551	11.2	LOS B	3.3	25.6	0.47	0.34	44.1
1ax	L1	236	3.0	0.551	11.2	LOS B	3.3	25.6	0.47	0.34	43.0
16ax	R1	270	3.0	0.551	11.2	LOS B	3.3	25.6	0.47	0.34	42.6
Approach		516	3.0	0.551	11.2	LOS B	3.3	25.6	0.47	0.34	42.8
West: Brookfield											
2	T1	330	3.0	0.394	9.0	LOS A	1.8	13.9	0.48	0.41	45.2
12a	R1	118	3.0	0.311	7.8	LOS A	1.3	10.1	0.45	0.37	51.9
12	R2	142	3.0	0.311	7.8	LOS A	1.3	10.1	0.45	0.37	46.5
Approach		590	3.0	0.394	8.5	LOS A	1.8	13.9	0.47	0.39	46.7
All Vehicles		1328	3.0	0.551	9.0	LOS A	3.3	25.6	0.43	0.34	45.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	399	0	4	443	43	20
Future Volume (Veh/h)	399	0	4	443	43	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	420	0	4	466	45	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	241			97		
pX, platoon unblocked					0.98	
vC, conflicting volume			420		661	210
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			420		602	210
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		89	97
cM capacity (veh/h)			1136		419	796

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	280	140	159	311	66
Volume Left	0	0	4	0	45
Volume Right	0	0	0	0	21
cSH	1700	1700	1136	1700	493
Volume to Capacity	0.16	0.08	0.00	0.18	0.13
Queue Length 95th (m)	0.0	0.0	0.1	0.0	3.5
Control Delay (s)	0.0	0.0	0.2	0.0	13.4
Lane LOS			A		B
Approach Delay (s)	0.0		0.1		13.4
Approach LOS					B

Intersection Summary				
Average Delay	1.0			
Intersection Capacity Utilization	26.4%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	42	399	413	30	33	195
Future Volume (Veh/h)	42	399	413	30	33	195
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	44	420	435	32	35	205
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		192	146			
pX, platoon unblocked						
vC, conflicting volume	467				749	234
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	467				749	234
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				90	73
cM capacity (veh/h)	1091				334	768

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	184	280	290	177	240
Volume Left	44	0	0	0	35
Volume Right	0	0	0	32	205
cSH	1091	1700	1700	1700	646
Volume to Capacity	0.04	0.16	0.17	0.10	0.37
Queue Length 95th (m)	1.0	0.0	0.0	0.0	13.0
Control Delay (s)	2.3	0.0	0.0	0.0	13.8
Lane LOS	A				B
Approach Delay (s)	0.9		0.0		13.8
Approach LOS					B

Intersection Summary				
Average Delay	3.2			
Intersection Capacity Utilization	50.6%	ICU Level of Service		A
Analysis Period (min)	15			

Appendix G

2019 Conditions: SYNCHRO and SIDRA Capacity Analysis and MMLoS

Multi-Modal Level of Service - Intersections Form

Consultant	**Parsons**	**Project**	**770 Brookfield**
Scenario	**Projected**	**Date**	**Jan-18**
Comments			

	INTERSECTIONS	Brookfield/Riverside				Brookfield/Canada Post			
	Crossing Side	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	9	9	5	5	0 - 2		4	4
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m		No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Protected/ Permissive	Protected/ Permissive	Protected	Protected	Permissive		Permissive	No left turn / Prohib.
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control		No right turn	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed		RTOR prohibited	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No	No		No	No
	Right Turn Channel	Conv'tl without Receiving Lane	Conventional with Receiving Lane	Smart Channel	Conv'tl without Receiving Lane	No Channel		No Channel	No Channel
	Corner Radius	15-25m	10-15m	10-15m	15-25m	5-10m		0-3m	5-10m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings		Std transverse markings	Std transverse markings
	PETSI Score	**-27**	**-28**	**51**	**47**	**86**		**64**	**62**
	Ped. Exposure to Traffic LoS	**F**	**F**	**D**	**D**	**B**	**-**	**C**	**C**
	Cycle Length	120	120	120	120	55		55	55
	Effective Walk Time	7	7	32	32	15		7	7
	Average Pedestrian Delay	**53**	**53**	**32**	**32**	**15**		**21**	**21**
	Pedestrian Delay LoS	**E**	**E**	**D**	**D**	**B**	**-**	**C**	**C**
	Level of Service	**F**	**F**	**D**	**D**	**B**	**-**	**C**	**C**
		F				**C**			
	Approach From	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic		Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP
	Right Turn Lane Configuration	≤ 50 m Introduced right turn lane	≤ 50 m	≤ 50 m	≤ 50 m			Not Applicable	Not Applicable
	Right Turning Speed	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h			Not Applicable	Not Applicable
	Cyclist relative to RT motorists	**B**	**D**	**D**	**D**	**#N/A**	**-**	**Not Applicable**	**Not Applicable**
	Separated or Mixed Traffic	**Separated**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**-**	**Separated**	**Separated**
	Left Turn Approach	≥ 2 lanes crossed	≥ 2 lanes crossed	One lane crossed	One lane crossed	No lane crossed		1 lane crossed	1 lane crossed
	Operating Speed	> 50 to < 60 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	> 40 to ≤ 50 km/h		> 50 to < 60 km/h	> 50 to < 60 km/h
	Left Turning Cyclist	**F**	**F**	**E**	**E**	**B**	**-**	**D**	**D**
	Level of Service	**F**	**F**	**E**	**E**	**#N/A**	**-**	**D**	**D**
		F				**#N/A**			
Transit	Average Signal Delay	> 40 sec	> 40 sec	> 40 sec	> 40 sec	≤ 10 sec		≤ 20 sec	≤ 20 sec
	Level of Service	**F**	**F**	**F**	**F**	**B**	**-**	**C**	**C**
		F				**C**			
Truck	Effective Corner Radius	> 15 m	10 - 15 m	10 - 15 m	> 15 m	< 10 m		< 10 m	
	Number of Receiving Lanes on Departure from Intersection	1	≥ 2	≥ 2	≥ 2	≥ 2		1	
	Level of Service	**C**	**B**	**B**	**A**	**D**	**-**	**F**	**-**
		C				**F**			
Auto	Volume to Capacity Ratio	> 1.00				0.0 - 0.60			
	Level of Service	**F**				**A**			

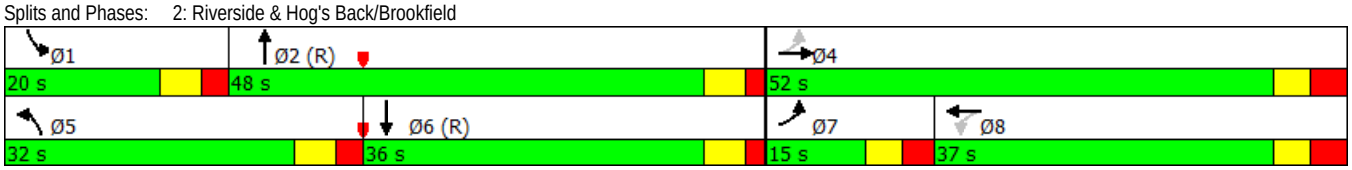
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	305	134	63	113	279	1219	178	613
Future Volume (vph)	305	134	63	113	279	1219	178	613
Lane Group Flow (vph)	321	302	66	233	294	1665	187	951
Turn Type	pm+pt	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases	7	4		8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	7	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.2	36.7	36.7	36.7	11.1	22.6	11.1	22.6
Total Split (s)	15.0	52.0	37.0	37.0	32.0	48.0	20.0	36.0
Total Split (%)	12.5%	43.3%	30.8%	30.8%	26.7%	40.0%	16.7%	30.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	3.4	3.4	3.4	2.4	1.9	2.4	1.9
Lost Time Adjust (s)	-2.2	-2.7	-2.7	-2.7	-2.1	-1.6	-2.1	-1.6
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	C-Max	Max	C-Max
Act Effct Green (s)	37.9	37.9	22.9	22.9	38.1	44.0	26.1	32.0
Actuated g/C Ratio	0.32	0.32	0.19	0.19	0.32	0.37	0.22	0.27
v/c Ratio	1.21	0.55	0.34	0.68	0.55	0.94	0.51	0.74
Control Delay	155.4	30.1	43.7	45.3	40.4	46.8	49.1	39.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	155.4	30.1	43.7	45.3	40.4	46.8	49.1	39.9
LOS	F	C	D	D	D	D	D	D
Approach Delay		94.6		45.0		45.8		41.4
Approach LOS		F		D		D		D
Queue Length 50th (m)	~65.1	47.8	13.8	43.1	56.6	133.0	38.8	67.8
Queue Length 95th (m)	#121.4	65.9	23.0	63.2	#96.7	#165.5	#80.3	83.7
Internal Link Dist (m)		152.7		116.6		209.7		156.3
Turn Bay Length (m)	18.0				140.0		135.0	
Base Capacity (vph)	266	684	281	480	538	1770	368	1291
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	1.21	0.44	0.23	0.49	0.55	0.94	0.51	0.74

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 91 (76%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 105	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.21	
Intersection Signal Delay: 52.1	Intersection LOS: D
Intersection Capacity Utilization 88.7%	ICU Level of Service E
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: Riverside & Hog's Back/Brookfield



Lane Group	EBL	EBT	WBT	SBL
Lane Configurations				
Traffic Volume (vph)	30	357	234	11
Future Volume (vph)	30	357	234	11
Lane Group Flow (vph)	0	408	382	20
Turn Type	Perm	NA	NA	Prot
Protected Phases		2	6	4
Permitted Phases	2			
Detector Phase	2	2	6	4
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	26.2	26.2	26.2	25.5
Total Split (s)	34.0	34.0	34.0	26.0
Total Split (%)	56.7%	56.7%	56.7%	43.3%
Yellow Time (s)	3.3	3.3	3.3	3.3
All-Red Time (s)	1.9	1.9	1.9	2.2
Lost Time Adjust (s)		-1.2	-1.2	-1.5
Total Lost Time (s)		4.0	4.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	C-Max	None
Act Effct Green (s)		54.1	54.1	13.5
Actuated g/C Ratio		0.90	0.90	0.22
v/c Ratio		0.15	0.13	0.05
Control Delay		2.6	2.0	12.8
Queue Delay		0.0	0.0	0.0
Total Delay		2.6	2.0	12.8
LOS		A	A	B
Approach Delay		2.6	2.0	12.8
Approach LOS		A	A	B
Queue Length 50th (m)		0.0	0.0	1.1
Queue Length 95th (m)		m20.2	13.1	4.4
Internal Link Dist (m)		65.5	4.1	50.6
Turn Bay Length (m)				
Base Capacity (vph)		2791	2883	603
Starvation Cap Reductn		0	0	0
Spillback Cap Reductn		0	0	0
Storage Cap Reductn		0	0	0
Reduced v/c Ratio		0.15	0.13	0.03

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.15	
Intersection Signal Delay: 2.6	Intersection LOS: A
Intersection Capacity Utilization 47.4%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 3: Brookfield & 20 m W of Hobson

MOVEMENT SUMMARY

Site: Brookfield/Airport Parkway/Flannery

AM Peak Hour - Projected 2019
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Flannery											
3	L2	87	3.0	0.337	8.3	LOS A	1.1	8.2	0.41	0.40	46.6
18	R2	100	3.0	0.337	8.3	LOS A	1.1	8.2	0.41	0.40	44.8
18b	R3	91	3.0	0.337	8.3	LOS A	1.1	8.2	0.41	0.40	48.2
Approach		278	3.0	0.337	8.3	LOS A	1.1	8.2	0.41	0.40	46.5
East: Airport Parkway Northbound											
1b	L3	1	3.0	0.233	5.8	LOS A	1.0	7.5	0.24	0.13	51.9
1	L2	4	3.0	0.233	5.8	LOS A	1.0	7.5	0.24	0.13	47.5
6	T1	229	3.0	0.233	5.8	LOS A	1.0	7.5	0.24	0.13	47.0
Approach		234	3.0	0.233	5.8	LOS A	1.0	7.5	0.24	0.13	47.0
NorthEast: Airport Parkway Southbound											
1bx	L3	3	3.0	0.274	7.7	LOS A	1.1	8.4	0.47	0.41	46.8
1ax	L1	31	3.0	0.274	7.7	LOS A	1.1	8.4	0.47	0.41	45.6
16ax	R1	182	3.0	0.274	7.7	LOS A	1.1	8.4	0.47	0.41	45.2
Approach		216	3.0	0.274	7.7	LOS A	1.1	8.4	0.47	0.41	45.3
West: Brookfield											
2	T1	282	3.0	0.268	6.0	LOS A	1.2	9.1	0.16	0.06	46.9
12a	R1	109	3.0	0.169	5.0	LOS A	0.7	5.1	0.14	0.05	55.0
12	R2	69	3.0	0.169	5.0	LOS A	0.7	5.1	0.14	0.05	48.9
Approach		460	3.0	0.268	5.6	LOS A	1.2	9.1	0.15	0.06	48.9
All Vehicles		1188	3.0	0.337	6.6	LOS A	1.2	9.1	0.29	0.21	47.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	378	71	42	200	18	19
Future Volume (Veh/h)	378	71	42	200	18	19
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	398	75	44	211	19	20
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	249			90		
pX, platoon unblocked						
vC, conflicting volume			473		629	236
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			473		629	236
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		95	97
cM capacity (veh/h)			1085		398	765

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	265	208	114	141	39
Volume Left	0	0	44	0	19
Volume Right	0	75	0	0	20
cSH	1700	1700	1085	1700	528
Volume to Capacity	0.16	0.12	0.04	0.08	0.07
Queue Length 95th (m)	0.0	0.0	1.0	0.0	1.8
Control Delay (s)	0.0	0.0	3.5	0.0	12.4
Lane LOS			A		B
Approach Delay (s)	0.0		1.6		12.4
Approach LOS					B

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	228	451	172	45	12	39
Future Volume (Veh/h)	228	451	172	45	12	39
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	240	475	181	47	13	41
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		194	144			
pX, platoon unblocked						
vC, conflicting volume	228				922	114
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	228				922	114
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	82				94	96
cM capacity (veh/h)	1337				221	917

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	398	317	121	107	54
Volume Left	240	0	0	0	13
Volume Right	0	0	0	47	41
cSH	1337	1700	1700	1700	521
Volume to Capacity	0.18	0.19	0.07	0.06	0.10
Queue Length 95th (m)	5.0	0.0	0.0	0.0	2.6
Control Delay (s)	5.6	0.0	0.0	0.0	12.7
Lane LOS	A				B
Approach Delay (s)	3.1		0.0		12.7
Approach LOS					B

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	40.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	399	5	1	261	0	0
Future Volume (Veh/h)	399	5	1	261	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	420	5	1	275	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	141			198		
pX, platoon unblocked						
vC, conflicting volume			425		562	212
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			425		562	212
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1131		457	793

Direction, Lane #	EB 1	EB 2	WB 1	WB 2
Volume Total	280	145	93	183
Volume Left	0	0	1	0
Volume Right	0	5	0	0
cSH	1700	1700	1131	1700
Volume to Capacity	0.16	0.09	0.00	0.11
Queue Length 95th (m)	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.1	0.0
Lane LOS			A	
Approach Delay (s)	0.0		0.0	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	15.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	368	0	0	366	0	0
Future Volume (Veh/h)	368	0	0	366	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	387	0	0	385	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	28					
pX, platoon unblocked			0.98		0.98	0.98
vC, conflicting volume			387		580	194
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			333		529	135
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1198		469	871

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	194	194	192	192	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	1700
Volume to Capacity	0.11	0.11	0.11	0.11	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS					A
Approach Delay (s)	0.0		0.0		0.0
Approach LOS					A

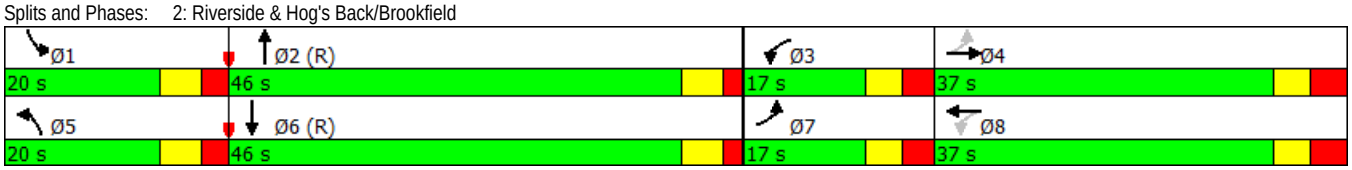
Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	281	124	289	182	162	732	240	1263
Future Volume (vph)	281	124	289	182	162	732	240	1263
Lane Group Flow (vph)	296	443	304	335	171	873	253	1790
Turn Type	pm+pt	NA	pm+pt	NA	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.2	36.7	11.2	36.7	11.1	22.6	11.1	22.6
Total Split (s)	17.0	37.0	17.0	37.0	20.0	46.0	20.0	46.0
Total Split (%)	14.2%	30.8%	14.2%	30.8%	16.7%	38.3%	16.7%	38.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	3.4	2.9	3.4	2.4	1.9	2.4	1.9
Lost Time Adjust (s)	-2.2	-2.7	-2.2	-2.7	-2.1	-1.6	-2.1	-1.6
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	C-Max	Max	C-Max
Act Effct Green (s)	44.7	31.7	44.7	31.7	17.3	42.0	17.3	42.0
Actuated g/C Ratio	0.37	0.26	0.37	0.26	0.14	0.35	0.14	0.35
v/c Ratio	0.95	0.91	1.25	0.73	0.70	0.52	1.03	1.06
Control Delay	70.7	57.1	170.7	46.2	65.7	31.5	117.2	75.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	70.7	57.1	170.7	46.2	65.7	31.5	117.2	75.8
LOS	E	E	F	D	E	C	F	E
Approach Delay		62.5		105.5		37.1		80.9
Approach LOS		E		F		D		F
Queue Length 50th (m)	48.5	80.3	~73.2	64.7	39.3	57.9	~68.6	~165.0
Queue Length 95th (m)	#88.1	#138.3	#128.5	97.8	#72.0	71.0	#119.1	#195.0
Internal Link Dist (m)		152.7		124.6		209.7		156.3
Turn Bay Length (m)	18.0				140.0		135.0	
Base Capacity (vph)	310	503	243	479	245	1683	245	1690
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	0.95	0.88	1.25	0.70	0.70	0.52	1.03	1.06

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 84 (70%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.25	
Intersection Signal Delay: 71.1	Intersection LOS: E
Intersection Capacity Utilization 102.5%	ICU Level of Service G
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.

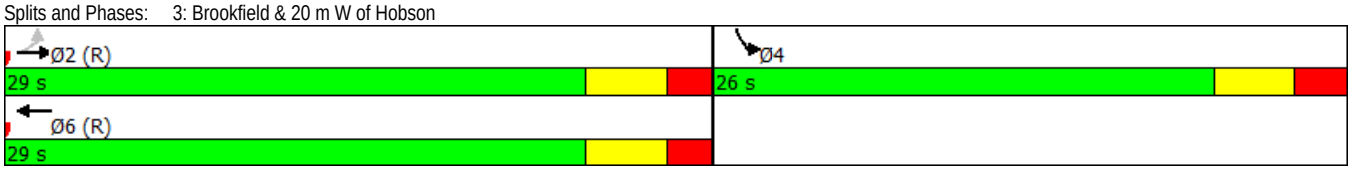
Splits and Phases: 2: Riverside & Hog's Back/Brookfield



Lane Group	EBL	EBT	WBT	SBL
Lane Configurations				
Traffic Volume (vph)	4	376	394	136
Future Volume (vph)	4	376	394	136
Lane Group Flow (vph)	0	400	430	224
Turn Type	Perm	NA	NA	Prot
Protected Phases		2	6	4
Permitted Phases	2			
Detector Phase	2	2	6	4
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	26.2	26.2	26.2	25.5
Total Split (s)	29.0	29.0	29.0	26.0
Total Split (%)	52.7%	52.7%	52.7%	47.3%
Yellow Time (s)	3.3	3.3	3.3	3.3
All-Red Time (s)	1.9	1.9	1.9	2.2
Lost Time Adjust (s)		-1.2	-1.2	-1.5
Total Lost Time (s)		4.0	4.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	C-Max	None
Act Effct Green (s)		32.7	32.7	14.3
Actuated g/C Ratio		0.59	0.59	0.26
v/c Ratio		0.21	0.21	0.47
Control Delay		6.3	6.2	14.8
Queue Delay		0.0	0.0	0.0
Total Delay		6.3	6.2	14.8
LOS		A	A	B
Approach Delay		6.3	6.2	14.8
Approach LOS		A	A	B
Queue Length 50th (m)		7.3	7.6	13.9
Queue Length 95th (m)		19.2	20.0	23.1
Internal Link Dist (m)		73.1	3.0	50.6
Turn Bay Length (m)				
Base Capacity (vph)		1918	2009	694
Starvation Cap Reductn		0	0	0
Spillback Cap Reductn		0	0	0
Storage Cap Reductn		0	0	0
Reduced v/c Ratio		0.21	0.21	0.32

Intersection Summary	
Cycle Length: 55	
Actuated Cycle Length: 55	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 8.1	Intersection LOS: A
Intersection Capacity Utilization 33.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Brookfield & 20 m W of Hobson



MOVEMENT SUMMARY

Site: Brookfield/Airport Parkway/Flannery

PM Peak Hour - Projected 2019
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Flannery											
3	L2	36	3.0	0.134	6.0	LOS A	0.3	2.7	0.38	0.35	47.4
18	R2	44	3.0	0.134	6.0	LOS A	0.3	2.7	0.38	0.35	45.5
18b	R3	24	3.0	0.134	6.0	LOS A	0.3	2.7	0.38	0.35	49.1
Approach		104	3.0	0.134	6.0	LOS A	0.3	2.7	0.38	0.35	47.0
East: Airport Parkway Northbound											
1b	L3	1	3.0	0.116	4.4	LOS A	0.4	3.3	0.13	0.04	52.5
1	L2	16	3.0	0.116	4.4	LOS A	0.4	3.3	0.13	0.04	48.0
6	T1	106	3.0	0.116	4.4	LOS A	0.4	3.3	0.13	0.04	47.5
Approach		123	3.0	0.116	4.4	LOS A	0.4	3.3	0.13	0.04	47.6
NorthEast: Airport Parkway Southbound											
1bx	L3	10	3.0	0.569	11.7	LOS B	3.5	27.0	0.49	0.36	43.9
1ax	L1	236	3.0	0.569	11.7	LOS B	3.5	27.0	0.49	0.36	42.8
16ax	R1	284	3.0	0.569	11.7	LOS B	3.5	27.0	0.49	0.36	42.4
Approach		530	3.0	0.569	11.7	LOS B	3.5	27.0	0.49	0.36	42.6
West: Brookfield											
2	T1	349	3.0	0.417	9.4	LOS A	1.9	15.1	0.50	0.42	45.0
12a	R1	118	3.0	0.316	7.9	LOS A	1.3	10.3	0.45	0.37	51.8
12	R2	146	3.0	0.316	7.9	LOS A	1.3	10.3	0.45	0.37	46.4
Approach		613	3.0	0.417	8.8	LOS A	1.9	15.1	0.48	0.40	46.5
All Vehicles		1370	3.0	0.569	9.3	LOS A	3.5	27.0	0.44	0.35	45.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	404	12	20	453	64	37
Future Volume (Veh/h)	404	12	20	453	64	37
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	425	13	21	477	67	39
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	241			97		
pX, platoon unblocked					0.97	
vC, conflicting volume			438		712	219
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			438		640	219
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		83	95
cM capacity (veh/h)			1118		388	785

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	283	155	180	318	106
Volume Left	0	0	21	0	67
Volume Right	0	13	0	0	39
cSH	1700	1700	1118	1700	477
Volume to Capacity	0.17	0.09	0.02	0.19	0.22
Queue Length 95th (m)	0.0	0.0	0.4	0.0	6.4
Control Delay (s)	0.0	0.0	1.1	0.0	14.7
Lane LOS			A		B
Approach Delay (s)	0.0		0.4		14.7
Approach LOS					B

Intersection Summary				
Average Delay	1.7			
Intersection Capacity Utilization	41.5%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	42	416	443	30	33	195
Future Volume (Veh/h)	42	416	443	30	33	195
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	44	438	466	32	35	205
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		192	146			
pX, platoon unblocked						
vC, conflicting volume	498				789	249
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	498				789	249
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				89	73
cM capacity (veh/h)	1062				314	751

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	190	292	311	187	240
Volume Left	44	0	0	0	35
Volume Right	0	0	0	32	205
cSH	1062	1700	1700	1700	624
Volume to Capacity	0.04	0.17	0.18	0.11	0.38
Queue Length 95th (m)	1.0	0.0	0.0	0.0	13.7
Control Delay (s)	2.3	0.0	0.0	0.0	14.3
Lane LOS	A				B
Approach Delay (s)	0.9		0.0		14.3
Approach LOS					B

Intersection Summary				
Average Delay	3.2			
Intersection Capacity Utilization	52.0%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	450	11	3	471	0	0
Future Volume (Veh/h)	450	11	3	471	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	474	12	3	496	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	149			190		
pX, platoon unblocked						
vC, conflicting volume			486		734	243
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			486		734	243
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1073		354	758

Direction, Lane #	EB 1	EB 2	WB 1	WB 2
Volume Total	316	170	168	331
Volume Left	0	0	3	0
Volume Right	0	12	0	0
cSH	1700	1700	1073	1700
Volume to Capacity	0.19	0.10	0.00	0.19
Queue Length 95th (m)	0.0	0.0	0.1	0.0
Control Delay (s)	0.0	0.0	0.2	0.0
Lane LOS			A	
Approach Delay (s)	0.0		0.1	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	19.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	515	0	0	409	0	0
Future Volume (Veh/h)	515	0	0	409	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	542	0	0	431	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	27					
pX, platoon unblocked			0.95		0.95	0.95
vC, conflicting volume			542		758	271
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			416		643	131
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1084		386	850

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	271	271	216	216	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	1700
Volume to Capacity	0.16	0.16	0.13	0.13	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS					A
Approach Delay (s)	0.0		0.0		0.0
Approach LOS					A

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	18.4%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix H

2022 Conditions: SYNCHRO and SIDRA Capacity Analysis

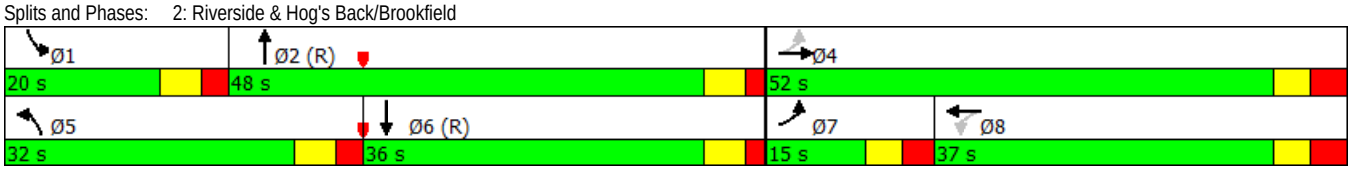
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	305	138	63	124	279	1256	180	632
Future Volume (vph)	305	138	63	124	279	1256	180	632
Lane Group Flow (vph)	321	306	66	253	294	1704	189	971
Turn Type	pm+pt	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases	7	4		8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	7	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.2	36.7	36.7	36.7	11.1	22.6	11.1	22.6
Total Split (s)	15.0	52.0	37.0	37.0	32.0	48.0	20.0	36.0
Total Split (%)	12.5%	43.3%	30.8%	30.8%	26.7%	40.0%	16.7%	30.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	3.4	3.4	3.4	2.4	1.9	2.4	1.9
Lost Time Adjust (s)	-2.2	-2.7	-2.7	-2.7	-2.1	-1.6	-2.1	-1.6
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	C-Max	Max	C-Max
Act Effct Green (s)	39.1	39.1	24.1	24.1	36.9	44.0	24.9	32.0
Actuated g/C Ratio	0.33	0.33	0.20	0.20	0.31	0.37	0.21	0.27
v/c Ratio	1.22	0.54	0.32	0.70	0.56	0.96	0.54	0.75
Control Delay	160.1	29.5	42.4	46.7	41.6	50.3	50.9	40.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	160.1	29.5	42.4	46.7	41.6	50.3	50.9	40.6
LOS	F	C	D	D	D	D	D	D
Approach Delay		96.3		45.8		49.0		42.3
Approach LOS		F		D		D		D
Queue Length 50th (m)	~65.6	47.9	13.4	47.7	57.9	138.2	40.0	70.0
Queue Length 95th (m)	#124.6	67.2	23.1	69.5	#96.7	#172.7	#81.8	86.3
Internal Link Dist (m)		152.7		116.6		209.7		156.3
Turn Bay Length (m)	18.0				140.0		135.0	
Base Capacity (vph)	263	684	280	480	521	1769	352	1291
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	1.22	0.45	0.24	0.53	0.56	0.96	0.54	0.75

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 91 (76%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.22	
Intersection Signal Delay: 54.1	Intersection LOS: D
Intersection Capacity Utilization 90.6%	ICU Level of Service E
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: Riverside & Hog's Back/Brookfield



Lane Group	EBL	EBT	WBT	SBL
Lane Configurations				
Traffic Volume (vph)	30	368	248	11
Future Volume (vph)	30	368	248	11
Lane Group Flow (vph)	0	419	397	20
Turn Type	Perm	NA	NA	Prot
Protected Phases		2	6	4
Permitted Phases	2			
Detector Phase	2	2	6	4
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	26.2	26.2	26.2	25.5
Total Split (s)	34.0	34.0	34.0	26.0
Total Split (%)	56.7%	56.7%	56.7%	43.3%
Yellow Time (s)	3.3	3.3	3.3	3.3
All-Red Time (s)	1.9	1.9	1.9	2.2
Lost Time Adjust (s)		-1.2	-1.2	-1.5
Total Lost Time (s)		4.0	4.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	C-Max	None
Act Effct Green (s)		54.1	54.1	13.5
Actuated g/C Ratio		0.90	0.90	0.22
v/c Ratio		0.15	0.14	0.05
Control Delay		2.6	2.1	12.8
Queue Delay		0.0	0.0	0.0
Total Delay		2.6	2.1	12.8
LOS		A	A	B
Approach Delay		2.6	2.1	12.8
Approach LOS		A	A	B
Queue Length 50th (m)		0.0	0.0	1.1
Queue Length 95th (m)		m20.7	13.6	4.4
Internal Link Dist (m)		65.5	4.1	50.6
Turn Bay Length (m)				
Base Capacity (vph)		2788	2914	606
Starvation Cap Reductn		0	0	0
Spillback Cap Reductn		0	0	0
Storage Cap Reductn		0	0	0
Reduced v/c Ratio		0.15	0.14	0.03

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.15	
Intersection Signal Delay: 2.6	Intersection LOS: A
Intersection Capacity Utilization 41.6%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 3: Brookfield & 20 m W of Hobson

MOVEMENT SUMMARY

Site: Brookfield/Airport Parkway/Flannery

AM Peak Hour - Projected 2022
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Flannery											
3	L2	87	3.0	0.344	8.5	LOS A	1.1	8.4	0.43	0.42	46.5
18	R2	100	3.0	0.344	8.5	LOS A	1.1	8.4	0.43	0.42	44.7
18b	R3	91	3.0	0.344	8.5	LOS A	1.1	8.4	0.43	0.42	48.1
Approach		278	3.0	0.344	8.5	LOS A	1.1	8.4	0.43	0.42	46.3
East: Airport Parkway Northbound											
1b	L3	1	3.0	0.239	5.9	LOS A	1.0	7.7	0.24	0.13	51.8
1	L2	4	3.0	0.239	5.9	LOS A	1.0	7.7	0.24	0.13	47.5
6	T1	235	3.0	0.239	5.9	LOS A	1.0	7.7	0.24	0.13	46.9
Approach		240	3.0	0.239	5.9	LOS A	1.0	7.7	0.24	0.13	47.0
NorthEast: Airport Parkway Southbound											
1bx	L3	3	3.0	0.285	7.8	LOS A	1.1	8.8	0.48	0.42	46.7
1ax	L1	31	3.0	0.285	7.8	LOS A	1.1	8.8	0.48	0.42	45.5
16ax	R1	189	3.0	0.285	7.8	LOS A	1.1	8.8	0.48	0.42	45.1
Approach		223	3.0	0.285	7.8	LOS A	1.1	8.8	0.48	0.42	45.2
West: Brookfield											
2	T1	302	3.0	0.287	6.2	LOS A	1.3	9.9	0.16	0.06	46.8
12a	R1	115	3.0	0.175	5.0	LOS A	0.7	5.3	0.14	0.05	55.0
12	R2	69	3.0	0.175	5.0	LOS A	0.7	5.3	0.14	0.05	49.0
Approach		486	3.0	0.287	5.8	LOS A	1.3	9.9	0.15	0.06	48.8
All Vehicles		1228	3.0	0.344	6.8	LOS A	1.3	9.9	0.29	0.22	47.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	390	74	47	208	33	20
Future Volume (Veh/h)	390	74	47	208	33	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	411	78	49	219	35	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	249			90		
pX, platoon unblocked						
vC, conflicting volume			489		658	244
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			489		658	244
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		91	97
cM capacity (veh/h)			1070		379	756

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	274	215	122	146	56
Volume Left	0	0	49	0	35
Volume Right	0	78	0	0	21
cSH	1700	1700	1070	1700	466
Volume to Capacity	0.16	0.13	0.05	0.09	0.12
Queue Length 95th (m)	0.0	0.0	1.1	0.0	3.1
Control Delay (s)	0.0	0.0	3.7	0.0	13.8
Lane LOS			A		B
Approach Delay (s)	0.0		1.7		13.8
Approach LOS					B

Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	34.7%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	228	467	194	45	12	39
Future Volume (Veh/h)	228	467	194	45	12	39
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	240	492	204	47	13	41
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		194	144			
pX, platoon unblocked						
vC, conflicting volume	251				954	126
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	251				954	126
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	82				94	95
cM capacity (veh/h)	1311				210	902

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	404	328	136	115	54
Volume Left	240	0	0	0	13
Volume Right	0	0	0	47	41
cSH	1311	1700	1700	1700	503
Volume to Capacity	0.18	0.19	0.08	0.07	0.11
Queue Length 95th (m)	5.1	0.0	0.0	0.0	2.7
Control Delay (s)	5.7	0.0	0.0	0.0	13.0
Lane LOS	A				B
Approach Delay (s)	3.1		0.0		13.0
Approach LOS					B

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	414	8	3	283	0	0
Future Volume (Veh/h)	414	8	3	283	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	436	8	3	298	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	141			198		
pX, platoon unblocked						
vC, conflicting volume			444		595	222
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			444		595	222
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1112		434	782

Direction, Lane #	EB 1	EB 2	WB 1	WB 2
Volume Total	291	153	102	199
Volume Left	0	0	3	0
Volume Right	0	8	0	0
cSH	1700	1700	1112	1700
Volume to Capacity	0.17	0.09	0.00	0.12
Queue Length 95th (m)	0.0	0.0	0.1	0.0
Control Delay (s)	0.0	0.0	0.3	0.0
Lane LOS			A	
Approach Delay (s)	0.0		0.1	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	15.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	380	0	0	384	0	14
Future Volume (Veh/h)	380	0	0	384	0	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	400	0	0	404	0	15
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	28					
pX, platoon unblocked			0.98		0.98	0.98
vC, conflicting volume			400		602	200
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			342		549	138
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	98
cM capacity (veh/h)			1187		456	866

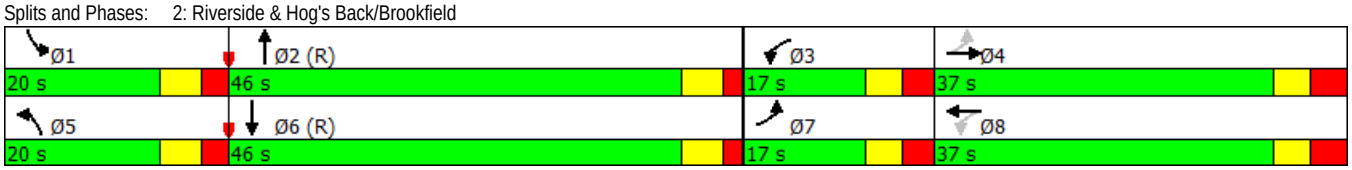
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	200	200	202	202	15
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	15
cSH	1700	1700	1700	1700	866
Volume to Capacity	0.12	0.12	0.12	0.12	0.02
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.4
Control Delay (s)	0.0	0.0	0.0	0.0	9.2
Lane LOS					A
Approach Delay (s)	0.0		0.0		9.2
Approach LOS					A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	21.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	281	131	289	194	162	755	247	1301
Future Volume (vph)	281	131	289	194	162	755	247	1301
Lane Group Flow (vph)	296	450	304	353	171	897	260	1830
Turn Type	pm+pt	NA	pm+pt	NA	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.2	36.7	11.2	36.7	11.1	22.6	11.1	22.6
Total Split (s)	17.0	37.0	17.0	37.0	20.0	46.0	20.0	46.0
Total Split (%)	14.2%	30.8%	14.2%	30.8%	16.7%	38.3%	16.7%	38.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	3.4	2.9	3.4	2.4	1.9	2.4	1.9
Lost Time Adjust (s)	-2.2	-2.7	-2.2	-2.7	-2.1	-1.6	-2.1	-1.6
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	C-Max	Max	C-Max
Act Effct Green (s)	44.9	31.9	44.9	31.9	17.1	42.0	17.1	42.0
Actuated g/C Ratio	0.37	0.27	0.37	0.27	0.14	0.35	0.14	0.35
v/c Ratio	0.99	0.92	1.25	0.76	0.71	0.53	1.08	1.08
Control Delay	80.2	59.6	171.5	48.5	66.6	31.8	129.1	84.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	80.2	59.6	171.5	48.5	66.6	31.8	129.1	84.1
LOS	F	E	F	D	E	C	F	F
Approach Delay		67.8		105.4		37.4		89.7
Approach LOS		E		F		D		F
Queue Length 50th (m)	48.5	83.6	~73.5	69.7	39.3	59.9	~72.0	~172.4
Queue Length 95th (m)	#94.2	#143.4	#128.8	104.4	#72.0	73.2	#123.5	#202.3
Internal Link Dist (m)		152.7		124.6		209.7		156.3
Turn Bay Length (m)	18.0				140.0		135.0	
Base Capacity (vph)	298	501	243	479	241	1684	241	1690
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	0.99	0.90	1.25	0.74	0.71	0.53	1.08	1.08

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 84 (70%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.25	
Intersection Signal Delay: 76.1	Intersection LOS: E
Intersection Capacity Utilization 103.7%	ICU Level of Service G
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.	

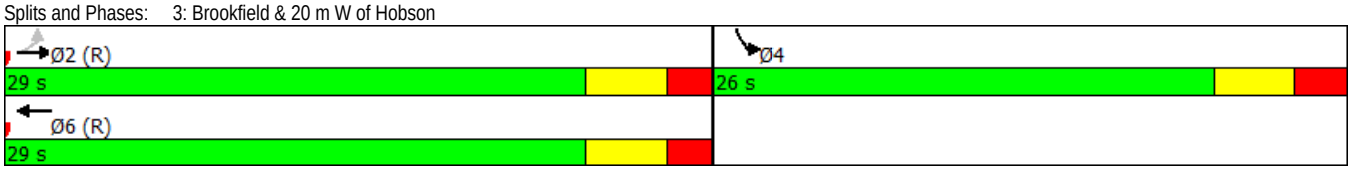
Splits and Phases: 2: Riverside & Hog's Back/Brookfield



Lane Group	EBL	EBT	WBT	SBL
Lane Configurations				
Traffic Volume (vph)	4	388	421	136
Future Volume (vph)	4	388	421	136
Lane Group Flow (vph)	0	412	458	224
Turn Type	Perm	NA	NA	Prot
Protected Phases		2	6	4
Permitted Phases	2			
Detector Phase	2	2	6	4
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	26.2	26.2	26.2	25.5
Total Split (s)	29.0	29.0	29.0	26.0
Total Split (%)	52.7%	52.7%	52.7%	47.3%
Yellow Time (s)	3.3	3.3	3.3	3.3
All-Red Time (s)	1.9	1.9	1.9	2.2
Lost Time Adjust (s)		-1.2	-1.2	-1.5
Total Lost Time (s)		4.0	4.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	C-Max	None
Act Effct Green (s)		32.7	32.7	14.3
Actuated g/C Ratio		0.59	0.59	0.26
v/c Ratio		0.21	0.23	0.47
Control Delay		6.4	6.3	14.8
Queue Delay		0.0	0.0	0.0
Total Delay		6.4	6.3	14.8
LOS		A	A	B
Approach Delay		6.4	6.3	14.8
Approach LOS		A	A	B
Queue Length 50th (m)		7.5	8.3	13.9
Queue Length 95th (m)		19.8	21.4	23.1
Internal Link Dist (m)		73.1	3.0	50.6
Turn Bay Length (m)				
Base Capacity (vph)		1918	2008	694
Starvation Cap Reductn		0	0	0
Spillback Cap Reductn		0	0	0
Storage Cap Reductn		0	0	0
Reduced v/c Ratio		0.21	0.23	0.32

Intersection Summary	
Cycle Length: 55	
Actuated Cycle Length: 55	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 8.1	Intersection LOS: A
Intersection Capacity Utilization 33.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Brookfield & 20 m W of Hobson



MOVEMENT SUMMARY

Site: Brookfield/Airport Parkway/Flannery

PM Peak Hour - Projected 2022
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Flannery											
3	L2	36	3.0	0.136	6.1	LOS A	0.4	2.8	0.39	0.37	47.3
18	R2	44	3.0	0.136	6.1	LOS A	0.4	2.8	0.39	0.37	45.4
18b	R3	24	3.0	0.136	6.1	LOS A	0.4	2.8	0.39	0.37	49.0
Approach		104	3.0	0.136	6.1	LOS A	0.4	2.8	0.39	0.37	46.9
East: Airport Parkway Northbound											
1b	L3	1	3.0	0.119	4.5	LOS A	0.4	3.4	0.13	0.04	52.4
1	L2	16	3.0	0.119	4.5	LOS A	0.4	3.4	0.13	0.04	48.0
6	T1	109	3.0	0.119	4.5	LOS A	0.4	3.4	0.13	0.04	47.5
Approach		126	3.0	0.119	4.5	LOS A	0.4	3.4	0.13	0.04	47.6
NorthEast: Airport Parkway Southbound											
1bx	L3	10	3.0	0.587	12.2	LOS B	3.7	28.6	0.51	0.38	43.7
1ax	L1	236	3.0	0.587	12.2	LOS B	3.7	28.6	0.51	0.38	42.6
16ax	R1	299	3.0	0.587	12.2	LOS B	3.7	28.6	0.51	0.38	42.2
Approach		545	3.0	0.587	12.2	LOS B	3.7	28.6	0.51	0.38	42.4
West: Brookfield											
2	T1	369	3.0	0.441	9.9	LOS A	2.1	16.4	0.51	0.44	44.8
12a	R1	123	3.0	0.321	7.9	LOS A	1.4	10.5	0.45	0.37	51.8
12	R2	146	3.0	0.321	7.9	LOS A	1.4	10.5	0.45	0.37	46.4
Approach		638	3.0	0.441	9.0	LOS A	2.1	16.4	0.48	0.41	46.4
All Vehicles		1413	3.0	0.587	9.6	LOS A	3.7	28.6	0.46	0.36	44.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	416	20	32	470	75	38
Future Volume (Veh/h)	416	20	32	470	75	38
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	438	21	34	495	79	40
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	241			97		
pX, platoon unblocked					0.96	
vC, conflicting volume			459		764	230
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			459		678	230
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		78	95
cM capacity (veh/h)			1098		360	773

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	292	167	199	330	119
Volume Left	0	0	34	0	79
Volume Right	0	21	0	0	40
cSH	1700	1700	1098	1700	439
Volume to Capacity	0.17	0.10	0.03	0.19	0.27
Queue Length 95th (m)	0.0	0.0	0.7	0.0	8.3
Control Delay (s)	0.0	0.0	1.7	0.0	16.2
Lane LOS			A		C
Approach Delay (s)	0.0		0.6		16.2
Approach LOS					C

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	42	436	470	30	33	195
Future Volume (Veh/h)	42	436	470	30	33	195
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	44	459	495	32	35	205
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		192	146			
pX, platoon unblocked						
vC, conflicting volume	527				828	264
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	527				828	264
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				88	72
cM capacity (veh/h)	1036				296	735

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	197	306	330	197	240
Volume Left	44	0	0	0	35
Volume Right	0	0	0	32	205
cSH	1036	1700	1700	1700	604
Volume to Capacity	0.04	0.18	0.19	0.12	0.40
Queue Length 95th (m)	1.0	0.0	0.0	0.0	14.4
Control Delay (s)	2.2	0.0	0.0	0.0	14.8
Lane LOS	A				B
Approach Delay (s)	0.9		0.0		14.8
Approach LOS					B

Intersection Summary				
Average Delay	3.1			
Intersection Capacity Utilization	53.4%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	471	17	6	496	0	0
Future Volume (Veh/h)	471	17	6	496	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	496	18	6	522	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	149			190		
pX, platoon unblocked						
vC, conflicting volume			514		778	257
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			514		778	257
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1048		331	742

Direction, Lane #	EB 1	EB 2	WB 1	WB 2
Volume Total	331	183	180	348
Volume Left	0	0	6	0
Volume Right	0	18	0	0
cSH	1700	1700	1048	1700
Volume to Capacity	0.19	0.11	0.01	0.20
Queue Length 95th (m)	0.0	0.0	0.1	0.0
Control Delay (s)	0.0	0.0	0.3	0.0
Lane LOS			A	
Approach Delay (s)	0.0		0.1	
Approach LOS				

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	22.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	531	0	0	436	0	10
Future Volume (Veh/h)	531	0	0	436	0	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	559	0	0	459	0	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	27					
pX, platoon unblocked			0.95		0.95	0.95
vC, conflicting volume			559		788	280
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			429		670	134
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1070		370	845

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	280	280	230	230	11
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	11
cSH	1700	1700	1700	1700	845
Volume to Capacity	0.16	0.16	0.14	0.14	0.01
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.3
Control Delay (s)	0.0	0.0	0.0	0.0	9.3
Lane LOS					A
Approach Delay (s)	0.0		0.0		9.3
Approach LOS					A

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	25.5%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix I

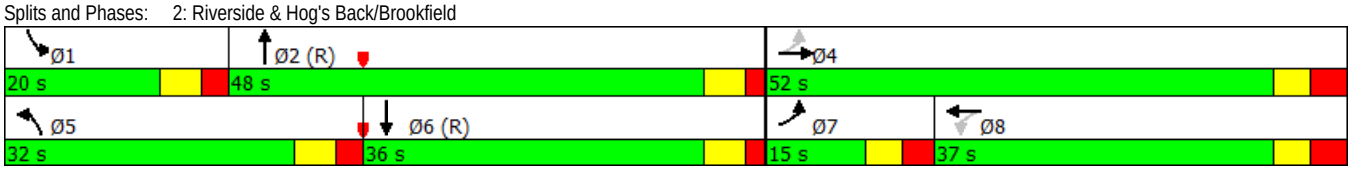
2027 Conditions: SYNCHRO and SIDRA Capacity Analysis

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	305	138	63	130	279	1320	180	664
Future Volume (vph)	305	138	63	130	279	1320	180	664
Lane Group Flow (vph)	321	306	66	259	294	1771	189	1005
Turn Type	pm+pt	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases	7	4		8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	7	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	10.0	10.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.2	36.7	36.7	36.7	11.1	22.6	11.1	22.6
Total Split (s)	15.0	52.0	37.0	37.0	32.0	48.0	20.0	36.0
Total Split (%)	12.5%	43.3%	30.8%	30.8%	26.7%	40.0%	16.7%	30.0%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	3.4	3.4	3.4	2.4	1.9	2.4	1.9
Lost Time Adjust (s)	-2.2	-2.7	-2.7	-2.7	-2.1	-1.6	-2.1	-1.6
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes		Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	C-Max	Max	C-Max
Act Effct Green (s)	39.5	39.5	24.5	24.5	36.5	44.0	24.5	32.0
Actuated g/C Ratio	0.33	0.33	0.20	0.20	0.30	0.37	0.20	0.27
v/c Ratio	1.22	0.53	0.32	0.71	0.57	1.00	0.55	0.78
Control Delay	159.9	29.1	41.8	47.2	42.2	58.3	51.7	41.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	159.9	29.1	41.8	47.2	42.2	58.3	51.7	41.9
LOS	F	C	D	D	D	E	D	D
Approach Delay		96.0		46.1		56.0		43.4
Approach LOS		F		D		E		D
Queue Length 50th (m)	~65.5	47.6	13.3	49.4	58.3	~147.6	40.2	73.7
Queue Length 95th (m)	#124.5	66.9	22.9	71.8	#98.4	#185.1	#82.8	90.5
Internal Link Dist (m)		152.7		116.6		209.7		156.3
Turn Bay Length (m)	18.0				140.0		135.0	
Base Capacity (vph)	263	684	280	479	515	1770	346	1289
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	1.22	0.45	0.24	0.54	0.57	1.00	0.55	0.78

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 91 (76%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.22	
Intersection Signal Delay: 57.7	Intersection LOS: E
Intersection Capacity Utilization 92.3%	ICU Level of Service F
Analysis Period (min) 15	

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

Splits and Phases: 2: Riverside & Hog's Back/Brookfield



Lane Group	EBL	EBT	WBT	SBL
Lane Configurations				
Traffic Volume (vph)	30	386	260	11
Future Volume (vph)	30	386	260	11
Lane Group Flow (vph)	0	438	410	20
Turn Type	Perm	NA	NA	Prot
Protected Phases		2	6	4
Permitted Phases	2			
Detector Phase	2	2	6	4
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	26.2	26.2	26.2	25.5
Total Split (s)	34.0	34.0	34.0	26.0
Total Split (%)	56.7%	56.7%	56.7%	43.3%
Yellow Time (s)	3.3	3.3	3.3	3.3
All-Red Time (s)	1.9	1.9	1.9	2.2
Lost Time Adjust (s)		-1.2	-1.2	-1.5
Total Lost Time (s)		4.0	4.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	C-Max	None
Act Effct Green (s)		54.1	54.1	13.5
Actuated g/C Ratio		0.90	0.90	0.22
v/c Ratio		0.16	0.14	0.05
Control Delay		2.7	2.1	12.8
Queue Delay		0.0	0.0	0.0
Total Delay		2.7	2.1	12.8
LOS		A	A	B
Approach Delay		2.7	2.1	12.8
Approach LOS		A	A	B
Queue Length 50th (m)		0.0	0.0	1.1
Queue Length 95th (m)		m21.7	14.2	4.4
Internal Link Dist (m)		65.5	4.1	50.6
Turn Bay Length (m)				
Base Capacity (vph)		2791	2918	606
Starvation Cap Reductn		0	0	0
Spillback Cap Reductn		0	0	0
Storage Cap Reductn		0	0	0
Reduced v/c Ratio		0.16	0.14	0.03

Intersection Summary	
Cycle Length: 60	
Actuated Cycle Length: 60	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.16	
Intersection Signal Delay: 2.6	Intersection LOS: A
Intersection Capacity Utilization 42.5%	ICU Level of Service A
Analysis Period (min) 15	

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

Splits and Phases: 3: Brookfield & 20 m W of Hobson

MOVEMENT SUMMARY

Site: Brookfield/Airport Parkway/Flannery

AM Peak Hour - Projected 2027
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Flannery											
3	L2	87	3.0	0.349	8.6	LOS A	1.1	8.5	0.44	0.44	46.4
18	R2	100	3.0	0.349	8.6	LOS A	1.1	8.5	0.44	0.44	44.6
18b	R3	91	3.0	0.349	8.6	LOS A	1.1	8.5	0.44	0.44	48.0
Approach		278	3.0	0.349	8.6	LOS A	1.1	8.5	0.44	0.44	46.2
East: Airport Parkway Northbound											
1b	L3	1	3.0	0.251	6.0	LOS A	1.1	8.2	0.24	0.13	51.7
1	L2	4	3.0	0.251	6.0	LOS A	1.1	8.2	0.24	0.13	47.4
6	T1	247	3.0	0.251	6.0	LOS A	1.1	8.2	0.24	0.13	46.9
Approach		252	3.0	0.251	6.0	LOS A	1.1	8.2	0.24	0.13	46.9
NorthEast: Airport Parkway Southbound											
1bx	L3	3	3.0	0.288	8.0	LOS A	1.1	8.9	0.49	0.44	46.7
1ax	L1	31	3.0	0.288	8.0	LOS A	1.1	8.9	0.49	0.44	45.4
16ax	R1	189	3.0	0.288	8.0	LOS A	1.1	8.9	0.49	0.44	45.0
Approach		223	3.0	0.288	8.0	LOS A	1.1	8.9	0.49	0.44	45.1
West: Brookfield											
2	T1	322	3.0	0.306	6.4	LOS A	1.4	10.9	0.16	0.07	46.7
12a	R1	115	3.0	0.175	5.0	LOS A	0.7	5.3	0.14	0.05	55.0
12	R2	69	3.0	0.175	5.0	LOS A	0.7	5.3	0.14	0.05	49.0
Approach		506	3.0	0.306	5.9	LOS A	1.4	10.9	0.16	0.06	48.6
All Vehicles		1260	3.0	0.349	6.9	LOS A	1.4	10.9	0.29	0.22	47.1

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	410	74	47	219	33	20
Future Volume (Veh/h)	410	74	47	219	33	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	432	78	49	231	35	21
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	249			90		
pX, platoon unblocked						
vC, conflicting volume			510		684	255
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			510		684	255
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		90	97
cM capacity (veh/h)			1051		364	744

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	288	222	126	154	56
Volume Left	0	0	49	0	35
Volume Right	0	78	0	0	21
cSH	1700	1700	1051	1700	451
Volume to Capacity	0.17	0.13	0.05	0.09	0.12
Queue Length 95th (m)	0.0	0.0	1.1	0.0	3.2
Control Delay (s)	0.0	0.0	3.6	0.0	14.1
Lane LOS			A		B
Approach Delay (s)	0.0		1.6		14.1
Approach LOS					B

Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	35.6%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	228	491	202	45	12	39
Future Volume (Veh/h)	228	491	202	45	12	39
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	240	517	213	47	13	41
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		194	144			
pX, platoon unblocked						
vC, conflicting volume	260				975	130
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	260				975	130
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	82				94	95
cM capacity (veh/h)	1302				203	896

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	412	345	142	118	54
Volume Left	240	0	0	0	13
Volume Right	0	0	0	47	41
cSH	1302	1700	1700	1700	492
Volume to Capacity	0.18	0.20	0.08	0.07	0.11
Queue Length 95th (m)	5.1	0.0	0.0	0.0	2.8
Control Delay (s)	5.6	0.0	0.0	0.0	13.2
Lane LOS	A				B
Approach Delay (s)	3.1		0.0		13.2
Approach LOS					B

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	42.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	434	8	3	296	0	0
Future Volume (Veh/h)	434	8	3	296	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	457	8	3	312	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	141			198		
pX, platoon unblocked						
vC, conflicting volume			465		623	232
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			465		623	232
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1093		417	770

Direction, Lane #	EB 1	EB 2	WB 1	WB 2
Volume Total	305	160	107	208
Volume Left	0	0	3	0
Volume Right	0	8	0	0
cSH	1700	1700	1093	1700
Volume to Capacity	0.18	0.09	0.00	0.12
Queue Length 95th (m)	0.0	0.0	0.1	0.0
Control Delay (s)	0.0	0.0	0.3	0.0
Lane LOS			A	
Approach Delay (s)	0.0		0.1	
Approach LOS				

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	16.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	398	0	0	403	0	14
Future Volume (Veh/h)	398	0	0	403	0	14
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	419	0	0	424	0	15
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	28					
pX, platoon unblocked			0.98		0.98	0.98
vC, conflicting volume			419		631	210
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			356		573	141
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	98
cM capacity (veh/h)			1171		439	860

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	210	210	212	212	15
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	15
cSH	1700	1700	1700	1700	860
Volume to Capacity	0.12	0.12	0.12	0.12	0.02
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.4
Control Delay (s)	0.0	0.0	0.0	0.0	9.3
Lane LOS					A
Approach Delay (s)	0.0		0.0		9.3
Approach LOS					A

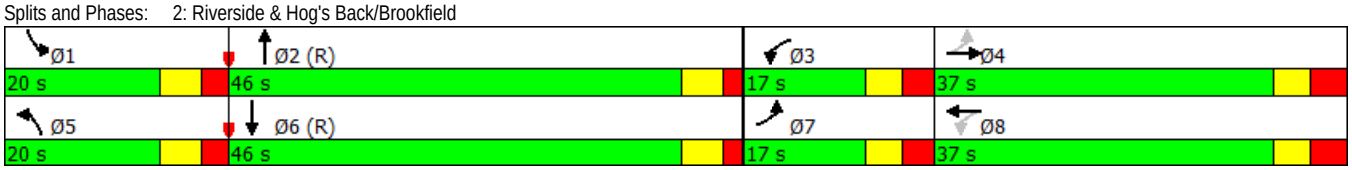
Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	21.6%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	281	131	289	203	162	793	247	1368
Future Volume (vph)	281	131	289	203	162	793	247	1368
Lane Group Flow (vph)	296	450	304	363	171	937	260	1901
Turn Type	pm+pt	NA	pm+pt	NA	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	10.0	5.0	10.0	5.0	10.0	5.0	10.0
Minimum Split (s)	11.2	36.7	11.2	36.7	11.1	22.6	11.1	22.6
Total Split (s)	17.0	37.0	17.0	37.0	20.0	46.0	20.0	46.0
Total Split (%)	14.2%	30.8%	14.2%	30.8%	16.7%	38.3%	16.7%	38.3%
Yellow Time (s)	3.3	3.3	3.3	3.3	3.7	3.7	3.7	3.7
All-Red Time (s)	2.9	3.4	2.9	3.4	2.4	1.9	2.4	1.9
Lost Time Adjust (s)	-2.2	-2.7	-2.2	-2.7	-2.1	-1.6	-2.1	-1.6
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	Max	C-Max	Max	C-Max
Act Effct Green (s)	44.9	31.9	44.9	31.9	17.1	42.0	17.1	42.0
Actuated g/C Ratio	0.37	0.27	0.37	0.27	0.14	0.35	0.14	0.35
v/c Ratio	1.02	0.92	1.25	0.78	0.71	0.56	1.08	1.12
Control Delay	86.5	59.6	171.5	50.3	66.6	32.3	129.1	99.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	86.5	59.6	171.5	50.3	66.6	32.3	129.1	99.7
LOS	F	E	F	D	E	C	F	F
Approach Delay		70.3		105.6		37.6		103.2
Approach LOS		E		F		D		F
Queue Length 50th (m)	~48.7	83.6	~73.5	72.6	39.3	63.4	~72.0	~185.5
Queue Length 95th (m)	#99.2	#143.4	#128.8	#109.7	#72.0	77.2	#123.5	#215.4
Internal Link Dist (m)		152.7		124.6		209.7		156.3
Turn Bay Length (m)	18.0				140.0		135.0	
Base Capacity (vph)	291	501	243	478	241	1685	241	1691
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	1.02	0.90	1.25	0.76	0.71	0.56	1.08	1.12

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Offset: 84 (70%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 115	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.25	
Intersection Signal Delay: 82.8	Intersection LOS: F
Intersection Capacity Utilization 105.1%	ICU Level of Service G
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.

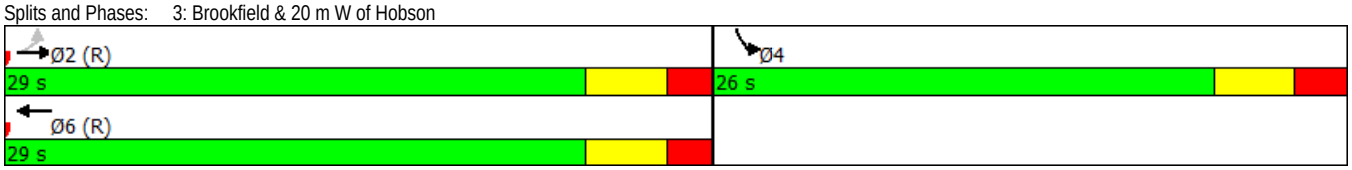
Splits and Phases: 2: Riverside & Hog's Back/Brookfield



Lane Group	EBL	EBT	WBT	SBL
Lane Configurations				
Traffic Volume (vph)	4	407	441	136
Future Volume (vph)	4	407	441	136
Lane Group Flow (vph)	0	432	479	224
Turn Type	Perm	NA	NA	Prot
Protected Phases		2	6	4
Permitted Phases	2			
Detector Phase	2	2	6	4
Switch Phase				
Minimum Initial (s)	10.0	10.0	10.0	10.0
Minimum Split (s)	26.2	26.2	26.2	25.5
Total Split (s)	29.0	29.0	29.0	26.0
Total Split (%)	52.7%	52.7%	52.7%	47.3%
Yellow Time (s)	3.3	3.3	3.3	3.3
All-Red Time (s)	1.9	1.9	1.9	2.2
Lost Time Adjust (s)		-1.2	-1.2	-1.5
Total Lost Time (s)		4.0	4.0	4.0
Lead/Lag				
Lead-Lag Optimize?				
Recall Mode	C-Max	C-Max	C-Max	None
Act Effct Green (s)		32.7	32.7	14.3
Actuated g/C Ratio		0.59	0.59	0.26
v/c Ratio		0.23	0.24	0.47
Control Delay		6.4	6.4	14.8
Queue Delay		0.0	0.0	0.0
Total Delay		6.4	6.4	14.8
LOS		A	A	B
Approach Delay		6.4	6.4	14.8
Approach LOS		A	A	B
Queue Length 50th (m)		8.0	8.7	13.9
Queue Length 95th (m)		20.7	22.4	23.1
Internal Link Dist (m)		73.1	3.0	50.6
Turn Bay Length (m)				
Base Capacity (vph)		1918	2008	694
Starvation Cap Reductn		0	0	0
Spillback Cap Reductn		0	0	0
Storage Cap Reductn		0	0	0
Reduced v/c Ratio		0.23	0.24	0.32

Intersection Summary	
Cycle Length: 55	
Actuated Cycle Length: 55	
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 8.1	Intersection LOS: A
Intersection Capacity Utilization 34.4%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Brookfield & 20 m W of Hobson



MOVEMENT SUMMARY

Site: Brookfield/Airport Parkway/Flannery

PM Peak Hour - Projected 2027
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Flannery											
3	L2	36	3.0	0.139	6.3	LOS A	0.4	2.8	0.40	0.38	47.3
18	R2	44	3.0	0.139	6.3	LOS A	0.4	2.8	0.40	0.38	45.4
18b	R3	24	3.0	0.139	6.3	LOS A	0.4	2.8	0.40	0.38	48.9
Approach		104	3.0	0.139	6.3	LOS A	0.4	2.8	0.40	0.38	46.8
East: Airport Parkway Northbound											
1b	L3	1	3.0	0.125	4.5	LOS A	0.5	3.6	0.13	0.04	52.4
1	L2	16	3.0	0.125	4.5	LOS A	0.5	3.6	0.13	0.04	48.0
6	T1	115	3.0	0.125	4.5	LOS A	0.5	3.6	0.13	0.04	47.4
Approach		132	3.0	0.125	4.5	LOS A	0.5	3.6	0.13	0.04	47.6
NorthEast: Airport Parkway Southbound											
1bx	L3	10	3.0	0.591	12.3	LOS B	3.7	29.1	0.52	0.39	43.6
1ax	L1	236	3.0	0.591	12.3	LOS B	3.7	29.1	0.52	0.39	42.5
16ax	R1	299	3.0	0.591	12.3	LOS B	3.7	29.1	0.52	0.39	42.2
Approach		545	3.0	0.591	12.3	LOS B	3.7	29.1	0.52	0.39	42.3
West: Brookfield											
2	T1	369	3.0	0.441	9.9	LOS A	2.1	16.4	0.51	0.44	44.8
12a	R1	149	3.0	0.352	8.4	LOS A	1.5	11.9	0.46	0.39	51.8
12	R2	146	3.0	0.352	8.4	LOS A	1.5	11.9	0.46	0.39	46.4
Approach		664	3.0	0.441	9.2	LOS A	2.1	16.4	0.49	0.41	46.5
All Vehicles		1445	3.0	0.591	9.7	LOS A	3.7	29.1	0.46	0.37	45.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	438	20	32	493	75	38
Future Volume (Veh/h)	438	20	32	493	75	38
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	461	21	34	519	79	40
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	241			97		
pX, platoon unblocked					0.96	
vC, conflicting volume			482		799	241
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			482		703	241
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		77	95
cM capacity (veh/h)			1077		345	760

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	307	175	207	346	119
Volume Left	0	0	34	0	79
Volume Right	0	21	0	0	40
cSH	1700	1700	1077	1700	423
Volume to Capacity	0.18	0.10	0.03	0.20	0.28
Queue Length 95th (m)	0.0	0.0	0.7	0.0	8.7
Control Delay (s)	0.0	0.0	1.6	0.0	16.8
Lane LOS			A		C
Approach Delay (s)	0.0		0.6		16.8
Approach LOS					C

Intersection Summary			
Average Delay	2.0		
Intersection Capacity Utilization	45.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	42	458	492	30	33	195
Future Volume (Veh/h)	42	458	492	30	33	195
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	44	482	518	32	35	205
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)		192	146			
pX, platoon unblocked						
vC, conflicting volume	550				863	275
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	550				863	275
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	96				88	72
cM capacity (veh/h)	1016				281	722

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	205	321	345	205	240
Volume Left	44	0	0	0	35
Volume Right	0	0	0	32	205
cSH	1016	1700	1700	1700	588
Volume to Capacity	0.04	0.19	0.20	0.12	0.41
Queue Length 95th (m)	1.0	0.0	0.0	0.0	15.0
Control Delay (s)	2.2	0.0	0.0	0.0	15.3
Lane LOS	A				C
Approach Delay (s)	0.9		0.0		15.3
Approach LOS					C

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	494	17	6	519	0	0
Future Volume (Veh/h)	494	17	6	519	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	520	18	6	546	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	149			190		
pX, platoon unblocked						
vC, conflicting volume			538		814	269
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			538		814	269
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		100	100
cM capacity (veh/h)			1026		314	729

Direction, Lane #	EB 1	EB 2	WB 1	WB 2
Volume Total	347	191	188	364
Volume Left	0	0	6	0
Volume Right	0	18	0	0
cSH	1700	1700	1026	1700
Volume to Capacity	0.20	0.11	0.01	0.21
Queue Length 95th (m)	0.0	0.0	0.1	0.0
Control Delay (s)	0.0	0.0	0.3	0.0
Lane LOS			A	
Approach Delay (s)	0.0		0.1	
Approach LOS				

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	22.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	557	0	0	456	0	10
Future Volume (Veh/h)	557	0	0	456	0	10
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	586	0	0	480	0	11
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)	27					
pX, platoon unblocked			0.95		0.95	0.95
vC, conflicting volume			586		826	293
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			448		702	138
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	99
cM capacity (veh/h)			1049		352	837

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	293	293	240	240	11
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	11
cSH	1700	1700	1700	1700	837
Volume to Capacity	0.17	0.17	0.14	0.14	0.01
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.3
Control Delay (s)	0.0	0.0	0.0	0.0	9.4
Lane LOS					A
Approach Delay (s)	0.0		0.0		9.4
Approach LOS					A

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	26.3%	ICU Level of Service	A
Analysis Period (min)	15		