Transportation Impact Assessment – Step 4: Analysis

Riverside South Phase 12

Prepared for Urbandale Corporation
by IBI Group

April 24, 2019

TIA Plan Reports - Certification

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 associate 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[1] professional in good standing, whose field of expertise [check √ appropriate field(s)] is either transportation engineering □ or transportation planning □.

[1] **License or 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.**

Dated at Ottawa this 24th day of April, 2019.
(City)

Name: David Hook, P.Eng.

Professional Title: Project Engineer

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

Office Contact Information (Please Print)
Address: 400-333 Preston Street
City / Postal Code: K1S 5N4
Telephone / Extension: 613-225-1311 ext. 64029
E-Mail Address: dhook@ibigroup.com

Stamp

Document Control Page

CLIENT:	Urbandale Corporation
PROJECT NAME:	Riverside South Phase 12
REPORT TITLE:	Transportation Impact Assessment
IBI REFERENCE:	120031
VERSION:	First Submission
DIGITAL MASTER:	J:\120031_RSPhase12\5.2 Reports\5.2.4 Transportation\5.2.4.5 Traffic Impact\3 - Analysis
ORIGINATOR:	Ben Pascolo-Neveu, Eric McLaren
REVIEWER:	David Hook
AUTHORIZATION:	Justin Date
CIRCULATION LIST:	Mike Giampa - City of Ottawa Transportation Project Manager
HISTORY:	TIA Step 1 & 2 Submitted for City Review – March 15, 2019 TIA Step 3 Submitted for City Review – March 27, 2019 TIA Step 4 Submitted to Client Review – April 24, 2019

Table of Contents

Table of Contents

Table of Contents

List of Tables

Table of Contents

List of Figures

Table of Contents

List of Exhibits

List of Appendices

Executive Summary

IBI Group (IBI) was retained by Urbandale Corporation to undertake a Transportation Impact Assessment (TIA) in support of a Draft Plan of Subdivision application for a proposed residential development to be located at 708 and 750 River Road, Ottawa. Both parcels have direct frontage onto River Road, however the southern parcel (750 River Road) will be accessed through 760 River Road (ownership by others) to the immediate south.

The northern parcel (708 River Road) will consist of 80 single-family homes and 110 condominium units, while the southern parcel (750 River Road) will consist of 55 townhome units. The proposed development will be constructed in two phases with the single-family and townhomes expected to be built out and occupied by 2021 followed by the condominium units in 2024.

Turning movement counts conducted by the City indicate that traffic volumes along River Road through the study area are presently in the order of 700 to 800 vehicles in the peak direction during the weekday morning and afternoon peak hours. Traffic volumes of this magnitude are an indication that the River Road corridor may be currently experiencing congestion issues. With significant growth in background travel demand expected within the horizon year of this study, River Road is expected to operate at its theoretical capacity as a two-lane facility by 2029.

There are 17 known developments of significance in the vicinity of the proposed development that were considered in the analysis for this TIA. According to Canada Mortgage and Housing Corporation (CMHC) statistics, historical new housing starts in the Riverside South Community range from 300 to 400 units per year. By contrast, this study assumes a high growth scenario with a build-out rate of 450 units per year from 2019 to 2029. The rate of development assumed in this study is deemed appropriate given the high market demand for new housing in the Riverside South community.

Based on the traffic analysis results, the proposed residential development is expected to generate up to 161 and 182 two-way vehicular trips during the weekday morning and afternoon peak hours, respectively. These traffic volumes were distributed amongst three all-movements access intersections, representing a marginal increase in traffic volumes with respect to the overall traffic projections expected within the 2029 horizon year of the study. For the purposes of this analysis, all site-generated traffic was assumed to exclusively utilize the arterial road network within the study area. River Road is expected to operate at capacity as a two-lane facility within the timeframe of this study primarily as a result of significant increases in background travel demand. As the transportation network in Riverside South is built to its ultimate configuration, east-west collectors Borbridge Avenue and Solarium Avenue will be extended further east to connect with Limebank Road, providing opportunities for traffic to be distributed amongst the broader transportation network, ultimately providing relief to these congested conditions.

The study has identified critical deficiencies in the Level of Service across all transportation modes. These deficiencies are a result of background conditions and not as a direct result of the proposed development. The implementation of protected crossings of River Road is one of the most essential improvements necessary to make transit service accessible to developments on the west side of River Road and reduce vehicular demand along the corridor. The study assumes these crossings will be implemented with any other signalization along the corridor.

The results of the analysis indicate that the Earl Armstrong and River Road intersection is presently approaching its theoretical capacity with a LOS ‘E’ during both the weekday morning and afternoon peak hours. This intersection is expected to continue to operate with poor levels of service during these peak periods with and without the proposed development traffic as a result of increased travel demand projected within Riverside South as well as steady growth in cross-commuter traffic to/ from Barrhaven.

With regards to site access, the River and Phase 12 North Access intersection was shown to operate above its theoretical capacity under Future (2029) Total Traffic conditions with a stop-controlled eastbound approach and single, shared lanes on all approaches. Traffic volumes utilizing the North Access however are expected to be minimal with only 17 and 11 weekday morning and afternoon trips expected to egress at this location, respectively, with sidestreet delays expected in the order of 1 to 2 minutes. With underground traffic signal infrastructure already in place at the River/ Summerhill intersection and traffic signals warranted within the timeframe of this study, the southern access will serve as the primary access/ egress for 708 River Road.

The results of the analysis indicate that the intersections of River/ Summerhill, River/ Borbridge, and River/ Atrium/ 760 River Access will require signals to operate at acceptable levels of service (LOS 'D' or better), however warrants are only triggered at River/ Summerhill within the horizon year of this study. Each of these intersections are shown to be operationally-required as a result of background travel demand, and will therefore will be necessary to accommodate the proposed development.

As confirmed through the analysis undertaken for this report, Functional Design Drawings of recommended roadway improvements to support a Roadway Modification Application (RMA) off-site intersection improvements will be required at River/ Summerhill and River/ Atrium Ridge to provide access to the proposed development.

Based on the findings of this study, it is the overall opinion of IBI Group that the proposed development will integrate well with and can be safely accommodated by the adjacent transportation network with the recommended actions and modifications in place.

1 Introduction

IBI Group (IBI) was retained by Urbandale Corporation to undertake a Transportation Impact Assessment (TIA) in support of a Draft Plan of Subdivision application for a proposed residential development to be located at 708 and 750 River Road, Ottawa.

In accordance with the City of Ottawa's Transportation Impact Assessment Guidelines, published in June 2017, the following report is divided into four major components:

- **Screening** – Prior to the commencement of a TIA, an initial assessment of the proposed development is undertaken to establish the need for a comprehensive review of the site based on three triggers: Trip Generation, Location and Safety.
- **Scoping** – This component of the TIA report describes both the existing and planned conditions in the vicinity of the development and defines such study parameters as the study area, analysis periods and horizon years of the development. It also provides an opportunity to identify any scope exemptions that would eliminate elements of scope described in the TIA Guidelines but not relevant to the development proposal, based on consultation with City staff.
- **Forecasting** – The Forecasting component of the TIA is intended to review both the development-generated travel demand and the background network travel demand, and provides an opportunity to rationalize this demand to ensure projections are within the capacity constraints of the transportation network.
- **Analysis** – This component documents the results of any analyses undertaken to ensure that the transportation related features of the proposed development are in conformance with prescribed technical standards and that its impacts on the transportation network are both sustainable and effectively managed. It also identifies a development strategy to ensure that what is being proposed is aligned with the City of Ottawa's city-building objectives.

Throughout the development of a TIA report, each of the four study components above are submitted in draft form to the City of Ottawa and undergo a review by a designated Transportation Project Manager. Any comments received are addressed to the satisfaction of the City's Transportation Project Manager before proceeding with subsequent components of the study. All technical comments and responses throughout this process are included in **Appendix A**.

Dependent on the findings of this report, the complete submission of this Transportation Impact Assessment may also require Functional Design Drawings of recommended roadway improvements to support a Roadway Modification Application (RMA). The submission may also require a post-development Monitoring Plan to track performance of the planned TIA Strategy. The need for these two elements will be confirmed through the analysis undertaken for this report.

2 TIA Screening

An initial screening was completed to confirm the need for a Transportation Impact Assessment by reviewing the following three triggers:

- **Trip Generation**: Based on the magnitude of the proposed development, the site is expected to generate up to 285 person-trips during morning and afternoon weekday peak hours. With consideration of the proposed land use and the documented modal share for the local area, the proposed development is expected to exceed the 60 person trip threshold during the weekday peak hours and therefore the Trip Generation trigger is satisfied.
- **Location**: The proposed development will not be accessed from a boundary street that is designated as part of the City's Transit Priority, Rapid Transit network, however the site is on a spine cycling route and is also partially located within 600m of an existing rapid transit station and Transit-Oriented Development (TOD) Zone. The Location trigger is therefore satisfied.
- **Safety**: Boundary street conditions were reviewed to determine if there is an elevated potential for safety concerns adjacent the site. As the proposed development will access River Road, an arterial roadway with a posted speed limit of 80 km/h south of Earl Armstrong Road, there may be potential for safety concerns and therefore the Safety trigger is satisfied.

As the proposed development meets the Trip Generation, Location and Safety triggers, the need to undertake a Transportation Impact Assessment is confirmed.

A copy of the Screening Form is provided in **Appendix B**.

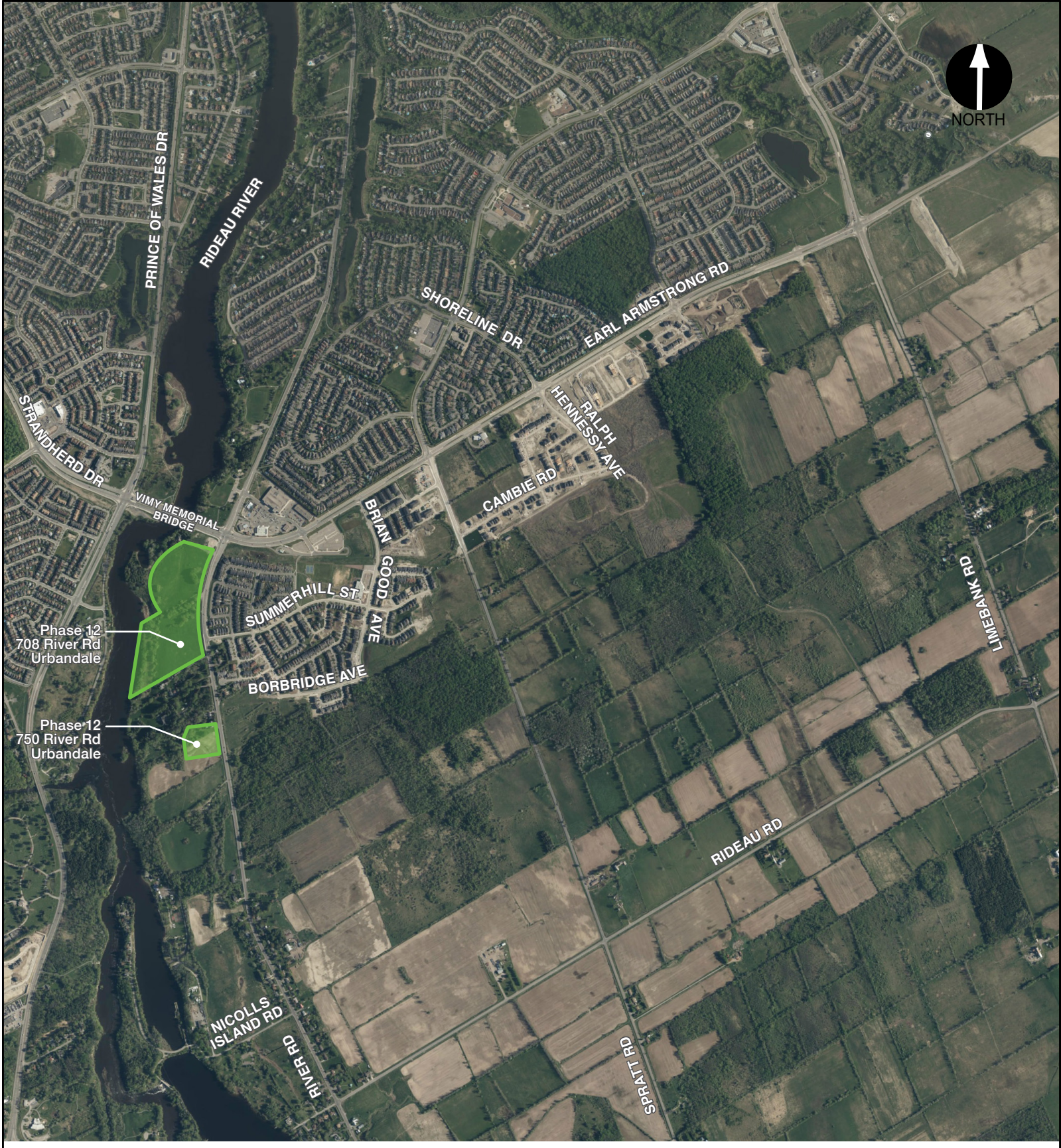
3 Project Scoping

3.1 Description of Proposed Development

3.1.1 Site Location

The proposed development consists of two separate property parcels with the municipal addresses of 708 and 750 River Road, located in the community of Riverside South. The total lot size is approximately 20.5 hectares and is bound by River Road to the east, the Rideau River to the west, Earl Armstrong Road to the north and undeveloped lands to the south. Both parcels have direct frontage onto River Road, however the southern parcel (750 River Road) will be accessed through 760 River Road (ownership by others) to the immediate south.

The site location and its surrounding context is illustrated in **Exhibit 1**.



Proposed Development

IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 1: Site Location

Project No: 120031
Date: April 2019
Scale:
0m 50m 100m

3.1.2 Land Use Details

Table 1 summarizes the proposed land uses included in this development.

Table 1 - Land Use Statistics

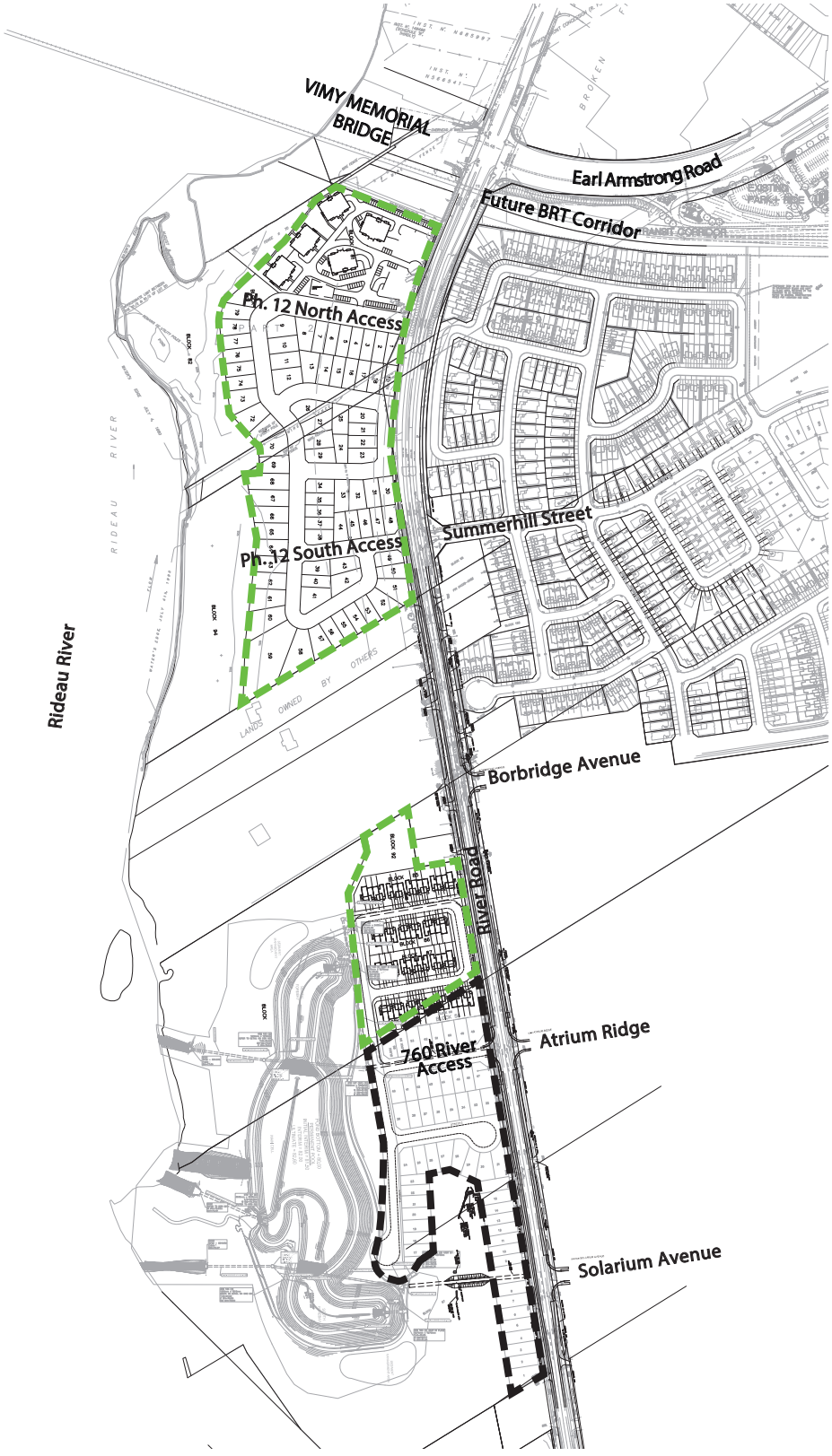
LAND USE	SIZE (APPROX. # OF UNITS)
Single-Family Homes	80
Townhomes	55
Condominium Units	110

The Draft Plan the proposed development, as well as the conceptual plan for 760 River Road to the south are illustrated in **Exhibit 2**.

The conceptual plan for 760 River Road, which presently has no defined development timeline, indicates the potential for approximately 55 single-family homes on these lands.

3.1.3 Development Phasing & Date of Occupancy

The proposed Riverside South Phase 12 development will be constructed in two phases with the single-family and townhomes expected to be built out and occupied by 2021 followed by the condominium units in 2024.


NORTH
VIMY MEMORIAL BRIDGE
Earl Armstrong Road
Future BRT Corridor
Ph. 12 North Access
Ph. 12 South Access
Summerhill Street
Rideau River
Borbridge Avenue
River Road
760 River Access
Atrium Ridge
Solarium Avenue
Proposed Development Limits
760 River Road Development Limits (By Others)

3.2 Existing Conditions

3.2.1 Existing Road Network

3.2.1.1 Roadways

The proposed development is bound by the following street(s):

- **River Road** is a 2-lane urban arterial roadway with a ROW of 37.5m that runs parallel with the Rideau River from Riverside Drive/ Limebank Road to the southern urban boundary. River Road has a 4-lane urban cross section at the intersection with Earl Armstrong Road. The posted speed limit on River Road is 60 km/h at the north and south approaches to Earl Armstrong Road, and increases to 80km/h south of Earl Armstrong Road as the road transitions to a 2-lane rural cross-section. River Road was recently re-constructed between Summerhill Street and Solarium Avenue.

Other streets within the vicinity of the proposed development are as follows:

- **Earl Armstrong Road** is designated as an urban arterial road with a 44.5m ROW in the City of Ottawa Official Plan. Earl Armstrong Road is oriented east-west and extends from River Road in the west to High Road in the east. Further west, across the Vimy Memorial Bridge, Earl Armstrong Road becomes Strandherd Drive, which is also designated as an urban arterial road with a similar ROW. Earl Armstrong Road has a four-lane urban cross-section from the Riverview Park and Ride to just east of Limebank Road. To the west of the Riverview Park and Ride, two additional exclusive bus lanes are provided crossing the Rideau River. The posted speed limit on Earl Armstrong Road is 70km/h to the west of the Riverview Park and Ride station.
- **Summerhill Street** is an east-west 2-lane urban local road with a ROW of 20m that provides access to the Riverside South Phase 9 community. The speed limit on Summerhill Street is 50km/h.

3.2.1.2 Intersections

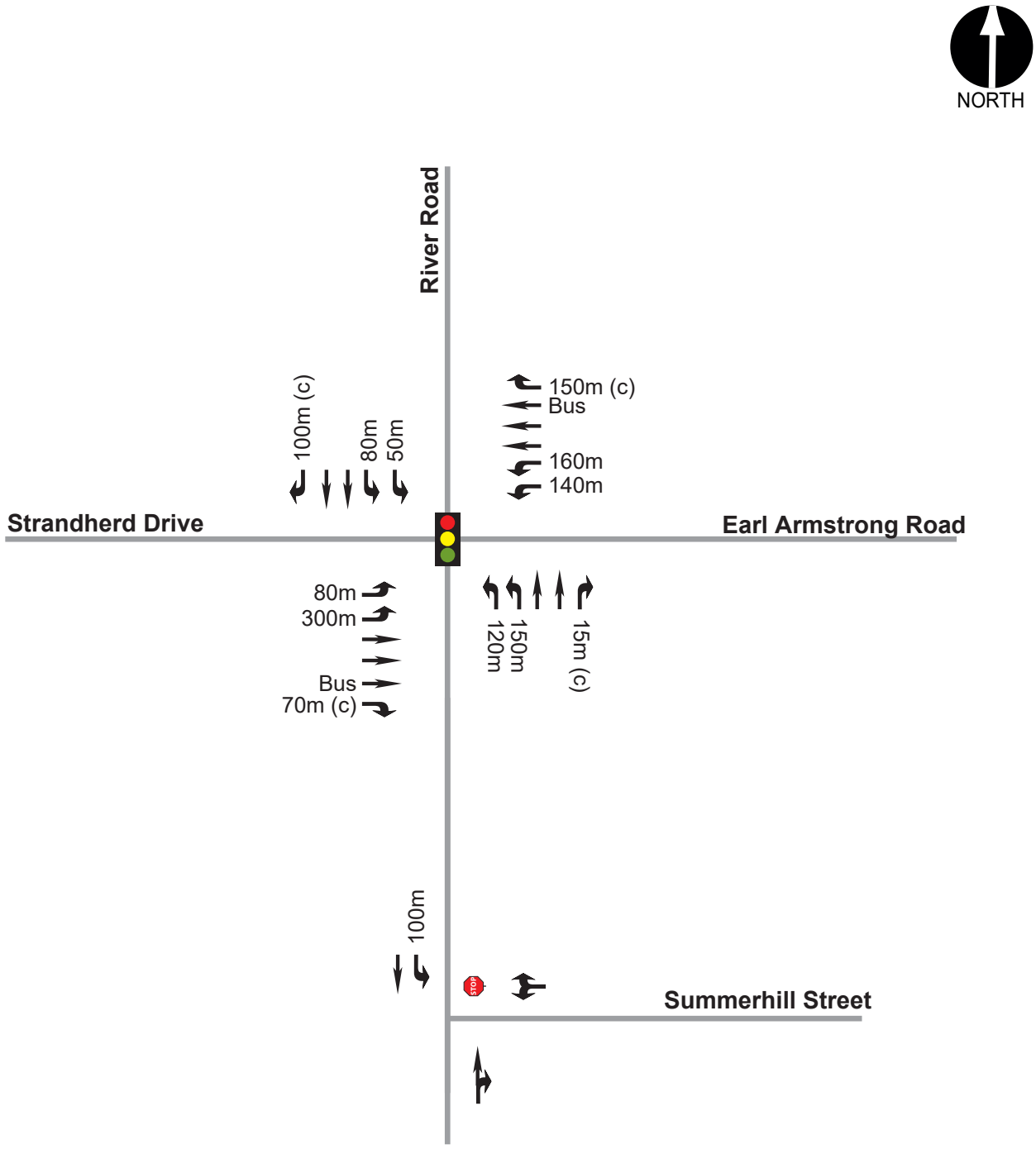
The following existing intersections have the greatest potential to be impacted by the proposed development:

- Earl Armstrong Road and River Road
- River Road and Summerhill Street

The intersection control and lane configurations of each intersection are shown in **Exhibit 3**.

3.2.1.3 Traffic Management Measures

There are currently no existing traffic management or traffic calming measures on the boundary streets within the vicinity of the proposed development.



LEGEND

STOP CONTROL

SIGNAL CONTROL

TRAVEL LANES AND PERMITTED MOVEMENTS

(c) CHANNELIZATION

XXm AUXILIARY STORAGE LENGTH (in metres)
DOES NOT INCLUDE TAPER LENGTH

3.2.1.4 Existing Traffic Volumes

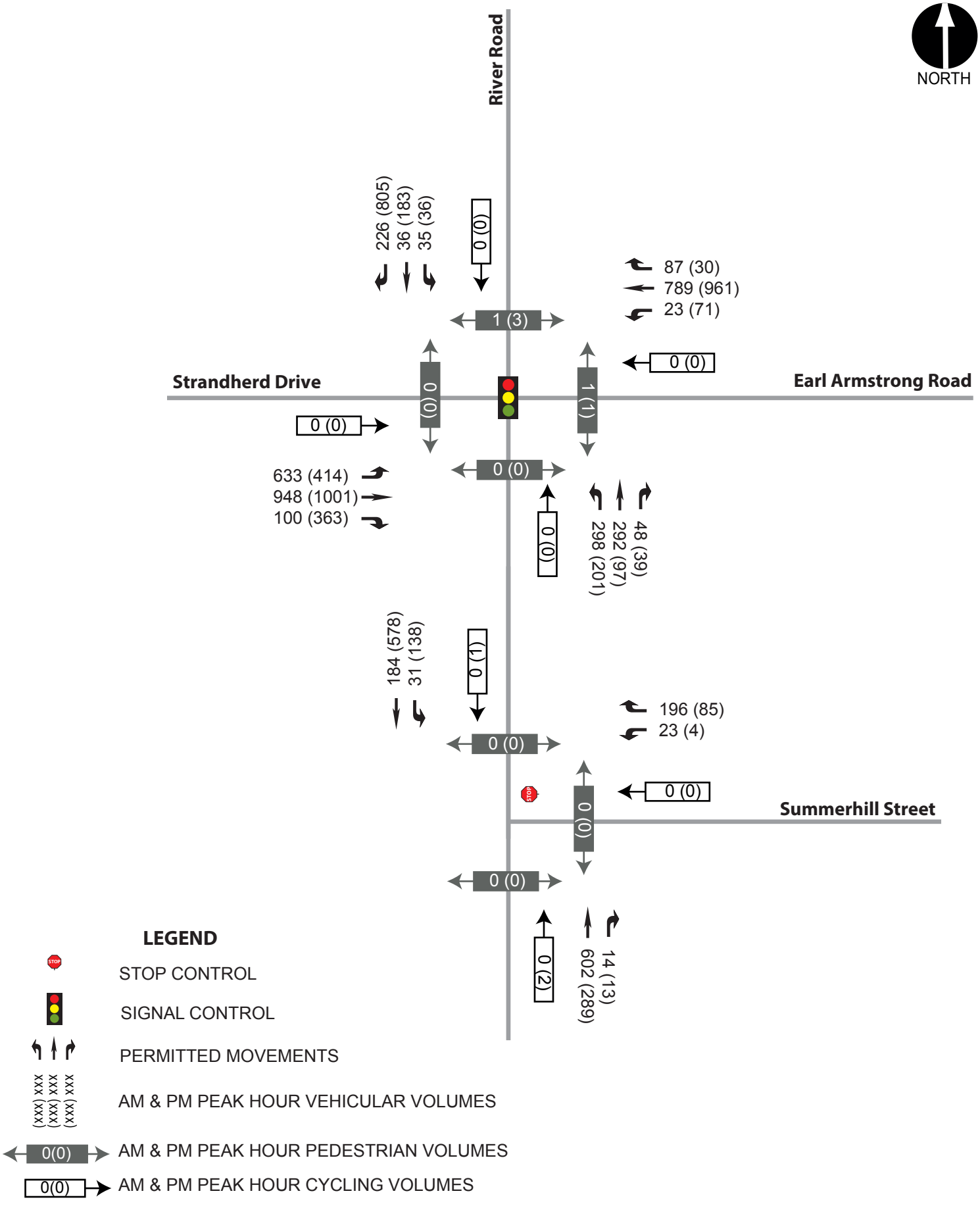
As the proposed development will comprise of residential land uses, the weekday peak hour traffic conditions will be most affected by the associated increase in traffic. Weekday morning and afternoon peak hour turning movement counts were therefore obtained from the City of Ottawa at the following intersections within close proximity to the site:

- Earl Armstrong Road and River Road (City of Ottawa, February 2019)
- River Road and Summerhill Street (City of Ottawa, April 2017)

It shall be noted that River Road recently underwent construction from Summerhill Street to Solarium Avenue with local detours in place. The traffic data referenced in this study was not impacted by this period of construction.

A growth rate was applied to through volumes along River Road at Summerhill Street and balanced along the corridor to approximate existing (2019) traffic volumes. Justification of background traffic volumes is discussed further in the Forecasting section of this TIA.

Peak hour traffic volumes representative of existing conditions are shown in **Exhibit 4**. Traffic count data is provided in **Appendix C**.



IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 4: Exsiting (2019)
Peak Hour Vehicle, Pedestrian
and Cyclist Volumes

Project No. 120031
Date: April 2019
Scale: N.T.S

3.2.2 Existing Bicycle and Pedestrian Facilities

Exclusive cycling lanes and concrete sidewalks exist on both sides of River Road for a distance of 150m north of Earl Armstrong Road as well as on both sides of Earl Armstrong Road east and west of River Road. There is an existing multi-use pathway (MUP) along the west side of Prince of Wales Drive, extending both north and south of Vimy Memorial Bridge. Along the east side of the Rideau River, a MUP exists to the north of Earl Armstrong Road.

South of Earl Armstrong Road, paved shoulders exist along River Road for pedestrians and cyclists.

3.2.3 Existing Transit Facilities and Service

The following transit routes, operated by OC Transpo, exist within the vicinity of the site:

- **Route #94** provides regular, all-day service between Millennium Station and the Riverview Park & Ride and operates on a 15-minute headway. On weekends, service frequency is reduced to every 30 minutes.
- **Route #99** provides regular, all-day service between South Keys station and Barrhaven Centre. During weekday peak periods, service is extended to LeBreton Station and the route operates on a 15-minute headway. On weekends, frequency is reduced to 30 minutes.
- **Route #198** provides weekday peak period service between South Keys station and the Riverview Park and Ride. This route does not operate on weekends.
- **Route #278** provides weekday peak period service between Earl Armstrong/Limebank and Mackenzie King Station and operates on a 15-minute headway.
- **Route #299** provides weekday peak period service between the village of Manotick and LeBreton Station.

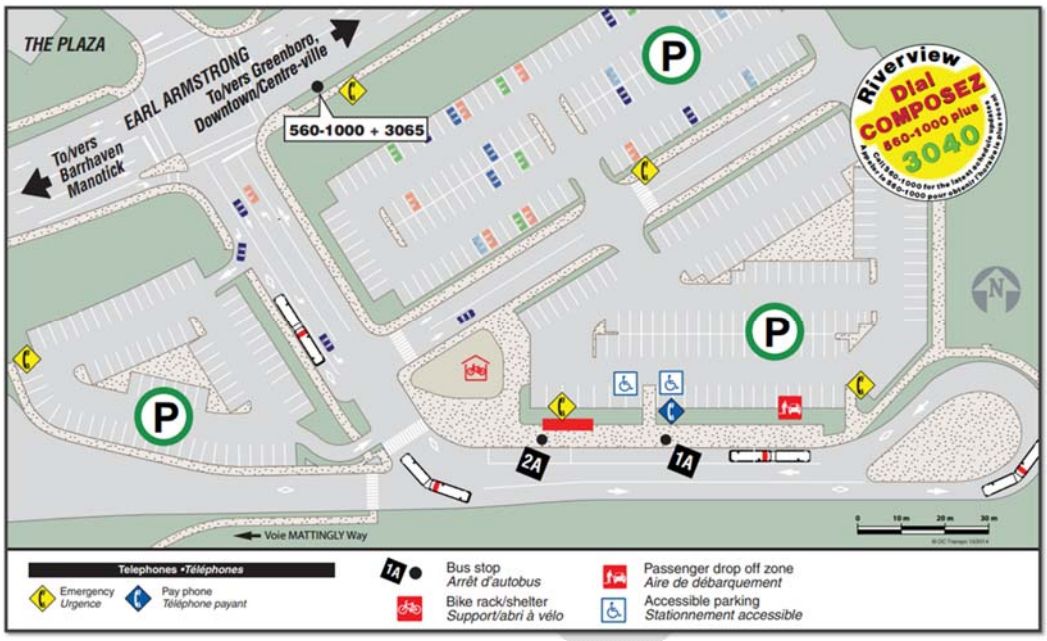
The northern development parcel, 708 River Road, is located partially within the Transit-Oriented Development (TOD) zone surrounding Riverview Station, which services all of the above noted routes. The proposed condominium units will be within a 550-metre walking distance of the Riverview Station, while the lower-density units will be greater than 750-metre walking distance.

Bus stops nearest to the southern portion of the development at 750 River Road are within 100m of the proposed access intersection, and provide access to Route #299 only. All other routes are accessed via bus stops at the Riverview Park and Ride.

Transit service maps for the individual routes above are provided in **Appendix D**.

The Riverview Park & Ride, completed in August 2010, contains approximately 400 parking spaces and is located approximately one kilometer northeast of the proposed development on Earl Armstrong Road. Each of the transit routes described above can be accessed via this station. Exclusive transit lanes are provided on Earl Armstrong Road between the Riverview Park & Ride and the adjacent community of Barrhaven via the Vimy Memorial Bridge. The Riverview Park & Ride station is shown below in **Figure 1**.

Figure 1 - Riverview Transit Station and Park & Ride



Source: OC Transpo

3.2.4 Collision History

A review of historical collision data has been reviewed for the road network surrounding the proposed development. The TIA Guidelines require a safety review if at least six collisions for any one movement or of a discernible pattern, over a five year period have occurred. **Table 2** summarizes all reported collisions between January 1, 2013 and January 1, 2018.

Table 2 – Reported Collisions within Vicinity of Proposed Development

LOCATION	# OF REPORTED COLLISIONS	RE-OCCURING EVENTS
Earl Armstrong & River	61	• Southbound rear end impact type: 25 similar cases • Northbound rear end impact type: 9 similar cases • Eastbound rear end impact type: 6 similar cases • Westbound rear end impact type: 5 similar cases
Earl Armstrong Road - River to Spratt	6	• Property Damage Only (PD only): 4 similar cases
River Road - Earl Armstrong to Nicolls Island	8	• Single-Motor Vehicle (SMV): 4 similar cases

Based on the collision history noted above, the intersection of Earl Armstrong Road and River Road warrants further analysis which will be reviewed in subsequent sections of this report.

Detailed collision records are provided in **Appendix E**.

3.3 Planned Conditions

3.3.1 Transportation Network

3.3.1.1 Future Road Network Projects

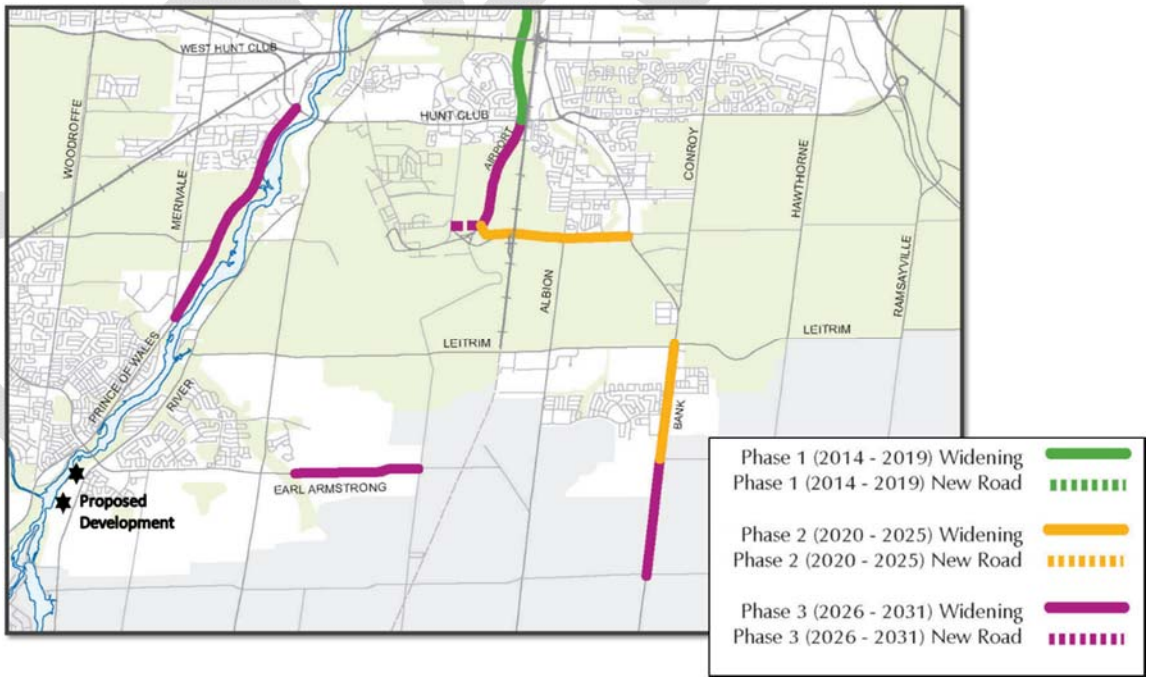
The 2013 Transportation Master Plan (TMP) outlines future road network modifications required in the 2031 'Affordable Network'. The following projects were noted that may have an impact on area traffic within the vicinity of the site:

- **Earl Armstrong Road** – Planned widening from two to four lanes between Limebank Road and Bowesville Road (Phase 3: 2026-2031)
- **Prince of Wales Drive** – Planned widening from two to four lanes between Merivale Road and West Hunt Club Road (Phase 3: 2026-2031)

The *2019 City-Wide Development Charges Background Study (March 25, 2019)* identifies that the Earl Armstrong Road and Prince of Wales Drive road projects are planned for implementation between 2030 and 2031.

Figure 2 illustrates the planned changes to the arterial road network projects in the broader area, as per the TMP Affordable Plan. It should also be noted that Prince of Wales Drive has recently undergone intersection modifications complete with coordinated network modifications from approximately 480m north of Strandherd Drive to West Hunt Club Road. These road modifications were substantially completed in December 2017.

Figure 2 - Future Road Network Projects



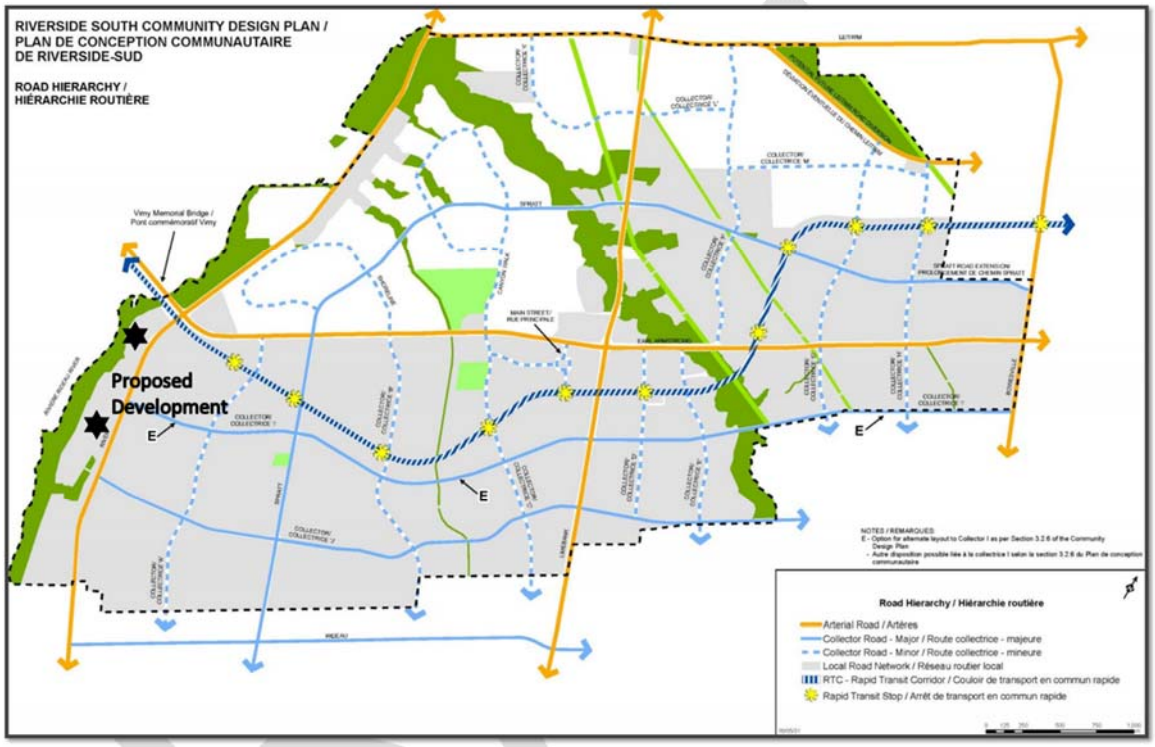
Source: 2013 Transportation Master Plan – Map 11 '2031 Affordable Network'

The Riverside South Community Design Plan (CDP) identifies two major east-west collector roads to the south of the planned rapid transit corridor. As indicated in **Figure 3** below, Collector 'I'

represents Borbridge Avenue which will ultimately extend from River Road to Bowesville Road. Collector 'J', also referred to as Solarium Avenue, will provide a connection between River Road and Limebank Road further to the south.

Also within the context area of this study, the CDP indicates that Brian Good Avenue will be extended south to Rideau Road, as indicated by a dashed line in **Figure 3** below, between River Road and Spratt Road.

Figure 3 - Riverside South Community Design Plan - Network Concept



Source: Riverside South Community Design Plan

3.3.1.2 Future Transit Facilities and Services

The 2013 TMP outlines the future rapid transit and transit priority (RTTP) network. The following projects were noted in the 'Affordable RTTP Network' that may have a future impact on study area traffic:

- **O-Train Trillium Line South** – Extension of the O-Train from Greenboro Station to Limebank, including new stations at Gladstone, Walkley, South Keys, Leitrim and Earl Armstrong / Bowesville, and a spur line to the Airport, including a new station at Uplands. Based on the Trillium Line LRT Extension Environmental Project Report (EPR) Addendum (September, 2018), there have been notable changes to the planned extension of the Trillium Line since the publication of the TMP. These changes include:
    - The location of the Bowesville Station has been moved further south near Earl Armstrong Road
    - The Trillium Line terminus has been extended to Limebank Road.
    - Crossings of Earl Armstrong Road, Bowesville Road and Limebank Road will be grade-separated.

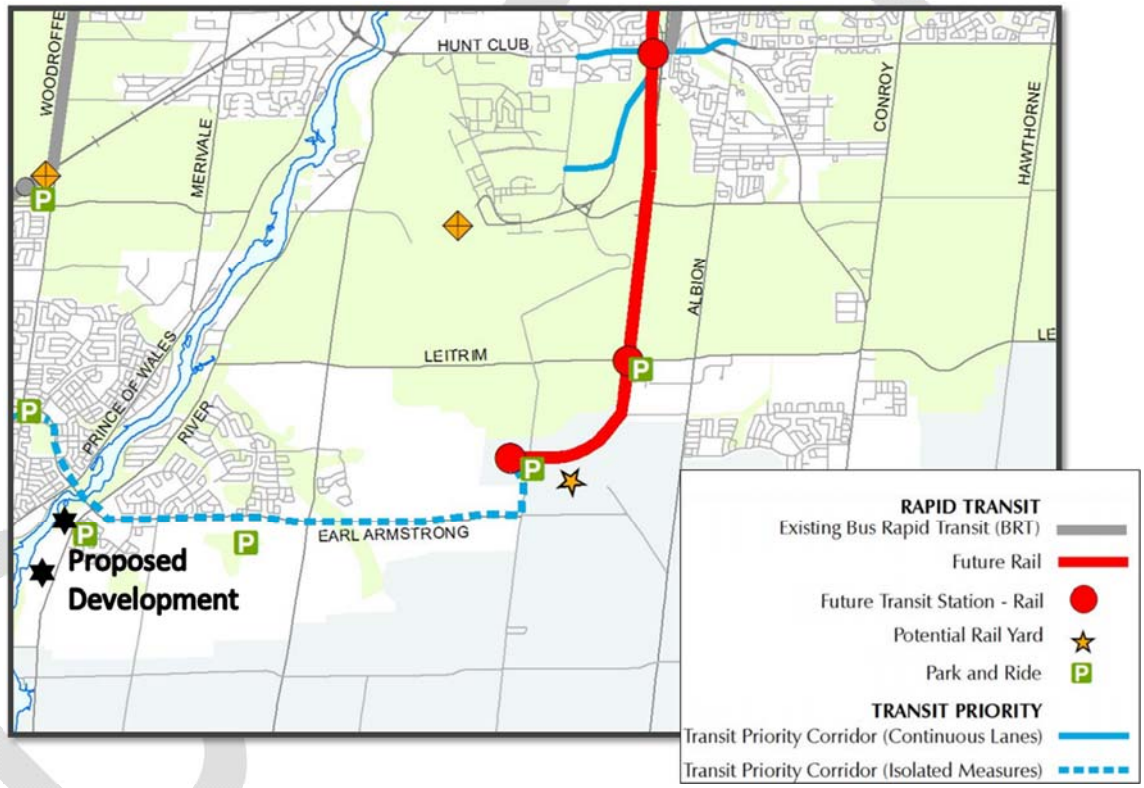
The City is targeting the completion of the O-Train extension to Riverside South by 2022.

- **Chapman Mills/ Strandherd Drive/ Earl Armstrong Road Transit Priority Corridor** - The corridor is expected to be upgraded with transit signal priority and queue jump lanes between the Barrhaven Town Centre Station and Bowesville Station. There is presently no specific timing available for the implementation of this project.

As shown previously in **Figure 3**, the Riverside South CDP identifies the eventual construction of a Rapid Transit Corridor immediately to the north of the proposed development, connecting the Riverside Park and Ride with the future O-Train terminus at Limebank Road. The implementation of this corridor, however, is presently not expected within the horizon year of this study.

Figure 4 shows the transit infrastructure projects in the vicinity of the proposed development that are part of the 2031 Affordable Network. Note that the figure below does not account for the changes to the Trillium Line LRT Extension described in the EPR Addendum which recommends a realignment of the LRT corridor and terminates at Limebank Road.

Figure 4 - Future 'Affordable RTTP Network Projects'



Source: 2013 Transportation Master Plan – Map 5 '2031 Affordable Network'

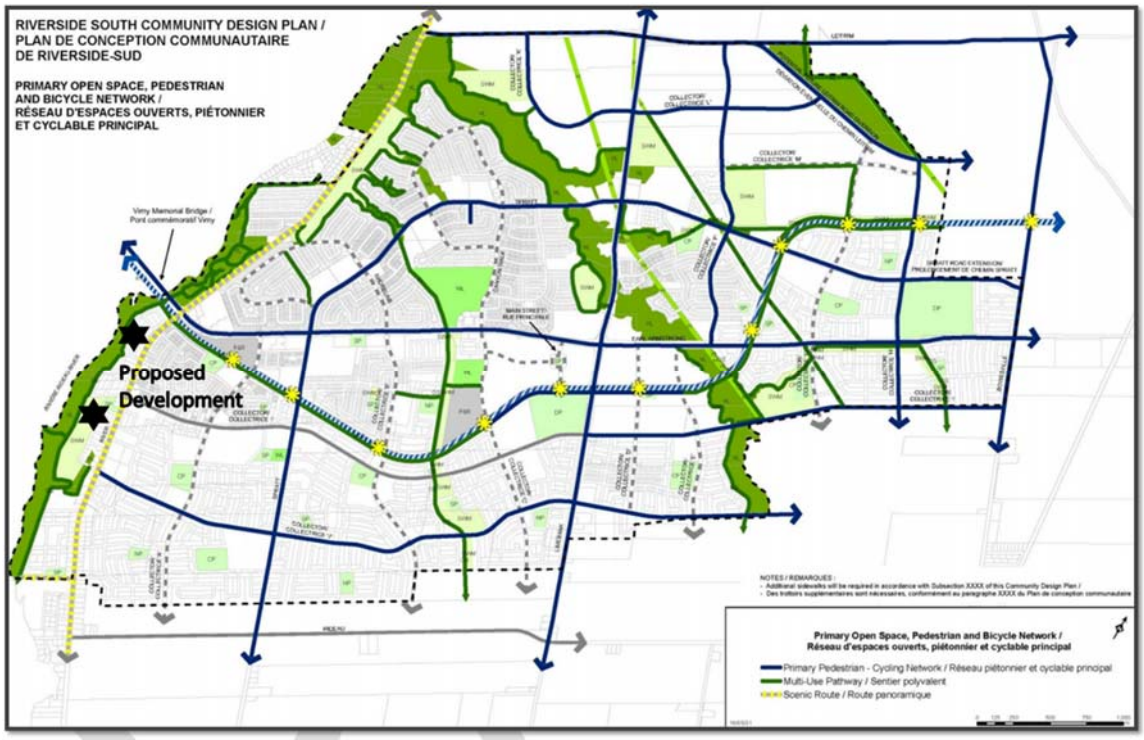
3.3.1.3 Future Cycling and Pedestrian Facilities

The Transportation Master Plan (TMP) designates Earl Armstrong Road and River Road as Spine Routes, which form part of a system linking the commercial, employment, institutional, residential and educational nodes throughout the City of Ottawa. River Road was recently reconstructed and provides paved shoulders on both sides of the road. There are currently no plans to introduce concrete sidewalks along this corridor, however the TMP identifies a major pathway west of River Road between Earl Armstrong Road and Nicolls Island Road. This pathway was also identified in the Riverside South Community Design Plan (CDP), approved in 2016, however the timing of this active transportation link is unknown.

The Riverside South CDP also provides details on proposed active transportation facilities within the area, including a multi-use pathway along the proposed Rapid Transit corridor and east of the Rideau River. Furthermore, it shows Earl Armstrong Road, Solarium Avenue and Borbridge Avenue east of Spratt Road as being part of the "Primary Pedestrian – Cycling Network".

The planned cycling and pedestrian network indicated in the CDP is shown below in **Figure 5**.

Figure 5 - Riverside South Community Design Plan - Cycling and Pedestrian Network



Source: Riverside South Community Design Plan

3.3.2 Future Adjacent Developments

The City of Ottawa Transportation Impact Assessment (TIA) Guidelines specify that all significant developments proposed within the surrounding area which are likely to occur within the study's horizon year must be identified and taken into consideration in the development of future background traffic projections.

There are 17 known developments of significance in the vicinity of the proposed development. For these developments, all unoccupied units have been accounted for in the development of background traffic volumes using consistent trip generation assumptions. Traffic generated by occupied units is assumed to have been captured in the existing traffic data, based on a site visit conducted by IBI staff on September 9, 2018.

All current developments applications adjacent to the site are summarized in **Table 3**. Future potential developments that have no official status are summarized in **Table 4**. Build-out assumptions for future potential developments are provided in the Forecasting section of this report.

The approximate locations of all current adjacent development applications and future potential developments are shown in **Exhibit 5**.

Table 3 - Adjacent Developments (Current Development Applications)

DEVELOPMENT	LAND USE	SIZE	BUILT/ OCCUPIED	% BUILT/ OCCUPIED	BUILD-OUT
Claridge Phase 2 (Sub-Phase 1)	Single Family Residential	268 units	0 units	0%	2021
	Townhome	172 units	0 units	0%	2021
Claridge Phase 2 (Sub-Phase 2)	Single Family Residential	78 units	0 units	0%	2026
	Townhome	237 units	0 units	0%	2026
Riverside Phase 8 (RSDC)	Single Family Residential	176 units	153 units	87%	2019
	Townhome	256 units	234 units	91%	2019
	Stacked Townhome	146 units	0 units	0%	2019
Phase 9 South (RSDC)	Single Family Residential	414 units	404 units	98%	2019
	Townhome	760 units	0 units	0%	Complete
	Stacked Townhome	181 units	181 units	100%	Complete
Phase 9 North (RSDC)	Shopping Centre	101,000 sqft	0 sqft	0%	2019
	Stacked Townhome	94 units	81 units	86%	2019
Phase 9 Southeast (Urbandale)	Single Family Residential	22 units	0 units	0%	2019
	Townhome	114 units	0 units	0%	2019
Phase 13 (RSDC)	Single Family Residential	282 units	18 units	6%	2019
	Townhome	190 units	0 units	0%	2019
RSDC Phase 15 (Sub-Phase 1)	Single Family Residential	215 units	0 units	0%	2021
	Townhome	373 units	0 units	0%	2021
RSDC Phase 15 (Sub Phases 2 & 3)	Single Family Residential	293 units	0 units	0%	2026
	Townhome	192 units	0 units	0%	2026

4725 Spratt Road (Claridge)	Townhome	275 units	0 units	0%	2021
879 River Road (Richcraft)	Townhome	117 units	0 units	0%	2020
673 River Road (Cardel Homes)	Single Family Residential	234 units	0 units	0%	2029
	Townhome	260 units	0 units	0%	2029

Note: Occupancy rates are based on a site visit conducted by IBI Group staff on September 9, 2018
RSDC = Riverside South Development Corporation

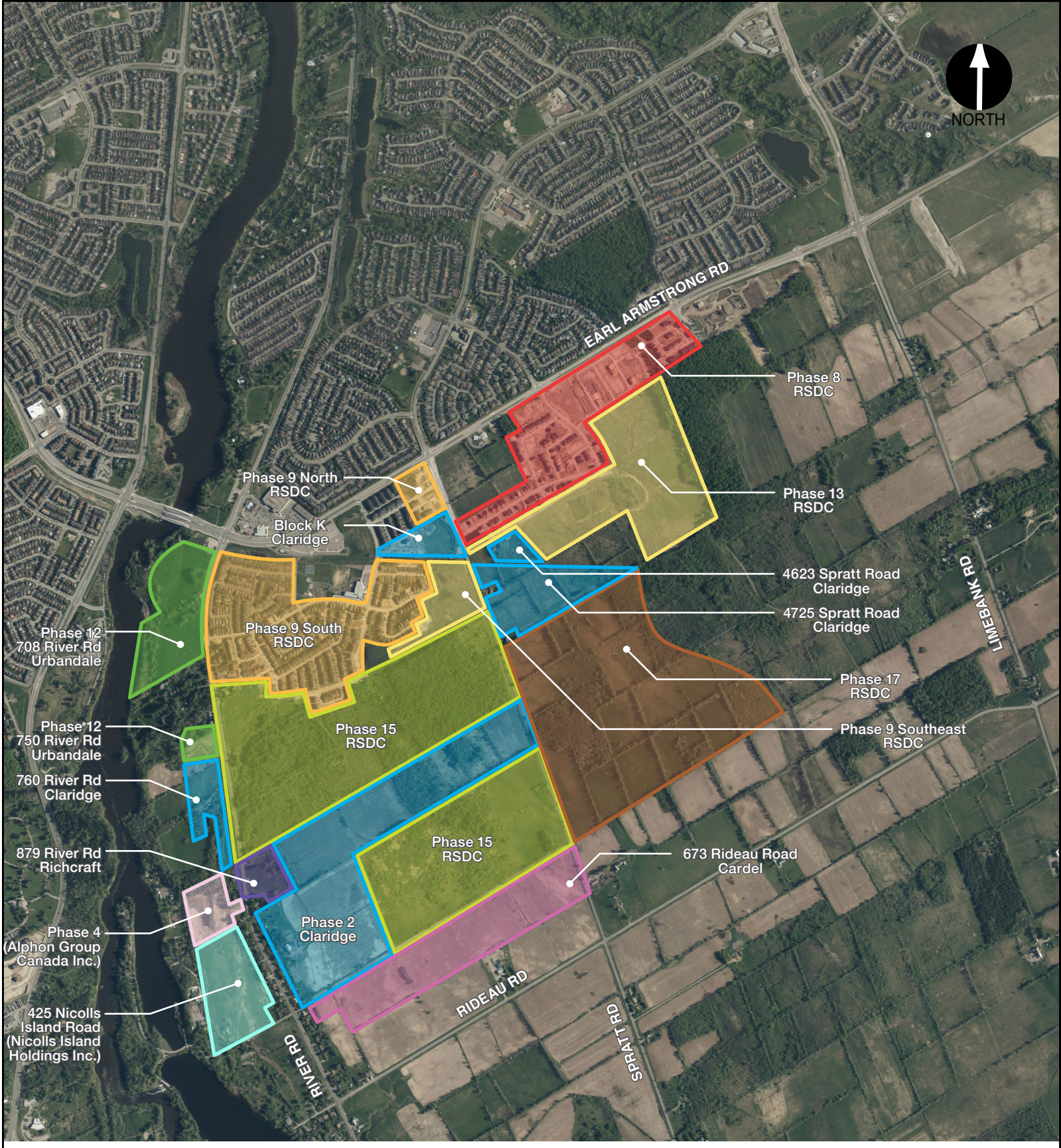
Table 4 - Future Potential Developments [1]

DEVELOPMENT	LAND USE	SIZE
760 River Road	Single Family Residential	55 units
Block K (RSDC)	Stacked Townhomes	43 units
	Shopping Centre	143,000 sqft
Phase 17 – 4775 & 4875 Spratt Road (Urbandale) [2]	Single Family Residential	588 units
	Townhome	294 units
Phase 4 (Nicolls Island Road Holdings Inc.)	Single Family Residential	24 units
	Townhome	31 units
425 Nicolls Island Road (Alphon Group Canada Inc.)	Single Family Residential	118 units
	Townhome	23 units

Note: Occupancy rates are based on a site visit conducted by IBI Group staff on September 9, 2018.
RSDC = Riverside South Development Corporation

[1] Build-out years are not known for these developments and construction has not started. Assumptions regarding the build-out of developments in Table 4 are provided in the Forecasting section of this report.

[2] Preliminary unit count based on residential density targets specified on Page 16 of the Riverside South Community Design Plan (2016).



- Riverside South Development Corporation (RSDC) – Phase 8
- Riverside South Development Corporation (RSDC) – Phase 9
- Riverside South Development Corporation (RSDC) – Phase 13
- Riverside South Development Corporation (RSDC) – Phase 15
- Riverside South Development Corporation (RSDC) – Phase 17
- Cardel
- Alphon Group Canada Inc.
- Nicolls Island Holdings Inc.
- Richcraft
- Urbandale
- Claridge

IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 5: Adjacent Development

Project No: 120031
Date: April 2019
Scale:
0m 50m 100m

3.3.3 Network Concept Screenline

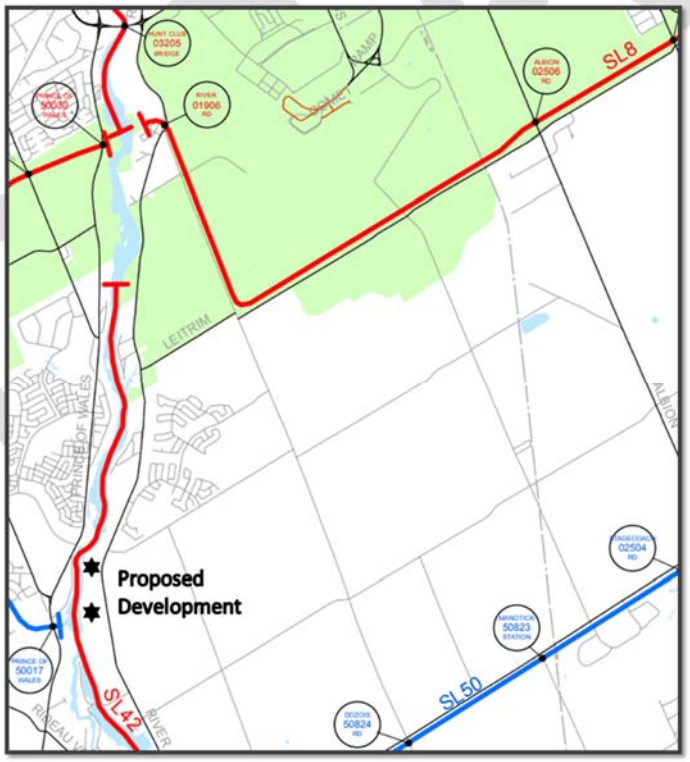
A screenline is a predetermined boundary between areas of major traffic generation that captures all significant points of entry from one area to another to compare crossing demand with the available roadway capacity. Screenlines are typically located along geographical barriers such as rivers, rail lines or within the greenbelt. To capture existing flow and model future demand, count stations are established at each crossing point along the screenline.

The nearest strategic planning screenlines adjacent to the development have been considered in the screenline analysis:

- **SL8 – Leitrim** – This is the nearest east/west screenline to the north of the study area. It is located just north of Leitrim Road and runs from east of Hawthorne Road to just east of Limebank Road, transitioning to a north/south screenline travelling east of Limebank Road before terminating at the intersection of Limebank and River Road. This screenline has three crossing points immediately north of Leitrim Road at Hawthorne Road, Bank Street and Albion Road, as well as an additional crossing point at River Road where Limebank Road transitions to Riverside Drive.
- **SL42 – Rideau River (Manotick)** – This is the nearest north/south screenline to the study area, and it is located along the Rideau River from just south of Mitch Owens Road to just north of Leitrim Road. It has two crossing points: the Vimy Memorial Bridge and the Manotick Bridge.

SL8 and SL42 are shown in **Figure 6**, as determined from the City of Ottawa's Road Network Development Report (2013), a supporting document to the 2013 Transportation Master Plan (TMP). Analysis of the Network Impact at these screenlines will be assessed in the Analysis section of this report.

Figure 6 – Screenlines



3.4 Study Area

Based on a review of the information presented thus far, a study area bound by Earl Armstrong Road to the north, River Road to the east and the southern limit of the proposed development will provide a sufficient assessment of the development's impact on the adjacent transportation network.

The following intersections will therefore be assessed for vehicular capacity as part of this study:

- Earl Armstrong Road and River Road
- River Road and Ph. 12 North Access
- River Road and Ph. 12 South Access/ Summerhill Street
- River Road and 760 River Access/ Atrium Ridge

Multi-modal Level of Service will be conducted for all signalized intersections within the study area described above, as well as along River Road between Earl Armstrong and the southern limits of the proposed development.

3.5 Time Periods

As the proposed development will consist of residential land uses, traffic generated during the weekday morning and afternoon peak hours is expected to result in the most significant impact to traffic operations on the adjacent network.

3.6 Study Horizon Year

The following future analysis years will be assessed in this study:

- Year 2021 – Full Build-out/ Occupancy of Single-Family and Townhome Units Only
- Year 2024 – Full Build-out/ Occupancy of Proposed Development
- Year 2029 – 5 years Beyond Full Build-out/ Occupancy

As noted above, the proposed development is being evaluated with interim analysis years of 2021 and 2024 (full build-out/ occupancy) to coincide with the phasing of the development. The study horizon year for the development is therefore 2029.

3.7 Exemptions Review

The TIA Guidelines provide exemption considerations for elements of the Design Review and Network Impact components. **Table 5** summarizes the TIA modules that are not applicable to this study.

Table 5 - Exemptions Review

TIA MODULE	ELEMENT	EXEMPTION CONISDERATIONS	REQUIRED
DESIGN REVIEW COMPONENT			
4.1 Development Design	4.1.2 Circulation and Access	• Only required for site plans	✗
	4.1.3 New Street Networks	• Only required for plans of subdivision	✓
4.2 Parking	4.2.1 Parking Supply	• Only required for site plans	✗
	4.2.2 Spillover Parking	• Only required for site plans where parking supply is 15% below unconstrained demand	✗
NETWORK IMPACT COMPONENT			
4.5 Transportation Demand Management	All Elements	• Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	✓
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	• Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	✗
4.8 Network Concept	n/a	• Only required when proposed development generates more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by established zoning	✓

4 Forecasting

4.1 Development Generated Traffic

4.1.1 Trip Generation Methodology

Peak hour site-generated traffic volumes were developed using the 2009 TRANS Trip Generation Residential Trip Rates Study Report. The TRANS trip generation rates are based on a blended rate derived from 17 trip generation studies undertaken in 2008, the Institute of Transportation Engineers (ITE) Trip Generation Manual and the 2005 TRANS OD Travel Survey. Separate trip generation rates exist for each of the four general geographic areas in Ottawa: Core, Urban (Inside the Greenbelt), Suburban (Outside the Greenbelt) and Rural. These trip generation rates reflect existing travel behavior by dwelling type and geographic area. Adjusted trip generation rates also exist to reflect increased transit usage for developments in close proximity to rapid transit stations.

The Transportation Impact Assessment (TIA) Guidelines recommend the TRANS trip generation rates be converted to person-trips based on the vehicular mode share proportions detailed in the TRANS Trip Generation study. The person-trips are to be subdivided based on representative mode share percentages applicable to the study area to determine the number of vehicle, transit, pedestrian, cycling and other trip types.

Local mode shares were based on the TRANS Committee: 2011 Origin-Destination (OD) Survey completed for the City of Ottawa. The OD Survey has mode share breakdowns for specific Traffic Assessment Zones (TAZ) throughout the City; the South Gloucester/ Leitrim TAZ has been referenced for this study.

4.1.2 Trip Generation Results

4.1.2.1 Vehicle Trip Generation

Peak hour vehicular traffic volumes associated with the Riverside South Phase 12 development were determined using the peak hour trip generation rates in the TRANS Trip Generation study. The vehicular trip generation results for the proposed development have been summarized in **Table 6**.

Table 6 - TRANS Vehicular Trip Generation Results (Riverside South Phase 12)

BUILD-OUT YEAR	LAND USE	SIZE (DU)	PERIOD	GENERATED TRIPS (VPH)		
				IN	OUT	TOTAL
2021	Townhouse	55	AM	11	19	30
			PM	21	18	39
2021	Single-Family Homes	80	AM	15	37	52
			PM	41	26	67
2024	Condominium Units	110	AM	14	37	51
			PM	29	21	50

Notes: DU = Dwelling Units, vph = Vehicles Per Hour

As the southern enclave of Riverside South Phase 12 is reliant on 760 River Road for access to the adjacent road network, the 760 River Road parcel has been given special consideration in this

study to ensure that the site access has been designed to sufficiently accommodate the total expected volume of traffic, based on the conceptual plan.

Traffic generation for 760 River Road is provided in **Table 7** below:

Table 7 - TRANS Vehicular Trip Generation Results (760 River Road)

LAND USE	SIZE (DU)	PERIOD	GENERATED TRIPS (VPH)		
			IN	OUT	TOTAL
Single-Family Homes	55	AM	11	27	39
		PM	31	19	50

Notes: DU = Dwelling Units, vph = Vehicles Per Hour

Since the timing of 760 River Road is not presently not known, the study has conservatively assumed that it will be fully occupied by the 2024 horizon year.

4.1.2.2 Person Trip Generation

The person-trip to vehicle-trip conversion factors for TRANS trip generation rates vary depending on the peak hour, geographic location and land use considered. The vehicular trip generation results from the previous section were divided by the vehicle mode shares to determine the number of person-trips likely to be generated.

The results after applying the corresponding vehicle mode share conversion factor have been summarized in **Table 8** and **Table 9** for the proposed development and the adjacent 760 River Road development, respectively.

Table 8 - Person-Trip Results (Riverside South Phase 12)

BUILD-OUT YEAR	LAND USE	VEH MODE SHARE	PERIOD	PERSON TRIPS (PPH)		
				IN	OUT	TOTAL
2021	Townhouse	55%	AM	20	35	55
		61%	PM	34	30	64
2021	Single-Family Homes	55%	AM	27	67	94
		64%	PM	64	41	105
2024	Condominium Units	44%	AM	32	84	116
		44%	PM	67	48	115
			AM Total	**79**	**186**	**265**
			PM Total	**165**	**119**	**284**

Notes: DU = Dwelling Units, pph = persons per hour

Table 9 - Person-Trip Results (760 River Road)

LAND USE	PERIOD	GENERATED TRIPS (VPH)		
		IN	OUT	TOTAL
Condominium Units	AM	20	50	70
	PM	48	30	78

4.1.2.3 Mode Share Proportions

The 2011 TRANS Origin-Destination (O-D) Survey provides approximations of the existing modal share within the South Gloucester/ Leitrim Traffic Assessment Zone (TAZ). Relevant extracts from the 2011 O-D Survey are provided in **Appendix F**.

Adjustments were made to the Transit Modal Split (TMS) in future horizons to better reflect the impact of transit infrastructure projects planned in the TMP. The methodology for these adjustments is provided in Section 4.3.2. It should be noted that these adjustments were limited traffic generation at 708 River Road, and that modal shares for 750 and 760 River Road are assumed to follow the existing mode shares from the OD Survey for all analysis years considered in this study.

For the proposed development as a whole, no adjustments were made to active modes of transportation such as walking and cycling for future planning horizons. This approach should be considered conservative.

The existing and proposed mode share targets for the South Gloucester/ Leitrim TAZ for each of the analysis horizons are outlined in **Table 10**.

Table 10 - Existing and Proposed Mode Share for South Gloucester/Leitrim (2011 O-D Survey)

TRAVEL MODE	MODE SHARE BY HORIZON YEAR FOR 708 RIVER ROAD							
	O-D SURVEY (2011)		INTERIM BUILD-OUT (2021)		FULL BUILD-OUT (2024)		FULL BUILD-OUT + 5 YRS (2029)	
	AM	PM	AM	PM	AM	PM	AM	PM
Auto Driver	64%	68%	62%	65%	60%	63%	56%	59%
Transit	12%	11%	14%	14%	16%	16%	20%	20%
Auto Passenger	17%	15%	No Change					
Cycling	1%	1%						
Walking	0%	0%						
Other	6%	5%						

4.1.2.4 Trip Reduction Factors

Deduction of Existing Development Trips

Not Applicable: The proposed development lands are currently undeveloped, and do not generate any traffic volumes.

Pass-by Traffic

Not Applicable: The proposed development will not generate pass-by traffic.

Synergy/ Internalization

Not Applicable: The proposed development will include only residential land uses, therefore internalization reduction factors are not required for this study.

4.1.2.5 Trip Generation by Mode

The mode share targets from **Table 10** were applied to the number of development generated person-trips to determine the number of trips per travel mode. The results after applying the mode share targets are summarized in **Table 11** for the proposed development.

Table 11 – Peak Hour Person Trips by Mode and Horizon Year (Riverside South Phase 12)

MODE	2021 AM		2021 PM		2024 AM		2024 PM		2029 AM		2029 PM	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT	IN	OUT
Auto Driver	**30**	**64**	**65**	**47**	**48**	**113**	**106**	**76**	**46**	**107**	**100**	**73**
Transit	6	14	13	9	12	28	25	18	14	34	30	21
Auto Passenger	8	14	15	11	14	32	25	18	14	32	25	18
Walking	0	1	1	1	1	2	2	1	1	2	2	1
Cycling	0	0	0	0	0	0	0	0	0	0	0	0
Other	3	5	3	4	5	11	8	6	5	11	8	6
Total	**145**		**169**		**265**		**284**		**265**		**284**	

The resulting number of person-trips by mode for 760 River Road are summarized in **Table 12**, assuming build-out of the development occurs by 2024 to coincide with the full build-out of the Riverside South Phase 12 development.

Table 12 – Peak Hour Person Trips by Mode and Horizon Year (760 River Road)

MODE	2024 AM		2024 PM		2029 AM		2029 PM	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT
Auto Driver	13	32	33	21	13	32	33	21
Transit	2	6	5	3	2	6	5	3
Auto Passenger	3	8	7	5	3	8	7	5
Walking	0	0	0	0	0	0	0	0
Cycling	0	0	0	0	0	0	0	0
Other	1	3	2	2	1	3	2	2
Total	70		78		70		78	

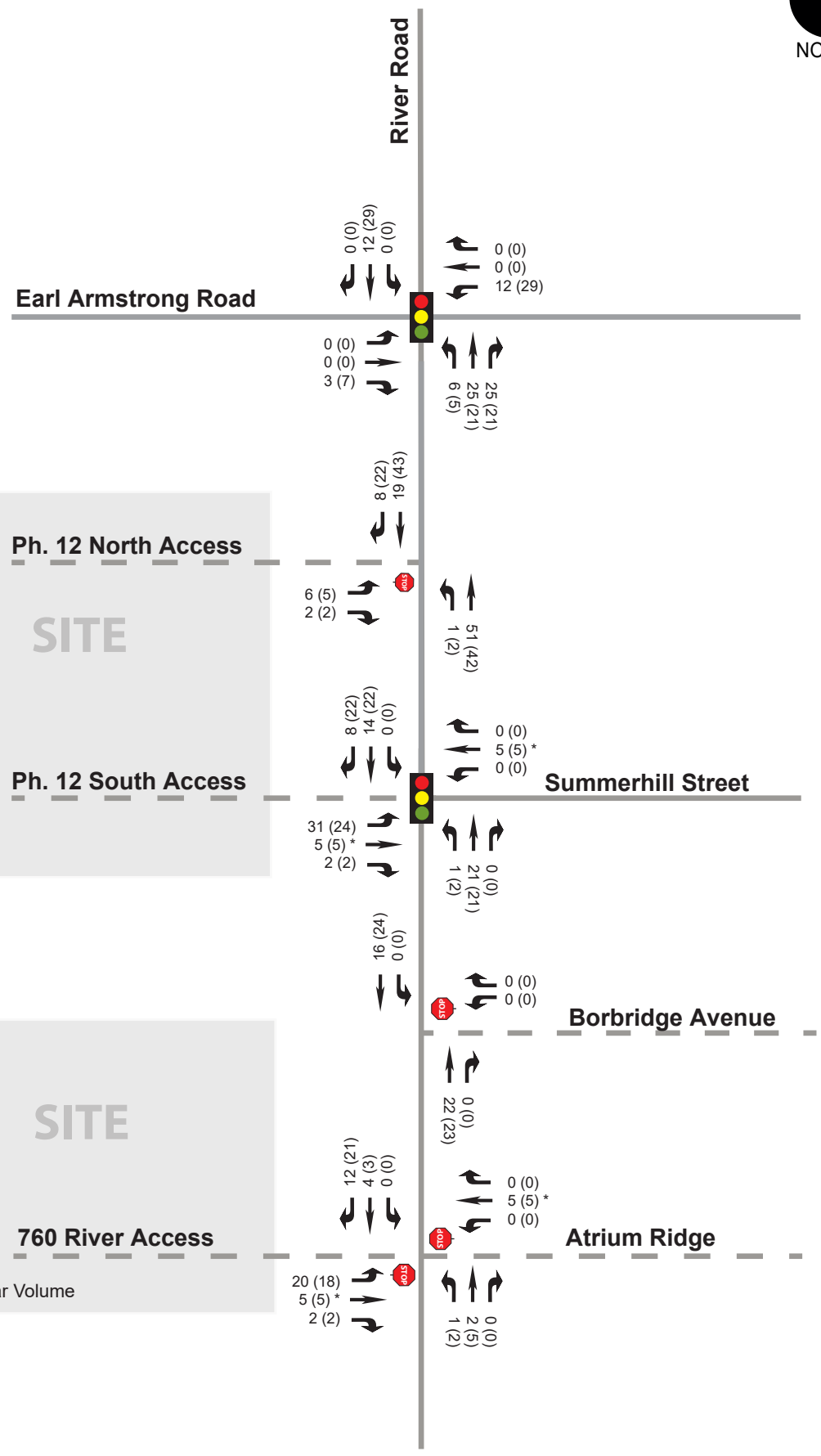
4.1.3 Trip Distribution and Assignment

With consideration that the land use of the proposed development will be residential, the anticipated distribution of site-generated traffic in each of the four cardinal directions will be

consistent with the AM Peak commuter flow based on the 2011 O-D Survey data. Assignment of site-generated traffic along logical routes for each direction has been assumed as follows and is consistent with approved transportation impact assessments studies recently completed for nearby adjacent developments:

- 90% to/from North
    - 40% via River Road
    - 40% via Limebank Road
    - 10% via Prince of Wales Drive
- 10% to/from South
    - 10% via River Road

Utilizing the estimated number of new auto trips and applying the above distribution, future site-generated traffic volumes in the 2021, 2024 and 2029 horizon years are illustrated for each of the study area intersections in **Exhibit 6**, **Exhibit 7** and **Exhibit 8**, respectively.

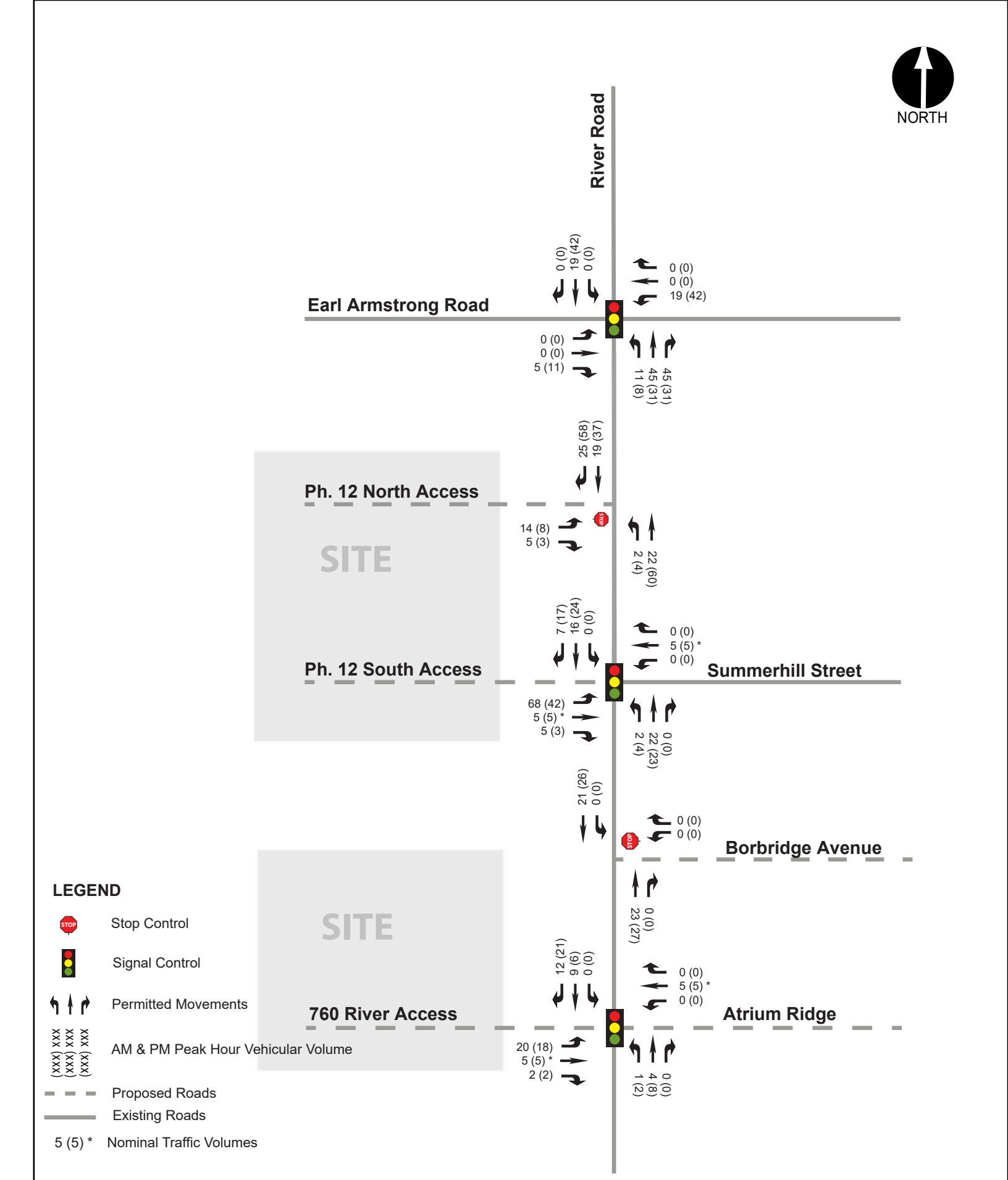


IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 6
Site Generated Traffic (2021)

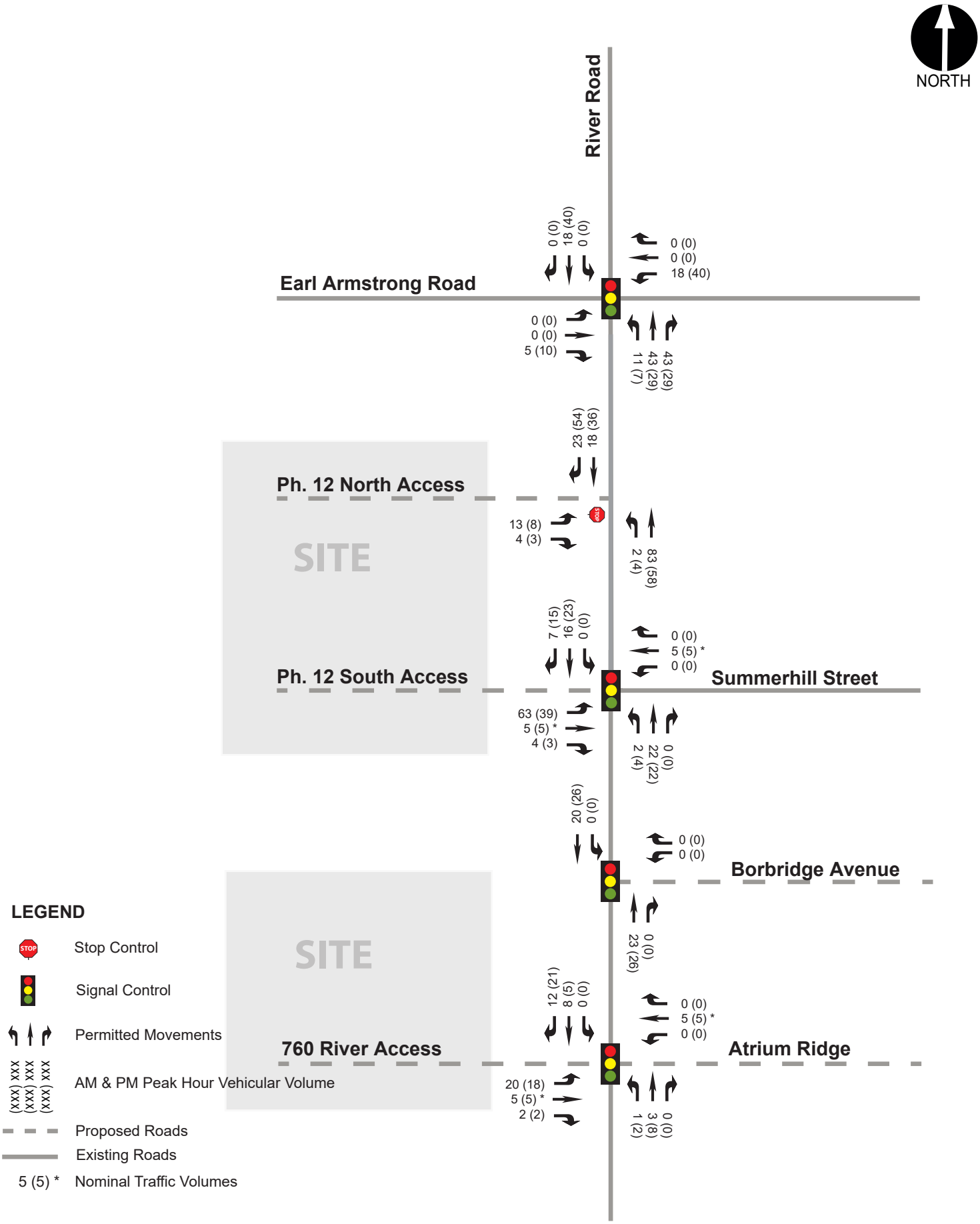
Project No. 120031
Date: April 2019
Scale: N.T.S



Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 7
Site Generated Traffic (2024)

Project No. 120031
Date: April 2019
Scale: N.T.S



IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 8
Site Generated Traffic (2029)

Project No. 120031
Date: April 2019
Scale: N.T.S

4.2 Background Network Traffic

4.2.1 Changes to the Background Transportation Network

To properly assess future traffic conditions, planned modifications to the transportation network that may impact travel patterns or demand within the study area have been considered. The Scoping section of this TIA reviewed the anticipated changes to the study area transportation network based on the Transportation Master Plan (TMP), Capital Budget Forecasts and the *2019 City-Wide Development Charges Background Study*, and determined that there are no major arterial road network modifications planned within the study area.

There are a number of anticipated transportation network changes triggered by development in the surrounding Riverside South Community. A summary of the relevant local transportation network changes has been provided below:

- Solarium Avenue (Collector 'J'), a new east-west collector road south of the study area, will connect River Road, Spratt Road and Limebank Road. The connection from River Road to Spratt Road is expected to be in place by 2020.
- Borbridge Avenue, an existing collector road, will be extended from River Road to Spratt Road, forming a new T-intersection at River Road and connecting to Collector 'I' at Spratt Road to form a new four-way intersection. The intersection of Borbridge and River is expected to be open for general traffic in spring 2019, while the extension and connection of Borbridge Avenue to Spratt is expected to be completed later in 2019.
- Brian Good Avenue will be extended south of its existing terminus at Borbridge Avenue to provide a connection with Solarium Avenue and continue further south towards Rideau Road.
- The Riverside South Phase 2 and Phase 15 TIAs conducted by IBI Group (November 2017) recommended the conversion of Earl Armstrong/ Brian Good from a stop controlled intersection to a signalized intersection immediately due to existing traffic capacity issues.
- The Riverside South Phase 13 TIA conducted by Dillon Consulting (July 2014) recommended dual westbound left-turn lanes at the Earl Armstrong / Spratt intersection with storage lane lengths of 70m by 2023.

4.2.2 General Background Growth Rates

The background growth rate is intended to represent regional growth from outside the study area that will travel along the adjacent road network. Consistent with approved TIAs completed in the broader study area, the following growth rates were proposed within the study area for the calculation of future background traffic estimates:

- 0% linear growth per annum for through movements along River Road south of Earl Armstrong Road
- 0.5% linear growth per annum for all movements at the Earl Armstrong Road and River Road intersection with the exception of eastbound and westbound through movements in the weekday morning and afternoon peak hours, respectively, which are expected to sustain a 1.0% growth rate.

As with previous TIAs completed within Riverside South, adjustments were made to the background growth rate at the intersection of Earl Armstrong and River to better reflect the impact of planned transit infrastructure projects planned in the TMP. The methodology for these adjustments is provided in Section 4.3.3.2.

A general background growth rate has not been applied to collector and local roadways within the study area, as traffic generation relating to all known future adjacent developments has been exclusively accounted for in the analysis.

4.2.3 Other Area Development

All current adjacent development applications and future potential developments within the study area were previously identified in **Table 3** and **Table 4**, respectively. All of the developments identified have been accounted for in the future background volume projections. The developments represent specific areas of growth within the study area and are therefore considered in addition to the general background growth rate discussed previously.

A site survey was completed documenting all occupied units within these development lands. All unoccupied units have been accounted for separately in the development of future background traffic volumes established in this study. Conversely, all occupied units have been accounted for in the existing (2019) volumes.

According to Canada Mortgage and Housing Corporation (CMHC) statistics, historical new housing starts in the Riverside South Community range from 300 to 400 units per year. This study assumes a high growth scenario with a build-out rate of 450 units per year from 2019 to 2029. Construction of future potential developments is assumed to start after 2024 and progress uniformly to bridge the gap between the build-out of current development applications and the expected market absorption rate of 450 units per year. The rate of development assumed in this study is deemed appropriate given the high market demand for new housing in the Riverside South community.

4.3 Demand Rationalization

The purpose of this section is to rationalize future travel demands within the study area to account for potential capacity limitations in the transportation network and its ability to effectively accommodate the additional demand generated by a new development.

4.3.1 Description of Capacity Issues

4.3.1.1 Earl Armstrong and River

The Earl Armstrong Road and River Road intersection has been operating at or above its theoretical capacity since the Vimy Memorial Bridge opened in 2014, as determined in recent transportation studies for nearby developments. Despite the intersection having been built to its ultimate, 4-lane configuration with dual left-turn lanes on all approaches, channelized right-turn lanes, as well as exclusive bus and cycling lanes, the intersection remains congested during peak periods with limited opportunities to increase vehicular capacity.

As previously shown in **Exhibit 4**, weekday morning and afternoon peak hour volumes along Earl Armstrong Road at River Road are presently in the order of 1,000 vehicles per hour in the peak direction, which is within the capacity limitations (1,000 vehicles per hour per lane) for two lanes on an arterial road. Traffic volumes on River Road immediately south of Earl Armstrong Road are presently in the order of 800 vehicles per hour in the peak direction, which is also under capacity.

Even though the through volumes within the study area are presently shown to be within the capacity limitations along Earl Armstrong and River Roads, heavy turning movement volumes are a contributing factor to existing capacity issues at this intersection. The eastbound left-turn during the weekday morning peak hour and southbound right-turn during the weekday afternoon peak hour have been recorded in the order of 635 vehicles and 805 vehicles, respectively. The magnitude of these volumes suggests that these movements may be experiencing capacity

issues, and that additional contributions to these movements (or their opposing movements) will further exacerbate congestion at this intersection.

It should be noted, however, that based on the distribution of site-generated traffic assumed in this study, the proposed development is not expected to contribute additional traffic volumes to either of these turning movements. Further to this, there are viable alternative routes available to local traffic to avoid this bottleneck in the transportation network, such as Limebank Road and Prince of Wales Drive. According to the *Needs and Opportunities Report* (2013), the Leitrim Screenline (SL 8) has additional inbound capacity during the weekday morning peak period to accommodate diverted trips from the Earl Armstrong Road and River Road intersection to ensure that the theoretical capacity of the intersection is not exceeded in the future analysis scenarios.

4.3.1.2 River and Summerhill

Once the west leg of the River Road and Summerhill Street intersection is constructed, it is expected that there may be excessive delays on the eastbound-left movement. Analyses conducted in other TIAs within the study area previously indicated that the traffic volumes in future peak direction along River Road would exceed 1,100 vehicles during the peak hours, providing few gaps for vehicles entering from the side street. These volumes are further-increased with consideration of additional developments lands along the corridor and to the south.

In anticipation of these constraints, the City had proactively installed underground traffic signal infrastructure at the River and Summerhill intersection in late 2018. It is expected that the inclusion of the west leg will trigger the need for signalization at the intersection, based on intersection capacity analysis and Ontario Traffic Manual (OTM) signal warrants.

The Analysis section of this TIA will confirm the timing of any localized issues at any of the study area intersections under background and total traffic conditions, and suggest mitigation measures where applicable.

4.3.2 Adjustment to Development Generated Demands

Development generated demand and mode share can vary over time to reflect changes to the transportation network. The City continues to promote the proliferation of transit and active transportation modes in order to meet the mode share targets set in the Transportation Master Plan (TMP). Transit is expected to play a significant role, and will have an impact on travel behaviour within the study area.

Although pedestrian and cycling facilities have expanded within the Riverside South Community, the impact on development generated traffic demand is not expected to result in any significant changes to the target mode share assumed for this study.

4.3.2.1 Transit Modal Share

The trip generation results presented in **Table 11** had been adjusted to account for future increases in transit mode share (TMS). The TMP indicates that the transit mode share in the morning peak period from Riverside South/ Leitrim area to all other areas in the City was estimated at 9% in 2011 with a transit mode share target of 16% by 2031.

This 7% increase in the transit modal share (TMS) is based on expected Rapid Transit and Transit Priority projects outlined in the ‘Affordable Network’ of the TMP. Within the Riverside South Community specifically, the TMP notes that transit priority measures are to be implemented along Earl Armstrong Road to provide improved connectivity between the Town Centres of Barrhaven South and Riverside South.

The *Trillium Line LRT Extension Addendum* (Sept. 2018) identifies a few significant changes to the TMP’s conceptual alignment for the Trillium Line South Extension, including the relocation of

the planned terminus station from its original location at Bowesville to within the Riverside South Community Core at Limebank Road. The South Extension is planned as part of the Light Rail Transit (LRT) Phase 2 project with a recently-revised target date of 2022.

The impacts to travel behaviour associated with locating a major light rail transit hub within the Riverside South Community by 2022 are therefore not accounted for in the City's Transportation Master Plan 2031 TMS projections. It is very likely that the 2031 transit modal share (TMS) target of 16% will be achieved well in advance of the City's ultimate planning horizon as a result of the LRT South Extension. In recognition of this, the following TMS target for both site-generated traffic and adjacent development traffic has been assumed:

- Year 2021:
    - TMS = 14%
- Year 2024:
    - TMS = 16% (TMP 2031 target)
- Year 2029:
    - TMS = 20%

The above noted increases in transit modal share assume proportional decreases in vehicular trip generation, and have been adjusted to account for the expected delay associated with the LRT Southern Extension.

4.3.3 Adjustment to Background Network Demands

4.3.3.1 Transit Mode Share

Previous TIAs conducted in the Riverside South area were carried under the assumption that the Trillium Line South Extension would be completed by 2021, however the City has recently indicated that this portion of LRT Stage 2 will be delayed until 2022. It was therefore necessary to adjust the transit mode share for all adjacent developments to align with the more realistic levels noted above.

4.3.3.2 Background Growth Rate Reductions

As discussed in Section 4.2.2, a regional background growth rate of 1.0% was applied to select movements along arterial roadways within the study area. This growth rate was based on previously approved traffic studies for developments located within the study area. Local side street traffic volumes were not subject to this growth rate as traffic generated by all potential and future adjacent development were explicitly accounted for in the analysis.

At the intersection of Earl Armstrong Road and River Road intersection, a growth rate of 0.5% was applied to all movements with the exception of the eastbound through in the morning peak period and the westbound through in the afternoon peak period. These two movements retained the 1.0% background growth rate. The reason for the reduction to the remaining movements can be summarized as follows:

1. The Vimy Memorial Bridge crossing was opened in late 2014 and traffic volumes at the Earl Armstrong Road and River Road intersection increased significantly in the first 2 years of operation, however this initial growth is unsustainable nor representative of future background growth. Therefore, the historical trends prior to the bridge opening were reviewed to define a baseline rate for future background growth for all movements to/ from River Road. This approach was considered to be a more representative predictor of future background growth since the transportation network in the local area in the

years prior to the Bridge opening was stable. The results of this analysis has been summarized in **Table 13**, which show flat to negative growth for nearly all movements during this period.

2. The Earl Armstrong Road and River Road intersection is currently operating above its theoretical capacity despite being constructed to its ultimate configuration. It therefore was considered unreasonable to assume a constant 1.0% growth rate through to the 2029 horizon year for all movements at this intersection. Background traffic should be expected to redirect to other routes as a result.

3. **Table 14** summarizes the post-bridge annual traffic volume trends. The results showed significant growth on major commuter movements e.g. the EBT and WBT, as expected, however on minor movements such as the EBR, WBL, NBL and NBR, growth was less significant and could be attributed to new local residents from the ongoing development of the Riverside South Community. It was therefore deemed appropriate to apply a marginal growth linear growth rate of 0.5% per annum to each movement. These movements are the most logical access and egress routes for local trips. As previously noted, all known future potential and proposed adjacent developments are accounted for separately in this analysis, therefore applying an additional growth rate to these movements may constitute double counting of future trips generated by the local community.

4. Projected growth on the southbound right-turn and eastbound left-turn movements is assumed to be marginal within the timeframe of the study, as continued growth at the current rate is not sustainable. As such, a marginal growth rate of 0.5% was applied linearly to the future projected traffic volumes.

Table 13 - Earl Armstrong Road and River Road Historical Peak Hour Traffic Volumes – Pre-Bridge

COUNT DATE	COMBINED AM & PM TRAFFIC VOLUMES BY MOVEMENT					
	WBL	WBR	NBT	NBR	SBL	SBT
June 2006	304	240	799	266	123	643
May 2007	284	271	756	231	138	610
May 2008	342	156	659	301	127	535
June 2009	370	209	761	231	175	610
July 2013	349	97	620	166	88	470
July 2014	356	168	794	222	88	567
Trend	Pos	Neg	Neg	Neg	Neg	Neg

Table 14 – Earl Armstrong Road and River Road Historical Peak Hour Traffic Volumes – Post Bridge

COUNT DATE	COMBINED AM & PM TRAFFIC VOLUMES BY MOVEMENT											
	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
August 2014[1]	695	1124	248	148	1040	106	305	535	127	54	396	652
Sept 2015	722	1769	380	174	1399	150	430	516	133	59	318	922
March 2016	667	1721	353	164	1457	104	400	503	130	52	273	768
June 2016	643	1836	415	181	1512	139	502	498	144	60	335	898
Feb 2019	1047	1949	463	94	1801	117	499	389	87	71	219	1031
Long-Term Trend [2]	Pos	Pos	Pos	-	Pos	Neg	-	Neg	-	-	Neg	Pos

Notes: EB/WB/NB/SB – eastbound, westbound, northbound, southbound; L/T/R = left/through/right
[1] Count completed shortly after Vimy Memorial Bridge opened, expected to be low and was considered an outlier
[2] Considers long-term trend in traffic volumes from June 2006 to Feb 2019

Table 14The historical trends noted in **Table 14** support the 0.5% background growth rate assumptions at the Earl Armstrong Road and River Road intersection. The only exceptions to the 0.5% growth rate were the eastbound through in the morning peak period and the westbound through in the afternoon peak period. Cross traffic between the Barrhaven South and Riverside South communities is expected to continue increasing as City infrastructure projects are completed as part of Phases 2 and 3 of the TMP network timetable, such as the extension of the Trillium Line to Limebank Road and the planned widening and extension of Earl Armstrong Road east of Limebank Road. Therefore, the 1.0% background growth rate applied to these two movements was considered reasonable.

In addition to the above, a 0.5% background growth rate was also applied to movements that showed flat or negative trends.

4.3.3.3 River Road Background Growth Rate

As noted previously, a 0% growth rate was applied to through movements along River Road, which is consistent with previously approved studies. With the significant development and construction of at least four new access intersections expected to occur along this corridor within the timeframe of this study, the peak direction capacity is expected to exceed 1000 vehicles per hour per lane in the peak direction, therefore it is not reasonable to expect that additional regional traffic growth of any significance will be sustained along this corridor. It is anticipated that traffic growth will originate almost exclusively from adjacent development traffic, which has was accounted for extensively for the development of traffic volumes for this report.

4.4 Traffic Volume Summary

4.4.1 Future Background Traffic Volumes

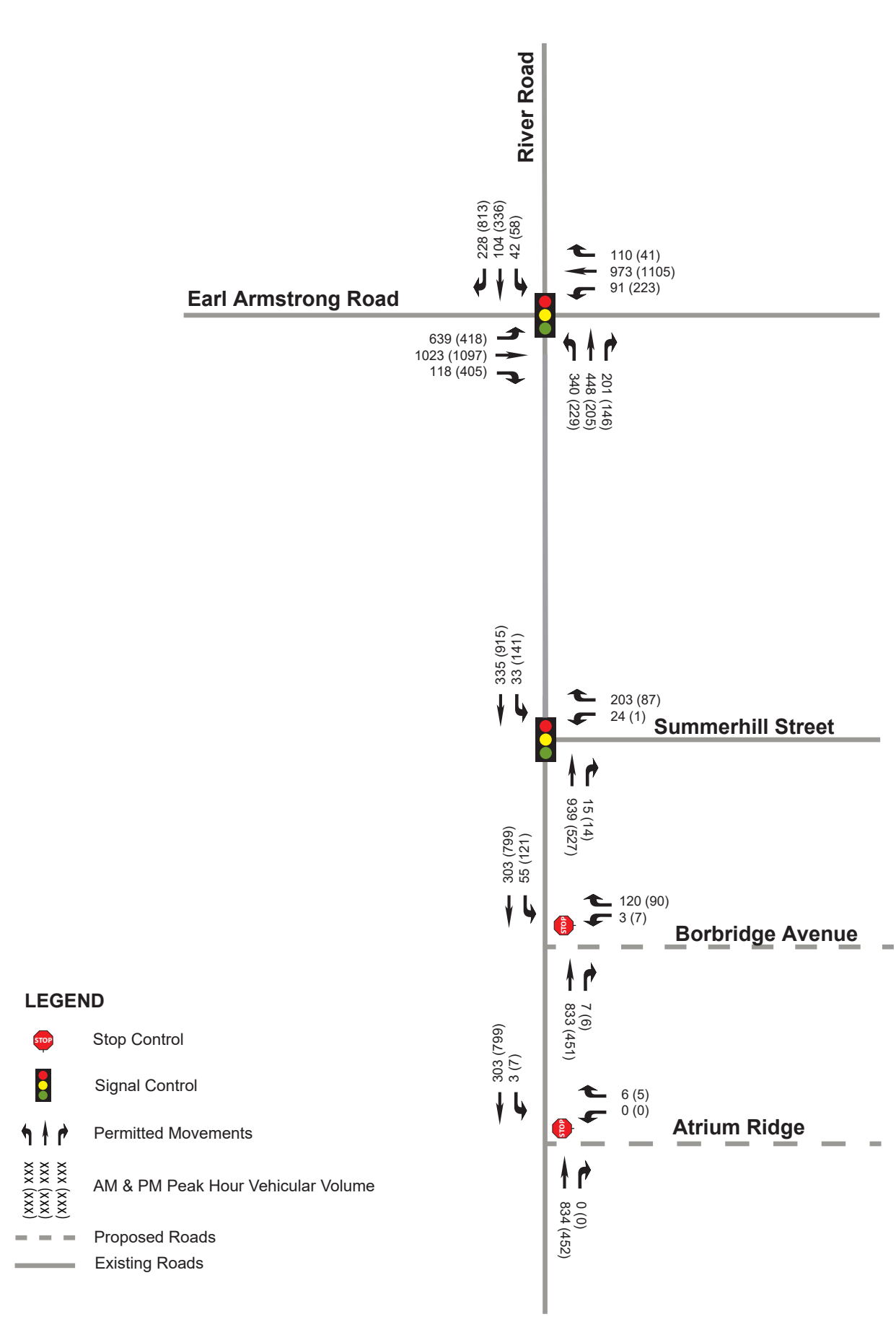
Future background traffic volumes projections have been established by combining the adjacent development traffic and background traffic derived through the application of a growth rate as discussed previously.

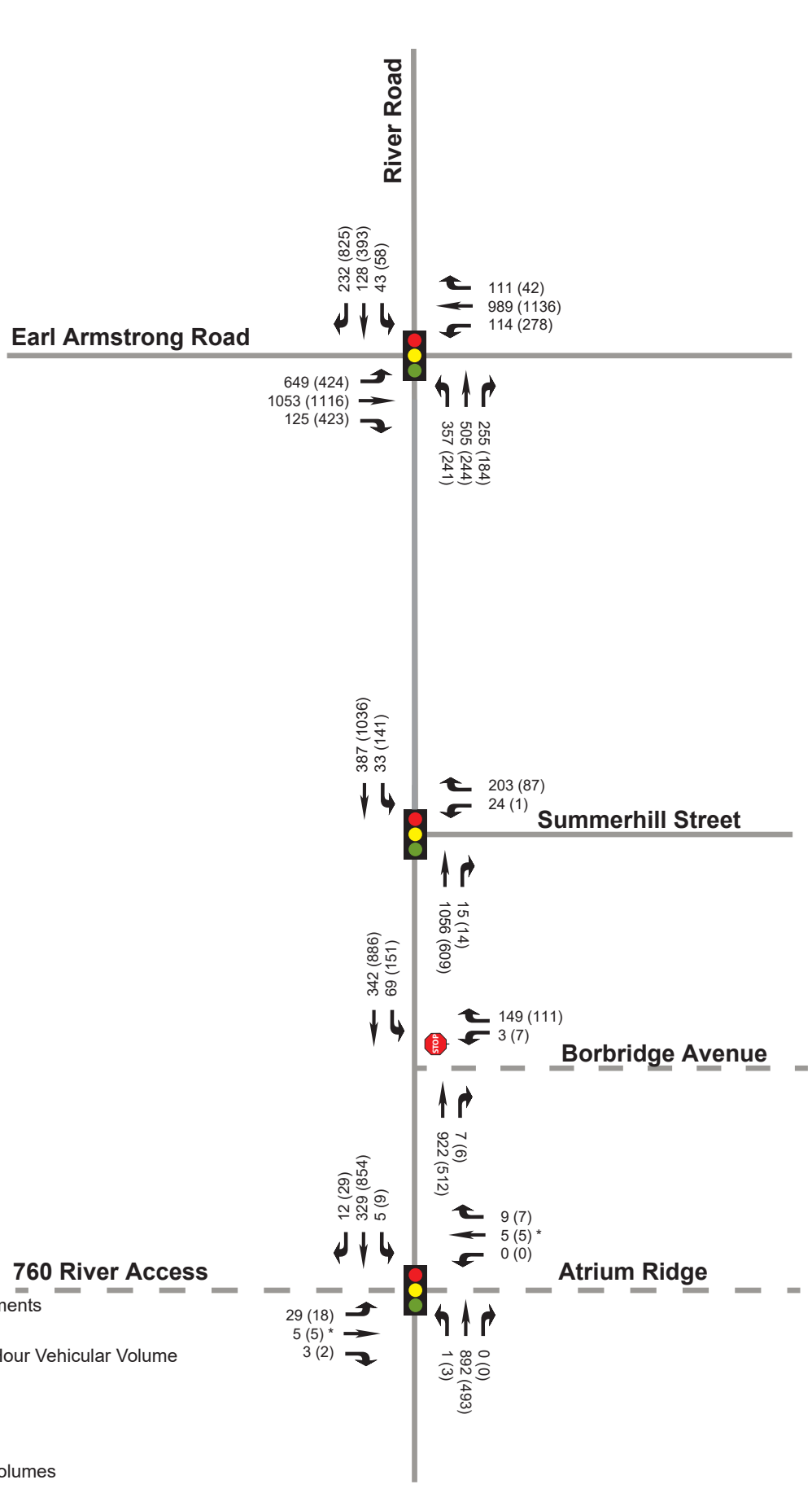
Exhibits 7 to 9 present the future background traffic volumes anticipated for the 2021 and 2024 build-out year, as well as the 2029 study horizon, respectively.

4.4.2 Future Total Traffic Volumes

Future total volumes have been derived by combining the site-generated traffic in **Exhibit 6** with the future background volumes in **Exhibits 7** to **9**.

Exhibits 10 to **12** present the future total traffic volumes anticipated for 2021, 2024 and 2029 horizon years, respectively.


NORTH
River Road
Earl Armstrong Road
228 (813)
104 (336)
42 (58)
110 (41)
973 (1105)
91 (223)
639 (418)
1023 (1097)
118 (405)
340 (229)
448 (205)
201 (146)
335 (915)
33 (141)
203 (87)
24 (1)
Summerhill Street
15 (14)
939 (527)
303 (799)
55 (121)
120 (90)
3 (7)
Borbridge Avenue
7 (6)
833 (451)
303 (799)
3 (7)
6 (5)
0 (0)
Atrium Ridge
0 (0)
834 (452)
LEGEND
Stop Control
Signal Control
Permitted Movements
AM & PM Peak Hour Vehicular Volume
Proposed Roads
Existing Roads

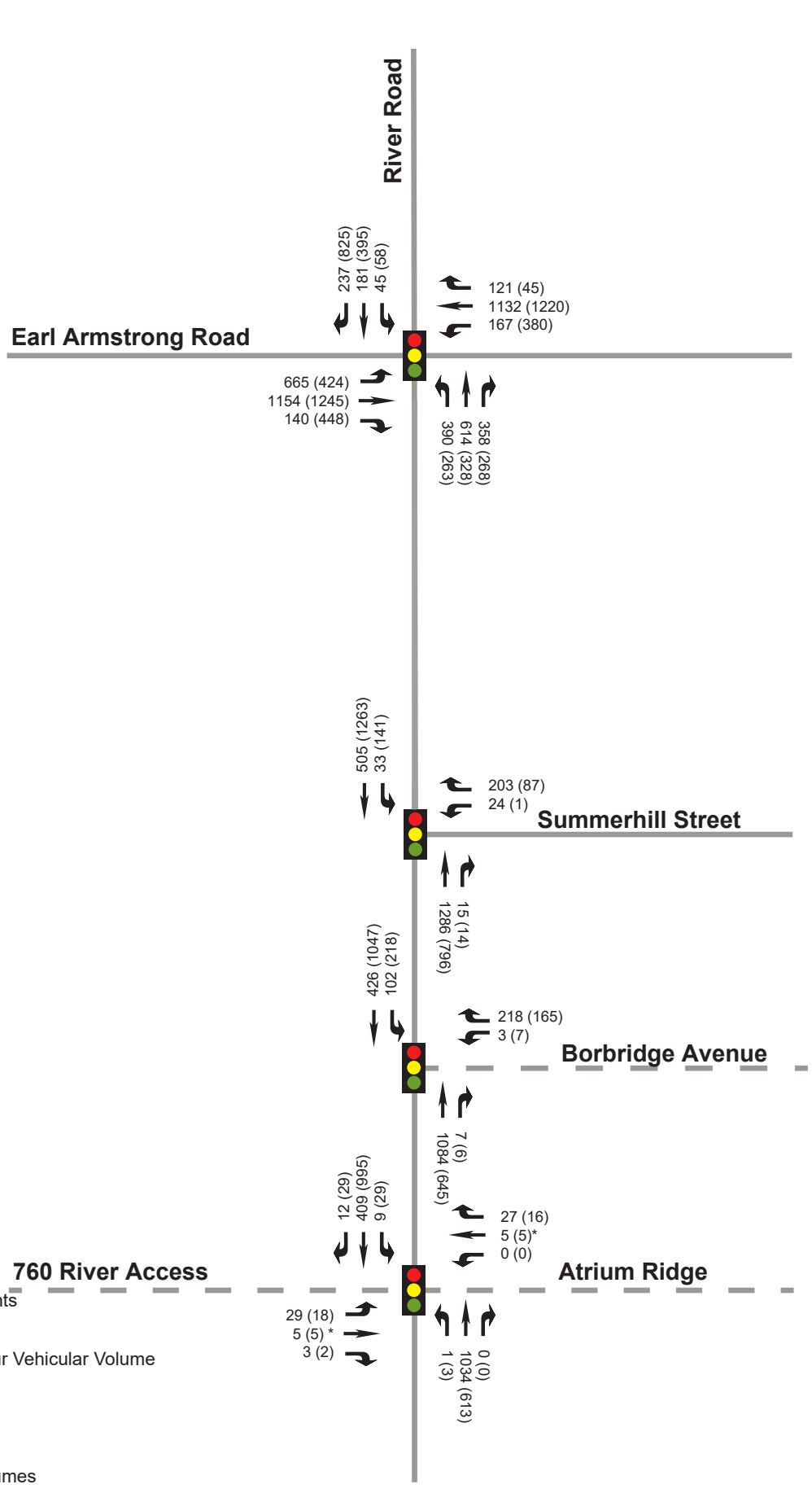


IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 10:
Future (2024) Background Traffic

Project No. 120031
Date: April 2019
Scale: N.T.S

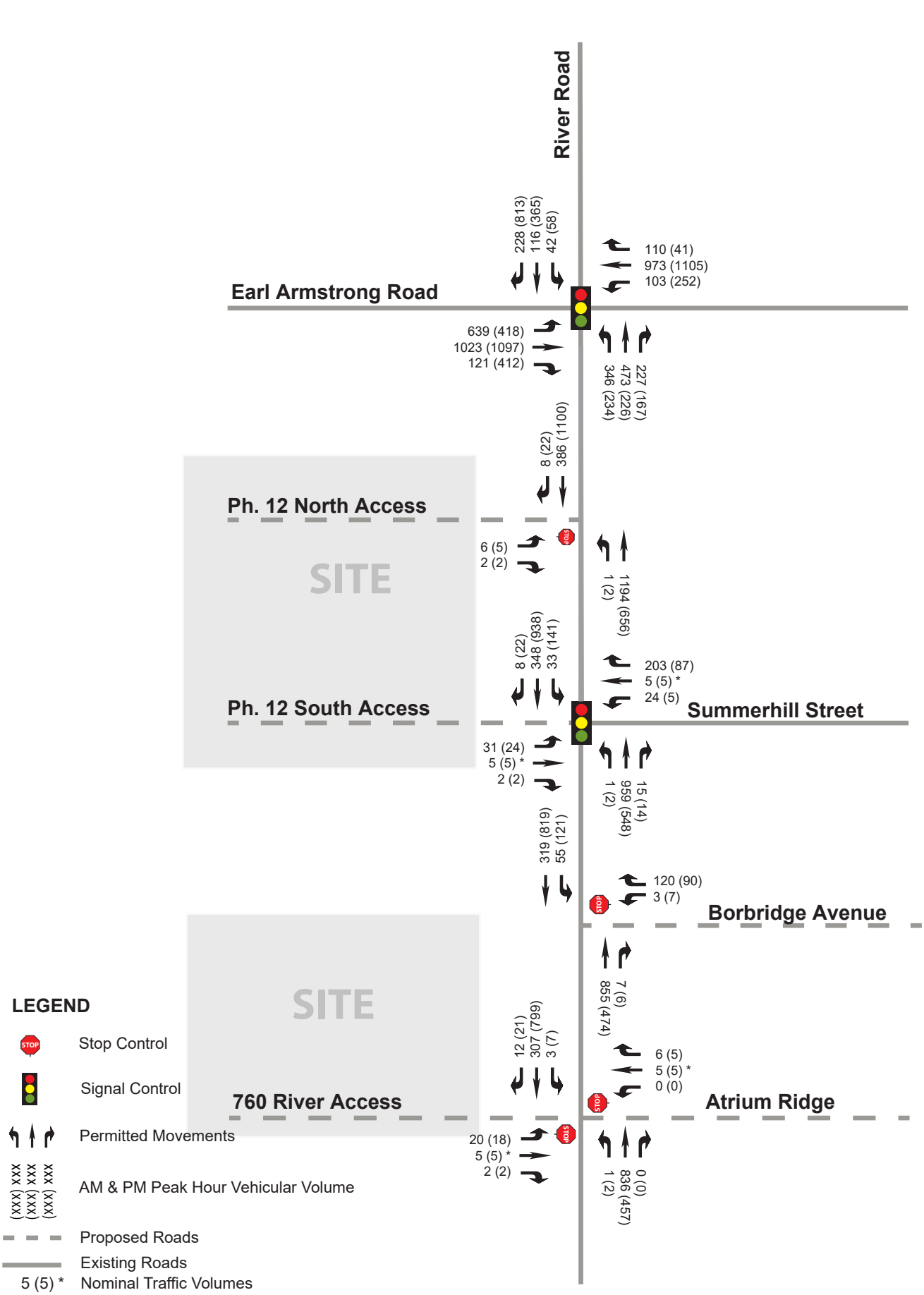


IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 11:
Future (2029) Background Traffic

Project No. 120031
Date: April 2019
Scale: N.T.S

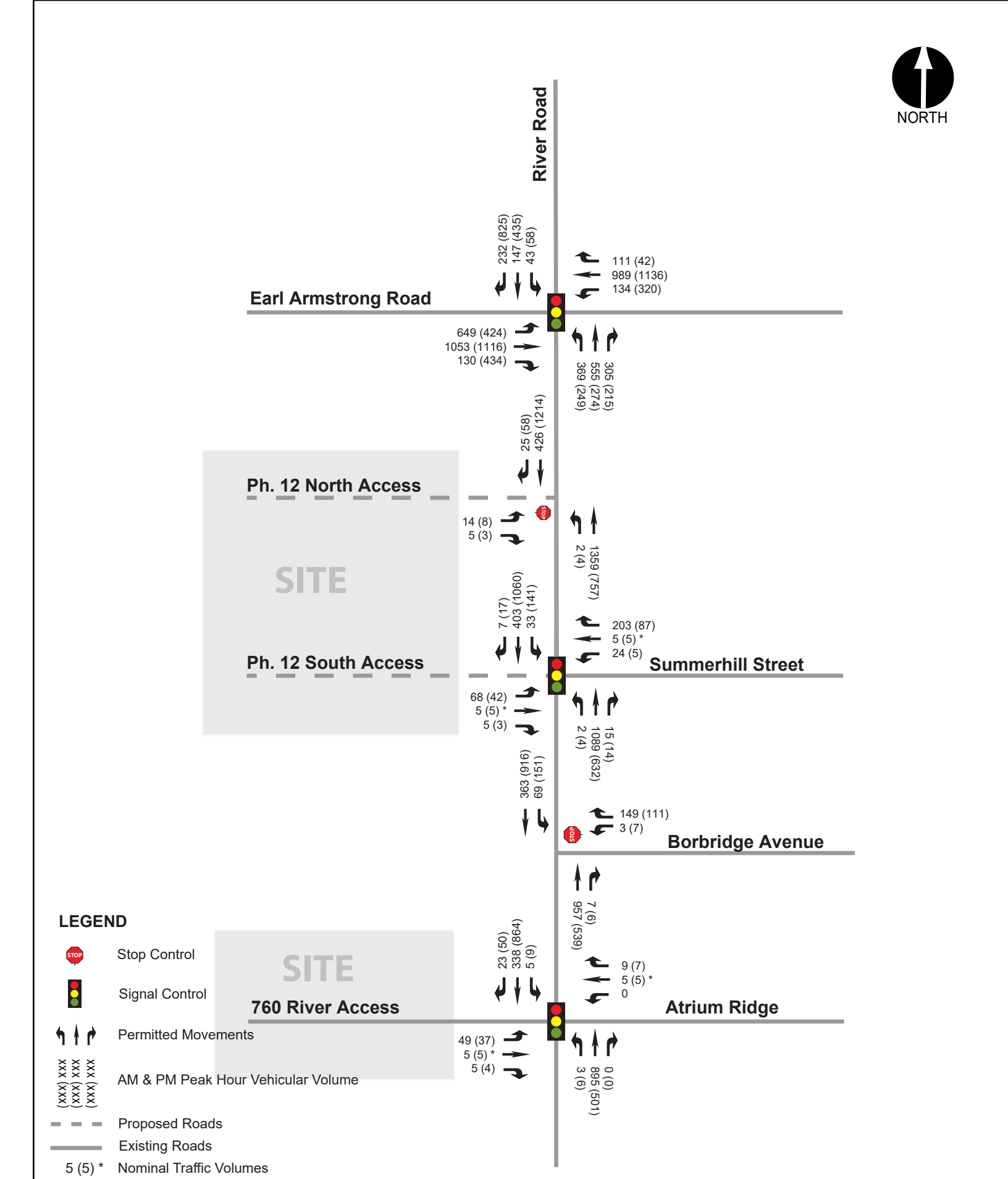


IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 12:
Future (2021) Total Traffic

Project No. 120031
Date: April 2019
Scale: N.T.S

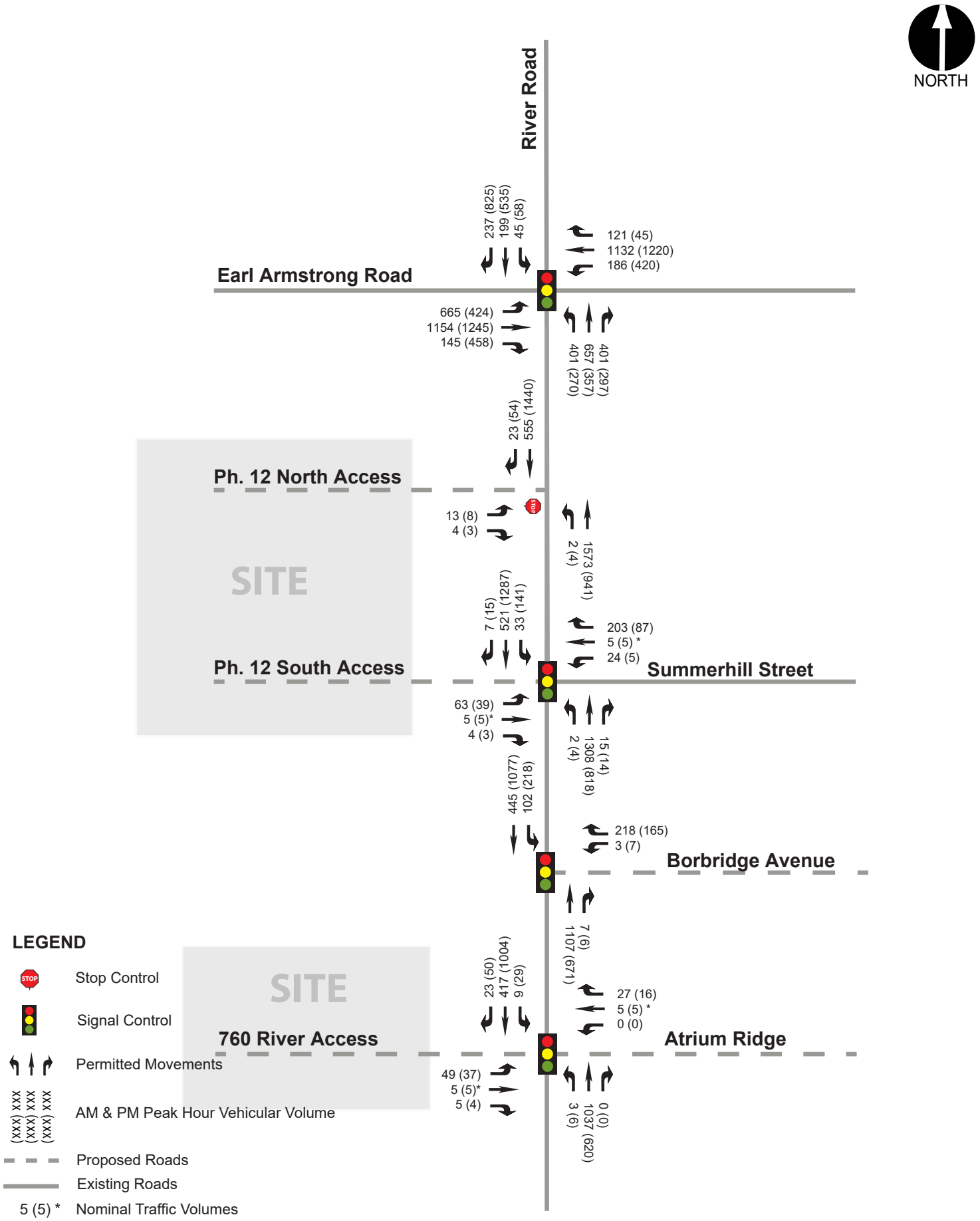


IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 13:
Future (2024) Total Traffic

Project No. 120031
Date: April 2019
Scale: N.T.S



IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 14:
Future (2029) Total Traffic

Project No. 120031
Date: April 2019
Scale: N.T.S

5 Analysis

5.1 Development Design

5.1.1 Design for Sustainable Modes

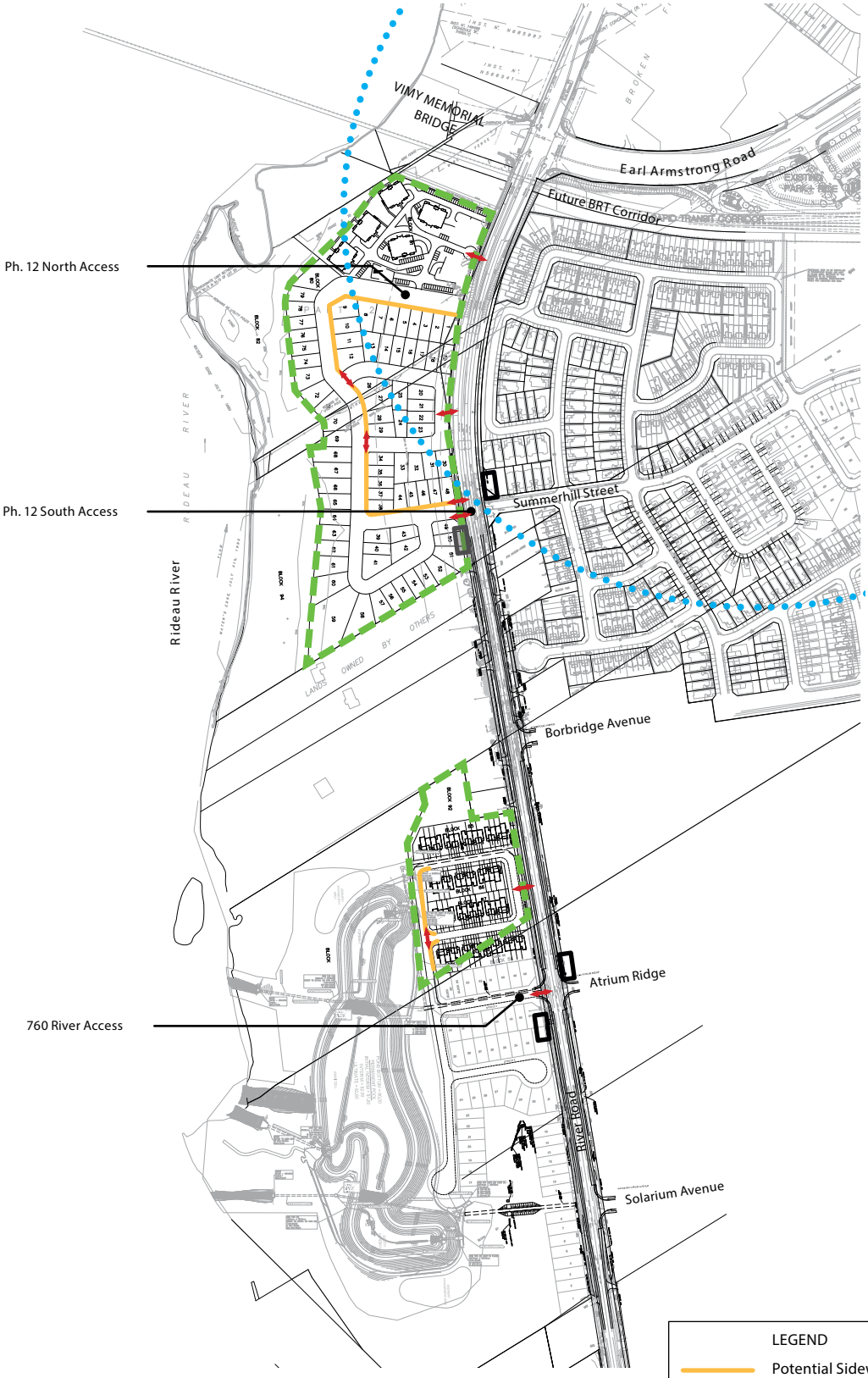
The enhancement of existing transit routes and/or the addition of new routes will be required to provide adequate transit service coverage. All-day transit service can potentially be extended along River Road south of Earl Armstrong Road, with strategically placed stops to capture 100% of the proposed residential units within 400m walking distance, as shown in **Exhibit 15**.

The Riverview Transit Station is located approximately 550 metre walking distance from the northern development parcel, 708 River Road, while the lower density units associated with 750 River Road will be greater than 750 metre walking distance from this station. It is anticipated that any local transit route providing service to the proposed development will provide direct connectivity to Riverview Station. It should be noted that transit coverage has been provisioned for with the installation of a bus pads at the intersections of River/ Summerhill (northbound) and River/ Atrium (northbound and southbound).

Once the future Barrhaven-Riverside South Bus Rapid Transit Corridor is constructed along the northern limits of the site, high quality transit service will connect Riverview Station and the Limebank LRT Station, proposed within the Riverside South Town Centre.

It is anticipated that as development within the Riverside South Community progresses, any future pedestrian and cycling connections identified in the primary pedestrian-cycling network in the Riverside South Community Design Plan will be constructed. Select local roads proposed within the development will provide sidewalks on at least one side to facilitate connections to nearby schools, parks, pathways and other community attractions.

There are presently no formal sidewalks or cycling facilities along River Road within the proposed development frontage, however it is expected that the River and Summerhill/ Ph. 12 South Access intersection will include formal pedestrian facilities once it is converted to a four-legged intersection and signalized to facilitate access to local transit stops. Future signalization of River Road/ Atrium Ridge will also enable access to transit stops from the southern enclave (750 River Road) of the proposed development.



IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 15: Proposed Mobility Plan

Project No: 120031
Date: April 2019
Scale:
0m 50m 100m

5.1.2 New Street Networks

The proposed development consists of local roads configured in a modified grid pattern with two connections to River Road provided for 708 River Road, and single connection to River Road provided for 750 River Road through adjacent lands to the south. Consistent with the objectives of the Community Design Plan (CDP), frequent intersections with short block lengths are proposed to mitigate the risk of speeding while providing a more porous, walkable network for pedestrians.

Sidewalks will be constructed on select local roads within the development. There may be an opportunity to provide pedestrian connections between the future multi-use pathways (MUPs) proposed to the north and west of the site.

5.2 Parking

Not Applicable: The Parking Supply and Spillover Parking elements are exempt from this TIA, as defined in the study scope. These elements are not required for Draft Plans of Subdivision.

5.3 Boundary Streets

5.3.1 Mobility

River Road is the only existing boundary street associated with the proposed development, abutting the site to the east.

There is presently no 'complete streets' concept plan for River Road, and based on recent discussions with the City it is understood that the rural two-lane cross-section on River Road is to be maintained south of Earl Armstrong for the foreseeable future.

Segment-based MMLOS results for Spratt Road along the property frontage are provided in **Table 15** below. Details of the MMLOS analysis are provided in **Appendix G**.

Table 15 - Segment MMLOS - Existing & Future Conditions

LOCATION	LEVEL OF SERVICE BY MODE			
	PEDESTRIAN (PLOS)	BICYCLE (BLOS)	TRANSIT (TLOS)	TRUCK (TkLOS)
TARGET	**C**	**C**	**D**	**D**
SEGMENTS				
River Road – Earl Armstrong to Ph. 12 North Access	**F**	**E**	**D**	**A**
River Road – Ph. 12 North Access to Southern Property Limit	**F**	**E**	**D**	**B**

Note 1: Sidewalk must be 1.5m to meet provincial standard

5.3.2 Road Safety

A summary of all reported collisions within the study period over the past five years was presented in the Section 3.2.4. The City requires a safety review if at least six collisions for any one movement or of a discernible pattern, over a five year period have occurred. The analysis identified a collision pattern at the Earl Armstrong and River intersection.

In the past five years, there have been 45 rear-end collisions at this intersection. There have been 6 in the eastbound direction, 9 in the northbound direction and 26 in the southbound direction.

Details of these collisions were reviewed to determine if there is any probable cause for these repeated collisions:

- Eastbound
    - Time of day: Peak hour (4 of 6)
- Northbound
    - Surface condition: Slush/Wet (4 of 9)
    - Time of day: Peak hour (5 of 9)
- Southbound
    - Surface condition: Slush/Wet (4 of 17)
    - Time of day: Peak hour (10 of 17)

Based on the above, there is no evident pattern or specific cause for collisions in these directions and can each be considered random occurrences.

In the southbound direction, 17 of these rear end collisions were caused by vehicles turning right, while the other 9 various manoeuvres can be considered random. Of these, 4 of the collisions occurred in unfavourable conditions. The only similar condition rear-end collisions were 8 southbound right-turning vehicles in the afternoon peak hour.

The 8 recorded rear-end collisions were likely caused by the high number of southbound right-turning vehicles at the River and Earl Armstrong intersection during the afternoon peak hour. Over 800 southbound right-turning vehicles were recorded in the afternoon peak hour, which is well above what is normally observed at a major intersection. These vehicles are required to yield to over 1,000 westbound through vehicles. It is expected that rear-end collisions may occur at this level of traffic intensity. The only mitigation measure is to reduce traffic volumes on the observed movement. City policies are attempting to accomplish this over time, as more supportive infrastructure projects are completed, such as the widening of Prince of Wales and completion of the O-Train: Line 2 extension to Limebank Road. As implementation gradually occurs, traffic volumes and the reported number of collisions is expected to decrease.

5.4 Access Intersections

5.4.1 Location and Design of Access

The proposed development will provide direct access to River Road at these locations, two of which will form a fourth leg at the established intersection locations:

1) Phase 12 North Access – An all-movements access is proposed approximately 205 metres south of the Earl Armstrong/ River Road intersections and 235 metres north of Summerhill Street. The access will have a 24.0m Right-of-Way (ROW), however it is intended as a secondary access to River Road.
2) Phase 12 South Access – An all-movements access is proposed on the west leg of River Road/ Summerhill Street intersection approximately 275 metres north of Borbridge Avenue. The access will have an 18.0m Right-of-Way (ROW). With underground traffic signal infrastructure already in place, this intersection will serve as a primary access/ egress for 708 River Road.
3) 760 River Access – An all-movements access is proposed on the west leg of the River Road/ Atrium Ridge intersection approximately 325 metres south of the future Borbridge Avenue. The access will have an 18.0m ROW, consistent with the planned ROW for Atrium Ridge to the east. This intersection will provide access to both 750 and 760 River Road.

There are no other existing private approaches of significance along River Road within the study area.

5.4.2 Intersection Control

5.4.2.1 Traffic Signal Warrants

Based on the projected traffic volumes, the intersection of River and Summerhill/ Ph. 12 South Access is expected to trigger the warrants under Future (2024) Total Traffic conditions.

The other proposed access intersections, Phase 12 North Access and 760 River Access do not trigger traffic signal warrants under Future (2029) Total Traffic conditions.

The results of the traffic signal warrants are provided in **Appendix H**.

5.4.2.2 Roundabout Analysis

As per the City's Roundabout Implementation Policy, intersections that satisfy any of the following criteria should be screened utilizing the Roundabout Initial Feasibility Screening Tool:

- At any new City intersection
- Where traffic signals are warranted
- At intersections where capacity or safety problems are being experienced

As previously discussed, the City has pre-emptively installed underground signal infrastructure at River and Summerhill, therefore this intersection will not be considered as a potential candidate for a roundabout in this study.

The remaining site access intersections, River and Ph. 12 North Access and River and 760 River Access/ Atrium Ridge, were assessed against the above noted criteria and a Roundabout Feasibility Screening Tool was completed for each location, since both are considered as 'new City intersections'. The results of the Roundabout Feasibility Screening Tool indicates that a roundabout may be problematic at either location due to significant differences in directional flow experienced along River Road within the study area. Furthermore, based on the suitability factors a roundabout is not technically feasible at either location.

The results of the Roundabout Feasibility Screening Tool are provided in **Appendix H**.

5.4.3 Intersection Design (MMLOS)

Intersection MMLOS was completed for the intersection of River Road and Summerhill Street/ Phase 12 South Access, as well as River/ Atrium/ 760 River Access. Both of these access intersections are expected to require traffic signals to satisfy capacity requirements within the timeframe of this study. Section 5.9 describes the results of the Multi-Modal Level of Service (MMLOS) and Synchro analysis for these access intersections and any other signalized intersections in the study area.

5.5 Transportation Demand Management (TDM)

The City of Ottawa is committed to implementing Transportation Demand Management (TDM) measures on a City-wide basis in an effort to reduce automobile dependence, particularly during the weekday peak travel periods. TDM initiatives are aimed at encouraging individuals to use non-auto modes of travel during the peak periods.

5.5.1 Context for TDM

As described in the Forecasting section of this report, mode shares used to estimate future development traffic were based on the 2011 TRANS Origin-Destination Survey for the South Gloucester/Leitrim Traffic Assessment Zone (TAZ). The active transportation mode shares were assumed to remain unchanged, as the relative impact of any reasonable adjustments would be insignificant across all modes within the timeframe of this study.

The proposed development aligns with the objectives of the Riverside South Community Design Plan (CDP) and Building Better and Smarter Suburbs (BBSS) policy documents, which promotes sustainable and compact growth. Condominium units are proposed within the Transit-Oriented Development (TOD) zone, a denser form of development appropriate for a suburban TOD zone, promoting increased transit ridership and use of adjacent active transportation facilities with the overall effect of reducing reliance on private automobile transportation.

5.5.2 Need and Opportunity

Riverside South is presently an auto-oriented suburb with a single transit hub, Riverview Station, however the planned implementation of a light rail station within the Town Centre and the future extension of the BRT corridor through Riverside South provide opportunities to increase transit modal share and more effectively utilize existing transit infrastructure. Improving transit connectivity between residential areas and nearby transit hubs as the community grows will help to maximize use of the transit system.

As previously illustrated in **Exhibit 6**, the projected increase in site-generated traffic associated with the proposed development is expected to be relatively low in comparison with the total travel demand generated by all other adjacent developments expected to occur within the timeframe of this study. Any fluctuations in traffic generated solely by the proposed development are therefore unlikely to result in significant traffic impacts, therefore future conditions would be primarily influenced by background demand.

In order to effectively accommodate the expected future travel demand within the Riverside South Community, it is important that the City continue to promptly expand the existing transit service network as the road network evolves in order to capture local trips and provide direct connections to major transit hubs within the community. Providing high quality transit service within Riverside South will help promote the use of transit as a convenient and efficient alternative mode of transportation, particularly for sites within 600m of planned rapid transit stations, thereby reducing auto-dependency. The implementation of protected pedestrian crossings of River Road is one of the most essential improvements necessary to make transit service accessible to developments on the west side of River Road.

5.5.3 TDM Program

The proposed development conforms to the City's TDM principles by providing convenient and direct connections to adjacent pedestrian, cycling and transit facilities where available. The internal road network has been configured with short street segments and frequent intersections to provide direct connections to River Road, the nearest roadway supporting transit service. Sidewalks and appropriate pedestrian connections will be provided throughout the subdivision to facilitate access to local amenities, pathways and the adjacent road and transit network.

The City of Ottawa's TDM Measures Checklist was completed for the proposed development, and the results are provided in **Appendix I**.

5.6 Neighbourhood Traffic Management

5.6.1 Adjacent Neighbourhoods

Not Applicable: The proposed development is not dependent on local or collector roads for access to the subdivision, therefore this section is exempt from this TIA.

5.7 Transit

5.7.1 Route Capacity

The estimated future 2029 total transit passenger demand within the study area was provided in Section 4.1.2.5 Trip Generation by Mode. The results have been summarized in **Table 16**.

Table 16 - 2029 Development Generated Transit Demand

PERIOD	PEAK PERIOD DEMAND	
	IN	OUT
AM	14	34
PM	30	21

By the 2029 horizon year, the newly proposed extension of the LRT Southern Extension to Limebank Road, combined with local transit service to Riverview Station is expected to provide sufficient transit capacity to accommodate future demand. It is recommended that OC-Transpo plan future transit routes to accommodate the transit demand of the proposed development.

5.8 Review of Network Concept

As discussed in Section 3.3.3 Network Concept Screenline, the following screenlines are applicable to this study: SL8 – Leitrim; and SL42 – Rideau River (Manotick). A summary comparison of the City 2031 Network Concept demand and capacity has been provided in **Table 17**.

Table 17 – 2031 Network Concept

SCREENLINE	AM 2031 PREFERRED INBOUND		
	DEMAND	CAPACITY	V/C RATIO
SL8 - Leitrim	5,884	7,000	0.84
SL42 – Rideau River (Manotick)	2,596	3,800	0.68

Note 1 - Table results from Road Network Development Report: Final Report (December 2013)

Traffic generated exclusively by the proposed development traffic generate less than 100 vehicle new trips across these screenlines and therefore will not trigger any capacity deficiencies. It is important to note that the results shown in **Table 17** rely heavily on planned capital projects noted in the TMP and therefore may not be representative of current projections as result of infrastructure timing adjustments.

5.9 Intersection Design

The following sections summarize the methodology and results of the multi-modal intersection capacity analysis conducted within the study area.

5.9.1 Intersection Control

5.9.1.1 Traffic Signal Warrants

Traffic signal warrants for site access intersections were discussed previously in Section 5.4. Analysis of other study area intersections indicates that traffic signals are not warranted at the intersection of River Road and Borbridge Avenue under Future (2029) Total Traffic conditions.

5.9.1.2 Roundabout Analysis

The feasibility of implementing a roundabout was evaluated at River and Borbridge. It was determined that this would not be an appropriate location for a roundabout, as the intersection does not triggers signal warrants, has already been constructed and is set to open in spring 2019.

It was therefore not necessary to undertake further investigation with the Roundabout Initial Feasibility Screening Tool at this location.

The feasibility of implementing roundabouts at applicable site access intersections was evaluated in Section 5.4. The results of the Roundabout Feasibility Screening Tool are provided in **Appendix H**.

5.9.2 Intersection Analysis Criteria (Automobile)

The following section outlines the City of Ottawa's methodology for determining motor vehicle Level-of-Service (LOS) at signalized and unsignalized intersections.

5.9.2.1 Signalized Intersections

In qualitative terms, the Level-of-Service (LOS) defines operational conditions within a traffic stream and their perception by motorists. A LOS definition generally describes these conditions in terms of such factors as delay, speed and travel time, freedom to manoeuvre, traffic interruptions, safety, comfort and convenience. LOS can also be related to the ratio of the volume to capacity (v/c) which is simply the relationship of the traffic volume (either measured or forecast) to the capability of the intersection or road section to accommodate a given traffic volume. This capability varies depending on the factors described above. LOS are given letter designations from 'A' to 'F'. LOS 'A' represents the best operating conditions and LOS 'E' represents the level at which the intersection or an approach to the intersection is carrying the maximum traffic volume that can, practicably, be accommodated. LOS 'F' indicates that the intersection is operating beyond its theoretical capacity.

The City of Ottawa has developed criteria as part of the Transportation Impact Assessment Guidelines, which directly relate the volume to capacity (v/c) ratio of a signalized intersection to a LOS designation. These criteria are as follows:

Table 18 - LOS Criteria for Signalized Intersections

LOS	VOLUME TO CAPACITY RATIO (v/c)
A	0 to 0.60
B	0.61 to 0.70
C	0.71 to 0.80
D	0.81 to 0.90
E	0.91 to 1.00
F	> 1.00

The intersection capacity analysis technique provides an indication of the LOS for each movement at the intersection under consideration and for the intersection as a whole. The overall v/c ratio for an intersection is defined as the sum of equivalent volumes for all critical movements at the intersection divided by the sum of capacities for all critical movements.

The Level of Service calculation is based on locally-specific parameters as described in the TIA Guidelines and incorporates existing signal timing plans obtained from the City of Ottawa. The analysis existing conditions utilized a Peak Hour Factor (PHF) of 0.90, while future conditions considers optimized signal timing plans and use of a Peak Hour Factor (PHF) of 1.0 to recognize peak spreading beyond a 15-minute period in congested conditions.

5.9.2.2 Unsignalized Intersections

The capacity of an unsignalized intersection can also be expressed in terms of the LOS it provides. For an unsignalized intersection, the Level of Service is defined in terms of the average movement delays at the intersection. This is defined as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line; this includes the time required for a vehicle to travel from the last-in-queue position to the first-in-queue position. The average delay for any particular minor movement at the un-signalized intersection is a function of the capacity of the approach and the degree of saturation.

The Highway Capacity Manual 2010 (HCM), prepared by the Transportation Research Board, includes the following Levels of Service criteria for un-signalized intersections, related to average movement delays at the intersection, as indicated in **Table 19**.

Table 19 - LOS Criteria for Unsignalized Intersections

LOS	DELAY (seconds)
A	<10
B	>10 and <15
C	>15 and <25
D	>25 and <35
E	>35 and <50
F	>50

The unsignalized intersection capacity analysis technique included in the HCM and used in the current study provides an indication of the Level of Service for each movement of the intersection under consideration. By this technique, the performance of the unsignalized intersection can be compared under varying traffic scenarios, using the Level of Service concept in a qualitative sense. One unsignalized intersection can be compared with another unsignalized intersection using this concept. Level of Service 'E' represents the capacity of the movement under consideration and generally, in large urban areas, Level of Service 'D' is considered to represent an acceptable operating condition. Level of Service 'E' is considered an acceptable operating condition for planning purposes for intersections located within Ottawa's Urban Core the downtown and its vicinity). Level of Service 'F' indicates that the movement is operating beyond its design capacity.

5.9.3 Intersection Capacity Analysis

Following the established intersection capacity analysis criteria described above, the existing and future conditions are analyzed during the weekday peak hour traffic volumes derived in this study.

The following section presents the results of the intersection capacity analysis. All tables summarize study area intersection LOS results during the weekday morning and afternoon peak hour periods.

The Synchro analysis was calibrated based on traffic flows observed during the time of traffic count data collection.

The Synchro output files have been provided in **Appendix J**.

5.9.3.1 Existing (2019) Traffic

An intersection capacity analysis has been undertaken using the Existing (2019) Traffic volumes presented in **Table 20**, yielding the following results:

Table 20 - Intersection Capacity Analysis: Existing (2019) Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & River	Signalized [1]	**E (0.93)**	**WBT (0.93)**	**E (1.00)**	**WBT & SBR (1.00)**
River & Summerhill	Unsignalized	**D** (25.8s)	WB (25.8s)	**B** (12.0s)	WB (12.0s)

Notes:
[1] Intersection model calibrated to local conditions for the PM Peak Hour. Saturated flow rate increased on movements showing v/c ratios above 1.00 to just under or equal to 1.00.

5.9.3.2 Future (2021) Background Traffic

An intersection capacity analysis has been undertaken using the Future (2021) Background Traffic volumes presented in **Table 21**, yielding the following results:

Table 21 - Intersection Capacity Analysis: 2021 Background Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & River	Signalized	**D** (0.81)	EBL (0.81)	**E (0.93)**	**NBL & SBR (0.93)**
River & Summerhill	Unsignalized	**F (53.2s)**	**WB (53.2s)**	**C** (16.0s)	WB (16.0s)
> River & Summerhill [1]	Signalized	**D** (0.85)	NBT (0.85)	**C** (0.69)	SBT (0.69)
River & Borbridge	Unsignalized	**C** (20.3s)	WB (20.3s)	**C** (15.0s)	WB (15.0s)
River & Atrium	Unsignalized	**B** (14.9s)	WB (14.9s)	**B** (11.0s)	WB (11.0s)

Notes:
[1] *Signals are required operationally at River & Summerhill*

5.9.3.3 Future (2024) Background Traffic

An intersection capacity analysis has been undertaken using the Future (2024) Background Traffic volumes presented in **Table 22**, yielding the following results:

Table 22 - Intersection Capacity Analysis: 2024 Background Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & River	Signalized	**E (0.98)**	**EBL (0.98)**	**F (1.02)**	**EBT (1.02)**
River & Summerhill	Unsignalized	**F (53.2s)**	**WB (0.89)**	**C** (18.7s)	WB (18.7s)
> River & Summerhill [1]	Signalized	**D** (0.89)	NBT (0.89)	**C** (0.74)	SBT (0.74)
River & Borbridge	Unsignalized	**C** (20.6s)	WB (20.6s)	**C** (17.8s)	WB (17.8s)
River & Atrium/ 760 River Access	Unsignalized	**B** (14.9s)	WB (14.9s)	**E (39.5s)**	**EB (39.5s)**
> River & Atrium/ 760 River Access [1]	Signalized	**A** (0.57)	NBT (0.57)	**A** (0.56)	SBT (0.56)

Notes:
[1] Signals are required operationally at River/ Summerhill, as well as at River & Atrium/ 760 River Access.

As indicated above, the intersection of Earl Armstrong and River is expected to approach its theoretical capacity by 2024 under background traffic conditions, without the addition of site-generated traffic. Potential mitigation measures are discussed in Section 5.11.

5.9.3.4 Future (2029) Background Traffic

An intersection capacity analysis has been undertaken using the Future (2029) Background Traffic volumes presented in **Table 22**, yielding the following results:

Table 23 - Intersection Capacity Analysis: 2029 Background Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & River	Signalized	**F (1.15)**	**WBT (1.15)**	**F (1.19)**	**WBL (1.19)**
> River & Summerhill [1]	Signalized	**E (0.95)**	**NBT (0.95)**	**D** (0.83)	SBT (0.83)
River & Borbridge	Unsignalized	**F (70.0s)**	**WB (70.0s)**	**E (39.7s)**	**WB (39.7s)**
> River & Borbridge [2]	Signalized	**C** (0.78)	NBT (0.78)	**D** (0.85)	SBT (0.85)
River & Atrium/ 760 River Access	Unsignalized	**F (57.1s)**	**EB (57.1s)**	**F (73.2s)**	**EB (73.2s)**
> River & Atrium/ 760 River Access [3]	Signalized	**B** (0.69)	NBT (0.69)	**B** (0.64)	SBT (0.64)

Notes:
[1] Signals are required operationally at River & Summerhill, River & Borbridge, as well as River & Atrium/ 760 River Access.

5.9.3.5 Future (2021) Total Traffic

An intersection capacity analysis has been undertaken using the Future (2021) Total Traffic volumes presented in **Table 24**, yielding the following results:

Table 24 - Intersection Capacity Analysis: 2021 Total Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & River	Signalized	**E (0.95)**	**WBT (0.95)**	**E (0.98)**	**EBT (0.98)**
River & Ph. 12 North Access	Unsignalized	**D** (30.3s)	EB (30.3s)	**E (40.3s)**	**EB (40.3s)**
River & Summerhill/ Ph. 12 South Access	Unsignalized	**F (292.8s)**	**EB (292.8s)**	**F (151.9s)**	**EB (151.9s)**
> River & Summerhill/ Ph. 12 South Access [1]	Signalized	**D** (0.87)	NBT (0.87)	**C** (0.72)	SBT (0.72)
River & Borbridge	Unsignalized	**C** (21.0s)	WB (21.0s)	**C** (15.1s)	WB (15.5s)
River & Atrium/ 760 River Access	Unsignalized	**D** (27.6s)	EB (27.6s)	**D** (34.2s)	EB (34.2s)

Notes:
[1] *Signals are required operationally at River & Summerhill.*

5.9.3.6 Future (2024) Total Traffic

An intersection capacity analysis has been undertaken using the Future (2024) Total Traffic volumes presented in **Table 25**, yielding the following results:

Table 25 - Intersection Capacity Analysis: 2024 Total Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & River	Signalized	**F (1.01)**	**EBL (1.01)**	**F (1.08)**	**EBT (1.08)**
River & Ph. 12 North Access	Unsignalized	**E (42.8s)**	**EB (42.8s)**	**F (54.9s)**	**EB (54.9s)**
River & Summerhill/ Ph. 12 South Access	*> Signalized* [1]	**D** (0.90)	NBT (0.90)	C (0.78)	SBT (0.78)
River & Borbridge	Unsignalized	**D** (27.7s)	NBT (27.7s)	**C** (18.8s)	WB (18.8s)
River & Atrium/ 760 River Access	Unsignalized	**E (41.2s)**	**EB (41.2s)**	**F (50.9s)**	**EB (50.9s)**
	> Signalized [1]	**B** (0.62)	NBT (0.62)	**B** (0.63)	SBT (0.63)

Notes:
[1] Signals are required operationally at River/ Summerhill, River & Borbridge, as well as River & Atrium/ 760 River Access.

It shall be noted that the addition of development-generated traffic is shown to have only a marginal impact on the intersection of Earl Armstrong/ River Road, as well as other study area intersections.

5.9.3.7 Future (2029) Total Traffic

An intersection capacity analysis has been undertaken using the Future (2029) Total Traffic volumes presented in **Table 25**, yielding the following results:

Table 26 - Intersection Capacity Analysis: 2029 Total Traffic

INTERSECTION	TRAFFIC CONTROL	AM PEAK HOUR		PM PEAK HOUR	
		OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)	OVERALL LOS (V/C OR DELAY)	CRITICAL MOVEMENTS (V/C OR DELAY)
Earl Armstrong & River	Signalized	**F (1.18)**	**WBT (1.18)**	**F (1.22)**	**WBL (1.22)**
River & Ph. 12 North Access	Unsignalized	**F (77.5s)**	**EB (76.1s)**	**F (112.2s)**	**EB (112.2s)**
> River & Summerhill/ Ph. 12 South Access [1]	Signalized	**E (1.00)**	**NBT (1.00)**	**D** (0.90)	SBT (0.90)
River & Borbridge	Unsignalized	**F (77.0s)**	**WB (77.0s)**	**D** (29.4s)	WB (29.4s)
> River & Borbridge [1]	Signalized	**D** (0.89)	NBT (0.89)	**D** (0.85)	SBT (0.85)
River & Atrium/ 760 River Access	Unsignalized	**F (93.1s)**	**EB (93.1s)**	**F (112.9s)**	**EB (118.9s)**
> River & Atrium/ 760 River Access [1]	Signalized	**C** (0.75)	NBT (0.75)	**B** (0.69)	SBT (0.69)

Notes:
[1] Signals are required operationally at River/ Summerhill, River & Borbridge, as well as River & Atrium/ 760 River Access.

5.9.4 Intersection Design (MMLOS)

Analysis of existing and future conditions for each mode has been conducted based on the methodology prescribed in the City of Ottawa Multi-Modal Level of Service (MMLOS) Guidelines (approved by City Council in October 2015 and amended in October 2016). The Level of Service (LOS) for each mode has been calculated for each intersection where signals exist or are anticipated.

The Existing (2019) and Future (2029) Total intersection MMLOS results have been summarized in **Table 27**. At the River Road/ Earl Armstrong intersection, the existing MMLOS results remain the unchanged for future conditions.

Detailed analysis results for existing and future conditions are provided **Appendix G**.

Table 27 - Intersection MMLOS - Existing and Future Conditions

LOCATION	SCENARIO	LEVEL OF SERVICE BY MODE			
		PEDESTRIAN (PLOS)	BICYCLE (BLOS)	TRANSIT (TLOS)	TRUCK (TkLOS)
TARGET		**C**	**C**	**D**	**D**
INTERSECTIONS					
River & Earl Armstrong	Existing (2019) & Future Total (2029)	**F**	**F**	**F**	**B**
River & Summerhill/ Ph. 12 South Access	Future (2029) Total	**E**	**E**	**E**	**E**
River & Borbridge	Future (2029) Total	**E**	**E**	**C**	**E**
River & Atrium/ 760 River Access	Future (2029) Total	**E**	**E**	**B**	**E**

5.9.4.1 Intersection Pedestrian Level of Service (PLOS)

The PLOS at intersections is based on several factors including the number of traffic lanes that pedestrians must cross, corner radii, and whether the crossing allows for permissive or protective right or left turns, among others. The City of Ottawa minimum target for PLOS is 'C'.

The results of the analysis indicate that the Earl Armstrong and River intersection is currently experiencing a PLOS of 'F' primarily due to the number of lanes that pedestrians must cross at each approach. This intersection has been constructed to its ultimate configuration, and no reasonable modifications can be implemented to improve the PLOS without negatively impacting other modes, therefore it is reasonable to expect that the PLOS will continue to perform poorly as indicated by future MMLOS results.

Analysis indicates that the remaining study area intersections are expected to operate above the City's target with a PLOS of 'E', based on the delay to pedestrians associated with the long cycle lengths and short pedestrian walk times. There may be opportunities to reduce the cycle lengths at these intersections, however for the purposes of this analysis, cycle lengths between 120s and 130s were assumed.

5.9.4.2 Intersection Bicycle Level of Service (BLOS)

The BLOS at intersections is dependent on several factors: the number of lanes that the cyclist is required to cross to make a left-turn; the presence of a dedicated right-turn lane on the approach; and the operating speed of each approach. The City target for BLOS is 'C'.

The results of the analysis indicate that the Earl Armstrong and River intersection is currently experiencing a BLOS 'F', due to the high operating speeds along both roadways (i.e. 60 km/h or greater) in combination with the number of lanes that cyclists must cross to make a left-turn.

It is anticipated that the remaining study area intersections will operate with a BLOS of 'E' primarily as a result of the high operating speeds along River Road.

Since it is not appropriate to utilize bike boxes along high speed corridors, this is not a feasible option at any of the study area intersections, therefore no reasonable modifications can be implemented to improve the BLOS without negatively impacting other modes.

5.9.4.3 Intersection Transit Level of Service (TLOS)

Intersection TLOS is based on the average signal delay experienced by transit vehicles at each intersection. The City Target TLOS is 'D'.

The results of the analysis indicate that the most severe delays at the Earl Armstrong/ River intersection will result in a TLOS of 'F' on the south leg in the morning peak period, and on the south and east legs in the afternoon peak period under Future (2029) Total Traffic Conditions. The degradation of the TLOS is triggered by the expected increase in background travel demand within the timeframe of this study. No reasonable modifications can be implemented to improve the TLOS without negatively impacting other modes.

5.9.4.4 Intersection Truck Level of Service (TKLOS)

The Truck LOS (TKLOS) is based on the right-turn radii, as well as the number of receiving lanes for vehicles making a right-turn from the traffic lane being analyzed. The City of Ottawa target for TKLOS is 'D'.

Earl Armstrong and River meets the City's target with a TKLOS of 'B'. River, while the remaining intersections along River Road marginally exceed the City's target with a TKLOS of 'E' due to the single-receiving lanes on each approach, as well as the tighter turning radii.

5.10 Geometric Review

The following section reviews all geometric requirements for the study area intersections.

5.10.1 Sight Distance and Corner Clearances

The Phase 12 North Access is proposed along a mildly curved section of River Road that affords drivers a favourable perspective both upstream and downstream of the access with no significant horizontal or vertical alignment constraints. Sight distance and corner clearances are therefore not expected to be a concern at this location, and visibility beyond intersections to the north and south will be achievable.

The Phase 12 South Access will be constructed across from the existing Summerhill Street access along a straight segment of River Road with no significant horizontal or vertical deflections.

The southernmost access, referred to as 760 River Access, proposes an intersection along a straight section of River Road with no significant horizontal or vertical deflections, thereby minimizing any potential sightline issues.

5.10.2 Auxiliary Lane Analysis

Auxiliary turning lane requirements for all intersections within the study area are described as follows:

5.10.2.1 Unsignalized Auxiliary Left-Turn Lane Requirements

Not Applicable: The results of the analysis indicate that, under Future (2029) Total Traffic conditions, traffic signals are anticipated at all study area intersections with the exception of the River and Phase 12 North Access. This access is expected to experience very few vehicles on the northbound left-turn movement (i.e. no greater than 5 vehicles during weekday peak hours), therefore MTO left-turn signal warrant analysis was deemed unnecessary at this intersection.

5.10.2.2 Signalized Auxiliary Left-Turn Requirements

A review of auxiliary left-turn lane storage requirements was completed at all signalized intersections within the study area in the 2026 total traffic scenario. The review compared the projected 95th percentile queue lengths from Synchro operational results, and the standard queue length calculation based on the following equation:

$$Storage\ Length = \frac{NL}{C} \times 1.5$$

Where:
N = number of vehicles per hour
L = Length occupied by a vehicle in the queue = 7 m
C = number of traffic signal cycles per hour (assumed 120s cycle length)

The results of the auxiliary left-turn lane analysis are summarized below in **Table 28**.

Table 28 - Auxiliary Left-Turn Storage Analysis at Signalized Intersections

INTERSECTION	APPROACH	95TH %ILE QUEUE LENGTH (M)	CALCULATED QUEUE LENGTH (M)	EXISTING STORAGE LENGTH (M)	STORAGE DEFICIENCY (M)
Earl Armstrong & River	NB	#85	70	150 (D) 120 (S)	Existing Storage Adequate
	SB	15	10	80 (D) 50 (S)	Existing Storage Adequate
	EB	#160	120	300 (D) 80 (S)	Existing Storage Adequate
	WB	#80	75	160 (D) 140 (S)	Existing Storage Adequate
River & Summerhill/ Ph. 12 South Access	NB	<10	5	-	No Storage Required
	SB	15	50	100	Existing Storage Adequate
River & Borbridge	SB	25	85	-	85
River & Atrium/ 760 River Access	NB	<10	5	-	No Storage Required
	SB	<10	10	-	10

Recommended storage lengths do not consider deceleration and taper lengths. Values rounded to nearest 5m.
- Synchro queue length at congested intersections. From Synchro 9 User Guide "In practice, 95th percentile queue shown will rarely be exceeded and the queues shown with the # footnote are acceptable for the design of storage bays."

As per the results of the queue length analyses presented above, it is recommended that southbound left-turn storage lanes of at least 85 metres and 10 metres are painted to accommodate future background traffic demand at the intersections of River/ Borbridge and River/ Atrium, respectively. The recent reconstruction of River Road had provisioned for these lanes and therefore sufficient pavement width is available with no need for road widening.

5.10.2.3 Unsignalized Auxiliary Right-Turn Lane Requirements

The Transportation Association of Canada (TAC) suggests that auxiliary right-turn lanes be considered "when the volume of decelerating or accelerating vehicles compared with through vehicles causes undue hazard." Consideration for auxiliary right-turn lanes is typically given when the right-turning traffic exceeds 10% of the through volume and is at least 60 vehicles per hour.

None of the right-turning movements associated with unsignalized study area intersections along River Road are projected to exceed these thresholds under Future (2029) Total Traffic conditions, therefore right-turn lanes were not considered at any of the unsignalized intersections within the study area.

5.10.2.4 Signalized Auxiliary Right-Turn Lane Requirements

Similarly for signalized intersections, Section 9.14 of TAC suggests that auxiliary right-turn lanes shall be considered when more than 10% of vehicles on an approach are turning right and when the peak hour demand exceeds 60 vehicles. The purpose of this guideline is to mitigate operational impacts to through-traffic, particularly on high-speed arterial roadways such as River Road, and may not be applicable in all circumstances.

The results of the auxiliary right-turn lane analysis are summarized below in **Table 29** below:

Table 29 – Auxiliary Right-Turn Lane Storage Analysis at Signalized Intersections

INTERSECTION	APPROACH	RIGHT TURN VOLUME	APPROACH VEHICLES TURNING RIGHT (%)	95TH %ILE QUEUE LENGTH (M)	EXISTING/ PROPOSED STORAGE LENGTH (M)	STORAGE DEFICIENCY (M)[1]
Earl Armstrong & River	EB	458	22%	85	70	15
	WB	121	8%	<10	150	Existing Storage Adequate
	NB	297	27%	25	25	Existing Storage Adequate
	SB	825	58%	#180	100	80
River & Summerhill/ Ph. 12 South Access	NB	15	1%	<10	-	No Storage Required
	SB	15	1%	<10	-	No Storage Required
River & Borbridge	NB	7	1%	<10	-	No Storage Required
River & Atrium/ 760 River Access	NB	5	<1%	<10	-	No Storage Required
	SB	50	5%	<10	-	No Storage Required

Note 1 - Recommended storage lengths do not include deceleration lane and taper lengths. Values rounded to nearest 5m.

- Synchro queue length at congested intersections. From Synchro 9 User Guide "In practice, 95th percentile queue shown will rarely be exceeded and the queues shown with the # footnote are acceptable for the design of storage bays."

Based on the above results for the Earl Armstrong and River intersection, and confirmed through intersection capacity analyses, it is recommended to extend the eastbound and northbound right-turn lanes by at least 15 metres and 80 metres, respectively. It should be noted that the proposed development is expected to contribute minimal traffic to each of these movements, and therefore any potential spillback issues are primarily a result of background travel demand.

Right-turn storage bays are not required at the other study area intersections to accommodate projected 2029 total traffic volumes.

5.11 Summary of Improvements Indicated and Modification Options

Based on the intersection capacity, Multi-Modal Level of Service and auxiliary lane analyses results presented above, off-site improvements to the adjacent road network have been recommended in order to accommodate multi-modal demands of both background traffic and additional traffic generated by the proposed development.

The recommended off-site roadway modifications under 2029 total traffic conditions are shown graphically in **Exhibit 16**.

5.11.1 Earl Armstrong Road & River Road

The results of the analysis indicate that the Earl Armstrong and River intersection is presently approaching its theoretical capacity with a LOS 'E' during both the weekday morning and afternoon peak hours. This intersection is expected to continue to operate with poor levels of service during these peak periods with and without the proposed development traffic as a result of increased travel demand projected within Riverside South as well as steady growth in cross-commuter traffic from Barrhaven. The eastbound left-turn and southbound right-turn are considered critical movements in the weekday morning and afternoon peak hours, respectively. The proposed development is not expected to contribute additional traffic to either of these movements. The development of east-west major collector roads (Borbridge Avenue and Solarium Avenue) will ultimately provide greater connectivity through the community and long-term relief to this intersection. In addition to this, the City's planned investment in rapid transit in the community will also provide greater mobility options and will aid the operation of this intersection in the long term.

Queue length analyses indicates that storage deficiencies on the eastbound and southbound-right turn channelized right-turn lanes may be encountered by the 2029 horizon year or sooner. It is recommended that the City consider extension of these lanes by at least 15m and 80m, respectively, to prevent spillback into the adjacent through lanes. The results of the analysis indicate that these modifications would be required with or without the inclusion of site-generated traffic.

As indicated by the MMLOS results, it has also been noted that the intersection is expected to perform poorly for other modes of travel, and a review of potential options indicated that there are no feasible improvements that would not impact vehicular capacity.

The planned implementation of the LRT South Extension will result in a shift of some automobile trips to more sustainable modes, however, to further reduce the vehicle mode share, it is recommended that the City review the timing of the future bus rapid transit extension through Riverside South to address future capacity constraints of the road network. Providing a continuous rapid transit corridor between these two rapidly-growing communities will ultimately reduce auto-dependency for cross-commuter trips along Earl Armstrong Road, which is not sustainable in the long term at current growth levels.

5.11.2 River Road & Phase 12 North Access

The results of the analysis indicate that the River and Phase 12 North Access intersection is expected to operate above its theoretical capacity under Future (2029) Total Traffic conditions with a stop-controlled eastbound approach and single, shared lanes on all approaches.

It should be noted, however, that the Phase 12 South Access at Summerhill Street is expected to trigger signal warrants well in advance of the study horizon, therefore providing a more attractive egress route, with a consistent and reliable delay as a result of signal phasing.

Traffic volumes utilizing the North Access are therefore expected to be minimal with only 17 and 11 weekday morning and afternoon trips expected to egress at this location during peak hours. Despite the poor level of service, delays are only expected to be in the order of 1 to 2 minutes assuming free-flow traffic along River Road.

Based on the proposed location of this access approximately 205m south of Earl Armstrong/ River, and the 95th percentile queue length of at most 85 metres projected for the northbound through movement during the weekday morning peak hour, there are expected to be few issues associated with vehicular blockage at this access. Should a blockage occur under particularly congested conditions, drivers typically leave gaps as a curtesy to facilitate the egress of vehicular traffic from

the sidestreet access. Outside of the weekday peak hours, is not expected that there will be any significant delays experienced to sidestreet traffic at this intersection.

It is important to note that the Phase 12 North Access will provide a secondary all-movements emergency access route direct emergency vehicle access to the northern enclave of the development where higher-density housing is planned.

Based on the conclusions of the analysis, no auxiliary lanes required at this intersection and thus no RMA will be required to construct the Phase 12 North Access.

5.11.3 River Road & Summerhill Street/ Phase 12 South Access

The results of the analysis indicate that the River and Summerhill/ Phase 12 intersection will require signals to operate at acceptable levels of service under Future (2021) Background Traffic conditions, with signals being warranted by the Future (2024) Total Traffic condition.

Synchro results and the City's queue length calculation indicate that the existing southbound left-turn storage lane is capable of accommodating traffic volumes under Future (2029) Total Traffic conditions.

The results of the analysis indicate that River and Summerhill may approach its theoretical capacity as a signalized intersection by 2029 with and without the inclusion of site-generated traffic from the proposed development based on the rate of development within the community.

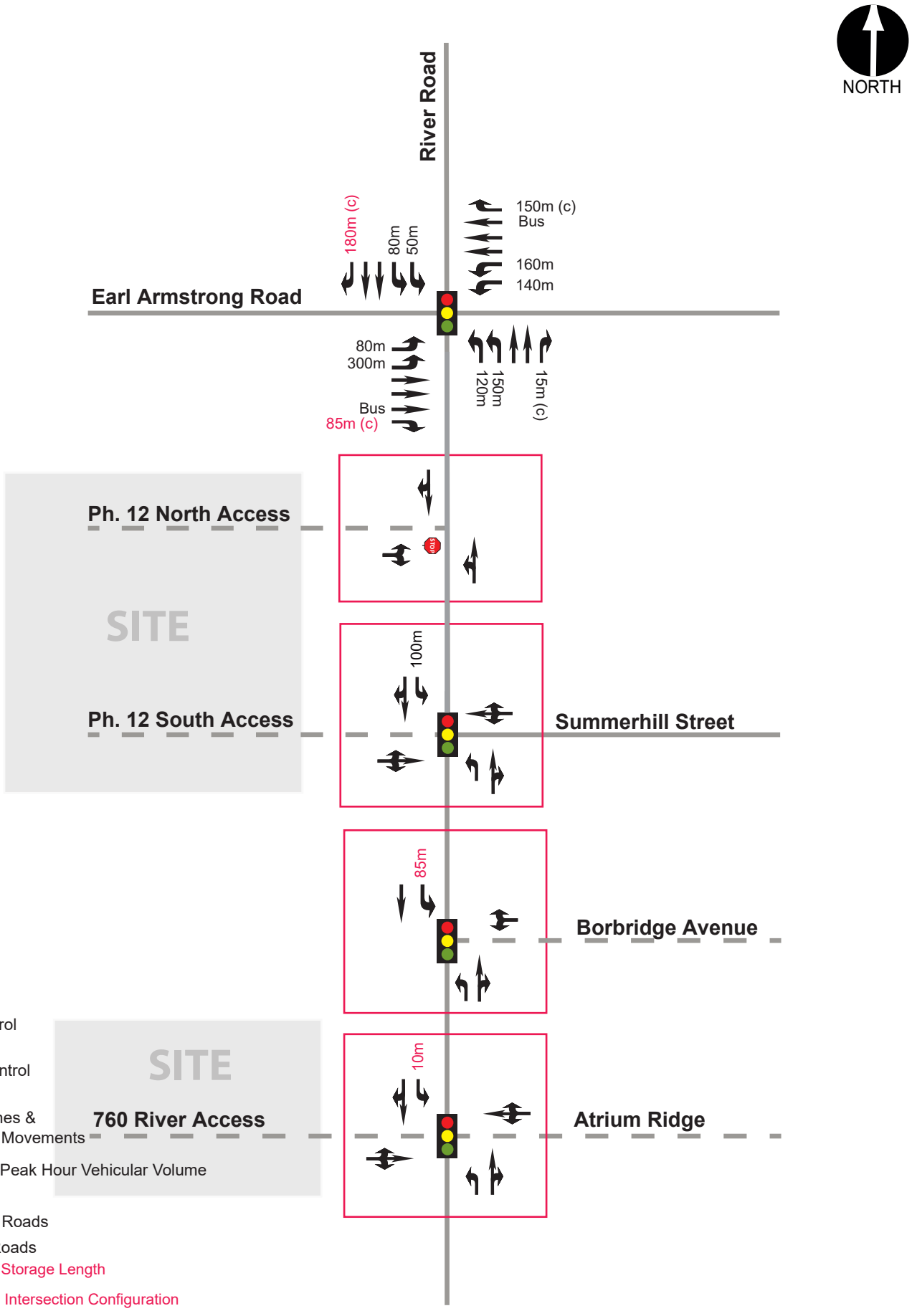
5.11.4 River Road & Borbridge Avenue

The results of the analysis indicate that the River and Borbridge intersection is expected to experience significant delays on the westbound approach and may require signals to operate at acceptable levels of service by 2029 under background traffic conditions. Despite the need to provide signals to satisfy operational requirements, it should be noted that signals are not warranted within the timeframe of this study, based on the background growth projections assumed.

5.11.5 River Road & Atrium Ridge/ 760 River Access

Based on the results of the analysis, the River and Atrium/ 760 River Access intersection is expected to experience significant delays on the sidestreet movements and will require signals to operate at acceptable levels (i.e. LOS 'D' or better) under Future (2024) Background and Future (2024) Total Traffic conditions. The results of the analysis indicate, however, that traffic signals are not warranted within the timeframe of this study based on background growth projections assumed.

Both Synchro results and the first-principles queue length calculation indicate that a southbound left-turn storage bay is required to alleviate congestion of the southbound through movement during the weekday afternoon peak hour, and allow the intersection to operate at LOS 'D' or better under Future (2029) Background or Future (2029) Total Traffic conditions. Sufficient pavement width was reserved for this future auxiliary lane under recent reconstruction of River Road.



IBI

Riverside South Phase 12
Transportation Impact Assessment

EXHIBIT 16:
Future (2029) Lane Configurations & Intersection Control

Project No. 120031
Date: April 2019
Scale: N.T.S

6 Conclusion

The proposed residential development at 708 and 750 River Road is expected to generate up to 161 and 182 two-way vehicular trips during the weekday morning and afternoon peak hours, respectively. These traffic volumes were distributed amongst three all-movements access intersections, representing a marginal increase in traffic volumes with respect to the overall traffic projections expected within the 2029 horizon year of the study. For the purposes of this analysis, all site-generated traffic was assumed to exclusively utilize the arterial road network within the study area. River Road is expected to operate at capacity as a two-lane facility within the timeframe of this study primarily as a result of significant increases in background travel demand. As the transportation network in Riverside South is built to its ultimate configuration, east-west collectors Borbridge Avenue and Solarium Avenue will be extended further east to connect with Limebank Road, providing opportunities for traffic to be distributed amongst the broader transportation network, ultimately providing relief to these congested conditions.

The study has identified critical deficiencies in the Level of Service across all transportation modes. These deficiencies are a result of background conditions and not as a direct result of the proposed development. The implementation of protected pedestrian crossings of River Road is one of the most essential improvements necessary to make transit service accessible to developments on the west side of River Road and reduce vehicular demand along the corridor. The study assumes these crossings will be implemented with any other signalization along the corridor.

The results of the analysis indicate that the intersections of River/ Summerhill, River/ Borbridge, and River/ Atrium/ 760 River Access will require signals to operate at acceptable levels of service (LOS ‘D’ or better), however warrants are only triggered at River/ Summerhill. Each of these intersections are shown to be operationally-required as a result of background travel demand, and will therefore be necessary to accommodate the proposed development.

Off-site intersection improvements will be required at River/ Summerhill and River/ Atrium Ridge to provide access to the proposed development. An RMA will be included with the submission of this Transportation Impact Assessment for both of these locations.

Based on the findings of this study, it is the overall opinion of IBI Group that the proposed development will integrate well with and can be safely accommodated by the adjacent transportation network with the recommended actions and modifications in place.

Appendix A – City Circulation Comments

Steps 1 & 2 Submission (Screening & Scoping) – Circulation & Comments Response

City review and response from Scoping Submission: March 25, 2019
Transportation Project Manager: Mike Giampa

1) No comments were received from the City Transportation Project Manager, Mike Giampa, regarding the Scoping submission (Steps 1 and 2).

Steps 3 Submission (Forecasting) – Circulation & Comments Response

City review and response from Forecasting Submission: April 10, 2019
Transportation Project Manager: Mike Giampa

Transportation Engineering Services

1) Please review the development-related person trips for single-family homes and condominium units. The numbers supplied are low.

   The development-related person trips for the 80 single-family homes were derived based on the approximately 75% of units (60 homes) located outside of the TOD zone, while the remaining 25% (20 homes) were located within the Riverview TOD zone.
   The condominium unit development-generated person-trip generation has been updated to reflect the use of high-rise condominium land use with a base vehicle trip rate of 0.46 in both the morning and afternoon peak hours with and without the Transit Bonus (see Table 6.3 in 2009 TRANS Trip Generation Study Report).
   A total column has been added to the Table 8 to show the total morning and afternoon peak hour person-trips for full build-out of the proposed development by 2024.

2) Element 3.13 - Please review/modify trip assignments in exhibits 6 and 8 as some of the numbers do not match.

   The trip generation exhibits have been updated to reflect changes to the trip generation noted in the previous response.

3) Section 4.3.3.2 indicates that a 50% reduction in morning EBL and afternoon SBR volumes is expected following the widening of Prince of Wales. However, this reduction is not likely at the 2029 horizon year as the widening is now projected to occur beyond 2031.

   The TIA has been updated to reflect the delay to the widening of Prince of Wales Drive and the associated reductions on the eastbound left-turn and southbound right-turn at the intersection of River and Earl Armstrong have been removed.

Traffic Signal Operations

1) The strategy report should show where possible transit routes will align. If proximity to the park & ride is driving up the modal share, consider that these users will still need to exit the development site by car to drive to the park & ride. Please indicate this in the strategy report.

   It is assumed that local transit stops providing direct connections to Riverview Station will be located along River Road to provide local transit coverage within 400m of all doors/units not located within the Riverview TOD zone. It should be noted that there are provisions for bus stops at the intersection of River/ Summerhill and River/ Atrium to support enhanced transit service along River Road. Furthermore, pedestrian facilities will be provided at the intersection of River and Summerhill/ Phase 12 South Access once it is constructed as a signalized intersection, creating a safe and convenient crossing location for pedestrians to access nearby transit stops. It is acknowledged, however, that the lack of a controlled crossing location planned within close proximity to 750 River Road may create resistance for motorists to shift to utilizing local transit service to access the park and ride, therefore for this portion of the proposed development it is proposed to maintain the observed transit modal splits of 12% in the morning and 11% in the afternoon peak hours reported in the 2011 OD Survey for all analysis years considered in this study. This approach should be considered conservative.

Appendix B – Screening Form

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	708 and 750 River Road, Ottawa, ON
Description of Location	Gloucester South Nepean – Between Earl Armstrong Road and Rideau Road and west of River Road
Land Use Classification	Residential
Development Size (units)	55 townhome units 80 single-family homes 110 condominium units
Development Size (m^2)	N/A
Number of Accesses and Locations	Three (3) new all movement accesses located off of River Road
Phase of Development	Two Phases
Buildout Year	2021 – single family and townhomes 2024 – condominiums

If available, please attach a sketch of the development or site plan to this form.

2. Trip Generation Trigger

Considering the Development's Land Use type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type	Minimum Development Size
Single-family homes	40 units ✓
Townhomes or apartments	90 units ✓
Office	3,500 m^2
Industrial	5,000 m^2
Fast-food restaurant or coffee shop	100 m^2
Destination retail	1,000 m^2
Gas station or convenience market	75 m^2

** If the development has a land use type other than what is presented in the table above, estimates of person-trip generation may be made based on average trip generation characteristics represented in the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.*

Based on the results above, the Trip Generation Trigger was satisfied.

3. Location Triggers

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Spine Bicycle Networks?	✓	
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?*	✓	

**DPA and TOD are identified in the City of Ottawa Official Plan (DPA in Section 2.5.1 and Schedules A and B; TOD in Annex 6). See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA).*

Based on the results above, the Location Trigger was satisfied.

4. Safety Triggers

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

Based on the results above, the Safety Trigger was satisfied.

5. Summary

	Yes	No
Does the development satisfy the Trip Generation Trigger?	✓	
Does the development satisfy the Location Trigger?	✓	
Does the development satisfy the Safety Trigger?	✓	

All three of the triggers were satisfied. Therefore, the TIA Study must continue into the next stage (Scoping).

Appendix C – Traffic Data

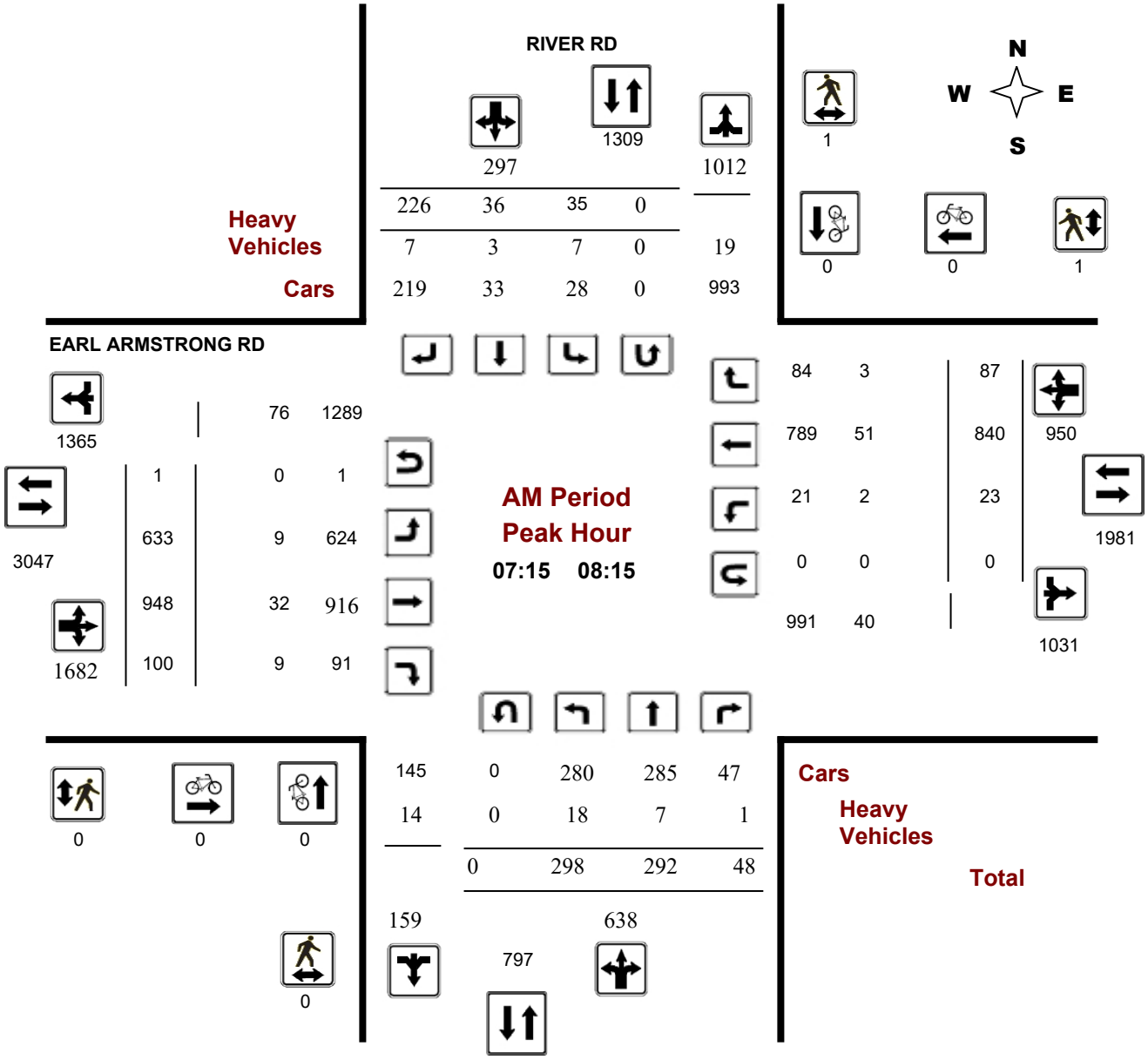
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EARL ARMSTRONG RD @ RIVER RD

Survey Date: Wednesday, February 20, 2019 **WO No:** 38315

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



Comments

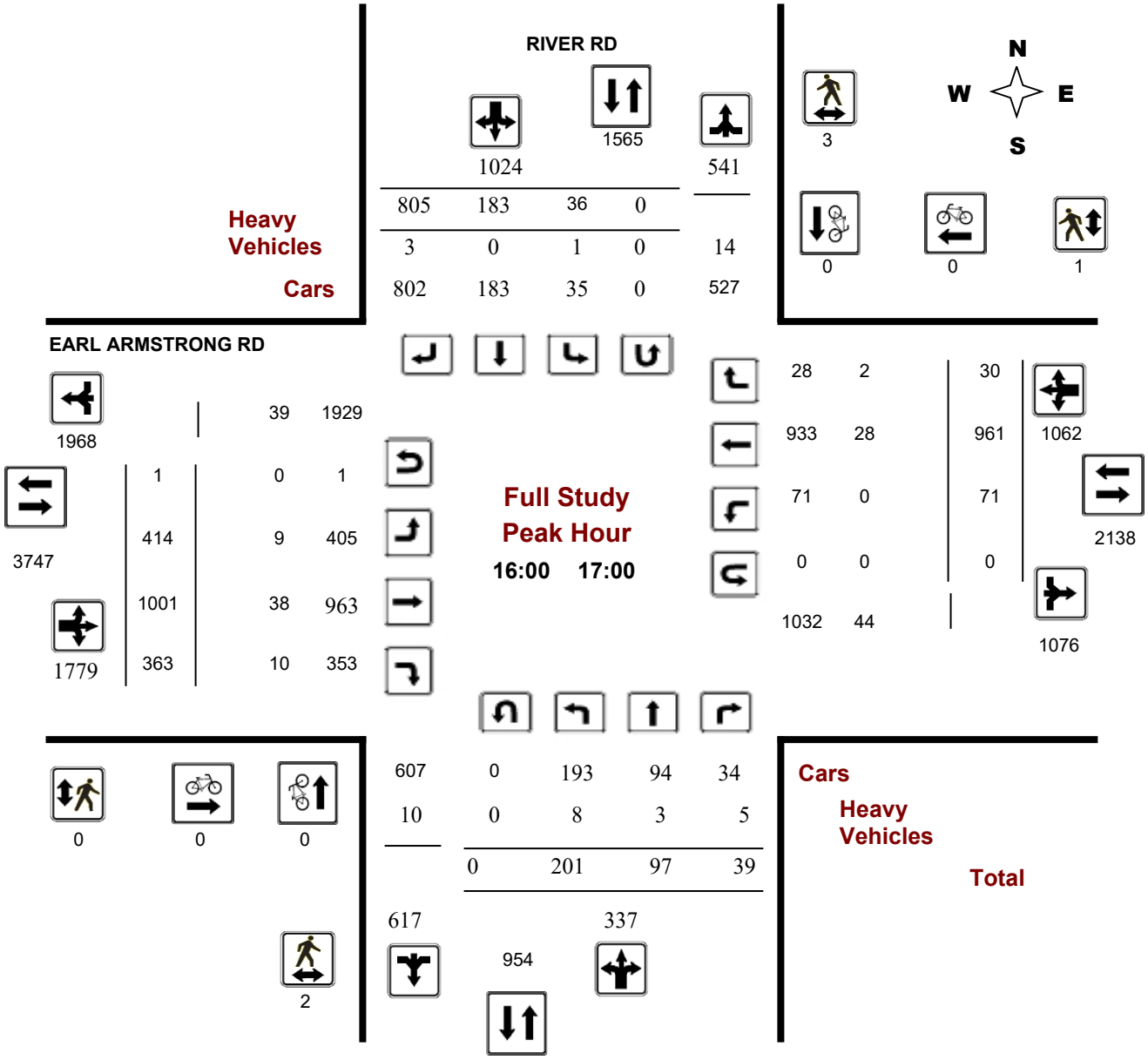
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

EARL ARMSTRONG RD @ RIVER RD

Survey Date: Wednesday, February 20, 2019 **WO No:** 38315

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



Comments

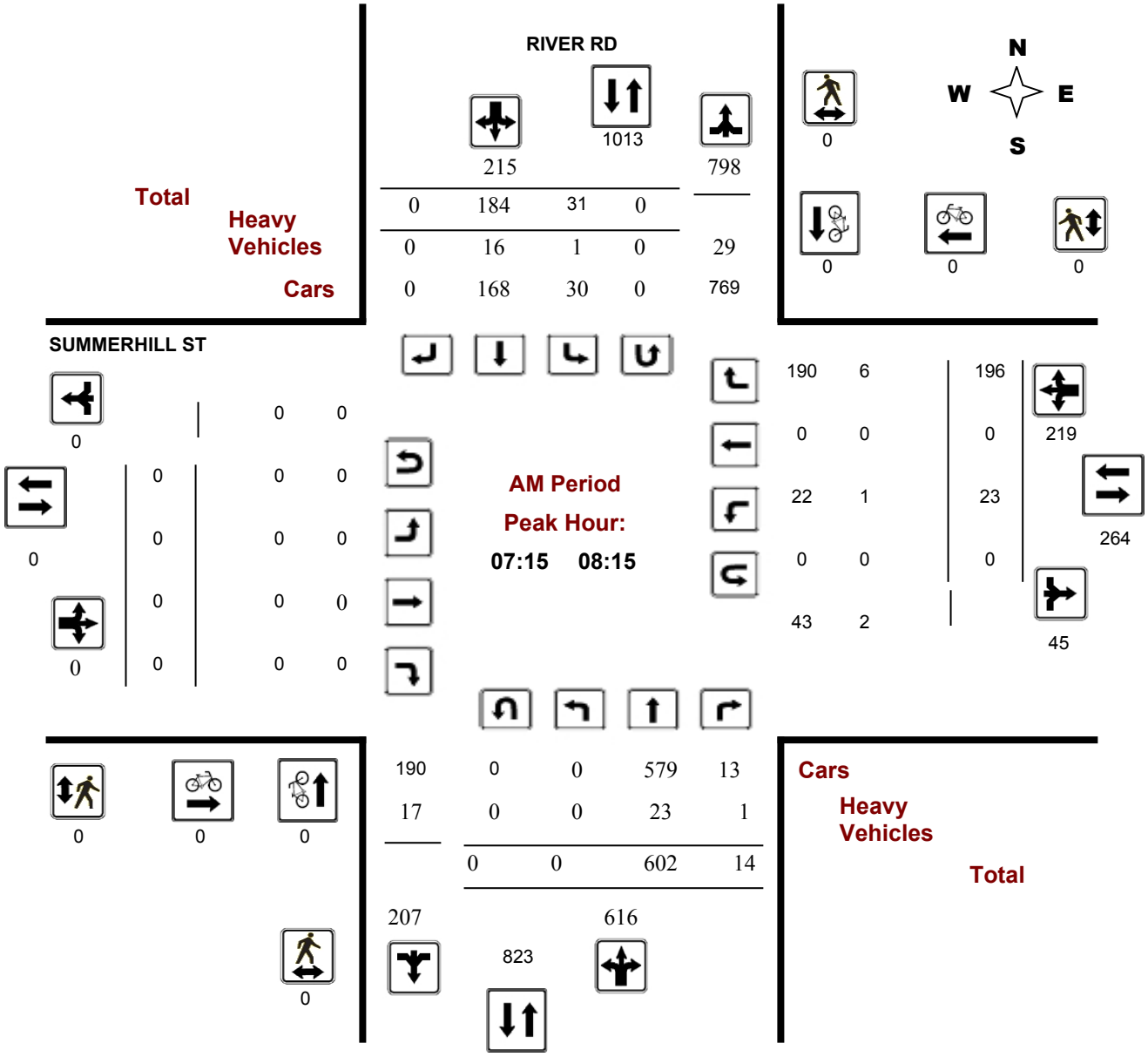
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

RIVER RD @ SUMMERHILL ST

Survey Date: Thursday, April 20, 2017 **WO No:** 36934

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



Comments

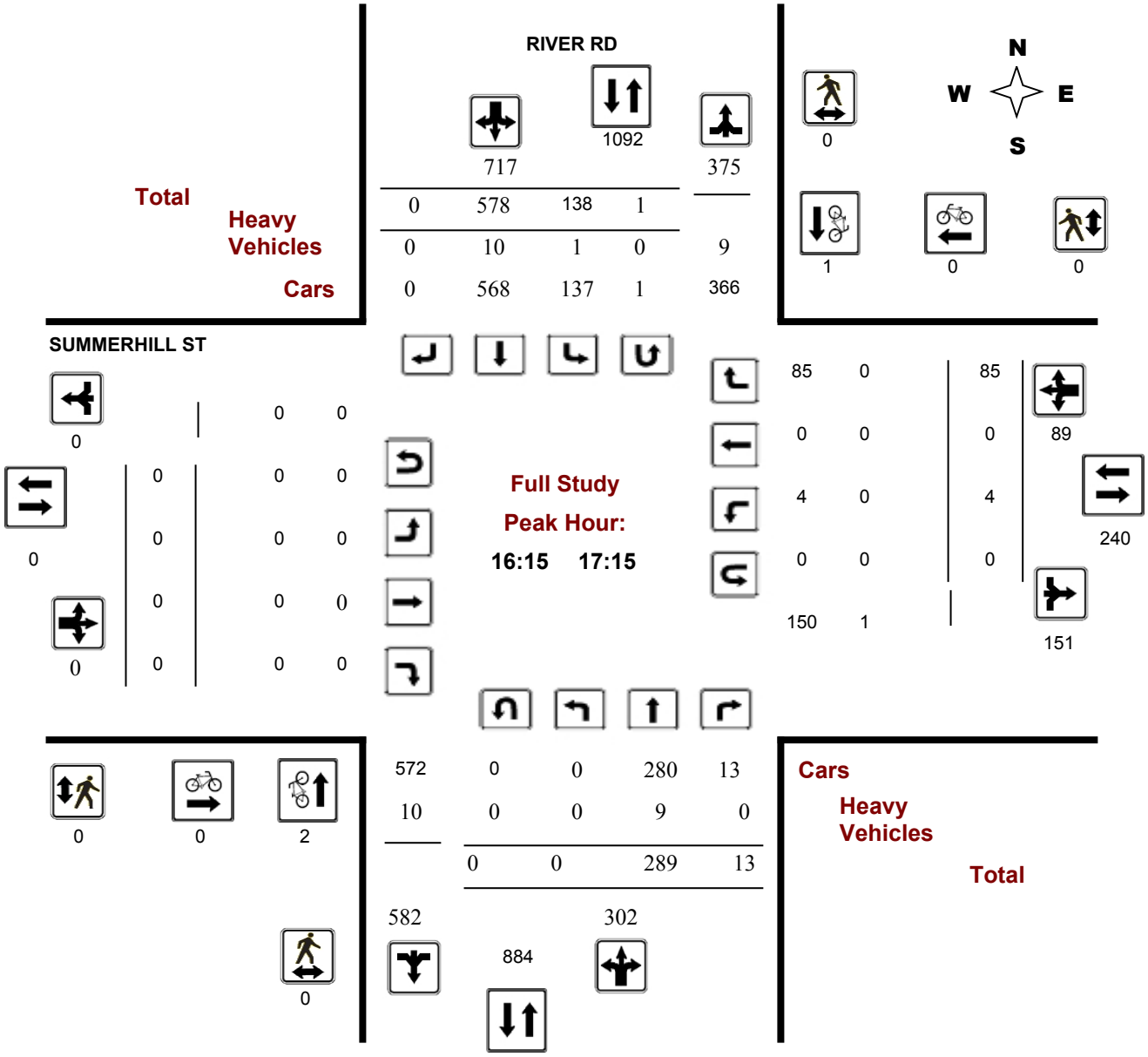
Transportation Services - Traffic Services

Turning Movement Count - Full Study Peak Hour Diagram

RIVER RD @ SUMMERHILL ST

Survey Date: Thursday, April 20, 2017 **WO No:** 36934

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

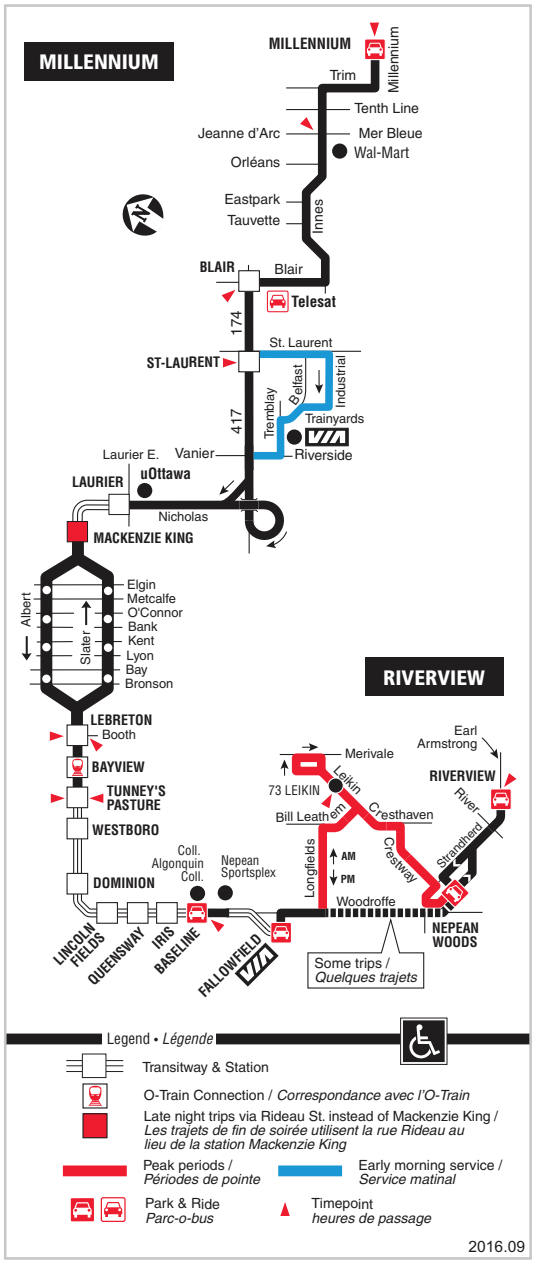


Comments

Appendix D – OC Transpo Routes

94 MILLENNIUM / RIVERVIEW

7 days a week / 7 jours par semaine
All day service
Service toute la journée



Information / Renseignement.....**613-741-4390**

Customer Relations
Service à la clientèle **613-842-3600**

Lost and Found / Objets perdus **613-563-4011**

Schedule / Horaire.....**613-560-1000**

Text / Texto **560560**

plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

Effective / En vigueur Sept. 4 sept. 2016

99 Rapide

GREENBORO LEBRETON
BARRHAVEN

7 days a week / 7 jours par semaine

Transitway & Station

Transitway & Station
(Peak periods only / Périodes de pointe seulement)

Sat. & Sun. only / Sam. et dim. seulement

Park & Ride / Parc-o-bus

Timepoint / Heures de passage

2018.04

Schedule / Horaire.....613-560-1000
Text / Texto 560560
plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

Customer Relations
Service à la clientèle **613-842-3600**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité **613-741-2478**

Effective April 22 , 2018
En vigueur 22 avril 2018

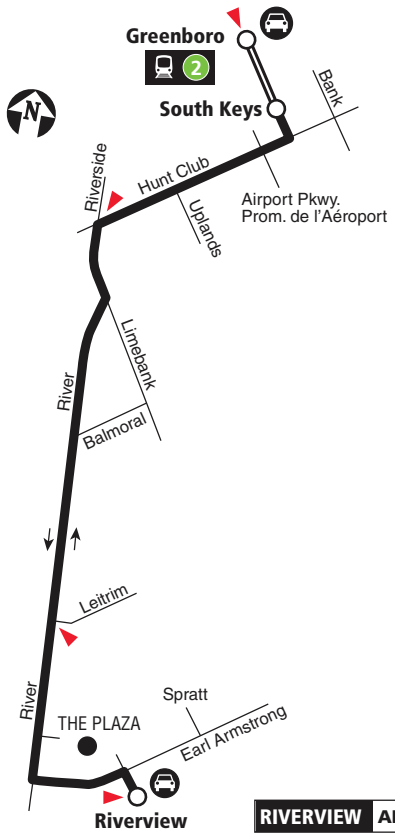
OC Transpo
INFO 613-741-4390
octranspo.com

198 RIVERVIEW / GREENBORO

Local

Monday to Friday / Lundi au vendredi
Peak periods only
Périodes de pointe seulement

GREENBORO PM ↑



RIVERVIEW AM ↓

Transitway & Station
Park & Ride / Parc-o-bus
Timepoint / Heures de passage

2017.12

Schedule / Horaire.....613-560-1000
Text / Texto 560560
plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

Customer Relations
Service à la clientèle **613-842-3600**
Lost and Found / Objets perdus..... **613-563-4011**
Security / Sécurité **613-741-2478**

Effective Dec. 24, 2017
En vigueur 24 déc. 2017

OC Transpo
INFO 613-741-4390
octranspo.com

NEW / NOUVEAU

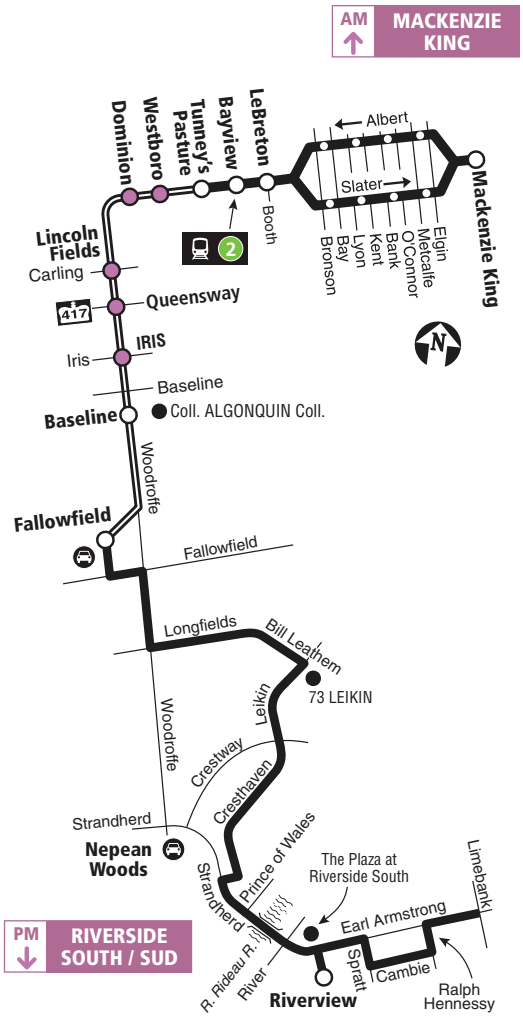
278 Connexion

MACKENZIE KING
RIVERSIDE
SOUTH / SUD

Monday to Friday / Lundi au vendredi

Peak periods only

Périodes de pointe seulement



Transitway & Station

Limited stops: Off only in AM / No stop in PM
Arrêts limités : Débarquement en AM seulement / Aucun arrêt en PM

Park & Ride / Parc-o-bus

2017.12

Schedule / Horaire.....613-560-1000
Text / Texto 560560

plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

Customer Relations
Service à la clientèle **613-842-3600**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité..... **613-741-2478**

Effective December 24, 2017
En vigueur 24 décembre 2017

OC Transpo

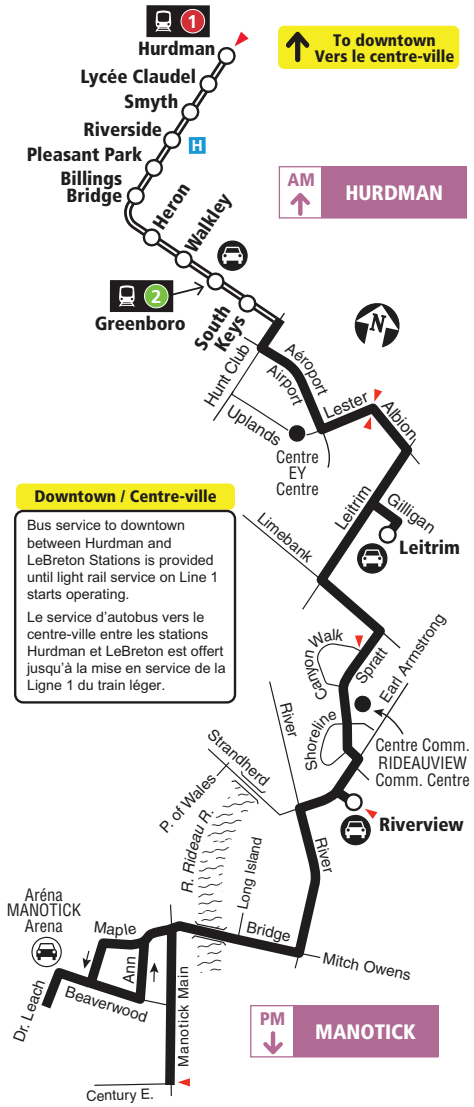
INFO 613-741-4390
octranspo.com

FORMER / ANCIEN 99

299 Connexion

HURDMAN LEBRETON
MANOTICK

Monday to Friday / Lundi au vendredi



2018.04

Schedule / Horaire.....613-560-1000
Text / Texto 560560
plus your four digit bus stop number / *plus* votre numéro d'arrêt à quatre chiffres

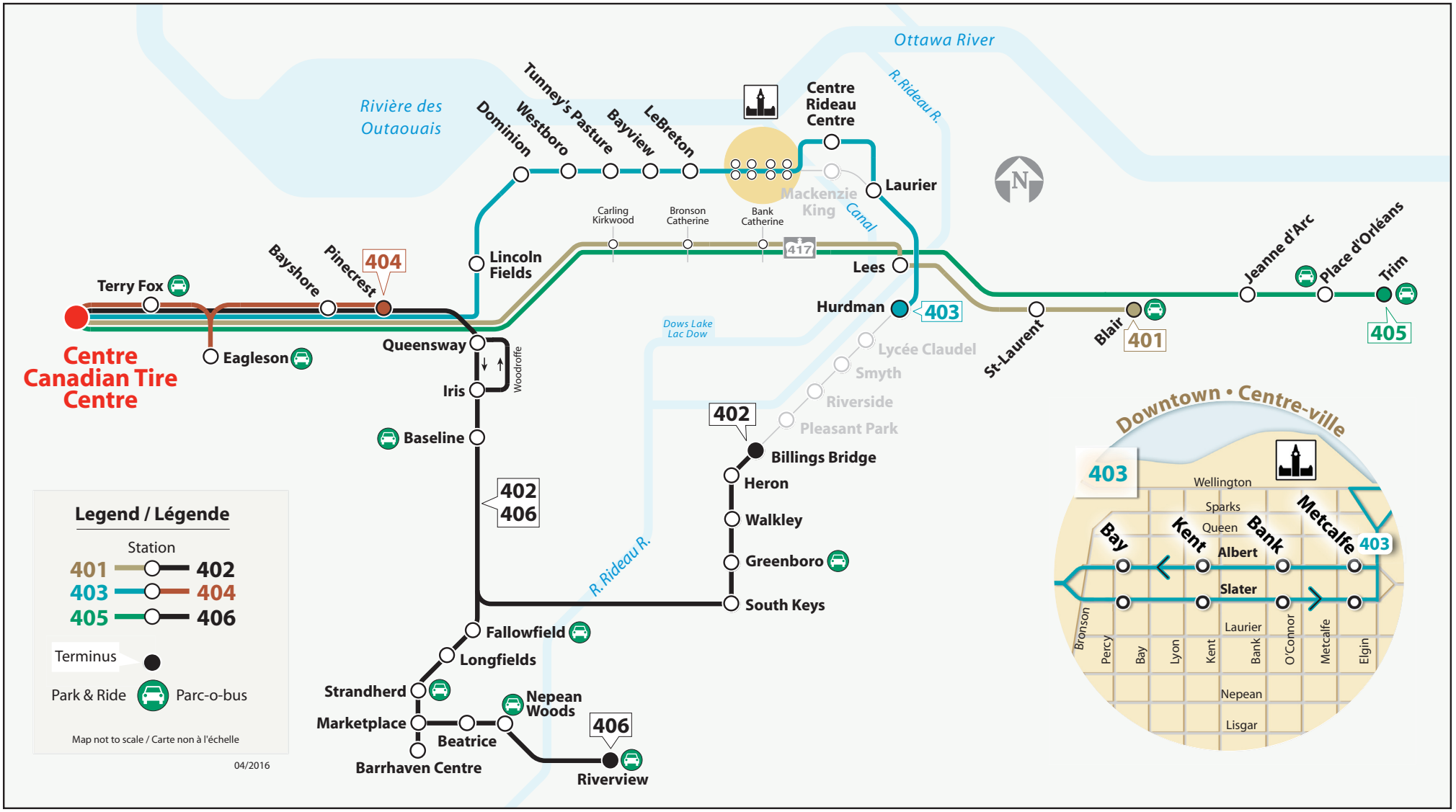
Customer Relations
Service à la clientèle **613-842-3600**

Lost and Found / Objets perdus..... **613-563-4011**

Security / Sécurité..... **613-741-2478**

Effective April 23, 2018
En vigueur 23 avril 2018

OC Transpo
INFO 613-741-4390
octranspo.com


Ottawa River
Rivière des Outaouais
R. Rideau R.
Tunney's Pasture
Dominion
Westboro
Bayview
LeBreton
Centre Rideau Centre
Laurier
Mackenzie King
Canal
Carling Kirkwood
Bronson Catherine
Bank Catherine
417
Lees
Hurdman
403
Jeanne d'Arc
Place d'Orléans
Trim
405
Blair
401
St-Laurent
Lycée Claudel
Smyth
Riverside
Pleasant Park
Dows Lake Lac Dow
402
Billings Bridge
Heron
Walkley
Greenboro
South Keys
Lincoln Fields
Bayshore
Pinecrest
404
Terry Fox
Eagleson
Centre Canadian Tire Centre
Queensway
Woodroffe
Iris
Baseline
402
406
Fallowfield
Longfields
Strandherd
Marketplace
Barrhaven Centre
Beatrice
Nepean Woods
406
Riverview
Downtown • Centre-ville
403
Wellington
Sparks
Queen
Albert
Slater
Laurier
Bay
Kent
Bank
Metcalfe
Bronson
Percy
Lyon
O'Connor
Elgin
Nepean
Lisgar
Legend / Légende
Station
401
402
403
404
405
406
Terminus
Park & Ride
Parc-o-bus
Map not to scale / Carte non à l'échelle
04/2016

Appendix E – Collision Data

City Operations - Transportation Services

Collision Details Report - Public Version

From: January 1, 2013 **To:** December 31, 2017

Location: BRIAN GOOD AVE @ EARL ARMSTRONG RD

Traffic Control: Stop sign **Total Collisions:** 4

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Aug-26, Wed,23:48	Clear	Angle	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2015-Oct-11, Sun,11:48	Clear	Angle	Non-fatal injury	Dry	North	Turning left	Pick-up truck	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Mar-21, Tue,17:25	Clear	Angle	P.D. only	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Municipal transit bus	Other motor vehicle	
2017-Mar-24, Fri,16:40	Snow	Turning movement	Non-fatal injury	Wet	West	Turning left	Pick-up truck	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Pick-up truck	Other motor vehicle	

Location: EARL ARMSTRONG RD @ PARK N RIDE/295 E OF RIVER RD

Traffic Control: Traffic signal **Total Collisions:** 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped

2015-Sep-17, Thu,12:12	Clear	Rear end	Non-fatal injury	Dry	East	Going ahead	Pick-up truck	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2017-Jan-20, Fri,07:08	Clear	Turning movement	Non-fatal injury	Wet	East	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: EARL ARMSTRONG RD @ RIVER RD

Traffic Control: Traffic signal **Total Collisions:** 61

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Feb-05, Wed,16:55	Snow	Angle	P.D. only	Loose snow	North	Slowing or stopping	Pick-up truck	Other motor vehicle	
					West	Turning left	Passenger van	Other motor vehicle	
2014-Mar-27, Thu,07:45	Clear	Rear end	Non-reportable	Dry	North	Turning right	Passenger van	Other motor vehicle	
					North	Turning right	Passenger van	Other motor vehicle	
2014-Jul-18, Fri,21:01	Clear	Angle	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Pick-up truck	Other motor vehicle	
2014-Aug-19, Tue,19:51	Clear	SMV other	Non-fatal injury	Dry	North	Turning left	Motorcycle	Debris on road	
2014-Nov-07, Fri,09:31	Rain	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	

2014-Nov-07, Fri,20:10	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
2014-Oct-25, Sat,14:08	Rain	Rear end	P.D. only	Wet	North	Turning left	Automobile, station wagon	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
					North	Turning left	Automobile, station wagon	Other motor vehicle
2014-Nov-15, Sat,10:48	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Slowing or stopping	Pick-up truck	Other motor vehicle
2014-Dec-20, Sat,19:39	Clear	Rear end	Non-fatal injury	Dry	South	Turning right	Passenger van	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2015-Mar-31, Tue,15:32	Clear	Rear end	Non-fatal injury	Dry	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Pick-up truck	Other motor vehicle
2015-Feb-08, Sun,10:30	Snow	Rear end	P.D. only	Packed snow	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2015-Jun-25, Thu,16:01	Clear	Rear end	P.D. only	Dry	North	Turning right	Automobile, station wagon	Other motor vehicle
					North	Turning right	Automobile, station wagon	Other motor vehicle

2015-Oct-01, Thu,14:39	Clear	Rear end	Non-fatal injury	Dry	South	Slowing or stopping	Passenger van	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2015-May-01, Fri,07:12	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-13, Fri,07:30	Clear	Rear end	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					East	Turning left	Pick-up truck	Other motor vehicle
2015-Feb-26, Thu,15:30	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
2015-Jul-27, Mon,16:03	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Motor home	Other motor vehicle
					East	Going ahead	Municipal transit bus	Other motor vehicle
2015-Jun-09, Tue,16:13	Clear	Rear end	P.D. only	Wet	West	Turning right	Passenger van	Other motor vehicle
					West	Turning right	Automobile, station wagon	Other motor vehicle
2015-Aug-12, Wed,08:25	Clear	Rear end	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					East	Turning left	Automobile, station wagon	Other motor vehicle
2015-Aug-11, Tue,16:17	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	
2015-Feb-12, Thu,12:53	Snow	Rear end	P.D. only	Loose snow	South	Turning right	Automobile, station wagon	Other motor vehicle	
					South	Turning right	Pick-up truck	Other motor vehicle	
2016-Jun-01, Wed,08:14	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-Jun-10, Fri,16:02	Clear	Rear end	Non-fatal injury	Dry	East	Turning right	Pick-up truck	Other motor vehicle	
					East	Turning right	Automobile, station wagon	Other motor vehicle	
2015-Oct-20, Tue,15:00	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-Sep-08, Tue,12:00	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Pick-up truck	Other motor vehicle	
					South	Slowing or stopping	Pick-up truck	Other motor vehicle	
2015-Sep-30, Wed,13:00	Clear	SMV other	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Pedestrian	1
2015-Dec-04, Fri,16:57	Clear	Rear end	Non-fatal injury	Dry	North	Turning right	Automobile, station wagon	Other motor vehicle	
					North	Turning right	Automobile, station wagon	Other motor vehicle	

2015-Oct-24, Sat,21:30	Rain	Rear end	P.D. only	Wet	North	Turning left	Automobile, station wagon	Other motor vehicle
					North	Turning left	Pick-up truck	Other motor vehicle
2015-Dec-05, Sat,11:49	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Slowing or stopping	Pick-up truck	Other motor vehicle
2016-Jan-14, Thu,17:11	Clear	Rear end	P.D. only	Slush	North	Turning right	Passenger van	Other motor vehicle
					North	Turning right	Automobile, station wagon	Other motor vehicle
2016-Mar-27, Sun,13:20	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
2016-Sep-15, Thu,19:37	Clear	Angle	Non-fatal injury	Dry	South	Turning right	Automobile, station wagon	Cyclist
					West	Going ahead	Bicycle	Other motor vehicle
2016-Nov-16, Wed,17:39	Clear	Rear end	Non-fatal injury	Dry	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2016-Apr-09, Sat,16:30	Clear	Rear end	P.D. only	Dry	West	Turning right	Pick-up truck	Other motor vehicle
					West	Turning right	Automobile, station wagon	Other motor vehicle
2016-Jul-29, Fri,07:37	Clear	Turning movement	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle

					East	Turning left	Automobile, station wagon	Other motor vehicle
2016-Sep-22, Thu,15:14	Clear	Rear end	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle
2017-Jan-09, Mon,11:36	Clear	Rear end	P.D. only	Dry	East	Turning right	Passenger van	Other motor vehicle
					East	Turning right	Pick-up truck	Other motor vehicle
2017-Sep-01, Fri,16:00	Clear	Angle	Non-fatal injury	Dry	East	Going ahead	Bicycle	Other motor vehicle
					South	Turning right	Unknown	Cyclist
2017-Feb-14, Tue,20:42	Snow	Turning movement	Non-fatal injury	Loose snow	East	Turning left	Pick-up truck	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Skidding/sliding
					South	Stopped	Passenger van	Other motor vehicle
2017-Jan-23, Mon,15:50	Clear	Rear end	Non-fatal injury	Dry	South	Turning right	Passenger van	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2017-Feb-16, Thu,10:58	Snow	Rear end	Non-fatal injury	Wet	South	Turning right	School bus	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle
2017-Mar-01, Wed,17:52	Clear	Rear end	P.D. only	Wet	South	Turning right	Automobile, station wagon	Other motor vehicle

					South	Turning right	Automobile, station wagon	Other motor vehicle
2016-Nov-04, Fri,11:12	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Stopped	Pick-up truck	Other motor vehicle
2016-Nov-24, Thu,11:30	Clear	Sideswipe	P.D. only	Wet	East	Changing lanes	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle
2016-Nov-18, Fri,22:31	Fog, mist, smoke, dust	Angle	Non-fatal injury	Wet	South	Turning left	Pick-up truck	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Mar-11, Sat,19:34	Clear	Other	P.D. only	Dry	West	Reversing	Passenger van	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2017-May-19, Fri,12:30	Clear	Rear end	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2017-May-23, Tue,18:16	Clear	Rear end	P.D. only	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					East	Stopped	Automobile, station wagon	Other motor vehicle
2017-May-30, Tue,16:23	Clear	Rear end	P.D. only	Dry	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle

2017-Jun-21, Wed,17:52	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
2017-Jun-26, Mon,15:30	Clear	Rear end	Non-fatal injury	Dry	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Passenger van	Other motor vehicle
2017-Sep-12, Tue,16:22	Clear	Rear end	Non-fatal injury	Dry	North	Turning right	Automobile, station wagon	Other motor vehicle
					North	Turning right	Automobile, station wagon	Other motor vehicle
2017-Jul-19, Wed,11:30	Clear	Rear end	P.D. only	Dry	South	Turning right	Passenger van	Other motor vehicle
					South	Turning right	Pick-up truck	Other motor vehicle
2017-Aug-16, Wed,10:45	Clear	Rear end	P.D. only	Wet	North	Turning right	Automobile, station wagon	Other motor vehicle
					North	Turning right	Automobile, station wagon	Other motor vehicle
2017-Sep-22, Fri,17:08	Clear	Rear end	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle
					South	Stopped	Automobile, station wagon	Other motor vehicle
2017-Nov-25, Sat,10:32	Rain	Turning movement	P.D. only	Wet	West	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Pick-up truck	Other motor vehicle

2017-Nov-29, Wed,16:45	Clear	Rear end	P.D. only	Dry	West	Slowing or stopping	Pick-up truck	Other motor vehicle	
					West	Slowing or stopping	Passenger van	Other motor vehicle	
2017-Sep-28, Thu,07:17	Clear	Rear end	P.D. only	Dry	South	Changing lanes	Automobile, station wagon	Other motor vehicle	
					South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
2013-Mar-06, Wed,14:44	Clear	SMV other	Non-fatal injury	Wet	North	Turning right	Truck - dump	Rollover	
2013-Feb-17, Sun,14:08	Clear	Rear end	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2013-Jun-27, Thu,10:31	Clear	Rear end	P.D. only	Dry	South	Going ahead	Delivery van	Other motor vehicle	
					South	Stopped	Automobile, station wagon	Other motor vehicle	

Location: EARL ARMSTRONG RD @ SPRATT RD

Traffic Control: Traffic signal **Total Collisions:** 28

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Apr-04, Fri,10:30	Clear	SMV other	P.D. only	Dry	East	Turning left	Pick-up truck	Ran off road	
2014-Oct-30, Thu,18:39	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	
2014-Jan-03, Fri,11:15	Snow	Turning movement	P.D. only	Ice	East	Turning left	Automobile, station wagon	Other motor vehicle	

					West	Going ahead	Pick-up truck	Other motor vehicle
2014-May-27, Tue,09:20	Clear	Rear end	P.D. only	Dry	South	Turning right	Pick-up truck	Other motor vehicle
					South	Turning right	Passenger van	Other motor vehicle
2015-Feb-12, Thu,20:30	Clear	Angle	P.D. only	Loose snow	South	Turning right	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Dec-16, Tue,08:54	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2014-Jul-04, Fri,18:09	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2015-May-19, Tue,16:21	Clear	Turning movement	Non-fatal injury	Dry	West	Going ahead	Pick-up truck	Other motor vehicle
					East	Turning left	Passenger van	Other motor vehicle
2015-May-28, Thu,08:30	Clear	Turning movement	Non-fatal injury	Dry	West	Turning left	Pick-up truck	Other motor vehicle
					East	Going ahead	Passenger van	Other motor vehicle
2015-Sep-17, Thu,14:25	Clear	Rear end	P.D. only	Dry	East	Slowing or stopping	Pick-up truck	Other motor vehicle
					East	Stopped	Passenger van	Other motor vehicle

2016-Feb-18, Thu,13:46	Clear	Turning movement	Non-fatal injury	Dry	West	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Truck - open	Other motor vehicle
2016-May-10, Tue,07:30	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Delivery van	Other motor vehicle
2016-Oct-26, Wed,20:00	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
2017-Jan-05, Thu,15:55	Clear	Turning movement	Non-fatal injury	Wet	West	Turning left	Automobile, station wagon	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Nov-09, Wed,08:03	Clear	Turning movement	P.D. only	Dry	East	Turning left	Pick-up truck	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2016-Dec-21, Wed,17:45	Clear	Turning movement	P.D. only	Wet	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Jan-26, Thu,07:40	Rain	Rear end	Non-fatal injury	Wet	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle

2017-Mar-21, Tue,18:44	Clear	Turning movement	P.D. only	Dry	East	Turning left	Unknown	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Apr-06, Thu,08:00	Clear	Rear end	Non-fatal injury	Wet	South	Turning right	Pick-up truck	Other motor vehicle
					South	Turning right	Passenger van	Other motor vehicle
2017-Oct-28, Sat,22:05	Rain	Turning movement	P.D. only	Wet	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Aug-01, Tue,16:55	Clear	Angle	Non-fatal injury	Dry	East	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
					West	Stopped	Automobile, station wagon	Other motor vehicle
2017-Aug-09, Wed,18:00	Clear	Rear end	P.D. only	Dry	West	Going ahead	Pick-up truck	Other motor vehicle
					West	Stopped	Pick-up truck	Other motor vehicle
2017-Nov-24, Fri,18:25	Clear	Turning movement	Non-fatal injury	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle
					West	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Dec-15, Fri,17:30	Snow	Rear end	P.D. only	Loose snow	South	Turning right	Automobile, station wagon	Other motor vehicle
					South	Turning right	Automobile, station wagon	Other motor vehicle

2013-Feb-28, Thu,08:02	Snow	Angle	Non-fatal injury	Packed snow	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Turning left	Pick-up truck	Other motor vehicle	
2013-Nov-14, Thu,18:03	Clear	Turning movement	P.D. only	Dry	North	Turning left	Pick-up truck	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	
2013-Nov-01, Fri,01:30	Clear	SMV other	P.D. only	Wet	East	Turning left	Automobile, station wagon	Curb	
2013-Nov-17, Sun,13:27	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	

Location: EARL ARMSTRONG RD btwn RIVER RD & SPRATT RD

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
2016-Feb-06, Sat,18:29	Clear	Rear end	Non-fatal injury	Dry	East	Slowing or stopping	Pick-up truck	Other motor vehicle	
					East	Stopped	Pick-up truck	Other motor vehicle	
2015-Nov-27, Fri,17:14	Rain	SMV other	Non-fatal injury	Wet	West	Going ahead	Automobile, station wagon	Pedestrian	1
2017-Jan-09, Mon,10:21	Clear	SMV other	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Snowbank/drift	
2017-Jan-18, Wed,08:00	Clear	Turning movement	P.D. only	Loose snow	West	Turning right	Pick-up truck	Other motor vehicle	

					West	Turning right	Automobile, station wagon	Other motor vehicle	
2017-Jun-13, Tue,18:32	Clear	Sideswipe	P.D. only	Dry	East	Changing lanes	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Pick-up truck	Other motor vehicle	
2017-Nov-28, Tue,18:08	Clear	Rear end	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					West	Slowing or stopping	Pick-up truck	Other motor vehicle	

Location: NICOLLS ISLAND RD @ RIVER RD

Traffic Control: Stop sign

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Feb-26, Thu,13:46	Clear	Rear end	P.D. only	Ice	North	Going ahead	Pick-up truck	Other motor vehicle	
					North	Turning left	Pick-up truck	Other motor vehicle	
2015-Jun-25, Thu,11:28	Clear	Angle	P.D. only	Dry	East	Turning left	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Truck - dump	Other motor vehicle	

Location: RIDEAU RD @ SPRATT RD

Traffic Control: Stop sign

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2018-Mar-01, Thu,13:00	Clear	SMV other	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Ran off road	

Location: RIVER RD @ 175 N OF EARL ARMSTRONG/LOBLAWS SC

Traffic Control: Traffic signal **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2013-Sep-06, Fri,10:25	Clear	SMV other	Non-fatal injury	Dry	West	Turning left	Automobile, station wagon	Curb	

Location: RIVER RD @ RIDEAU RD

Traffic Control: Stop sign **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Aug-24, Wed,22:55	Clear	Angle	Non-fatal injury	Dry	West	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: RIVER RD @ SOUTH GOWER BOUNDARY RD

Traffic Control: Stop sign **Total Collisions:** 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-Nov-27, Mon,06:57	Clear	Angle	P.D. only	Dry	West	Turning left	Pick-up truck	Other motor vehicle	
					North	Going ahead	Pick-up truck	Other motor vehicle	

Location: RIVER RD @ SUMMERHILL ST

Traffic Control: Stop sign **Total Collisions:** 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Dec-07, Sun,14:25	Clear	Rear end	Non-fatal injury	Dry	West	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2014-Jan-25, Sat,12:39	Clear	Rear end	Non-fatal injury	Wet	South	Going ahead	Automobile, station wagon	Other motor vehicle	

					South	Turning left	Pick-up truck	Other motor vehicle	

Location: RIVER RD btwn EARL ARMSTRONG RD & 175 N OF EARL ARMSTRONG/LOBLAWS SC

Traffic Control: No control **Total Collisions:** 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2013-Jun-13, Thu,21:35	Clear	SMV other	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Animal - wild	
2013-Jan-30, Wed,09:36	Clear	Sideswipe	P.D. only	Wet	North	Going ahead	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Truck - dump	Other motor vehicle	

Location: RIVER RD btwn EARL ARMSTRONG RD & NICOLLS ISLAND RD

Traffic Control: No control **Total Collisions:** 8

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Mar-12, Wed,16:39	Snow	Approaching	P.D. only	Loose snow	South	Going ahead	Automobile, station wagon	Skidding/sliding	
					North	Going ahead	Pick-up truck	Other motor vehicle	
2014-Mar-13, Thu,08:25	Clear	Approaching	Non-fatal injury	Packed snow	South	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Automobile, station wagon	Other motor vehicle	
2014-Aug-14, Thu,11:51	Clear	SMV other	P.D. only	Dry	South	Going ahead	Truck - dump	Other	
2014-Aug-14, Thu,11:51	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Other	
2015-Feb-02, Mon,12:47	Clear	Rear end	P.D. only	Loose snow	North	Going ahead	Truck - open	Other motor vehicle	

					North	Stopped	Pick-up truck	Other motor vehicle
2016-Aug-02, Tue,15:21	Clear	Other	P.D. only	Dry	South	Reversing	Farm tractor	Other motor vehicle
					South	Turning left	Automobile, station wagon	Other
2016-Jan-01, Fri,02:33	Snow	SMV other	P.D. only	Wet	South	Going ahead	Automobile, station wagon	Skidding/sliding
2017-Dec-29, Fri,23:58	Clear	SMV other	P.D. only	Ice	West	Going ahead	Pick-up truck	Skidding/sliding

Location: RIVER RD btwn MULLIGAN ST & LEITRIM RD

Traffic Control: No control

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-Aug-04, Fri,09:02	Clear	Rear end	P.D. only	Dry	North	Slowing or stopping	Automobile, station wagon	Other motor vehicle	
					North	Stopped	Automobile, station wagon	Other motor vehicle	
2018-May-09, Wed,02:42	Clear	SMV other	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Ditch	

Location: RIVER RD btwn NICOLLS ISLAND RD & RIDEAU RD

Traffic Control: No control

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2015-Apr-18, Sat,13:00	Clear	SMV other	P.D. only	Dry	North	Going ahead	Automobile, station wagon	Ditch	

Location: SPRATT RD btwn CANYON WALK DR & HOLLOW TRAIL GT

Traffic Control: No control

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-Sep-18, Mon,17:03	Clear	SMV unattended vehicle	P.D. only	Dry	West	Going ahead	Automobile, station wagon	Unattended vehicle	

Location: SPRATT RD btwn CANYON WALK DR & OWLS CABIN AVE

Traffic Control: No control

Total Collisions: 2

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2016-Feb-03, Wed,09:05	Freezing Rain	Angle	P.D. only	Slush	South	Turning left	Automobile, station wagon	Other motor vehicle	
					East	Going ahead	Passenger van	Other motor vehicle	
					West	Stopped	Automobile, station wagon	Other motor vehicle	
2016-May-30, Mon,16:42	Clear	Approaching	Non-fatal injury	Dry	East	Going ahead	Pick-up truck	Other motor vehicle	
					West	Going ahead	Pick-up truck	Other motor vehicle	

Location: SPRATT RD btwn EARL ARMSTRONG RD & RIDEAU RD

Traffic Control: No control

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2013-Feb-14, Thu,20:16	Snow	SMV other	P.D. only	Wet	North	Going ahead	Automobile, station wagon	Ran off road	

Appendix F – Trip Generation Data

Table 3.12: Person Trip Generation Rates – (all households with residents not older than 55 years of age)

Person Trip Generation Rates

All Households with persons 55 years of age or less
AM and PM Peak Hours

Dwelling Unit Types \ Geographic Areas		Core Area Person Trip Rate	Core Area %▽	Urban Area (Inside the greenbelt) Person Trip Rate	Urban Area %▽	Suburban (Outside the greenbelt) Person Trip Rate	Suburban %▽	Rural Person Trip Rate	Rural %▽	All Areas Person Trip Rate
Single detached:	AM	0.85	- 7%	0.99	+ 9%	0.94	+ 3%	0.78	- 14%	0.91
	PM	0.74	- 3%	0.75	- 1%	0.79	+ 4%	0.71	- 7%	0.76
Semi-detached:	AM	0.79	- 10%	0.97	10%	0.89	+ 1%	0.64	- 27%	0.88
	PM	0.74	- 1%	0.68	- 9%	0.82	+ 9%	0.60	- 20%	0.75
Row Townhouse:	AM	0.71	- 3%	0.78	+ 7%	0.67	- 8%	0.74	+ 1%	0.73
	PM	0.62	- 3%	0.60	- 6%	0.69	+ 8%	0.56	- 13%	0.64
Apartment:	AM	0.48	- 4%	0.51	+ 2%	0.53	+ 6%	0.36	- 28%	0.50
	PM	0.45	0%	0.42	- 7%	0.52	+ 16%	0.52	+ 16%	0.45
All Types:	AM	0.62	- 23%	0.82	+ 2%	0.86	+ 8%	0.76	- 5%	0.80
	PM	0.57	- 16%	0.63	- 7%	0.75	+ 10%	0.69	+ 1%	0.68

Note: 5 % (+ or -) represents the percentage delta change in trip rate when compared against the average trip rate across all geographic areas

Table 3.13: Mode Shares - (all households with residents not older than 55 years of age)

Reported Mode Shares

All Households with persons 55 years of age or less
AM and PM Peak Hours

Dwelling Unit Types \ Geographic Areas		Core Area Vehicle Trips	Core Area Transit Share	Core Area Non-Motorised	Urban Area (Inside the greenbelt) Vehicle Trips	Urban Area Transit Share	Urban Area Non-Motorised	Suburban (Outside the greenbelt) Vehicle Trips	Suburban Transit Share	Suburban Non-Motorised	Rural * Vehicle Trips	Rural * Transit Share	Rural * Non-Motorised	All Areas Vehicle Trips	All Areas Transit Share	All Areas Non-Motorised
Single - Detached:	AM	35%	20%	33%	51%	26%	11%	55%	25%	9%	60%	27%	4%	54%	25%	10%
	PM	45%	11%	32%	58%	19%	13%	64%	19%	6%	73%	13%	2%	63%	17%	8%
Semi-Detached:	AM	38%	30%	26%	44%	35%	10%	52%	24%	12%	64%	27%	5%	49%	28%	12%
	PM	36%	20%	34%	51%	27%	13%	62%	17%	7%	77%	12%	1%	58%	20%	10%
Row / Townhouse:	AM	33%	22%	40%	45%	34%	10%	55%	27%	8%	73%	15%	3%	49%	30%	11%
	PM	39%	15%	42%	53%	28%	8%	61%	22%	6%	74%	15%	1%	57%	24%	9%
Apartment:	AM	27%	27%	43%	37%	41%	14%	44%	34%	13%	76%	8%	16%	36%	35%	23%
	PM	23%	29%	42%	40%	37%	14%	44%	33%	9%	48%	4%	17%	35%	33%	23%
All Types:	AM	32%	24%	38%	47%	31%	11%	54%	26%	9%	61%	26%	4%	51%	27%	11%
	PM	34%	21%	38%	53%	24%	12%	62%	20%	6%	73%	13%	2%	59%	20%	10%

Note: Percentages do not necessarily sum to 100% as the proportion of automobile passengers have not been tabulated. Vehicle trips reflect the percentage of vehicle drivers.
* - Rural area sample size is extremely low and mode shares are highly influenced by school types where public transportation levels are high during the AM versus the PM peaks.

Table 3.17: Blended Vehicle Trip Rate Directional Splits

Comparison of Directional Splits (Inbound/Outbound) AM and PM Peak Hours								
ITE Land Use Code	Area / Dwelling Unit Type / Data Source		2008 Count Data		ITE		Blended Rate	
			Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
210	Single-detached dwellings	AM	33%	67%	25%	75%	29%	71%
		PM	60%	40%	63%	37%	62%	39%
224	Semi-detached dwellings, townhouses, rowhouses	AM	40%	60%	33%	67%	37%	64%
		PM	55%	45%	51%	49%	53%	47%
231	Low-rise condominiums (1 or 2 floors)	AM	36%	64%	25%	75%	31%	70%
		PM	54%	46%	58%	42%	56%	44%
232	High-rise condominiums (3+ floors)	AM	36%	64%	19%	81%	28%	73%
		PM	54%	46%	62%	38%	58%	42%
233	Luxury condominiums	AM	36%	64%	23%	77%	30%	71%
		PM	54%	46%	63%	37%	59%	42%
221	Low-rise apartments (2 floors)	AM	22%	78%	21%	79%	22%	79%
		PM	62%	38%	65%	35%	64%	37%
223	Mid-rise apartments (3-10 floors)	AM	22%	78%	25%	75%	24%	77%
		PM	62%	38%	61%	39%	62%	39%
222	High-rise apartments (10+ floors)	AM	22%	78%	25%	75%	24%	77%
		PM	62%	38%	61%	39%	62%	39%

The analysis of the OD Survey results confirmed that lower vehicle trip rates were reported in the core areas and higher vehicle trip rates in the suburban and rural areas. To account for the change in vehicle trip rates between geographic areas, the blended rates have been adjusted using information contained in Table 3.14. The resulting vehicle trip rates are highlighted in Table 3.18: Recommended Vehicle Trip Generation Rates without Transit Bonus.

Table 3.18: Recommended Vehicle Trip Generation Rates without Transit Bonus

Recommended Vehicle Trip Generation Rates AM and PM Peak Hours							
ITE Land Use Code	Dwelling Unit Type / Geographic Area		Vehicle Trip Rates				
			Core	Urban (Inside the Greenbelt)	Suburban (Outside the Greenbelt)	Rural	All Areas
210	Single-detached dwellings	AM	0.40	0.67	0.70	0.62	0.66
		PM	0.60	0.76	0.90	0.92	0.81
224	Semi-detached dwellings, townhouses, rowhouses	AM	0.34	0.51	0.54	0.62	0.52
		PM	0.39	0.51	0.71	0.67	0.61
231	Low-rise condominiums (1 or 2 floors)	AM	0.34	0.50	0.60	0.71	0.47
		PM	0.29	0.49	0.66	0.72	0.46
232	High-rise condominiums (3+ floors)	AM	0.26	0.38	0.46	0.54	0.36
		PM	0.20	0.34	0.46	0.50	0.32
233	Luxury condominiums	AM	0.31	0.45	0.55	0.65	0.43
		PM	0.24	0.40	0.55	0.59	0.38
221	Low-rise apartments (2 floors)	AM	0.21	0.31	0.37	0.44	0.29
		PM	0.20	0.34	0.46	0.50	0.32
223	Mid-rise apartments (3-10 floors)	AM	0.17	0.24	0.29	0.35	0.23
		PM	0.16	0.28	0.37	0.41	0.26
222	High-rise apartments (10+ floors)	AM	0.17	0.24	0.29	0.35	0.23
		PM	0.16	0.27	0.36	0.39	0.25

Note: See Table 6.3 for recommended vehicle trip rates with transit bonus

Table 6.3: Recommended Vehicle Trip Generation Rates for Residential Land Uses with Transit Bonus

Recommended Vehicle Trip Generation Rates with Transit Bonus AM and PM Peak Hours									
ITE Land Use Code	Dwelling Unit Type / Geographic Area		Vehicle Trip Rate						
			Core		Urban (Inside the Greenbelt)		Suburban (Outside the Greenbelt)		Rural
			Base Rate	< 600m to Rapid Transit	Base Rate	< 600m to Rapid Transit	Base Rate	< 600m to Rapid Transit	Base Rate
210	Single-detached dwellings	AM	0.40	0.31	0.67	0.50	0.70	0.49	0.62
		PM	0.60	0.33	0.76	0.57	0.90	0.63	0.92
224	Semi-detached dwellings, townhouses, rowhouses	AM	0.34	0.34	0.51	0.50	0.54	0.39	0.62
		PM	0.39	0.38	0.51	0.51	0.71	0.51	0.67
231	Low-rise condominiums (1 or 2 floors)	AM	0.34	0.34	0.50	0.50	0.60	0.60	0.71
		PM	0.29	0.29	0.49	0.49	0.66	0.66	0.72
232	High-rise condominiums (3+ floors)	AM	0.26	0.26	0.38	0.38	0.46	0.46	0.54
		PM	0.20	0.20	0.34	0.34	0.46	0.46	0.50
233	Luxury condominiums	AM	0.31	0.31	0.45	0.45	0.55	0.55	0.65
		PM	0.24	0.24	0.40	0.40	0.55	0.55	0.59
221	Low-rise apartments (2 floors)	AM	0.21	0.21	0.31	0.31	0.37	0.37	0.44
		PM	0.20	0.20	0.34	0.34	0.46	0.46	0.50
223	Mid-rise apartments (3-10 floors)	AM	0.17	0.17	0.24	0.24	0.29	0.29	0.35
		PM	0.16	0.16	0.28	0.28	0.37	0.37	0.41
222	High-rise apartments (10+ floors)	AM	0.17	0.17	0.24	0.24	0.29	0.29	0.35
		PM	0.16	0.16	0.27	0.27	0.36	0.36	0.39

Note: The transit bonus was only applied to geographic areas and dwelling unit types where the reported transit mode shares were less than the transit mode share reported for residential development located within the 600m proximity to a rapid transit station. It is noted that condominium and apartment housing categories reported similar levels of transit mode shares independent of location to rapid transit stations.

6.5 Future Data Collection

While the rates presented in were prepared by blending the vehicle trip rates from ITE, the OD Survey and the 2008 local trip generation studies, it is important to stress the importance and need for ongoing local trip generation surveys to monitor changes in travel behaviour. The 2008 trip generation studies undertaken to support this study provide insight into local travel patterns and a well organized ongoing annual data collection program aimed at trip generation surveys of key land uses or requirement for data collection by local developers will continue to provide recent and accurate local trip generation rates. For example the high-rise apartment category of dwelling units reported the lowest peak hour vehicle trip rates.

Appendix G – MMLOS Analysis

Multi-Modal Level of Service
Riverside South Phase 12 (Project #120031)
Scenario: Existing (2019) Traffic Conditions

April 5, 2019

IBI

INTERSECTIONS		EARL ARMSTRONG & RIVER (signalized)				RIVER & SUMMERHILL (unsignalized)			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	6	6	7	7				
	Median	No Median	No Median	No Median	No Median				
	Island Refuge								
	Conflicting Left Turns (from street to right)	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive				
	Conflicting Right Turns (from street to left)	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control				
	RTOR? (from street to left)	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed				
	Ped Leading Interval? (on cross street)	No	No	No	No				
	Corner Radius	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'				
	Right Turn Channel	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'				
	Crosswalk Type	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings				
	LOS (PETSI)	**34 E**	**34 E**	**18 F**	**18 F**				
	Cycle Length (sec)	120	120	120	120				
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	7	7				
	LOS (Delay,seconds)	**54.3 E**	**54.3 E**	**54.3 E**	**54.3 E**				
	Overall Level of Service	**F**							
Cyclist	Type of Bikeway	Bike Pocket at Intersection	Bike Pocket at Intersection	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track				
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow	Slow				
	Right Turn Storage Length	≤ 50m	≤ 50m	> 50m	> 50m				
	Dual Right Turn?	No	No	No	No				
	Shared Through-Right?	No	No	No	No				
	Bike Box?	No	No	No	No				
	Number of Lanes Crossed for Left Turns	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed				
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h				
	Dual Left Turn Lanes?	No	No	No	No				
	Level of Service	**F**	**F**	**F**	**F**				
		F							
Transit	Average Signal Delay	>40 sec	>40 sec	>40 sec	>40 sec				
	Level of Service	**F**	**F**	**F**	**F**				
		F							
Truck	Turning Radius (Right Turn)	10 to 15m	10 to 15m	10 to 15m	10 to 15m				
	Number of Receiving Lanes	2+	2+	2+	2+				
		B	**B**	**B**	**B**				
		B							
Auto	**Level of Service**	**(See Synchro Results)**				**(See Synchro Results)**			

SEGMENTS		EARL ARMSTRONG & RIVER (signalized)	Section			RIVER & SUMMERHILL (unsignalized)	Section			RIVER & SOUTHERN PROPERTY LMIIT
			1	2	3		1	2	3	
Pedestrian	Sidewalk Width		No Sidewalk	No Sidewalk	No Sidewalk		No Sidewalk	No Sidewalk	No Sidewalk	
	Boulevard Width		N/A	N/A	N/A		N/A	N/A	N/A	
	AADT		> 3000	> 3000	> 3000		> 3000	> 3000	> 3000	
	On-Street Parking		No	No	No		No	No	No	
	Operating Speed		61 km/h or more	61 km/h or more	51 to 60 km/h		61 km/h or more	61 km/h or more	61 km/h or more	
	Level of Service		**F**	**F**	**F**		**F**	**F**	**F**	
			F				**F**			
Cyclist	Type of Bikeway		Bike Lanes Not Adjacent Parking Lane				Bike Lanes Not Adjacent Parking Lane			
	Number of Travel Lanes (per direction)		1 Travel Lane Per Direction				1 Travel Lane Per Direction			
	Raised Median?		No				No			
	Bike Lane Width		≥1.8 m wide bike lane				≥1.8 m wide bike lane			
	Operating Speed		≥ 70 km/h				≥ 70 km/h			
	Bike Lane Blockages (Commercial Areas)		Rare				Rare			
	Median Refuge		No Median Refuge				No Median Refuge			
	Number of Travel Lanes on Sidestreet		2 Lanes Crossed				2 Lanes Crossed			
	Sidestreet Operating Speed		50 km/h				50 km/h			
	Level of Service		**E**				**E**			
Transit	Facility Type		Mixed Traffic				Mixed Traffic			
	Friction		Limited parking/driveway friction				Limited parking/driveway friction			
	Level of Service		**D**				**D**			
Truck	Curb Lane Width		>3.7	>3.7	>3.7		>3.7	>3.7	>3.7	
	Number of Travel Lanes		3+	3+	3+		2	2	2	
			A	**A**	**A**		**B**	**B**	**B**	
			A				**B**			

* Intersection LOS only applies to signalized intersections

Multi-Modal Level of Service
Riverside South Phase 12 (Project #120031)
Scenario: Future (2029) Background Traffic Conditions

April 5, 2019

IBI

INTERSECTIONS		EARL ARMSTRONG & RIVER (signalized)				RIVER & SUMMERHILL (signalized)			River & Borbridge (signalized)				RIVER & 760 River Access/ Atrium Ridge (signalized)			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	6	6	7	7	3	3	2	3	3	2		3	3	2	2
	Median	No Median	No Median	No Median	No Median	No Median	No Median	No Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median
	Island Refuge															
	Conflicting Left Turns (from street to right)	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive		Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control		Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed		RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Leading Interval? (on cross street)	No	No	No	No	No	No	No	No	No	No		No	No	No	No
	Corner Radius	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m		> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m
	Right Turn Channel	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	No right turn channel	No right turn channel	No right turn channel	No right turn channel	No right turn channel	No right turn channel		No right turn channel	No right turn channel	No right turn channel	No right turn channel
	Crosswalk Type	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings		Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETSI)	34 E	34 E	18 F	18 F	70 C	70 C	85 B	70 C	70 C	85 B		70 C	70 C	85 B	85 B
	Cycle Length (sec)	120	120	120	120	130	130	130	120	120	120		120	120	120	120
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	7	7	7	7	7	7	7	7		7	7	7	7
	LOS (Delay,seconds)	54.3 E	54.3 E	54.3 E	54.3 E	59.3 E	59.3 E	59.3 E	54.3 E	54.3 E	54.3 E		54.3 E	54.3 E	54.3 E	54.3 E
	Overall Level of Service	F				E			E				E			
Cyclist	Type of Bikeway	Bike Pocket at Intersection	Bike Pocket at Intersection	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic		Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow	Slow	Slow	Slow	Slow	Slow	Slow	Slow		Slow	Slow	Slow	Slow
	Right Turn Storage Length	≤ 50m	≤ 50m	> 50m	> 50m	≤ 50m	≤ 50m	> 50m	≤ 50m	≤ 50m	> 50m		≤ 50m	≤ 50m	> 50m	> 50m
	Dual Right Turn?	No	No	No	No	No	No	No	No	No	No		No	No	No	No
	Shared Through-Right?	No	No	No	No	No	No	No	No	No	No		No	No	No	No
	Bike Box?	No	No	No	No	No	No	No	No	No	No		No	No	No	No
	Number of Lanes Crossed for Left Turns	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	1 Lane Crossed	1 Lane Crossed	No Lanes Crossed	1 Lane Crossed	1 Lane Crossed	No Lanes Crossed		1 Lane Crossed	1 Lane Crossed	No Lanes Crossed	No Lanes Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h	50km/h	≥ 60km/h	≥ 60km/h	50km/h		≥ 60km/h	≥ 60km/h	50km/h	50km/h
	Dual Left Turn Lanes?	No	No	No	No	No	No	No	No	No	No		No	No	No	No
	Level of Service	F	F	F	F	E	E	B	E	E	B		E	E	B	B
		F				E			E				E			
Transit	Average Signal Delay	>40 sec	>40 sec	>40 sec	>40 sec	≤40 sec	≤40 sec		≤20 sec	≤20 sec			≤10 sec	≤10 sec		
	Level of Service	F	F	F	F	E	E	A	C	C	A		B	B	A	A
		F				E			C				B			
Truck	Turning Radius (Right Turn)	10 to 15m	10 to 15m	10 to 15m	10 to 15m	10 to 15m	10 to 15m	10 to 15m	10 to 15m	10 to 15m	10 to 15m		10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes	2+	2+	2+	2+	1	1	1	1	1	1		1	1	1	1
		B	B	B	B	E	E	E	E	E	E		E	E	E	E
		B				E			E				E			
Auto	**Level of Service**	(See Synchro Results)				(See Synchro Results)			(See Synchro Results)				(See Synchro Results)			

SEGMENTS		EARL ARMSTRONG & RIVER (signalized)	Section			RIVER & SUMMERHILL (signalized)	Section			River & Borbridge (signalized)	Section			RIVER & 760 River Access/ Atrium Ridge (signalized)	Section			RIVER & SOUTHERN PROPERTY LIMIT
			1	2	3		1	2	3		1	2	3		1	2	3	
Pedestrian	Sidewalk Width		No Sidewalk	No Sidewalk	No Sidewalk		No Sidewalk	No Sidewalk	No Sidewalk		No Sidewalk	No Sidewalk	No Sidewalk		No Sidewalk	No Sidewalk	No Sidewalk	
	Boulevard Width		N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A	
	AADT		> 3000	> 3000	> 3000		> 3000	> 3000	> 3000		> 3000	> 3000	> 3000		> 3000	> 3000	> 3000	
	On-Street Parking		No	No	No		No	No	No		No	No	No		No	No	No	
	Operating Speed		61 km/h or more	61 km/h or more	51 to 60 km/h		61 km/h or more	61 km/h or more	61 km/h or more		61 km/h or more	61 km/h or more	61 km/h or more		61 km/h or more	61 km/h or more	61 km/h or more	
	Level of Service		F	F	F		F	F	F		F	F	F		F	F	F	
			F				F				F				F			
Cyclist	Type of Bikeway		Bike Lanes Not Adjacent Parking Lane				Bike Lanes Not Adjacent Parking Lane				Bike Lanes Not Adjacent Parking Lane				Bike Lanes Not Adjacent Parking Lane			
	Number of Travel Lanes (per direction)		1 Travel Lane Per Direction				1 Travel Lane Per Direction				1 Travel Lane Per Direction				1 Travel Lane Per Direction			
	Raised Median?		No				No				No				No			
	Bike Lane Width		≥1.8 m wide bike lane				≥1.8 m wide bike lane				≥1.8 m wide bike lane				≥1.8 m wide bike lane			
	Operating Speed		≥ 70 km/h				≥ 70 km/h				≥ 70 km/h				≥ 70 km/h			
	Bike Lane Blockages (Commercial Areas)		Rare				Rare				Rare				Rare			
	Median Refuge		No Median Refuge				No Median Refuge				No Median Refuge				No Median Refuge			
	Number of Travel Lanes on Sidestreet		2 Lanes Crossed				2 Lanes Crossed				2 Lanes Crossed				2 Lanes Crossed			
	Sidestreet Operating Speed		50 km/h				50 km/h				50 km/h				50 km/h			
	Level of Service		E				E				E				E			
Transit	Facility Type		Mixed Traffic				Mixed Traffic				Mixed Traffic				Mixed Traffic			
	Friction		Limited parking/driveway friction				Limited parking/driveway friction				Limited parking/driveway friction				Limited parking/driveway friction			
	Level of Service		D				D				D				D			
Truck	Curb Lane Width		>3.7	>3.7	>3.7		>3.7	>3.7	>3.7		>3.7	>3.7	>3.7		>3.7	>3.7	>3.7	
	Number of Travel Lanes		3+	3+	3+		2	2	2		2	2	2		2	2	2	
			A	A	A		B	B	B		B	B	B		B	B	B	
			A				B				B				B			

* Intersection LOS only applies to signalized intersections

Multi-Modal Level of Service
Riverside South Phase 12 (Project #120031)
Scenario: Future (2029) Total Traffic Conditions

April 5, 2019

IBI

INTERSECTIONS		EARL ARMSTRONG & RIVER (signalized)				RIVER & PH. 12 North Access (unsignalized)				RIVER & PH. 12 SOUTH ACCESS/ SUMMERHILL (signalized)				River & Borbridge (signalized)				RIVER & 760 River Access/ Atrium Ridge (signalized)			
		NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg	NORTH leg	SOUTH leg	EAST leg	WEST leg
Pedestrian	Lanes (do NOT include lanes protected by bulb-outs)	6	6	7	7					3	3	2	2	3	3	2		3	3	2	2
	Median	No Median	No Median	No Median	No Median					No Median	No Median	No Median	No Median	No Median	No Median	No Median		No Median	No Median	No Median	No Median
	Island Refuge																				
	Conflicting Left Turns (from street to right)	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive					Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive		Protected/permissive	Protected/permissive	Protected/permissive	Protected/permissive
	Conflicting Right Turns (from street to left)	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control					Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control		Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	RTOR? (from street to left)	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed					RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed		RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Leading Interval? (on cross street)	No	No	No	No					No	No	No	No	No	No	No		No	No	No	No
	Corner Radius	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'					> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m		> 10m to 15m	> 10m to 15m	> 10m to 15m	> 10m to 15m
	Right Turn Channel	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'	Right turn 'smart channel'					No right turn channel	No right turn channel	No right turn channel	No right turn channel	No right turn channel	No right turn channel	No right turn channel		No right turn channel	No right turn channel	No right turn channel	No right turn channel
	Crosswalk Type	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings					Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings		Standard transverse markings	Standard transverse markings	Standard transverse markings	Standard transverse markings
	LOS (PETSI)	34 E	34 E	18 F	18 F					70 C	70 C	85 B	85 B	70 C	70 C	85 B		70 C	70 C	85 B	85 B
	Cycle Length (sec)	120	120	120	120					130	130	130	130	120	120	120		120	120	120	120
	Pedestrian Walk Time (solid white symbol) (sec)	7	7	7	7					7	7	7	7	7	7	7		7	7	7	7
	LOS (Delay,seconds)	54.3 E	54.3 E	54.3 E	54.3 E					59.3 E	59.3 E	59.3 E	59.3 E	54.3 E	54.3 E	54.3 E		54.3 E	54.3 E	54.3 E	54.3 E
	Overall Level of Service	F								E				E				E			
Cyclist	Type of Bikeway	Bike Pocket at Intersection	Bike Pocket at Intersection	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track					Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic	Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic		Bike Lanes/Cycle Track	Bike Lanes/Cycle Track	Mixed Traffic	Mixed Traffic
	Turning Speed (based on corner radius & angle)	Slow	Slow	Slow	Slow					Slow	Slow	Slow	Slow	Slow	Slow	Slow		Slow	Slow	Slow	Slow
	Right Turn Storage Length	≤ 50m	≤ 50m	> 50m	> 50m					≤ 50m	≤ 50m	> 50m	> 50m	≤ 50m	≤ 50m	> 50m		≤ 50m	≤ 50m	> 50m	> 50m
	Dual Right Turn?	No	No	No	No					No	No	No	No	No	No	No		No	No	No	No
	Shared Through-Right?	No	No	No	No					No	No	No	No	No	No	No		No	No	No	No
	Bike Box?	No	No	No	No					No	No	No	No	No	No	No		No	No	No	No
	Number of Lanes Crossed for Left Turns	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed	2+ Lanes Crossed					1 Lane Crossed	1 Lane Crossed	No Lanes Crossed	No Lanes Crossed	1 Lane Crossed	1 Lane Crossed	No Lanes Crossed		1 Lane Crossed	1 Lane Crossed	No Lanes Crossed	No Lanes Crossed
	Operating Speed on Approach	≥ 60km/h	≥ 60km/h	≥ 60km/h	≥ 60km/h					≥ 60km/h	≥ 60km/h	50km/h	50km/h	≥ 60km/h	≥ 60km/h	50km/h		≥ 60km/h	≥ 60km/h	50km/h	50km/h
	Dual Left Turn Lanes?	No	No	No	No					No	No	No	No	No	No	No		No	No	No	No
	Level of Service	F	F	F	F					E	E	B	B	E	E	B		E	E	B	B
		F								E				E				E			
Transit	Average Signal Delay	>40 sec	>40 sec	>40 sec	>40 sec					≤40 sec	≤40 sec			≤20 sec	≤20 sec			≤10 sec	≤10 sec		
	Level of Service	F	F	F	F					E	E	A	A	C	C	A		B	B	A	A
		F								E				C				B			
Truck	Turning Radius (Right Turn)	10 to 15m	10 to 15m	10 to 15m	10 to 15m					10 to 15m	10 to 15m	10 to 15m	10 to 15m	10 to 15m	10 to 15m	10 to 15m		10 to 15m	10 to 15m	10 to 15m	10 to 15m
	Number of Receiving Lanes	2+	2+	2+	2+					1	1	1	1	1	1	1		1	1	1	1
		B	B	B	B					E	E	E	E	E	E	E		E	E	E	E
		B								E				E				E			
Auto	**Level of Service**	(See Synchro Results)				(See Synchro Results)				(See Synchro Results)				(See Synchro Results)				(See Synchro Results)			

SEGMENTS		EARL ARMSTRONG & RIVER (signalized)	Section			RIVER & PH. 12 North Access (unsignalized)	Section			RIVER & PH. 12 SOUTH ACCESS/ SUMMERHILL (signalized)	Section			River & Borbridge (signalized)	Section			RIVER & 760 River Access/ Atrium Ridge (signalized)	Section			RIVER & SOUTHERN PROPERTY LIMIT
			1	2	3		1	2	3		1	2	3		1	2	3		1	2	3	
Pedestrian	Sidewalk Width		No Sidewalk	No Sidewalk	No Sidewalk		No Sidewalk	No Sidewalk	No Sidewalk		No Sidewalk	No Sidewalk	No Sidewalk		No Sidewalk	No Sidewalk	No Sidewalk		No Sidewalk	No Sidewalk	No Sidewalk	
	Boulevard Width		N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A	
	AADT		> 3000	> 3000	> 3000		> 3000	> 3000	> 3000		> 3000	> 3000	> 3000		> 3000	> 3000	> 3000		> 3000	> 3000	> 3000	
	On-Street Parking		No	No	No		No	No	No		No	No	No		No	No	No		No	No	No	
	Operating Speed		61 km/h or more	61 km/h or more	51 to 60 km/h		61 km/h or more	61 km/h or more	61 km/h or more		61 km/h or more	61 km/h or more	61 km/h or more		61 km/h or more	61 km/h or more	61 km/h or more		61 km/h or more	61 km/h or more	61 km/h or more	
	Level of Service		F	F	F		F	F	F		F	F	F		F	F	F		F	F	F	
			F				F				F				F				F			
Cyclist	Type of Bikeway		Bike Lanes Not Adjacent Parking Lane				Bike Lanes Not Adjacent Parking Lane				Bike Lanes Not Adjacent Parking Lane				Bike Lanes Not Adjacent Parking Lane				Bike Lanes Not Adjacent Parking Lane			
	Number of Travel Lanes (per direction)		1 Travel Lane Per Direction				1 Travel Lane Per Direction				1 Travel Lane Per Direction				1 Travel Lane Per Direction				1 Travel Lane Per Direction			
	Raised Median?		No				No				No				No				No			
	Bike Lane Width		≥1.8 m wide bike lane				≥1.8 m wide bike lane				≥1.8 m wide bike lane				≥1.8 m wide bike lane				≥1.8 m wide bike lane			
	Operating Speed		≥ 70 km/h				≥ 70 km/h				≥ 70 km/h				≥ 70 km/h				≥ 70 km/h			
	Bike Lane Blockages (Commercial Areas)		Rare				Rare				Rare				Rare				Rare			
	Median Refuge		No Median Refuge				No Median Refuge				No Median Refuge				No Median Refuge				No Median Refuge			
	Number of Travel Lanes on Sidestreet		2 Lanes Crossed				2 Lanes Crossed				2 Lanes Crossed				2 Lanes Crossed				2 Lanes Crossed			
	Sidestreet Operating Speed		50 km/h				50 km/h				50 km/h				50 km/h				50 km/h			
	Level of Service		E				E				E				E				E			
Transit	Facility Type		Mixed Traffic				Mixed Traffic				Mixed Traffic				Mixed Traffic				Mixed Traffic			
	Friction		Limited parking/driveway friction				Limited parking/driveway friction				Limited parking/driveway friction				Limited parking/driveway friction				Limited parking/driveway friction			
	Level of Service		D				D				D				D				D			
Truck	Curb Lane Width		>3.7	>3.7	>3.7		>3.7	>3.7	>3.7		>3.7	>3.7	>3.7		>3.7	>3.7	>3.7		>3.7	>3.7	>3.7	
	Number of Travel Lanes		3+	3+	3+		2	2	2		2	2	2		2	2	2		2	2	2	
			A	A	A		B	B	B		B	B	B		B	B	B		B	B	B	
			A				B				B				B				B			

* Intersection LOS only applies to signalized intersections

Appendix H – Intersection Control Warrants

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision

GO TO Justification:

What are the intersecting roadways? River & Summerhill/ Ph. 12 South Access

What is the direction of the Main Road street? North-South

When was the data collected? Future (2024) Total AM & PM Scenarios

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 1

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Rural

Population < 10,000 AND Speed >= 70 km/hr

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Northbound Approach			Minor Eastbound Approach			Main Southbound Approach			Minor Westbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
7:00	2	1,078	15	68	5	5	33	403	7	24	5	203	
8:00	1	539	8	34	3	3	17	202	4	12	3	102	
9:00	1	539	8	34	3	3	17	202	4	12	3	102	
10:00	1	539	8	34	3	3	17	202	4	12	3	102	
15:00	4	632	14	42	5	3	141	1,060	17	5	5	87	
16:00	2	316	7	21	3	2	71	530	9	3	3	44	
17:00	2	316	7	21	3	2	71	530	9	3	3	44	
18:00	2	316	7	21	3	2	71	530	9	3	3	44	
Total	**15**	**4,275**	**73**	**275**	**25**	**20**	**435**	**3,658**	**60**	**73**	**25**	**725**	**0**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	
13-24	
25-36	

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume									
Factored 8 hour pedestrian volume	0		0		0		0		
% Assigned to crossing rate									
Net 8 Hour Pedestrian Volume at Crossing									0
Net 8 Hour Vehicular Volume on Street Being Crossed									6,411

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	0	0	0	0	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds									
Factored volume of total pedestrians	0		0		0		0		
Factored volume of delayed pedestrians	0		0		0		0		
% Assigned to Crossing Rate	0%		0%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									0
Net 8 Hour Volume of Delayed Pedestrians									0

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: River & Summerhill/ Ph. 12 South Access

Count Date: Future (2024) Total AM & PM Scenarios

Justification 1: Minimum Vehicle Volumes

Free Flow Rural Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☑	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	7:00	8:00	9:00	10:00	15:00	16:00	17:00	18:00		
1A	480	720	600	900	1,848	924	924	924	2,015	1,008	1,008	1,008		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
1B	120	170	120	170	310	155	155	155	147	74	74	74		
	COMPLIANCE %				100	100	100	100	100	61	61	61	684	85
Free Flow Signal Justification 1:					Both 1A and 1B 100% Fulfilled each of 8 hours					Yes ☐		No ☑		
					Lesser of 1A or 1B at least 80% fulfilled each of 8 hours					Yes ☑		No ☐		

Justification 2: Delay to Cross Traffic

Free Flow Rural Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☑	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	7:00	8:00	9:00	10:00	15:00	16:00	17:00	18:00		
2A	480	720	600	900	1,538	769	769	769	1,868	934	934	934		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
2B	50	75	50	75	97	49	49	49	123	26	26	26		
	COMPLIANCE %				100	97	97	97	100	52	52	52	647	81
Free Flow Signal Justification 2:					Both 2A and 2B 100% fulfilled each of 8 hours					Yes ☐		No ☑		
					Lesser of 2A or 2B at least 80% fulfilled each of 8 hours					Yes ☑		No ☐		

Justification 3: Combination

Combination Justification 1 and 2

	Justification Satisfied 80% or More			Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☑	NO ☐	YES ☑	NO ☐
Justification 2	Delay Cross Traffic	YES ☑	NO ☐	JUSTIFIED	

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main)	Heaviest Minor Approach	Required Value	Average % Compliance	Overall % Compliance
		X	Y (actual)	Y (warrant threshold)		
Justification 4	7:00	1,538	232	80	100 %	68 %
	15:00	1,868	97	80	100 %	
	16:00	934	49	133	36 %	
	17:00	934	49	133	36 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: River & Summerhill/ Ph. 12 South Access

Count Date: Future (2024) Total AM & PM Scenarios

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					
	2601 - 7000	Not Justified				
	> 7000					

Pedestrian Delay Analysis

Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200	Not Justified		
	200 - 300			
	> 300			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: River & Summerhill/ Ph. 12 South Access

Count Date: Future (2024) Total AM & PM Scenarios

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☐	☑
	B	Crossing Volume	85	%		
2. Delay to Cross Traffic	A	Main Road	100	%	☐	☑
	B	Crossing Road	81	%		
3. Combination	A	Justificaton 1	85	%	☑	☐
	B	Justification 2	81	%		
4. 4-Hr Volume			68	%	☐	☑
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			

Proposed Collision Justification (Justification 5A)

Return to Justifications 1- 6

INPUT

a.- Intersection type (no input required): 3

b.- What year is the intersection being considered for traffic signals? 2004

c.- What is the collision history and annual average daily traffic over the past few years? (Please fill in table below)

Year	Traffic Volume		Impact Type/Year						
	Major AADT	Minor AADT	Approach-ing	Angle	Rear end	Sideswipe	Turning movement	SMV	Other
2000	21626	3893	0	4	5	1	4	0	0
2001	22059	3971	0	6	4	1	3	1	1
2002	22500	4050	0	7	5	2	2	1	0
2003	23300	4200	0	8	3	3	2	1	0
2004	23648	6528	0	9	0	4	1	0	0

d.- If known, please enter the expected traffic volume after signals are introduced. Otherwise, leave the cell blank.

Year	Main AADT	Minor AADT
2004		

ANALYSIS

Reducible Collisions

	2000	2001	2002	2003	2004		2004 (Signal)
Total Number of Crashes Per Year	8	9	9	10	10		---
Parameter k	0.81	0.81	0.81	0.81	0.81		0.60
Model Prediction	1.46	1.50	1.53	1.59	2.15		2.15
$C_{i,y}$	0.680	0.696	0.712	0.741	1.000		1.000
Comp. Ratio for Period	3.829						1.000

Non-reducible Collisions

	2000	2001	2002	2003	2004		2004 (Signal)
Total Number of Crashes Per Year	6	7	8	7	4		---
Parameter k	1.47	1.47	1.47	1.47	1.47		1.19
Model Prediction	1.17	1.18	1.20	1.23	1.38		1.38
$C_{i,y}$	0.849	0.860	0.870	0.890	1.000		1.000
Comp. Ratio for Period	4.469						1.000

	Reducible Collisions	Non-reducible Collisions
Total Number of Historical Crashes	46	32
Expected Annual Crashes without Signalization based on SPF	2.150	1.377
Expected Annual Crashes without Signalization	11.131	6.046
Variance of Expected Annual Crashes without Signalization	2.647	1.092
Expected Annual Crashes after Signalization based on SPF	2.089	3.286
Expected Annual Crashes after Signalization	10.813	14.425
Variance of Expected Annual Crashes after Signalization	194.857	174.867

	Reducible Collisions	Non-reducible Collisions
Weights for Unsignalized Intersections	0.27	0.18
Weights for Signalized Intersections	0.30	0.25

RESULTS

Justification	Compliance		Signal Justified? YES	Signal Justified? NO
5. Collision Experience	Net Safety Change	2.757	☐	☑
	Total Collisions will ***Increase*** after this intersection is signalized			

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision | GO TO Justification:

What are the intersecting roadways? River & Borbridge

What is the direction of the Main Road street? North-South

When was the data collected? Future (2029) Total AM & PM Scenarios

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 1

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 3

d.- What is the operating environment? Rural Population < 10,000 AND Speed >= 70 km/hr

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Northbound Approach			Minor Eastbound Approach			Main Southbound Approach			Minor Westbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
7:00	0	1,107	7	0	0	0	102	445	0	3	0	218	
8:00	0	554	4	0	0	0	51	223	0	2	0	109	
9:00	0	554	4	0	0	0	51	223	0	2	0	109	
10:00	0	554	4	0	0	0	51	223	0	2	0	109	
15:00	0	671	6	0	0	0	218	1,077	0	7	0	165	
16:00	0	336	3	0	0	0	109	539	0	4	0	83	
17:00	0	336	3	0	0	0	109	539	0	4	0	83	
18:00	0	336	3	0	0	0	109	539	0	4	0	83	
Total	**0**	**4,445**	**33**	**0**	**0**	**0**	**800**	**3,805**	**0**	**25**	**0**	**958**	**0**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	
13-24	
25-36	

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume									
Factored 8 hour pedestrian volume	0		0		0		0		
% Assigned to crossing rate									
Net 8 Hour Pedestrian Volume at Crossing									0
Net 8 Hour Vehicular Volume on Street Being Crossed									6,411

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	0	0	0	0	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds									
Factored volume of total pedestrians	0		0		0		0		
Factored volume of delayed pedestrians	0		0		0		0		
% Assigned to Crossing Rate	0%		0%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									0
Net 8 Hour Volume of Delayed Pedestrians									0

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: River & Borbridge

Count Date: Future (2029) Total AM & PM Scenarios

Justification 1: Minimum Vehicle Volumes

Free Flow Rural Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☑	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	7:00	8:00	9:00	10:00	15:00	16:00	17:00	18:00		
1A	480	720	600	900	1,882	941	941	941	2,144	1,072	1,072	1,072		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
1B	180	255	180	255	221	111	111	111	172	86	86	86		
	COMPLIANCE %				100	61	61	61	96	48	48	48	523	65
Free Flow Signal Justification 1:					Both 1A and 1B 100% Fulfilled each of 8 hours — Yes ☐ No ☑									
					Lesser of 1A or 1B at least 80% fulfilled each of 8 hours — Yes ☐ No ☑									

Justification 2: Delay to Cross Traffic

Free Flow Rural Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☑	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	7:00	8:00	9:00	10:00	15:00	16:00	17:00	18:00		
2A	480	720	600	900	1,661	831	831	831	1,972	986	986	986		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
2B	50	75	50	75	3	2	2	2	116	4	4	4		
	COMPLIANCE %				6	3	3	3	100	7	7	7	136	17
Free Flow Signal Justification 2:					Both 2A and 2B 100% fulfilled each of 8 hours — Yes ☐ No ☑									
					Lesser of 2A or 2B at least 80% fulfilled each of 8 hours — Yes ☐ No ☑									

Justification 3: Combination

Combination Justification 1 and 2

	Justification Satisfied 80% or More			Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☐	NO ☑	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main) X	Heaviest Minor Approach Y (actual)	Required Value Y (warrant threshold)	Average % Compliance	Overall % Compliance
Justification 4	7:00	1,672	221	80	100 %	86 %
	15:00	1,968	172	80	100 %	
	16:00	984	86	121	71 %	
	17:00	984	86	121	71 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: River & Borbridge

Count Date: Future (2029) Total AM & PM Scenarios

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					
	2601 - 7000	Not Justified				
	> 7000					

Pedestrian Delay Analysis

Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200	Not Justified		
	200 - 300			
	> 300			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: River & Borbridge

Count Date: Future (2029) Total AM & PM Scenarios

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☐	☑
	B	Crossing Volume	65	%		
2. Delay to Cross Traffic	A	Main Road	100	%	☐	☑
	B	Crossing Road	17	%		
3. Combination	A	Justificaton 1	65	%	☐	☑
	B	Justification 2	17	%		
4. 4-Hr Volume			86	%	☐	☑
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			

Proposed Collision Justification (Justification 5A)

Return to Justifications 1- 6

INPUT

a.- Intersection type (no input required): 3

b.- What year is the intersection being considered for traffic signals? 2004

c.- What is the collision history and annual average daily traffic over the past few years? (Please fill in table below)

Year	Traffic Volume		Impact Type/Year						
	Major AADT	Minor AADT	Approach-ing	Angle	Rear end	Sideswipe	Turning movement	SMV	Other
2000	21626	3893	0	4	5	1	4	0	0
2001	22059	3971	0	6	4	1	3	1	1
2002	22500	4050	0	7	5	2	2	1	0
2003	23300	4200	0	8	3	3	2	1	0
2004	23648	6528	0	9	0	4	1	0	0

d.- If known, please enter the expected traffic volume after signals are introduced. Otherwise, leave the cell blank.

Year	Main AADT	Minor AADT
2004		

ANALYSIS

Reducible Collisions

	2000	2001	2002	2003	2004		2004 (Signal)
Total Number of Crashes Per Year	8	9	9	10	10		---
Parameter k	0.81	0.81	0.81	0.81	0.81		0.60
Model Prediction	1.46	1.50	1.53	1.59	2.15		2.15
$C_{i,y}$	0.680	0.696	0.712	0.741	1.000		1.000
Comp. Ratio for Period	3.829						1.000

Non-reducible Collisions

	2000	2001	2002	2003	2004		2004 (Signal)
Total Number of Crashes Per Year	6	7	8	7	4		---
Parameter k	1.47	1.47	1.47	1.47	1.47		1.19
Model Prediction	1.17	1.18	1.20	1.23	1.38		1.38
$C_{i,y}$	0.849	0.860	0.870	0.890	1.000		1.000
Comp. Ratio for Period	4.469						1.000

	Reducible Collisions	Non-reducible Collisions
Total Number of Historical Crashes	46	32
Expected Annual Crashes without Signalization based on SPF	2.150	1.377
Expected Annual Crashes without Signalization	11.131	6.046
Variance of Expected Annual Crashes without Signalization	2.647	1.092
Expected Annual Crashes after Signalization based on SPF	2.089	3.286
Expected Annual Crashes after Signalization	10.813	14.425
Variance of Expected Annual Crashes after Signalization	194.857	174.867

	Reducible Collisions	Non-reducible Collisions
Weights for Unsignalized Intersections	0.27	0.18
Weights for Signalized Intersections	0.30	0.25

RESULTS

Justification	Compliance		Signal Justified? YES	Signal Justified? NO
5. Collision Experience	Net Safety Change	2.757	☐	☑
	Total Collisions will ***Increase*** after this intersection is signalized			

Input Data Sheet

Analysis Sheet | Results Sheet | Proposed Collision | GO TO Justification:

What are the intersecting roadways? River & Atrium/ 760 River Access

What is the direction of the Main Road street? North-South

When was the data collected? Future (2029) Total AM & PM Scenarios

Justification 1 - 4: Volume Warrants

a.- Number of lanes on the Main Road? 1

b.- Number of lanes on the Minor Road? 1

c.- How many approaches? 4

d.- What is the operating environment? Rural Population < 10,000 AND Speed >= 70 km/hr

e.- What is the eight hour vehicle volume at the intersection? (Please fill in table below)

Hour Ending	Main Northbound Approach			Minor Eastbound Approach			Main Southbound Approach			Minor Westbound Approach			Pedestrians Crossing Main Road
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
7:00	3	1,037	0	49	5	5	9	417	23	0	5	27	
8:00	2	519	0	25	3	3	5	209	12	0	3	14	
9:00	2	519	0	25	3	3	5	209	12	0	3	14	
10:00	2	519	0	25	3	3	5	209	12	0	3	14	
15:00	6	620	0	37	5	4	29	1,004	50	0	5	16	
16:00	3	310	0	19	3	2	15	502	25	0	3	8	
17:00	3	310	0	19	3	2	15	502	25	0	3	8	
18:00	3	310	0	19	3	2	15	502	25	0	3	8	
Total	**23**	**4,143**	**0**	**215**	**25**	**23**	**95**	**3,553**	**183**	**0**	**25**	**108**	**0**

Justification 5: Collision Experience

Preceding Months	Number of Collisions*
1-12	
13-24	
25-36	

* Include only collisions that are susceptable to correction through the installation of traffic signal control

Justification 6: Pedestrian Volume

a.- Please fill in table below summarizing total pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume									
Factored 8 hour pedestrian volume	0		0		0		0		
% Assigned to crossing rate									
Net 8 Hour Pedestrian Volume at Crossing									0
Net 8 Hour Vehicular Volume on Street Being Crossed									6,411

b.- Please fill in table below summarizing delay to pedestrians crossing major roadway at the intersection or in proximity to the intersection (zones). Please reference Section 4.8 of the Manual for further explanation and graphical representation.

	Zone 1		Zone 2		Zone 3 (if needed)		Zone 4 (if needed)		Total
	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	Assisted	Unassisted	
Total 8 hour pedestrian volume	0	0	0	0	0	0	0	0	
Total 8 hour pedestrians delayed greater than 10 seconds									
Factored volume of total pedestrians	0		0		0		0		
Factored volume of delayed pedestrians	0		0		0		0		
% Assigned to Crossing Rate	0%		0%		0%		0%		
Net 8 Hour Volume of Total Pedestrians									0
Net 8 Hour Volume of Delayed Pedestrians									0

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: River & Atrium/ 760 River Access

Count Date: Future (2029) Total AM & PM Scenarios

Justification 1: Minimum Vehicle Volumes

Free Flow Rural Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 Lanes		2 or More Lanes		Hour Ending									
Flow Condition	FREE FLOW ☑	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	7:00	8:00	9:00	10:00	15:00	16:00	17:00	18:00		
1A	480	720	600	900	1,580	790	790	790	1,776	888	888	888		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
1B	120	170	120	170	91	46	46	46	67	34	34	34		
	COMPLIANCE %				76	38	38	38	56	28	28	28	329	41
Free Flow Signal Justification 1:					Both 1A and 1B 100% Fulfilled each of 8 hours — Yes ☐ No ☑									
					Lesser of 1A or 1B at least 80% fulfilled each of 8 hours — Yes ☐ No ☑									

Justification 2: Delay to Cross Traffic

Free Flow Rural Conditions

Justification	Guidance Approach Lanes				Percentage Warrant								Total Across	Section Percent
	1 lanes		2 or More lanes		Hour Ending									
Flow Condition	FREE FLOW ☑	RESTR. FLOW ☐	FREE FLOW ☐	RESTR. FLOW ☐	7:00	8:00	9:00	10:00	15:00	16:00	17:00	18:00		
2A	480	720	600	900	1,489	745	745	745	1,709	855	855	855		
	COMPLIANCE %				100	100	100	100	100	100	100	100	800	100
2B	50	75	50	75	54	27	27	27	42	21	21	21		
	COMPLIANCE %				100	54	54	54	84	42	42	42	472	59
Free Flow Signal Justification 2:					Both 2A and 2B 100% fulfilled each of 8 hours — Yes ☐ No ☑									
					Lesser of 2A or 2B at least 80% fulfilled each of 8 hours — Yes ☐ No ☑									

Justification 3: Combination

Combination Justification 1 and 2

Justification Satisfied 80% or More				Two Justifications Satisfied 80% or More	
Justification 1	Minimum Vehicle Volume	YES ☐	NO ☑	YES ☐	NO ☑
Justification 2	Delay Cross Traffic	YES ☐	NO ☑		NOT JUSTIFIED

Justification 4: Four Hour Volume

Justification	Time Period	Total Volume of Both Approaches (Main) X	Heaviest Minor Approach Y (actual)	Required Value Y (warrant threshold)	Average % Compliance	Overall % Compliance
Justification 4	7:00	1,489	74	80	93 %	52 %
	15:00	1,709	61	80	76 %	
	16:00	855	31	155	20 %	
	17:00	855	31	155	20 %	

Analysis Sheet

Input Sheet | Results Sheet | Proposed Collision

GO TO Justification:

Intersection: River & Atrium/ 760 River Access

Count Date: Future (2029) Total AM & PM Scenarios

Justification 5: Collision Experience

Justification	Preceding Months	% Fulfillment	Overall % Compliance
Justification 5	1-12	0 %	0 %
	13-24	0 %	
	25-36	0 %	

Justification 6: Pedestrian Volume

Pedestrian Volume Analysis

8 Hour Vehicular Volume V_8		Net 8 Hour Pedestrian Volume				
		< 200	200 - 275	276 - 475	476 - 1000	>1000
Justification 6A	< 1440					
	1440 - 2600					
	2601 - 7000	Not Justified				
	> 7000					

Pedestrian Delay Analysis

Net Total 8 Hour Volume of Total Pedestrians		Net Total 8 Hour Volume of Delayed Pedestrians		
		< 75	75 - 130	> 130
Justification 6B	< 200	Not Justified		
	200 - 300			
	> 300			

Results Sheet

Input Sheet | Analysis Sheet | Proposed Collision

GO TO Justification:

Intersection: River & Atrium/ 760 River Access

Count Date: Future (2029) Total AM & PM Scenarios

Summary Results

Justification			Compliance		Signal Justified? YES	Signal Justified? NO
1. Minimum Vehicular Volume	A	Total Volume	100	%	☐	☑
	B	Crossing Volume	41	%		
2. Delay to Cross Traffic	A	Main Road	100	%	☐	☑
	B	Crossing Road	59	%		
3. Combination	A	Justificaton 1	41	%	☐	☑
	B	Justification 2	59	%		
4. 4-Hr Volume			52	%	☐	☑
5. Collision Experience			0	%	☐	☑
6. Pedestrians	A	Volume	Justification not met		☐	☑
	B	Delay	Justification not met			

Proposed Collision Justification (Justification 5A)

Return to Justifications 1- 6

INPUT

a.- Intersection type (no input required): 3

b.- What year is the intersection being considered for traffic signals? 2004

c.- What is the collision history and annual average daily traffic over the past few years? (Please fill in table below)

Year	Traffic Volume		Impact Type/Year						
	Major AADT	Minor AADT	Approach-ing	Angle	Rear end	Sideswipe	Turning movement	SMV	Other
2000	21626	3893	0	4	5	1	4	0	0
2001	22059	3971	0	6	4	1	3	1	1
2002	22500	4050	0	7	5	2	2	1	0
2003	23300	4200	0	8	3	3	2	1	0
2004	23648	6528	0	9	0	4	1	0	0

d.- If known, please enter the expected traffic volume after signals are introduced. Otherwise, leave the cell blank.

Year	Main AADT	Minor AADT
2004		

ANALYSIS

Reducible Collisions

	2000	2001	2002	2003	2004		2004 (Signal)
Total Number of Crashes Per Year	8	9	9	10	10		---
Parameter k	0.81	0.81	0.81	0.81	0.81		0.60
Model Prediction	1.46	1.50	1.53	1.59	2.15		2.15
$C_{i,y}$	0.680	0.696	0.712	0.741	1.000		1.000
Comp. Ratio for Period	3.829						1.000

Non-reducible Collisions

	2000	2001	2002	2003	2004		2004 (Signal)
Total Number of Crashes Per Year	6	7	8	7	4		---
Parameter k	1.47	1.47	1.47	1.47	1.47		1.19
Model Prediction	1.17	1.18	1.20	1.23	1.38		1.38
$C_{i,y}$	0.849	0.860	0.870	0.890	1.000		1.000
Comp. Ratio for Period	4.469						1.000

	Reducible Collisions	Non-reducible Collisions
Total Number of Historical Crashes	46	32
Expected Annual Crashes without Signalization based on SPF	2.150	1.377
Expected Annual Crashes without Signalization	11.131	6.046
Variance of Expected Annual Crashes without Signalization	2.647	1.092
Expected Annual Crashes after Signalization based on SPF	2.089	3.286
Expected Annual Crashes after Signalization	10.813	14.425
Variance of Expected Annual Crashes after Signalization	194.857	174.867

	Reducible Collisions	Non-reducible Collisions
Weights for Unsignalized Intersections	0.27	0.18
Weights for Signalized Intersections	0.30	0.25

RESULTS

Justification	Compliance		Signal Justified? YES	Signal Justified? NO
5. Collision Experience	Net Safety Change	2.757	☐	☑
	Total Collisions will ***Increase*** after this intersection is signalized			

City of Ottawa
Roundabout Initial Feasability Screening Tool

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road modifications including all-way stop control, traffic signals, auxiliary lanes, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed with an Intersection Control Study to investigate the feasibility of a roundabout in more detail.

1	Project Name:	Riverside South Phase 12
2	Intersection:	River Road and Phase 12 North Access
3	Location and Description of Intersection: Lane Configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection then indicate type of control	The proposed intersection of River Road and Phase 12 North Access is located approximately 175m south of the Earl Armstrong and River Road intersection.
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	A stop-controlled eastbound approach with freeflow along River Road.
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet	A single-lane roundabout is being considered.
6	Why is a roundabout being considered?	As an alternative to signalization.

7 Are there contra-indications for a roundabout?

If "Yes" is indicated for one or more of the contra-indications then a roundabout may be problematic at the subject intersection. That is not to say that a

No.	Contra-Indication	Outcome
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes ☐ No ☒
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes ☐ No ☒
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes ☐ No ☒
4	Is the intersection located within a coordinated signal system?	Yes ☐ No ☒
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes ☐ No ☒
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes ☒ No ☐
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes ☐ No ☒

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection..

No.	Suitability Factor	Outcome
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1 injury crash per 1 million vehicles entering (MVE)?	Yes ☐ No ☒
2	Has there been a fatal crash at the intersection in the last 10 years?	Yes ☐ No ☒
3	Are capacity problems currently being experienced, or expected in the future?	Yes ☒ No ☐
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes ☐ No ☒
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes ☐ No ☒
6	Will Planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes ☐ No ☒
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes ☐ No ☒

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	This location has one contra-indication: Significant differences in directional flows. Furthermore, based on the suitability factors, a roundabout is not feasible at this location.

City of Ottawa
Roundabout Initial Feasability Screening Tool

The intent of this screening tool is to provide a relatively quick assessment of the feasibility of a roundabout at a particular intersection in comparison to other appropriate forms of traffic control or road modifications including all-way stop control, traffic signals, auxiliary lanes, etc. The intended outcome of this tool is to provide enough information to assist staff in deciding whether or not to proceed with an Intersection Control Study to investigate the feasibility of a roundabout in more detail.

1	Project Name:	River Road Reconstruction
2	Intersection:	River Road and Atrium/ Phase 12 South Access
3	Location and Description of Intersection: Lane Configuration, total or approach AADT, distance to nearby intersection(s), etc. Attach or sketch a diagram and include existing and/or horizon-year turning movements. If an existing intersection then indicate type of control	The proposed intersection of River and Atrium/ Ph. 12 North Access is located approximately 300 m south of the future Borbridge Avenue intersection.
4	What traditional modifications are proposed? All-way stop control, traffic signals, auxiliary lanes, etc. Attach or sketch a diagram if necessary.	Auxiliary left-turn lanes - NB and SB approaches. Stop control on side streets initially. Traffic signals may be required ultimately to reduce delays to side street and to provide controlled crossing location for peds and cyclists. However signal warrants are not met.
5	What size of roundabout is being considered? Describe, and attach a Roundabout Traffic Flow Worksheet	A single-lane roundabout is being considered.
6	Why is a roundabout being considered?	As an alternative to signalization.

7 Are there contra-indications for a roundabout?

If "Yes" is indicated for one or more of the contra-indications then a roundabout may be problematic at the subject intersection. That is not to say that a

No.	Contra-Indication	Outcome
1	Is there insufficient property at the intersection (i.e. less than 44 metres diameter if considering a single-lane roundabout, and less than 60 metres if considering a two-lane roundabout) or property constraints that would require demolition of adjacent structures?	Yes [ ] No [X]
2	Are there any instances where stopping sight distance (SSD) of a roundabout yield line may not be attainable (i.e. the intersection is on a crest vertical curve)?	Yes [ ] No [X]
3	Is there an existing uncontrolled approach with a grade in excess of 4 percent?	Yes [ ] No [X]
4	Is the intersection located within a coordinated signal system?	Yes [ ] No [X]
5	Is there a closely-spaced traffic signal or railway crossing that could not be controlled with a nearby roundabout?	Yes [ ] No [X]
6	Are significant differences in directional flows or any situations of sudden high demand expected?	Yes [X] No [ ]
7	Are there known visually-impaired pedestrians that cross this intersection?	Yes [ ] No [X]

8 Are there suitability factors for a roundabout?

If "Yes" is indicated for two or more of the suitability factors then a roundabout should be technically feasible at the subject intersection..

No.	Suitability Factor	Outcome
1	Does the intersection currently experience an average collision frequency of more than 1.5 injury crashes per year, or a collision rate in excess of 1 injury crash per 1 million vehicles entering (MVE)?	Yes [ ] No [X]
2	Has there been a fatal crash at the intersection in the last 10 years?	Yes [ ] No [X]
3	Are capacity problems currently being experienced, or expected in the future?	Yes [X] No [ ]
4	Are traffic signals warranted, or expected to be warranted in the future?	Yes [ ] No [X]
5	Does the intersection have more than 4 legs, or unusual geometry?	Yes [ ] No [X]
6	Will Planned modifications to the intersection require that nearby structures be widened (i.e. to accommodate left-turn lanes)?	Yes [ ] No [X]
7	Is the intersection located at a transition between rural and urban environments (i.e. an urban boundary) such that a roundabout could act as a means of speed transition?	Yes [ ] No [x]

9	Conclusions/recommendation whether to proceed with an Intersection Control Study:	This location has one contra-indication: Significant differences in directional flows. Furthermore, based on the suitability factors a roundabout is not technically feasible at this location.

Appendix I – TDM Checklist

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

Legend

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

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

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

		TDM measures: *Residential developments*	Check if proposed & add descriptions
	1.	**TDM PROGRAM MANAGEMENT**	
	1.1	**Program coordinator**	
BASIC ★	1.1.1	Designate an internal coordinator, or contract with an external coordinator	☐ No
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐ NO
	2.	**WALKING AND CYCLING**	
	2.1	**Information on walking/cycling routes & destinations**	
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☐ No
	2.2	**Bicycle skills training**	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☐ No

			TDM measures: *Residential developments*	Check if proposed & add descriptions
		3.	**TRANSIT**	
		3.1	**Transit information**	
BASIC		3.1.1	Display relevant transit schedules and route maps at entrances *(multi-family, condominium)*	☐
BETTER		3.1.2	Provide real-time arrival information display at entrances *(multi-family, condominium)*	☐
		3.2	**Transit fare incentives**	
BASIC	★	3.2.1	Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	☐
BETTER		3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	☐
		3.3	**Enhanced public transit service**	
BETTER	★	3.3.1	Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels *(subdivision)*	☐
		3.4	**Private transit service**	
BETTER		3.4.1	Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	☐
		4.	**CARSHARING & BIKESHARING**	
		4.1	**Bikeshare stations & memberships**	
BETTER		4.1.1	Contract with provider to install on-site bikeshare station (*multi-family)*	☐
BETTER		4.1.2	Provide residents with bikeshare memberships, either free or subsidized *(multi-family)*	☐
		4.2	**Carshare vehicles & memberships**	
BETTER		4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	☐
BETTER		4.2.2	Provide residents with carshare memberships, either free or subsidized	☐
		5.	**PARKING**	
		5.1	**Priced parking**	
BASIC	★	5.1.1	Unbundle parking cost from purchase price *(condominium)*	☐
BASIC	★	5.1.2	Unbundle parking cost from monthly rent *(multi-family)*	☐

NO

TDM measures: *Residential developments*				Check if proposed & add descriptions
		6.	**TDM MARKETING & COMMUNICATIONS**	
		6.1	**Multimodal travel information**	
BASIC	★	6.1.1	Provide a multimodal travel option information package to new residents	☐ No
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐ No

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	☐ current draft plan shows one of the 7 buildings having parking infront of the building
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	☐ Should be able to do
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	☑
REQUIRED	1.2.2	Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible *(see Official Plan policy 4.3.12)*	☑

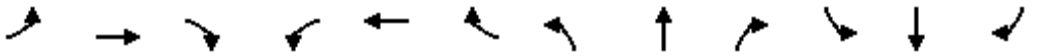
TDM-supportive design & infrastructure measures: *Residential developments*			Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3	Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas 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	☐ No
	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	☐ NO
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)	☐ No

		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)*	☑ If the same as existing Allora, each building will have offer spots for 8 bikes outside and 4 bikes in the undergroun parking garage, so a total of 12 spots per building
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)*	☑ (84 spots in total with 7 buildings)
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	☐ NO
	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	☐ No
	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)	☐ No
	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	☐ No
	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	☐ No
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	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 J – Intersection Capacity Analysis

Existing (2019) Traffic

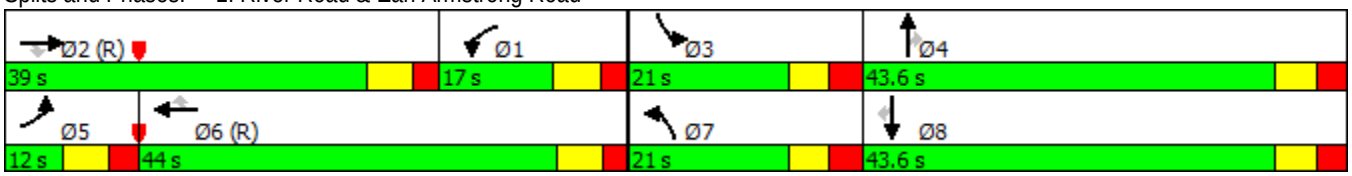


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	633	948	100	23	840	87	298	292	48	35	36	226
Future Volume (vph)	633	948	100	23	840	87	298	292	48	35	36	226
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.99			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3321	3357	1419	3077	3262	1502	3164	3390	1517	2795	3202	1502
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3319	3357	1419	3077	3262	1482	3164	3390	1497	2792	3202	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			155			155			215			215
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			202.2			387.0	
Travel Time (s)		22.5			28.0			12.1			23.2	
Confl. Peds. (#/hr)	1					1			1	1		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	1%	3%	9%	9%	6%	3%	6%	2%	2%	20%	8%	3%
Adj. Flow (vph)	703	1053	111	26	933	97	331	324	53	39	40	251
Shared Lane Traffic (%)												
Lane Group Flow (vph)	703	1053	111	26	933	97	331	324	53	39	40	251
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	35.1	35.1	11.8	35.1	35.1	11.8	43.6	43.6	11.8	43.6	43.6
Total Split (s)	12.0	39.0	39.0	17.0	44.0	44.0	21.0	43.6	43.6	21.0	43.6	43.6
Total Split (%)	10.0%	32.3%	32.3%	14.1%	36.5%	36.5%	17.4%	36.2%	36.2%	17.4%	36.2%	36.2%
Maximum Green (s)	5.2	32.5	32.5	10.2	37.5	37.5	14.3	37.0	37.0	14.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	30.3	63.9	63.9	8.4	37.0	37.0	14.3	24.6	24.6	7.1	12.4	12.4
Actuated g/C Ratio	0.25	0.53	0.53	0.07	0.31	0.31	0.12	0.20	0.20	0.06	0.10	0.10
v/c Ratio	0.84	0.59	0.13	0.12	0.93	0.17	0.89	0.47	0.11	0.24	0.12	0.72

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	53.9	23.4	1.5	52.7	57.2	1.3	77.5	45.8	0.5	57.1	48.2	22.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	53.9	23.4	1.5	52.7	57.2	1.3	77.5	45.8	0.5	57.1	48.2	22.8
LOS	D	C	A	D	E	A	E	D	A	E	D	C
Approach Delay		33.6			51.9			57.2			29.9	
Approach LOS		C			D			E			C	
Queue Length 50th (m)	73.6	86.5	0.0	2.7	103.0	0.0	37.1	35.7	0.0	4.2	4.3	7.5
Queue Length 95th (m)	#124.0	124.7	3.8	6.9	#138.4	1.8	#60.4	46.2	0.0	9.4	8.7	30.5
Internal Link Dist (m)		413.3			520.9			178.2			363.0	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	834	1778	824	260	1014	567	375	1040	608	331	982	609
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.84	0.59	0.13	0.10	0.92	0.17	0.88	0.31	0.09	0.12	0.04	0.41

Intersection Summary			
Area Type:	Other		
Cycle Length: 120.6			
Actuated Cycle Length: 120.6			
Offset: 63 (52%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 42.4		Intersection LOS: D	
Intersection Capacity Utilization 76.3%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	5.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	23	196	602	14	31	184
Future Vol, veh/h	23	196	602	14	31	184
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	1000	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	4	3	4	8	3	9
Mvmt Flow	26	218	669	16	34	204

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	950	677	0	0	684	0
Stage 1	677	-	-	-	-	-
Stage 2	273	-	-	-	-	-
Critical Hdwy	7.14	6.23	-	-	4.13	-
Critical Hdwy Stg 1	6.14	-	-	-	-	-
Critical Hdwy Stg 2	6.14	-	-	-	-	-
Follow-up Hdwy	3.536	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	238	451	-	-	905	-
Stage 1	439	-	-	-	-	-
Stage 2	729	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	231	451	-	-	905	-
Mov Cap-2 Maneuver	231	-	-	-	-	-
Stage 1	439	-	-	-	-	-
Stage 2	702	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25.8	0	1.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	410	905	-
HCM Lane V/C Ratio	-	-	0.593	0.038	-
HCM Control Delay (s)	-	-	25.8	9.1	-
HCM Lane LOS	-	-	D	A	-
HCM 95th %tile Q(veh)	-	-	3.7	0.1	-

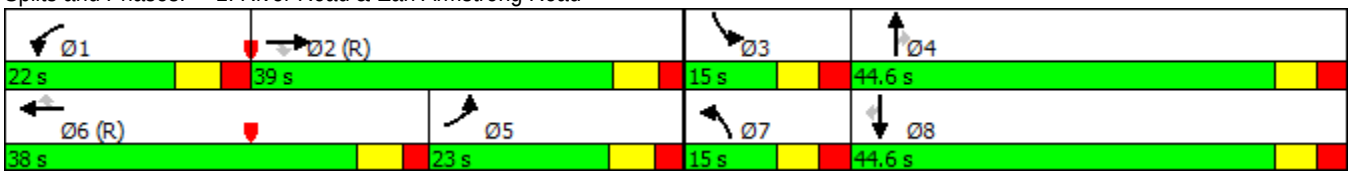
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	414	1001	363	71	961	30	201	97	39	36	183	805
Future Volume (vph)	414	1001	363	71	961	30	201	97	39	36	183	805
Ideal Flow (vphpl)	2000	1800	1800	1800	2200	1800	2000	1800	1800	1800	1800	2400
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.98			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3654	3325	1502	3288	4103	1446	3584	3357	1369	3257	3458	2063
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3649	3325	1502	3288	4103	1423	3584	3357	1351	3252	3458	2063
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			310			155			215			363
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			202.2			357.4	
Travel Time (s)		22.5			28.0			12.1			21.4	
Confl. Peds. (#/hr)	3					3			1	1		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	2%	4%	3%	2%	3%	7%	4%	3%	13%	3%	0%	0%
Adj. Flow (vph)	460	1112	403	79	1068	33	223	108	43	40	203	894
Shared Lane Traffic (%)												
Lane Group Flow (vph)	460	1112	403	79	1068	33	223	108	43	40	203	894
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	23.0	39.0	39.0	22.0	38.0	38.0	15.0	44.6	44.6	15.0	44.6	44.6
Total Split (%)	19.1%	32.3%	32.3%	18.2%	31.5%	31.5%	12.4%	37.0%	37.0%	12.4%	37.0%	37.0%
Maximum Green (s)	16.2	32.5	32.5	15.2	31.5	31.5	8.3	38.0	38.0	8.3	38.0	38.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	16.2	42.0	42.0	8.3	31.5	31.5	8.3	41.9	41.9	6.9	38.0	38.0
Actuated g/C Ratio	0.13	0.35	0.35	0.07	0.26	0.26	0.07	0.35	0.35	0.06	0.32	0.32
v/c Ratio	0.94	0.96	0.56	0.35	1.00	0.07	0.91	0.09	0.07	0.22	0.19	1.00

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	79.9	58.3	11.5	57.4	71.5	0.3	93.5	28.4	0.2	56.6	30.6	53.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.9	58.3	11.5	57.4	71.5	0.3	93.5	28.4	0.2	56.6	30.6	53.9
LOS	E	E	B	E	E	A	F	C	A	E	C	D
Approach Delay		53.8			68.6			64.0			49.9	
Approach LOS		D			E			E			D	
Queue Length 50th (m)	51.9	~135.8	14.5	8.6	122.7	0.0	25.3	8.5	0.0	4.3	16.8	132.1
Queue Length 95th (m)	#80.1	#181.0	44.2	15.6	#164.7	0.0	#46.2	15.0	0.0	9.5	25.5	#214.0
Internal Link Dist (m)		413.3			520.9			178.2			333.4	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	490	1157	724	414	1071	486	246	1165	609	224	1089	898
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.96	0.56	0.19	1.00	0.07	0.91	0.09	0.07	0.18	0.19	1.00

Intersection Summary

Area Type: Other
Cycle Length: 120.6
Actuated Cycle Length: 120.6
Offset: 91 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 57.4 Intersection LOS: E
Intersection Capacity Utilization 84.7% 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: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	2

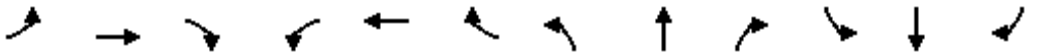
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	85	289	13	138	578
Future Vol, veh/h	4	85	289	13	138	578
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	1000	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	4	3	3	2	1	2
Mvmt Flow	4	94	321	14	153	642

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1277	328	0	0	336	0
Stage 1	328	-	-	-	-	-
Stage 2	949	-	-	-	-	-
Critical Hdwy	6.44	6.23	-	-	4.11	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.327	-	-	2.209	-
Pot Cap-1 Maneuver	182	711	-	-	1229	-
Stage 1	725	-	-	-	-	-
Stage 2	373	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	159	711	-	-	1229	-
Mov Cap-2 Maneuver	159	-	-	-	-	-
Stage 1	725	-	-	-	-	-
Stage 2	327	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12	0	1.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	615	1229	-
HCM Lane V/C Ratio	-	-	0.161	0.125	-
HCM Control Delay (s)	-	-	12	8.3	-
HCM Lane LOS	-	-	B	A	-
HCM 95th %tile Q(veh)	-	-	0.6	0.4	-

Future (2021) Background Traffic

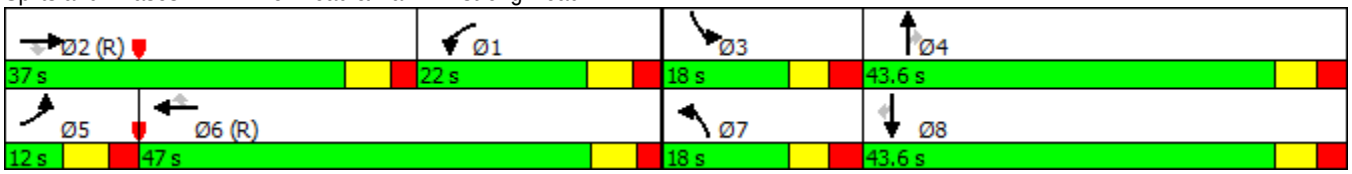


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	639	1023	118	91	973	110	340	448	201	42	104	228
Future Volume (vph)	639	1023	118	91	973	110	340	448	201	42	104	228
Ideal Flow (vphpl)	2000	1800	1800	1800	2200	1800	2000	1800	1800	1800	1800	2400
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.99			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3690	3357	1419	3077	3987	1502	3516	3390	1517	2795	3202	2003
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3688	3357	1419	3077	3987	1482	3516	3390	1497	2793	3202	2003
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			155			155			215			215
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			202.2			357.4	
Travel Time (s)		22.5			28.0			12.1			21.4	
Confl. Peds. (#/hr)	1					1			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	3%	9%	9%	6%	3%	6%	2%	2%	20%	8%	3%
Adj. Flow (vph)	639	1023	118	91	973	110	340	448	201	42	104	228
Shared Lane Traffic (%)												
Lane Group Flow (vph)	639	1023	118	91	973	110	340	448	201	42	104	228
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	12.0	37.0	37.0	22.0	47.0	47.0	18.0	43.6	43.6	18.0	43.6	43.6
Total Split (%)	10.0%	30.7%	30.7%	18.2%	39.0%	39.0%	14.9%	36.2%	36.2%	14.9%	36.2%	36.2%
Maximum Green (s)	5.2	30.5	30.5	15.2	40.5	40.5	11.3	37.0	37.0	11.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	25.8	51.1	51.1	11.6	36.9	36.9	14.6	26.6	26.6	7.2	16.8	16.8
Actuated g/C Ratio	0.21	0.42	0.42	0.10	0.31	0.31	0.12	0.22	0.22	0.06	0.14	0.14
v/c Ratio	0.81	0.72	0.17	0.31	0.80	0.20	0.80	0.60	0.40	0.25	0.23	0.49

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	55.2	33.9	2.3	52.3	43.8	2.2	67.0	46.5	6.6	57.2	45.3	10.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.2	33.9	2.3	52.3	43.8	2.2	67.0	46.5	6.6	57.2	45.3	10.4
LOS	E	C	A	D	D	A	E	D	A	E	D	B
Approach Delay		39.4			40.6			45.5			25.3	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	67.7	93.6	0.0	9.6	101.6	0.0	37.8	48.7	0.0	4.5	10.9	2.5
Queue Length 95th (m)	#127.0	#146.2	5.8	16.7	119.3	4.3	#67.8	60.5	14.1	9.8	16.7	20.4
Internal Link Dist (m)		413.3			520.9			178.2			333.4	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	789	1421	690	387	1338	600	425	1040	608	261	982	763
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	0.72	0.17	0.24	0.73	0.18	0.80	0.43	0.33	0.16	0.11	0.30

Intersection Summary			
Area Type:	Other		
Cycle Length: 120.6			
Actuated Cycle Length: 120.6			
Offset: 69 (57%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.81			
Intersection Signal Delay: 39.9		Intersection LOS: D	
Intersection Capacity Utilization 76.2%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	24	203	939	15	33	335
Future Vol, veh/h	24	203	939	15	33	335
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	1000	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	4	3	4	8	3	9
Mvmt Flow	24	203	939	15	33	335

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1348	947	0	0	954	0
Stage 1	947	-	-	-	-	-
Stage 2	401	-	-	-	-	-
Critical Hdwy	6.44	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	165	315	-	-	716	-
Stage 1	374	-	-	-	-	-
Stage 2	672	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	157	315	-	-	716	-
Mov Cap-2 Maneuver	157	-	-	-	-	-
Stage 1	374	-	-	-	-	-
Stage 2	641	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	53.2	0	0.9
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	285	716	-
HCM Lane V/C Ratio	-	-	0.796	0.046	-
HCM Control Delay (s)	-	-	53.2	10.3	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	6.3	0.1	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	24	203	939	15	33	335
Future Volume (vph)	24	203	939	15	33	335
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.879		0.998			
Flt Protected	0.995				0.950	
Satd. Flow (prot)	1544	0	1745	0	1679	1670
Flt Permitted	0.995				0.165	
Satd. Flow (perm)	1544	0	1745	0	292	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	196		2			
Link Speed (k/h)	50		80			80
Link Distance (m)	387.6		283.0			234.8
Travel Time (s)	27.9		12.7			10.6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	3%	4%	8%	3%	9%
Adj. Flow (vph)	24	203	939	15	33	335
Shared Lane Traffic (%)						
Lane Group Flow (vph)	227	0	954	0	33	335
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.5		24.9		24.0	24.0
Total Split (s)	28.2		91.8		91.8	91.8
Total Split (%)	23.5%		76.5%		76.5%	76.5%
Maximum Green (s)	22.7		85.9		85.9	85.9
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.9		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.5		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	15.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	11.5		41.9		41.9	41.9
Actuated g/C Ratio	0.18		0.64		0.64	0.64
v/c Ratio	0.53		0.85		0.18	0.31
Control Delay	12.6		17.7		6.8	5.8
Queue Delay	0.0		0.0		0.0	0.0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	12.6		17.7		6.8	5.8
LOS	B		B		A	A
Approach Delay	12.6		17.7			5.9
Approach LOS	B		B			A
Queue Length 50th (m)	2.6		63.1		1.1	12.5
Queue Length 95th (m)	24.4		137.5		4.8	27.4
Internal Link Dist (m)	363.6		259.0			210.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	692		1697		284	1624
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.33		0.56		0.12	0.21

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 65.5			
Natural Cycle: 80			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 14.1		Intersection LOS: B	
Intersection Capacity Utilization 77.3%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 3: River Road & Summerhill St

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	120	833	7	55	303
Future Vol, veh/h	3	120	833	7	55	303
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	120	833	7	55	303

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1250	837	0	0	840	0
Stage 1	837	-	-	-	-	-
Stage 2	413	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	191	367	-	-	795	-
Stage 1	425	-	-	-	-	-
Stage 2	668	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	175	367	-	-	795	-
Mov Cap-2 Maneuver	175	-	-	-	-	-
Stage 1	425	-	-	-	-	-
Stage 2	613	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.3	0	1.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	357	795	-
HCM Lane V/C Ratio	-	-	0.345	0.069	-
HCM Control Delay (s)	-	-	20.3	9.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0.2	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	6	834	0	3	303
Future Vol, veh/h	0	6	834	0	3	303
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	6	834	0	3	303

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1143	834	0	0	834	0
Stage 1	834	-	-	-	-	-
Stage 2	309	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	221	368	-	-	799	-
Stage 1	426	-	-	-	-	-
Stage 2	745	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	220	368	-	-	799	-
Mov Cap-2 Maneuver	220	-	-	-	-	-
Stage 1	426	-	-	-	-	-
Stage 2	741	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.9	0	0.1
HCM LOS	B		

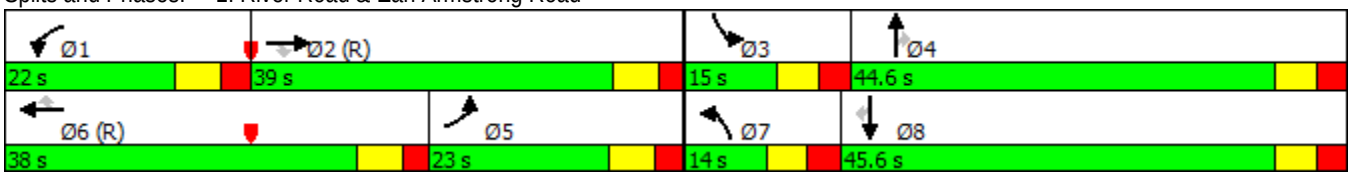
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	368	799	-
HCM Lane V/C Ratio	-	-	0.016	0.004	-
HCM Control Delay (s)	-	-	14.9	9.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	414	1001	363	71	961	30	201	97	39	36	183	805
Future Volume (vph)	414	1001	363	71	961	30	201	97	39	36	183	805
Ideal Flow (vphpl)	2000	1800	1800	1800	2200	1800	2000	1800	1800	1800	1800	2400
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.98			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3654	3325	1502	3288	4103	1446	3584	3357	1369	3257	3458	2063
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3648	3325	1502	3288	4103	1423	3584	3357	1351	3252	3458	2063
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			310			155			215			372
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			146.6			357.4	
Travel Time (s)		22.5			28.0			8.8			21.4	
Confl. Peds. (#/hr)	3					3			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	4%	3%	2%	3%	7%	4%	3%	13%	3%	0%	0%
Adj. Flow (vph)	414	1001	363	71	961	30	201	97	39	36	183	805
Shared Lane Traffic (%)												
Lane Group Flow (vph)	414	1001	363	71	961	30	201	97	39	36	183	805
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	23.0	39.0	39.0	22.0	38.0	38.0	14.0	44.6	44.6	15.0	45.6	45.6
Total Split (%)	19.1%	32.3%	32.3%	18.2%	31.5%	31.5%	11.6%	37.0%	37.0%	12.4%	37.8%	37.8%
Maximum Green (s)	16.2	32.5	32.5	15.2	31.5	31.5	7.3	38.0	38.0	8.3	39.0	39.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	17.4	46.1	46.1	8.0	34.2	34.2	7.3	40.6	40.6	6.8	35.1	35.1
Actuated g/C Ratio	0.14	0.38	0.38	0.07	0.28	0.28	0.06	0.34	0.34	0.06	0.29	0.29
v/c Ratio	0.79	0.79	0.47	0.33	0.83	0.06	0.93	0.09	0.07	0.20	0.18	0.93

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	61.9	40.7	8.2	57.3	48.2	0.2	102.1	28.1	0.2	56.3	31.3	39.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.9	40.7	8.2	57.3	48.2	0.2	102.1	28.1	0.2	56.3	31.3	39.8
LOS	E	D	A	E	D	A	F	C	A	E	C	D
Approach Delay		39.0			47.5			69.0			38.9	
Approach LOS		D			D			E			D	
Queue Length 50th (m)	46.0	109.7	8.0	7.7	106.7	0.0	22.8	7.6	0.0	3.9	14.9	97.3
Queue Length 95th (m)	#68.1	#152.4	32.4	14.4	#138.5	0.0	#43.6	13.7	0.0	8.8	23.1	#165.6
Internal Link Dist (m)		413.3			520.9			122.6			333.4	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	526	1270	765	414	1161	514	216	1130	597	224	1118	918
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.79	0.47	0.17	0.83	0.06	0.93	0.09	0.07	0.16	0.16	0.88

Intersection Summary			
Area Type:	Other		
Cycle Length: 120.6			
Actuated Cycle Length: 120.6			
Offset: 91 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Natural Cycle: 105			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.93			
Intersection Signal Delay: 43.5		Intersection LOS: D	
Intersection Capacity Utilization 84.7%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	87	527	14	141	915
Future Vol, veh/h	5	87	527	14	141	915
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	1000	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	4	3	3	2	1	2
Mvmt Flow	5	87	527	14	141	915

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1731	534	0	0	541	0
Stage 1	534	-	-	-	-	-
Stage 2	1197	-	-	-	-	-
Critical Hdwy	6.44	6.23	-	-	4.11	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.327	-	-	2.209	-
Pot Cap-1 Maneuver	96	544	-	-	1033	-
Stage 1	584	-	-	-	-	-
Stage 2	284	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	83	544	-	-	1033	-
Mov Cap-2 Maneuver	83	-	-	-	-	-
Stage 1	584	-	-	-	-	-
Stage 2	245	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16	0	1.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	418	1033	-
HCM Lane V/C Ratio	-	-	0.22	0.136	-
HCM Control Delay (s)	-	-	16	9	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	0.8	0.5	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	5	87	527	14	141	915
Future Volume (vph)	5	87	527	14	141	915
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			1.00			
Frt	0.872		0.997			
Flt Protected	0.997				0.950	
Satd. Flow (prot)	1535	0	1761	0	1712	1784
Flt Permitted	0.997				0.440	
Satd. Flow (perm)	1535	0	1761	0	793	1784
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	87		3			
Link Speed (k/h)	50		80			80
Link Distance (m)	387.6		283.0			234.8
Travel Time (s)	27.9		12.7			10.6
Confl. Bikes (#/hr)				2		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	3%	3%	2%	1%	2%
Adj. Flow (vph)	5	87	527	14	141	915
Shared Lane Traffic (%)						
Lane Group Flow (vph)	92	0	541	0	141	915
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.5		23.9		23.9	23.9
Total Split (s)	28.0		92.0		92.0	92.0
Total Split (%)	23.3%		76.7%		76.7%	76.7%
Maximum Green (s)	22.5		86.1		86.1	86.1
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.9		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.5		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	15.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	10.9		45.7		45.7	45.7
Actuated g/C Ratio	0.18		0.75		0.75	0.75
v/c Ratio	0.27		0.41		0.24	0.69

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Control Delay	10.4		5.6		5.3	9.8
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	10.4		5.6		5.3	9.8
LOS	B		A		A	A
Approach Delay	10.4		5.6			9.2
Approach LOS	B		A			A
Queue Length 50th (m)	0.5		23.3		5.1	56.3
Queue Length 95th (m)	11.5		36.9		10.8	93.6
Internal Link Dist (m)	363.6		259.0			210.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	666		1761		793	1784
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.14		0.31		0.18	0.51

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 61.1			
Natural Cycle: 80			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 8.1		Intersection LOS: A	
Intersection Capacity Utilization 68.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 3: River Road & Summerhill St

Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	90	451	6	121	795
Future Vol, veh/h	7	90	451	6	121	795
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	90	451	6	121	795

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1491	454	0	0	457	0
Stage 1	454	-	-	-	-	-
Stage 2	1037	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	136	606	-	-	1104	-
Stage 1	640	-	-	-	-	-
Stage 2	342	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	109	606	-	-	1104	-
Mov Cap-2 Maneuver	109	-	-	-	-	-
Stage 1	640	-	-	-	-	-
Stage 2	275	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15	0	1.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	456	1104	-
HCM Lane V/C Ratio	-	-	0.213	0.11	-
HCM Control Delay (s)	-	-	15	8.7	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.4	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	5	452	0	7	799
Future Vol, veh/h	0	5	452	0	7	799
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	5	452	0	7	799

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1265	452	0	0	452	0
Stage 1	452	-	-	-	-	-
Stage 2	813	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	187	608	-	-	1109	-
Stage 1	641	-	-	-	-	-
Stage 2	436	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	185	608	-	-	1109	-
Mov Cap-2 Maneuver	185	-	-	-	-	-
Stage 1	641	-	-	-	-	-
Stage 2	431	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	608	1109	-
HCM Lane V/C Ratio	-	-	0.008	0.006	-
HCM Control Delay (s)	-	-	11	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

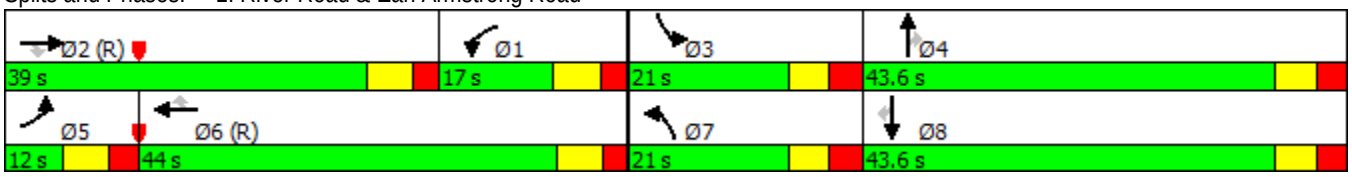
Future (2024) Background Traffic

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	649	1053	125	115	989	111	357	505	255	43	128	232
Future Volume (vph)	649	1053	125	115	989	111	357	505	255	43	128	232
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.99			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3321	3357	1419	3077	3262	1502	3164	3390	1517	2795	3202	1502
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3319	3357	1419	3077	3262	1482	3164	3390	1497	2793	3202	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			155			155			215			215
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			202.2			387.0	
Travel Time (s)		22.5			28.0			12.1			23.2	
Confl. Peds. (#/hr)	1					1			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	3%	9%	9%	6%	3%	6%	2%	2%	20%	8%	3%
Adj. Flow (vph)	649	1053	125	115	989	111	357	505	255	43	128	232
Shared Lane Traffic (%)												
Lane Group Flow (vph)	649	1053	125	115	989	111	357	505	255	43	128	232
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	35.1	35.1	11.8	35.1	35.1	11.8	43.6	43.6	11.8	43.6	43.6
Total Split (s)	12.0	39.0	39.0	17.0	44.0	44.0	21.0	43.6	43.6	21.0	43.6	43.6
Total Split (%)	10.0%	32.3%	32.3%	14.1%	36.5%	36.5%	17.4%	36.2%	36.2%	17.4%	36.2%	36.2%
Maximum Green (s)	5.2	32.5	32.5	10.2	37.5	37.5	14.3	37.0	37.0	14.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	24.0	51.3	51.3	10.2	37.5	37.5	14.3	27.6	27.6	7.3	18.2	18.2
Actuated g/C Ratio	0.20	0.43	0.43	0.08	0.31	0.31	0.12	0.23	0.23	0.06	0.15	0.15
v/c Ratio	0.98	0.74	0.18	0.44	0.98	0.20	0.95	0.65	0.50	0.25	0.27	0.57

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	79.9	34.1	2.7	58.3	64.3	2.4	88.9	46.5	11.7	57.2	44.8	12.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.9	34.1	2.7	58.3	64.3	2.4	88.9	46.5	11.7	57.2	44.8	12.8
LOS	E	C	A	E	E	A	F	D	B	E	D	B
Approach Delay		48.2			58.1			52.1			27.7	
Approach LOS		D			E			D			C	
Queue Length 50th (m)	73.1	99.3	0.0	12.5	112.0	0.0	40.4	54.4	7.2	4.6	13.1	3.2
Queue Length 95th (m)	#135.4	#147.5	7.0	21.1	#152.3	4.6	#66.9	66.1	27.2	10.0	19.8	22.4
Internal Link Dist (m)		413.3			520.9			178.2			363.0	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	660	1427	692	260	1014	567	375	1040	608	331	982	609
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.98	0.74	0.18	0.44	0.98	0.20	0.95	0.49	0.42	0.13	0.13	0.38

Intersection Summary			
Area Type:	Other		
Cycle Length: 120.6			
Actuated Cycle Length: 120.6			
Offset: 63 (52%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.98			
Intersection Signal Delay: 50.0		Intersection LOS: D	
Intersection Capacity Utilization 90.0%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	24	203	939	15	33	335
Future Vol, veh/h	24	203	939	15	33	335
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	1000	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	4	3	4	8	3	9
Mvmt Flow	24	203	939	15	33	335

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1348	947	0	0	954	0
Stage 1	947	-	-	-	-	-
Stage 2	401	-	-	-	-	-
Critical Hdwy	6.44	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.327	-	-	2.227	-
Pot Cap-1 Maneuver	165	315	-	-	716	-
Stage 1	374	-	-	-	-	-
Stage 2	672	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	157	315	-	-	716	-
Mov Cap-2 Maneuver	157	-	-	-	-	-
Stage 1	374	-	-	-	-	-
Stage 2	641	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	53.2	0	0.9
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	285	716	-
HCM Lane V/C Ratio	-	-	0.796	0.046	-
HCM Control Delay (s)	-	-	53.2	10.3	-
HCM Lane LOS	-	-	F	B	-
HCM 95th %tile Q(veh)	-	-	6.3	0.1	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	24	203	1056	15	33	387
Future Volume (vph)	24	203	1056	15	33	387
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.879		0.998			
Flt Protected	0.995				0.950	
Satd. Flow (prot)	1544	0	1746	0	1679	1670
Flt Permitted	0.995				0.131	
Satd. Flow (perm)	1544	0	1746	0	231	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	157		1			
Link Speed (k/h)	50		80			80
Link Distance (m)	387.6		297.0			234.8
Travel Time (s)	27.9		13.4			10.6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	3%	4%	8%	3%	9%
Adj. Flow (vph)	24	203	1056	15	33	387
Shared Lane Traffic (%)						
Lane Group Flow (vph)	227	0	1071	0	33	387
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.5		24.0		24.0	24.0
Total Split (s)	28.2		91.8		91.8	91.8
Total Split (%)	23.5%		76.5%		76.5%	76.5%
Maximum Green (s)	22.7		85.9		85.9	85.9
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.9		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.5		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	15.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	12.8		55.4		55.4	55.4
Actuated g/C Ratio	0.16		0.69		0.69	0.69
v/c Ratio	0.60		0.89		0.21	0.34
Control Delay	20.6		20.8		8.0	5.8
Queue Delay	0.0		0.8		0.0	0.0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	20.6		21.6		8.0	5.8
LOS	C		C		A	A
Approach Delay	20.6		21.6			5.9
Approach LOS	C		C			A
Queue Length 50th (m)	7.9		83.2		1.2	15.1
Queue Length 95th (m)	36.2		207.0		5.7	36.2
Internal Link Dist (m)	363.6		273.0			210.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	576		1621		214	1551
Starvation Cap Reductn	0		264		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.39		0.79		0.15	0.25

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 80.5			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 17.6		Intersection LOS: B	
Intersection Capacity Utilization 83.8%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 3: River Road & Summerhill St

Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	120	833	7	55	303
Future Vol, veh/h	3	120	833	7	55	303
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	120	833	7	55	303

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1250	837	0	0	840	0
Stage 1	837	-	-	-	-	-
Stage 2	413	-	-	-	-	-
Critical Hdwy	7.12	6.22	-	-	4.12	-
Critical Hdwy Stg 1	6.12	-	-	-	-	-
Critical Hdwy Stg 2	6.12	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	150	367	-	-	795	-
Stage 1	361	-	-	-	-	-
Stage 2	616	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	140	367	-	-	795	-
Mov Cap-2 Maneuver	140	-	-	-	-	-
Stage 1	361	-	-	-	-	-
Stage 2	565	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.6	0	1.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	353	795	-
HCM Lane V/C Ratio	-	-	0.348	0.069	-
HCM Control Delay (s)	-	-	20.6	9.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.5	0.2	-

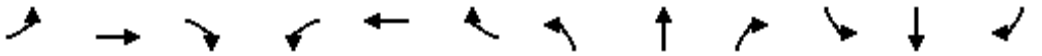
Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	0	0	0	6	0	834	0	3	303	0
Future Vol, veh/h	0	0	0	0	0	6	0	834	0	3	303	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	0	0	0	6	0	834	0	3	303	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1146	1143	303	1143	1143	834	303	0	0	834	0	0
Stage 1	309	309	-	834	834	-	-	-	-	-	-	-
Stage 2	837	834	-	309	309	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	176	200	737	177	200	368	1258	-	-	799	-	-
Stage 1	701	660	-	362	383	-	-	-	-	-	-	-
Stage 2	361	383	-	701	660	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	172	199	737	176	199	368	1258	-	-	799	-	-
Mov Cap-2 Maneuver	172	199	-	176	199	-	-	-	-	-	-	-
Stage 1	701	657	-	362	383	-	-	-	-	-	-	-
Stage 2	355	383	-	697	657	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	14.9	0	0.1
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1258	-	-	-	368	799	-	-
HCM Lane V/C Ratio	-	-	-	-	0.016	0.004	-	-
HCM Control Delay (s)	0	-	-	0	14.9	9.5	0	-
HCM Lane LOS	A	-	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0	-	-

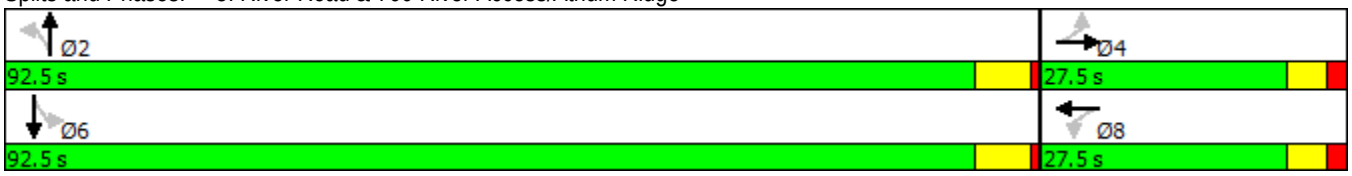


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	0	3	0	0	9	1	892	0	5	329	12
Future Volume (vph)	29	0	3	0	0	9	1	892	0	5	329	12
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	10.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.987			0.865						0.995	
Flt Protected		0.957								0.950		
Satd. Flow (prot)	0	1685	0	0	1543	0	0	1784	0	1695	1775	0
Flt Permitted										0.359		
Satd. Flow (perm)	0	1761	0	0	1543	0	0	1784	0	641	1775	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			217						4	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		345.9			387.3			489.9			281.0	
Travel Time (s)		24.9			27.9			22.0			12.6	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	29	0	3	0	0	9	1	892	0	5	329	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	32	0	0	9	0	0	893	0	5	341	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	27.5	27.5		27.5	27.5		24.0	24.0		24.0	24.0	
Total Split (s)	27.5	27.5		27.5	27.5		92.5	92.5		92.5	92.5	
Total Split (%)	22.9%	22.9%		22.9%	22.9%		77.1%	77.1%		77.1%	77.1%	
Maximum Green (s)	22.0	22.0		22.0	22.0		86.6	86.6		86.6	86.6	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.9	1.9		1.9	1.9		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5			5.5			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		11.3			11.3			48.1		48.1	48.1	
Actuated g/C Ratio		0.21			0.21			0.89		0.89	0.89	
v/c Ratio		0.08			0.02			0.57		0.01	0.22	
Control Delay		15.2			0.1			5.4		2.8	2.6	
Queue Delay		0.0			0.0			0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		15.2			0.1			5.4		2.8	2.6	
LOS		B			A			A		A	A	
Approach Delay		15.2			0.1			5.4			2.6	
Approach LOS		B			A			A			A	
Queue Length 50th (m)		0.4			0.0			0.0		0.0	0.0	
Queue Length 95th (m)		7.3			0.0			87.8		0.9	20.4	
Internal Link Dist (m)		321.9			363.3			465.9			257.0	
Turn Bay Length (m)										10.0		
Base Capacity (vph)		816			821			1784		641	1775	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.04			0.01			0.50		0.01	0.19	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 54.3			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 4.8		Intersection LOS: A	
Intersection Capacity Utilization 68.4%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 5: River Road & 760 River Access/Atrium Ridge

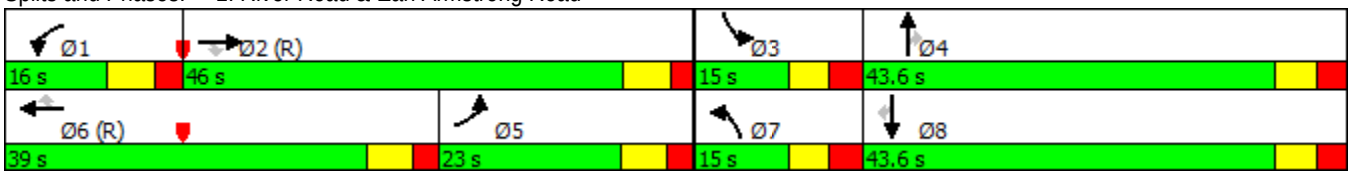


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	424	1116	423	278	1136	42	241	244	184	58	393	825
Future Volume (vph)	424	1116	423	278	1136	42	241	244	184	58	393	825
Ideal Flow (vphpl)	2000	1800	1800	1800	2200	1800	2000	1800	1800	1800	1800	2400
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.98			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3654	3325	1502	3288	4103	1446	3584	3357	1369	3257	3458	2063
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3649	3325	1502	3288	4103	1423	3584	3357	1351	3253	3458	2063
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			306			155			215			355
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			202.2			357.4	
Travel Time (s)		22.5			28.0			12.1			21.4	
Confl. Peds. (#/hr)	3					3			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	4%	3%	2%	3%	7%	4%	3%	13%	3%	0%	0%
Adj. Flow (vph)	424	1116	423	278	1136	42	241	244	184	58	393	825
Shared Lane Traffic (%)												
Lane Group Flow (vph)	424	1116	423	278	1136	42	241	244	184	58	393	825
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	23.0	46.0	46.0	16.0	39.0	39.0	15.0	43.6	43.6	15.0	43.6	43.6
Total Split (%)	19.1%	38.1%	38.1%	13.3%	32.3%	32.3%	12.4%	36.2%	36.2%	12.4%	36.2%	36.2%
Maximum Green (s)	16.2	39.5	39.5	9.2	32.5	32.5	8.3	37.0	37.0	8.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	16.2	39.5	39.5	10.4	33.7	33.7	8.3	39.3	39.3	7.3	35.8	35.8
Actuated g/C Ratio	0.13	0.33	0.33	0.09	0.28	0.28	0.07	0.33	0.33	0.06	0.30	0.30
v/c Ratio	0.87	1.02	0.61	0.98	0.99	0.08	0.98	0.22	0.32	0.29	0.38	0.96

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	69.6	73.9	13.3	104.9	68.4	0.3	108.6	31.0	3.8	57.7	34.6	45.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.6	73.9	13.3	104.9	68.4	0.3	108.6	31.0	3.8	57.7	34.6	45.7
LOS	E	E	B	F	E	A	F	C	A	E	C	D
Approach Delay		59.9			73.4			51.5			42.8	
Approach LOS		E			E			D			D	
Queue Length 50th (m)	47.3	~136.4	18.8	~35.6	~139.2	0.0	27.5	20.6	0.0	6.3	35.2	111.3
Queue Length 95th (m)	#70.7	#174.1	49.8	#60.7	#177.2	0.0	#51.3	30.6	9.5	12.4	47.9	#186.0
Internal Link Dist (m)		413.3			520.9			178.2			333.4	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	490	1089	697	283	1146	509	246	1092	584	224	1060	879
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	1.02	0.61	0.98	0.99	0.08	0.98	0.22	0.32	0.26	0.37	0.94

Intersection Summary			
Area Type:	Other		
Cycle Length: 120.6			
Actuated Cycle Length: 120.6			
Offset: 91 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.02			
Intersection Signal Delay: 58.5		Intersection LOS: E	
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: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	87	609	14	141	1036
Future Vol, veh/h	5	87	609	14	141	1036
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	1000	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	4	3	3	2	1	2
Mvmt Flow	5	87	609	14	141	1036

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1934	616	0	0	623	0
Stage 1	616	-	-	-	-	-
Stage 2	1318	-	-	-	-	-
Critical Hdwy	6.44	6.23	-	-	4.11	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.327	-	-	2.209	-
Pot Cap-1 Maneuver	72	489	-	-	963	-
Stage 1	535	-	-	-	-	-
Stage 2	248	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	61	489	-	-	963	-
Mov Cap-2 Maneuver	61	-	-	-	-	-
Stage 1	535	-	-	-	-	-
Stage 2	212	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.7	0	1.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	354	963	-
HCM Lane V/C Ratio	-	-	0.26	0.146	-
HCM Control Delay (s)	-	-	18.7	9.4	-
HCM Lane LOS	-	-	C	A	-
HCM 95th %tile Q(veh)	-	-	1	0.5	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	5	87	609	14	141	1036
Future Volume (vph)	5	87	609	14	141	1036
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			1.00			
Frt	0.872		0.997			
Flt Protected	0.997				0.950	
Satd. Flow (prot)	1535	0	1761	0	1712	1784
Flt Permitted	0.997				0.396	
Satd. Flow (perm)	1535	0	1761	0	714	1784
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	87		2			
Link Speed (k/h)	50		80			80
Link Distance (m)	387.6		283.0			234.8
Travel Time (s)	27.9		12.7			10.6
Confl. Bikes (#/hr)				2		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	3%	3%	2%	1%	2%
Adj. Flow (vph)	5	87	609	14	141	1036
Shared Lane Traffic (%)						
Lane Group Flow (vph)	92	0	623	0	141	1036
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.5		24.0		24.0	24.0
Total Split (s)	27.5		92.5		92.5	92.5
Total Split (%)	22.9%		77.1%		77.1%	77.1%
Maximum Green (s)	22.0		86.6		86.6	86.6
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.9		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.5		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	15.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	11.2		55.4		55.4	55.4
Actuated g/C Ratio	0.16		0.78		0.78	0.78
v/c Ratio	0.29		0.45		0.25	0.74

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Control Delay	12.5		5.3		4.9	10.6
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	12.5		5.3		4.9	10.6
LOS	B		A		A	B
Approach Delay	12.5		5.3			9.9
Approach LOS	B		A			A
Queue Length 50th (m)	0.6		28.8		5.2	74.2
Queue Length 95th (m)	13.4		44.6		11.1	123.8
Internal Link Dist (m)	363.6		259.0			210.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	586		1733		703	1756
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.16		0.36		0.20	0.59

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 70.9			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 8.5		Intersection LOS: A	
Intersection Capacity Utilization 75.4%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 3: River Road & Summerhill St

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	111	512	6	151	890
Future Vol, veh/h	7	111	512	6	151	890
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	111	512	6	151	890

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1707	515	0	0	518	0
Stage 1	515	-	-	-	-	-
Stage 2	1192	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	100	560	-	-	1048	-
Stage 1	600	-	-	-	-	-
Stage 2	288	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	72	560	-	-	1048	-
Mov Cap-2 Maneuver	72	-	-	-	-	-
Stage 1	600	-	-	-	-	-
Stage 2	206	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.8	0	1.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	399	1048	-
HCM Lane V/C Ratio	-	-	0.296	0.144	-
HCM Control Delay (s)	-	-	17.8	9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.2	0.5	-

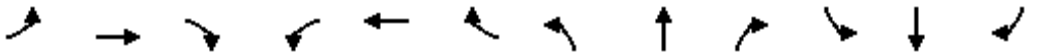
Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	18	0	2	0	0	7	3	493	0	9	858	29
Future Vol, veh/h	18	0	2	0	0	7	3	493	0	9	858	29
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	0	2	0	0	7	3	493	0	9	858	29

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1394	1390	873	1391	1404	493	887	0	0	493	0	0
Stage 1	891	891	-	499	499	-	-	-	-	-	-	-
Stage 2	503	499	-	892	905	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	119	142	349	120	140	576	763	-	-	1071	-	-
Stage 1	337	361	-	554	544	-	-	-	-	-	-	-
Stage 2	551	544	-	337	355	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	116	139	349	117	137	576	763	-	-	1071	-	-
Mov Cap-2 Maneuver	116	139	-	117	137	-	-	-	-	-	-	-
Stage 1	335	355	-	551	541	-	-	-	-	-	-	-
Stage 2	542	541	-	329	349	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	39.5	11.3	0.1	0.1
HCM LOS	E	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	763	-	-	124	576	1071	-	-
HCM Lane V/C Ratio	0.004	-	-	0.161	0.012	0.008	-	-
HCM Control Delay (s)	9.7	0	-	39.5	11.3	8.4	0	-
HCM Lane LOS	A	A	-	E	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.6	0	0	-	-

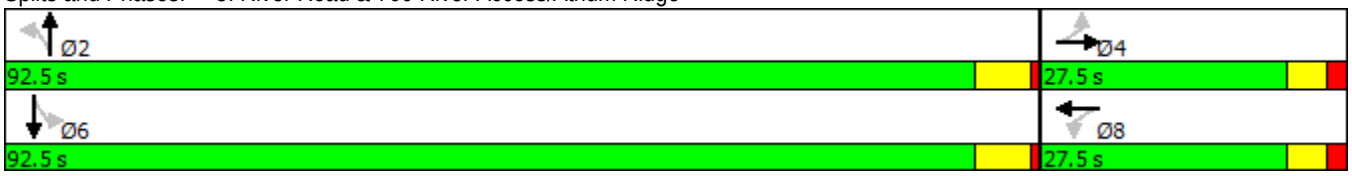


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	2	0	0	7	3	493	0	9	858	29
Future Volume (vph)	18	0	2	0	0	7	3	493	0	9	858	29
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	10.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.865						0.995	
Flt Protected		0.957								0.950		
Satd. Flow (prot)	0	1684	0	0	1543	0	0	1784	0	1695	1775	0
Flt Permitted								0.996		0.482		
Satd. Flow (perm)	0	1759	0	0	1543	0	0	1777	0	860	1775	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			453						4	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		345.9			387.3			489.9			295.0	
Travel Time (s)		24.9			27.9			22.0			13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	18	0	2	0	0	7	3	493	0	9	858	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	20	0	0	7	0	0	496	0	9	887	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	27.5	27.5		27.5	27.5		23.9	23.9		23.9	23.9	
Total Split (s)	27.5	27.5		27.5	27.5		92.5	92.5		92.5	92.5	
Total Split (%)	22.9%	22.9%		22.9%	22.9%		77.1%	77.1%		77.1%	77.1%	
Maximum Green (s)	22.0	22.0		22.0	22.0		86.6	86.6		86.6	86.6	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.9	1.9		1.9	1.9		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5			5.5			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		11.6			11.6			47.1		47.1	47.1	
Actuated g/C Ratio		0.22			0.22			0.89		0.89	0.89	
v/c Ratio		0.05			0.01			0.31		0.01	0.56	
Control Delay		11.9			0.0			2.9		2.6	5.1	
Queue Delay		0.0			0.0			0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		11.9			0.0			2.9		2.6	5.1	
LOS		B			A			A		A	A	
Approach Delay		11.9						2.9			5.1	
Approach LOS		B						A			A	
Queue Length 50th (m)		0.0			0.0			0.0		0.0	0.0	
Queue Length 95th (m)		4.7			0.0			31.7		1.2	83.9	
Internal Link Dist (m)		321.9			363.3			465.9			271.0	
Turn Bay Length (m)										10.0		
Base Capacity (vph)		864			980			1777		860	1775	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.02			0.01			0.28		0.01	0.50	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 52.9			
Natural Cycle: 75			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.56			
Intersection Signal Delay: 4.4		Intersection LOS: A	
Intersection Capacity Utilization 67.4%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 5: River Road & 760 River Access/Atrium Ridge



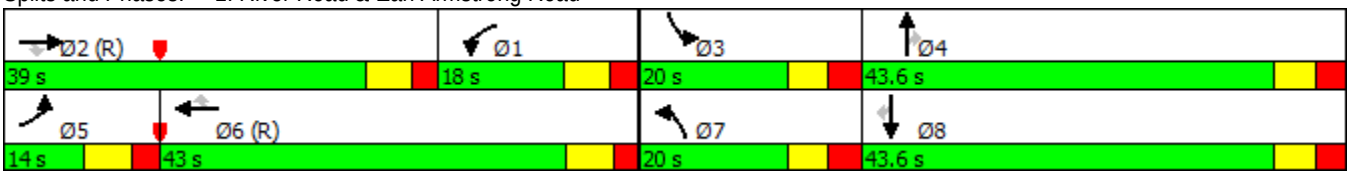
Future (2029) Background Traffic

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	665	1154	140	167	1132	121	390	614	358	45	181	237
Future Volume (vph)	665	1154	140	167	1132	121	390	614	358	45	181	237
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.99			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3321	3357	1419	3077	3262	1502	3164	3390	1517	2795	3202	1502
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3320	3357	1419	3077	3262	1482	3164	3390	1497	2793	3202	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			155			155			218			215
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			202.2			387.0	
Travel Time (s)		22.5			28.0			12.1			23.2	
Confl. Peds. (#/hr)	1					1			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	3%	9%	9%	6%	3%	6%	2%	2%	20%	8%	3%
Adj. Flow (vph)	665	1154	140	167	1132	121	390	614	358	45	181	237
Shared Lane Traffic (%)												
Lane Group Flow (vph)	665	1154	140	167	1132	121	390	614	358	45	181	237
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	35.1	35.1	11.8	35.1	35.1	11.8	43.6	43.6	11.8	43.6	43.6
Total Split (s)	14.0	39.0	39.0	18.0	43.0	43.0	20.0	43.6	43.6	20.0	43.6	43.6
Total Split (%)	11.6%	32.3%	32.3%	14.9%	35.7%	35.7%	16.6%	36.2%	36.2%	16.6%	36.2%	36.2%
Maximum Green (s)	7.2	32.5	32.5	11.2	36.5	36.5	13.3	37.0	37.0	13.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	21.4	46.7	46.7	11.2	36.5	36.5	13.3	31.2	31.2	7.3	22.8	22.8
Actuated g/C Ratio	0.18	0.39	0.39	0.09	0.30	0.30	0.11	0.26	0.26	0.06	0.19	0.19
v/c Ratio	1.13	0.89	0.22	0.59	1.15	0.22	1.12	0.70	0.65	0.26	0.30	0.52

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	123.5	45.5	4.5	61.4	116.8	3.0	133.5	44.9	20.6	57.4	41.3	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	123.5	45.5	4.5	61.4	116.8	3.0	133.5	44.9	20.6	57.4	41.3	10.8
LOS	F	D	A	E	F	A	F	D	C	E	D	B
Approach Delay		69.0			100.6			63.9			27.3	
Approach LOS		E			F			E			C	
Queue Length 50th (m)	~89.1	123.7	0.0	18.2	~152.4	0.0	~50.4	65.2	27.1	4.8	17.8	4.0
Queue Length 95th (m)	#153.9	#193.5	10.6	28.8	#190.3	6.7	#78.4	76.4	52.8	10.4	24.6	21.9
Internal Link Dist (m)		413.3			520.9			178.2			363.0	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	588	1299	644	285	987	556	348	1042	611	308	982	609
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.13	0.89	0.22	0.59	1.15	0.22	1.12	0.59	0.59	0.15	0.18	0.39

Intersection Summary			
Area Type:	Other		
Cycle Length: 120.6			
Actuated Cycle Length: 120.6			
Offset: 59 (49%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.15			
Intersection Signal Delay: 72.6		Intersection LOS: E	
Intersection Capacity Utilization 97.7%		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: 1: River Road & Earl Armstrong Road



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	24	203	1286	15	33	505
Future Volume (vph)	24	203	1286	15	33	505
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.879		0.998			
Flt Protected	0.995				0.950	
Satd. Flow (prot)	1544	0	1746	0	1679	1670
Flt Permitted	0.995				0.075	
Satd. Flow (perm)	1544	0	1746	0	133	1670
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	109		1			
Link Speed (k/h)	50		80			80
Link Distance (m)	387.6		297.0			234.8
Travel Time (s)	27.9		13.4			10.6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	3%	4%	8%	3%	9%
Adj. Flow (vph)	24	203	1286	15	33	505
Shared Lane Traffic (%)						
Lane Group Flow (vph)	227	0	1301	0	33	505
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.5		24.0		24.0	24.0
Total Split (s)	28.0		102.0		102.0	102.0
Total Split (%)	21.5%		78.5%		78.5%	78.5%
Maximum Green (s)	22.5		96.1		96.1	96.1
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.9		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.5		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	15.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	15.6		96.7		96.7	96.7
Actuated g/C Ratio	0.13		0.78		0.78	0.78
v/c Ratio	0.79		0.95		0.32	0.39
Control Delay	45.7		29.4		14.7	5.7
Queue Delay	0.0		4.6		0.0	0.0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	45.7		34.1		14.7	5.7
LOS	D		C		B	A
Approach Delay	45.7		34.1			6.3
Approach LOS	D		C			A
Queue Length 50th (m)	25.8		206.0		1.8	29.1
Queue Length 95th (m)	51.2		#396.5		9.3	55.0
Internal Link Dist (m)	363.6		273.0			210.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	370		1364		104	1305
Starvation Cap Reductn	0		46		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.61		0.99		0.32	0.39

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 123.7			
Natural Cycle: 120			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.95			
Intersection Signal Delay: 28.1		Intersection LOS: C	
Intersection Capacity Utilization 96.5%		ICU Level of Service F	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: River Road & Summerhill St

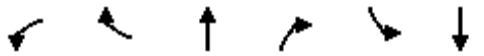
Intersection	
Int Delay, s/veh	9.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	218	1084	7	102	426
Future Vol, veh/h	3	218	1084	7	102	426
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	218	1084	7	102	426

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1718	1088	0	0	1091	0
Stage 1	1088	-	-	-	-	-
Stage 2	630	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	99	262	-	-	640	-
Stage 1	323	-	-	-	-	-
Stage 2	531	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	78	262	-	-	640	-
Mov Cap-2 Maneuver	78	-	-	-	-	-
Stage 1	323	-	-	-	-	-
Stage 2	420	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	70	0	2.3
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	254	640	-
HCM Lane V/C Ratio	-	-	0.87	0.159	-
HCM Control Delay (s)	-	-	70	11.7	0
HCM Lane LOS	-	-	F	B	A
HCM 95th %tile Q(veh)	-	-	7.3	0.6	-



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	3	218	1084	7	102	426
Future Volume (vph)	3	218	1084	7	102	426
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.867		0.999			
Flt Protected	0.999					0.990
Satd. Flow (prot)	1545	0	1783	0	0	1766
Flt Permitted	0.999					0.504
Satd. Flow (perm)	1545	0	1783	0	0	899
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	151		1			
Link Speed (k/h)	50		80			80
Link Distance (m)	416.9		281.0			297.0
Travel Time (s)	30.0		12.6			13.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	3	218	1084	7	102	426
Shared Lane Traffic (%)						
Lane Group Flow (vph)	221	0	1091	0	0	528
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.5		24.0		24.0	24.0
Total Split (s)	27.5		92.5		92.5	92.5
Total Split (%)	22.9%		77.1%		77.1%	77.1%
Maximum Green (s)	22.0		86.6		86.6	86.6
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.9		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0			0.0
Total Lost Time (s)	5.5		5.9			5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	15.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	12.9		87.7			87.7
Actuated g/C Ratio	0.12		0.78			0.78
v/c Ratio	0.71		0.78			0.75
Control Delay	29.1		12.9			16.1
Queue Delay	0.0		0.5			0.0
Total Delay	29.1		13.4			16.1
LOS	C		B			B
Approach Delay	29.1		13.4			16.1

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	29	0	3	0	0	27	1	1034	0	9	409	12
Future Vol, veh/h	29	0	3	0	0	27	1	1034	0	9	409	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	29	0	3	0	0	27	1	1034	0	9	409	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1483	1469	415	1471	1475	1034	421	0	0	1034	0	0
Stage 1	433	433	-	1036	1036	-	-	-	-	-	-	-
Stage 2	1050	1036	-	435	439	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	103	127	637	105	126	282	1138	-	-	672	-	-
Stage 1	601	582	-	280	309	-	-	-	-	-	-	-
Stage 2	275	309	-	600	578	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	92	124	637	103	123	282	1138	-	-	672	-	-
Mov Cap-2 Maneuver	92	124	-	103	123	-	-	-	-	-	-	-
Stage 1	600	572	-	279	308	-	-	-	-	-	-	-
Stage 2	248	308	-	586	568	-	-	-	-	-	-	-

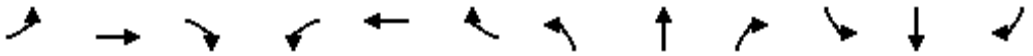
Approach	EB	WB	NB	SB
HCM Control Delay, s	57.1	19.1	0	0.2
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1138	-	-	100	282	672	-	-
HCM Lane V/C Ratio	0.001	-	-	0.32	0.096	0.013	-	-
HCM Control Delay (s)	8.2	0	-	57.1	19.1	10.4	0	-
HCM Lane LOS	A	A	-	F	C	B	A	-
HCM 95th %tile Q(veh)	0	-	-	1.2	0.3	0	-	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Approach LOS	C		B			B
Queue Length 50th (m)	13.1		88.8			40.4
Queue Length 95th (m)	35.9		206.3			#125.4
Internal Link Dist (m)	392.9		257.0			273.0
Turn Bay Length (m)						
Base Capacity (vph)	424		1396			703
Starvation Cap Reductn	0		76			0
Spillback Cap Reductn	0		0			0
Storage Cap Reductn	0		0			0
Reduced v/c Ratio	0.52		0.83			0.75

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 112			
Natural Cycle: 120			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 16.1		Intersection LOS: B	
Intersection Capacity Utilization 119.1%		ICU Level of Service H	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 4: River Road & Borbridge Avenue

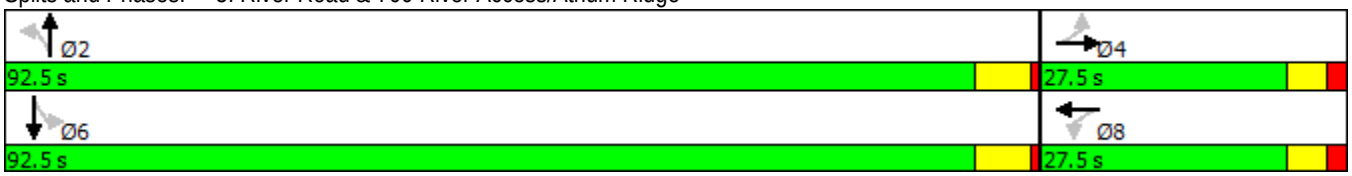


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	0	3	0	0	27	1	1034	0	9	409	12
Future Volume (vph)	29	0	3	0	0	27	1	1034	0	9	409	12
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.987			0.865						0.996	
Flt Protected		0.957									0.999	
Satd. Flow (prot)	0	1685	0	0	1543	0	0	1784	0	0	1775	0
Flt Permitted		0.811									0.980	
Satd. Flow (perm)	0	1428	0	0	1543	0	0	1784	0	0	1742	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			166						3	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		345.9			387.3			489.9			281.0	
Travel Time (s)		24.9			27.9			22.0			12.6	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	29	0	3	0	0	27	1	1034	0	9	409	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	32	0	0	27	0	0	1035	0	0	430	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	27.5	27.5		27.5	27.5		24.0	24.0		24.0	24.0	
Total Split (s)	27.5	27.5		27.5	27.5		92.5	92.5		92.5	92.5	
Total Split (%)	22.9%	22.9%		22.9%	22.9%		77.1%	77.1%		77.1%	77.1%	
Maximum Green (s)	22.0	22.0		22.0	22.0		86.6	86.6		86.6	86.6	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.9	1.9		1.9	1.9		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0			0.0	
Total Lost Time (s)		5.5			5.5			5.9			5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		11.6			11.6			54.9			54.9	
Actuated g/C Ratio		0.18			0.18			0.84			0.84	
v/c Ratio		0.12			0.07			0.69			0.29	
Control Delay		18.5			0.3			8.2			3.4	
Queue Delay		0.0			0.0			0.0			0.0	
Total Delay		18.5			0.3			8.2			3.4	
LOS		B			A			A			A	
Approach Delay		18.5			0.3			8.2			3.4	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Approach LOS		B			A			A			A	
Queue Length 50th (m)		0.7			0.0			74.0			17.0	
Queue Length 95th (m)		8.4			0.0			119.7			26.0	
Internal Link Dist (m)		321.9			363.3			465.9			257.0	
Turn Bay Length (m)												
Base Capacity (vph)		578			708			1770			1728	
Starvation Cap Reductn		0			0			0			0	
Spillback Cap Reductn		0			0			0			0	
Storage Cap Reductn		0			0			0			0	
Reduced v/c Ratio		0.06			0.04			0.58			0.25	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 65			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 6.9		Intersection LOS: A	
Intersection Capacity Utilization 76.0%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 5: River Road & 760 River Access/Atrium Ridge

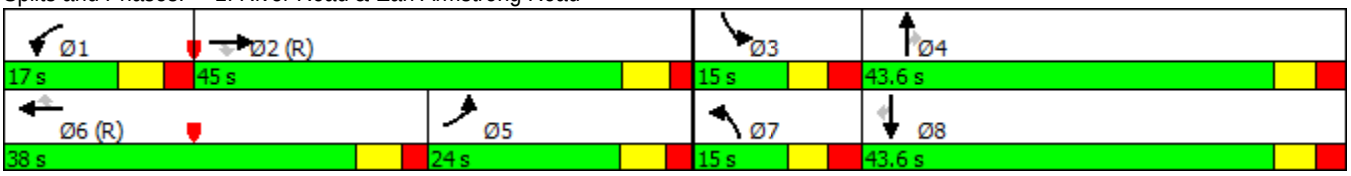


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	424	1245	448	380	1220	45	263	328	268	58	495	825
Future Volume (vph)	424	1245	448	380	1220	45	263	328	268	58	495	825
Ideal Flow (vphpl)	2000	1800	1800	1800	2200	1800	2000	1800	1800	1800	1800	2400
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.98			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3654	3325	1502	3288	4103	1446	3584	3357	1369	3257	3458	2063
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3650	3325	1502	3288	4103	1423	3584	3357	1351	3253	3458	2063
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			250			155			268			375
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			202.2			357.4	
Travel Time (s)		22.5			28.0			12.1			21.4	
Confl. Peds. (#/hr)	3					3			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	4%	3%	2%	3%	7%	4%	3%	13%	3%	0%	0%
Adj. Flow (vph)	424	1245	448	380	1220	45	263	328	268	58	495	825
Shared Lane Traffic (%)												
Lane Group Flow (vph)	424	1245	448	380	1220	45	263	328	268	58	495	825
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	24.0	45.0	45.0	17.0	38.0	38.0	15.0	43.6	43.6	15.0	43.6	43.6
Total Split (%)	19.9%	37.3%	37.3%	14.1%	31.5%	31.5%	12.4%	36.2%	36.2%	12.4%	36.2%	36.2%
Maximum Green (s)	17.2	38.5	38.5	10.2	31.5	31.5	8.3	37.0	37.0	8.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	17.2	38.5	38.5	11.8	33.1	33.1	8.3	38.9	38.9	7.3	35.4	35.4
Actuated g/C Ratio	0.14	0.32	0.32	0.10	0.27	0.27	0.07	0.32	0.32	0.06	0.29	0.29
v/c Ratio	0.81	1.17	0.69	1.19	1.09	0.09	1.07	0.30	0.43	0.29	0.49	0.95

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	63.6	125.6	21.5	157.6	94.8	0.4	129.7	32.2	6.1	57.7	36.6	42.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.6	125.6	21.5	157.6	94.8	0.4	129.7	32.2	6.1	57.7	36.6	42.9
LOS	E	F	C	F	F	A	F	C	A	E	D	D
Approach Delay		91.1			106.7			53.9			41.3	
Approach LOS		F			F			D			D	
Queue Length 50th (m)	46.8	~170.5	37.7	~56.3	~163.3	0.0	~32.6	28.5	0.0	6.3	45.8	105.8
Queue Length 95th (m)	#67.2	#209.0	72.9	#84.3	#201.7	0.0	#57.2	40.4	17.9	12.4	60.6	#179.5
Internal Link Dist (m)		413.3			520.9			178.2			333.4	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	521	1061	649	320	1124	502	246	1082	617	224	1060	892
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	1.17	0.69	1.19	1.09	0.09	1.07	0.30	0.43	0.26	0.47	0.92

Intersection Summary			
Area Type:	Other		
Cycle Length: 120.6			
Actuated Cycle Length: 120.6			
Offset: 91 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.19			
Intersection Signal Delay: 78.6		Intersection LOS: E	
Intersection Capacity Utilization 93.2%		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: 1: River Road & Earl Armstrong Road



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	1	87	796	14	141	1263
Future Volume (vph)	1	87	796	14	141	1263
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	100.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			1.00			
Frt	0.867		0.998			
Flt Protected	0.999				0.950	
Satd. Flow (prot)	1530	0	1763	0	1712	1784
Flt Permitted	0.999				0.321	
Satd. Flow (perm)	1530	0	1763	0	578	1784
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	87		2			
Link Speed (k/h)	50		80			80
Link Distance (m)	387.6		283.0			234.8
Travel Time (s)	27.9		12.7			10.6
Confl. Bikes (#/hr)				2		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	4%	3%	3%	2%	1%	2%
Adj. Flow (vph)	1	87	796	14	141	1263
Shared Lane Traffic (%)						
Lane Group Flow (vph)	88	0	810	0	141	1263
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.5		25.0		24.0	24.0
Total Split (s)	27.5		97.5		97.5	97.5
Total Split (%)	22.0%		78.0%		78.0%	78.0%
Maximum Green (s)	22.0		91.6		91.6	91.6
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.9		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.5		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	15.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	10.9		89.5		89.5	89.5
Actuated g/C Ratio	0.10		0.85		0.85	0.85
v/c Ratio	0.37		0.54		0.29	0.83

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Control Delay	16.1		4.9		4.3	12.9
Queue Delay	0.0		0.0		0.0	0.0
Total Delay	16.1		4.9		4.3	12.9
LOS	B		A		A	B
Approach Delay	16.1		4.9			12.1
Approach LOS	B		A			B
Queue Length 50th (m)	0.2		44.9		5.6	130.0
Queue Length 95th (m)	14.1		65.9		11.5	226.1
Internal Link Dist (m)	363.6		259.0			210.8
Turn Bay Length (m)					100.0	
Base Capacity (vph)	412		1502		492	1519
Starvation Cap Reductn	0		0		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.21		0.54		0.29	0.83

Intersection Summary			
Area Type:	Other		
Cycle Length: 125			
Actuated Cycle Length: 105			
Natural Cycle: 110			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 9.7		Intersection LOS: A	
Intersection Capacity Utilization 88.0%		ICU Level of Service E	
Analysis Period (min) 15			

Splits and Phases: 3: River Road & Summerhill St

Intersection	
Int Delay, s/veh	4.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	165	645	6	218	1047
Future Vol, veh/h	7	165	645	6	218	1047
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	165	645	6	218	1047

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2131	648	0	0	651	0
Stage 1	648	-	-	-	-	-
Stage 2	1483	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	54	470	-	-	935	-
Stage 1	521	-	-	-	-	-
Stage 2	208	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	24	470	-	-	935	-
Mov Cap-2 Maneuver	24	-	-	-	-	-
Stage 1	521	-	-	-	-	-
Stage 2	92	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	39.7	0	1.7
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	268	935	-
HCM Lane V/C Ratio	-	-	0.642	0.233	-
HCM Control Delay (s)	-	-	39.7	10	0
HCM Lane LOS	-	-	E	B	A
HCM 95th %tile Q(veh)	-	-	4	0.9	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	7	165	645	6	218	1051
Future Volume (vph)	7	165	645	6	218	1051
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	85.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.870		0.999			
Flt Protected	0.998				0.950	
Satd. Flow (prot)	1549	0	1783	0	1695	1784
Flt Permitted	0.998				0.364	
Satd. Flow (perm)	1549	0	1783	0	649	1784
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	165		1			
Link Speed (k/h)	50		80			80
Link Distance (m)	405.6		295.0			283.0
Travel Time (s)	29.2		13.3			12.7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	7	165	645	6	218	1051
Shared Lane Traffic (%)						
Lane Group Flow (vph)	172	0	651	0	218	1051
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.5		23.9		23.9	23.9
Total Split (s)	27.5		92.5		92.5	92.5
Total Split (%)	22.9%		77.1%		77.1%	77.1%
Maximum Green (s)	22.0		86.6		86.6	86.6
Yellow Time (s)	3.6		5.0		5.0	5.0
All-Red Time (s)	1.9		0.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.5		5.9		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	15.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	10.9		52.2		52.2	52.2
Actuated g/C Ratio	0.15		0.70		0.70	0.70
v/c Ratio	0.47		0.52		0.48	0.85
Control Delay	12.1		6.8		8.9	15.7
Queue Delay	0.0		0.0		0.0	0.5

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	12.1		6.8		8.9	16.2
LOS	B		A		A	B
Approach Delay	12.1		6.8			15.0
Approach LOS	B		A			B
Queue Length 50th (m)	0.7		30.7		9.9	76.7
Queue Length 95th (m)	18.9		53.1		23.1	141.1
Internal Link Dist (m)	381.6		271.0			259.0
Turn Bay Length (m)					85.0	
Base Capacity (vph)	588		1713		623	1714
Starvation Cap Reductn	0		0		0	280
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.29		0.38		0.35	0.73

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 75			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 12.2		Intersection LOS: B	
Intersection Capacity Utilization 79.1%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 4: River Road & Borbridge Avenue

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	18	0	2	0	0	16	3	613	0	29	995	29
Future Vol, veh/h	18	0	2	0	0	16	3	613	0	29	995	29
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	0	2	0	0	16	3	613	0	29	995	29

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1695	1687	1010	1688	1701	613	1024	0	0	613	0	0
Stage 1	1068	1068	-	619	619	-	-	-	-	-	-	-
Stage 2	627	619	-	1069	1082	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	73	94	291	74	92	492	678	-	-	966	-	-
Stage 1	268	298	-	476	480	-	-	-	-	-	-	-
Stage 2	471	480	-	268	294	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	66	87	291	69	85	492	678	-	-	966	-	-
Mov Cap-2 Maneuver	66	87	-	69	85	-	-	-	-	-	-	-
Stage 1	266	277	-	473	477	-	-	-	-	-	-	-
Stage 2	452	477	-	248	273	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	73.2	12.6	0.1	0.2
HCM LOS	F	B		

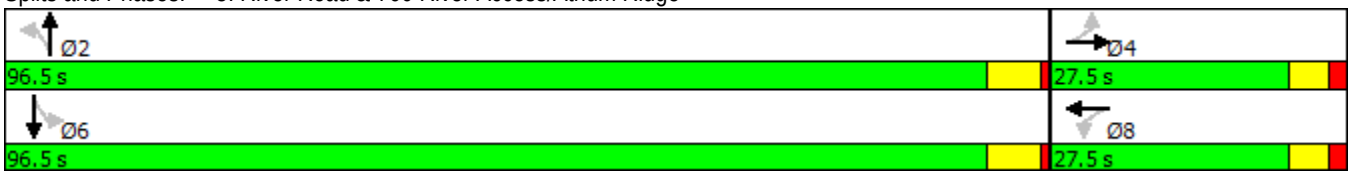
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	678	-	-	72	492	966	-	-
HCM Lane V/C Ratio	0.004	-	-	0.278	0.033	0.03	-	-
HCM Control Delay (s)	10.3	0	-	73.2	12.6	8.8	0	-
HCM Lane LOS	B	A	-	F	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1	0.1	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	18	0	2	0	0	16	3	613	0	29	995	29
Future Volume (vph)	18	0	2	0	0	16	3	613	0	29	995	29
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	10.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.865						0.996	
Flt Protected		0.957								0.950		
Satd. Flow (prot)	0	1684	0	0	1543	0	0	1784	0	1695	1777	0
Flt Permitted								0.997		0.470		
Satd. Flow (perm)	0	1759	0	0	1543	0	0	1779	0	839	1777	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			368						3	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		345.9			387.3			489.9			295.0	
Travel Time (s)		24.9			27.9			22.0			13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	18	0	2	0	0	16	3	613	0	29	995	29
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	20	0	0	16	0	0	616	0	29	1024	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	27.5	27.5		27.5	27.5		24.0	24.0		24.0	24.0	
Total Split (s)	27.5	27.5		27.5	27.5		96.5	96.5		96.5	96.5	
Total Split (%)	22.2%	22.2%		22.2%	22.2%		77.8%	77.8%		77.8%	77.8%	
Maximum Green (s)	22.0	22.0		22.0	22.0		90.6	90.6		90.6	90.6	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.9	1.9		1.9	1.9		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5			5.5			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		11.8			11.8			54.3		54.3	54.3	
Actuated g/C Ratio		0.20			0.20			0.90		0.90	0.90	
v/c Ratio		0.05			0.03			0.38		0.04	0.64	
Control Delay		13.3			0.1			2.9		2.2	5.8	
Queue Delay		0.0			0.0			0.0		0.0	0.0	

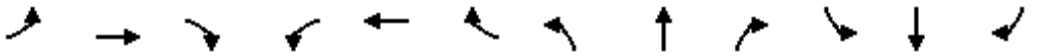
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		13.3			0.1			2.9		2.2	5.8	
LOS		B			A			A		A	A	
Approach Delay		13.3			0.1			2.9			5.7	
Approach LOS		B			A			A			A	
Queue Length 50th (m)		0.0			0.0			0.0		0.0	0.0	
Queue Length 95th (m)		5.2			0.0			41.6		2.5	113.7	
Internal Link Dist (m)		321.9			363.3			465.9			271.0	
Turn Bay Length (m)										10.0		
Base Capacity (vph)		778			878			1759		829	1757	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.03			0.02			0.35		0.03	0.58	

Intersection Summary			
Area Type:	Other		
Cycle Length: 124			
Actuated Cycle Length: 60			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 4.7		Intersection LOS: A	
Intersection Capacity Utilization 75.0%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 5: River Road & 760 River Access/Atrium Ridge



Future (2021) Total Traffic

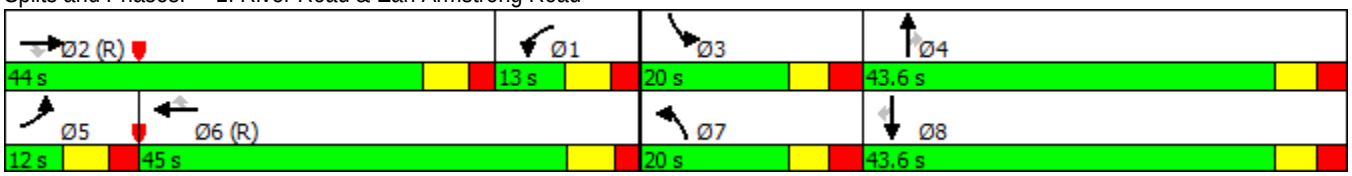


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	639	1023	121	103	973	110	346	473	227	42	116	228
Future Volume (vph)	639	1023	121	103	973	110	346	473	227	42	116	228
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.99			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3321	3357	1419	3077	3262	1502	3164	3390	1517	2795	3202	1502
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3319	3357	1419	3077	3262	1482	3164	3390	1497	2793	3202	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			155			155			215			215
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			143.7			387.0	
Travel Time (s)		22.5			28.0			8.6			23.2	
Confl. Peds. (#/hr)	1					1			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	3%	9%	9%	6%	3%	6%	2%	2%	20%	8%	3%
Adj. Flow (vph)	639	1023	121	103	973	110	346	473	227	42	116	228
Shared Lane Traffic (%)												
Lane Group Flow (vph)	639	1023	121	103	973	110	346	473	227	42	116	228
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	35.1	35.1	11.8	35.1	35.1	11.8	43.6	43.6	11.8	43.6	43.6
Total Split (s)	12.0	44.0	44.0	13.0	45.0	45.0	20.0	43.6	43.6	20.0	43.6	43.6
Total Split (%)	10.0%	36.5%	36.5%	10.8%	37.3%	37.3%	16.6%	36.2%	36.2%	16.6%	36.2%	36.2%
Maximum Green (s)	5.2	37.5	37.5	6.2	38.5	38.5	13.3	37.0	37.0	13.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	25.0	56.3	56.3	6.7	37.9	37.9	13.9	26.3	26.3	7.2	17.2	17.2
Actuated g/C Ratio	0.21	0.47	0.47	0.06	0.31	0.31	0.12	0.22	0.22	0.06	0.14	0.14
v/c Ratio	0.93	0.65	0.16	0.61	0.95	0.19	0.95	0.64	0.46	0.25	0.25	0.57

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	68.5	28.0	2.0	71.3	58.8	2.2	90.3	47.6	9.3	57.2	45.5	12.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	68.5	28.0	2.0	71.3	58.8	2.2	90.3	47.6	9.3	57.2	45.5	12.8
LOS	E	C	A	E	E	A	F	D	A	E	D	B
Approach Delay		40.8			54.6			53.4			27.5	
Approach LOS		D			D			D			C	
Queue Length 50th (m)	70.9	86.0	0.0	11.5	108.0	0.0	39.4	51.4	2.2	4.5	12.0	2.5
Queue Length 95th (m)	#129.3	122.6	5.7	#22.4	#145.0	4.4	#67.2	63.2	20.2	9.8	18.5	21.8
Internal Link Dist (m)		413.3			520.9			119.7			363.0	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	688	1566	744	170	1041	578	363	1040	608	308	982	609
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.93	0.65	0.16	0.61	0.93	0.19	0.95	0.45	0.37	0.14	0.12	0.37

Intersection Summary			
Area Type:	Other		
Cycle Length: 120.6			
Actuated Cycle Length: 120.6			
Offset: 63 (52%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.95			
Intersection Signal Delay: 46.3		Intersection LOS: D	
Intersection Capacity Utilization 83.2%		ICU Level of Service E	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	6	2	1	1194	386	8
Future Vol, veh/h	6	2	1	1194	386	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	2	1	1194	386	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1586	390	394	0	-	0
Stage 1	390	-	-	-	-	-
Stage 2	1196	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	119	658	1165	-	-	-
Stage 1	684	-	-	-	-	-
Stage 2	287	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	119	658	1165	-	-	-
Mov Cap-2 Maneuver	119	-	-	-	-	-
Stage 1	684	-	-	-	-	-
Stage 2	286	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	30.3	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1165	-	150	-	-
HCM Lane V/C Ratio	0.001	-	0.053	-	-
HCM Control Delay (s)	8.1	0	30.3	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

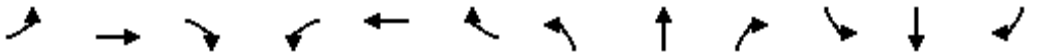
Intersection	
Int Delay, s/veh	18.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	31	5	2	24	5	203	1	959	15	33	348	8
Future Vol, veh/h	31	5	2	24	5	203	1	959	15	33	348	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	1000	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	4	0	3	0	4	8	3	9	0
Mvmt Flow	31	5	2	24	5	203	1	959	15	33	348	8

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1491	1394	352	1391	1391	967	356	0	0	974	0	0
Stage 1	418	418	-	969	969	-	-	-	-	-	-	-
Stage 2	1073	976	-	422	422	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.14	6.5	6.23	4.1	-	-	4.13	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.14	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.14	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.536	4	3.327	2.2	-	-	2.227	-	-
Pot Cap-1 Maneuver	103	143	696	118	143	307	1214	-	-	704	-	-
Stage 1	616	594	-	302	334	-	-	-	-	-	-	-
Stage 2	269	332	-	605	592	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	33	136	696	110	136	307	1214	-	-	704	-	-
Mov Cap-2 Maneuver	33	136	-	110	136	-	-	-	-	-	-	-
Stage 1	615	566	-	301	333	-	-	-	-	-	-	-
Stage 2	90	331	-	570	564	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	292.8	79.4	0	0.9
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1214	-	-	39	253	704	-	-
HCM Lane V/C Ratio	0.001	-	-	0.974	0.917	0.047	-	-
HCM Control Delay (s)	8	-	-	292.8	79.4	10.4	-	-
HCM Lane LOS	A	-	-	F	F	B	-	-
HCM 95th %tile Q(veh)	0	-	-	3.7	8.1	0.1	-	-

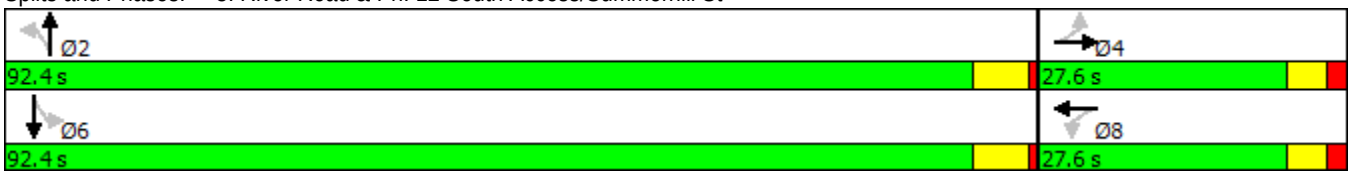


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	5	2	24	5	203	1	959	15	33	348	8
Future Volume (vph)	31	5	2	24	5	203	1	959	15	33	348	8
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	100.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993			0.882			0.998			0.997	
Flt Protected		0.961			0.995					0.950		
Satd. Flow (prot)	0	1737	0	0	1550	0	0	1746	0	1679	1668	0
Flt Permitted		0.561			0.963					0.292		
Satd. Flow (perm)	0	1014	0	0	1500	0	0	1746	0	516	1668	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			191			2			2	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		291.0			387.6			297.0			234.8	
Travel Time (s)		21.0			27.9			13.4			10.6	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	4%	0%	3%	0%	4%	8%	3%	9%	0%
Adj. Flow (vph)	31	5	2	24	5	203	1	959	15	33	348	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	38	0	0	232	0	0	975	0	33	356	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	27.5	27.5		27.5	27.5		23.9	23.9		23.9	23.9	
Total Split (s)	27.6	27.6		27.6	27.6		92.4	92.4		92.4	92.4	
Total Split (%)	23.0%	23.0%		23.0%	23.0%		77.0%	77.0%		77.0%	77.0%	
Maximum Green (s)	22.1	22.1		22.1	22.1		86.5	86.5		86.5	86.5	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.9	1.9		1.9	1.9		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5			5.5			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		12.1			12.1			44.0		44.0	44.0	
Actuated g/C Ratio		0.18			0.18			0.64		0.64	0.64	
v/c Ratio		0.21			0.55			0.87		0.10	0.33	
Control Delay		33.1			14.4			18.8		4.9	5.9	
Queue Delay		0.0			0.0			0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		33.1			14.4			18.8		4.9	5.9	
LOS		C			B			B		A	A	
Approach Delay		33.1			14.4			18.8			5.8	
Approach LOS		C			B			B			A	
Queue Length 50th (m)		3.2			3.6			66.0		1.1	13.5	
Queue Length 95th (m)		15.0			28.3			152.2		4.2	31.0	
Internal Link Dist (m)		267.0			363.6			273.0			210.8	
Turn Bay Length (m)										100.0		
Base Capacity (vph)		356			649			1675		495	1601	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.11			0.36			0.58		0.07	0.22	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 68.4			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.87			
Intersection Signal Delay: 15.4		Intersection LOS: B	
Intersection Capacity Utilization 79.0%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 3: River Road & Ph. 12 South Access/Summerhill St



Intersection	
Int Delay, s/veh	2.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	120	855	7	55	319
Future Vol, veh/h	3	120	855	7	55	319
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	120	855	7	55	319

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1288	859	0	0	862	0
Stage 1	859	-	-	-	-	-
Stage 2	429	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	181	356	-	-	780	-
Stage 1	415	-	-	-	-	-
Stage 2	657	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	165	356	-	-	780	-
Mov Cap-2 Maneuver	165	-	-	-	-	-
Stage 1	415	-	-	-	-	-
Stage 2	600	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21	0	1.5
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	346	780	-
HCM Lane V/C Ratio	-	-	0.355	0.071	-
HCM Control Delay (s)	-	-	21	10	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.6	0.2	-

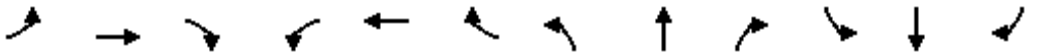
Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	20	5	2	0	5	6	1	836	0	3	307	12
Future Vol, veh/h	20	5	2	0	5	6	1	836	0	3	307	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	20	5	2	0	5	6	1	836	0	3	307	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1163	1157	313	1161	1163	836	319	0	0	836	0	0
Stage 1	319	319	-	838	838	-	-	-	-	-	-	-
Stage 2	844	838	-	323	325	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	172	196	727	172	195	367	1241	-	-	798	-	-
Stage 1	693	653	-	361	382	-	-	-	-	-	-	-
Stage 2	358	382	-	689	649	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	165	195	727	167	194	367	1241	-	-	798	-	-
Mov Cap-2 Maneuver	165	195	-	167	194	-	-	-	-	-	-	-
Stage 1	692	650	-	360	381	-	-	-	-	-	-	-
Stage 2	347	381	-	678	646	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	28.5	19.4	0	0.1
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1241	-	-	180	261	798	-	-
HCM Lane V/C Ratio	0.001	-	-	0.15	0.042	0.004	-	-
HCM Control Delay (s)	7.9	0	-	28.5	19.4	9.5	0	-
HCM Lane LOS	A	A	-	D	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.5	0.1	0	-	-



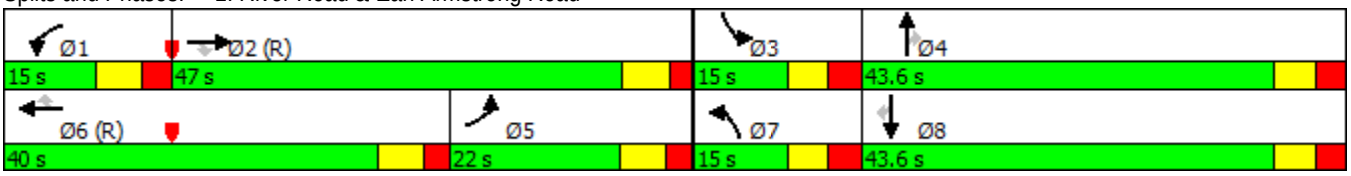
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	418	1097	411	249	1105	41	234	224	165	58	362	813
Future Volume (vph)	418	1097	411	249	1105	41	234	224	165	58	362	813
Ideal Flow (vphpl)	2000	1800	1800	1800	2200	1800	2000	1800	1800	1800	1800	2400
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.98			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3654	3325	1502	3288	4103	1446	3584	3357	1369	3257	3458	2063
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3649	3325	1502	3288	4103	1423	3584	3357	1351	3253	3458	2063
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			332			155			215			334
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			137.6			357.4	
Travel Time (s)		22.5			28.0			8.3			21.4	
Confl. Peds. (#/hr)	3					3			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	4%	3%	2%	3%	7%	4%	3%	13%	3%	0%	0%
Adj. Flow (vph)	418	1097	411	249	1105	41	234	224	165	58	362	813
Shared Lane Traffic (%)												
Lane Group Flow (vph)	418	1097	411	249	1105	41	234	224	165	58	362	813
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	22.0	47.0	47.0	15.0	40.0	40.0	15.0	43.6	43.6	15.0	43.6	43.6
Total Split (%)	18.2%	39.0%	39.0%	12.4%	33.2%	33.2%	12.4%	36.2%	36.2%	12.4%	36.2%	36.2%
Maximum Green (s)	15.2	40.5	40.5	8.2	33.5	33.5	8.3	37.0	37.0	8.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	15.2	40.5	40.5	9.4	34.7	34.7	8.3	39.2	39.2	7.3	35.8	35.8
Actuated g/C Ratio	0.13	0.34	0.34	0.08	0.29	0.29	0.07	0.33	0.33	0.06	0.30	0.30
v/c Ratio	0.91	0.98	0.57	0.97	0.94	0.08	0.95	0.21	0.28	0.29	0.35	0.96

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	76.7	63.2	10.1	104.9	57.1	0.3	102.2	30.8	2.7	57.7	34.2	47.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	76.7	63.2	10.1	104.9	57.1	0.3	102.2	30.8	2.7	57.7	34.2	47.4
LOS	E	E	B	F	E	A	F	C	A	E	C	D
Approach Delay		54.8			64.0			50.2			44.0	
Approach LOS		D			E			D			D	
Queue Length 50th (m)	47.0	124.2	12.0	~32.1	125.5	0.0	26.7	18.8	0.0	6.3	32.1	112.9
Queue Length 95th (m)	#72.8	#166.5	39.2	#56.1	#165.7	0.0	#49.2	28.3	5.8	12.4	44.3	#186.8
Internal Link Dist (m)		413.3			520.9			113.6			333.4	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	460	1116	724	257	1181	520	246	1091	584	224	1060	864
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.91	0.98	0.57	0.97	0.94	0.08	0.95	0.21	0.28	0.26	0.34	0.94

Intersection Summary

Area Type: Other
Cycle Length: 120.6
Actuated Cycle Length: 120.6
Offset: 47 (39%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 54.1 Intersection LOS: D
Intersection Capacity Utilization 89.1% 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: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	4	1	2	652	1096	19
Future Vol, veh/h	4	1	2	652	1096	19
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	1	2	652	1096	19

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1762	1106	1115	0	-	0
Stage 1	1106	-	-	-	-	-
Stage 2	656	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	93	256	626	-	-	-
Stage 1	317	-	-	-	-	-
Stage 2	516	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	93	256	626	-	-	-
Mov Cap-2 Maneuver	93	-	-	-	-	-
Stage 1	317	-	-	-	-	-
Stage 2	513	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	40.3	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	626	-	107	-	-
HCM Lane V/C Ratio	0.003	-	0.047	-	-
HCM Control Delay (s)	10.8	0	40.3	-	-
HCM Lane LOS	B	A	E	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕		↰	↕	
Traffic Vol, veh/h	20	5	1	5	5	87	2	548	14	141	937	19
Future Vol, veh/h	20	5	1	5	5	87	2	548	14	141	937	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	1000	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	0	0	0	4	0	3	0	3	2	1	2	0
Mvmt Flow	20	5	1	5	5	87	2	548	14	141	937	19

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1834	1795	947	1791	1797	555	956	0	0	562	0	0
Stage 1	1229	1229	-	559	559	-	-	-	-	-	-	-
Stage 2	605	566	-	1232	1238	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.14	6.5	6.23	4.1	-	-	4.11	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.14	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.14	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.536	4	3.327	2.2	-	-	2.209	-	-
Pot Cap-1 Maneuver	59	81	319	62	81	529	727	-	-	1014	-	-
Stage 1	220	252	-	510	514	-	-	-	-	-	-	-
Stage 2	488	511	-	215	250	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	42	69	319	52	69	529	727	-	-	1014	-	-
Mov Cap-2 Maneuver	42	69	-	52	69	-	-	-	-	-	-	-
Stage 1	219	217	-	508	512	-	-	-	-	-	-	-
Stage 2	402	509	-	180	215	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	151.9	23.4	0	1.2
HCM LOS	F	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	727	-	-	47	291	1014	-	-
HCM Lane V/C Ratio	0.003	-	-	0.553	0.333	0.139	-	-
HCM Control Delay (s)	10	0	-	151.9	23.4	9.1	-	-
HCM Lane LOS	A	A	-	F	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	2.1	1.4	0.5	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	5	1	5	5	87	2	548	14	141	937	19
Future Volume (vph)	20	5	1	5	5	87	2	548	14	141	937	19
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	100.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			1.00	
Frt		0.995			0.879			0.997			0.997	
Flt Protected		0.963			0.997					0.950		
Satd. Flow (prot)	0	1744	0	0	1550	0	0	1761	0	1712	1779	0
Flt Permitted		0.827			0.981			0.998		0.476		
Satd. Flow (perm)	0	1498	0	0	1525	0	0	1758	0	858	1779	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			87			3			2	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		330.9			387.6			283.0			234.8	
Travel Time (s)		23.8			27.9			12.7			10.6	
Confl. Bikes (#/hr)									2			1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	4%	0%	3%	0%	3%	2%	1%	2%	0%
Adj. Flow (vph)	20	5	1	5	5	87	2	548	14	141	937	19
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	26	0	0	97	0	0	564	0	141	956	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	27.5	27.5		27.5	27.5		23.9	23.9		23.9	23.9	
Total Split (s)	27.5	27.5		27.5	27.5		92.5	92.5		92.5	92.5	
Total Split (%)	22.9%	22.9%		22.9%	22.9%		77.1%	77.1%		77.1%	77.1%	
Maximum Green (s)	22.0	22.0		22.0	22.0		86.6	86.6		86.6	86.6	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.9	1.9		1.9	1.9		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5			5.5			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		10.5			10.5			47.5		47.5	47.5	
Actuated g/C Ratio		0.16			0.16			0.74		0.74	0.74	
v/c Ratio		0.11			0.30			0.43		0.22	0.72	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay		27.6			11.9			5.8		5.1	10.8	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		27.6			11.9			5.8		5.1	10.8	
LOS		C			B			A		A	B	
Approach Delay		27.6			11.9			5.8			10.0	
Approach LOS		C			B			A			B	
Queue Length 50th (m)		2.2			0.9			24.7		5.1	61.9	
Queue Length 95th (m)		9.6			13.2			40.4		10.8	106.5	
Internal Link Dist (m)		306.9			363.6			259.0			210.8	
Turn Bay Length (m)										100.0		
Base Capacity (vph)		536			601			1758		858	1779	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.05			0.16			0.32		0.16	0.54	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 63.8			
Natural Cycle: 80			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.72			
Intersection Signal Delay: 9.0		Intersection LOS: A	
Intersection Capacity Utilization 107.5%		ICU Level of Service G	
Analysis Period (min) 15			

Splits and Phases: 3: River Road & Phase 12 South Access/Summerhill St

Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	90	473	6	121	822
Future Vol, veh/h	7	90	473	6	121	822
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	850	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	90	473	6	121	822

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1540	476	0	0	479	0
Stage 1	476	-	-	-	-	-
Stage 2	1064	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	127	589	-	-	1083	-
Stage 1	625	-	-	-	-	-
Stage 2	332	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	113	589	-	-	1083	-
Mov Cap-2 Maneuver	113	-	-	-	-	-
Stage 1	625	-	-	-	-	-
Stage 2	295	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.1	0	1.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	452	1083	-
HCM Lane V/C Ratio	-	-	0.215	0.112	-
HCM Control Delay (s)	-	-	15.1	8.7	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.4	-

Intersection	
Int Delay, s/veh	0.9

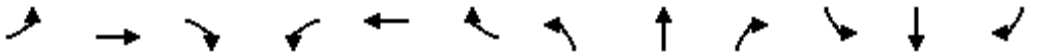
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	18	5	2	0	5	5	2	456	0	7	802	21
Future Vol, veh/h	18	5	2	0	5	5	2	456	0	7	802	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	5	2	0	5	5	2	456	0	7	802	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1292	1287	813	1290	1297	456	823	0	0	456	0	0
Stage 1	827	827	-	460	460	-	-	-	-	-	-	-
Stage 2	465	460	-	830	837	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	140	164	378	140	162	604	807	-	-	1105	-	-
Stage 1	366	386	-	581	566	-	-	-	-	-	-	-
Stage 2	578	566	-	364	382	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	135	162	378	135	160	604	807	-	-	1105	-	-
Mov Cap-2 Maneuver	135	162	-	135	160	-	-	-	-	-	-	-
Stage 1	365	384	-	579	564	-	-	-	-	-	-	-
Stage 2	566	564	-	355	380	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	34.2	19.8	0	0.1
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	807	-	-	148	253	1105	-	-
HCM Lane V/C Ratio	0.002	-	-	0.169	0.04	0.006	-	-
HCM Control Delay (s)	9.5	0	-	34.2	19.8	8.3	-	-
HCM Lane LOS	A	A	-	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.6	0.1	0	-	-

Future (2024) Total Traffic



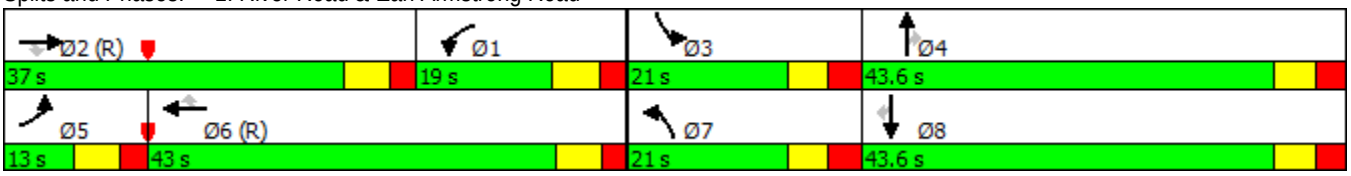
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	649	1053	130	134	989	111	368	550	300	43	147	232
Future Volume (vph)	649	1053	130	134	989	111	368	550	300	43	147	232
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.99			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3321	3357	1419	3077	3262	1502	3164	3390	1517	2795	3202	1502
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3319	3357	1419	3077	3262	1482	3164	3390	1497	2793	3202	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			155			155			215			215
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			130.3			387.0	
Travel Time (s)		22.5			28.0			7.8			23.2	
Confl. Peds. (#/hr)	1					1			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	3%	9%	9%	6%	3%	6%	2%	2%	20%	8%	3%
Adj. Flow (vph)	649	1053	130	134	989	111	368	550	300	43	147	232
Shared Lane Traffic (%)												
Lane Group Flow (vph)	649	1053	130	134	989	111	368	550	300	43	147	232
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	35.1	35.1	11.8	35.1	35.1	11.8	43.6	43.6	11.8	43.6	43.6
Total Split (s)	13.0	37.0	37.0	19.0	43.0	43.0	21.0	43.6	43.6	21.0	43.6	43.6
Total Split (%)	10.8%	30.7%	30.7%	15.8%	35.7%	35.7%	17.4%	36.2%	36.2%	17.4%	36.2%	36.2%
Maximum Green (s)	6.2	30.5	30.5	12.2	36.5	36.5	14.3	37.0	37.0	14.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	23.4	47.7	47.7	12.2	36.5	36.5	14.3	29.2	29.2	7.3	19.8	19.8
Actuated g/C Ratio	0.19	0.40	0.40	0.10	0.30	0.30	0.12	0.24	0.24	0.06	0.16	0.16
v/c Ratio	1.01	0.79	0.20	0.43	1.00	0.20	0.98	0.67	0.57	0.25	0.28	0.54

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	86.0	38.7	3.5	55.6	71.4	2.4	95.2	45.7	16.1	57.2	43.7	11.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	86.0	38.7	3.5	55.6	71.4	2.4	95.2	45.7	16.1	57.2	43.7	11.8
LOS	F	D	A	E	E	A	F	D	B	E	D	B
Approach Delay		53.0			63.5			53.4			27.5	
Approach LOS		D			E			D			C	
Queue Length 50th (m)	73.6	104.7	0.0	14.3	~113.7	0.0	41.8	59.1	15.4	4.6	15.0	3.2
Queue Length 95th (m)	#140.0	#162.2	8.3	23.6	#155.5	4.7	#69.7	70.4	38.5	10.0	21.6	21.7
Internal Link Dist (m)		413.3			520.9			106.3			363.0	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	644	1328	655	311	987	556	375	1040	608	331	982	609
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.01	0.79	0.20	0.43	1.00	0.20	0.98	0.53	0.49	0.13	0.15	0.38

Intersection Summary

Area Type: Other
Cycle Length: 120.6
Actuated Cycle Length: 120.6
Offset: 63 (52%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.01
Intersection Signal Delay: 53.5 Intersection LOS: D
Intersection Capacity Utilization 91.3% 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: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	14	5	2	1348	426	25
Future Vol, veh/h	14	5	2	1348	426	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	5	2	1348	426	25

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1791	439	451	0	-	0
Stage 1	439	-	-	-	-	-
Stage 2	1352	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	89	618	1109	-	-	-
Stage 1	650	-	-	-	-	-
Stage 2	241	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	88	618	1109	-	-	-
Mov Cap-2 Maneuver	88	-	-	-	-	-
Stage 1	650	-	-	-	-	-
Stage 2	239	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	42.8	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1109	-	114	-	-
HCM Lane V/C Ratio	0.002	-	0.167	-	-
HCM Control Delay (s)	8.3	0	42.8	-	-
HCM Lane LOS	A	A	E	-	-
HCM 95th %tile Q(veh)	0	-	0.6	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	0	5	24	0	203	2	1078	15	33	403	7
Future Volume (vph)	68	0	5	24	0	203	2	1078	15	33	403	7
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	100.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.991			0.879			0.998			0.997	
Flt Protected		0.955			0.995					0.950		
Satd. Flow (prot)	0	1722	0	0	1544	0	0	1746	0	1679	1667	0
Flt Permitted		0.382			0.958					0.262		
Satd. Flow (perm)	0	689	0	0	1486	0	0	1746	0	463	1667	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			144			1			2	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		318.2			387.6			297.0			234.8	
Travel Time (s)		22.9			27.9			13.4			10.6	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	4%	0%	3%	0%	4%	8%	3%	9%	0%
Adj. Flow (vph)	68	0	5	24	0	203	2	1078	15	33	403	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	73	0	0	227	0	0	1095	0	33	410	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	27.5	27.5		27.5	27.5		23.9	23.9		23.9	23.9	
Total Split (s)	30.0	30.0		30.0	30.0		90.0	90.0		90.0	90.0	
Total Split (%)	25.0%	25.0%		25.0%	25.0%		75.0%	75.0%		75.0%	75.0%	
Maximum Green (s)	24.5	24.5		24.5	24.5		84.1	84.1		84.1	84.1	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.9	1.9		1.9	1.9		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5			5.5			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		13.6			13.6			59.0		59.0	59.0	
Actuated g/C Ratio		0.16			0.16			0.69		0.69	0.69	
v/c Ratio		0.55			0.63			0.90		0.10	0.35	
Control Delay		44.5			24.3			22.3		5.1	6.0	
Queue Delay		0.0			0.0			0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		44.5			24.3			22.3		5.1	6.0	
LOS		D			C			C		A	A	
Approach Delay		44.5			24.3			22.3			5.9	
Approach LOS		D			C			C			A	
Queue Length 50th (m)		6.2			10.8			96.5		1.2	17.8	
Queue Length 95th (m)		23.5			39.2			#234.6		4.8	41.0	
Internal Link Dist (m)		294.2			363.6			273.0			210.8	
Turn Bay Length (m)										100.0		
Base Capacity (vph)		231			560			1579		419	1508	
Starvation Cap Reductn		0			0			4		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.32			0.41			0.70		0.08	0.27	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 84.9			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 19.5		Intersection LOS: B	
Intersection Capacity Utilization 95.5%		ICU Level of Service F	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: River Road & Phase 12 South Access/Summerhill St

Intersection	
Int Delay, s/veh	3.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	149	945	7	69	363
Future Vol, veh/h	3	149	945	7	69	363
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	850	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	149	945	7	69	363

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1450	949	0	0	952	0
Stage 1	949	-	-	-	-	-
Stage 2	501	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	144	316	-	-	722	-
Stage 1	376	-	-	-	-	-
Stage 2	609	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	130	316	-	-	722	-
Mov Cap-2 Maneuver	130	-	-	-	-	-
Stage 1	376	-	-	-	-	-
Stage 2	551	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.7	0	1.7
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	307	722	-
HCM Lane V/C Ratio	-	-	0.495	0.096	-
HCM Control Delay (s)	-	-	27.7	10.5	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	2.6	0.3	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	49	0	5	0	0	9	3	895	0	5	338	23
Future Vol, veh/h	49	0	5	0	0	9	3	895	0	5	338	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	100	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	49	0	5	0	0	9	3	895	0	5	338	23

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1266	1261	350	1263	1272	895	361	0	0	895	0	0
Stage 1	360	360	-	901	901	-	-	-	-	-	-	-
Stage 2	906	901	-	362	371	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	146	170	693	147	168	339	1198	-	-	758	-	-
Stage 1	658	626	-	333	357	-	-	-	-	-	-	-
Stage 2	331	357	-	657	620	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	141	168	693	145	166	339	1198	-	-	758	-	-
Mov Cap-2 Maneuver	141	168	-	145	166	-	-	-	-	-	-	-
Stage 1	655	622	-	331	355	-	-	-	-	-	-	-
Stage 2	321	355	-	648	616	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	41.2	15.9	0	0.1
HCM LOS	E	C		

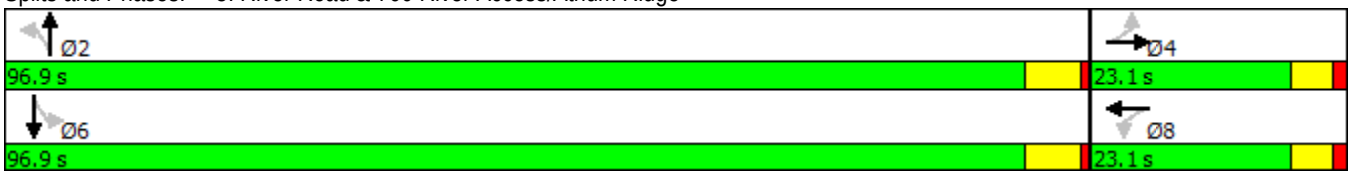
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1198	-	-	152	339	758	-	-
HCM Lane V/C Ratio	0.003	-	-	0.355	0.027	0.007	-	-
HCM Control Delay (s)	8	0	-	41.2	15.9	9.8	-	-
HCM Lane LOS	A	A	-	E	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	1.5	0.1	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	0	5	0	0	9	3	895	0	5	338	23
Future Volume (vph)	49	0	5	0	0	9	3	895	0	5	338	23
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	10.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.987			0.865						0.990	
Flt Protected		0.957								0.950		
Satd. Flow (prot)	0	1685	0	0	1543	0	0	1784	0	1695	1766	0
Flt Permitted		0.748						0.999		0.349		
Satd. Flow (perm)	0	1317	0	0	1543	0	0	1783	0	623	1766	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		26			234						8	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		345.9			387.3			489.9			281.0	
Travel Time (s)		24.9			27.9			22.0			12.6	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	49	0	5	0	0	9	3	895	0	5	338	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	54	0	0	9	0	0	898	0	5	361	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.1	23.1		23.1	23.1		23.9	23.9		23.9	23.9	
Total Split (s)	23.1	23.1		23.1	23.1		96.9	96.9		96.9	96.9	
Total Split (%)	19.3%	19.3%		19.3%	19.3%		80.8%	80.8%		80.8%	80.8%	
Maximum Green (s)	18.0	18.0		18.0	18.0		91.0	91.0		91.0	91.0	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.1			5.1			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		11.0			11.0			47.5		47.5	47.5	
Actuated g/C Ratio		0.19			0.19			0.82		0.82	0.82	
v/c Ratio		0.20			0.02			0.62		0.01	0.25	
Control Delay		19.4			0.1			7.4		3.2	3.6	
Queue Delay		0.0			0.0			0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		19.4			0.1			7.4		3.2	3.6	
LOS		B			A			A		A	A	
Approach Delay		19.4			0.1			7.4			3.6	
Approach LOS		B			A			A			A	
Queue Length 50th (m)		2.9			0.0			52.8		0.2	12.9	
Queue Length 95th (m)		11.9			0.0			89.9		0.9	21.7	
Internal Link Dist (m)		321.9			363.3			465.9			257.0	
Turn Bay Length (m)										10.0		
Base Capacity (vph)		462			676			1783		623	1766	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.12			0.01			0.50		0.01	0.20	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 58.1			
Natural Cycle: 70			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.62			
Intersection Signal Delay: 6.8		Intersection LOS: A	
Intersection Capacity Utilization 71.3%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 5: River Road & 760 River Access/Atrium Ridge

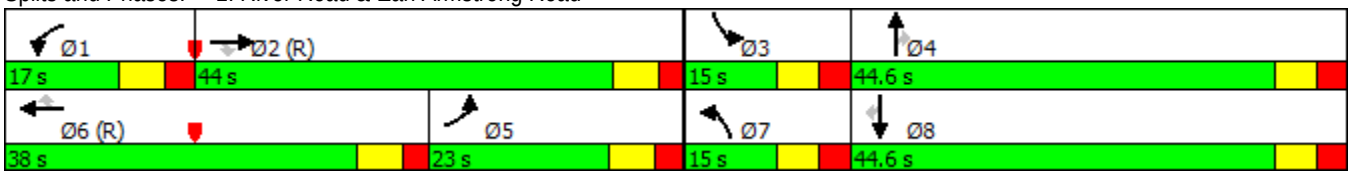


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	424	1116	434	320	1136	42	249	274	215	58	435	825
Future Volume (vph)	424	1116	434	320	1136	42	249	274	215	58	435	825
Ideal Flow (vphpl)	2000	1800	1800	1800	2200	1800	2000	1800	1800	1800	1800	2400
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.98			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3654	3325	1502	3288	4103	1446	3584	3357	1369	3257	3458	2063
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3649	3325	1502	3288	4103	1423	3584	3357	1351	3253	3458	2063
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			281			155			215			362
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			145.6			357.4	
Travel Time (s)		22.5			28.0			8.7			21.4	
Confl. Peds. (#/hr)	3					3			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	4%	3%	2%	3%	7%	4%	3%	13%	3%	0%	0%
Adj. Flow (vph)	424	1116	434	320	1136	42	249	274	215	58	435	825
Shared Lane Traffic (%)												
Lane Group Flow (vph)	424	1116	434	320	1136	42	249	274	215	58	435	825
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	23.0	44.0	44.0	17.0	38.0	38.0	15.0	44.6	44.6	15.0	44.6	44.6
Total Split (%)	19.1%	36.5%	36.5%	14.1%	31.5%	31.5%	12.4%	37.0%	37.0%	12.4%	37.0%	37.0%
Maximum Green (s)	16.2	37.5	37.5	10.2	31.5	31.5	8.3	38.0	38.0	8.3	38.0	38.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	16.2	37.5	37.5	11.9	33.2	33.2	8.3	39.8	39.8	7.3	36.3	36.3
Actuated g/C Ratio	0.13	0.31	0.31	0.10	0.28	0.28	0.07	0.33	0.33	0.06	0.30	0.30
v/c Ratio	0.87	1.08	0.66	0.99	1.01	0.08	1.01	0.25	0.37	0.29	0.42	0.94

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	69.6	92.1	17.4	102.6	72.6	0.3	116.2	30.7	5.9	57.7	34.7	42.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.6	92.1	17.4	102.6	72.6	0.3	116.2	30.7	5.9	57.7	34.7	42.6
LOS	E	F	B	F	E	A	F	C	A	E	C	D
Approach Delay		70.9			77.0			52.3			40.7	
Approach LOS		E			E			D			D	
Queue Length 50th (m)	47.3	~143.0	27.7	~42.3	~143.3	0.0	~28.8	23.1	0.0	6.3	39.0	107.8
Queue Length 95th (m)	#70.7	#180.7	61.2	#68.7	#181.2	0.0	#53.4	33.6	15.6	12.4	52.3	#181.1
Internal Link Dist (m)		413.3			520.9			121.6			333.4	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	490	1033	660	323	1128	503	246	1107	589	224	1089	897
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	1.08	0.66	0.99	1.01	0.08	1.01	0.25	0.37	0.26	0.40	0.92

Intersection Summary			
Area Type:	Other		
Cycle Length: 120.6			
Actuated Cycle Length: 120.6			
Offset: 91 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Green			
Natural Cycle: 125			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 1.08			
Intersection Signal Delay: 62.8		Intersection LOS: E	
Intersection Capacity Utilization 90.8%		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: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	3	4	757	1185	58
Future Vol, veh/h	8	3	4	757	1185	58
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	3	4	757	1185	58

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1979	1214	1243	0	-	0
Stage 1	1214	-	-	-	-	-
Stage 2	765	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	68	221	560	-	-	-
Stage 1	281	-	-	-	-	-
Stage 2	459	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	67	221	560	-	-	-
Mov Cap-2 Maneuver	67	-	-	-	-	-
Stage 1	281	-	-	-	-	-
Stage 2	453	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	54.9	0.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	560	-	83	-	-
HCM Lane V/C Ratio	0.007	-	0.133	-	-
HCM Control Delay (s)	11.5	0	54.9	-	-
HCM Lane LOS	B	A	F	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	42	5	3	5	5	87	4	632	14	141	1060	17
Future Volume (vph)	42	5	3	5	5	87	4	632	14	141	1060	17
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	100.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			1.00	
Frt		0.992			0.879			0.997			0.998	
Flt Protected		0.960			0.997					0.950		
Satd. Flow (prot)	0	1733	0	0	1550	0	0	1762	0	1712	1781	0
Flt Permitted		0.761			0.980			0.995		0.433		
Satd. Flow (perm)	0	1374	0	0	1524	0	0	1753	0	780	1781	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			87			2			2	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		330.9			387.6			283.0			234.8	
Travel Time (s)		23.8			27.9			12.7			10.6	
Confl. Bikes (#/hr)									2			1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	4%	0%	3%	0%	3%	2%	1%	2%	0%
Adj. Flow (vph)	42	5	3	5	5	87	4	632	14	141	1060	17
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	50	0	0	97	0	0	650	0	141	1077	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	27.5	27.5		27.5	27.5		26.5	26.5		26.5	26.5	
Total Split (s)	27.5	27.5		27.5	27.5		92.5	92.5		92.5	92.5	
Total Split (%)	22.9%	22.9%		22.9%	22.9%		77.1%	77.1%		77.1%	77.1%	
Maximum Green (s)	22.0	22.0		22.0	22.0		86.6	86.6		86.6	86.6	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.9	1.9		1.9	1.9		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5			5.5			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		11.1			11.1			58.8		58.8	58.8	
Actuated g/C Ratio		0.15			0.15			0.78		0.78	0.78	
v/c Ratio		0.25			0.33			0.48		0.23	0.78	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay		38.1			14.8			5.7		4.7	12.0	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		38.1			14.8			5.7		4.7	12.0	
LOS		D			B			A		A	B	
Approach Delay		38.1			14.8			5.7			11.1	
Approach LOS		D			B			A			B	
Queue Length 50th (m)		5.1			1.0			30.8		5.2	81.5	
Queue Length 95th (m)		19.7			15.7			52.6		11.5	148.6	
Internal Link Dist (m)		306.9			363.6			259.0			210.8	
Turn Bay Length (m)										100.0		
Base Capacity (vph)		427			532			1676		746	1703	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.12			0.18			0.39		0.19	0.63	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 75.7			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.78			
Intersection Signal Delay: 10.2		Intersection LOS: B	
Intersection Capacity Utilization 120.2%		ICU Level of Service H	
Analysis Period (min) 15			

Splits and Phases: 3: River Road & Phase 12 South Access/Summerhill St

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	111	539	6	151	912
Future Vol, veh/h	7	111	539	6	151	912
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	111	539	6	151	912

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1756	542	0	0	545	0
Stage 1	542	-	-	-	-	-
Stage 2	1214	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	93	540	-	-	1024	-
Stage 1	583	-	-	-	-	-
Stage 2	281	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	65	540	-	-	1024	-
Mov Cap-2 Maneuver	65	-	-	-	-	-
Stage 1	583	-	-	-	-	-
Stage 2	197	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.8	0	1.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	377	1024	-
HCM Lane V/C Ratio	-	-	0.313	0.147	-
HCM Control Delay (s)	-	-	18.8	9.1	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.3	0.5	-

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	37	0	4	0	0	7	6	501	0	9	860	50
Future Vol, veh/h	37	0	4	0	0	7	6	501	0	9	860	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	100	100	100	100	100	100	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	37	0	4	0	0	7	6	501	0	9	860	50

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1420	1416	885	1418	1441	501	910	0	0	501	0	0
Stage 1	903	903	-	513	513	-	-	-	-	-	-	-
Stage 2	517	513	-	905	928	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	114	137	344	114	133	570	748	-	-	1063	-	-
Stage 1	332	356	-	544	536	-	-	-	-	-	-	-
Stage 2	541	536	-	331	347	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	110	133	344	110	129	570	748	-	-	1063	-	-
Mov Cap-2 Maneuver	110	133	-	110	129	-	-	-	-	-	-	-
Stage 1	328	350	-	538	530	-	-	-	-	-	-	-
Stage 2	528	530	-	322	341	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	50.9	11.4	0.1	0.1
HCM LOS	F	B		

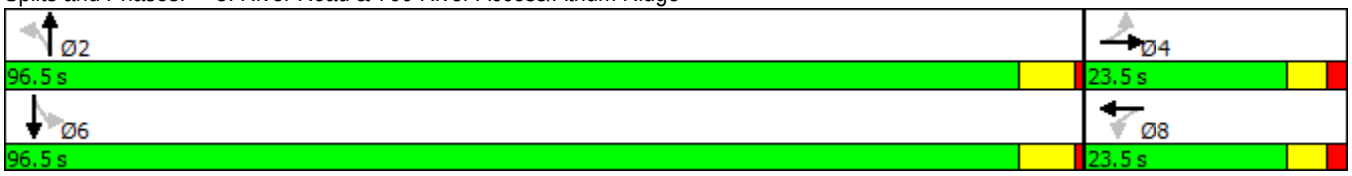
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	748	-	-	118	570	1063	-	-
HCM Lane V/C Ratio	0.008	-	-	0.347	0.012	0.008	-	-
HCM Control Delay (s)	9.9	0	-	50.9	11.4	8.4	0	-
HCM Lane LOS	A	A	-	F	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	1.4	0	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	5	4	0	5	7	6	501	0	9	860	50
Future Volume (vph)	37	5	4	0	5	7	6	501	0	9	860	50
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	10.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.988			0.921						0.992	
Flt Protected		0.961						0.999		0.950		
Satd. Flow (prot)	0	1694	0	0	1643	0	0	1783	0	1695	1770	0
Flt Permitted		0.760						0.991		0.516		
Satd. Flow (perm)	0	1340	0	0	1643	0	0	1768	0	921	1770	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			7						7	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		345.9			387.3			489.9			295.0	
Travel Time (s)		24.9			27.9			22.0			13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	37	5	4	0	5	7	6	501	0	9	860	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	46	0	0	12	0	0	507	0	9	910	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.5	23.5		23.5	23.5		24.0	24.0		24.0	24.0	
Total Split (s)	23.5	23.5		23.5	23.5		96.5	96.5		96.5	96.5	
Total Split (%)	19.6%	19.6%		19.6%	19.6%		80.4%	80.4%		80.4%	80.4%	
Maximum Green (s)	18.0	18.0		18.0	18.0		90.6	90.6		90.6	90.6	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.9	1.9		1.9	1.9		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5			5.5			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		11.2			11.2			49.7		49.7	49.7	
Actuated g/C Ratio		0.19			0.19			0.82		0.82	0.82	
v/c Ratio		0.18			0.04			0.35		0.01	0.63	
Control Delay		28.8			21.2			4.3		3.3	7.6	
Queue Delay		0.0			0.0			0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		28.8			21.2			4.3		3.3	7.6	
LOS		C			C			A		A	A	
Approach Delay		28.8			21.3			4.3			7.6	
Approach LOS		C			C			A			A	
Queue Length 50th (m)		4.6			0.5			21.3		0.3	55.5	
Queue Length 95th (m)		14.0			4.7			35.5		1.3	97.1	
Internal Link Dist (m)		321.9			363.3			465.9			271.0	
Turn Bay Length (m)										10.0		
Base Capacity (vph)		443			545			1768		921	1770	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.10			0.02			0.29		0.01	0.51	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 60.5			
Natural Cycle: 70			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.63			
Intersection Signal Delay: 7.2		Intersection LOS: A	
Intersection Capacity Utilization 69.8%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 5: River Road & 760 River Access/Atrium Ridge



Future (2029) Total Traffic

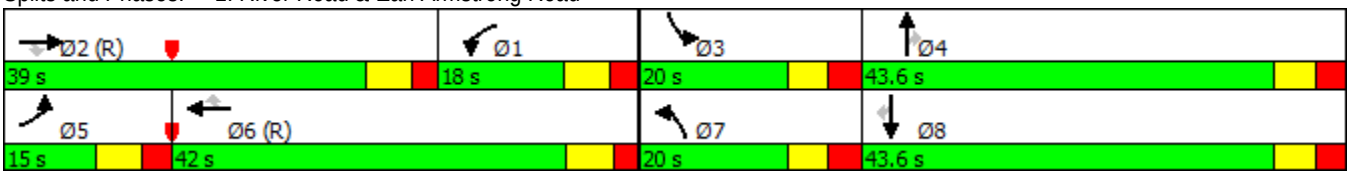
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	665	1154	145	186	1132	121	401	657	401	45	199	237
Future Volume (vph)	665	1154	145	186	1132	121	401	657	401	45	199	237
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.99			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3321	3357	1419	3077	3262	1502	3164	3390	1517	2795	3202	1502
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3320	3357	1419	3077	3262	1482	3164	3390	1497	2793	3202	1502
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			155			155			228			215
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			137.1			387.0	
Travel Time (s)		22.5			28.0			8.2			23.2	
Confl. Peds. (#/hr)	1					1			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	1%	3%	9%	9%	6%	3%	6%	2%	2%	20%	8%	3%
Adj. Flow (vph)	665	1154	145	186	1132	121	401	657	401	45	199	237
Shared Lane Traffic (%)												
Lane Group Flow (vph)	665	1154	145	186	1132	121	401	657	401	45	199	237
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	35.1	35.1	11.8	35.1	35.1	11.8	43.6	43.6	11.8	43.6	43.6
Total Split (s)	15.0	39.0	39.0	18.0	42.0	42.0	20.0	43.6	43.6	20.0	43.6	43.6
Total Split (%)	12.4%	32.3%	32.3%	14.9%	34.8%	34.8%	16.6%	36.2%	36.2%	16.6%	36.2%	36.2%
Maximum Green (s)	8.2	32.5	32.5	11.2	35.5	35.5	13.3	37.0	37.0	13.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lead	Lead	Lead	Lag	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	20.6	44.9	44.9	11.2	35.5	35.5	13.3	33.0	33.0	7.3	24.6	24.6
Actuated g/C Ratio	0.17	0.37	0.37	0.09	0.29	0.29	0.11	0.27	0.27	0.06	0.20	0.20
v/c Ratio	1.17	0.92	0.23	0.65	1.18	0.22	1.15	0.71	0.70	0.26	0.31	0.50

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	138.4	50.3	5.2	64.3	129.8	3.1	143.7	43.8	22.9	57.4	40.0	10.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	138.4	50.3	5.2	64.3	129.8	3.1	143.7	43.8	22.9	57.4	40.0	10.1
LOS	F	D	A	E	F	A	F	D	C	E	D	B
Approach Delay		76.8			110.7			65.5			26.9	
Approach LOS		E			F			E			C	
Queue Length 50th (m)	~93.0	127.6	0.0	20.5	~155.6	0.0	~52.9	69.1	34.4	4.8	19.2	3.9
Queue Length 95th (m)	#157.4	#200.5	12.1	31.6	#193.6	6.8	#81.4	80.2	62.1	10.4	26.1	21.2
Internal Link Dist (m)		413.3			520.9			113.1			363.0	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	568	1250	626	285	960	545	348	1054	622	308	982	609
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.17	0.92	0.23	0.65	1.18	0.22	1.15	0.62	0.64	0.15	0.20	0.39

Intersection Summary

Area Type: Other
Cycle Length: 120.6
Actuated Cycle Length: 120.6
Offset: 63 (52%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.18
Intersection Signal Delay: 78.4 Intersection LOS: E
Intersection Capacity Utilization 98.9% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	13	4	2	1573	555	23
Future Vol, veh/h	13	4	2	1573	555	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	4	2	1573	555	23

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2144	567	578	0	-	0
Stage 1	567	-	-	-	-	-
Stage 2	1577	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	53	523	996	-	-	-
Stage 1	568	-	-	-	-	-
Stage 2	187	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	52	523	996	-	-	-
Mov Cap-2 Maneuver	52	-	-	-	-	-
Stage 1	568	-	-	-	-	-
Stage 2	184	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	77.5	0	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	996	-	66	-	-
HCM Lane V/C Ratio	0.002	-	0.258	-	-
HCM Control Delay (s)	8.6	0	77.5	-	-
HCM Lane LOS	A	A	F	-	-
HCM 95th %tile Q(veh)	0	-	0.9	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	63	5	4	24	5	203	2	1308	15	33	521	7
Future Volume (vph)	63	5	4	24	5	203	2	1308	15	33	521	7
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	100.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.992			0.882			0.998			0.998	
Flt Protected		0.958			0.995					0.950		
Satd. Flow (prot)	0	1730	0	0	1550	0	0	1746	0	1679	1668	0
Flt Permitted		0.272			0.960					0.210		
Satd. Flow (perm)	0	491	0	0	1496	0	0	1746	0	371	1668	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			106			1			1	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		318.2			387.6			297.0			234.8	
Travel Time (s)		22.9			27.9			13.4			10.6	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	4%	0%	3%	0%	4%	8%	3%	9%	0%
Adj. Flow (vph)	63	5	4	24	5	203	2	1308	15	33	521	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	72	0	0	232	0	0	1325	0	33	528	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	27.5	27.5		27.5	27.5		23.9	23.9		23.9	23.9	
Total Split (s)	27.5	27.5		27.5	27.5		102.5	102.5		102.5	102.5	
Total Split (%)	21.2%	21.2%		21.2%	21.2%		78.8%	78.8%		78.8%	78.8%	
Maximum Green (s)	22.0	22.0		22.0	22.0		96.6	96.6		96.6	96.6	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.9	1.9		1.9	1.9		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5			5.5			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		18.3			18.3			96.7		96.7	96.7	
Actuated g/C Ratio		0.14			0.14			0.77		0.77	0.77	
v/c Ratio		1.00			0.76			0.99		0.12	0.41	
Control Delay		158.7			43.8			39.2		5.7	6.7	
Queue Delay		0.0			0.0			8.6		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		158.7			43.8			47.7		5.7	6.7	
LOS		F			D			D		A	A	
Approach Delay		158.7			43.8			47.7			6.6	
Approach LOS		F			D			D			A	
Queue Length 50th (m)		16.2			28.1			~330.1		1.9	40.7	
Queue Length 95th (m)		#43.4			54.8			#406.8		5.0	57.4	
Internal Link Dist (m)		294.2			363.6			273.0			210.8	
Turn Bay Length (m)										100.0		
Base Capacity (vph)		87			348			1336		283	1276	
Starvation Cap Reductn		0			0			42		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.83			0.67			1.02		0.12	0.41	

Intersection Summary			
Area Type:	Other		
Cycle Length: 130			
Actuated Cycle Length: 126.4			
Natural Cycle: 130			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.00			
Intersection Signal Delay: 40.4		Intersection LOS: D	
Intersection Capacity Utilization 106.9%		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: 3: River Road & Phase 12 South Access/Summerhill St

Intersection	
Int Delay, s/veh	9.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	218	1107	7	102	445
Future Vol, veh/h	3	218	1107	7	102	445
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	850	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	218	1107	7	102	445

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1760	1111	0	0	1114	0
Stage 1	1111	-	-	-	-	-
Stage 2	649	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	93	254	-	-	627	-
Stage 1	315	-	-	-	-	-
Stage 2	520	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	78	254	-	-	627	-
Mov Cap-2 Maneuver	78	-	-	-	-	-
Stage 1	315	-	-	-	-	-
Stage 2	435	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	77	0	2.2
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	246	627	-
HCM Lane V/C Ratio	-	-	0.898	0.163	-
HCM Control Delay (s)	-	-	77	11.9	0
HCM Lane LOS	-	-	F	B	A
HCM 95th %tile Q(veh)	-	-	7.7	0.6	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	3	218	1107	7	102	445
Future Volume (vph)	3	218	1107	7	102	445
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	85.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.867		0.999			
Flt Protected	0.999				0.950	
Satd. Flow (prot)	1545	0	1783	0	1695	1784
Flt Permitted	0.999				0.115	
Satd. Flow (perm)	1545	0	1783	0	205	1784
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	148		1			
Link Speed (k/h)	50		80			80
Link Distance (m)	416.9		281.0			297.0
Travel Time (s)	30.0		12.6			13.4
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	3	218	1107	7	102	445
Shared Lane Traffic (%)						
Lane Group Flow (vph)	221	0	1114	0	102	445
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	22.5		22.5		22.5	22.5
Total Split (s)	22.5		77.5		77.5	77.5
Total Split (%)	22.5%		77.5%		77.5%	77.5%
Maximum Green (s)	18.0		73.0		73.0	73.0
Yellow Time (s)	3.5		3.5		3.5	3.5
All-Red Time (s)	1.0		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	4.5		4.5		4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	11.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	12.3		52.2		52.2	52.2
Actuated g/C Ratio	0.17		0.71		0.71	0.71
v/c Ratio	0.58		0.89		0.71	0.35
Control Delay	19.3		18.9		37.4	5.1
Queue Delay	0.0		1.2		0.0	0.0

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	19.3		20.1		37.4	5.1
LOS	B		C		D	A
Approach Delay	19.3		20.1			11.1
Approach LOS	B		C			B
Queue Length 50th (m)	7.6		75.2		5.2	15.0
Queue Length 95th (m)	32.3		195.8		#40.0	35.8
Internal Link Dist (m)	392.9		257.0			273.0
Turn Bay Length (m)					85.0	
Base Capacity (vph)	506		1623		186	1624
Starvation Cap Reductn	0		281		0	0
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.44		0.83		0.55	0.27

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 74			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.89			
Intersection Signal Delay: 17.4		Intersection LOS: B	
Intersection Capacity Utilization 96.0%		ICU Level of Service F	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

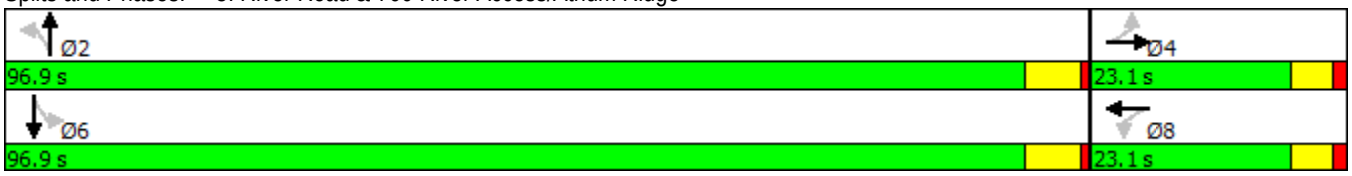
Splits and Phases: 4: River Road & Borbridge Avenue

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	49	5	5	0	5	27	3	1037	0	9	417	23
Future Volume (vph)	49	5	5	0	5	27	3	1037	0	9	417	23
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	10.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.989			0.886						0.992	
Flt Protected		0.960								0.950		
Satd. Flow (prot)	0	1694	0	0	1581	0	0	1784	0	1695	1770	0
Flt Permitted		0.740						0.999		0.294		
Satd. Flow (perm)	0	1306	0	0	1581	0	0	1783	0	525	1770	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			27						7	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		345.9			387.3			489.9			281.0	
Travel Time (s)		24.9			27.9			22.0			12.6	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	49	5	5	0	5	27	3	1037	0	9	417	23
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	59	0	0	32	0	0	1040	0	9	440	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	23.1	23.1		23.1	23.1		23.9	23.9		23.9	23.9	
Total Split (s)	23.1	23.1		23.1	23.1		96.9	96.9		96.9	96.9	
Total Split (%)	19.3%	19.3%		19.3%	19.3%		80.8%	80.8%		80.8%	80.8%	
Maximum Green (s)	18.0	18.0		18.0	18.0		91.0	91.0		91.0	91.0	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.1			5.1			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		12.0			12.0			56.5		56.5	56.5	
Actuated g/C Ratio		0.17			0.17			0.78		0.78	0.78	
v/c Ratio		0.27			0.11			0.75		0.02	0.32	
Control Delay		36.4			17.2			11.2		3.3	4.4	
Queue Delay		0.0			0.0			0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		36.4			17.2			11.2		3.3	4.4	
LOS		D			B			B		A	A	
Approach Delay		36.4			17.2			11.2			4.4	
Approach LOS		D			B			B			A	
Queue Length 50th (m)		6.4			0.6			72.9		0.3	16.8	
Queue Length 95th (m)		21.3			8.6			146.0		1.4	32.4	
Internal Link Dist (m)		321.9			363.3			465.9			257.0	
Turn Bay Length (m)										10.0		
Base Capacity (vph)		368			462			1733		510	1720	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.16			0.07			0.60		0.02	0.26	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 72.6			
Natural Cycle: 80			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 10.3		Intersection LOS: B	
Intersection Capacity Utilization 79.4%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 5: River Road & 760 River Access/Atrium Ridge



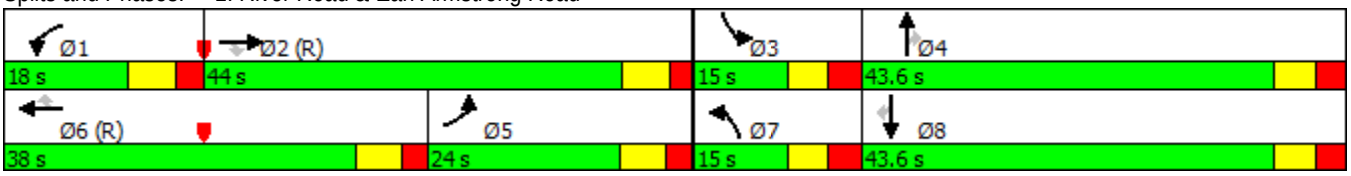
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	424	1245	458	420	1220	45	270	357	297	58	535	825
Future Volume (vph)	424	1245	458	420	1220	45	270	357	297	58	535	825
Ideal Flow (vphpl)	2000	1800	1800	1800	2200	1800	2000	1800	1800	1800	1800	2400
Storage Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Storage Lanes	2		1	2		1	2		1	2		1
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Ped Bike Factor	1.00					0.98			0.99	1.00		
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3654	3325	1502	3288	4103	1446	3584	3357	1369	3257	3458	2063
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3650	3325	1502	3288	4103	1423	3584	3357	1351	3253	3458	2063
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			232			155			297			375
Link Speed (k/h)		70			70			60			60	
Link Distance (m)		437.3			544.9			137.5			357.4	
Travel Time (s)		22.5			28.0			8.3			21.4	
Confl. Peds. (#/hr)	3					3			1	1		
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	4%	3%	2%	3%	7%	4%	3%	13%	3%	0%	0%
Adj. Flow (vph)	424	1245	458	420	1220	45	270	357	297	58	535	825
Shared Lane Traffic (%)												
Lane Group Flow (vph)	424	1245	458	420	1220	45	270	357	297	58	535	825
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases			2			6			4			8
Detector Phase	5	2	2	1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0	5.0	10.0	10.0
Minimum Split (s)	11.8	34.5	34.5	11.8	34.5	34.5	11.7	43.6	43.6	11.7	43.6	43.6
Total Split (s)	24.0	44.0	44.0	18.0	38.0	38.0	15.0	43.6	43.6	15.0	43.6	43.6
Total Split (%)	19.9%	36.5%	36.5%	14.9%	31.5%	31.5%	12.4%	36.2%	36.2%	12.4%	36.2%	36.2%
Maximum Green (s)	17.2	37.5	37.5	11.2	31.5	31.5	8.3	37.0	37.0	8.3	37.0	37.0
Yellow Time (s)	4.2	4.2	4.2	4.2	4.2	4.2	3.7	3.7	3.7	3.7	3.7	3.7
All-Red Time (s)	2.6	2.3	2.3	2.6	2.3	2.3	3.0	2.9	2.9	3.0	2.9	2.9
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.8	6.5	6.5	6.8	6.5	6.5	6.7	6.6	6.6	6.7	6.6	6.6
Lead/Lag	Lag	Lag	Lag	Lead	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	Min	Min	None	Min	Min
Walk Time (s)		7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		21.0	21.0		21.0	21.0		30.0	30.0		30.0	30.0
Pedestrian Calls (#/hr)		0	0		0	0		0	0		0	0
Act Effct Green (s)	17.2	37.5	37.5	12.6	32.9	32.9	8.3	39.1	39.1	7.3	35.6	35.6
Actuated g/C Ratio	0.14	0.31	0.31	0.10	0.27	0.27	0.07	0.32	0.32	0.06	0.30	0.30
v/c Ratio	0.81	1.21	0.73	1.22	1.09	0.09	1.10	0.33	0.47	0.29	0.52	0.95

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	63.6	138.7	25.5	169.1	96.7	0.4	137.5	32.5	6.1	57.7	37.3	42.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	63.6	138.7	25.5	169.1	96.7	0.4	137.5	32.5	6.1	57.7	37.3	42.5
LOS	E	F	C	F	F	A	F	C	A	E	D	D
Approach Delay		99.4			112.2			54.7			41.2	
Approach LOS		F			F			D			D	
Queue Length 50th (m)	46.8	~173.8	44.9	~62.5	~163.3	0.0	~34.3	31.4	0.0	6.3	50.3	105.8
Queue Length 95th (m)	#67.2	#212.2	82.2	#91.4	#201.7	0.0	#59.0	43.8	18.9	12.4	65.8	#179.5
Internal Link Dist (m)		413.3			520.9			113.5			333.4	
Turn Bay Length (m)	300.0		70.0	160.0		150.0	150.0		25.0	80.0		100.0
Base Capacity (vph)	521	1033	626	343	1119	501	246	1087	638	224	1060	892
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.81	1.21	0.73	1.22	1.09	0.09	1.10	0.33	0.47	0.26	0.50	0.92

Intersection Summary

Area Type: Other
Cycle Length: 120.6
Actuated Cycle Length: 120.6
Offset: 91 (75%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 125
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.22
Intersection Signal Delay: 82.8 Intersection LOS: F
Intersection Capacity Utilization 94.1% 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: 1: River Road & Earl Armstrong Road



Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	8	3	4	941	1440	54
Future Vol, veh/h	8	3	4	941	1440	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	8	3	4	941	1440	54

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	2416	1467	1494	0	-	0
Stage 1	1467	-	-	-	-	-
Stage 2	949	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	36	157	449	-	-	-
Stage 1	212	-	-	-	-	-
Stage 2	376	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	35	157	449	-	-	-
Mov Cap-2 Maneuver	35	-	-	-	-	-
Stage 1	212	-	-	-	-	-
Stage 2	369	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	112.2	0.1	0
HCM LOS	F		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	449	-	44	-	-
HCM Lane V/C Ratio	0.009	-	0.25	-	-
HCM Control Delay (s)	13.1	0	112.2	-	-
HCM Lane LOS	B	A	F	-	-
HCM 95th %tile Q(veh)	0	-	0.8	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	39	5	3	5	5	87	4	818	14	141	1287	15
Future Volume (vph)	39	5	3	5	5	87	4	818	14	141	1287	15
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	100.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								1.00			1.00	
Frt		0.991			0.879			0.998			0.998	
Flt Protected		0.960			0.997					0.950		
Satd. Flow (prot)	0	1731	0	0	1550	0	0	1763	0	1712	1781	0
Flt Permitted		0.569			0.984			0.995		0.356		
Satd. Flow (perm)	0	1026	0	0	1530	0	0	1755	0	642	1781	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			87			2			1	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		330.9			387.6			283.0			234.8	
Travel Time (s)		23.8			27.9			12.7			10.6	
Confl. Bikes (#/hr)									2			1
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	0%	0%	0%	4%	0%	3%	0%	3%	2%	1%	2%	0%
Adj. Flow (vph)	39	5	3	5	5	87	4	818	14	141	1287	15
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	47	0	0	97	0	0	836	0	141	1302	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	27.1	27.1		27.1	27.1		27.9	27.9		27.9	27.9	
Total Split (s)	27.1	27.1		27.1	27.1		92.9	92.9		92.9	92.9	
Total Split (%)	22.6%	22.6%		22.6%	22.6%		77.4%	77.4%		77.4%	77.4%	
Maximum Green (s)	22.0	22.0		22.0	22.0		87.0	87.0		87.0	87.0	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.5	1.5		1.5	1.5		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.1			5.1			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		15.0	15.0		15.0	15.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		10.6			10.6			91.1		91.1	91.1	
Actuated g/C Ratio		0.09			0.09			0.81		0.81	0.81	
v/c Ratio		0.47			0.44			0.59		0.27	0.90	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay		60.7			18.5			6.1		4.3	19.2	
Queue Delay		0.0			0.0			0.0		0.0	0.0	
Total Delay		60.7			18.5			6.1		4.3	19.2	
LOS		E			B			A		A	B	
Approach Delay		60.7			18.5			6.1			17.8	
Approach LOS		E			B			A			B	
Queue Length 50th (m)		8.2			1.8			46.5		5.3	141.4	
Queue Length 95th (m)		19.2			15.7			79.0		12.1	#322.6	
Internal Link Dist (m)		306.9			363.6			259.0			210.8	
Turn Bay Length (m)										100.0		
Base Capacity (vph)		203			369			1418		518	1439	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.23			0.26			0.59		0.27	0.90	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 112.7			
Natural Cycle: 120			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.90			
Intersection Signal Delay: 14.6		Intersection LOS: B	
Intersection Capacity Utilization 134.0%		ICU Level of Service H	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: River Road & Phase 12 South Access/Summerhill St

Intersection	
Int Delay, s/veh	3.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	165	671	6	218	1077
Future Vol, veh/h	7	165	671	6	218	1077
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	7	165	671	6	218	1077

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2187	674	0	0	677	0
Stage 1	674	-	-	-	-	-
Stage 2	1513	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	50	455	-	-	915	-
Stage 1	506	-	-	-	-	-
Stage 2	201	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	38	455	-	-	915	-
Mov Cap-2 Maneuver	38	-	-	-	-	-
Stage 1	506	-	-	-	-	-
Stage 2	153	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	29.4	0	1.7
HCM LOS	D		

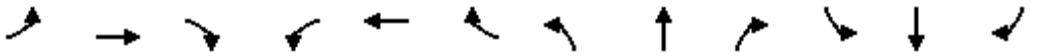
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	315	915	-
HCM Lane V/C Ratio	-	-	0.546	0.238	-
HCM Control Delay (s)	-	-	29.4	10.2	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	3.1	0.9	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	7	165	671	6	218	1073
Future Volume (vph)	7	165	671	6	218	1073
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0	0.0		0.0	85.0	
Storage Lanes	1	0		0	1	
Taper Length (m)	20.0				20.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.870		0.999			
Flt Protected	0.998				0.950	
Satd. Flow (prot)	1549	0	1783	0	1695	1784
Flt Permitted	0.998				0.350	
Satd. Flow (perm)	1549	0	1783	0	625	1784
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)	165		1			
Link Speed (k/h)	50		80			80
Link Distance (m)	405.6		295.0			283.0
Travel Time (s)	29.2		13.3			12.7
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	7	165	671	6	218	1073
Shared Lane Traffic (%)						
Lane Group Flow (vph)	172	0	677	0	218	1073
Turn Type	Perm		NA		Perm	NA
Protected Phases			2			6
Permitted Phases	8				6	
Detector Phase	8		2		6	6
Switch Phase						
Minimum Initial (s)	10.0		10.0		10.0	10.0
Minimum Split (s)	27.5		23.5		23.9	23.9
Total Split (s)	27.5		92.5		92.5	92.5
Total Split (%)	22.9%		77.1%		77.1%	77.1%
Maximum Green (s)	22.0		87.0		86.6	86.6
Yellow Time (s)	3.6		3.6		5.0	5.0
All-Red Time (s)	1.9		1.9		0.9	0.9
Lost Time Adjust (s)	0.0		0.0		0.0	0.0
Total Lost Time (s)	5.5		5.5		5.9	5.9
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		Min		Min	Min
Walk Time (s)	7.0		7.0		7.0	7.0
Flash Dont Walk (s)	15.0		11.0		11.0	11.0
Pedestrian Calls (#/hr)	0		0		0	0
Act Effct Green (s)	10.9		55.4		54.9	54.9
Actuated g/C Ratio	0.14		0.71		0.71	0.71
v/c Ratio	0.48		0.53		0.49	0.85
Control Delay	12.6		6.6		9.1	15.8
Queue Delay	0.0		0.0		0.0	0.7

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Total Delay	12.6		6.6		9.1	16.5
LOS	B		A		A	B
Approach Delay	12.6		6.6			15.2
Approach LOS	B		A			B
Queue Length 50th (m)	0.7		31.9		10.0	80.6
Queue Length 95th (m)	19.5		54.8		23.8	147.9
Internal Link Dist (m)	381.6		271.0			259.0
Turn Bay Length (m)					85.0	
Base Capacity (vph)	573		1705		597	1705
Starvation Cap Reductn	0		0		0	300
Spillback Cap Reductn	0		0		0	0
Storage Cap Reductn	0		0		0	0
Reduced v/c Ratio	0.30		0.40		0.37	0.76

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 77.7			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 12.3		Intersection LOS: B	
Intersection Capacity Utilization 80.3%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 4: River Road & Borbridge Avenue



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	5	4	0	5	16	6	620	0	29	1004	50
Future Volume (vph)	37	5	4	0	5	16	6	620	0	29	1004	50
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Storage Length (m)	0.0		0.0	0.0		0.0	0.0		0.0	10.0		0.0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (m)	20.0			20.0			20.0			20.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.988			0.897						0.993	
Flt Protected		0.961								0.950		
Satd. Flow (prot)	0	1694	0	0	1601	0	0	1784	0	1695	1772	0
Flt Permitted		0.754						0.992		0.449		
Satd. Flow (perm)	0	1329	0	0	1601	0	0	1770	0	801	1772	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			16						4	
Link Speed (k/h)		50			50			80			80	
Link Distance (m)		345.9			387.3			489.9			295.0	
Travel Time (s)		24.9			27.9			22.0			13.3	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
Adj. Flow (vph)	37	5	4	0	5	16	6	620	0	29	1004	50
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	46	0	0	21	0	0	626	0	29	1054	0
Turn Type	Perm	NA			NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	44.6	44.6		27.5	27.5		24.0	24.0		24.0	24.0	
Total Split (s)	44.6	44.6		44.6	44.6		75.4	75.4		75.4	75.4	
Total Split (%)	37.2%	37.2%		37.2%	37.2%		62.8%	62.8%		62.8%	62.8%	
Maximum Green (s)	39.1	39.1		39.1	39.1		69.5	69.5		69.5	69.5	
Yellow Time (s)	3.6	3.6		3.6	3.6		5.0	5.0		5.0	5.0	
All-Red Time (s)	1.9	1.9		1.9	1.9		0.9	0.9		0.9	0.9	
Lost Time Adjust (s)		0.0			0.0			0.0		0.0	0.0	
Total Lost Time (s)		5.5			5.5			5.9		5.9	5.9	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Min	Min		Min	Min	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	15.0	15.0		15.0	15.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)		10.4			10.4			75.3		75.3	75.3	
Actuated g/C Ratio		0.12			0.12			0.86		0.86	0.86	
v/c Ratio		0.29			0.10			0.41		0.04	0.69	
Control Delay		40.2			22.0			3.8		2.7	7.9	
Queue Delay		0.0			0.0			0.0		0.0	0.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Total Delay		40.2			22.0			3.8		2.7	7.9	
LOS		D			C			A		A	A	
Approach Delay		40.2			22.0			3.8			7.8	
Approach LOS		D			C			A			A	
Queue Length 50th (m)		7.2			0.8			29.2		0.9	77.6	
Queue Length 95th (m)		15.8			6.7			46.3		2.7	135.7	
Internal Link Dist (m)		321.9			363.3			465.9			271.0	
Turn Bay Length (m)										10.0		
Base Capacity (vph)		608			738			1524		689	1526	
Starvation Cap Reductn		0			0			0		0	0	
Spillback Cap Reductn		0			0			0		0	0	
Storage Cap Reductn		0			0			0		0	0	
Reduced v/c Ratio		0.08			0.03			0.41		0.04	0.69	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 87.2			
Natural Cycle: 120			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 7.4		Intersection LOS: A	
Intersection Capacity Utilization 77.8%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 5: River Road & 760 River Access/Atrium Ridge