3750 North Bowesville Road

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report

Prepared for:

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April 2022

PN: 2020-103

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1 Screening

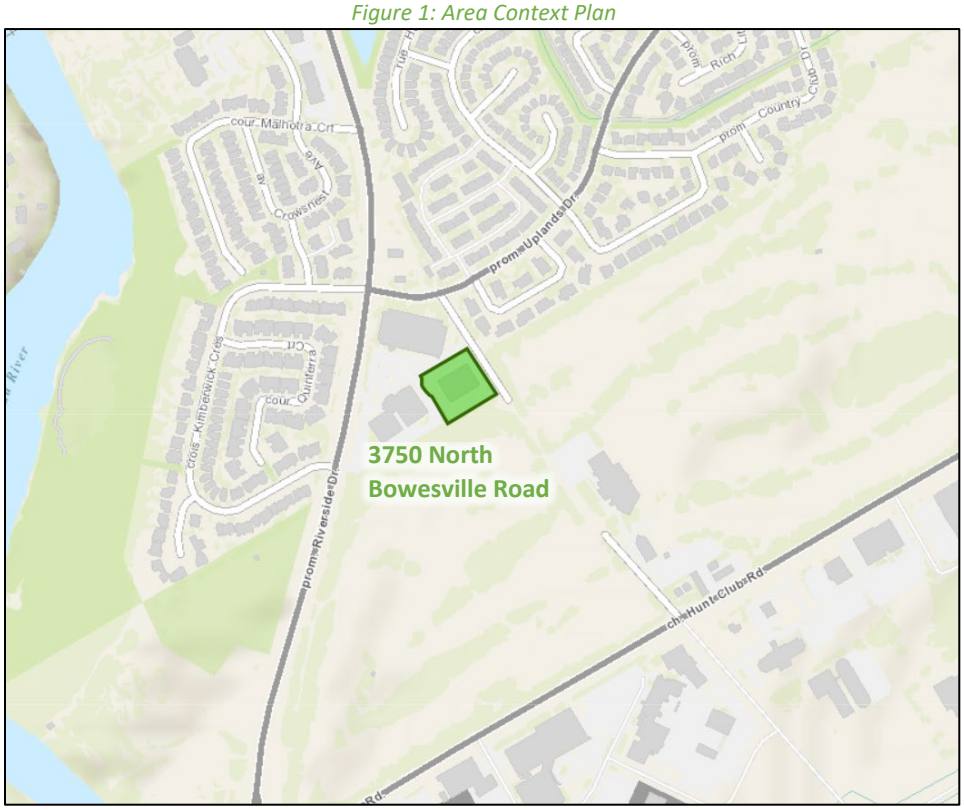
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for the TIA Study PM. As shown in the Screening Form, a TIA is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

2 Existing and Planned Conditions

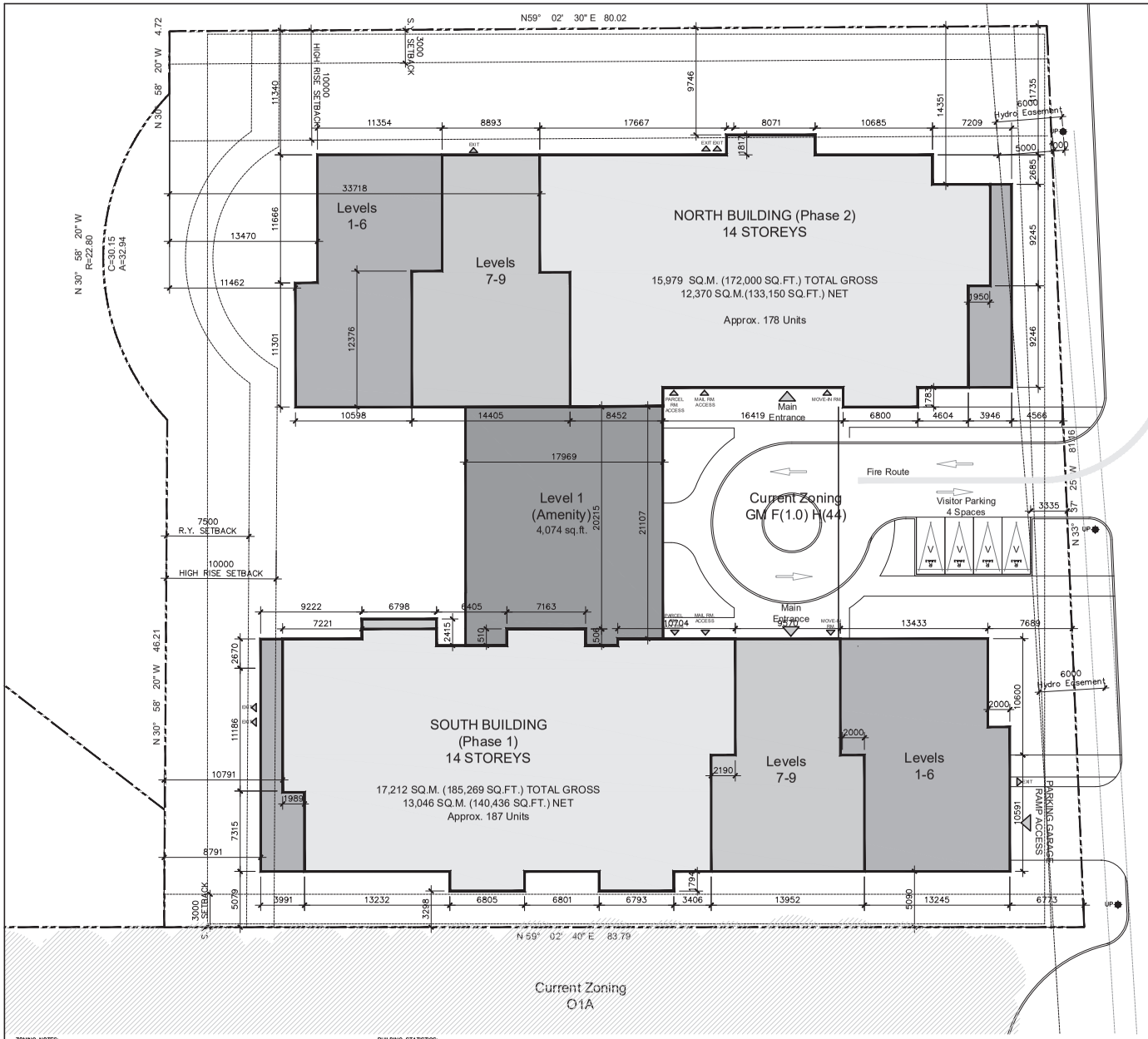
2.1 Proposed Development

The existing site, located at 3750 North Bowesville Road, is zoned as General Mixed Use Zone (GM F(1.0) H(44)) and currently is occupied by the Tudor Hall banquet and events venue. The proposed redevelopment consists of two 14-storey residential buildings with 365 units. There are a total of 357 interior vehicle parking spaces, 5 exterior vehicle parking spaces, and 183 interior bicycle parking spaces. The anticipated full build-out and occupancy horizon is 2026 with construction occurring in single phase. The concept plan remains an existing full-movements access for parking garage access and proposes the relocation of an existing full-movements access for fire route and visitor access on North Bowesville Road. The site is located within the Hunt Club Secondary Plan area. Figure 1 illustrates the Study Area Context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: December 8, 2021



LOCATION PLAN

BUILDING PARKING REQUIREMENTS

PROPOSED FIRE ROUTE
PROPOSED BUILDING
PERMANENT AND TEMPORARY EASEMENT AREA
MH EXISTING MAN HOLE
MH PROPOSED MAN HOLE
TSP EXISTING TRAFFIC LIGHT
FH EXISTING FIRE HYDRANT
CONC. CURB DETAIL TO CITY OF OTTAWA STANDARDS
BP BIKE PARKING SPACE
EXISTING LIGHT POLE
NEW LIGHT STANDARD
LS PROPOSED WALL MOUNT FIXTURE
WL PROPOSED WALL MOUNT FIXTURE
WL 2
SL EXISTING STREET LIGHTING BOX
TB EXISTING TRAFFIC SIGNAL BOX
EDGE OF SIDEWALK
PROPERTY LINE
SETBACK
DC PROPOSED DEPRESSED CURB DETAIL TO CITY OF OTTAWA STANDARD SC-7
CURB TO BE REBUILT
ROLL CURB
UP EXISTING UTILITY POLE
FDC FIRE DEPARTMENT CONNECTION
CB EXISTING CATCH BASIN
CB PROPOSED CATCH BASIN
AS SIGNAGE FOR ACCESSIBLE PARKING SPACE
FRS SIGNAGE FOR FIRE ROUTE ACCESS
EXISTING SIGN

JENNINGS REAL ESTATE

PROJECT TEAM

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xxx

ZONING NOTES:

CURRENT ZONING: GM F(1.0) H(44)
LOT AREA : 6819.5 m²

DEVELOPMENT STATS PHASE 1 + PHASE 2		REQUIRED	PROPOSED
LOT WIDTH			81.16m IRREGULAR
LOT DEPTH			83.7m IRREGULAR
FRONT YARD SETBACK	BOWESVILLE	3m	VARIES
REAR YARD SETBACK		7.5m	VARIES
SIDE YARD SETBACK		3m	VARIES
INTERIOR SIDE YARD SETBACK		3m	VARIES

TOTAL DEVELOPMENT FSI = 33,191 SQ.M.(TOTAL DEVELOPMENT GFA)/6819.5 SQ.M.(TOTAL SITE AREA) = 4.87

PHASE 1 (SOUTH BUILDING) FSI = 17,212 SQ.M.(PHASE 1 GFA)/6819.5 SQ.M.(TOTAL SITE AREA) = 2.52

PHASE 2 (NORTH BUILDING) FSI = 15,979 SQ.M.(PHASE 2 GFA)/6819.5 SQ.M.(TOTAL SITE AREA) = 2.34

BUILDING STATISTICS:

SOUTH BUILDING PHASE 1	PROPOSED		
TOTAL UNIT COUNT			187
STUDIOS	19	10%	
1 BEDROOM	94	50%	
1 BEDROOM + DEN		%	
2 BEDROOM (1 INBOARD BED)		%	
2 BEDROOM	75	40%	
2 BEDROOM + DEN		%	
NUMBER OF STOREYS	14 STOREYS		
MAXIMUM HEIGHT	44m *5m PROJECTION ABOVE MAX. HEIGHT FOR MECHANICAL PENTHOUSE AND AMENITY SPACE.		
AREA – TOTAL GFA	+/- 13,356 SQ.M.		
REQUIRED AMENITY SPACE REQUIREMENT 187 UNITS X 6 SQ.M. = 1,122 SQ.M. TOTAL AMENITY REQUIRED REQUIRED AMENITY SPACE TO BE COMMON – 561 SQ.M. PROVIDED COMMON AMENITY SPACE – 561 SQ.M.			

NORTH BUILDING PHASE 2	PROPOSED		
TOTAL UNIT COUNT			178
STUDIOS	18	10%	
1 BEDROOM	89	50%	
1 BEDROOM + DEN		%	
2 BEDROOM (1 INBOARD BED)		%	
2 BEDROOM	71	40%	
2 BEDROOM + DEN		%	
NUMBER OF STOREYS	14 STOREYS		
MAXIMUM HEIGHT	44m *5m PROJECTION ABOVE MAX. HEIGHT FOR MECHANICAL PENTHOUSE AND AMENITY SPACE.		
AREA – TOTAL GFA	+/- 12,370 SQ.M.		
REQUIRED AMENITY SPACE REQUIREMENT 178 UNITS X 6 SQ.M. = 1,068 SQ.M. TOTAL AMENITY REQUIRED REQUIRED AMENITY SPACE TO BE COMMON – 534 SQ.M. PROVIDED COMMON AMENITY SPACE – 534 SQ.M.			

TOTAL DEVELOPMENT – REQUIRED AMENITY SPACE: 365 UNITS X 6 SQ.M. = 2,190 SQ.M.
REQUIRED AMENITY SPACE TO BE COMMON – 1,095 SQ.M
REQUIRED COMMON AMENITY SPACE – 1,095 SQ.M.

1. BUILDING PARKING REQUIRED: PARKING RATIO OF 1.2/UNIT (438 RESIDENTIAL PARKING REQUIRED FOR 365 UNITS)

LAND USE	PROVIDED VEHICLE PARKING
RENTAL	306 RESIDENTIAL PARKING SPACES PROVIDED FOR 365 UNITS (0.84/UNIT) * LOCATED IN UNDERGROUND PARKING GARAGE

2. REQUIRED VISITOR PARKING: VISITOR PARKING RATIO OF 0.2/UNIT (73 VISITOR PARKING FOR 365 UNITS)

LAND USE	PROVIDED VISITOR PARKING
CONDO	37 VISITOR PARKING SPACES PROVIDED FOR 365 UNITS (0.1/UNIT) * LOCATED IN PARKING GARAGE AND AT GRADE
TOTAL PARKING PROVIDED	343 TOTAL PARKING PARKING SPACES (339 INTERIOR, 4 EXTERIOR)

3. BUILDING BICYCLE PARKING REQUIRED: 0.5 BICYCLE STALLS PER UNIT (183 STALLS REQUIRED FOR 365 UNITS).

PROVIDED BICYCLE PARKING
183 BICYCLE PARKING SPACES PROVIDED FOR 365 UNITS (0.5/UNIT) * LOCATED IN UNDERGROUND PARKING GARAGE AND AT GRADE

no.	date	revision
1	22-04-13	ISSUED FOR REZONING

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

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

Do not scale drawings.

This drawing may not be used for construction until signed.

HOBIN ARCHITECTURE

PROJECT/LOCATION:
3750 NORTH BOWESVILLE
OTTAWA ON.

DRAWING TITLE:
SITE PLAN

DRAWN BY:	DATE:	SCALE:
PB	22-04-12	1:150

PROJECT: 2115

DRAWING NO.: A1.00

REVISION NO.:

ONTARIO ASSOCIATION OF ARCHITECTS PATRICK M. HOBIN LICENCE 3049

2.2 Existing Conditions

2.2.1 Area Road Network

Riverside Drive: Riverside Drive is a City of Ottawa arterial road with a divided four-lane urban cross-section. Sidewalks are provided on both sides of the road, with it ending on the west side of the roadway at Uplands Riverside Park, and transitions to an asphalt pathway north of Malhotra Court. Paved boulevards are generally provided on both sides of the roadway. The posted speed limit is 60 km/h, and the City-protected right of way is 44.5 metres.

Uplands Drive: Uplands Drive is a City of Ottawa collector road with a two-lane urban cross-section. Asphalt pathways are provided on both sides of the road. On-street parking is permitted on the north side of the road. The posted speed limit is 50 km/h, and the existing right of way is 26.5 metres.

North Bowesville Road: North Bowesville Road is a City of Ottawa local road with a two-lane rural cross-section with gravel shoulders on both sides of the road. On-street parking is permitted on both sides of the road, the unposted speed limit is assumed to be 50 km/h, and the existing right of way varies between 19.0 and 20.0 metres.

Kimberwick Crescent: Kimberwick Crescent is a City of Ottawa local road with a two-lane urban cross-section. On-street parking is permitted on both sides of the road, the unposted speed limit is assumed to be 50 km/h, and the existing right of way is 20.0 metres.

2.2.2 Existing Intersections

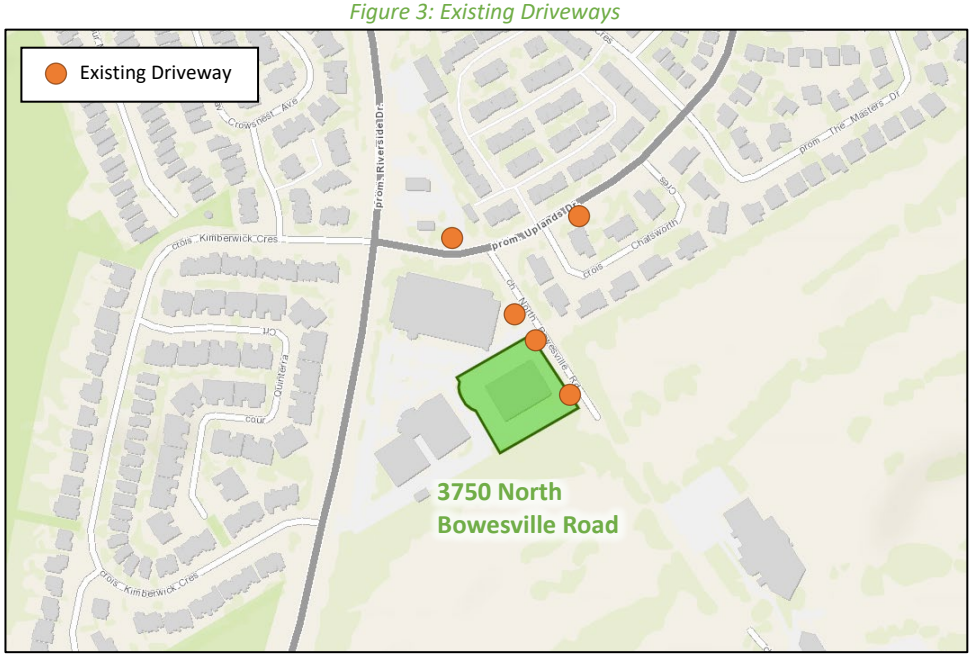
The existing signalized and key study area intersections within 400 metres of the site have been summarized below:

Riverside Drive at Uplands Drive / Kimberwick Crescent	The intersection of Riverside Drive at Uplands Drive/ Kimberwick Crescent is a signalized intersection. The northbound and southbound approaches each consist of an auxiliary left-turn lane, a through lane, and a shared through/right-turn lane. The eastbound approach consists of an auxiliary left-turn lane and a share through/right-turn lane, and westbound approach consists of a shared left-turn/through and right-turn lane. No turn restrictions were noted.
North Bowesville Road at Uplands Drive	The intersection of North Bowesville Road at Uplands Drive is a stop-controlled intersection on the minor approach of North Bowesville Road. All approaches, including the private southbound approach, consist of shared all-movement lanes. No turn restrictions were noted.

2.2.3 Existing Driveways

Within 200 metres of the proposed site access, two driveways to a banquet hall on the subject property and one driveway to an office building and its parking structure are present on the west side of North Bowesville Road, and one driveway to a townhouse and one to a gas station is present on Uplands Drive. Figure 3 illustrates the existing driveways.

Figure 3: Existing Driveways



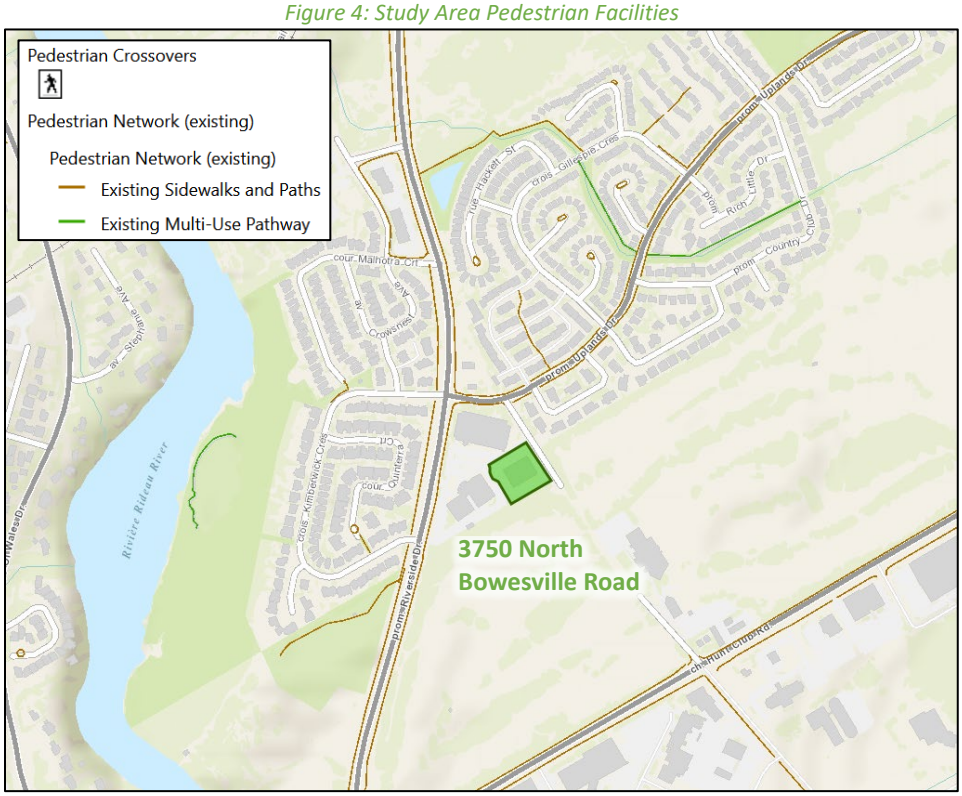
Source: http://maps.ottawa.ca/geoOttawa/ Accessed: December 8, 2021

2.2.4 Cycling and Pedestrian Facilities

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

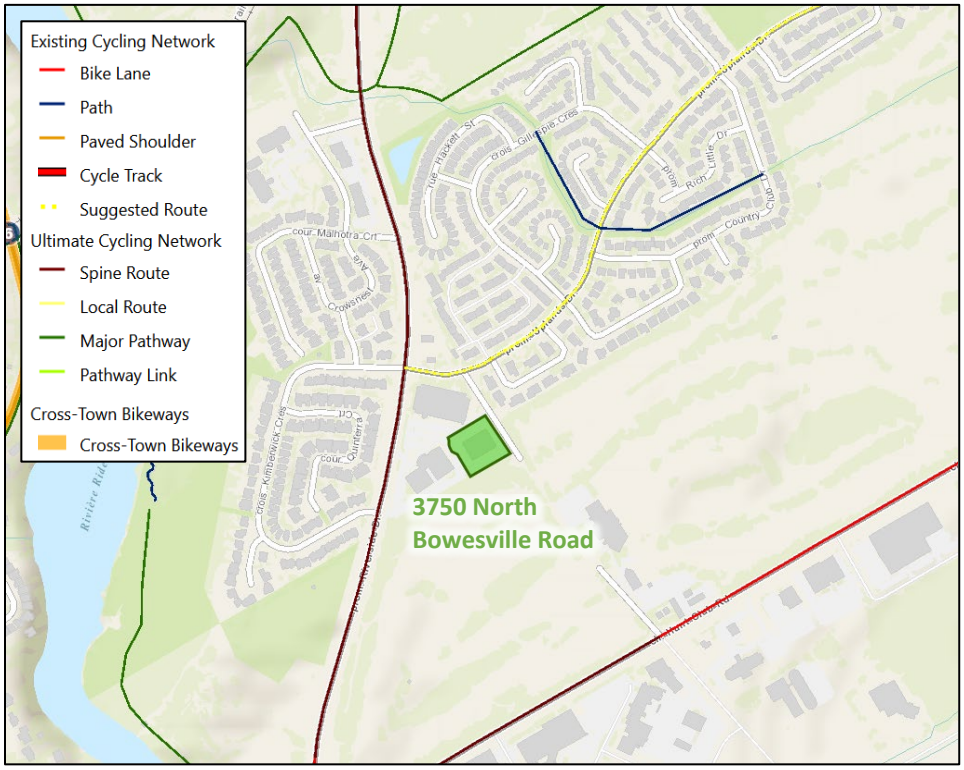
Sidewalks or asphalt pathways are provided along both sides of Uplands Drive and Riverside Drive. Riverside Drive is a spine route, and Uplands Drive is local route.

Figure 4: Study Area Pedestrian Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: December 8, 2021

Figure 5: Study Area Cycling Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: December 8, 2021

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

Figure 6: Existing Pedestrian Volumes

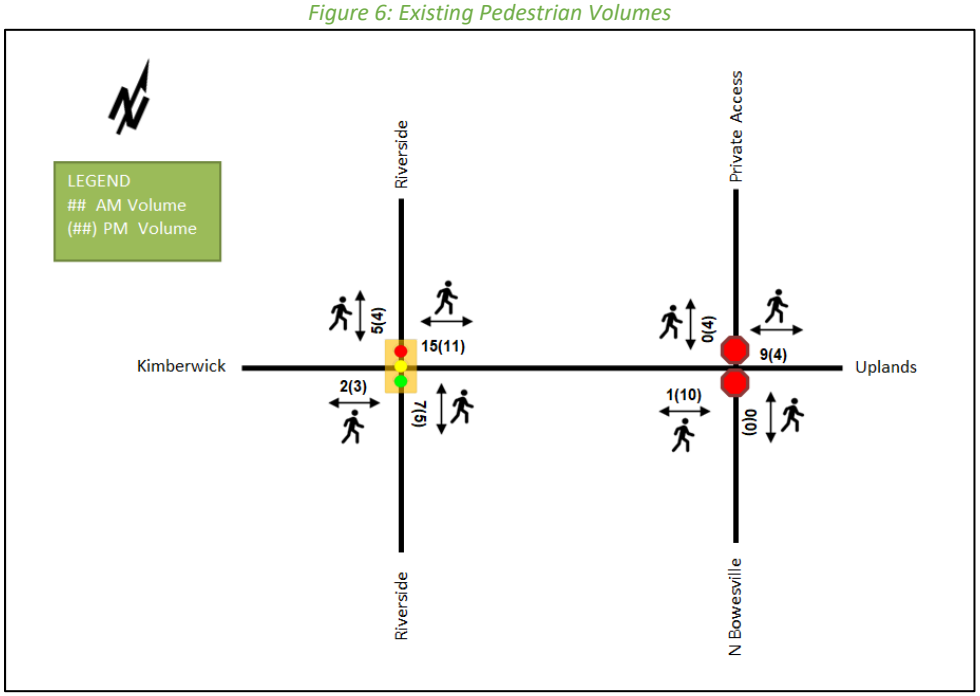
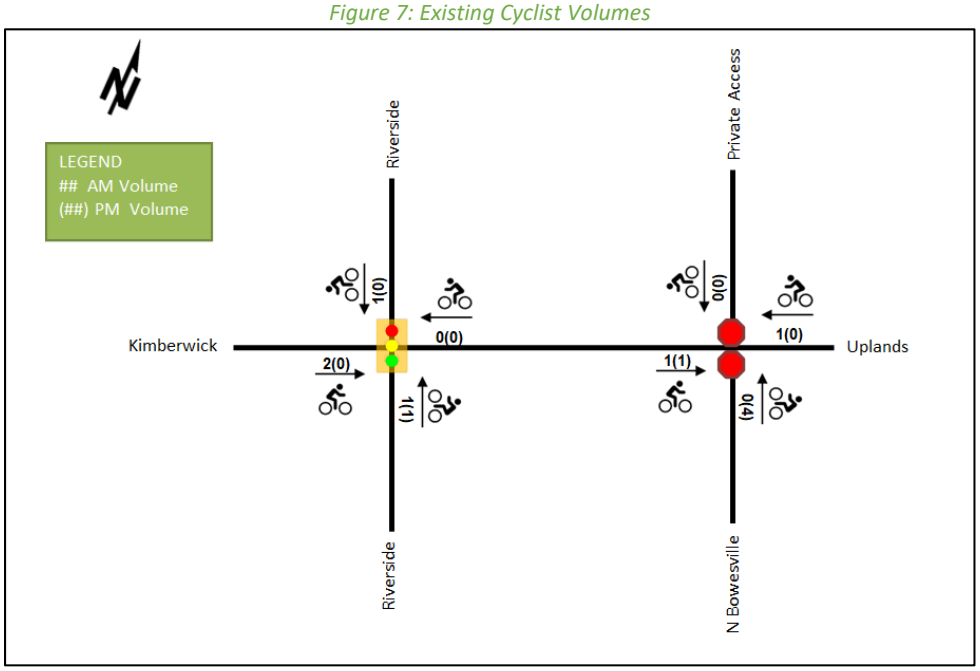


Figure 7: Existing Cyclist Volumes



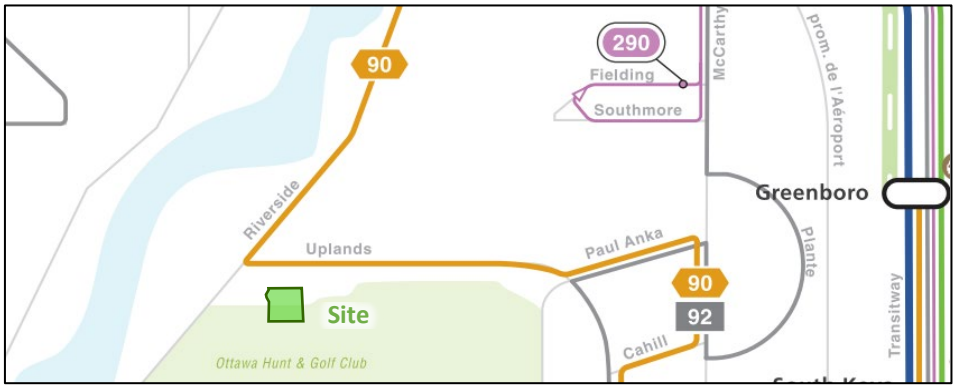
2.2.5 Existing Transit

Within the study area, the route #90 travels along Riverside Drive and Uplands Drive. Primary stops are located on Uplands Road between North Bowesville Road and Riverside Drive. The frequency of this route within proximity of the proposed site currently is:

- Route # 90 – 15-minute service all day, 30-minute service after 7:00 PM

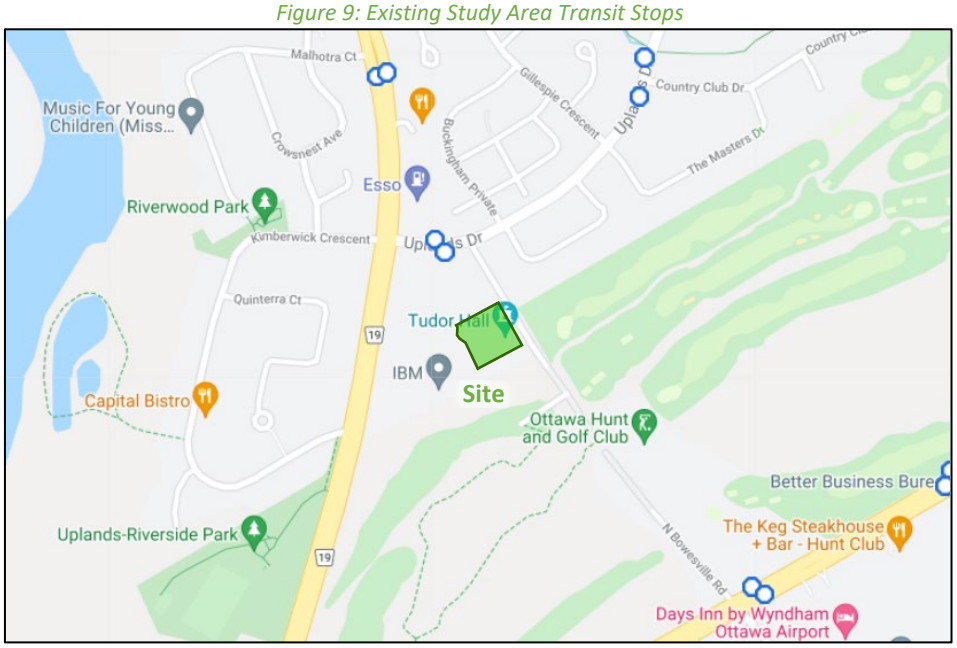
Figure 8 illustrates the transit system map in the study area and Figure 9 illustrates nearby transit stops.

Figure 8: Existing Study Area Transit Service



Source: http://www.octranspo.com/ Accessed: December 8, 2021

Figure 9: Existing Study Area Transit Stops



Source: http://www.octranspo.com/ Accessed: December 8, 2021

2.2.6 Existing Area Traffic Management Measures

Speed humps on Kimberwick Crescent are the primary traffic management measures within the study area.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from the City of Ottawa for the existing Study Area intersection. Table 1 summarizes the intersection count dates.

Table 1: Intersection Count Date

Intersection	Count Date
Riverside Drive at Uplands Drive/ Kimberwick Crescent	Wednesday, January 22, 2020
North Bowesville Road at Uplands Drive	Tuesday, November 26, 2019

Figure 10 illustrates the existing traffic counts, balanced along Uplands Drive, and Table 2 summarizes the existing intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and HCM 2010 average delay for unsignalized intersections. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 10: Existing Traffic Counts

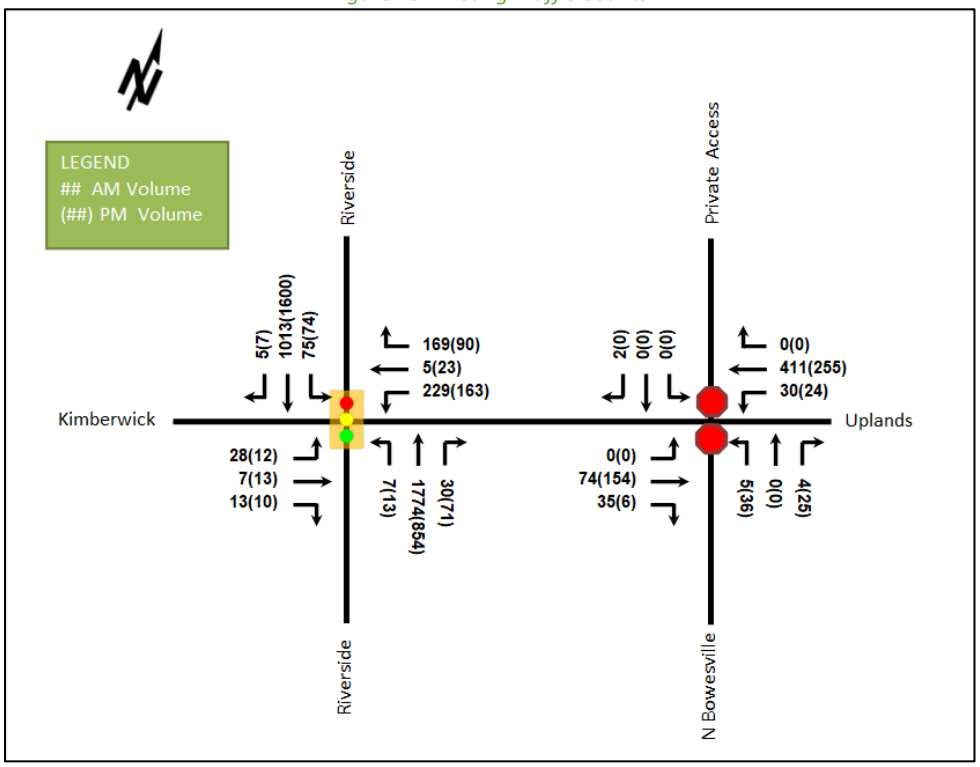


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Riverside Drive at Uplands Drive/ Kimberwick Crescent *Signalized*	EBL	A	0.20	40.7	14.8	A	0.09	42.8	8.5
	EBT/R	A	0.06	20.9	8.2	A	0.08	27.9	10.4
	WBL/T	E	0.92	**82.7**	**#106.4**	D	0.85	**80.2**	**#84.6**
	WBR	A	0.40	7.9	18.0	A	0.28	9.8	14.4
	NBL	A	0.03	14.6	3.6	A	0.14	17.3	5.8
	NBT/R	**F**	**1.06**	**66.6**	**#341.8**	A	0.52	16.3	102.1
	SBL	A	0.50	25.1	20.8	A	0.25	8.2	11.7
	SBT/R	A	0.51	11.3	82.5	C	0.76	15.0	182.1
	Overall	**F**	**1.02**	**46.5**	**-**	**D**	**0.82**	**19.5**	**-**
North Bowesville Road at Uplands Drive *Unsignalized*	EB	A	-	0.0	-	A	-	0.0	-
	WB	A	0.02	7.5	0.8	A	0.02	7.7	0.8
	NB	B	0.02	12.0	0.8	B	0.12	12.4	3.0
	SB	B	0.00	11.1	0.0	A	-	0.0	-
	Overall	**A**	**-**	**0.6**	**-**	**A**	**-**	**1.9**	**-**

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

At the intersection of Riverside Drive at Uplands Drive/Kimberwick Crescent, the northbound shared though/right turn movement during AM peak hour is over theoretical capacity and may subject to extended queues and the overall intersection is over theoretical capacity. The westbound shared left turn/through movement may subject to high delays and extended queues during both peak hours. Operations and volumes at this intersection may be influenced by conditions at the intersection of Riverside Drive at Hunt Club Road, particularly for the southbound movements beyond which queues may extend from the downstream intersection during the PM peak hour.

2.2.8 Collision Analysis

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

Table 3: Study Area Collision Summary, 2015-2019

		Number	%
Total Collisions		**35**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	4	11%
	Property Damage Only	31	89%
Initial Impact Type	**Angle**	3	9%
	Rear end	16	46%
	Sideswipe	2	6%
	Turning Movement	10	29%
	SMV Other	3	9%
	Other	1	3%
Road Surface Condition	**Dry**	22	63%
	Wet	7	20%
	Loose Snow	2	6%
	Slush	2	6%
	Packed Snow	2	6%
Pedestrian Involved		1	3%
Cyclists Involved		0	0%

Figure 11: Study Area Collision Records – Representation of 2015-2019

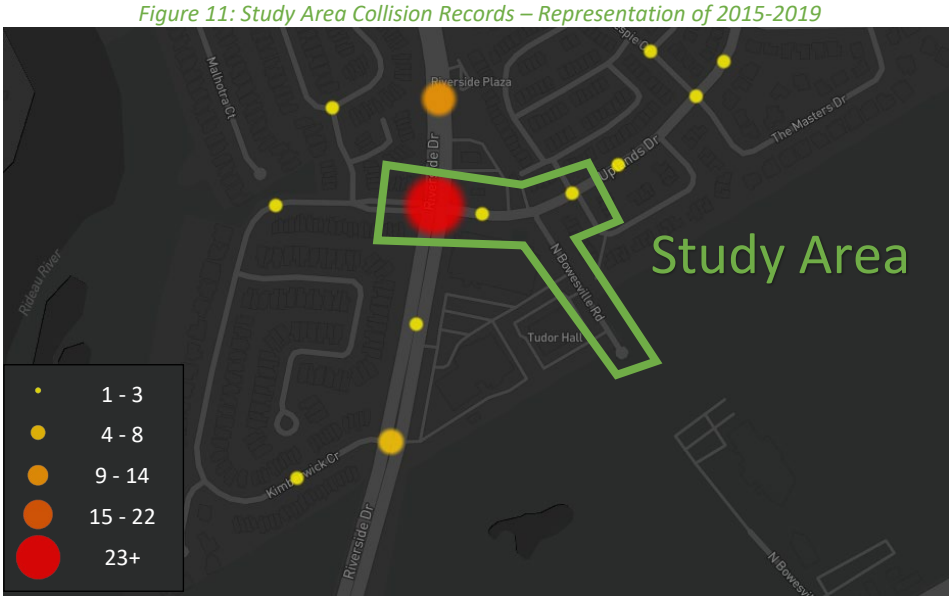


Table 4: Summary of Collision Locations, 2015-2019

	Number	%
Intersections / Segments	**35**	**100%**
Riverside Dr @ Uplands Dr/Kimberwick Cres	33	94%
Buckingham Priv @ Uplands Dr	1	3%
Uplands Dr Btwn Riverside Dr & North Bowesville Rd	1	3%

Within the study area, the intersection of Riverside Drive at Uplands Drive/Kimberwick Crescent is noted to have experienced higher collisions than other locations. Table 5 summarizes the collision types and conditions for ethe location.

Table 5: Riverside Drive at Uplands Drive/Kimberwick Crescent Collision Summary

		Number	%
Total Collisions		**33**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	4	12%
	Property Damage Only	29	88%
Initial Impact Type	**Angle**	3	9%
	Rear end	16	48%
	Sideswipe	2	6%
	Turning Movement	8	24%
	SMV Other	3	9%
	Other	1	3%
Road Surface Condition	**Dry**	21	64%
	Wet	7	21%
	Loose Snow	2	6%
	Slush	1	3%
	Packed Snow	2	6%
Pedestrian Involved		1	3%
Cyclists Involved		0	0%

The Riverside Drive at Uplands Drive/Kimberwick Crescent N intersection had a total of 33 collisions during the 2015-2019 time period, with 29 involving property damage only and the remaining four having non-fatal injuries. The collision types are most represented by the rear end with 16 collisions, followed by turning movement with eight collisions, and with the remaining collision types represented by angle, SMV other, and other. Rear end collisions are typical of congested areas. Turning movement collisions may be associated with third southbound receiving/acceleration lane along the gas station frontage. Weather conditions are not considered to affect collisions at this location.

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

The Transportation Master Plan identifies isolated transit priority measures along Riverside Drive within the Network Concept; however, it is not included in the Affordable Network.

2.3.2 Other Study Area Developments

3690 & 3630 Riverside Drive

The proposed development application includes a site plan to allow the construction of senior apartments and retirement home, a 48,450 ft^2 hotel, 10,000 ft^2 of retail, 29,000 ft^2 car dealership, and 20,000 ft^2 private school. Phase one of the development was initially anticipated to be built out by 2020 and to generate 208 new AM two-way peak-hour auto trips, 181 new PM two-way peak-hour auto trips. Phase two was initially anticipated to be

built out by 2021 to generate 71 new AM two-way peak-hour auto trips, 86 new PM two-way peak-hour auto trips. (Parsons, 2018)

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersections of:

- Riverside Drive at:
  - Uplands Drive/ Kimberwick Crescent
- North Bowesville Road at:
  - Uplands Drive
  - Site Access (Future Conditions)

The boundary road will be North Bowesville Road and screenline SL20 is located along the Rideau River to the west of the subject site but will not be analyzed as part of this study.

3.2 Time Periods

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

3.3 Horizon Years

The anticipated build-out year is 2026. As a result, the full build-out plus five years horizon year is 2031.

4 Exemption Review

Table 6 summarizes the exemptions for this TIA.

Table 6: Exemption Review

Module	Element	Explanation	Exempt/Required
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Required
	4.1.3 New Street Networks	Only required for plans of subdivision	Exempt
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Required
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Required
Network Impact Component			
4.5 Transportation Demand Management	All Elements	Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	Required
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	Required
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess	Exempt

Module	Element	Explanation	Exempt/Required
		of equivalent volume permitted by established zoning	

5 Development-Generated Travel Demand

5.1 Mode Shares

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

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

Travel Mode	Multi-Unit (High-Rise)	
	AM	PM
Auto Driver	39%	44%
Auto Passenger	6%	11%
Transit	44%	35%
Cycling	1%	2%
Walking	9%	9%
Total	**100%**	**100%**

5.2 Trip Generation

This TIA has been prepared using the vehicle and person trip rates for the residential dwellings using the TRANS Trip Generation Manual (2020). Table 8 summarizes the person trip rates for the proposed residential land use for each peak period.

Table 8: Trip Generation Person Trip Rates by Peak Period

Land Use	Land Use Code	Peak Period	Person Trip Rates
Multi-Unit (High-Rise)	221 & 222 (TRANS)	AM	0.80
		PM	0.90

Using the above person trip rates, the total person trip generation has been estimated. Table 9 summarizes the total person trip generation for the residential land use.

Table 9: Total Residential Person Trip Generation by Peak Period

Land Use	Units	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Multi-Unit (High-Rise)	365	91	201	292	191	138	329

Using the above mode share targets for the person trip rates, the person trips by mode have been projected. Trip generation by peak hour has been forecasted using the prescribed peak period conversion factors presented in the TRANS Trip Generation Manual (2020) for the residential component. Table 10 summarizes the residential trip generation by mode and peak hour.

Table 10: Residential Trip Generation by Mode

Travel Mode		AM Peak Hour				PM Peak Hour			
		Mode Share	In	Out	Total	Mode Share	In	Out	Total
Multi-Unit (High-Rise)	Auto Driver	**39%**	17	37	54	**44%**	37	27	64
	Auto Passenger	**6%**	2	6	8	**11%**	9	7	16
	Transit	**44%**	22	48	70	**35%**	31	23	54
	Cycling	**1%**	1	1	2	**2%**	2	1	3
	Walking	**9%**	5	10	15	**9%**	9	6	15
	Total	**100%**	**46**	**101**	**146**	**100%**	**84**	**61**	**145**

As shown above, a total of 54 AM and 64 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

5.3 Trip Distribution

To understand the travel patterns of the subject development, the OD Survey has been reviewed to determine the travel for the residential component, and these patterns were applied based on the build-out of Hunt Club. Table 11 below summarizes the distributions.

Table 11: OD Survey Distribution – Hunt Club

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

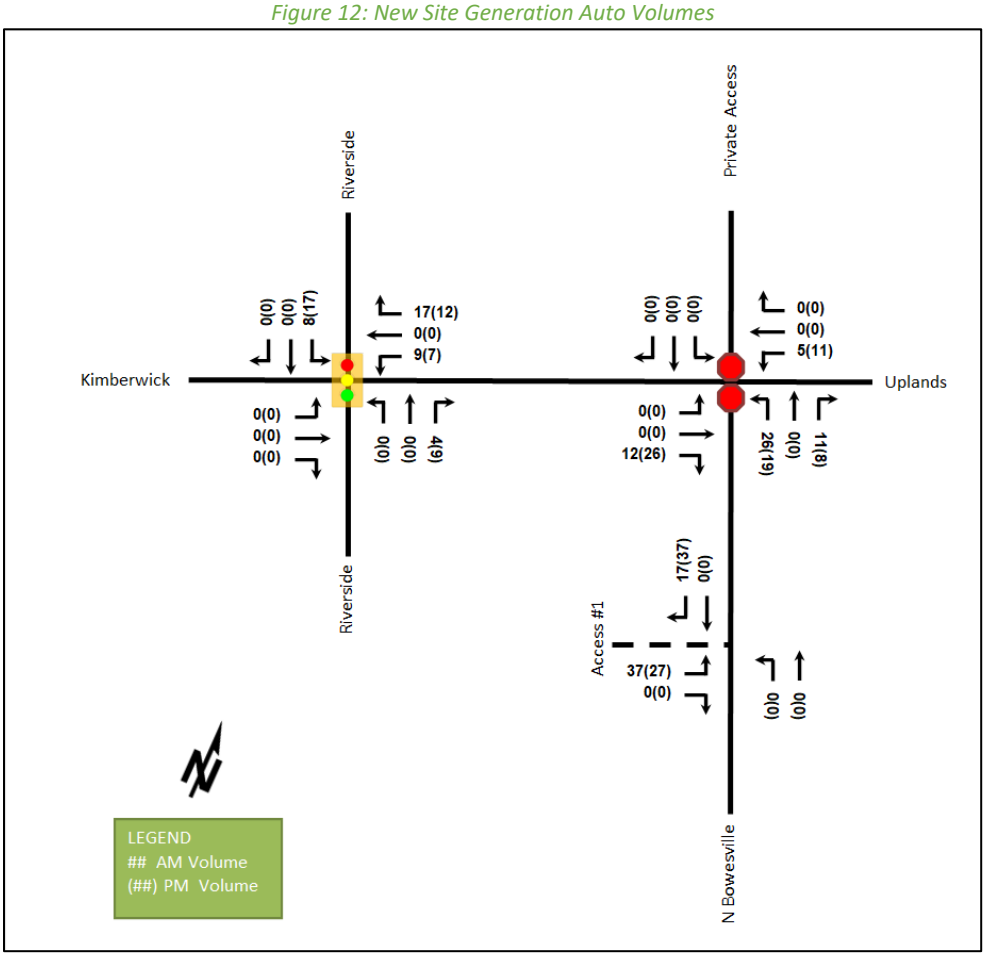
5.4 Trip Assignment

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

Table 12: Trip Assignment

To/From	Via
North	40% Riverside Drive (N)
South	10% Riverside Drive (S) 5% Uplands Drive (E)
East	5% Riverside Drive (N) 25% Uplands Drive (E)
West	15% Riverside Drive (S)
Total	**100%**

Figure 12: New Site Generation Auto Volumes



6 Background Network Travel Demands

6.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3 and is not considered to have any notable impact on the study area traffic volumes and travel patterns.

6.2 Background Growth

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

The growth rates derived from the 2011 and 2031 TRANS model horizons are projected to be positive along Riverside Drive in both directions and along Uplands Drive in the eastbound direction. And it is projected to be negative along Uplands Drive in the westbound direction. When reviewing the existing volumes and comparing to the projected 2031 TRANS volumes, it is noted that the study area volumes in the off-peak direction along Riverside Drive and peak direction along Uplands Drive have been exceeded. As a result, the modified growth rates have been applied to the study area network. The rates of TRANS Regional Model Projections are provided in Table 13, and Table 14 summarizes the growth rates applied within the study area.

Table 13: TRANS Regional Model Projections – Study Area Growth Rates

Street	TRANS Rate		Existing to 2031	
	Eastbound	Westbound	Eastbound	Westbound
Uplands Drive	0.49%	-1.01%	11.56%	-3.74%
	Northbound	**Southbound**	**Northbound**	**Southbound**
Riverside Drive	0.61%	0.09%	1.06%	-3.08%

Table 14: Study Area Growth Rates Applied

Street	AM Peak Hour		PM Peak Hour	
	Eastbound	Westbound	Eastbound	Westbound
Uplands Drive	0.50 %	-	-	0.50 %
	Northbound	**Southbound**	**Northbound**	**Southbound**
Riverside Drive	0.50 %	-	-	0.50 %

6.3 Other Developments

The background developments explicitly considered in the background conditions include 3690 & 3630 Riverside Drive and these background development volumes have been provided in Appendix F.

7 Demand Rationalization

7.1 2026 Future Background Operations

Figure 13 illustrates the 2026 background volumes and Table 15 summarizes the 2026 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and HCM 2010 average delay for unsignalized intersections. The synchro worksheets for the 2026 future background horizon are provided in Appendix G.

Figure 13: 2026 Future Background Volumes

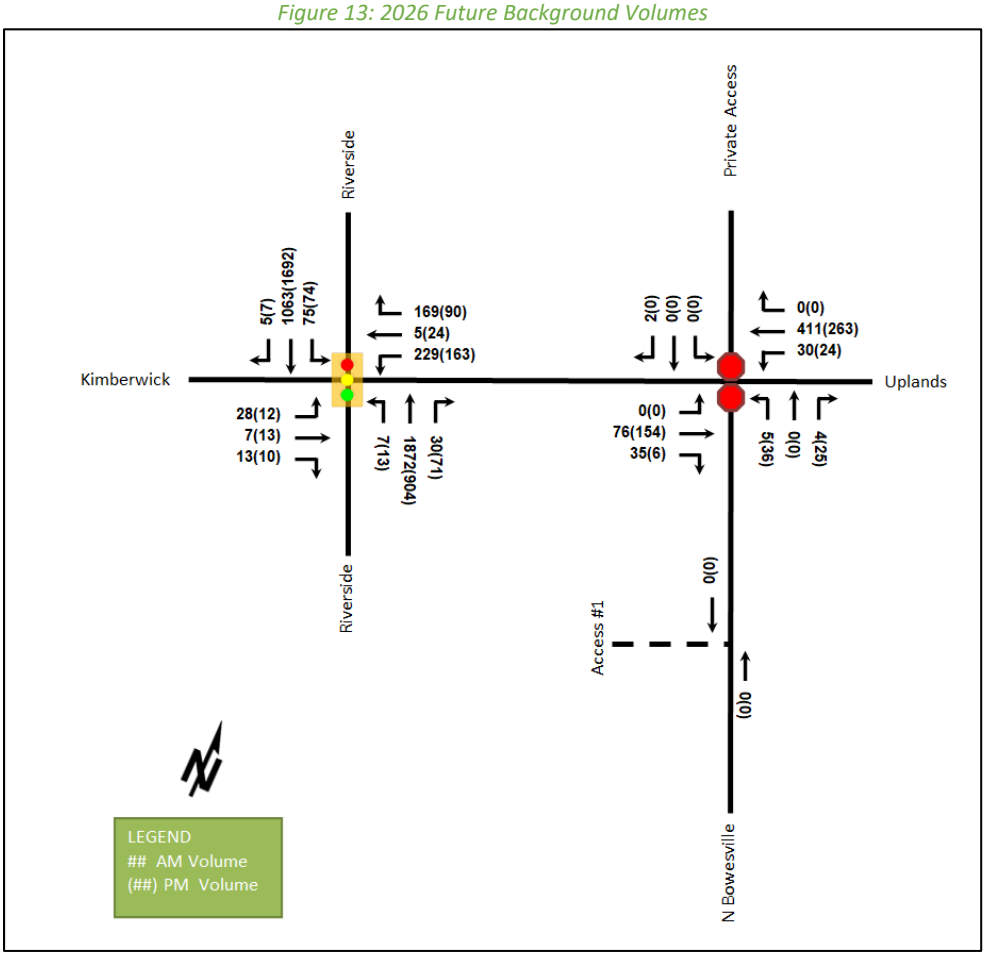


Table 15: 2026 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Riverside Drive at Uplands Drive/ Kimberwick Crescent ***Signalized***	EBL	A	0.17	39.9	13.5	A	0.08	42.7	8.0
	EBT/R	A	0.06	21.1	7.6	A	0.08	28.4	10.2
	WBL/T	D	0.88	77.0	**#91.9**	D	0.83	78.7	71.0
	WBR	A	0.39	8.2	16.9	A	0.28	10.4	13.8
	NBL	A	0.03	14.3	3.3	A	0.10	15.2	5.4
	NBT/R	E	0.99	43.9	**#315.0**	A	0.47	14.5	94.8
	SBL	A	0.49	25.3	19.2	A	0.22	7.7	10.8
	SBT/R	A	0.48	10.4	76.4	C	0.71	13.2	163.4
	Overall	**E**	**0.95**	**33.5**	-	**C**	**0.77**	**17.6**	-
North Bowesville Road at Uplands Drive ***Unsignalized***	EB	-	-	-	-	-	-	-	-
	WB	A	0.02	7.6	0.8	A	0.02	7.6	0.8
	NB	B	0.02	11.8	0.8	B	0.10	11.8	2.3
	SB	B	0.00	11.7	0.0	-	-	-	-
	Overall	**A**	-	**0.6**	-	**A**	-	**1.8**	-

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

At the intersection of Riverside Drive at Uplands Drive/Kimberwick Crescent, the westbound shared left-turn/through and northbound shared through/right-turn movements may subject to extended queues during the AM peak hour. The incremental improvement to the intersection operations is predominantly a result of the shift in peak hour factor to 1.00 for forecasted conditions.

7.2 2031 Future Background Operations

Figure 14 illustrates the 2031 background volumes and Table 16 summarizes the 2031 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and HCM 2010 average delay for unsignalized intersections. The synchro worksheets for the 2031 future background horizon are provided in Appendix H.

Figure 14: 2031 Future Background Volumes

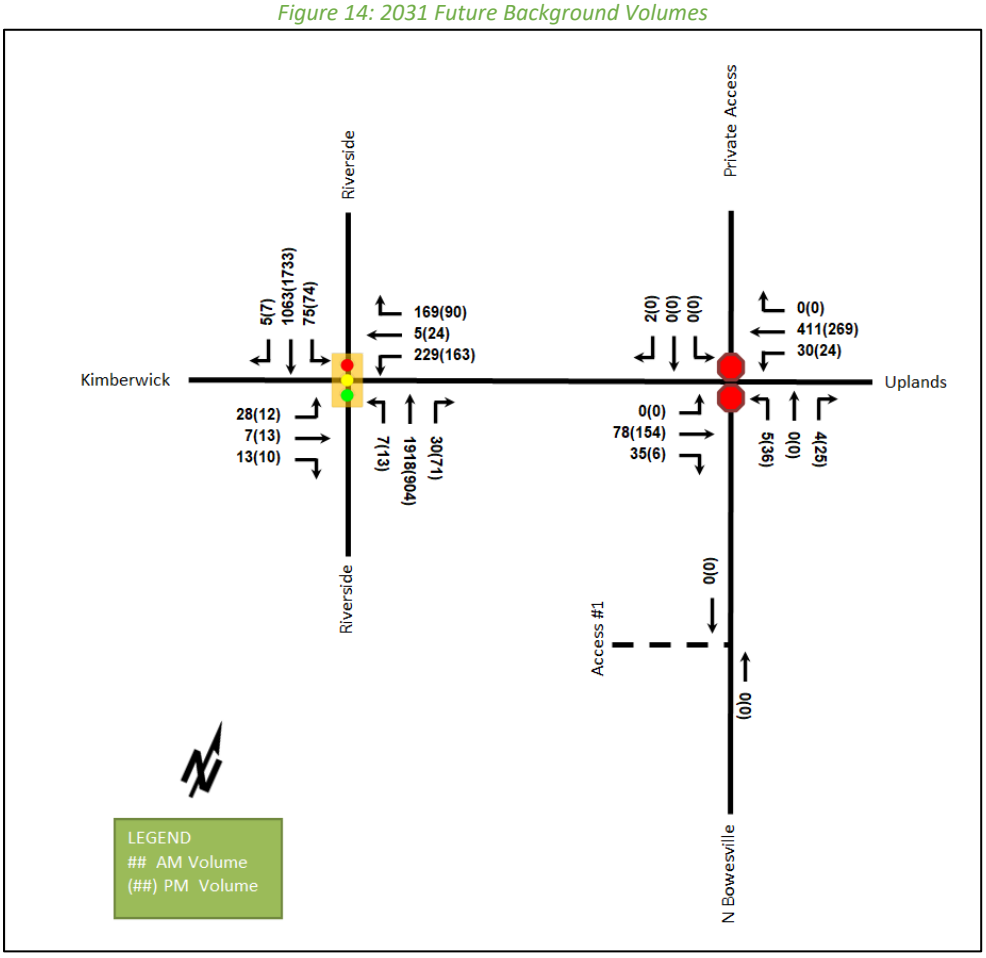


Table 16: 2031 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay (s)	Q (95th)	LOS	V/C	Delay (s)	Q (95th)
Riverside Drive at Uplands Drive/ Kimberwick Crescent *Signalized*	EBL	A	0.17	39.9	13.5	A	0.08	42.7	8.0
	EBT/R	A	0.06	21.1	7.6	A	0.08	28.4	10.2
	WBL/T	D	0.88	77.0	**#91.9**	D	0.83	78.7	71.0
	WBR	A	0.39	8.2	16.9	A	0.28	10.4	13.8
	NBL	A	0.03	14.3	3.3	A	0.11	15.7	5.5
	NBT/R	**F**	**1.01**	**49.7**	**#326.8**	A	0.47	14.5	94.8
	SBL	A	0.49	25.3	19.2	A	0.22	7.7	10.8
	SBT/R	A	0.48	10.4	76.4	C	0.73	13.6	171.9
	Overall	**E**	**0.97**	**36.8**	**-**	**C**	**0.79**	**17.8**	**-**
North Bowesville Road at Uplands Drive *Unsignalized*	EB	-	-	-	-	-	-	-	-
	WB	A	0.02	7.5	0.8	A	0.02	7.6	0.8
	NB	B	0.02	11.8	0.8	B	0.10	11.9	2.3
	SB	B	0.00	11.7	0.0	-	-	-	-
	Overall	**A**	**-**	**0.6**	**-**	**A**	**-**	**1.8**	**-**

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

The intersections at the 2031 future background condition are anticipated to operate similarly to the 2026 future background condition. At Riverside Drive at Uplands Drive/Kimberwick Crescent intersection during AM peak hour, the northbound share through/right-turn movement will be over theoretical and may start to be subject to extended queues and high delays due to the background growth along the corridor.

7.3 Modal Share Sensitivity and Demand Rationalization Conclusions

Capacity constraints have been noted on the northbound shared through/right-turn movement at the Riverside Drive at Uplands Drive/Kimberwick Crescent intersection in the existing conditions, due primarily to the high through volumes. The site generated volumes on this movement are forecasted to be low, totalling four trips during the AM peak hour and nine trips during the PM peak hour, and are not anticipated to be a contributing factor to the identified existing network constraint. No demand rationalization is required for this development.

8 Transportation Demand Management

8.1 Context for TDM

The mode shares used within the TIA represent the unmodified district mode shares. Overall, the modal shares are likely to be achieved and supporting TDM measures should be provided.

The subject site is not within a design priority area. The total bedroom count within the development is 512 bedrooms across both buildings with 220 bachelor/one-bedroom units and 146 two-bedroom units.

8.2 Need and Opportunity

The subject site has been assumed to rely on similar levels of auto travel to transit, and those assumptions have been carried through the analysis. As the unmodified district mode shares have been applied, risks to other network users from failing to meet mode share targets are low.

8.3 TDM Program

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

- Display local area maps with walking and cycling routes, and transit route information and schedules at major entrances
- Provide a multimodal travel option information package to new residents
- Inclusion of a 1-year Presto card for first time apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
- Unbundle parking cost from rental costs

9 Neighbourhood Traffic Management

Site traffic is proposed to access the arterial network via North Bowesville Road (a local road) and Uplands Drive Road (a collector road). The TIA Guidelines propose a neighbourhood traffic management threshold of 120 vehicles per peak hour for local roads and 300 vehicles per peak hour for collector roads, equivalent to two cars and five cars per minute in both directions total, respectively.

The existing volumes on North Bowesville Road are 74 two-way vehicles in the AM peak hour and 91 two-way vehicles in the PM peak hour and are below the thresholds. Overall, the site is forecasted to generate 54 new AM and 64 new PM two-way vehicle trips along North Bowesville Road, resulting in volumes of 128 two-way vehicles in the AM and 155 two-way vehicles in the PM peak hour.

The existing volumes on Uplands Drive east of North Bowesville Road are 519 two-way vehicles in the AM peak hour and 458 two-way vehicles in the PM peak hour, both above the collector road thresholds. The site is forecasted to generate 16 new AM and 19 new PM two-way vehicle trips on Uplands Drive east of North Bowesville Road, resulting in volumes of 535 two-way vehicles in the AM and 477 two-way vehicles in the PM peak hour.

On Uplands Drive west of North Bowesville Road are above the thresholds having 527 two-way vehicles in the AM peak hour and 451 two-way vehicles in the PM peak hour. The site is forecasted to generate 38 new AM and 45 new PM two-way vehicle trips on Uplands Drive west of North Bowesville Road, resulting in volumes of 565 two-way vehicles in the AM peak hour and 495 two-way vehicles in the PM peak hour.

The neighbourhood traffic management thresholds are considered too low and are presently being revised by the City. While over the prescribed theoretical local and collector road thresholds, the site is forecasted to generate approximately 3 cars per two minutes along North Bowesville Road and one car per minute and 20 seconds along Uplands Dive in either direction during peak hours. This volume increase is not considered a significant impact on North Bowesville Road and Uplands Drive Road or requiring of traffic management.

10 Transit

10.1 Route Capacity

In Section 5.1 the trip generation by mode was estimated, including an estimate of the number of transit trips that will be generated by the proposed development. Table 17 summarizes the transit trip generation.

Table 17: Trip Generation by Transit Mode

Travel Mode	Mode Share	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Transit	44% (35%)	22	48	70	31	23	54

The proposed development is anticipated to generate an additional 70 AM peak hour transit trips and 54 PM peak hour transit trips. Of these trips, 48 outbound AM trips and 31 inbound PM trips are anticipated. From the trip distribution found in Section 5.2, these values can be further broken down to 14 AM trips to the east and 34 trips to the west during the AM peak hour and nine trips from the east and 22 trips from the west during the PM peak hour.

Trips to all directions may be assumed to be serviced by route #90. Overall, the forecasted new transit trips would result in approximately 9 additional riders per bus per peak hour in the peak direction for route #90. The maximum service increase needed to accommodate these riders would be the substitution of a single higher capacity bus (i.e., an articulated bus in place of a standard bus) in the peak direction per peak hour.

10.2 Transit Priority

Examining the study area intersection delays, negligible impacts are noted on the transit movements at the study area intersections as a result of the development site traffic.

11 Network Intersection Design

11.1 Network Intersection Control

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

11.2 Network Intersection Design

11.2.1 2026 Future Total Network Intersection Operations

Figure 15 illustrates the 2026 future total intersection volumes and the network intersection operations are summarized below in Table 18. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and HCM 2010 average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix J.

Figure 15: 2026 Future Total Volumes

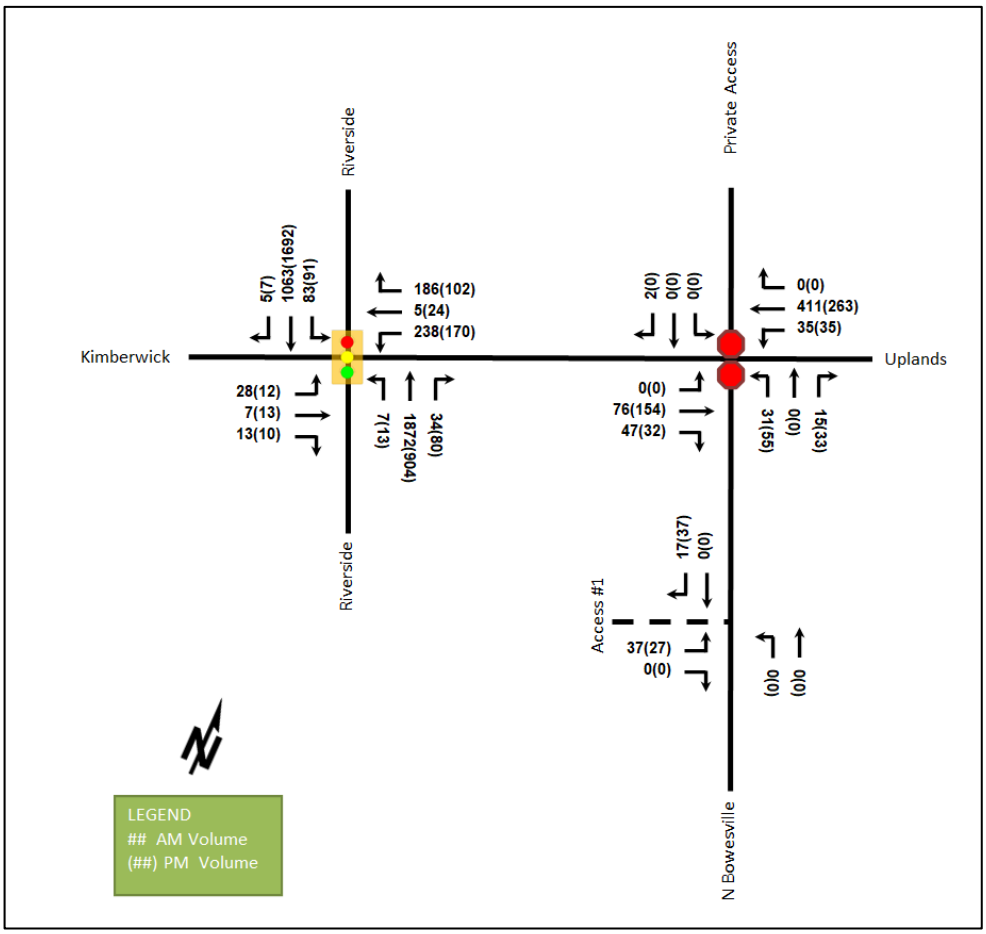


Table 18: 2026 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Riverside Drive at Uplands Drive/ Kimberwick Crescent ***Signalized***	EBL	A	0.18	39.9	13.6	A	0.08	42.5	8.0
	EBT/R	A	0.06	21.1	7.6	A	0.08	28.3	10.2
	WBL/T	D	0.90	79.2	**#96.8**	D	0.84	79.3	**#77.9**
	WBR	A	0.41	8.2	17.8	A	0.30	10.1	14.4
	NBL	A	0.03	14.7	3.4	A	0.11	15.8	5.4
	NBT/R	E	1.00	48.4	**#319.3**	A	0.49	15.9	97.3
	SBL	A	0.52	27.4	21.8	A	0.27	8.3	12.9
	SBT/R	A	0.48	10.6	76.4	C	0.71	13.5	163.4
	Overall	**E**	**0.97**	**36.2**	-	**C**	**0.78**	**18.3**	-
North Bowesville Road at Uplands Drive ***Unsignalized***	EB	A	-	0.0	0.0	A	-	0.0	0.0
	WB	A	0.02	7.5	0.8	A	0.03	7.7	0.8
	NB	B	0.10	13.3	2.3	B	0.16	12.8	4.5
	SB	B	0.00	11.7	0.0	A	-	0.0	-
	Overall	**A**	**-**	**1.5**	-	**A**	**-**	**2.4**	-

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

The intersections at the 2026 future total horizon are anticipated to operate similarly to the 2026 future background horizon. As in the existing conditions, the westbound shared left-turn/ through movement at Riverside Drive and Uplands Drive/ Kimberwick intersection during the PM peak hour may subject to extended queues. No mitigation of conditions is required for the subject site traffic.

11.2.2 2031 Future Total Network Intersection Operations

Figure 16 illustrates the 2031 future total intersection volumes and network intersection operations are summarized below in Table 19. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and HCM 2010 average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix K.

Figure 16: 2031 Future Total Volumes

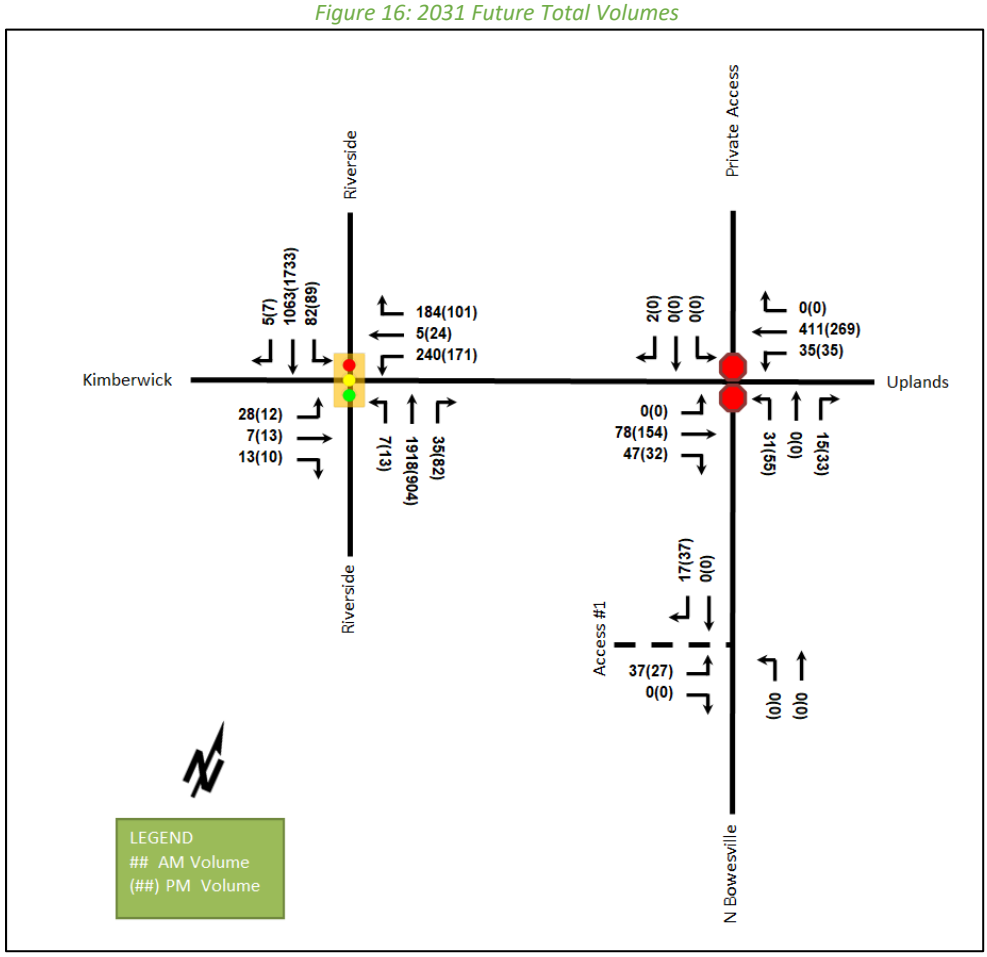


Table 19: 2031 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95th)	LOS	V/C	Delay	Q (95th)
Riverside Drive at Uplands Drive/ Kimberwick Crescent *Signalized*	EBL	A	0.18	39.9	13.6	A	0.08	42.5	8.0
	EBT/R	A	0.06	21.1	7.6	A	0.08	28.3	10.2
	WBL/T	D	0.90	79.2	**#96.8**	D	0.84	79.3	**#77.9**
	WBR	A	0.41	8.2	17.8	A	0.30	10.1	14.4
	NBL	A	0.03	14.7	3.4	A	0.12	16.2	5.5
	NBT/R	**F**	**1.03**	**54.8**	**#331.4**	A	0.49	15.9	97.3
	SBL	A	0.52	27.4	21.8	A	0.27	8.3	12.9
	SBT/R	A	0.48	10.6	76.4	C	0.73	14.0	171.9
	Overall	**E**	**0.98**	**39.9**	**-**	**C**	**0.79**	**18.5**	**-**
North Bowesville Road at Uplands Drive *Unsignalized*	EB	A	-	0.0	0.0	A	-	0.0	0.0
	WB	A	0.02	7.5	0.8	A	0.03	7.7	0.8
	NB	B	0.10	13.3	2.3	B	0.16	12.8	4.5
	SB	B	0.00	11.7	0.0	A	-	0.0	0.8
	Overall	**A**	**-**	**1.5**	**-**	**A**	**-**	**2.4**	**-**

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

The intersections at the 2026 future total horizon are anticipated to operate similarly to the 2026 future background horizon. Similar to 2026 future total horizon, and as in the existing conditions, the westbound shared left-turn/ through movement at Riverside Drive and Uplands Drive/ Kimberwick intersection at 2031 future total horizon may exhibit extended queues during PM peak hour. No mitigation of conditions is required for the subject site traffic.

11.2.3 Network Intersection MMLOS

Table 20 summarizes the MMLOS analysis for the network intersections of Riverside Drive at Uplands Drive/Kimberwick Crescent. The existing and future conditions for both intersections will be the same and are considered in one row. The intersection analysis is based on the land use designation of "General Urban Area". The MMLOS worksheets has been provided in Appendix L.

Table 20: Study Area Intersection MMLOS Analysis

Intersection	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
Riverside Drive at Uplands Drive/ Kimberwick Crescent	**F**	C	**F**	C	**F**	D	-	-	**E**	D

The pedestrian, bicycle, transit, and auto LOS will not be met at the study area intersection.

To meet pedestrian LOS targets, the maximum crossing distance on all pedestrian crossings would need to be reduced to three-lane widths.

To meet bicycle LOS at the intersection, the left-turn configurations would need to be two-stage or include turn boxes, and dedicated facilities would be required.

The transit LOS may not be met at the intersection beyond 2031, and the delay would need to be reduced to equal or below 30 seconds on all transit movements.

The improvements for the intersection are not the responsibility of the development and are provided for the City's planning.

11.2.4 Recommended Design Elements

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

12 Summary of Improvements Indicated and Modifications Options

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

Proposed Site and Screening

- The proposed site includes 365 apartment units
- The concept plan remains an existing full-movements access for parking garage access and proposes the relocation of an existing full-movements access for fire route and visitor access on North Bowesville Road
- The development is proposed to be completed as a single phase by 2026
- The trip generation trigger was met for the TIA Screening
- This report is in support of a zoning by-law amendment

Existing Conditions

- Riverside Drive is arterial roads, and Uplands Drive is a collector road in the study area
- Sidewalks or asphalt pathways are provided along both sides of Uplands Drive and Riverside Drive
- The high volumes roadways have produced a high number of collisions at the study area intersections, primarily at the Riverside Drive at Uplands Drive/Kimberwick Crescent intersection (94% or 33 collisions), predominantly represented by the rear end, which is typical of congested areas

Development Generated Travel Demand

- The proposed development is forecasted produce 146 two-way people trips during the AM peak hour and 145 two-way people trips during the PM peak hour
- Of the forecasted people trips, 54 two-way trips will be vehicle trips during the AM peak hour and 64 two-way trips will be vehicle trips during the PM peak hour
- Of the forecasted trips, 40 % are anticipated to travel north, 30 % to the east, and 15 % to both the west and south

Background Conditions

- The background developments were explicitly included in the background conditions, along with a total background growth of 0.50% per annum on peak directions along Uplands Drive and Riverside Drive
- The incremental improvement to the intersection operations is predominantly a result of the shift in peak hour factor to 1.00 for forecasted conditions

TDM

- Supportive TDM measures to be included within the proposed development should include:
  - Display local area maps with walking and cycling routes, and transit route information and schedules at major entrances
  - Provide a multimodal travel option information package to new residents
  - Inclusion of a 1-year Presto card for first time apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
  - Unbundle parking cost from rental costs

Neighbourhood Traffic Management

- The existing volumes on North Bowesville Road are 74 two-way vehicles in the AM peak hour and 91 two-way vehicles in the PM peak hour and are below the thresholds
- The existing volumes on Uplands Drive east of North Bowesville Road are 519 two-way vehicles in the AM peak hour and 458 two-way vehicles in the PM peak hour, both above the collector road thresholds
- The site is forecasted to generate approximately 3 cars per two minutes along North Bowesville Road and one car per minute and 20 seconds along Uplands Dive in either direction during peak hour
- The increased volume is not considered a significant impact on North Bowesville Road and Uplands Drive Road or require any traffic management

Transit

- The proposed development is anticipated to generate an additional 70 AM peak hour transit trips and 54 PM peak hour transit trips
- Overall, the forecasted new transit trips would result in approximately 9 additional riders per bus per peak hour in the peak direction for route #90
- Examining the study area intersection delays, negligible impacts are noted on the transit movements at the study area intersections as a result of the development site traffic

Network Intersection Design

- Generally, the network intersections will operate similarly to future background horizons
- As in the existing conditions, the westbound shared left-turn/ through movement at Riverside Drive and Uplands Drive/ Kimberwick intersection at future total horizons may exhibit extended queues during PM peak hour, and no mitigation of conditions is required
- The pedestrian LOS will not be met at Riverside Drive at Uplands Drive/ Kimberwick Crescent intersection and requires the maximum crossing distance on all pedestrian crossings to be reduced to three-lane widths
- The bicycle LOS will not be met at Riverside Drive at Uplands Drive/ Kimberwick Crescent intersection and requires dedicated facilities and the left-turn configurations be two-stage or include turn boxes
- The transit LOS may not be met at the intersection beyond 2031, and the delay would need to be reduced to equal or below 30 seconds on all transit movements

13 Conclusion

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

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Senior Transportation Engineer

Appendix A

TIA Screening Form and PM Certification Form

6 Plaza Court,
Ottawa ON K2H 7W1

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 15-Feb-22
Project Number: 2020-103
Project Reference: 3750 North Bowesville

1.1 Description of Proposed Development	
Municipal Address	3750 North Bowesville Road
Description of Location	0.68 ha parcel at the south end of North Bowesville Road on the west side of the road
Land Use Classification	General Mixed Use (GM F(1.0) H(44))
Development Size	~300 High-Rise Units
Accesses	One full-moves on North Bowesville Rd
Phase of Development	One
Buildout Year	2026
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Townhomes or apartments	
Development Size	300	Units
Trip Generation Trigger	Yes	

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

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

TIA Plan Reports

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

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

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

CERTIFICATION

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

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

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

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

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

Name: _____Andrew Harte_____
(Please Print)

Professional Title: _____Professional Engineer_____

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

Office Contact Information (Please Print)
Address: 13 Markham Avenue
City / Postal Code: Ottawa / K2G 3Z1
Telephone / Extension: (613) 697-3797
E-Mail Address: Andrew.Harte@CGHTransportation.com

Appendix B

Turning Movement Counts

Transportation Services - Traffic Services

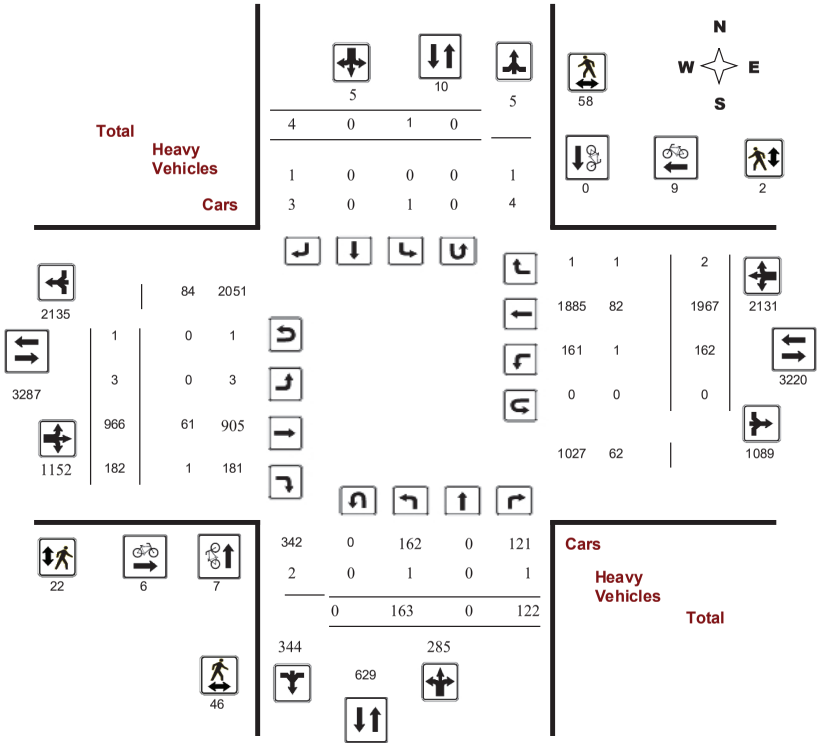
Turning Movement Count - Study Results

NORTH BOWESVILLE RD @ UPLANDS DR

Survey Date: Tuesday, November 26, 2019 **WO No:** 39101

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

Full Study Diagram



Transportation Services - Traffic Services

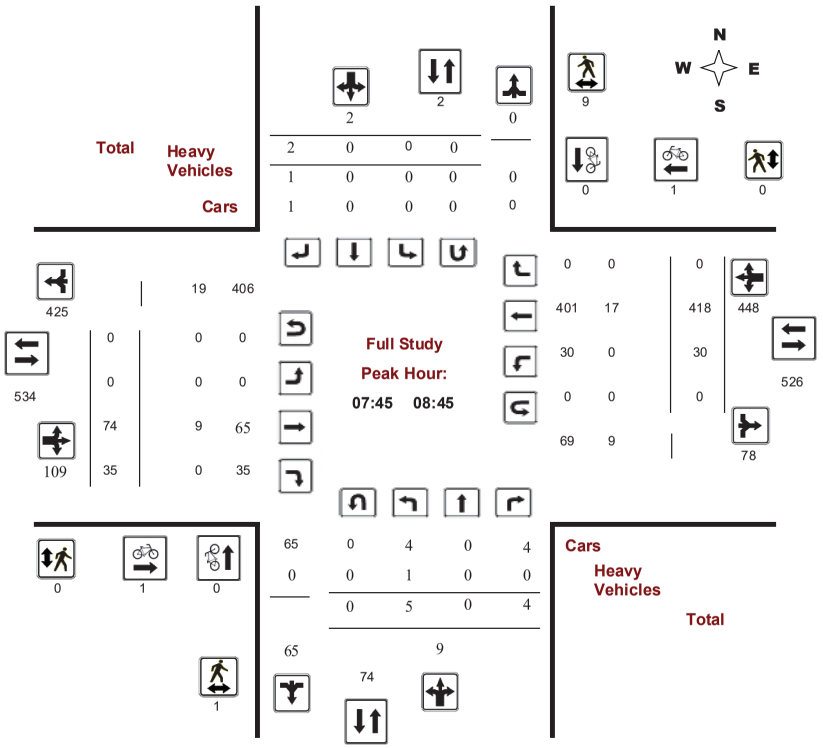
Turning Movement Count - Study Results

NORTH BOWESVILLE RD @ UPLANDS DR

Survey Date: Tuesday, November 26, 2019 **WO No:** 39101

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

Full Study Peak Hour Diagram



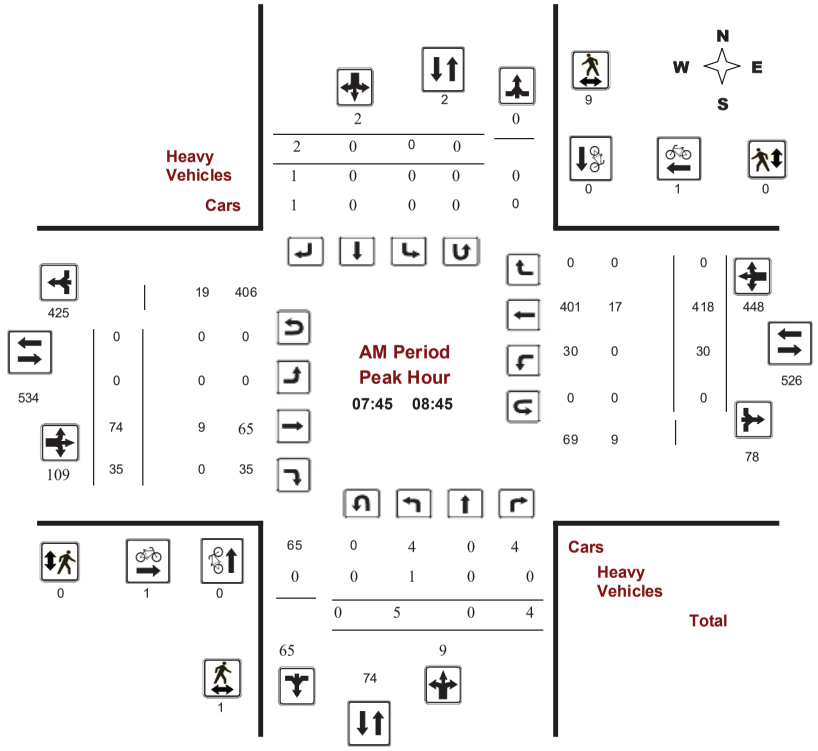
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

NORTH BOWESVILLE RD @ UPLANDS DR

Survey Date: Tuesday, November 26, 2019 **WO No:** 39101

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



Comments

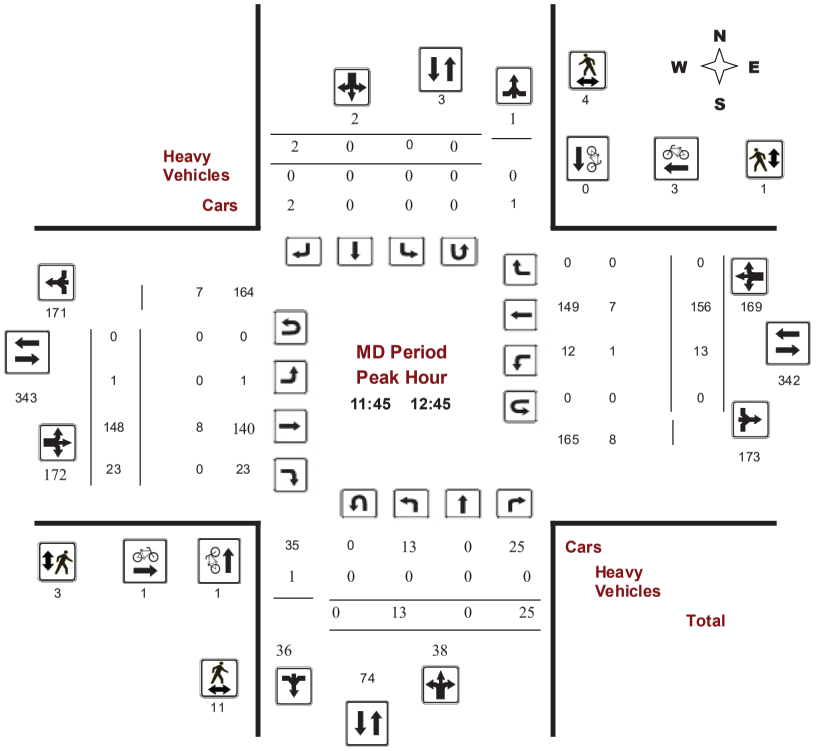
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

NORTH BOWESVILLE RD @ UPLANDS DR

Survey Date: Tuesday, November 26, 2019 **WO No:** 39101

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



Comments

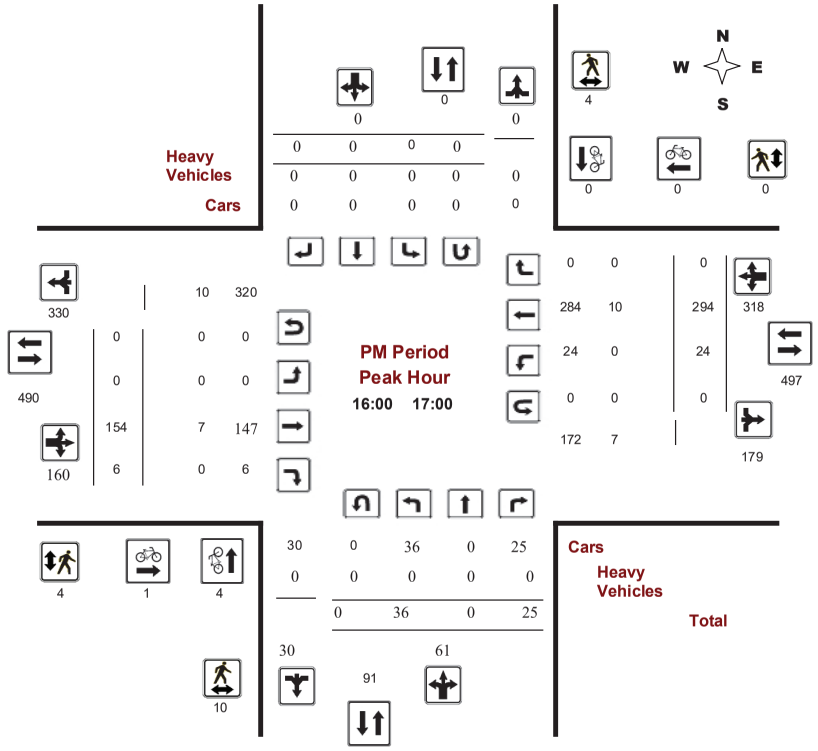
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

NORTH BOWESVILLE RD @ UPLANDS DR

Survey Date: Tuesday, November 26, 2019 **WO No:** 39101

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



Comments

Transportation Services - Traffic Services

Turning Movement Count - Study Results

NORTH BOWESVILLE RD @ UPLANDS DR

Survey Date: Tuesday, November 26, 2019 **WO No:** 39101

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

Full Study Summary (8 HR Standard)

Survey Date: Tuesday, November 26, 2019

Total Observed U-Turns

Northbound: 0 Southbound: 0

Eastbound: 1 Westbound: 0

AADT Factor 1.00

	Northbound				Southbound				Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	0	0	3	**3**	0	0	1	**1**	**4**	1	46	17	**64**	7	326	1	**334**	**398**	**402**
08:00 09:00	8	0	3	**11**	0	0	1	**1**	**12**	0	77	53	**130**	42	377	0	**419**	**549**	**561**
09:00 10:00	7	0	8	**15**	1	0	0	**1**	**16**	0	103	66	**169**	32	206	1	**239**	**408**	**424**
11:30 12:30	19	0	24	**43**	0	0	2	**2**	**45**	2	154	16	**172**	7	151	0	**158**	**330**	**375**
12:30 13:30	16	0	10	**26**	0	0	0	**0**	**26**	0	132	15	**147**	21	171	0	**192**	**339**	**365**
15:00 16:00	29	0	15	**44**	0	0	0	**0**	**44**	0	151	3	**154**	2	240	0	**242**	**396**	**440**
16:00 17:00	36	0	25	**61**	0	0	0	**0**	**61**	0	154	6	**160**	24	294	0	**318**	**478**	**539**
17:00 18:00	48	0	34	**82**	0	0	0	**0**	**82**	0	149	6	**155**	27	202	0	**229**	**384**	**466**
Sub Total	163	0	122	**285**	1	0	4	**5**	**290**	3	966	182	**1151**	162	1967	2	**2131**	**3282**	**3572**
U Turns	0			**0**	0			**0**	**0**	**1**			**1**	0			**0**	**1**	**1**
Total	163	0	122	**285**	1	0	4	**5**	**290**	4	966	182	**1152**	162	1967	2	**2131**	**3283**	**3573**
EQ 12Hr	227	0	170	**397**	1	0	6	**7**	**404**	6	1343	253	**1602**	225	2734	3	**2962**	**4564**	**4968**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	227	0	170	**397**	1	0	6	**7**	**404**	6	1343	253	**1602**	225	2734	3	**2962**	**4564**	**4968**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**1.00**					
AVG 24Hr	297	0	223	**520**	1	0	8	**9**	**529**	8	1759	331	**2098**	295	3582	4	**3881**	**5979**	**6508**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														**1.31**					

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

Transportation Services - Traffic Services

Turning Movement Count - Study Results

NORTH BOWESVILLE RD @ UPLANDS DR

Survey Date: Tuesday, November 26, 2019 **WO No:** 39101

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

Full Study 15 Minute Increments

Time Period		Northbound				Southbound					Eastbound				Westbound					Grand Total
		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	
07:00	07:15	0	0	0	0	0	0	0	0	**0**	0	10	3	13	2	46	1	49	**62**	**62**
07:15	07:30	0	0	1	1	0	0	0	0	**1**	0	9	3	12	1	57	0	58	**70**	**71**
07:30	07:45	0	0	1	1	0	0	0	0	**1**	1	10	6	17	1	101	0	102	**119**	**120**
07:45	08:00	0	0	1	1	0	0	1	1	**2**	0	17	5	22	3	122	0	125	**147**	**149**
08:00	08:15	0	0	0	0	0	0	0	0	**0**	0	14	8	22	11	104	0	115	**137**	**137**
08:15	08:30	2	0	1	3	0	0	1	1	**4**	0	24	13	37	8	108	0	116	**153**	**157**
08:30	08:45	3	0	2	5	0	0	0	0	**5**	0	19	9	28	8	84	0	92	**120**	**125**
08:45	09:00	3	0	0	3	0	0	0	0	**3**	1	20	23	44	15	81	0	96	**140**	**143**
09:00	09:15	1	0	2	3	0	0	0	0	**3**	0	28	24	52	19	56	1	76	**128**	**131**
09:15	09:30	2	0	3	5	0	0	0	0	**5**	0	20	17	37	6	52	0	58	**95**	**100**
09:30	09:45	2	0	2	4	1	0	0	1	**5**	0	32	12	44	3	50	0	53	**97**	**102**
09:45	10:00	2	0	1	3	0	0	0	0	**3**	0	23	13	36	4	48	0	52	**88**	**91**
11:30	11:45	9	0	1	10	0	0	0	0	**10**	1	37	1	39	1	36	0	37	**76**	**86**
11:45	12:00	5	0	14	19	0	0	0	0	**19**	0	34	3	37	2	38	0	40	**77**	**96**
12:00	12:15	4	0	4	8	0	0	1	1	**9**	1	44	4	49	3	32	0	35	**84**	**93**
12:15	12:30	1	0	5	6	0	0	1	1	**7**	0	39	8	47	1	45	0	46	**93**	**100**
12:30	12:45	3	0	2	5	0	0	0	0	**5**	0	31	8	39	7	41	0	48	**87**	**92**
12:45	13:00	6	0	6	12	0	0	0	0	**12**	0	33	2	35	3	44	0	47	**82**	**94**
13:00	13:15	6	0	0	6	0	0	0	0	**6**	0	31	2	33	2	46	0	48	**81**	**87**
13:15	13:30	1	0	2	3	0	0	0	0	**3**	0	37	3	40	9	40	0	49	**89**	**92**
15:00	15:15	3	0	4	7	0	0	0	0	**7**	0	48	1	49	0	44	0	44	**93**	**100**
15:15	15:30	7	0	3	10	0	0	0	0	**10**	0	36	1	37	0	55	0	55	**92**	**102**
15:30	15:45	10	0	5	15	0	0	0	0	**15**	0	31	0	31	1	67	0	68	**99**	**114**
15:45	16:00	9	0	3	12	0	0	0	0	**12**	0	36	1	37	1	74	0	75	**112**	**124**
16:00	16:15	8	0	6	14	0	0	0	0	**14**	0	40	0	40	2	79	0	81	**121**	**135**
16:15	16:30	13	0	7	20	0	0	0	0	**20**	0	47	2	49	9	77	0	86	**135**	**155**
16:30	16:45	6	0	6	12	0	0	0	0	**12**	0	37	2	39	5	69	0	74	**113**	**125**
16:45	17:00	9	0	6	15	0	0	0	0	**15**	0	30	2	32	8	69	0	77	**109**	**124**
17:00	17:15	13	0	16	29	0	0	0	0	**29**	0	36	2	38	7	59	0	66	**104**	**133**
17:15	17:30	16	0	7	23	0	0	0	0	**23**	0	38	0	38	6	49	0	55	**93**	**116**
17:30	17:45	10	0	4	14	0	0	0	0	**14**	0	32	2	34	9	49	0	58	**92**	**106**
17:45	18:00	9	0	7	16	0	0	0	0	**16**	0	43	2	45	5	45	0	50	**95**	**111**
Total:		163	0	122	285	1	0	4	5	**290**	4	966	182	1152	162	1967	2	2131	**290**	**3,573**

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

NORTH BOWESVILLE RD @ UPLANDS DR

Survey Date: Tuesday, November 26, 2019 **WO No:** 39101

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

Full Study Cyclist Volume

Time Period		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	1	0	**1**	0	0	**0**	**1**
07:15	07:30	0	0	**0**	0	1	**1**	**1**
07:30	07:45	0	0	**0**	0	0	**0**	**0**
07:45	08:00	0	0	**0**	0	1	**1**	**1**
08:00	08:15	0	0	**0**	0	0	**0**	**0**
08:15	08:30	0	0	**0**	0	0	**0**	**0**
08:30	08:45	0	0	**0**	1	0	**1**	**1**
08:45	09:00	0	0	**0**	1	0	**1**	**1**
09:00	09:15	0	0	**0**	0	1	**1**	**1**
09:15	09:30	0	0	**0**	0	0	**0**	**0**
09:30	09:45	0	0	**0**	1	0	**1**	**1**
09:45	10:00	0	0	**0**	0	0	**0**	**0**
11:30	11:45	0	0	**0**	0	2	**2**	**2**
11:45	12:00	0	0	**0**	1	0	**1**	**1**
12:00	12:15	1	0	**1**	0	0	**0**	**1**
12:15	12:30	0	0	**0**	0	2	**2**	**2**
12:30	12:45	0	0	**0**	0	1	**1**	**1**
12:45	13:00	0	0	**0**	0	1	**1**	**1**
13:00	13:15	1	0	**1**	0	0	**0**	**1**
13:15	13:30	0	0	**0**	0	0	**0**	**0**
15:00	15:15	0	0	**0**	0	0	**0**	**0**
15:15	15:30	0	0	**0**	0	0	**0**	**0**
15:30	15:45	0	0	**0**	1	0	**1**	**1**
15:45	16:00	0	0	**0**	0	0	**0**	**0**
16:00	16:15	0	0	**0**	0	0	**0**	**0**
16:15	16:30	4	0	**4**	0	0	**0**	**4**
16:30	16:45	0	0	**0**	0	0	**0**	**0**
16:45	17:00	0	0	**0**	1	0	**1**	**1**
17:00	17:15	0	0	**0**	0	0	**0**	**0**
17:15	17:30	0	0	**0**	0	0	**0**	**0**
17:30	17:45	0	0	**0**	0	0	**0**	**0**
17:45	18:00	0	0	**0**	0	0	**0**	**0**
Total		7	0	**7**	6	9	**15**	**22**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

NORTH BOWESVILLE RD @ UPLANDS DR

Survey Date: Tuesday, November 26, 2019 **WO No:** 39101

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

Full Study Pedestrian Volume

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	1	2	**3**	0	0	**0**	**3**
07:15 07:30	1	0	**1**	1	0	**1**	**2**
07:30 07:45	3	4	**7**	0	0	**0**	**7**
07:45 08:00	1	2	**3**	0	0	**0**	**3**
08:00 08:15	0	5	**5**	0	0	**0**	**5**
08:15 08:30	0	1	**1**	0	0	**0**	**1**
08:30 08:45	0	1	**1**	0	0	**0**	**1**
08:45 09:00	1	5	**6**	0	0	**0**	**6**
09:00 09:15	0	1	**1**	1	0	**1**	**2**
09:15 09:30	2	2	**4**	0	0	**0**	**4**
09:30 09:45	1	0	**1**	0	0	**0**	**1**
09:45 10:00	1	1	**2**	0	0	**0**	**2**
11:30 11:45	2	1	**3**	1	0	**1**	**4**
11:45 12:00	2	0	**2**	1	0	**1**	**3**
12:00 12:15	7	2	**9**	0	0	**0**	**9**
12:15 12:30	1	1	**2**	0	1	**1**	**3**
12:30 12:45	1	1	**2**	2	0	**2**	**4**
12:45 13:00	3	1	**4**	1	0	**1**	**5**
13:00 13:15	1	4	**5**	0	0	**0**	**5**
13:15 13:30	0	2	**2**	1	0	**1**	**3**
15:00 15:15	0	1	**1**	1	0	**1**	**2**
15:15 15:30	1	1	**2**	0	0	**0**	**2**
15:30 15:45	1	2	**3**	3	0	**3**	**6**
15:45 16:00	0	2	**2**	1	0	**1**	**3**
16:00 16:15	2	1	**3**	1	0	**1**	**4**
16:15 16:30	4	3	**7**	1	0	**1**	**8**
16:30 16:45	0	0	**0**	0	0	**0**	**0**
16:45 17:00	4	0	**4**	2	0	**2**	**6**
17:00 17:15	0	4	**4**	0	1	**1**	**5**
17:15 17:30	2	2	**4**	1	0	**1**	**5**
17:30 17:45	2	0	**2**	0	0	**0**	**2**
17:45 18:00	2	6	**8**	4	0	**4**	**12**
Total	46	58	**104**	22	2	**24**	**128**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

NORTH BOWESVILLE RD @ UPLANDS DR

Survey Date: Tuesday, November 26, 2019 **WO No:** 39101

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

Full Study Heavy Vehicles

		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	0	0	**0**	0	0	0	**0**	**0**	0	1	0	**1**	0	1	1	**2**	**3**	**3**
07:15	07:30	0	0	0	**0**	0	0	0	**0**	**0**	0	2	0	**2**	0	1	0	**1**	**3**	**3**
07:30	07:45	0	0	0	**0**	0	0	0	**0**	**0**	0	3	0	**3**	0	5	0	**5**	**8**	**8**
07:45	08:00	0	0	0	**0**	0	0	1	**1**	**1**	0	3	0	**3**	0	3	0	**3**	**6**	**7**
08:00	08:15	0	0	0	**0**	0	0	0	**0**	**0**	0	2	0	**2**	0	6	0	**6**	**8**	**8**
08:15	08:30	0	0	0	**0**	0	0	0	**0**	**0**	0	3	0	**3**	0	4	0	**4**	**7**	**7**
08:30	08:45	1	0	0	**1**	0	0	0	**0**	**1**	0	1	0	**1**	0	4	0	**4**	**5**	**6**
08:45	09:00	0	0	0	**0**	0	0	0	**0**	**0**	0	2	0	**2**	0	5	0	**5**	**7**	**7**
09:00	09:15	0	0	0	**0**	0	0	0	**0**	**0**	0	2	0	**2**	0	2	0	**2**	**4**	**4**
09:15	09:30	0	0	0	**0**	0	0	0	**0**	**0**	0	3	0	**3**	0	5	0	**5**	**8**	**8**
09:30	09:45	0	0	0	**0**	0	0	0	**0**	**0**	0	1	0	**1**	0	2	0	**2**	**3**	**3**
09:45	10:00	0	0	0	**0**	0	0	0	**0**	**0**	0	2	0	**2**	0	2	0	**2**	**4**	**4**
11:30	11:45	0	0	0	**0**	0	0	0	**0**	**0**	0	1	0	**1**	0	2	0	**2**	**3**	**3**
11:45	12:00	0	0	0	**0**	0	0	0	**0**	**0**	0	2	0	**2**	0	1	0	**1**	**3**	**3**
12:00	12:15	0	0	0	**0**	0	0	0	**0**	**0**	0	2	0	**2**	1	2	0	**3**	**5**	**5**
12:15	12:30	0	0	0	**0**	0	0	0	**0**	**0**	0	3	0	**3**	0	3	0	**3**	**6**	**6**
12:30	12:45	0	0	0	**0**	0	0	0	**0**	**0**	0	1	0	**1**	0	1	0	**1**	**2**	**2**
12:45	13:00	0	0	0	**0**	0	0	0	**0**	**0**	0	4	0	**4**	0	1	0	**1**	**5**	**5**
13:00	13:15	0	0	0	**0**	0	0	0	**0**	**0**	0	2	0	**2**	0	1	0	**1**	**3**	**3**
13:15	13:30	0	0	0	**0**	0	0	0	**0**	**0**	0	2	1	**3**	0	2	0	**2**	**5**	**5**
15:00	15:15	0	0	0	**0**	0	0	0	**0**	**0**	0	4	0	**4**	0	3	0	**3**	**7**	**7**
15:15	15:30	0	0	1	**1**	0	0	0	**0**	**1**	0	1	0	**1**	0	6	0	**6**	**7**	**8**
15:30	15:45	0	0	0	**0**	0	0	0	**0**	**0**	0	2	0	**2**	0	5	0	**5**	**7**	**7**
15:45	16:00	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**0**	0	3	0	**3**	**3**	**3**
16:00	16:15	0	0	0	**0**	0	0	0	**0**	**0**	0	2	0	**2**	0	3	0	**3**	**5**	**5**
16:15	16:30	0	0	0	**0**	0	0	0	**0**	**0**	0	3	0	**3**	0	2	0	**2**	**5**	**5**
16:30	16:45	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**0**	0	2	0	**2**	**2**	**2**
16:45	17:00	0	0	0	**0**	0	0	0	**0**	**0**	0	2	0	**2**	0	3	0	**3**	**5**	**5**
17:00	17:15	0	0	0	**0**	0	0	0	**0**	**0**	0	1	0	**1**	0	1	0	**1**	**2**	**2**
17:15	17:30	0	0	0	**0**	0	0	0	**0**	**0**	0	0	0	**0**	0	0	0	**0**	**0**	**0**
17:30	17:45	0	0	0	**0**	0	0	0	**0**	**0**	0	1	0	**1**	0	1	0	**1**	**2**	**2**
17:45	18:00	0	0	0	**0**	0	0	0	**0**	**0**	0	3	0	**3**	0	0	0	**0**	**3**	**3**
Total:	None	1	0	1	**2**	0	0	1	**1**	**3**	0	61	1	**62**	1	82	1	**84**	**146**	**149**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

NORTH BOWESVILLE RD @ UPLANDS DR

Survey Date: Tuesday, November 26, 2019 **WO No:** 39101

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

Full Study 15 Minute U-Turn Total

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

Transportation Services - Traffic Services

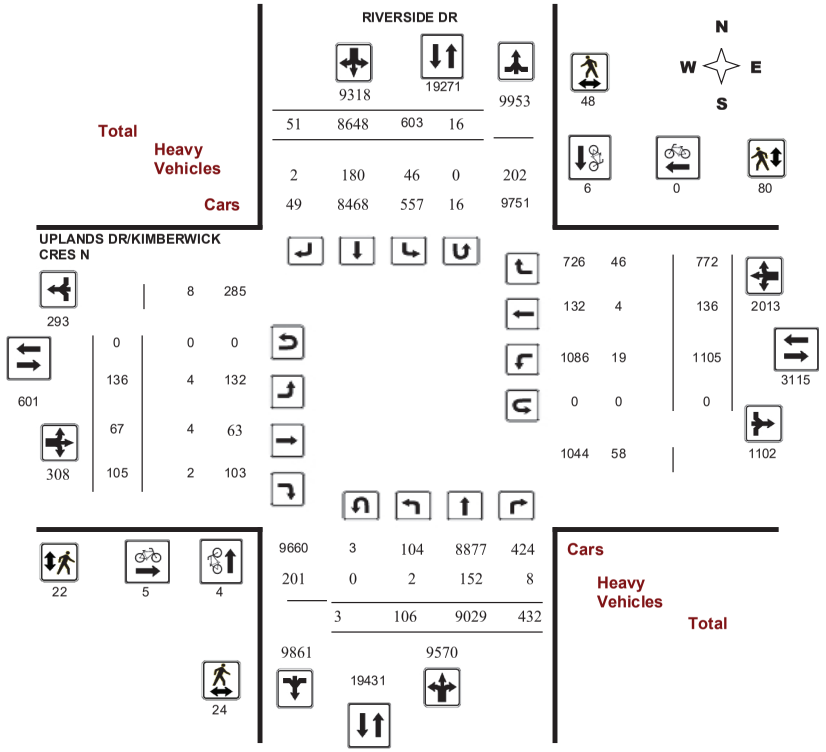
Turning Movement Count - Study Results

RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N

Survey Date: Wednesday, January 22, 2020 **WO No:** 39376

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

Full Study Diagram



5472191 - WED JAN 22, 2020 - 8HRS - LORETTA

Transportation Services - Traffic Services

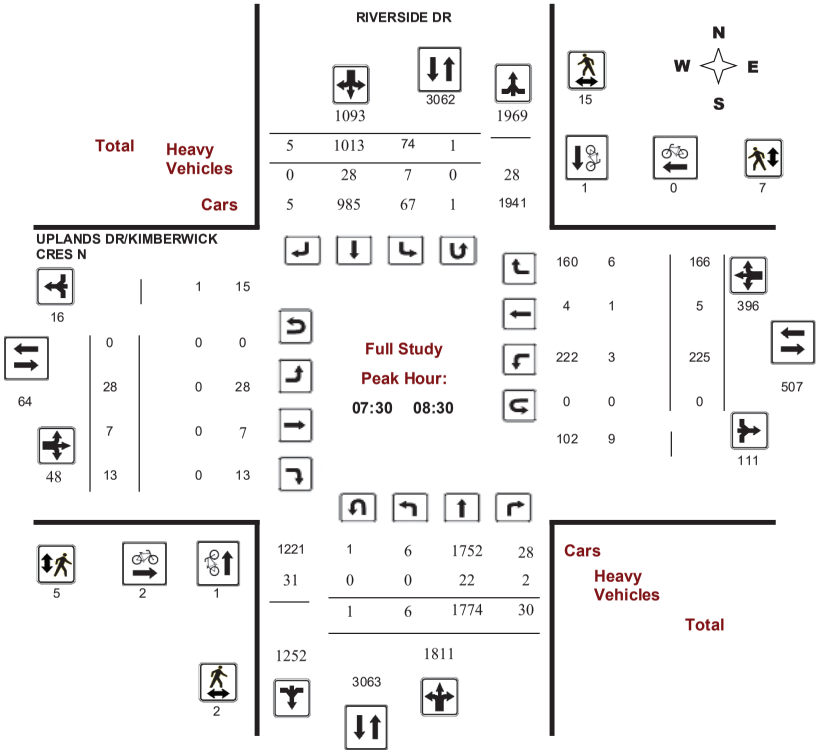
Turning Movement Count - Study Results

RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N

Survey Date: Wednesday, January 22, 2020 **WO No:** 39376

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

Full Study Peak Hour Diagram



5472191 - WED JAN 22, 2020 - 8HRS - LORETTA

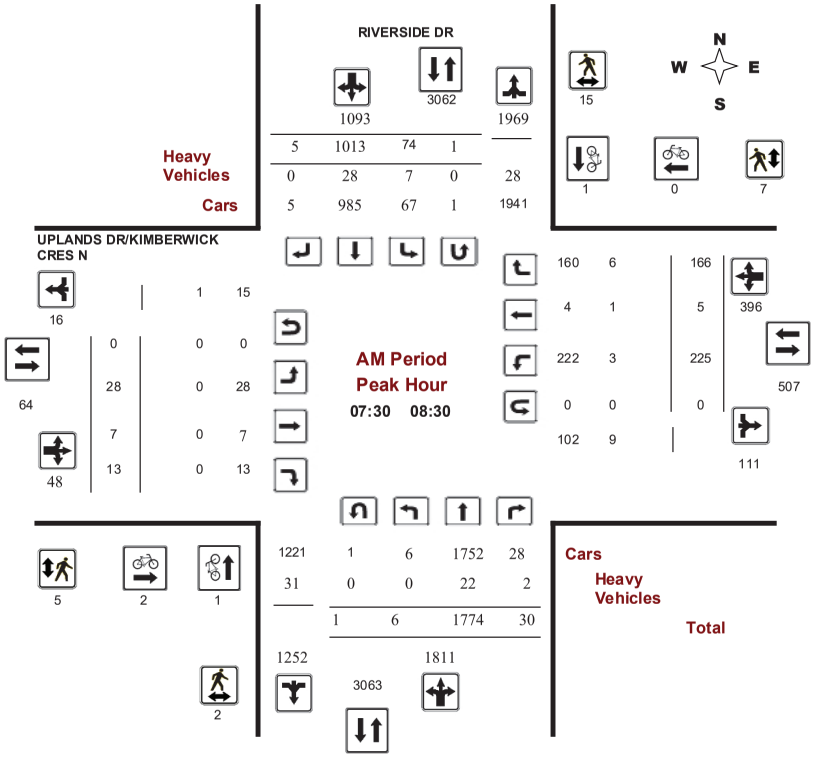
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N

Survey Date: Wednesday, January 22, 2020 **WO No:** 39376

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



Comments 5472191 - WED JAN 22, 2020 - 8HRS - LORETTA

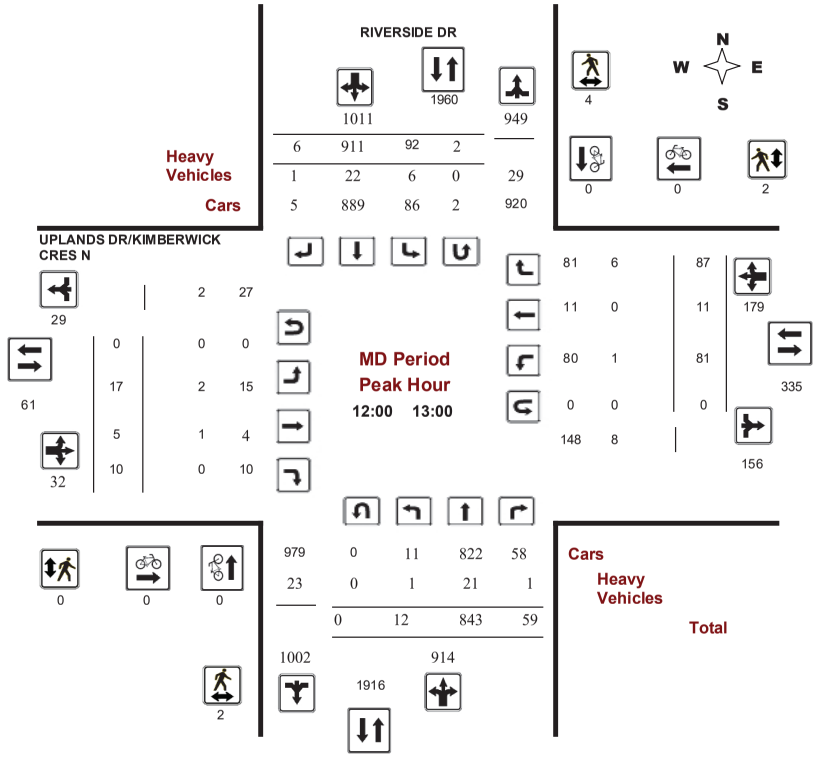
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N

Survey Date: Wednesday, January 22, 2020 **WO No:** 39376

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



Comments 5472191 - WED JAN 22, 2020 - 8HRS - LORETTA

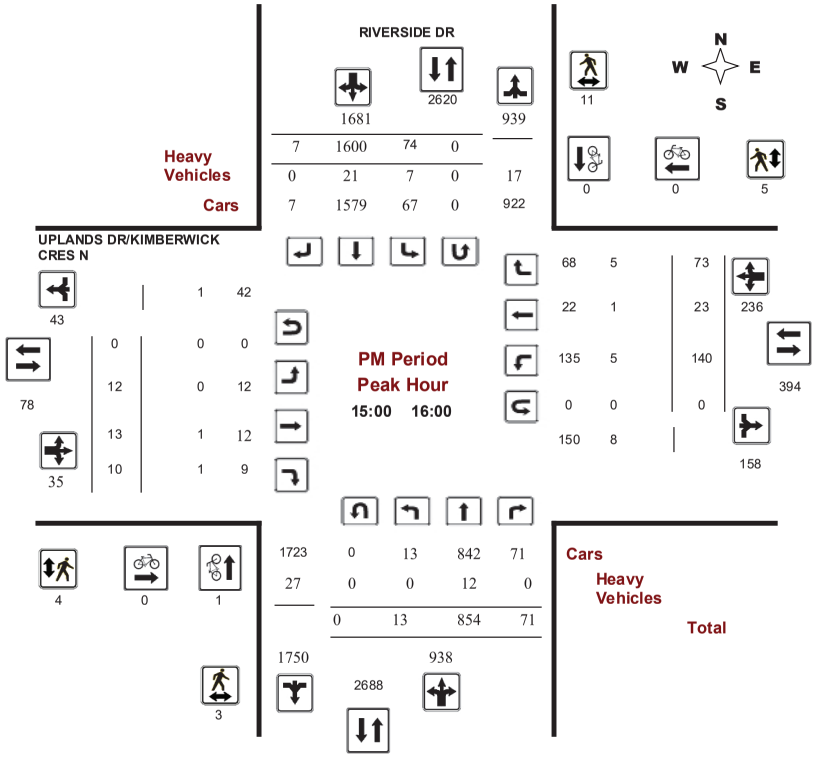
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N

Survey Date: Wednesday, January 22, 2020 **WO No:** 39376

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



Comments 5472191 - WED JAN 22, 2020 - 8HRS - LORETTA

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N

Survey Date: Wednesday, January 22, 2020 **WO No:** 39376

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

Full Study Summary (8 HR Standard)

Survey Date: Wednesday, January 22, 202

Total Observed U-Turns

Northbound: 3 Southbound: 16

Eastbound: 0 Westbound: 0

AADT Factor 1.00

	RIVERSIDE DR									UPLANDS DR/KIMBERWICK CRES N									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	2	1871	19	**1892**	40	859	5	**904**	**2796**	18	8	9	**35**	159	1	133	**293**	**328**	**3124**
08:00 09:00	8	1690	24	**1722**	100	945	6	**1051**	**2773**	27	3	14	**44**	202	9	149	**360**	**404**	**3177**
09:00 10:00	7	1234	49	**1290**	117	758	13	**888**	**2178**	27	7	4	**38**	100	7	102	**209**	**247**	**2425**
11:30 12:30	15	837	44	**896**	72	913	8	**993**	**1889**	15	6	10	**31**	80	7	85	**172**	**203**	**2092**
12:30 13:30	15	761	69	**845**	86	954	6	**1046**	**1891**	15	5	12	**32**	84	13	73	**170**	**202**	**2093**
15:00 16:00	13	854	71	**938**	74	1600	7	**1681**	**2619**	12	13	10	**35**	140	23	73	**236**	**271**	**2890**
16:00 17:00	21	855	86	**962**	42	1280	4	**1326**	**2288**	10	11	24	**45**	188	45	73	**306**	**351**	**2639**
17:00 18:00	25	927	70	**1022**	72	1339	2	**1413**	**2435**	12	14	22	**48**	152	31	84	**267**	**315**	**2750**
Sub Total	106	9029	432	**9567**	603	8648	51	**9302**	**18869**	136	67	105	**308**	1105	136	772	**2013**	**2321**	**21190**
U Turns	3			**3**	16			**16**	**19**	**0**			**0**	0			**0**	**0**	**19**
Total	109	9029	432	**9570**	619	8648	51	**9318**	**18888**	136	67	105	**308**	1105	136	772	**2013**	**2321**	**21209**
EQ 12Hr	152	12550	600	**13302**	860	12021	71	**12952**	**26254**	189	93	146	**428**	1536	189	1073	**2798**	**3226**	**29480**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														**1.39**					
AVG 12Hr	152	12550	600	**13302**	860	12021	71	**12952**	**26254**	189	93	146	**428**	1536	189	1073	**2798**	**3226**	**29480**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														**1.00**					
AVG 24Hr	199	16440	786	**17425**	1127	15748	93	**16968**	**34393**	248	122	191	**561**	2012	248	1406	**3666**	**4227**	**38620**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														**1.31**					

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

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N

Survey Date: Wednesday, January 22, 2020 **WO No:** 39376

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

Full Study 15 Minute Increments

		RIVERSIDE DR									UPLANDS DR/KIMBERWICK CRES N									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	509	4	513	7	151	1	159	**672**	2	1	0	3	22	0	25	47	**50**	**722**
07:15	07:30	1	473	6	480	7	206	1	214	**694**	2	1	2	5	25	0	22	47	**52**	**746**
07:30	07:45	2	427	6	435	12	230	2	244	**679**	9	4	3	16	49	1	55	105	**121**	**800**
07:45	08:00	0	462	3	465	14	272	1	287	**752**	5	2	4	11	63	0	31	94	**105**	**857**
08:00	08:15	3	427	8	438	19	261	0	280	**718**	7	1	3	11	51	2	42	95	**106**	**824**
08:15	08:30	2	458	13	473	30	250	2	282	**755**	7	0	3	10	62	2	38	102	**112**	**867**
08:30	08:45	1	437	2	440	17	202	1	220	**660**	6	1	4	11	52	5	39	96	**107**	**767**
08:45	09:00	2	368	1	371	36	232	3	271	**642**	7	1	4	12	37	0	30	67	**79**	**721**
09:00	09:15	1	328	10	339	31	184	4	219	**558**	8	1	3	12	31	1	30	62	**74**	**632**
09:15	09:30	1	315	10	326	39	213	3	255	**581**	5	1	0	6	26	3	28	57	**63**	**644**
09:30	09:45	3	307	11	321	24	191	3	218	**539**	7	2	0	9	22	1	22	45	**54**	**593**
09:45	10:00	2	284	18	304	26	170	3	199	**503**	7	3	1	11	21	2	22	45	**56**	**559**
11:30	11:45	0	210	8	218	17	222	3	242	**460**	5	1	2	8	23	0	25	48	**56**	**516**
11:45	12:00	9	202	11	222	10	235	3	248	**470**	4	3	4	11	17	3	18	38	**49**	**519**
12:00	12:15	3	206	16	225	24	233	0	257	**482**	3	0	2	5	17	3	26	46	**51**	**533**
12:15	12:30	4	219	9	232	24	223	2	249	**481**	3	2	2	7	23	1	16	40	**47**	**528**
12:30	12:45	3	232	11	246	21	222	3	246	**492**	4	2	3	9	21	2	19	42	**51**	**543**
12:45	13:00	2	186	23	211	25	233	1	259	**470**	7	1	3	11	20	5	26	51	**62**	**532**
13:00	13:15	7	164	13	184	19	216	2	237	**421**	4	0	4	8	27	5	17	49	**57**	**478**
13:15	13:30	3	179	22	204	22	283	0	305	**509**	0	2	2	4	16	1	11	28	**32**	**541**
15:00	15:15	4	219	20	243	22	433	3	458	**701**	5	3	6	14	28	4	30	62	**76**	**777**
15:15	15:30	2	222	19	243	18	408	3	429	**672**	2	6	0	8	36	5	11	52	**60**	**732**
15:30	15:45	5	211	17	233	13	413	1	427	**660**	2	1	3	6	27	7	15	49	**55**	**715**
15:45	16:00	2	202	15	219	21	346	0	367	**586**	3	3	1	7	49	7	17	73	**80**	**666**
16:00	16:15	7	227	16	250	7	334	1	342	**592**	1	4	2	7	52	8	16	76	**83**	**675**
16:15	16:30	2	222	20	244	10	325	1	336	**580**	3	0	7	10	46	9	18	73	**83**	**663**
16:30	16:45	8	189	24	221	15	298	1	314	**535**	4	4	10	18	40	15	22	77	**95**	**630**
16:45	17:00	5	217	26	248	13	323	1	337	**585**	2	3	5	10	50	13	17	80	**90**	**675**
17:00	17:15	6	214	21	241	8	294	0	302	**543**	1	3	7	11	45	9	18	72	**83**	**626**
17:15	17:30	3	224	16	243	23	351	0	374	**617**	3	6	3	12	41	6	21	68	**80**	**697**
17:30	17:45	8	239	19	266	25	333	1	359	**625**	5	1	6	12	37	11	30	78	**90**	**715**
17:45	18:00	8	250	14	272	20	361	1	382	**654**	3	4	6	13	29	5	15	49	**62**	**716**
Total:		109	9029	432	9570	619	8648	51	9318	**18888**	136	67	105	308	1105	136	772	2013	**18888**	**21,209**

Note: U-Turns are included in Totals.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N

Survey Date: Wednesday, January 22, 2020 **WO No:** 39376

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

Full Study Cyclist Volume

Time Period		RIVERSIDE DR			UPLANDS DR/KIMBERWICK CRES N			
		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00	07:15	0	0	**0**	0	0	**0**	**0**
07:15	07:30	0	0	**0**	0	0	**0**	**0**
07:30	07:45	0	0	**0**	0	0	**0**	**0**
07:45	08:00	0	0	**0**	0	0	**0**	**0**
08:00	08:15	1	0	**1**	0	0	**0**	**1**
08:15	08:30	0	1	**1**	2	0	**2**	**3**
08:30	08:45	0	1	**1**	1	0	**1**	**2**
08:45	09:00	0	1	**1**	0	0	**0**	**1**
09:00	09:15	0	0	**0**	1	0	**1**	**1**
09:15	09:30	0	1	**1**	1	0	**1**	**2**
09:30	09:45	0	0	**0**	0	0	**0**	**0**
09:45	10:00	0	1	**1**	0	0	**0**	**1**
11:30	11:45	0	0	**0**	0	0	**0**	**0**
11:45	12:00	0	0	**0**	0	0	**0**	**0**
12:00	12:15	0	0	**0**	0	0	**0**	**0**
12:15	12:30	0	0	**0**	0	0	**0**	**0**
12:30	12:45	0	0	**0**	0	0	**0**	**0**
12:45	13:00	0	0	**0**	0	0	**0**	**0**
13:00	13:15	0	0	**0**	0	0	**0**	**0**
13:15	13:30	0	0	**0**	0	0	**0**	**0**
15:00	15:15	0	0	**0**	0	0	**0**	**0**
15:15	15:30	1	0	**1**	0	0	**0**	**1**
15:30	15:45	0	0	**0**	0	0	**0**	**0**
15:45	16:00	0	0	**0**	0	0	**0**	**0**
16:00	16:15	0	0	**0**	0	0	**0**	**0**
16:15	16:30	0	0	**0**	0	0	**0**	**0**
16:30	16:45	0	0	**0**	0	0	**0**	**0**
16:45	17:00	1	0	**1**	0	0	**0**	**1**
17:00	17:15	0	0	**0**	0	0	**0**	**0**
17:15	17:30	0	0	**0**	0	0	**0**	**0**
17:30	17:45	1	1	**2**	0	0	**0**	**2**
17:45	18:00	0	0	**0**	0	0	**0**	**0**
Total		4	6	**10**	5	0	**5**	**15**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N

Survey Date: Wednesday, January 22, 2020 **WO No:** 39376

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

Full Study Pedestrian Volume

Time Period		RIVERSIDE DR			UPLANDS DR/KIMBERWICK CRES N			
		NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00	07:15	0	2	**2**	4	0	**4**	**6**
07:15	07:30	2	1	**3**	0	2	**2**	**5**
07:30	07:45	2	3	**5**	2	0	**2**	**7**
07:45	08:00	0	3	**3**	0	0	**0**	**3**
08:00	08:15	0	2	**2**	1	2	**3**	**5**
08:15	08:30	0	7	**7**	2	5	**7**	**14**
08:30	08:45	2	2	**4**	1	4	**5**	**9**
08:45	09:00	2	1	**3**	0	3	**3**	**6**
09:00	09:15	1	0	**1**	0	3	**3**	**4**
09:15	09:30	1	1	**2**	1	1	**2**	**4**
09:30	09:45	0	1	**1**	0	0	**0**	**1**
09:45	10:00	1	3	**4**	2	0	**2**	**6**
11:30	11:45	2	2	**4**	3	2	**5**	**9**
11:45	12:00	0	1	**1**	0	9	**9**	**10**
12:00	12:15	0	2	**2**	0	0	**0**	**2**
12:15	12:30	1	2	**3**	0	1	**1**	**4**
12:30	12:45	1	0	**1**	0	0	**0**	**1**
12:45	13:00	0	0	**0**	0	1	**1**	**1**
13:00	13:15	1	0	**1**	0	1	**1**	**2**
13:15	13:30	0	0	**0**	0	1	**1**	**1**
15:00	15:15	2	3	**5**	2	0	**2**	**7**
15:15	15:30	0	6	**6**	0	1	**1**	**7**
15:30	15:45	0	1	**1**	0	1	**1**	**2**
15:45	16:00	1	1	**2**	2	3	**5**	**7**
16:00	16:15	0	2	**2**	0	3	**3**	**5**
16:15	16:30	0	0	**0**	1	5	**6**	**6**
16:30	16:45	0	0	**0**	0	3	**3**	**3**
16:45	17:00	0	0	**0**	1	2	**3**	**3**
17:00	17:15	2	1	**3**	0	10	**10**	**13**
17:15	17:30	1	0	**1**	0	7	**7**	**8**
17:30	17:45	1	1	**2**	0	4	**4**	**6**
17:45	18:00	1	0	**1**	0	6	**6**	**7**
Total		24	48	**72**	22	80	**102**	**174**

5472191 - WED JAN 22, 2020 - 8HRS - LORETTA

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N

Survey Date: Wednesday, January 22, 2020 **WO No:** 39376

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

Full Study Heavy Vehicles

		RIVERSIDE DR									UPLANDS DR/KIMBERWICK CRES N									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	8	0	**8**	1	4	0	**5**	**13**	0	0	0	**0**	0	0	1	**1**	**1**	**14**
07:15	07:30	0	4	0	**4**	1	3	0	**4**	**8**	0	0	0	**0**	0	0	2	**2**	**2**	**10**
07:30	07:45	0	4	1	**5**	2	4	0	**6**	**11**	0	0	0	**0**	2	0	2	**4**	**4**	**15**
07:45	08:00	0	6	0	**6**	2	7	0	**9**	**15**	0	0	0	**0**	0	0	0	**0**	**0**	**15**
08:00	08:15	0	7	1	**8**	3	11	0	**14**	**22**	0	0	0	**0**	0	1	1	**2**	**2**	**24**
08:15	08:30	0	5	0	**5**	0	6	0	**6**	**11**	0	0	0	**0**	1	0	3	**4**	**4**	**15**
08:30	08:45	0	8	1	**9**	1	5	0	**6**	**15**	0	0	0	**0**	2	1	6	**9**	**9**	**24**
08:45	09:00	0	6	0	**6**	2	6	0	**8**	**14**	0	0	0	**0**	0	0	2	**2**	**2**	**16**
09:00	09:15	0	7	0	**7**	2	9	0	**11**	**18**	0	0	0	**0**	0	0	1	**1**	**1**	**19**
09:15	09:30	0	4	0	**4**	2	4	0	**6**	**10**	0	0	0	**0**	0	0	1	**1**	**1**	**11**
09:30	09:45	0	6	1	**7**	1	11	0	**12**	**19**	1	0	0	**1**	0	0	1	**1**	**2**	**21**
09:45	10:00	0	6	0	**6**	1	6	1	**8**	**14**	0	1	0	**1**	0	0	1	**1**	**2**	**16**
11:30	11:45	0	4	0	**4**	2	5	0	**7**	**11**	0	0	0	**0**	0	0	1	**1**	**1**	**12**
11:45	12:00	1	5	0	**6**	2	13	0	**15**	**21**	0	0	1	**1**	0	0	1	**1**	**2**	**23**
12:00	12:15	0	4	0	**4**	1	5	0	**6**	**10**	0	0	0	**0**	1	0	2	**3**	**3**	**13**
12:15	12:30	0	7	0	**7**	2	3	0	**5**	**12**	0	0	0	**0**	0	0	1	**1**	**1**	**13**
12:30	12:45	1	6	0	**7**	2	7	1	**10**	**17**	2	0	0	**2**	0	0	2	**2**	**4**	**21**
12:45	13:00	0	4	1	**5**	1	7	0	**8**	**13**	0	1	0	**1**	0	0	1	**1**	**2**	**15**
13:00	13:15	0	5	0	**5**	1	5	0	**6**	**11**	0	0	0	**0**	0	0	1	**1**	**1**	**12**
13:15	13:30	0	5	1	**6**	2	10	0	**12**	**18**	0	0	0	**0**	1	0	1	**2**	**2**	**20**
15:00	15:15	0	3	0	**3**	2	11	0	**13**	**16**	0	1	1	**2**	2	0	2	**4**	**6**	**22**
15:15	15:30	0	1	0	**1**	2	5	0	**7**	**8**	0	0	0	**0**	1	1	1	**3**	**3**	**11**
15:30	15:45	0	2	0	**2**	1	3	0	**4**	**6**	0	0	0	**0**	1	0	1	**2**	**2**	**8**
15:45	16:00	0	6	0	**6**	2	2	0	**4**	**10**	0	0	0	**0**	1	0	1	**2**	**2**	**12**
16:00	16:15	0	5	1	**6**	0	7	0	**7**	**13**	0	0	0	**0**	4	0	2	**6**	**6**	**19**
16:15	16:30	0	4	1	**5**	1	5	0	**6**	**11**	0	0	0	**0**	2	0	0	**2**	**2**	**13**
16:30	16:45	0	6	0	**6**	2	2	0	**4**	**10**	0	0	0	**0**	1	1	2	**4**	**4**	**14**
16:45	17:00	0	4	0	**4**	0	4	0	**4**	**8**	1	0	0	**1**	0	0	1	**1**	**2**	**10**
17:00	17:15	0	2	0	**2**	2	6	0	**8**	**10**	0	0	0	**0**	0	0	2	**2**	**2**	**12**
17:15	17:30	0	1	0	**1**	1	3	0	**4**	**5**	0	1	0	**1**	0	0	1	**1**	**2**	**7**
17:30	17:45	0	1	0	**1**	1	1	0	**2**	**3**	0	0	0	**0**	0	0	1	**1**	**1**	**4**
17:45	18:00	0	6	0	**6**	1	0	0	**1**	**7**	0	0	0	**0**	0	0	1	**1**	**1**	**8**
Total:	None	2	152	8	**162**	46	180	2	**228**	**390**	4	4	2	**10**	19	4	46	**69**	**79**	**469**

Transportation Services - Traffic Services

Turning Movement Count - Study Results

RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N

Survey Date: Wednesday, January 22, 2020 **WO No:** 39376

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

Full Study 15 Minute U-Turn Total

		RIVERSIDE DR	UPLANDS DR/KIMBERWICK CRES N			
Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	**0**
07:15	07:30	0	0	0	0	**0**
07:30	07:45	1	0	0	0	**1**
07:45	08:00	0	0	0	0	**0**
08:00	08:15	0	0	0	0	**0**
08:15	08:30	0	1	0	0	**1**
08:30	08:45	0	0	0	0	**0**
08:45	09:00	0	1	0	0	**1**
09:00	09:15	0	0	0	0	**0**
09:15	09:30	0	2	0	0	**2**
09:30	09:45	0	1	0	0	**1**
09:45	10:00	0	0	0	0	**0**
11:30	11:45	0	0	0	0	**0**
11:45	12:00	1	1	0	0	**2**
12:00	12:15	0	0	0	0	**0**
12:15	12:30	0	2	0	0	**2**
12:30	12:45	0	0	0	0	**0**
12:45	13:00	0	0	0	0	**0**
13:00	13:15	0	0	0	0	**0**
13:15	13:30	0	1	0	0	**1**
15:00	15:15	0	0	0	0	**0**
15:15	15:30	0	0	0	0	**0**
15:30	15:45	0	0	0	0	**0**
15:45	16:00	0	0	0	0	**0**
16:00	16:15	0	0	0	0	**0**
16:15	16:30	0	0	0	0	**0**
16:30	16:45	1	1	0	0	**2**
16:45	17:00	0	2	0	0	**2**
17:00	17:15	0	0	0	0	**0**
17:15	17:30	0	3	0	0	**3**
17:30	17:45	0	1	0	0	**1**
17:45	18:00	0	0	0	0	**0**
Total		3	16	0	0	**19**

Appendix C

Synchro Intersection Worksheets – Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	7	13	229	5	169	7	1774	30	75	1013	5
Future Volume (vph)	28	7	13	229	5	169	7	1774	30	75	1013	5
Satd. Flow (prot)	1658	1563	0	0	1656	1455	1658	3304	0	1551	3280	0
Flt Permitted	0.398				0.715		0.250			0.055		
Satd. Flow (perm)	687	1563	0	0	1240	1410	435	3304	0	90	3280	0
Satd. Flow (RTOR)		14				188		2			1	
Lane Group Flow (vph)	31	22	0	0	260	188	8	2004	0	83	1132	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		5.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5	34.5	31.1	31.1		11.1	31.1	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	65.0	65.0		20.0	85.0	
Total Split (%)	29.2%	29.2%		29.2%	29.2%	29.2%	54.2%	54.2%		16.7%	70.8%	
Yellow Time (s)	3.3	3.3		3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	3.2	3.2		3.2	3.2	3.2	2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5			6.5	6.5	6.1	6.1		6.1	6.1	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	27.3	27.3			27.3	27.3	68.1	68.1		80.1	80.1	
Actuated g/C Ratio	0.23	0.23			0.23	0.23	0.57	0.57		0.67	0.67	
v/c Ratio	0.20	0.06			0.93	0.40	0.03	1.07		0.52	0.52	
Control Delay	40.5	20.9			82.9	8.0	14.9	69.3		27.0	11.4	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	40.5	20.9			82.9	8.0	14.9	69.3		27.0	11.4	
LOS	D	C			F	A	B	E		C	B	
Approach Delay		32.4			51.5			69.1			12.4	
Approach LOS		C			D			E			B	
Queue Length 50th (m)	5.9	1.5			59.4	0.0	0.9	~286.7		6.5	67.4	
Queue Length 95th (m)	14.8	8.2			#106.7	18.0	3.6	#344.6		21.4	83.1	
Internal Link Dist (m)		147.2			77.5			257.5			196.3	
Turn Bay Length (m)	28.0						47.5			185.0		
Base Capacity (vph)	163	381			294	478	246	1875		229	2189	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.19	0.06			0.88	0.39	0.03	1.07		0.36	0.52	

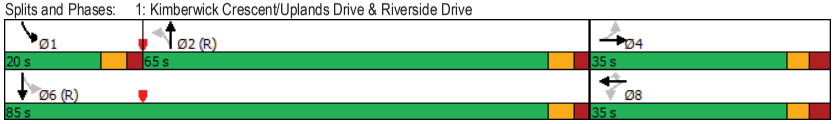
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 59 (49%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.07

Intersection Signal Delay: 48.0	Intersection LOS: D
Intersection Capacity Utilization 94.8%	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: Kimberwick Crescent/Uplands Drive & Riverside Drive



Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	74	35	30	411	0	5	0	4	0	0	2
Future Vol, veh/h	0	74	35	30	411	0	5	0	4	0	0	2
Conflicting Peds, #/hr	9	0	1	1	0	9	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	12	2	2	4	2	20	2	2	2	2	50
Mvmt Flow	0	82	39	33	457	0	6	0	4	0	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	466	0	0	122	0	0	627	635	103	636	654	466
Stage 1	-	-	-	-	-	-	103	103	-	532	532	-
Stage 2	-	-	-	-	-	-	524	532	-	104	122	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.3	6.52	6.22	7.12	6.52	6.7
Critical Hdwy Stg 1	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.68	4.018	3.318	3.518	4.018	3.75
Pot Cap-1 Maneuver	1095	-	-	1465	-	-	372	396	952	391	386	509
Stage 1	-	-	-	-	-	-	861	810	-	531	526	-
Stage 2	-	-	-	-	-	-	505	526	-	902	795	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1087	-	-	1464	-	-	362	381	951	378	371	505
Mov Cap-2 Maneuver	-	-	-	-	-	-	362	381	-	378	371	-
Stage 1	-	-	-	-	-	-	860	809	-	527	507	-
Stage 2	-	-	-	-	-	-	488	507	-	898	794	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	12.4	12.2
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	499	1087	-	-	1464	-	-	505
HCM Lane V/C Ratio	0.02	-	-	-	0.023	-	-	0.004
HCM Control Delay (s)	12.4	0	-	-	7.5	0	-	12.2
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	13	10	163	23	90	13	854	71	74	1600	7
Future Volume (vph)	12	13	10	163	23	90	13	854	71	74	1600	7
Satd. Flow (prot)	1658	1516	0	0	1640	1414	1658	3268	0	1551	3312	0
Flt Permitted	0.449				0.735		0.095			0.206		
Satd. Flow (perm)	776	1516	0	0	1254	1376	166	3268	0	336	3312	0
Satd. Flow (RTOR)		11				100		9			1	
Lane Group Flow (vph)	13	25	0	0	207	100	14	1028	0	82	1786	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		5.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5	34.5	31.1	31.1		11.1	31.1	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	70.0	70.0		25.0	95.0	
Total Split (%)	26.9%	26.9%		26.9%	26.9%	26.9%	53.8%	53.8%		19.2%	73.1%	
Yellow Time (s)	3.3	3.3		3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	3.2	3.2		3.2	3.2	3.2	2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5			6.5	6.5	6.1	6.1		6.1	6.1	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	25.0	25.0			25.0	25.0	78.6	78.6		92.4	92.4	
Actuated g/C Ratio	0.19	0.19			0.19	0.19	0.60	0.60		0.71	0.71	
v/c Ratio	0.09	0.08			0.86	0.29	0.14	0.52		0.26	0.76	
Control Delay	42.5	27.9			81.3	10.0	17.4	16.6		8.6	15.2	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	42.5	27.9			81.3	10.0	17.4	16.6		8.6	15.2	
LOS	D	C			F	A	B	B		A	B	
Approach Delay		32.9			58.1			16.6			14.9	
Approach LOS		C			E			B			B	
Queue Length 50th (m)	2.7	2.9			50.6	0.0	1.5	78.7		6.2	146.1	
Queue Length 95th (m)	8.5	10.4			#86.0	14.4	5.8	102.7		11.8	182.1	
Internal Link Dist (m)		147.2			77.5			257.5			196.3	
Turn Bay Length (m)	28.0						47.5			185.0		
Base Capacity (vph)	170	340			274	379	100	1978		415	2353	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.08	0.07			0.76	0.26	0.14	0.52		0.20	0.76	

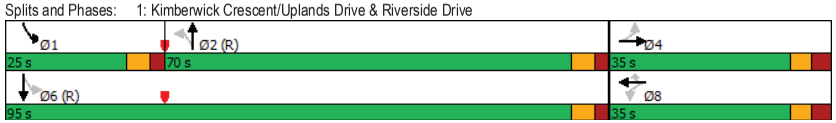
Intersection Summary
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 43 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 19.7	Intersection LOS: B
Intersection Capacity Utilization 90.1%	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: Kimberwick Crescent/Uplands Drive & Riverside Drive



Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	154	6	24	255	0	36	0	25	0	0	0
Future Vol, veh/h	0	154	6	24	255	0	36	0	25	0	0	0
Conflicting Peds, #/hr	4	0	10	10	0	4	4	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	2	5	2	2	3	2	2	2	2	2	2	2
Mvmt Flow	0	171	7	27	283	0	40	0	28	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	287	0	0	188	0	0	526	526	185	530	529	291
Stage 1	-	-	-	-	-	-	185	185	-	341	341	-
Stage 2	-	-	-	-	-	-	341	341	-	189	188	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1275	-	-	1386	-	-	462	457	857	460	455	748
Stage 1	-	-	-	-	-	-	817	747	-	674	639	-
Stage 2	-	-	-	-	-	-	674	639	-	813	745	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1271	-	-	1375	-	-	449	441	850	436	440	743
Mov Cap-2 Maneuver	-	-	-	-	-	-	449	441	-	436	440	-
Stage 1	-	-	-	-	-	-	810	741	-	672	622	-
Stage 2	-	-	-	-	-	-	656	622	-	786	739	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.7	12.4	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	557	1271	-	-	1375	-	-	-
HCM Lane V/C Ratio	0.122	-	-	-	0.019	-	-	-
HCM Control Delay (s)	12.4	0	-	-	7.7	0	-	0
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	-

Appendix D

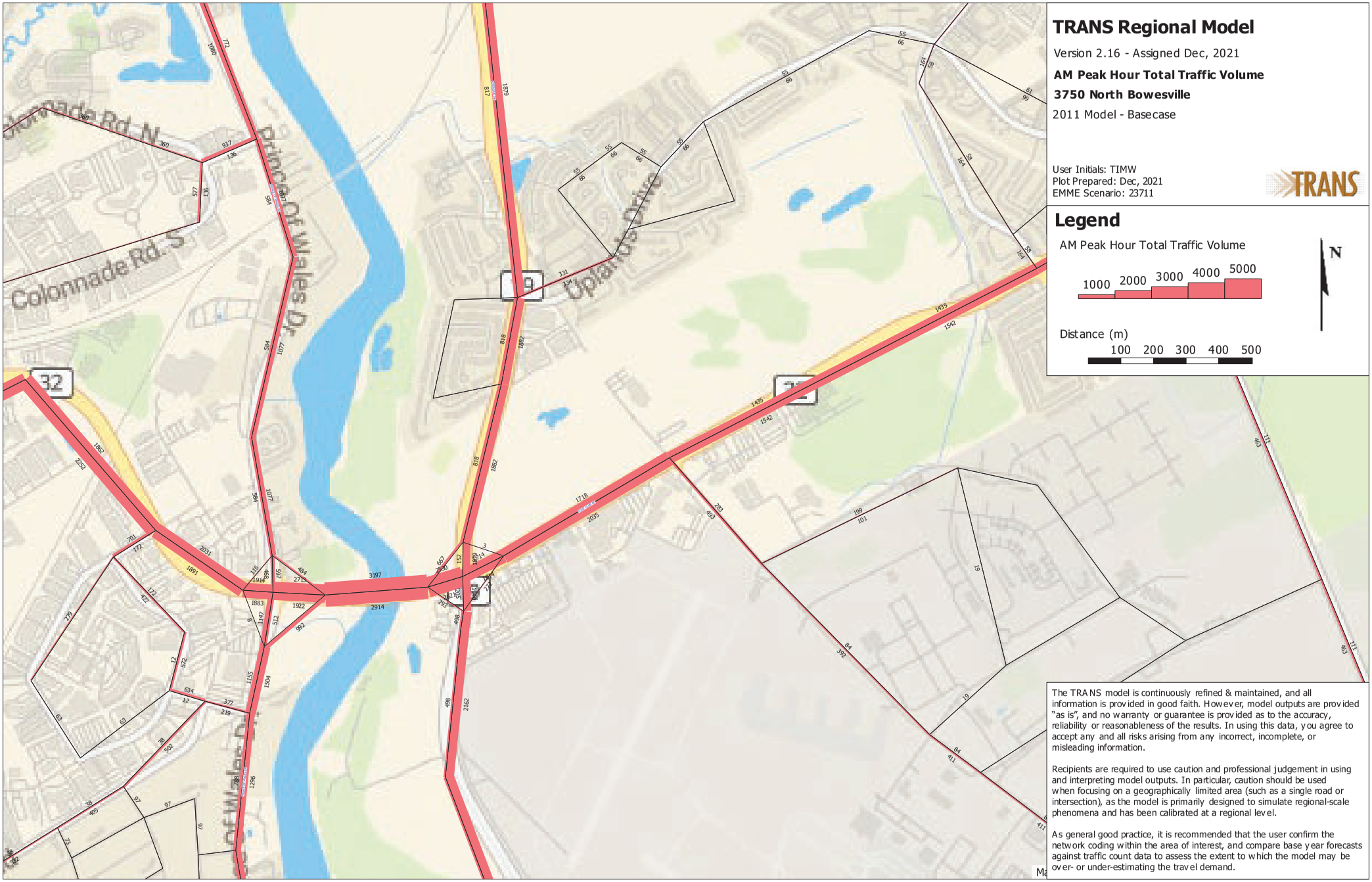
Collision Data

CGH TRANSPORTATION

Accident Date	Accident Year	Accident Time	Location	Environment Condition	Light	Traffic Control	Traffic Control Condition	Classification Of Accident	Initial Impact Type	Road Surface Condition
2017-01-04	2017	7:31	BUCKINGHAM PRIV @ UPLANDS DR	03 - Snow	03 - Dawn	02 - Stop sign		03 - P.D. only	05 - Turning movement	04 - Slush
2017-04-20	2017	17:00	UPLANDS DR btwn RIVERSIDE DR & NORTH BOWESVILLE RD	01 - Clear	01 - Daylight	10 - No control		03 - P.D. only	05 - Turning movement	01 - Dry
2015-02-22	2015	9:54	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	05 - Packed snow
2015-10-13	2015	10:35	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	02 - Rain	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	07 - SMV other	02 - Wet
2015-05-07	2015	4:22	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	07 - SMV other	01 - Dry
2015-08-09	2015	15:42	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2015-06-18	2015	11:09	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2015-09-04	2015	8:05	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2015-12-23	2015	17:39	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	02 - Rain	07 - Dark	01 - Traffic signal		03 - P.D. only	05 - Turning movement	02 - Wet
2015-11-22	2015	18:11	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2015-08-09	2015	15:05	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2015-09-05	2015	1:28	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2016-10-28	2016	20:54	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	07 - Dark	01 - Traffic signal		02 - Non-fatal injury	03 - Rear end	01 - Dry
2016-04-06	2016	18:32	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	03 - Snow	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	03 - Loose snow
2016-05-11	2016	9:28	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2016-08-13	2016	14:17	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2016-06-15	2016	17:30	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	04 - Sideswipe	01 - Dry
2016-07-02	2016	15:24	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-06-13	2017	12:13	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		02 - Non-fatal injury	02 - Angle	01 - Dry
2017-08-21	2017	14:00	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2017-01-25	2017	10:53	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2017-04-06	2017	7:36	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	02 - Wet
2017-12-25	2017	21:03	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N	03 - Snow	07 - Dark	01 - Traffic signal		03 - P.D. only	03 - Rear end	04 - Slush
2018-03-02	2018	17:37	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2018-03-08	2018	19:23	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	03 - Snow	07 - Dark	01 - Traffic signal		03 - P.D. only	07 - SMV other	05 - Packed snow
2018-03-08	2018	18:30	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	04 - Freezing Rain	05 - Dusk	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2018-04-20	2018	17:00	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2018-05-08	2018	20:42	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	01 - Clear	07 - Dark	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2018-05-30	2018	14:08	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	05 - Turning movement	01 - Dry
2018-06-27	2018	17:50	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	01 - Dry
2018-11-01	2018	10:39	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	03 - Rear end	02 - Wet
2018-11-26	2018	15:55	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	02 - Rain	01 - Daylight	01 - Traffic signal		03 - P.D. only	99 - Other	02 - Wet
2019-09-05	2019	17:20	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	04 - Sideswipe	01 - Dry
2019-11-18	2019	14:24	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	01 - Clear	01 - Daylight	01 - Traffic signal		03 - P.D. only	02 - Angle	01 - Dry
2019-12-04	2019	7:51	RIVERSIDE DR @ UPLANDS DR/KIMBERWICK CRES N (0006890)	03 - Snow	03 - Dawn	01 - Traffic signal		03 - P.D. only	03 - Rear end	03 - Loose snow

Appendix E

TRANS Model Plots



TRANS Regional Model

Version 2.16 - Assigned Dec, 2021

AM Peak Hour Total Traffic Volume

3750 North Bowesville

2011 Model - Basecase

User Initials: TIMW
Plot Prepared: Dec, 2021
EMME Scenario: 23711

TRANS

Legend

AM Peak Hour Total Traffic Volume

1000 2000 3000 4000 5000

N

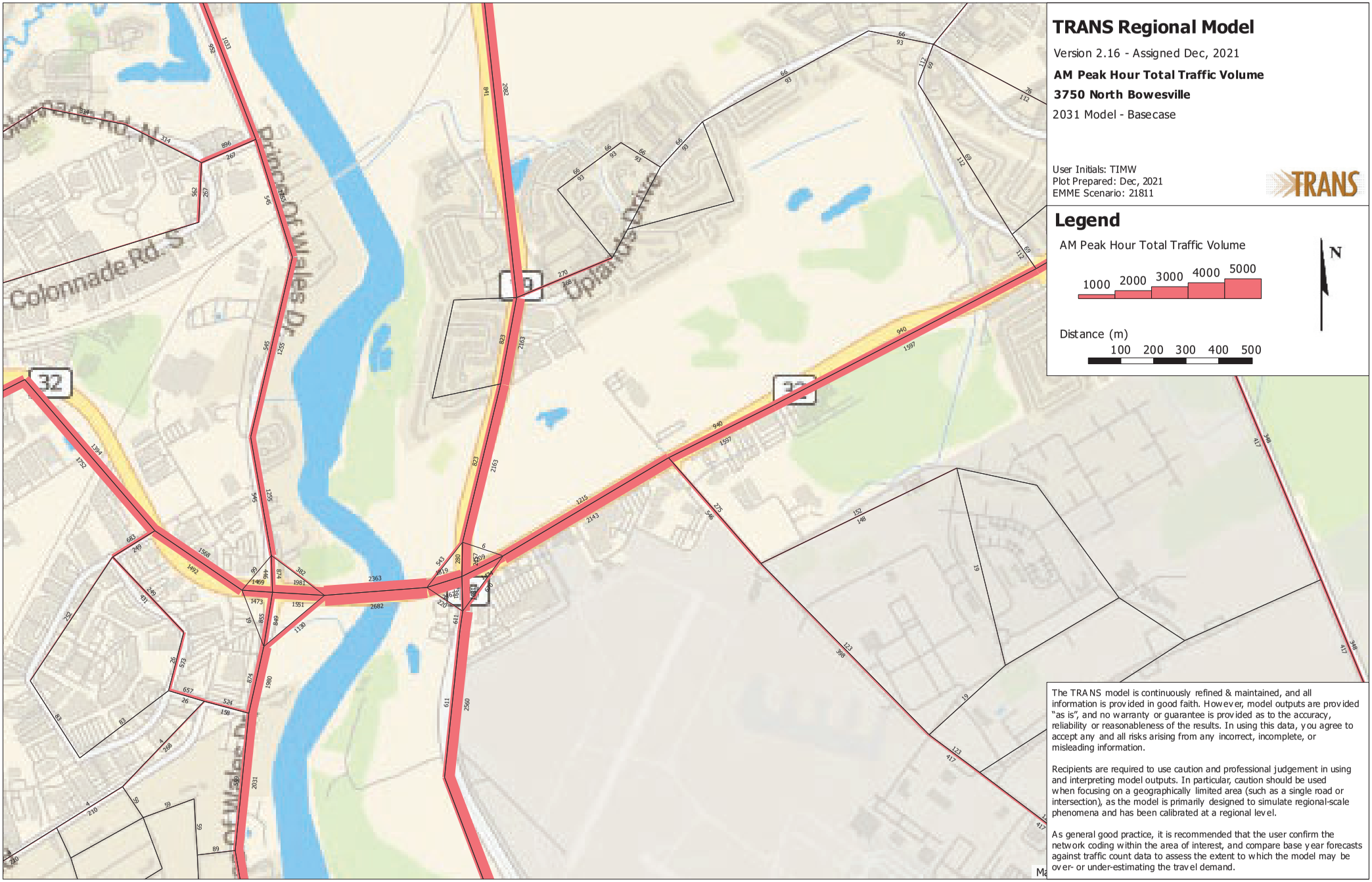
Distance (m)

100 200 300 400 500

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

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

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



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

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

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

Appendix F

Background Development Volumes

CGH TRANSPORTATION

3.1.3. TRIP ASSIGNMENT

A full movement driveway connection to Riverside Drive is proposed to serve the subject development. This driveway is proposed to be signalized and is located approximately 270 m north of the Riverside/Hunt Club intersection. Given the single proposed driveway, 'new' and 'pass-by' site-generated vehicle trips for Phase 1 are assigned to the study area network and illustrated as Figure 6. Phase 2 site-generated vehicle trips are illustrated as Figure 7.

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

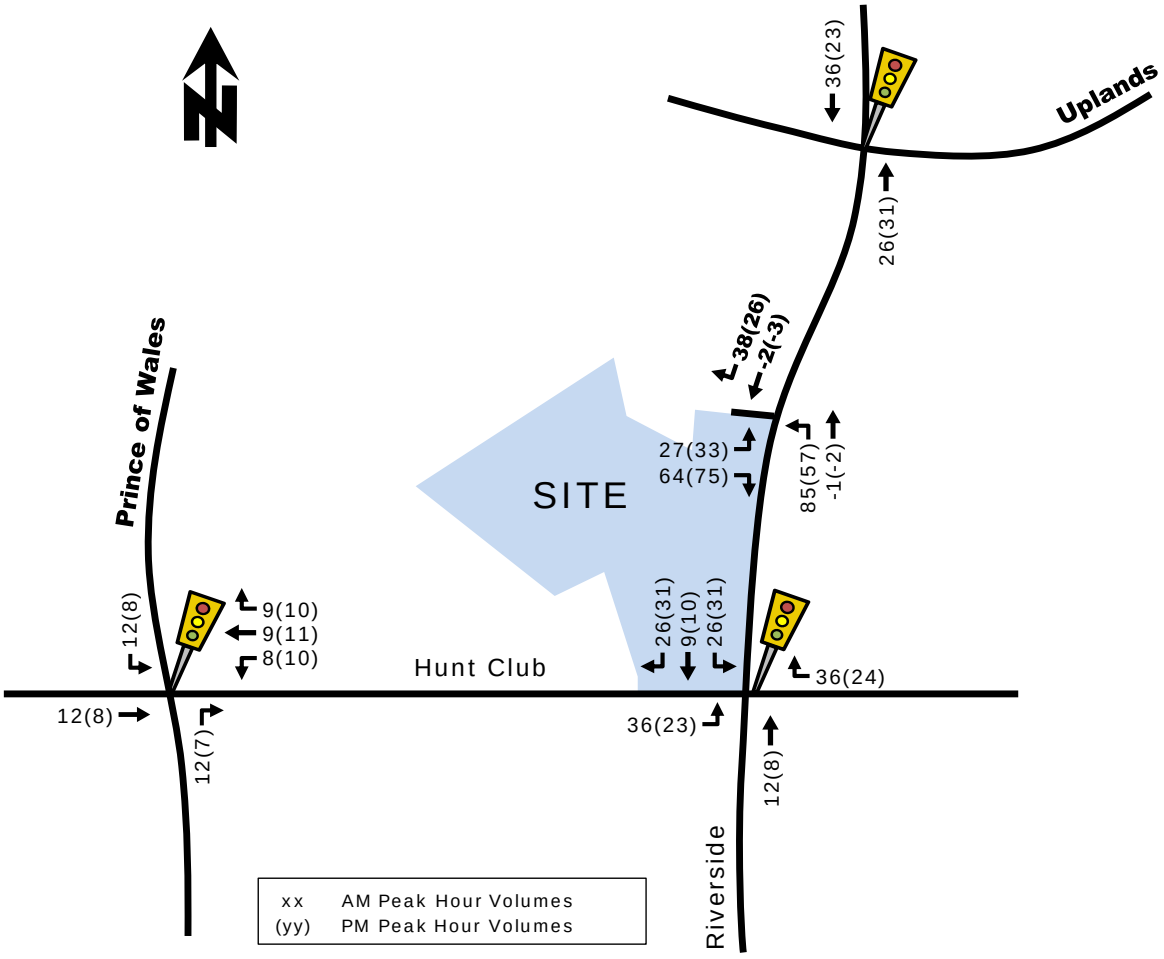
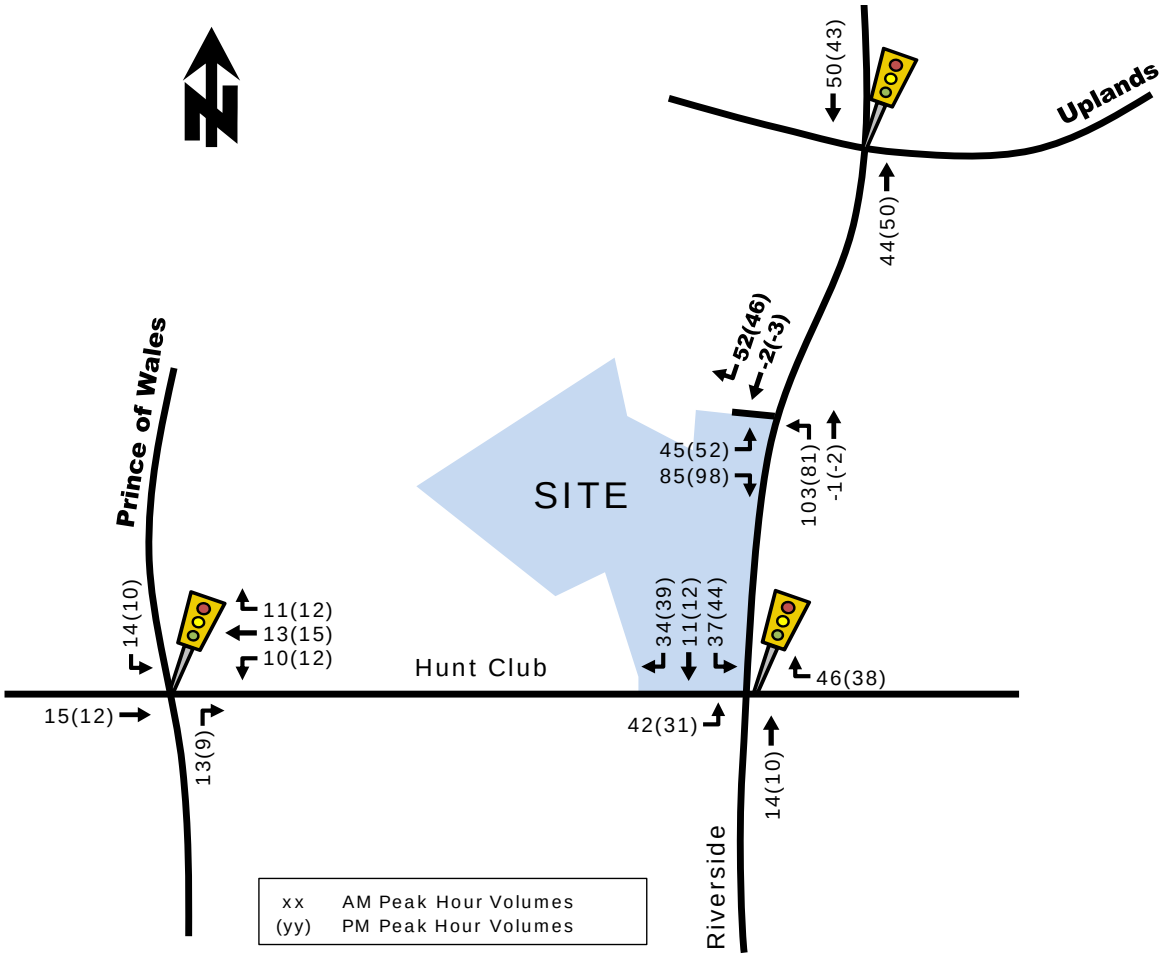


Figure 7: Phases 1 and 2 'New' and 'Pass-by' Site-Generated Traffic



Appendix G

Synchro Intersection Worksheets – 2026 Future Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	7	13	229	5	169	7	1872	30	75	1063	5
Future Volume (vph)	28	7	13	229	5	169	7	1872	30	75	1063	5
Satd. Flow (prot)	1658	1557	0	0	1657	1455	1658	3305	0	1551	3280	0
Flt Permitted	0.433				0.716		0.268			0.053		
Satd. Flow (perm)	746	1557	0	0	1242	1410	466	3305	0	87	3280	0
Satd. Flow (RTOR)		13				169		2			1	
Lane Group Flow (vph)	28	20	0	0	234	169	7	1902	0	75	1068	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		5.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5	34.5	31.1	31.1		11.1	31.1	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	65.0	65.0		20.0	85.0	
Total Split (%)	29.2%	29.2%		29.2%	29.2%	29.2%	54.2%	54.2%		16.7%	70.8%	
Yellow Time (s)	3.3	3.3		3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	3.2	3.2		3.2	3.2	3.2	2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5			6.5	6.5	6.1	6.1		6.1	6.1	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	25.8	25.8			25.8	25.8	70.0	70.0		81.6	81.6	
Actuated g/C Ratio	0.22	0.22			0.22	0.22	0.58	0.58		0.68	0.68	
v/c Ratio	0.17	0.06			0.88	0.39	0.03	0.99		0.49	0.48	
Control Delay	39.9	21.1			77.0	8.2	14.3	43.9		25.3	10.4	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	39.9	21.1			77.0	8.2	14.3	43.9		25.3	10.4	
LOS	D	C			E	A	B	D		C	B	
Approach Delay		32.1			48.2			43.8			11.3	
Approach LOS		C			D			D			B	
Queue Length 50th (m)	5.3	1.3			52.1	0.0	0.7	~258.7		5.9	61.7	
Queue Length 95th (m)	13.5	7.6			#91.9	16.9	3.3	#315.0		19.2	76.4	
Internal Link Dist (m)		147.2			77.5			257.5			196.3	
Turn Bay Length (m)	28.0						47.5			185.0		
Base Capacity (vph)	177	379			294	463	271	1929		228	2231	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.16	0.05			0.80	0.37	0.03	0.99		0.33	0.48	

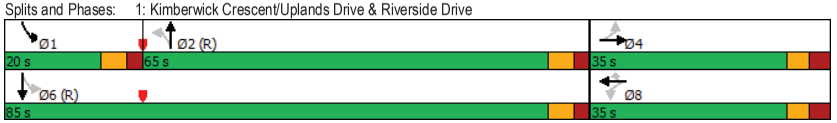
Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 59 (49%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.99

Intersection Signal Delay: 33.5	Intersection LOS: C
Intersection Capacity Utilization 97.6%	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: Kimberwick Crescent/Uplands Drive & Riverside Drive



Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	76	35	30	411	0	5	0	4	0	0	2
Future Vol, veh/h	0	76	35	30	411	0	5	0	4	0	0	2
Conflicting Peds, #/hr	9	0	1	1	0	9	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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	12	2	2	4	2	20	2	2	2	2	50
Mvmt Flow	0	76	35	30	411	0	5	0	4	0	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	420	0	0	112	0	0	567	575	95	576	592	420
Stage 1	-	-	-	-	-	-	95	95	-	480	480	-
Stage 2	-	-	-	-	-	-	472	480	-	96	112	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.3	6.52	6.22	7.12	6.52	6.7
Critical Hdwy Stg 1	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.68	4.018	3.318	3.518	4.018	3.75
Pot Cap-1 Maneuver	1139	-	-	1478	-	-	408	429	962	428	419	542
Stage 1	-	-	-	-	-	-	869	816	-	567	554	-
Stage 2	-	-	-	-	-	-	540	554	-	911	803	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1131	-	-	1477	-	-	398	414	961	415	405	538
Mov Cap-2 Maneuver	-	-	-	-	-	-	398	414	-	415	405	-
Stage 1	-	-	-	-	-	-	868	815	-	563	536	-
Stage 2	-	-	-	-	-	-	524	536	-	907	802	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	11.8	11.7
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	538	1131	-	-	1477	-	-	538
HCM Lane V/C Ratio	0.017	-	-	-	0.02	-	-	0.004
HCM Control Delay (s)	11.8	0	-	-	7.5	0	-	11.7
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0

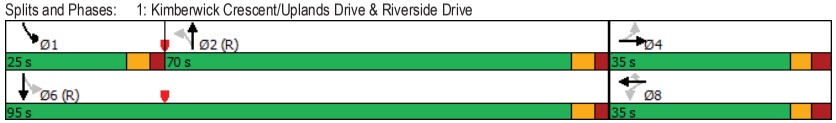
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	13	10	163	24	90	13	904	71	74	1692	7
Future Volume (vph)	12	13	10	163	24	90	13	904	71	74	1692	7
Satd. Flow (prot)	1658	1518	0	0	1640	1414	1658	3272	0	1551	3312	0
Flt Permitted	0.481				0.737		0.112			0.229		
Satd. Flow (perm)	830	1518	0	0	1257	1376	195	3272	0	374	3312	0
Satd. Flow (RTOR)		10				90		9			1	
Lane Group Flow (vph)	12	23	0	0	187	90	13	975	0	74	1699	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		5.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5	34.5	31.1	31.1		11.1	31.1	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	70.0	70.0		25.0	95.0	
Total Split (%)	26.9%	26.9%		26.9%	26.9%	26.9%	53.8%	53.8%		19.2%	73.1%	
Yellow Time (s)	3.3	3.3		3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	3.2	3.2		3.2	3.2	3.2	2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5			6.5	6.5	6.1	6.1		6.1	6.1	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	23.5	23.5			23.5	23.5	82.8	82.8		93.9	93.9	
Actuated g/C Ratio	0.18	0.18			0.18	0.18	0.64	0.64		0.72	0.72	
v/c Ratio	0.08	0.08			0.83	0.28	0.10	0.47		0.22	0.71	
Control Delay	42.7	28.4			78.7	10.4	15.2	14.5		7.7	13.2	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	42.7	28.4			78.7	10.4	15.2	14.5		7.7	13.2	
LOS	D	C			E	B	B	B		A	B	
Approach Delay		33.3			56.5			14.5			12.9	
Approach LOS		C			E			B			B	
Queue Length 50th (m)	2.6	2.8			46.1	0.0	1.3	68.1		5.1	120.8	
Queue Length 95th (m)	8.0	10.2			71.0	13.8	5.4	94.8		10.8	163.4	
Internal Link Dist (m)		147.2			77.5			257.5			196.3	
Turn Bay Length (m)	28.0						47.5			185.0		
Base Capacity (vph)	181	340			275	371	124	2086		441	2393	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.07	0.07			0.68	0.24	0.10	0.47		0.17	0.71	

Intersection Summary
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 43 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 17.6	Intersection LOS: B
Intersection Capacity Utilization 92.8%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: Kimberwick Crescent/Uplands Drive & Riverside Drive



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	0	154	6	24	263	0	36	0	25	0	0	0
Future Vol, veh/h	0	154	6	24	263	0	36	0	25	0	0	0
Conflicting Peds, #/hr	4	0	10	10	0	4	4	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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	5	2	2	3	2	2	2	2	2	2	2
Mvmt Flow	0	154	6	24	263	0	36	0	25	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	267	0	0	170	0	0	482	482	167	485	485	271
Stage 1	-	-	-	-	-	-	167	167	-	315	315	-
Stage 2	-	-	-	-	-	-	315	315	-	170	170	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1297	-	-	1407	-	-	495	484	877	492	482	768
Stage 1	-	-	-	-	-	-	835	760	-	696	656	-
Stage 2	-	-	-	-	-	-	696	656	-	832	758	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1293	-	-	1396	-	-	482	469	870	469	467	763
Mov Cap-2 Maneuver	-	-	-	-	-	-	482	469	-	469	467	-
Stage 1	-	-	-	-	-	-	828	754	-	694	641	-
Stage 2	-	-	-	-	-	-	680	641	-	808	752	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.6	11.8	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	590	1293	-	-	1396	-	-	-
HCM Lane V/C Ratio	0.103	-	-	-	0.017	-	-	-
HCM Control Delay (s)	11.8	0	-	-	7.6	0	-	0
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	-

Appendix H

Synchro Intersection Worksheets – 2031 Future Background Conditions

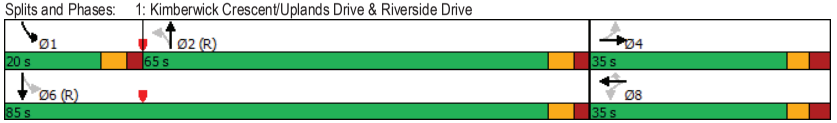
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	7	13	229	5	169	7	1918	30	75	1063	5
Future Volume (vph)	28	7	13	229	5	169	7	1918	30	75	1063	5
Satd. Flow (prot)	1658	1557	0	0	1657	1455	1658	3305	0	1551	3280	0
Flt Permitted	0.433				0.716		0.268			0.053		
Satd. Flow (perm)	746	1557	0	0	1242	1410	466	3305	0	87	3280	0
Satd. Flow (RTOR)		13				169		2			1	
Lane Group Flow (vph)	28	20	0	0	234	169	7	1948	0	75	1068	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		5.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5	34.5	31.1	31.1		11.1	31.1	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	65.0	65.0		20.0	85.0	
Total Split (%)	29.2%	29.2%		29.2%	29.2%	29.2%	54.2%	54.2%		16.7%	70.8%	
Yellow Time (s)	3.3	3.3		3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	3.2	3.2		3.2	3.2	3.2	2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5			6.5	6.5	6.1	6.1		6.1	6.1	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	25.8	25.8			25.8	25.8	70.0	70.0		81.6	81.6	
Actuated g/C Ratio	0.22	0.22			0.22	0.22	0.58	0.58		0.68	0.68	
v/c Ratio	0.17	0.06			0.88	0.39	0.03	1.01		0.49	0.48	
Control Delay	39.9	21.1			77.0	8.2	14.3	49.7		25.3	10.4	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	39.9	21.1			77.0	8.2	14.3	49.7		25.3	10.4	
LOS	D	C			E	A	B	D		C	B	
Approach Delay		32.1			48.2			49.5			11.3	
Approach LOS		C			D			D			B	
Queue Length 50th (m)	5.3	1.3			52.1	0.0	0.7	~270.8		5.9	61.7	
Queue Length 95th (m)	13.5	7.6			#91.9	16.9	3.3	#326.8		19.2	76.4	
Internal Link Dist (m)		147.2			77.5			257.5			196.3	
Turn Bay Length (m)	28.0						47.5			185.0		
Base Capacity (vph)	177	379			294	463	271	1929		228	2231	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.16	0.05			0.80	0.37	0.03	1.01		0.33	0.48	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 59 (49%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.01
Intersection Signal Delay: 36.8 Intersection LOS: D
Intersection Capacity Utilization 99.0% 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: Kimberwick Crescent/Uplands Drive & Riverside Drive



Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	78	35	30	411	0	5	0	4	0	0	2
Future Vol, veh/h	0	78	35	30	411	0	5	0	4	0	0	2
Conflicting Peds, #/hr	9	0	1	1	0	9	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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	12	2	2	4	2	20	2	2	2	2	50
Mvmt Flow	0	78	35	30	411	0	5	0	4	0	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	420	0	0	114	0	0	569	577	97	578	594	420
Stage 1	-	-	-	-	-	-	97	97	-	480	480	-
Stage 2	-	-	-	-	-	-	472	480	-	98	114	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.3	6.52	6.22	7.12	6.52	6.7
Critical Hdwy Stg 1	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.68	4.018	3.318	3.518	4.018	3.75
Pot Cap-1 Maneuver	1139	-	-	1475	-	-	407	427	959	427	418	542
Stage 1	-	-	-	-	-	-	867	815	-	567	554	-
Stage 2	-	-	-	-	-	-	540	554	-	908	801	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1131	-	-	1474	-	-	397	412	958	414	404	538
Mov Cap-2 Maneuver	-	-	-	-	-	-	397	412	-	414	404	-
Stage 1	-	-	-	-	-	-	866	814	-	563	536	-
Stage 2	-	-	-	-	-	-	524	536	-	904	800	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.5	11.8	11.7
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	537	1131	-	-	1474	-	-	538
HCM Lane V/C Ratio	0.017	-	-	-	0.02	-	-	0.004
HCM Control Delay (s)	11.8	0	-	-	7.5	0	-	11.7
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0

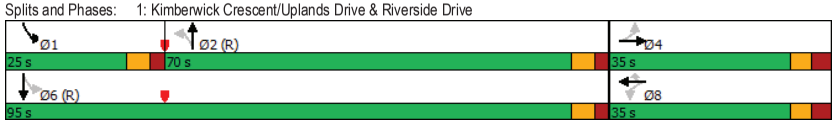
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	13	10	163	24	90	13	904	71	74	1733	7
Future Volume (vph)	12	13	10	163	24	90	13	904	71	74	1733	7
Satd. Flow (prot)	1658	1518	0	0	1640	1414	1658	3272	0	1551	3312	0
Flt Permitted	0.481				0.737		0.104			0.229		
Satd. Flow (perm)	830	1518	0	0	1257	1376	181	3272	0	374	3312	0
Satd. Flow (RTOR)		10				90		9			1	
Lane Group Flow (vph)	12	23	0	0	187	90	13	975	0	74	1740	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		5.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5	34.5	31.1	31.1		11.1	31.1	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	70.0	70.0		25.0	95.0	
Total Split (%)	26.9%	26.9%		26.9%	26.9%	26.9%	53.8%	53.8%		19.2%	73.1%	
Yellow Time (s)	3.3	3.3		3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	3.2	3.2		3.2	3.2	3.2	2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5			6.5	6.5	6.1	6.1		6.1	6.1	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	23.5	23.5			23.5	23.5	82.8	82.8		93.9	93.9	
Actuated g/C Ratio	0.18	0.18			0.18	0.18	0.64	0.64		0.72	0.72	
v/c Ratio	0.08	0.08			0.83	0.28	0.11	0.47		0.22	0.73	
Control Delay	42.7	28.4			78.7	10.4	15.7	14.5		7.7	13.6	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	42.7	28.4			78.7	10.4	15.7	14.5		7.7	13.6	
LOS	D	C			E	B	B	B		A	B	
Approach Delay		33.3			56.5			14.5			13.4	
Approach LOS		C			E			B			B	
Queue Length 50th (m)	2.6	2.8			46.1	0.0	1.3	68.1		5.1	127.1	
Queue Length 95th (m)	8.0	10.2			71.0	13.8	5.5	94.8		10.8	171.9	
Internal Link Dist (m)		147.2			77.5			257.5			196.3	
Turn Bay Length (m)	28.0						47.5			185.0		
Base Capacity (vph)	181	340			275	371	115	2086		441	2393	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.07	0.07			0.68	0.24	0.11	0.47		0.17	0.73	

Intersection Summary
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 43 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 17.8	Intersection LOS: B
Intersection Capacity Utilization 94.0%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 1: Kimberwick Crescent/Uplands Drive & Riverside Drive



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	0	154	6	24	269	0	36	0	25	0	0	0
Future Vol, veh/h	0	154	6	24	269	0	36	0	25	0	0	0
Conflicting Peds, #/hr	4	0	10	10	0	4	4	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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	5	2	2	3	2	2	2	2	2	2	2
Mvmt Flow	0	154	6	24	269	0	36	0	25	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	273	0	0	170	0	0	488	488	167	491	491	277
Stage 1	-	-	-	-	-	-	167	167	-	321	321	-
Stage 2	-	-	-	-	-	-	321	321	-	170	170	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1290	-	-	1407	-	-	490	480	877	488	478	762
Stage 1	-	-	-	-	-	-	835	760	-	691	652	-
Stage 2	-	-	-	-	-	-	691	652	-	832	758	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1286	-	-	1396	-	-	477	465	870	465	463	757
Mov Cap-2 Maneuver	-	-	-	-	-	-	477	465	-	465	463	-
Stage 1	-	-	-	-	-	-	828	754	-	689	637	-
Stage 2	-	-	-	-	-	-	675	637	-	808	752	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.6	11.9	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	585	1286	-	-	1396	-	-	-
HCM Lane V/C Ratio	0.104	-	-	-	0.017	-	-	-
HCM Control Delay (s)	11.9	0	-	-	7.6	0	-	0
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	-

Appendix I

MMLOS Analysis

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	☐
		1.2 Travel surveys	
BETTER		1.2.1 Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
		2. WALKING AND CYCLING	
		2.1 Information on walking/cycling routes & destinations	
BASIC		2.1.1 Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☑
		2.2 Bicycle skills training	
BETTER		2.2.1 Offer on-site cycling courses for residents, or subsidize off-site courses	☐

		TDM measures: *Residential developments*	Check if proposed & add descriptions
		3. TRANSIT	
		3.1 Transit information	
BASIC		3.1.1 Display relevant transit schedules and route maps at entrances *(multi-family, condominium)*	☑
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)*	☑

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

Appendix J

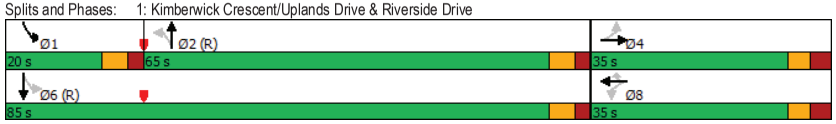
Synchro Intersection Worksheets – 2026 Future Total Conditions

Maximum v/c Ratio: 1.00

Intersection Signal Delay: 36.2	Intersection LOS: D
Intersection Capacity Utilization 98.5%	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: Kimberwick Crescent/Uplands Drive & Riverside Drive



Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	76	47	35	411	0	31	0	15	0	0	2
Future Vol, veh/h	0	76	47	35	411	0	31	0	15	0	0	2
Conflicting Peds, #/hr	9	0	1	1	0	9	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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	12	2	2	4	2	20	2	2	2	2	50
Mvmt Flow	0	76	47	35	411	0	31	0	15	0	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	420	0	0	124	0	0	583	591	101	597	614	420
Stage 1	-	-	-	-	-	-	101	101	-	490	490	-
Stage 2	-	-	-	-	-	-	482	490	-	107	124	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.3	6.52	6.22	7.12	6.52	6.7
Critical Hdwy Stg 1	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.68	4.018	3.318	3.518	4.018	3.75
Pot Cap-1 Maneuver	1139	-	-	1463	-	-	398	420	954	415	407	542
Stage 1	-	-	-	-	-	-	863	811	-	560	549	-
Stage 2	-	-	-	-	-	-	533	549	-	898	793	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1131	-	-	1462	-	-	387	404	953	396	391	538
Mov Cap-2 Maneuver	-	-	-	-	-	-	387	404	-	396	391	-
Stage 1	-	-	-	-	-	-	862	810	-	556	528	-
Stage 2	-	-	-	-	-	-	515	528	-	884	792	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.6	13.3	11.7
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	480	1131	-	-	1462	-	-	538
HCM Lane V/C Ratio	0.096	-	-	-	0.024	-	-	0.004
HCM Control Delay (s)	13.3	0	-	-	7.5	0	-	11.7
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	13	10	170	24	102	13	904	80	91	1692	7
Future Volume (vph)	12	13	10	170	24	102	13	904	80	91	1692	7
Satd. Flow (prot)	1658	1518	0	0	1640	1414	1658	3268	0	1551	3312	0
Flt Permitted	0.469				0.736		0.113			0.222		
Satd. Flow (perm)	810	1518	0	0	1255	1376	197	3268	0	363	3312	0
Satd. Flow (RTOR)		10				102		10			1	
Lane Group Flow (vph)	12	23	0	0	194	102	13	984	0	91	1699	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		5.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5	34.5	31.1	31.1		11.1	31.1	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	70.0	70.0		25.0	95.0	
Total Split (%)	26.9%	26.9%		26.9%	26.9%	26.9%	53.8%	53.8%		19.2%	73.1%	
Yellow Time (s)	3.3	3.3		3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	3.2	3.2		3.2	3.2	3.2	2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5			6.5	6.5	6.1	6.1		6.1	6.1	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	24.0	24.0			24.0	24.0	79.3	79.3		93.4	93.4	
Actuated g/C Ratio	0.18	0.18			0.18	0.18	0.61	0.61		0.72	0.72	
v/c Ratio	0.08	0.08			0.84	0.30	0.11	0.49		0.27	0.71	
Control Delay	42.5	28.3			79.3	10.1	15.8	15.9		8.3	13.5	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	42.5	28.3			79.3	10.1	15.8	15.9		8.3	13.5	
LOS	D	C			E	B	B	B		A	B	
Approach Delay		33.1			55.4			15.9			13.2	
Approach LOS		C			E			B			B	
Queue Length 50th (m)	2.5	2.7			47.7	0.0	1.4	71.1		6.6	124.4	
Queue Length 95th (m)	8.0	10.2			#77.9	14.4	5.4	97.3		12.9	163.4	
Internal Link Dist (m)		147.2			77.5			257.5			196.3	
Turn Bay Length (m)	28.0						47.5			185.0		
Base Capacity (vph)	177	340			275	381	120	1998		433	2378	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.07	0.07			0.71	0.27	0.11	0.49		0.21	0.71	

Intersection Summary

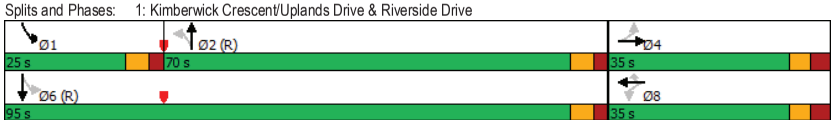
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 43 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 18.3	Intersection LOS: B
Intersection Capacity Utilization 93.1%	ICU Level of Service F
Analysis Period (min) 15	

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

Splits and Phases: 1: Kimberwick Crescent/Uplands Drive & Riverside Drive



Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	154	32	35	263	0	55	0	33	0	0	0
Future Vol, veh/h	0	154	32	35	263	0	55	0	33	0	0	0
Conflicting Peds, #/hr	4	0	10	10	0	4	4	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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	5	2	2	3	2	2	2	2	2	2	2
Mvmt Flow	0	154	32	35	263	0	55	0	33	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	267	0	0	196	0	0	517	517	180	524	533	271
Stage 1	-	-	-	-	-	-	180	180	-	337	337	-
Stage 2	-	-	-	-	-	-	337	337	-	187	196	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1297	-	-	1377	-	-	469	462	863	464	453	768
Stage 1	-	-	-	-	-	-	822	750	-	677	641	-
Stage 2	-	-	-	-	-	-	677	641	-	815	739	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1293	-	-	1366	-	-	454	443	856	435	434	763
Mov Cap-2 Maneuver	-	-	-	-	-	-	454	443	-	435	434	-
Stage 1	-	-	-	-	-	-	815	744	-	675	620	-
Stage 2	-	-	-	-	-	-	655	620	-	784	733	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.9	12.8	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	551	1293	-	-	1366	-	-	-
HCM Lane V/C Ratio	0.16	-	-	-	0.026	-	-	-
HCM Control Delay (s)	12.8	0	-	-	7.7	0	-	0
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.6	0	-	-	0.1	-	-	-

Appendix K

Synchro Intersection Worksheets – 2031 Future Total Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	7	13	238	5	186	7	1918	34	83	1063	5
Future Volume (vph)	28	7	13	238	5	186	7	1918	34	83	1063	5
Satd. Flow (prot)	1658	1557	0	0	1657	1455	1658	3301	0	1551	3280	0
Flt Permitted	0.420				0.716		0.268			0.054		
Satd. Flow (perm)	724	1557	0	0	1242	1410	466	3301	0	88	3280	0
Satd. Flow (RTOR)		13				186		2			1	
Lane Group Flow (vph)	28	20	0	0	243	186	7	1952	0	83	1068	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		5.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5	34.5	31.1	31.1		11.1	31.1	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	65.0	65.0		20.0	85.0	
Total Split (%)	29.2%	29.2%		29.2%	29.2%	29.2%	54.2%	54.2%		16.7%	70.8%	
Yellow Time (s)	3.3	3.3		3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	3.2	3.2		3.2	3.2	3.2	2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5			6.5	6.5	6.1	6.1		6.1	6.1	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	26.3	26.3			26.3	26.3	69.1	69.1		81.1	81.1	
Actuated g/C Ratio	0.22	0.22			0.22	0.22	0.58	0.58		0.68	0.68	
v/c Ratio	0.18	0.06			0.90	0.41	0.03	1.03		0.52	0.48	
Control Delay	39.9	21.1			79.2	8.2	14.7	54.8		27.4	10.6	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	39.9	21.1			79.2	8.2	14.7	54.8		27.4	10.6	
LOS	D	C			E	A	B	D		C	B	
Approach Delay		32.1			48.4			54.7			11.8	
Approach LOS		C			D			D			B	
Queue Length 50th (m)	5.3	1.3			54.6	0.0	0.7	~273.3		6.5	61.7	
Queue Length 95th (m)	13.6	7.6			#96.8	17.8	3.4	#331.4		21.8	76.4	
Internal Link Dist (m)		147.2			77.5			257.5			196.3	
Turn Bay Length (m)	28.0						47.5			185.0		
Base Capacity (vph)	171	379			294	476	268	1902		229	2217	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.16	0.05			0.83	0.39	0.03	1.03		0.36	0.48	

Intersection Summary

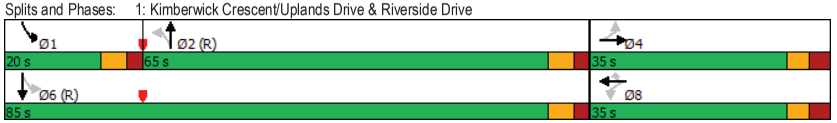
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 59 (49%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 120
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 1.03

Intersection Signal Delay: 39.9	Intersection LOS: D
Intersection Capacity Utilization 99.8%	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: Kimberwick Crescent/Uplands Drive & Riverside Drive



Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	78	47	35	411	0	31	0	15	0	0	2
Future Vol, veh/h	0	78	47	35	411	0	31	0	15	0	0	2
Conflicting Peds, #/hr	9	0	1	1	0	9	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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	12	2	2	4	2	20	2	2	2	2	50
Mvmt Flow	0	78	47	35	411	0	31	0	15	0	0	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	420	0	0	126	0	0	585	593	103	599	616	420
Stage 1	-	-	-	-	-	-	103	103	-	490	490	-
Stage 2	-	-	-	-	-	-	482	490	-	109	126	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.3	6.52	6.22	7.12	6.52	6.7
Critical Hdwy Stg 1	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.3	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.68	4.018	3.318	3.518	4.018	3.75
Pot Cap-1 Maneuver	1139	-	-	1460	-	-	397	418	952	413	406	542
Stage 1	-	-	-	-	-	-	861	810	-	560	549	-
Stage 2	-	-	-	-	-	-	533	549	-	896	792	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1131	-	-	1459	-	-	386	402	951	394	390	538
Mov Cap-2 Maneuver	-	-	-	-	-	-	386	402	-	394	390	-
Stage 1	-	-	-	-	-	-	860	809	-	556	528	-
Stage 2	-	-	-	-	-	-	515	528	-	882	791	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.6	13.3	11.7
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	479	1131	-	-	1459	-	-	538
HCM Lane V/C Ratio	0.096	-	-	-	0.024	-	-	0.004
HCM Control Delay (s)	13.3	0	-	-	7.5	0	-	11.7
HCM Lane LOS	B	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	13	10	170	24	102	13	904	80	91	1733	7
Future Volume (vph)	12	13	10	170	24	102	13	904	80	91	1733	7
Satd. Flow (prot)	1658	1518	0	0	1640	1414	1658	3268	0	1551	3312	0
Flt Permitted	0.469				0.736		0.105			0.222		
Satd. Flow (perm)	810	1518	0	0	1255	1376	183	3268	0	363	3312	0
Satd. Flow (RTOR)		10				102		10			1	
Lane Group Flow (vph)	12	23	0	0	194	102	13	984	0	91	1740	0
Turn Type	Perm	NA		Perm	NA	Perm	Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8		8	2			6		
Detector Phase	4	4		8	8	8	2	2		1	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0	10.0	10.0	10.0		5.0	10.0	
Minimum Split (s)	34.5	34.5		34.5	34.5	34.5	31.1	31.1		11.1	31.1	
Total Split (s)	35.0	35.0		35.0	35.0	35.0	70.0	70.0		25.0	95.0	
Total Split (%)	26.9%	26.9%		26.9%	26.9%	26.9%	53.8%	53.8%		19.2%	73.1%	
Yellow Time (s)	3.3	3.3		3.3	3.3	3.3	3.7	3.7		3.7	3.7	
All-Red Time (s)	3.2	3.2		3.2	3.2	3.2	2.4	2.4		2.4	2.4	
Lost Time Adjust (s)	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	6.5	6.5			6.5	6.5	6.1	6.1		6.1	6.1	
Lead/Lag							Lag	Lag		Lead		
Lead-Lag Optimize?							Yes	Yes		Yes		
Recall Mode	None	None		None	None	None	C-Max	C-Max		None	C-Max	
Act Effct Green (s)	24.0	24.0			24.0	24.0	79.3	79.3		93.4	93.4	
Actuated g/C Ratio	0.18	0.18			0.18	0.18	0.61	0.61		0.72	0.72	
v/c Ratio	0.08	0.08			0.84	0.30	0.12	0.49		0.27	0.73	
Control Delay	42.5	28.3			79.3	10.1	16.2	15.9		8.3	14.0	
Queue Delay	0.0	0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	42.5	28.3			79.3	10.1	16.2	15.9		8.3	14.0	
LOS	D	C			E	B	B	B		A	B	
Approach Delay		33.1			55.4			15.9			13.7	
Approach LOS		C			E			B			B	
Queue Length 50th (m)	2.5	2.7			47.7	0.0	1.4	71.1		6.6	130.7	
Queue Length 95th (m)	8.0	10.2			#77.9	14.4	5.5	97.3		12.9	171.9	
Internal Link Dist (m)		147.2			77.5			257.5			196.3	
Turn Bay Length (m)	28.0						47.5			185.0		
Base Capacity (vph)	177	340			275	381	111	1998		433	2378	
Starvation Cap Reductn	0	0			0	0	0	0		0	0	
Spillback Cap Reductn	0	0			0	0	0	0		0	0	
Storage Cap Reductn	0	0			0	0	0	0		0	0	
Reduced v/c Ratio	0.07	0.07			0.71	0.27	0.12	0.49		0.21	0.73	

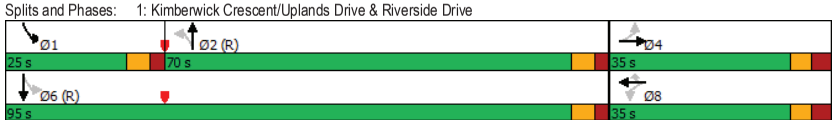
Intersection Summary
Cycle Length: 130
Actuated Cycle Length: 130
Offset: 43 (33%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.84

Intersection Signal Delay: 18.5	Intersection LOS: B
Intersection Capacity Utilization 94.3%	ICU Level of Service F
Analysis Period (min) 15	

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

Splits and Phases: 1: Kimberwick Crescent/Uplands Drive & Riverside Drive



Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	154	32	35	269	0	55	0	33	0	0	0
Future Vol, veh/h	0	154	32	35	269	0	55	0	33	0	0	0
Conflicting Peds, #/hr	4	0	10	10	0	4	4	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
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	5	2	2	3	2	2	2	2	2	2	2
Mvmt Flow	0	154	32	35	269	0	55	0	33	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	273	0	0	196	0	0	523	523	180	530	539	277
Stage 1	-	-	-	-	-	-	180	180	-	343	343	-
Stage 2	-	-	-	-	-	-	343	343	-	187	196	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
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	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1290	-	-	1377	-	-	465	459	863	460	449	762
Stage 1	-	-	-	-	-	-	822	750	-	672	637	-
Stage 2	-	-	-	-	-	-	672	637	-	815	739	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1286	-	-	1366	-	-	450	440	856	431	431	757
Mov Cap-2 Maneuver	-	-	-	-	-	-	450	440	-	431	431	-
Stage 1	-	-	-	-	-	-	815	744	-	670	616	-
Stage 2	-	-	-	-	-	-	650	616	-	784	733	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.9	12.8	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	547	1286	-	-	1366	-	-	-
HCM Lane V/C Ratio	0.161	-	-	-	0.026	-	-	-
HCM Control Delay (s)	12.8	0	-	-	7.7	0	-	0
HCM Lane LOS	B	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.6	0	-	-	0.1	-	-	-

Appendix L

TDM Checklist

CGH TRANSPORTATION

Multi-Modal Level of Service - Intersections Form

Consultant	**CGH Transportation Inc.**	**Project**	**3750 North Bowesville Road**
Scenario	**Existing/Future**	**Date**	**4/13/2022**
Comments			

	INTERSECTIONS	**Riverside Drive at Uplands Drive/ Kimberwick Crescent**			
	Crossing Side	**NORTH**	**SOUTH**	**EAST**	**WEST**
Pedestrian	Lanes	8	8	6	6
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	Permissive	Permissive	Protected/ Permissive	Permissive
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RToR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No	No	No	No
	Right Turn Channel	No Channel	No Channel	No Channel	No Channel
	Corner Radius	10-15m	10-15m	10-15m	10-15m
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings
	PETSI Score	**-12**	**-12**	**20**	**20**
	Ped. Exposure to Traffic LoS	**F**	**F**	**F**	**F**
	Cycle Length	120	120	120	120
	Effective Walk Time	61	41	8	8
	Average Pedestrian Delay	**15**	**26**	**52**	**52**
	Pedestrian Delay LoS	**B**	**C**	**E**	**E**
	Level of Service	**F**	**F**	**F**	**F**
		F			
	Approach From	**NORTH**	**SOUTH**	**EAST**	**WEST**
Bicycle	Bicycle Lane Arrangement on Approach	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic
	Right Turn Lane Configuration			≤ 50 m	
	Right Turning Speed			≤ 25 km/h	
	Cyclist relative to RT motorists	**#N/A**	**#N/A**	**D**	**#N/A**
	Separated or Mixed Traffic	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**
	Left Turn Approach	≥ 2 lanes crossed	≥ 2 lanes crossed	One lane crossed	One lane crossed
	Operating Speed	≥ 60 km/h	≥ 60 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h
	Left Turning Cyclist	**F**	**F**	**E**	**E**
	Level of Service	**#N/A**	**#N/A**	**E**	**#N/A**
		#N/A			
Transit	Average Signal Delay	≤ 30 sec	> 40 sec		
	Level of Service	**D**	**F**	**-**	**-**
		F			
Truck	Effective Corner Radius				
	Number of Receiving Lanes on Departure from Intersection				
	Level of Service	**-**	**-**	**-**	**-**
		-			
Auto	Volume to Capacity Ratio	0.91 - 1.00			
	Level of Service	**E**			