

**AGES DRIVE INDUSTRIAL BUILDINGS
899, 901, 903 AGES DRIVE
OTTAWA, ONTARIO**

TRANSPORTATION IMPACT ASSESSMENT

Prepared for:

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TRANSPORTATION IMPACT ASSESSMENT

STEP 1 - SCREENING

A Screening Form has been prepared which is included as Exhibit 1.1 in the Appendix. The Trip Generation Trigger has been triggered in the Screening Form. It is recommended that the assessment study proceed to the Scoping Document. The following will address the requirements of the Scoping Document.

STEP 2 - SCOPING

MODULE 2.1 – Existing and Planned Conditions

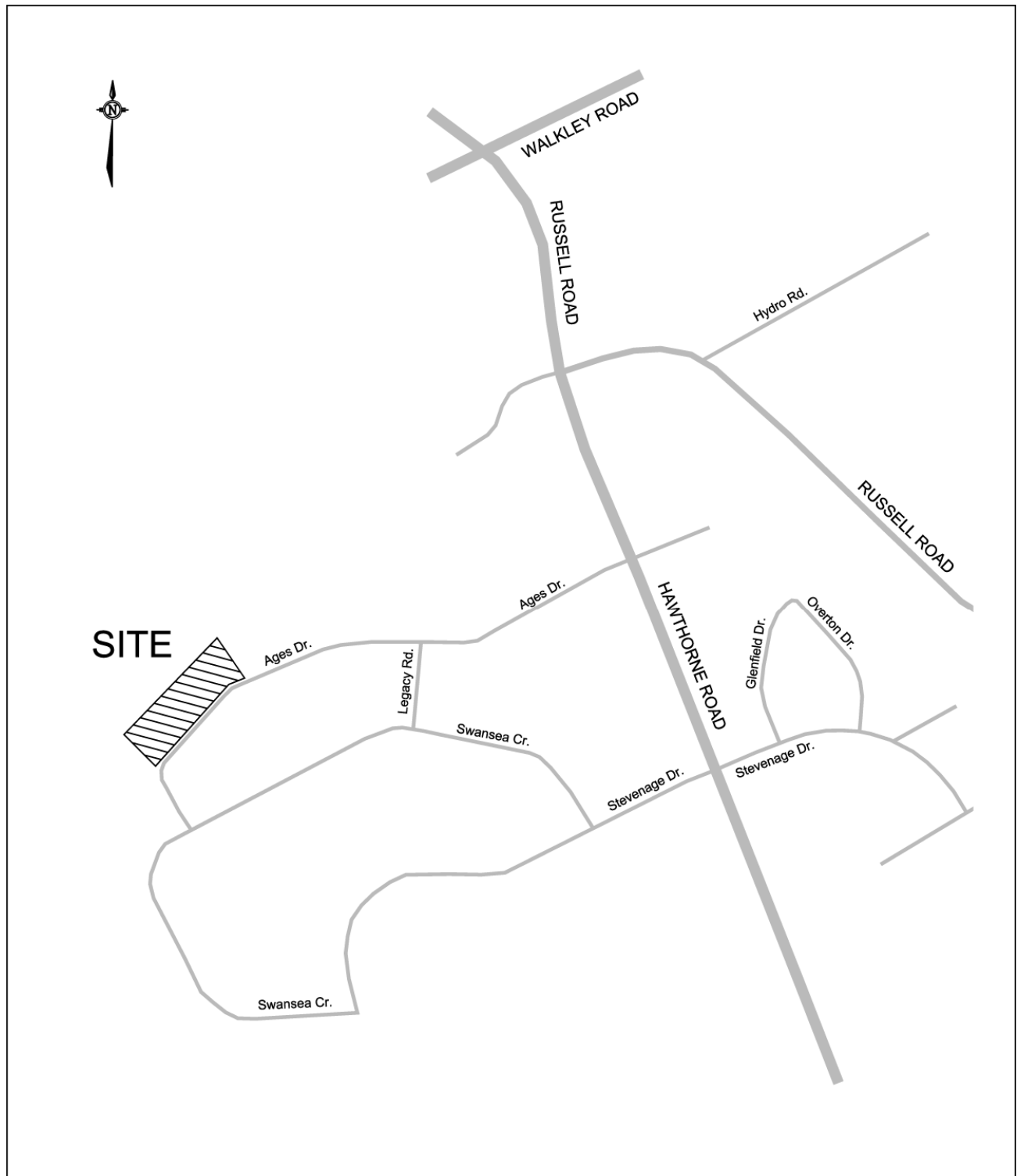
Element 2.1.1 – Proposed Development

Ages Drive Development Inc. is preparing to submit a Site Plan Application for the development of a parcel of land along the north side of Ages Drive just west of Hawthorne Road in the City of Ottawa. The development will be constructed on three adjoining parcels of land at 899, 901 and 903 Ages Drive. Figure 2.1 shows the location of the site.

The development will consist of the construction of two free standing buildings on the three parcels of land which would total 1.89 ha (4.65 acres) in size. The lands are currently vacant with an “IG3” Zoning – General Industrial Zoning which will support the proposed industrial development.

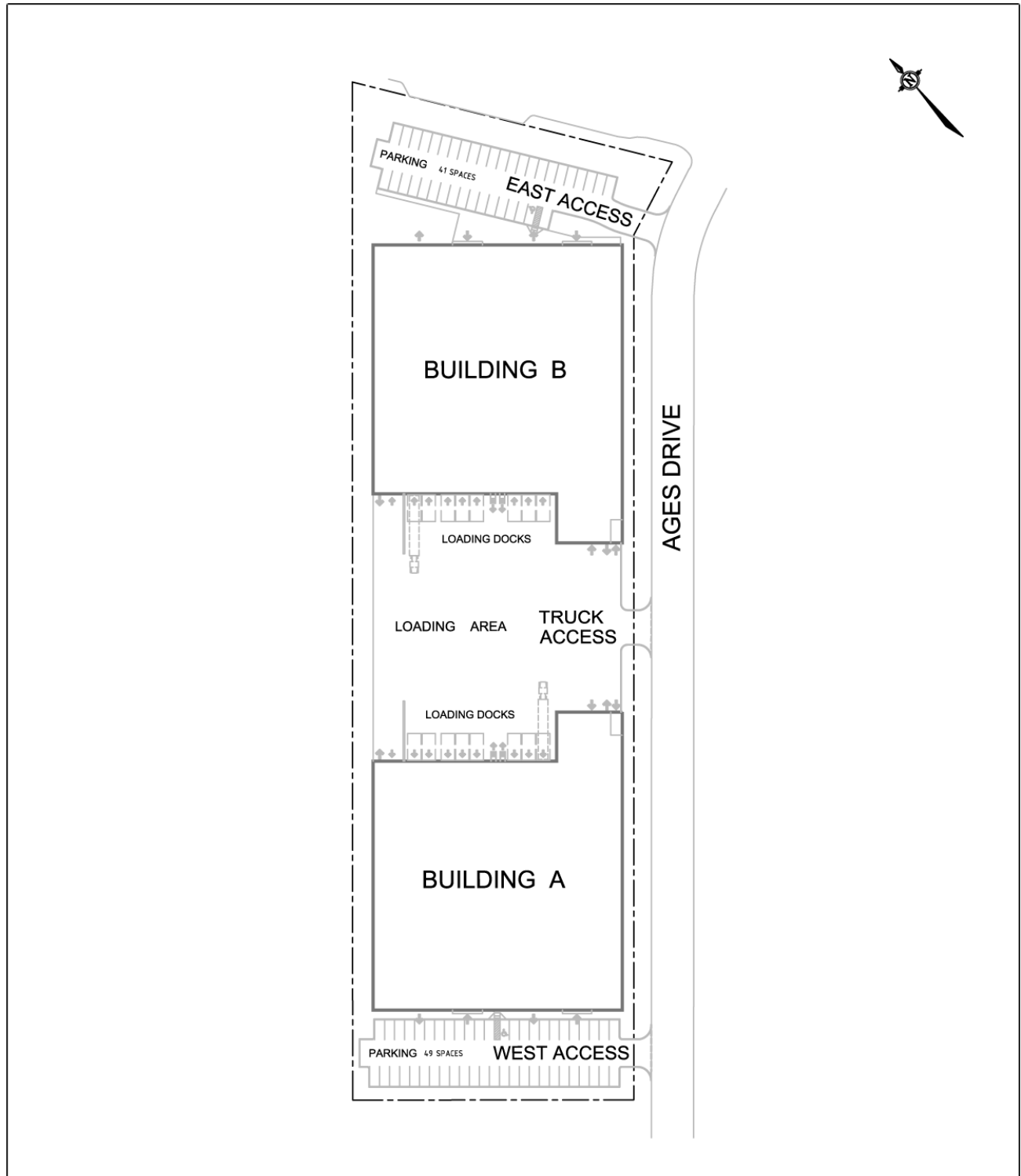
The development will consist of two single storey light industrial, multi-tenant buildings. Both Building “A” and Building “B” will have a gross floor area of 4,483.4 m² for a total development area of 8,966.8 m². The two buildings will have a shared loading area with each building providing 9 loading docks. The use of the buildings would be typically that of storage and warehousing with limited office or showroom space. The site will have three access points. One access is located at the west side of the development which would access a parking lot with 49 parking spaces for Building “A”. A second access is located at the east side of the development accessing a parking lot for Building “B” with 41 parking spaces. The third access is at the midpoint of the site frontage and would provide access to the loading area for both Buildings “A” and “B”. The development will be constructed in a single phase and is expected to be completed by 2019. Figure 2.2 provides a conceptual site plan of the development.

FIGURE 2.1
SITE LOCATION PLAN



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FIGURE 2.2
CONCEPTUAL SITE PLAN



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Element 2.1.2 – Existing Conditions

The development will be located on the north side of Ages Drive. Ages Drive is an east-west two lane industrial/commercial road under the jurisdiction of the City of Ottawa. Ages Drive is an urban road with an 11 m pavement width which connects to Hawthorne Road to the east and Swansea Crescent to the west. There are no sidewalks or cycling facilities along the road. The City of Ottawa *Transportation Master Plan* (TMP) identifies the road as a local street and is not part of the primary cycling network. The speed limit is unposted at 50 km./h.

Ages Drive connects to Hawthorne Road to the east. Hawthorne Road is under the jurisdiction of the City of Ottawa (OR 32). The TMP designates Hawthorne Road as an arterial road, and is a Spine Route in the Cycling Network – Primary Urban map. In the vicinity of Ages Drive, Hawthorne Road is a four lane undivided road with a shared centre left turn lane which provides back to back left turn movements into the commercial properties on both sides of the road. There are cycling lanes along both sides of the road. The speed limit is posted at 70 km./h.

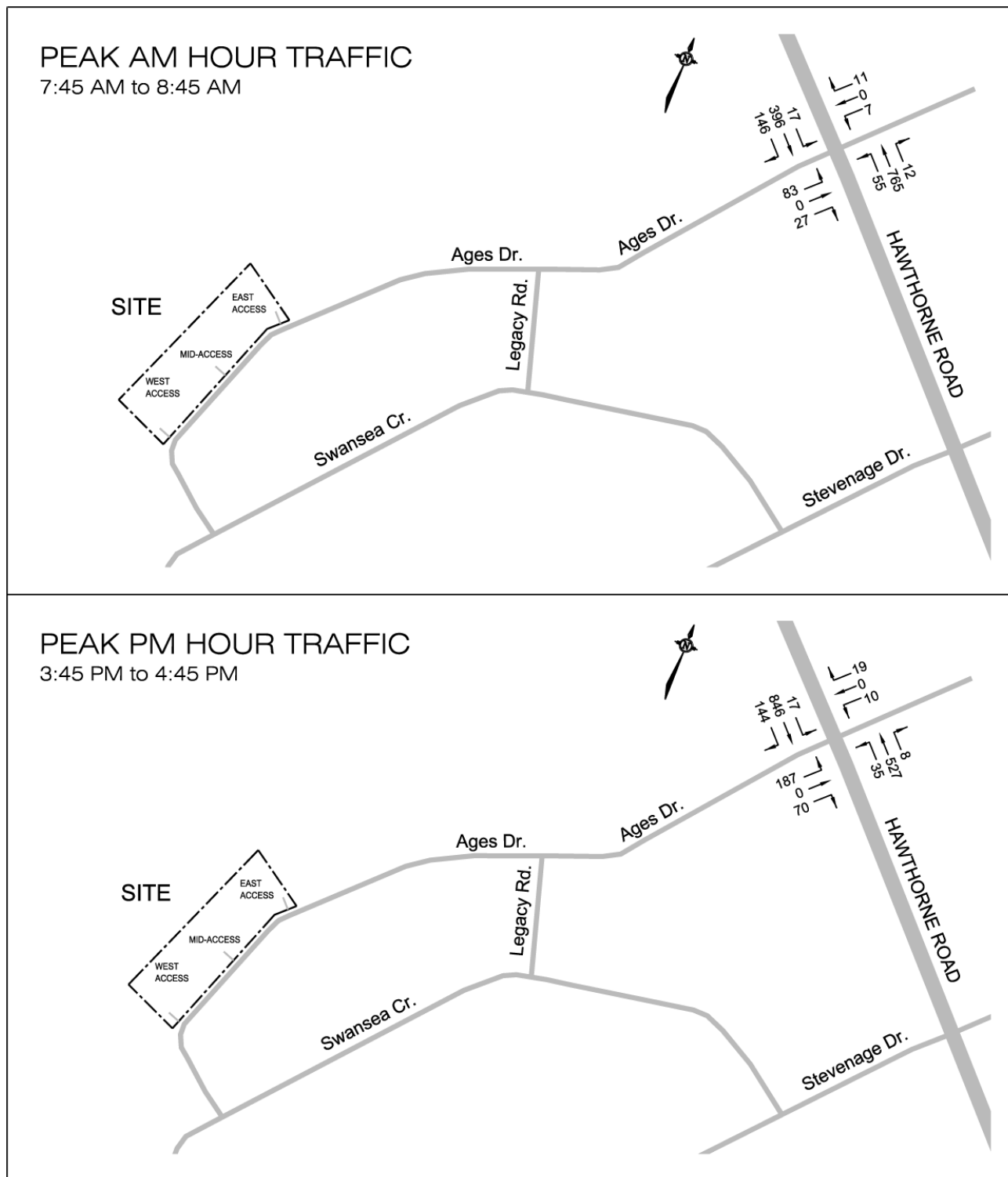
The intersection of Ages Drive and Hawthorne Road is controlled by traffic signals. Hawthorne Road forms the northbound and southbound approaches, Ages Drive the eastbound approach, and a private access to a commercial development forms the westbound approach. The intersection has the following lane configuration:

Northbound Hawthorne -	1 exclusive left turn lane 2 through lanes 1 exclusive right turn lane
Southbound Hawthorne -	1 exclusive left turn lane 2 through lanes 1 exclusive right turn lane (channelized)
Eastbound Ages -	1 exclusive left turn lane 1 through lane 1 exclusive right turn lane (channelized)
Private Access -	1 exclusive left turn lane 1 shared through/right lane

Figure 2.3 shows the most recent traffic counts taken on January 25, 2017 which were obtained from the City of Ottawa. The figure presents the peak AM and PM hour traffic, with the turning movement counts from the City of Ottawa provided as Exhibit 2.1 in the Appendix.

Collision reports were obtained from the City of Ottawa for the five year time period between the years January 1, 2013 and December 31, 2017. The collision reports were for the intersections of Ages/Hawthorne and Ages/Legacy, and for Ages Drive between Hawthorne and Legacy, and between Legacy and Swansea. There were no reported collisions during the five year period at the Ages/Swansea intersection. Table 2.1 summarizes the collisions by year and type, with the collision reports from the City of Ottawa provided as Exhibit 2.2 in the Appendix.

FIGURE 2.3
2017 PEAK AM AND PM HOUR TRAFFIC COUNTS – January 25, 2017



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**TABLE 2.1
COLLISION SUMMARY**

YEAR	COLLISION TYPE					TOTAL
	REAR END	ANGULAR	TURNING	SIDESWIPE	OTHER (SMV)	
Ages Drive at Hawthorne Road						
2013	1	1	1	1		4
2014		1	1			2
2015	1	1			1	3
2016		2	1	1		4
2017	1		1			<u>2</u>
TOTAL	3	5	4	2	1	15
Ages Drive at Legacy Road						
2013						0
2014			1			1
2015						0
2016						0
2017						<u>0</u>
TOTAL	0	0	1	0	0	1
Ages Drive between Hawthorne Road Legacy Road						
2013					2	2
2014						0
2015						0
2016						0
2017		2				<u>2</u>
TOTAL	0	2	0	0	2	4
Ages Drive between Legacy Road Swansea Crescent						
2013						0
2014						0
2015						0
2016						0
2017		1		1	1	<u>3</u>
TOTAL	0	1	0	1	1	3

Element 2.1.3 – Planned Conditions

The *Transportation Master Plan 2013* does not identify any roadway modifications planned along Hawthorne Road in the vicinity of the site.

There has been some commercial development in the past five years at the east side of the Ages/Hawthorne intersection with access provided as the westbound intersection approach, and some commercial development currently under construction at the Hawthorne/Russell intersection. There are no large developments planned for the immediate area in the foreseeable future.

MODULE 2.2 – Study Area and Time Periods

Element 2.2.1 – Study Area

The site trips generated by the industrial development would be mainly primary trips made by employees travelling to/from work. The location of the site and the surrounding roadway network would result in practically all of the site trips to enter and exit the site along Ages Drive from the Ages/Hawthorne intersection.

The study area for the Transportation Impact Assessment (TIA) report would be confined to the examination of the site accesses, and the operation of Ages Drive and the Ages/Hawthorne intersection. The site accesses will also be examined for the sight line of vehicles entering and exiting the site.

Element 2.2.2 – Time Periods

Although the tenants have not been established for the development, it is expected that the trips would comprise of employees arriving in the AM and departing in the PM with the time period coinciding with the peak hours of traffic along Hawthorne Road. The time period for the TIA analysis would be for the weekday peak AM and PM hours which the City of Ottawa traffic counts at the Ages/Hawthorne intersection determined to be between 7:45 and 8:45 for the AM hour and 3:45 and 4:45 for the PM hour.

Element 2.2.3 – Horizon Years

The industrial development would be constructed in one phase with the site expected to be completed and operational by the year 2019.

MODULE 2.3 – Exemptions Review

The exemptions, which provide possible reductions to the scope of work of the TIA Study, were examined using Table 4: Possible Exemptions which is provided in the City's *Transportation Impact Assessment Guidelines (2017)*. Utilizing the table, the following lists the possible exemptions proposed for the TIA Study report:

MODULE	ELEMENT	EXEMPTION CONSIDERATIONS
Design Review Component		
4.1 Development Design	4.1.2 Circulation and Access	No - Access to the development and site circulation will be examined.
	4.1.3 New Street Networks	Yes - Only required for subdivisions.
4.2 Parking	4.2.1 Parking Supply	No - the supply of parking will be discussed.
	4.2.2 Spillover Parking	Yes - Parking will meet the City of Ottawa By-laws. Spillover parking is not expected to be a problem.
Network Impact Component		
4.5 Transportation Demand Management	All Elements	Yes – The storage/warehouse use has few employees and would not benefit from TDM.
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Yes – The site will have access onto a local industrial road with few new trips.
4.8 Network Concept		Yes - The site would not generate more than 200 person-trips per peak hour in excess of the volume permitted by established zoning.

STEP 3 - FORECASTING

MODULE 3.1 - Development-Generated Travel Demand

Element 3.1.1 – Trip Generation and Mode Shares

The proposed development will consist of two light industrial buildings which will share a common loading area. Building A will be located on the west portion of the site and Building B on the east portion. The loading area will be located between both buildings with a separate entrance for trucks loading and unloading merchandise. Table 3.1 provides an inventory of the gross floor area of the buildings on site.

The number of expected site generated trips utilized the trip statistical data in the Institute of Transportation Engineers (ITE) document, *Trip Generation Manual 10th Edition*. The study will utilize the fitted curve equation for a “General Light Industrial” ITE 110 Land Use. The trip rates are shown in Table 3.2.

**TABLE 3.1
INVENTORY**

BUILDINGS	GROSS FLOOR AREA	
Building A	4,483.4 m ²	48,259 ft ²
Building B	4,483.4 m ²	48,259 ft ²
Total Building Size	8,966.8 m ²	96,518 ft ²

**TABLE 3.2
TRIP GENERATION RATES AND DIRECTIONAL SPLITS**

Peak Hr.	Peak AM Hour		Peak PM Hour	
Fitted Curve Equation	$\ln(T) = 0.74 \ln(X) + 0.39$		$\ln(T) = 0.69 \ln(X) + 0.43$	
Trip Rate	0.45 T/1000 ft ²		0.37 T/1000 ft ²	
Directional Distribution	88% Entering	12% Exiting	13% Entering	87% Exiting

The modal share was determined from statistical data in the *2011 TRANS-OD Survey Report* (page 97). The analysis used the data by Primary Travel Mode, recognizing the available transit service and surrounding community. Table 3.3 presents the modal shared summary which will be used in the TIA Submission.

**TABLE 3.3
MODE SHARE SUMMARY (Person-Trips)**

Future Mode Share Targets for the Development		
Travel Mode	Mode Share Target	Rationale
Transit	15%	Route 47 travels past the site to/from the St. Laurent transit station
Walking	0%	There are no residential communities within close proximity to the site
Cycling	2%	Consistent with the City's <i>Official Plan</i>
Auto Passenger	15%	Consistent with modal share observations in the TMP
Auto Driver	68%	

The number of person-trips was determined by the number of auto-trips calculated from the ITE trip rates, multiplied by 1.28 (from the TIA Guidelines) to convert auto-trips to person-trips. Table 3.4 shows the future peak hour person-trips.

TABLE 3.4
TOTAL PEAK HOUR SITE GENERATED TRIPS

Trips	AUTO-TRIP GENERATION		FUTURE PERSON-TRIPS	
	PEAK AM HR.	PEAK PM HR.	PEAK AM HR.	PEAK PM HR.
Buildings A & B	43 veh.	36 veh.	55 per.	46 per.

The peak hour person-trips per mode were determined by the product of the peak hour future person-trips from Table 3.4 and the future mode share from Table 3.3. The mode share of Table 3.3 was applied to both the expected peak AM and PM hour trips. The results are shown in Table 3.5.

TABLE 3.5
FUTURE DEVELOPMENT GENERATED PERSON-TRIPS

TRAVEL MODE	DEVELOPMENT GENERATED PERSON-TRIPS	
	PEAK AM HOUR	PEAK PM HOUR
Transit	8 per./trips	7 per./trips
Walking	0 per./trips	0 per./trips
Cycling	1 per./trips	1 per./trips
Auto Passenger	8 per./trips	7 per./trips
Auto Driver	38 per./trips	31 per./trips
Total Trips	55 per./trips	46 per./trips

The site is a 1.89 ha vacant parcel of land. There are no previous uses on the property or users which would share trips. There would be no applicable trip reduction factors applied to the proposed light industrial use.

Element 3.1.2 – Trip Distribution

The distribution of site generated trips for the proposed light industrial development was determined by examining the existing peak hour traffic pattern along Hawthorne Road. The volume of traffic along Hawthorne Road would show the preferred travel route of

drivers travelling to/from the employment areas. The trip distribution which will be utilized in the study for both the weekday peak AM hour and PM hour is as follows:

To/From the north along Hawthorne Road	40%
To/From the south along Hawthorne Road	60%

Element 3.1.3 – Trip Assignment

The trip assignment has examined the site generated trips with respect to the shortest and most convenient routes to/from the development. The study has assumed all site trips would enter and exit by way of Hawthorne Road and would use the most direct route along Ages Drive to the Ages/Hawthorne signalized intersection. The site trips used in the trip assignment were determined from the auto driver trips in Table 3.5, and would enter and exit the site at the directional distribution shown in Table 3.2. The site would provide a shared truck loading area between the two buildings, with a total of 9 loading spaces per building. The trucks would enter and exit the site throughout the day with few trucks arriving and departing during the peak hours of the adjacent street traffic. The study has assumed that all delivery truck trips would occur outside the peak hour time period of the adjacent roads. Figure 3.1 shows the weekday peak AM and PM hour trip assignment for the light industrial development.

MODULE 3.2 - Background Network Traffic Demands

Element 3.2.1 – Transportation Network Plans

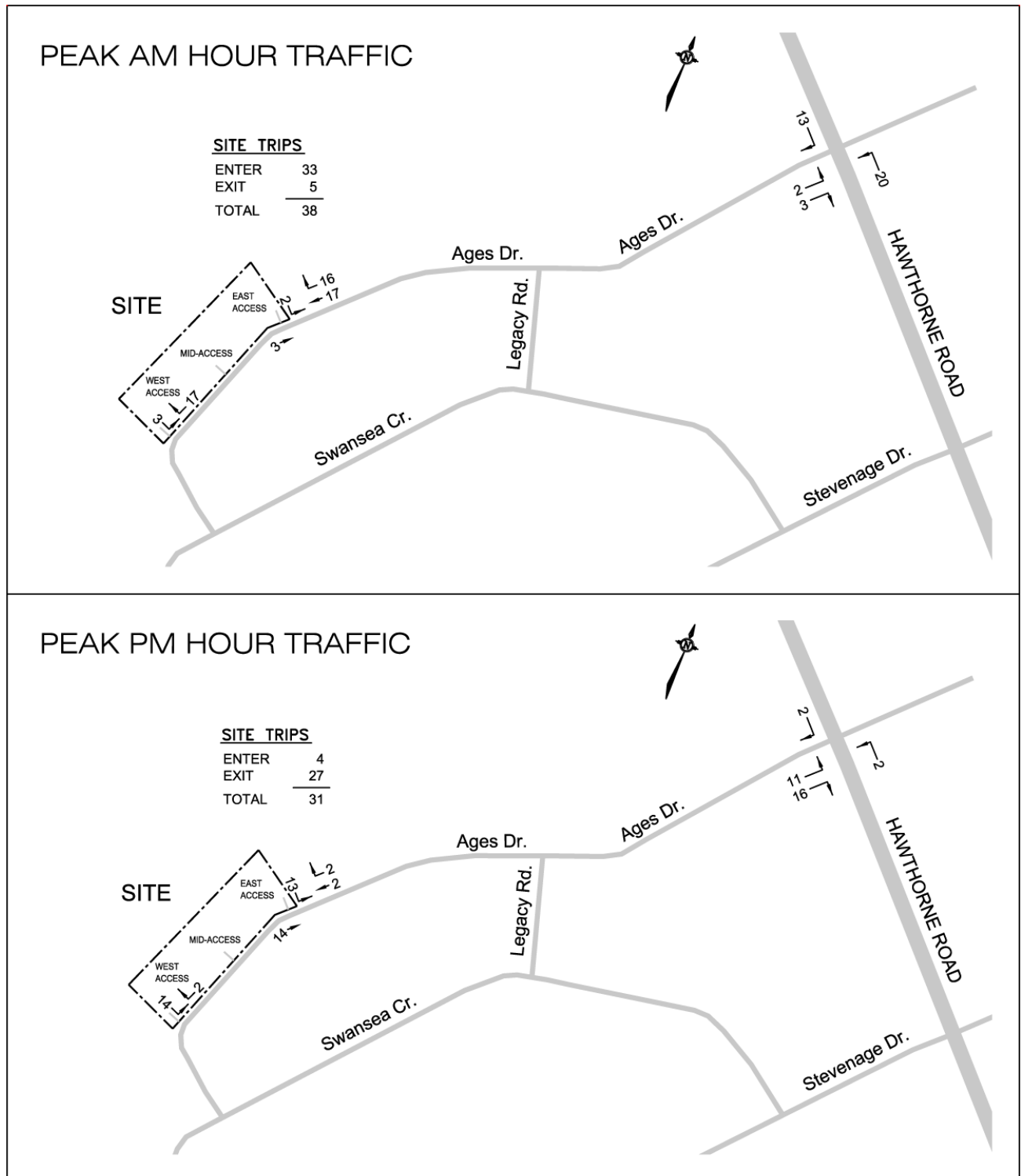
The City of Ottawa *Transportation Master Plan 2013* (TMP) was reviewed to identify transit and roadway projects in the vicinity of the development. The TMP did not identify any rapid transit, transit priority or road projects within the “2031 Affordable RTTP Network Projects” or “2031 Affordable Road Network”.

Element 3.2.2 – Background Growth

The growth in background traffic was determined by examination of historical traffic counts. The 2010 and 2015 traffic counts taken by the City of Ottawa at the south approach of the Russell/Hawthorne intersection were compared to the 2017 counts at the north approach to the Ages/Hawthorne intersection. The counts determined that the traffic along Hawthorne Road decreased over the seven year period from 2010 to 2017, and were approximately the same when comparing the 2015 to the 2017 traffic counts.

Following the examination of historical traffic volumes along Hawthorne Road, the study has increased the through movements at the north and south approaches to the Ages/Hawthorne intersection by an annual compounded rate of 2.0 percent to account for development outside the study area which would not include the proposed light industrial site. With no new development proposed along Ages Drive, the background traffic at the east and west approaches to the Ages/Hawthorne intersection were not increased to account for future growth.

FIGURE 3.1
WEEKDAY PEAK AM AND PM HOUR SITE GENERATED TRIPS



Element 3.2.3 – Other Developments

A Development Application Search was conducted which determined that new development in the area which would not be accounted for in the January 25, 2017 traffic counts would be the industrial developments at 3009 Hawthorne Road and two developments at the Hawthorne/Hunt Club intersection. Construction was still underway at the industrial development at 3020 Hawthorne Road with some of the development completed and occupied at the time of the counts. The additional new trips generated by the proposed development along Hawthorne Road would be accounted for within the 2.0 percent annual compounded growth factor.

The northbound and southbound Hawthorne Road through movements from the January 25, 2018 traffic counts (Figure 2.3) were increased at an annual compounded rate of 2.0 percent to the completion of the development in 2019, and to the year 2024 which represents five years beyond completion. Figure 3.2 shows the 2019 peak AM and PM hour background traffic (does not include trips from 899-903 Ages Drive development). Figure 3.3 shows the expected 2024 peak hour background traffic.

MODULE 3.3 - Demand Rationalization

An initial projection of expected site generated trips determined that the site would generate a relatively low volume of new trips onto the adjacent roads. The operational analysis of adjacent intersections conducted by this firm for development in the area determined that there should not be a roadway capacity issue due to the background or total auto demand at the Ages/Hawthorne intersection. There would be no requirement to applied measures to reduce travel demand to either background or site related trips.

MODULE 4 – ANALYSIS

MODULE 4.1 – Development Design

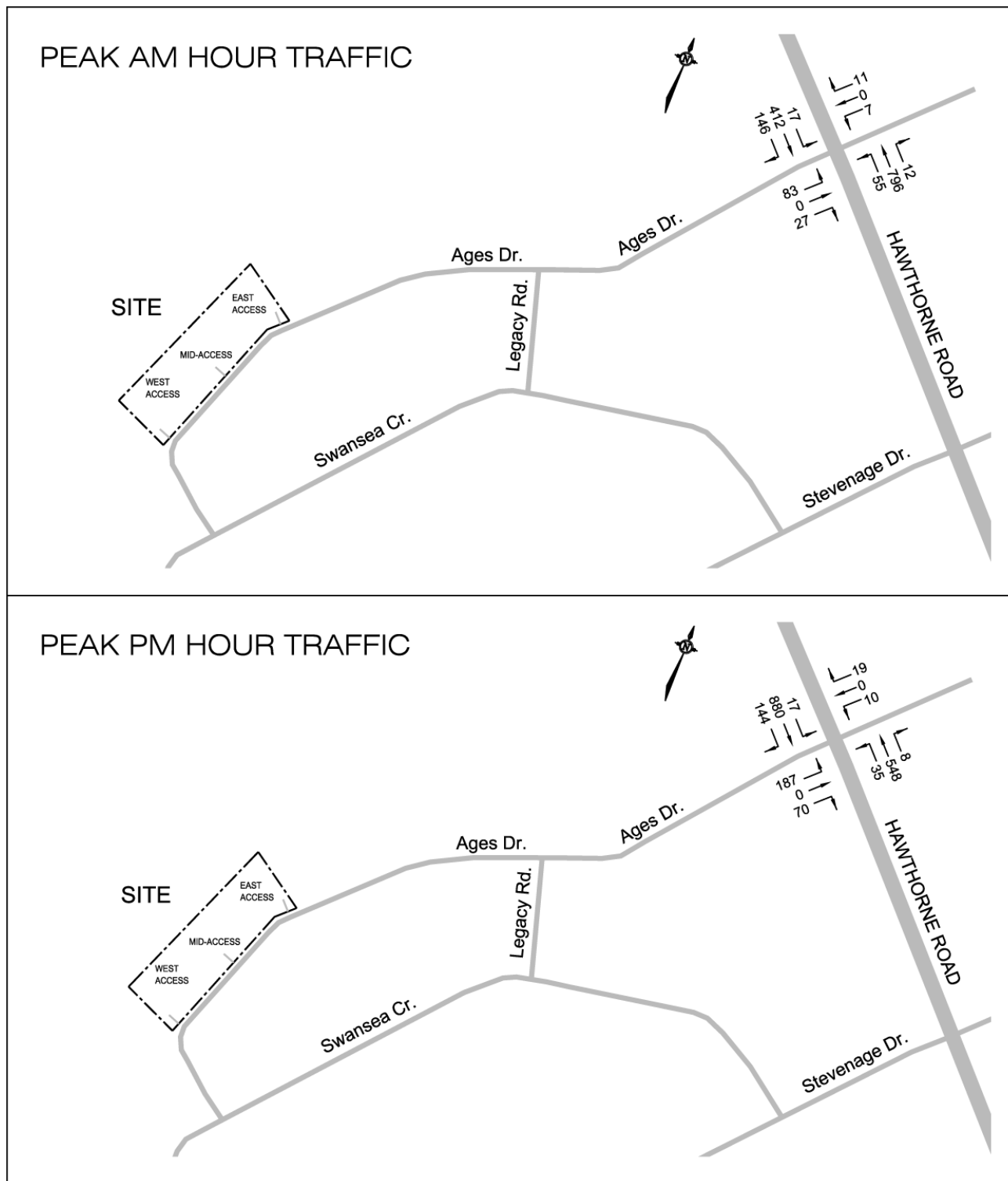
Element 4.1.1 – Design for Sustainable Modes

The site will be designed to provide adequate on-site parking for both vehicles and bicycles. The Site Plan provides a total for both buildings of 90 parking spaces for vehicles which will accommodate employees and patrons, 10 spaces for bicycles with bicycle racks in a protected space close to the building entrance, and 19 spaces for delivery trucks.

Ages Drive is an industrial/commercial local road with a pavement width of 11 m and no sidewalks. The location of the proposed buildings is not in close proximity to residential areas or retail/restaurant areas which would benefit from a sidewalk along the road.

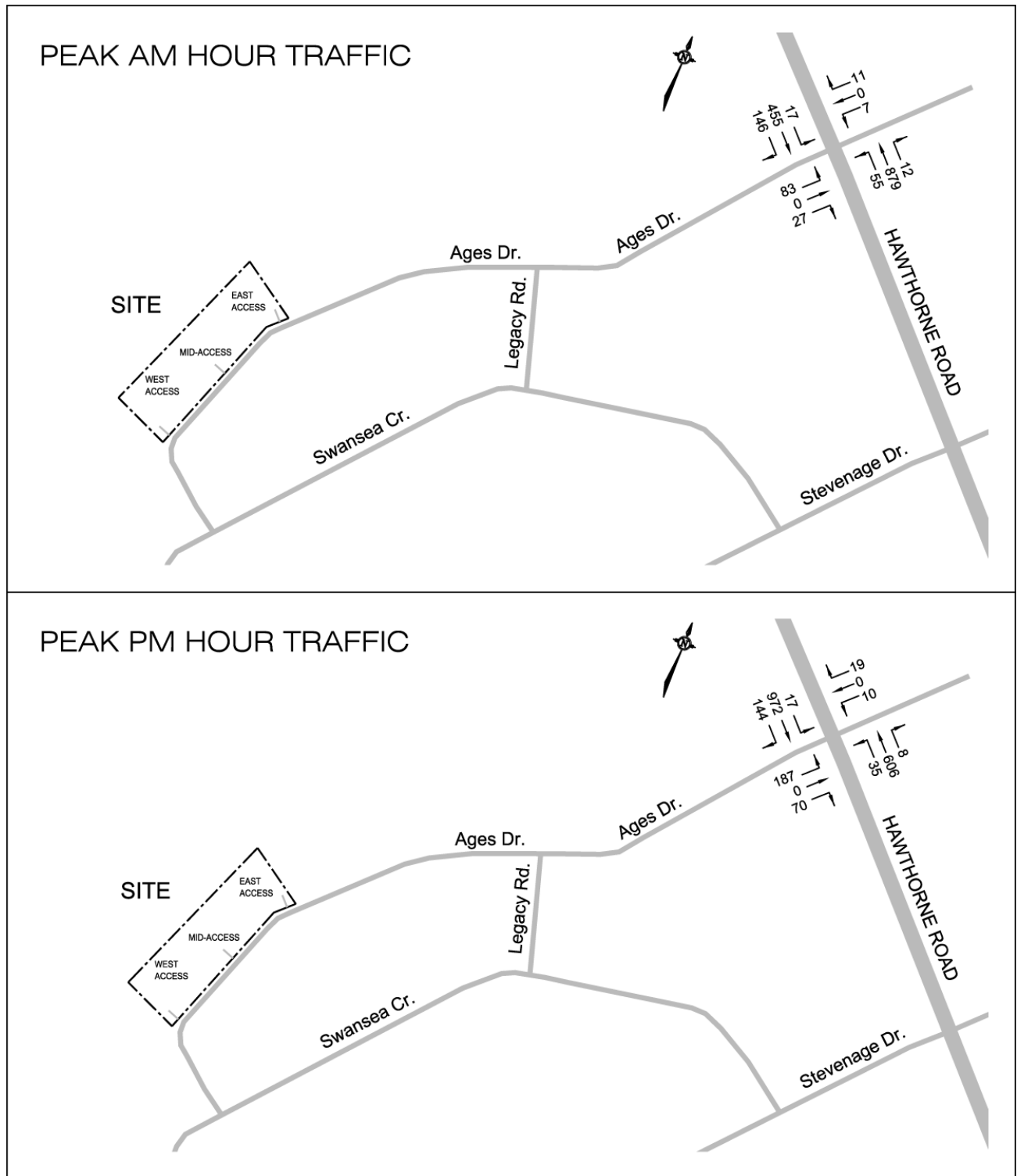
OC Transpo local Route 47 services the site with peak periods of service with buses traveling from the St. Laurent Transitway station past the site during the AM time period,

FIGURE 3.2
2019 WEEKDAY PEAK AM AND PM HOUR BACKGROUND TRAFFIC



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FIGURE 3.3
2024 WEEKDAY PEAK AM AND PM HOUR BACKGROUND TRAFFIC



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and traveling back to the Transitway station during the PM time period. Bus stops are located along Ages Drive within a 150 m distance from the proposed buildings.

Element 4.1.2 – Circulation and Access

The proposed development will contain three accesses. The West Access will service Building A and the East Access Building B. The central access will be a common access for delivery trucks to both Building A and B.

The east and west accesses would have a separation distance of approximately 215 m. Each access would be 7.0 m in width providing one lane entering and one lane exiting the site. The low volume of expected trips and the separation of accesses would result in both accesses to operate efficiently with no internal circulation conflicts. The truck access would be midway between Access A and Access B and would separate the movements between large trucks and cars.

Element 4.1.3 – New Street Networks

Exempt as determined in the Scoping module.

MODULE 4.2 – Parking

Element 4.2.1 – Parking Supply

The Site Plan provides a total of 90 vehicular parking spaces and 19 spaces for delivery trucks. The on-site parking would exceed the 72 parking spaces required under the Parking By-law for the property. The 90 parking spaces (supply) would be more than double the peak hour parking demand as determined in the auto-trip generation analysis calculated in Element 3.1.3 of Step 3 - Forecasting. There would be no parking impact on the surrounding area roads.

Element 4.2.2 – Spillover Parking

Exempt as determined in the Scoping module.

MODULE 4.3 – Boundary Street Design

The City of Ottawa Complete Streets concept allows for the safe movement of everyone whether they choose to walk, bike, drive, or take public transit. The boundary roads to the site would consist of the existing streets of Ages Drive and Hawthorne Road.

Ages Drive is an 11.0 m wide industrial/commercial local road which would provide an adequate roadway design for the safe movement of people to/from the bus stops and sufficient width for safe cycling. Ages Drive does not have sidewalks, but with no residential housing or retail in close proximity to the site, pedestrian activity along Ages

Drive is expected to be low which is substantiated by traffic counts at the Ages/Hawthorne intersection.

Hawthorne road is a four lane arterial road. Pedestrian sidewalks and cycling lanes are provided along the road which would provide the safe movement of people for all modes of travel.

The low number of site generated trips would not trigger the need for roadway modifications along either Ages Drive or Hawthorne Road.

Table 2.1 in Element 2.1.2 of Step 2 in the Scoping section of the TIA report shows the collision history over a five year period between January 1, 2013 and December 31, 2017 for the intersection of Ages/Hawthorne, along with the Ages/Legacy intersection and Ages Drive between Hawthorne Road and Swansea Crescent. The collision data determined that there was no pattern of more than six collisions per collision type over the five year time period at either intersection or along Ages Drive. Figure 4.1 provides a collision diagram for the Ages/Hawthorne intersection.

MODULE 4.4 – Access Intersection Design

Element 4.4.1 – Location and Design of Access

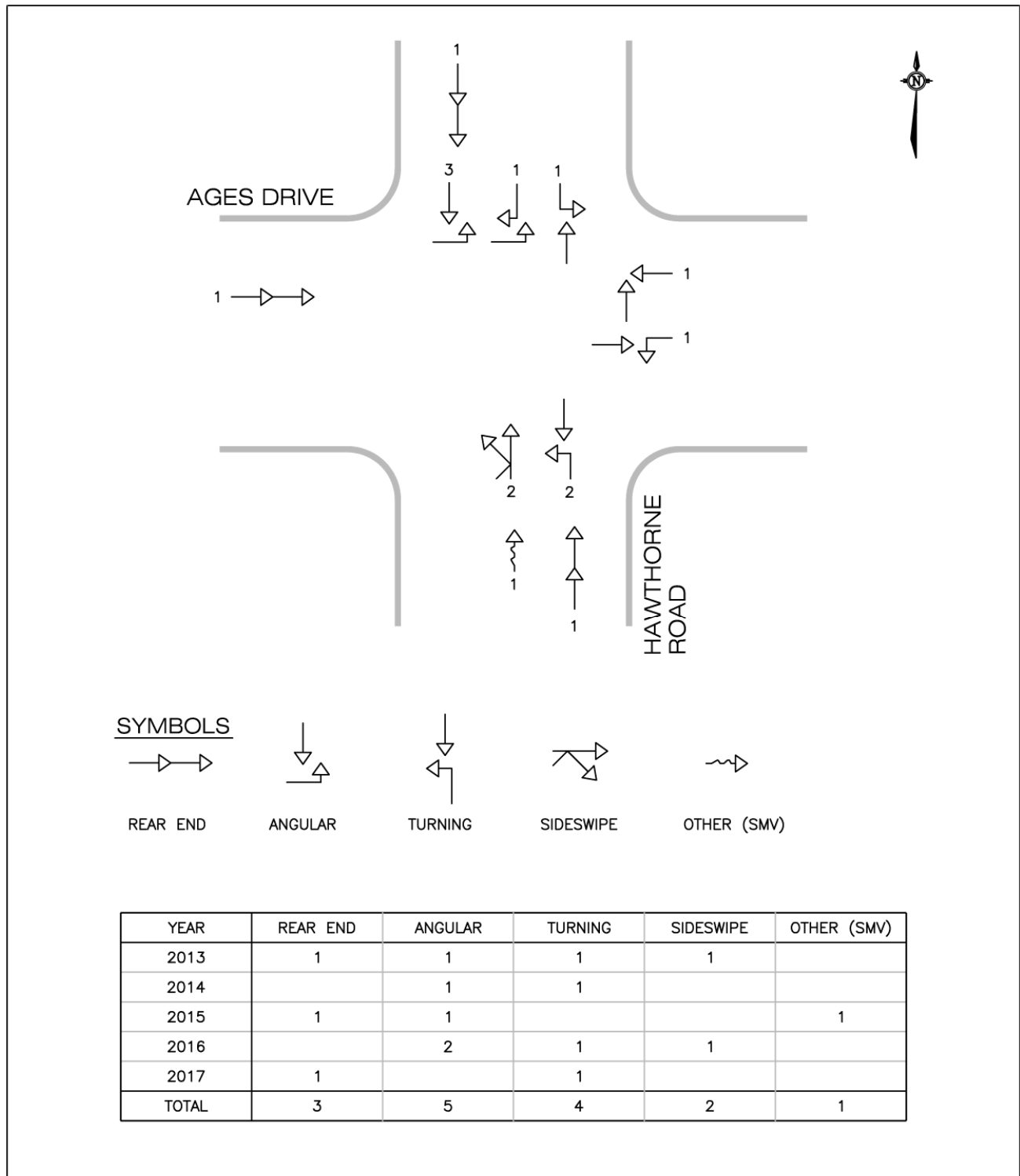
The site will provide three accesses onto Ages Drive. The first is the West Access for Building A and a second the East Access for Building B. Both accesses are 7.0 m in width and are intended as access to the parking lots for employees and patrons of the building tenants. The two accesses have a separation of approximately 215 m. There is a third access midpoint between the Building A and B accesses which is a truck access to a shared loading area for both Buildings A and B. The truck access is 9.0 m in width and is 111 m from the West Access and 104 m from the East Access.

There is an existing driveway on the south side of Ages Drive across from Building A. The driveway is to the parking lot and truck loading area for 900 Ages Drive and will be located approximately 40 m east of the site's West Access.

The clear throat length at the West Access is 8 m and at the East Access the clear throat length is 14 m. The accesses meet the suggested minimum clear throat lengths as documented in the Transportation Association of Canada (TAC) manual, *Geometric Design Guide for Canadian Roads*. Table 3.2.9.3 of the guidelines suggest a minimum clear throat length of 8 m along a collector road for a light industrial land use with a gross floor area of <10,000 m².

The site is located along the north side of Ages Drive with a horizontal curve in the road just west of the site and a less acute curve in the road east of the site. The sight line was examined for the West Access and truck access. The East Access is located at the horizontal curve in the road and would have a good sight line. The sight line at the accesses was examined utilizing the TAC guidelines, *Geometric Design Guide for*

FIGURE 4.1
FIVE YEAR COLLISION DIAGRAM – Ages/Hawthorne Intersection



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Canadian Roads. The sight line examined is the “Decision Sight Distance” shown in Figure 2.3.3.6 of the guidelines. The minimum stopping sight distance is the minimum distance required to allow drivers to bring their vehicles to a stop. The speed limit along Ages Drive is unposted at 50 km./h. which was assumed to be the design speed due to the horizontal alignment of the roadway. The minimum stopping sight distance was determined to be 60 m for a design speed of 50 km./h. The sight line looking west at the West Access was measured to be 61 m, and 245 m east of the access. The sight line at the truck access was 152 m looking to the west and 148 m looking to the east. The sight access for the light industrial development met the TAC guidelines for the minimum stopping sight distance.

Element 4.4.2 – Intersection Control

The site generated trips to/from the light industrial development would travel along Ages Drive from the intersection of Ages Drive and Hawthorne Road. The Ages/Hawthorne intersection is currently controlled by traffic signals. The traffic signal timing plan was obtained from the City of Ottawa and is provided as Exhibit 4.1 in the Appendix.

Element 4.4.3 – Intersection Design

The analysis of the intersection of Ages Drive and Hawthorne Road was completed for all modes using the *Multi-Modal Level of Service (MMLOS) Guidelines*. Each mode will be addressed in the following sections:

Vehicle Level of Service (LoS) – Intersection Capacity Analysis

The analysis of the Ages/Hawthorne intersection will use the *Highway Capacity Software, Version 7.6*, which utilizes the intersection capacity analysis procedure as documented in the *Highway Capacity Manual 2010 and 6th Edition*.

For a signalized intersection, the operation or level of service of an intersection is determined from the volume to capacity ratio (v/c) for each lane movement as documented by the City of Ottawa in the *Transportation Impact Assessment Guidelines (2017)*. The following relates the level of service with the volume to capacity ratio at each lane movement.

LEVEL OF SERVICE	VOLUME TO CAPACITY RATIO
Level of Service A	0 to 0.60
Level of Service B	0.61 to 0.70
Level of Service C	0.71 to 0.80
Level of Service D	0.81 to 0.90
Level of Service E	0.91 to 1.00
Level of Service F	> 1.00

The operational analysis of the Ages/Hawthorne intersection has used the most current traffic counts shown in Figure 2.3 of the Scoping Document and traffic signal timing plan (Exhibit 4.1) which were both obtained from the City of Ottawa.

The number of new site generated auto-trips was determined utilizing the Peak Hour Future Development Generated Person-Trips (Table 3.5) which were discussed in Element 3.1.1. One auto-trip was assumed to be the same as one auto driver trip from Table 3.5. The distribution of trips entering the site and trips exiting the site was determined from the distribution for all land uses as shown in Table 3.3. The number of auto-trips generated by the total development is presented in Table 4.1, and shown in Figure 3.1 of the Scoping Document.

TABLE 4.1
PEAK AM AND PM HOUR SITE GENERATED AUTO-TRIPS

LAND USE	PEAK AM HOUR			PEAK PM HOUR		
	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT
Industrial Development	38	33 (88%)	5 (12%)	31	4 (13%)	27 (87%)

The total traffic is the sum of the peak hour site generated trips (Figure 3.1), and the peak hour background traffic (Figure 3.2 for the year 2019 and Figure 3.3 for the year 2024). Figure 4.2 presents the total 2019 peak hour vehicular traffic and Figure 4.3 the total 2024 peak hour vehicular traffic.

Ages Drive and Hawthorne Road Intersection

The intersection of Ages Drive and Hawthorne Road is controlled by traffic signals. Hawthorne Road forms the northbound and southbound approaches, Ages Drive the eastbound approach, and a private access to an industrial development the westbound approach.

An operational analysis was completed utilizing the 2017 traffic counts and the expected 2019 and 2024 traffic volumes following the completion of the development. The analysis was conducted for the weekday peak AM and PM hours of the traffic along the surrounding roads.

The operational analysis using the existing 2017 traffic counts determined that all approaches to the intersection functioned at an acceptable Level of Service (LoS) "A" during the peak AM hour. During the peak PM hour all approaches functioned at a LoS "A" with the exception of the eastbound Ages Drive left turn movement which functioned at a LoS "B". The operation of the intersection approaches functioned at the same level of service for the expected 2019 and 2024 total traffic. Table 4.2 summarizes the peak hour operation of the intersection with the analysis sheet provided in the Appendix as Exhibit 4.2 to 4.7.

FIGURE 4.2
2019 WEEKDAY PEAK AM AND PM HOUR TOTAL TRAFFIC

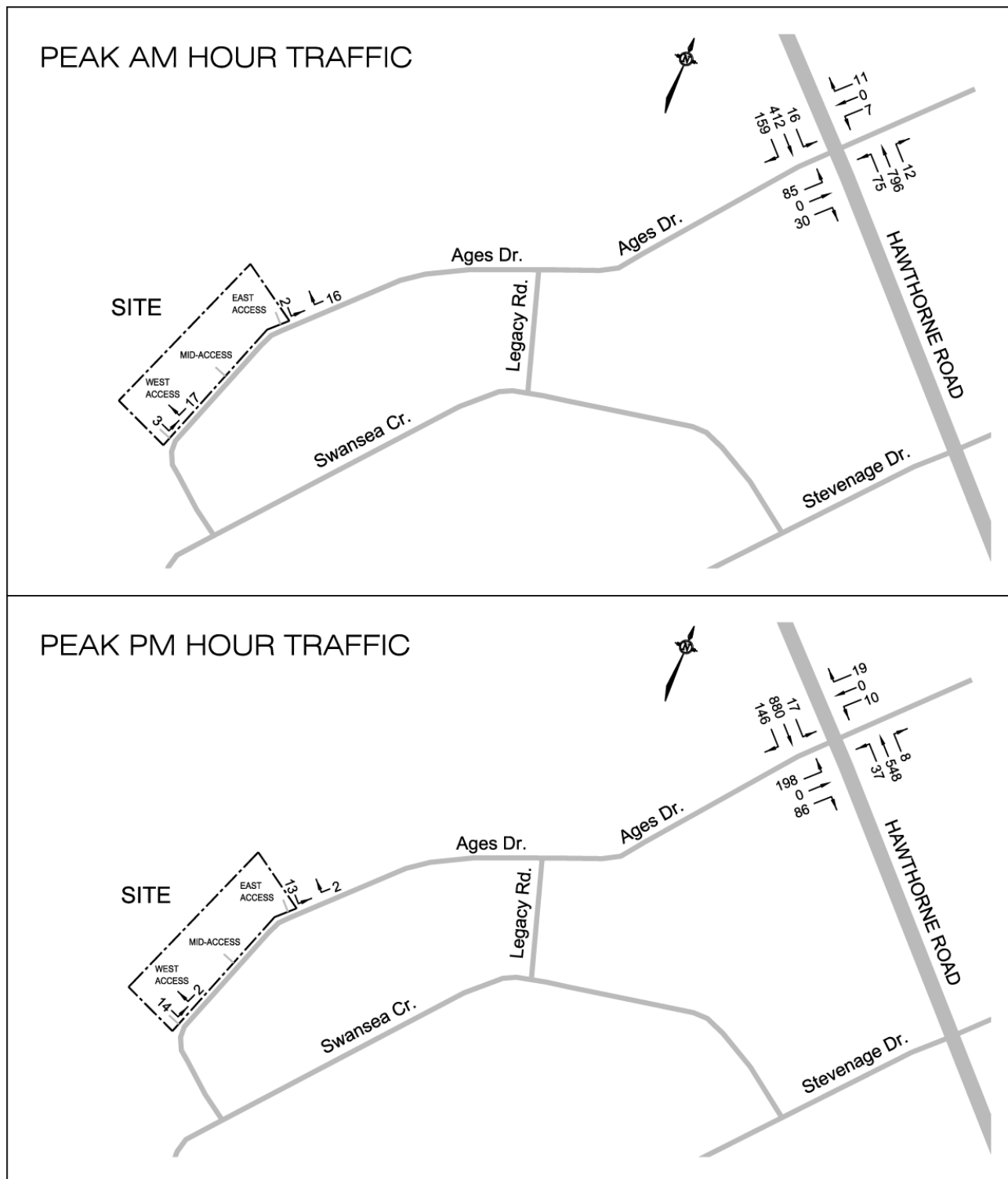


FIGURE 4.3
2024 WEEKDAY PEAK AM AND PM HOUR TOTAL TRAFFIC

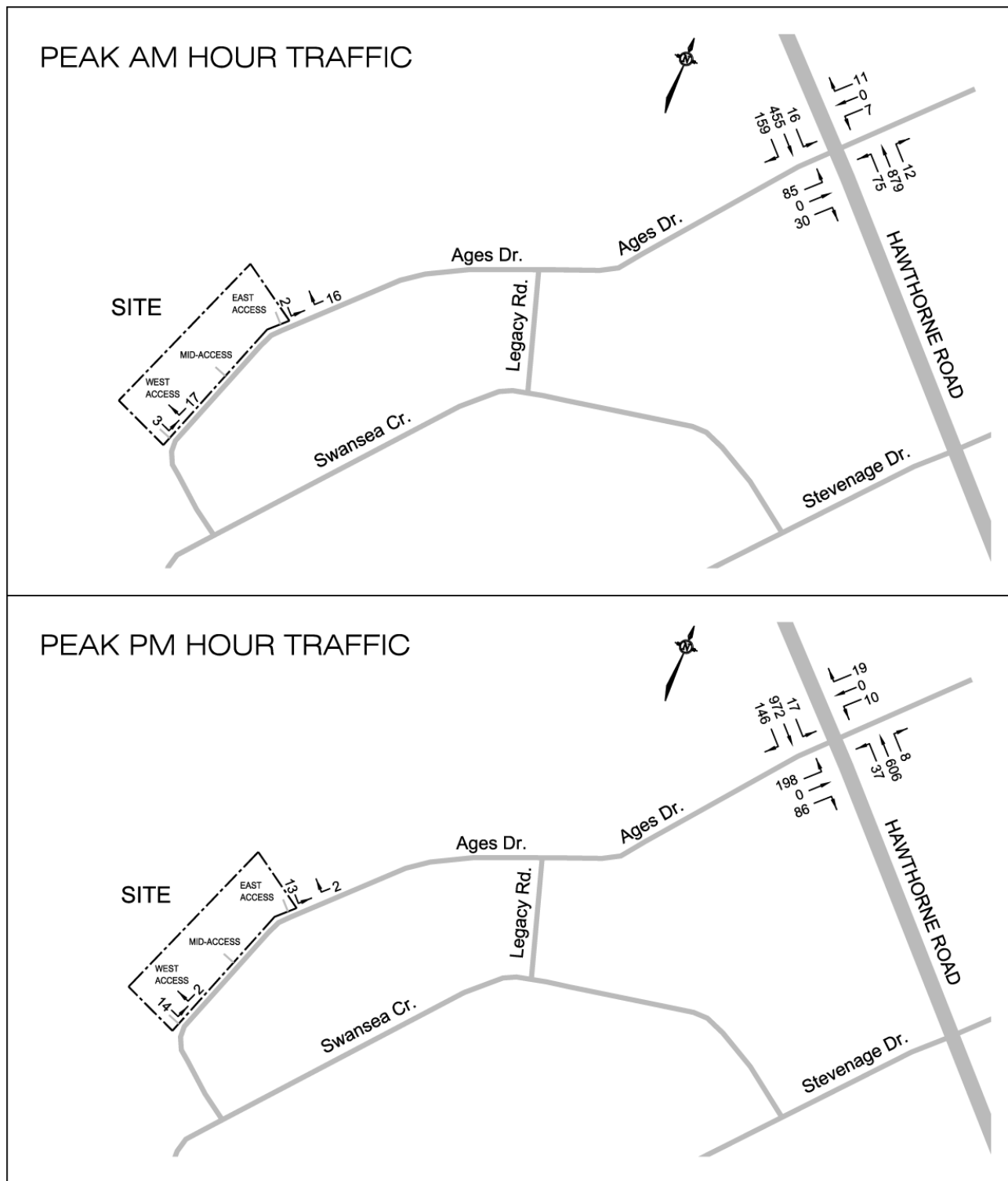


TABLE 4.2
AGES/HAWTHORNE INTERSECTION – LoS & v/c Ratio

Intersection Approach	WEEKDAY PEAK AM HOUR YEAR 2017 2019 (2024)		WEEKDAY PEAK PM HOUR YEAR 2017 2019 (2024)	
	LoS	v/c Ratio	LoS	v/c Ratio
EB Left – Ages Dr.	A A (A)	0.455 0.460 (0.460)	B B (B)	0.635 0.649 (0.649)
EB Through – Ages Dr.	A A (A)	0.000 0.000 (0.000)	A A (A)	0.000 0.000 (0.000)
WB Left – Private Rd.	A A (A)	0.038 0.037 (0.037)	A A (A)	0.031 0.030 (0.030)
WB Through/Right – Private	A A (A)	0.068 0.066 (0.066)	A A (A)	0.072 0.069 (0.069)
NB Left – Hawthorne Rd.	A A (A)	0.083 0.115 (0.121)	A A (A)	0.098 0.110 (0.122)
NB Through – Hawthorne Rd.	A A (A)	0.363 0.379 (0.418)	A A (A)	0.262 0.276 (0.305)
NB Right – Hawthorne Rd.	A A (A)	0.011 0.011 (0.011)	A A (A)	0.008 0.008 (0.008)
SB Left – Hawthorne Rd.	A A (A)	0.041 0.042 (0.046)	A A (A)	0.034 0.035 (0.037)
SB Through – Hawthorne Rd.	A A (A)	0.188 0.196 (0.216)	A A (A)	0.414 0.436 (0.481)

Examination of the left turn lane storage for the expected 2024 traffic determined that the northbound Hawthorne Road left turn lane onto Ages Drive required 20 m of vehicular storage with 70 m provided. The eastbound Ages Drive left turn lane onto Hawthorne Road requires 55 m of vehicular storage with 45 m provided. Any further extension of the Ages Drive left turn lane would place the Ages Drive private access to 3150 Hawthorne Road within the influence of the left turn lane. No modifications are recommended to the Ages/Hawthorne intersection due to the development of the site.

The collision data shown in Figure 4.1 and Exhibit 2.2 determined that there was no pattern of collision type over the five year time period and that the intersection experienced less than five collisions per year. There would be no requirement for roadway modifications to improve the safety of the intersection.

PEDESTRIAN LEVEL OF SERVICE (PLOS)

The pedestrian level of service was determined utilizing the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. There are no sidewalks along Ages Drive and the site is in an industrial/commercial area with no residential areas in close proximity. Table 4.3 presents the level of service for street segments and intersections within the study area, with the analysis for the 2024 traffic provided in the Appendix.

TABLE 4.3
PEDESTRIAN LEVEL OF SERVICE (PLOS) – Street Segments & Intersections

Street	Segment	Level of Service	Analysis
Ages Drive	Ages Drive to the Site	C	Exhibit 4.8
Intersection		Level of Service	Analysis
Ages Drive and Hawthorne Road		F	Exhibit 4.9

BICYCLE LEVEL OF SERVICE (BLOS)

The bicycle level of service (BLOS) was determined utilizing the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. Ages Drive is classified as an industrial/commercial local road. Ages Drive does not contain cycling lanes along the road. Table 4.4 presents the level of service for the road segments and intersections with the analysis for the 2024 traffic provided in the Appendix.

TABLE 4.4
BICYCLE LEVEL OF SERVICE (BLOS) – Street Segments & Intersections

Street	Segment	Level of Service	Analysis
Ages Drive	Ages Drive to the Site	B	Exhibit 4.10
Intersection		Level of Service	Analysis
Ages Drive and Hawthorne Road		F	Exhibit 4.11

TRANSIT LEVEL OF SERVICE (TLOS)

The industrial development is not located within the Transit Oriented Development area. The site is serviced by Route 47 which provides peak period service past the site to the St. Laurent Transit Station. On-street parking along both roads is permitted with no dedicated transit lanes.

Table 4.5 presents the level of service along the Ages Drive street segment which was determined from Exhibit 15 of the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. The transit level of service at the signalized intersection along the route was determined from the intersection capacity analysis for the approach delay at the intersection using the 2024 traffic.

TABLE 4.5
TRANSIT LEVEL OF SERVICE (TLOS) – Street Segments & Intersections

Street	Segment	Level of Service	Analysis
Ages Drive	Ages Drive to the Site	D	Exhibit 4.12
Intersection		Level of Service	Analysis
Ages Drive and Hawthorne Road		E	Exhibit 4.13

TRUCK LEVEL OF SERVICE (TkLOS) - Street Segments & Intersections

The truck level of service (TkLOS) was determined utilizing the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*. The truck LoS was determined for Ages Drive and the Ages/Hawthorne intersection. Table 4.6 presents the truck level of service for the Ages Drive street segment and Ages/Hawthorne intersection, with the analysis for the 2024 traffic provided as Exhibits 4.14 and 4.15.

TABLE 4.6
TRUCK LEVEL OF SERVICE (TkLOS) – Street Segments & Intersections

Street	Segment	Level of Service	Analysis
Ages Drive	Ages Drive to the Site	B	Exhibit 4.14
Intersection		Level of Service	Analysis
Ages Drive and Hawthorne Road		A	Exhibit 4.15

MODULE 4.5 – Transportation Demand Management

Exempt as determined in the Scoping module.

MODULE 4.6 – Neighbourhood Traffic Management

Element 4.6.1 – Adjacent Neighbourhoods

Exempt as determined in the Scoping module.

MODULE 4.7 - Transit

Element 4.7.1 – Transit Route Capacity

OC Transpo Route 47 is a local transit route which provides peak period service to/from the St. Laurent Transit Station. The future transit passenger demands can be accommodated at the St. Laurent Transit Station and the future LRT station which is expected to be completed and operational in the spring of 2019.

MODULE 4.8 – Review of Network Concept

Exempt as determined in the Scoping module.

MODULE 4.9 – Intersection Design

Element 4.9.1 – Intersection Control

The intersection of Ages Drive and Hawthorne Road is currently controlled by traffic signals. There would be no further intersection control modifications required.

Element 4.9.2 – Intersection Design

The operation of the intersection of Ages Drive and Hawthorne Road was analyzed to determine the operation and possible intersection modification which would be triggered by the proposed industrial development. The analysis determined that the proposed development would have a minor impact on the operation of the intersection and no modifications to the intersection are recommended.

SUMMARY

A summary of the level of service for the various modes of transportation are summarized in Table 4.7 with the results detailed in the analysis sheets provided as Exhibits in the Appendix. The Ages Drive street segment met the MMLOS targets for transit, and exceeded the targets for the passenger and cyclist modes of travel. The targets are shown in Exhibit 22 of the *Multi-Modal Level of Service (MMLOS) Guidelines*. The Ages/Hawthorne intersection exceeded the MMLOS target for the auto mode, but did not meet the targets for the pedestrian, cyclist or transit travel modes. The targets were not met due to the volume of traffic, number of lanes, and lane configuration of the intersection. The development of the Ages Drive Industrial Buildings resulted in a minor impact on the Ages/Hawthorne intersection and was not responsible for the pedestrian, cyclist or transit travel modes not meeting the targets.

TABLE 4.7
MULTI-MODAL (MMLOS) SUMMARY TABLE

SEGMENTS	Level of Service (LoS) – 2024				
	Pedestrian	Cyclist	Transit	Auto	Truck
Ages Drive	C	B	D	-	B
INTERSECTIONS	Level of Service (LoS) – 2024				
	Pedestrian	Cyclist	Transit	Auto	Truck
Ages/Hawthorne	F	F	E	A	A

Prepared by:

David J. Halpenny

David J. Halpenny, M. Eng., P. Eng.



APPENDIX

SCREENING FORM

TRAFFIC COUNTS

COLLISION REPORTS

TRAFFIC SIGNAL TIMING PLAN

TRAFFIC AND MMLOS ANALYSIS SHEETS

EXHIBIT 1.1 SCREENING FORM

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Municipal Address	899, 901, 903 Ages Drive, Ottawa
Description of Location	
Land Use Classification	"IG3" Zoning – General Industrial Zone
Development Size (units)	
Development Size (m ²)	Two building with a gross floor area of 8,600 m ²
Number of Accesses and Locations	Three accesses. One at the east property limit, one in the middle, and one at the west property limit.
Phase of Development	Single phase
Buildout Year	2019

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

2. Trip Generation Trigger

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

Land Use Type	Minimum Development Size
Industrial	5,000 m ²

	Yes	No
$4,390 \text{ m}^2 \text{ (Building A)} + 4,210 \text{ m}^2 \text{ (Building B)} = 8,600 \text{ m}^2$ $8,600 \text{ m}^2 > 5,000 \text{ m}^2$	X	

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

If the proposed development size is greater than the sizes identified above, the Trip Generation Trigger is satisfied.

3. Location Triggers

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

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

If any of the above questions were answered with 'Yes,' the Location Trigger is satisfied.

4. Safety Triggers

	Yes	No
Are posted speed limits on a boundary street are 80 km/hr or greater?		X
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?		X
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)?		X
Is the proposed driveway within auxiliary lanes of an intersection?		X
Does the proposed driveway make use of an existing median break that serves an existing site?		X
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?		X
Does the development include a drive-thru facility?		X

If any of the above questions were answered with 'Yes,' the Safety Trigger is satisfied.

5. Summary

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

If none of the triggers are satisfied, the TIA Study is complete. If one or more of the triggers is satisfied, the TIA Study must continue into the next stage (Screening and Scoping).

EXHIBIT 2.1

AGES DRIVE AND HAWTHORNE ROAD TRAFFIC COUNTS – January 25, 2017



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

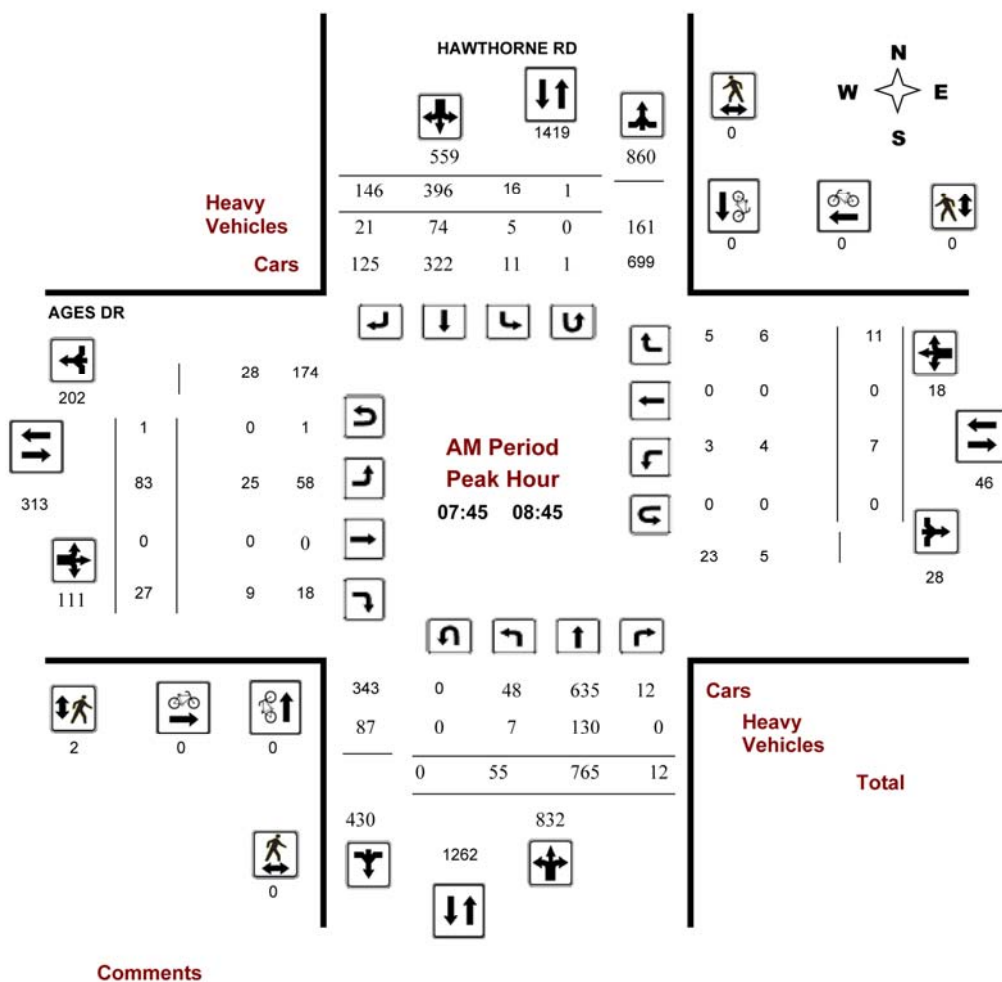
AGES DR @ HAWTHORNE RD

Survey Date: Wednesday, January 25, 2017

WO No: 36659

Start Time: 07:00

Device: Miovision





Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

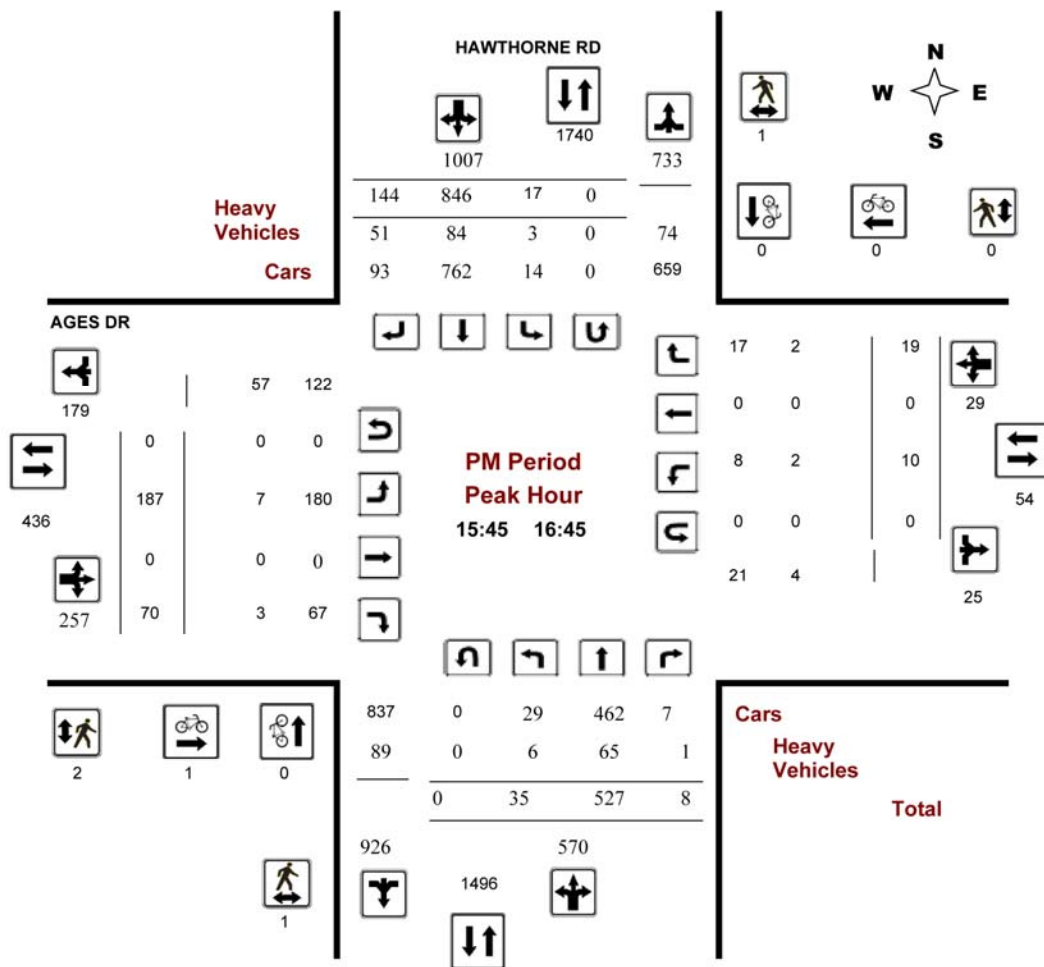
AGES DR @ HAWTHORNE RD

Survey Date: Wednesday, January 25, 2017

Start Time: 07:00

WO No: 36659

Device: Miovision





Transportation Services - Traffic Services

Work Order
36659

Turning Movement Count - Full Study Summary Report

AGES DR @ HAWTHORNE RD

Survey Date: Wednesday, January 25, 2017

Total Observed U-Turns

AADT Factor

Northbound: 1 Southbound: 1
Eastbound: 1 Westbound: 1

1.00

Full Study

HAWTHORNE RD										AGES DR										STR TOT	Grand Total
Period	Northbound				Southbound				STR TOT	Eastbound				Westbound							
	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT		LT	ST	RT	EB TOT	LT	ST	RT	WB TOT				
07:00 08:00	42	693	18	753	19	392	177	588	1341	106	0	15	121	2	2	15	19	140	1481		
08:00 09:00	50	747	8	805	14	412	118	544	1349	97	1	33	131	5	1	12	18	149	1498		
09:00 10:00	47	638	12	697	13	403	176	592	1289	100	0	42	142	7	1	13	21	163	1452		
11:30 12:30	36	524	10	570	16	510	211	737	1307	195	2	70	267	8	1	15	24	291	1598		
12:30 13:30	56	502	7	565	23	496	187	706	1271	172	1	69	242	7	0	20	27	269	1540		
15:00 16:00	40	543	6	589	12	734	161	907	1496	170	0	66	236	5	0	19	24	260	1756		
16:00 17:00	34	524	6	564	13	826	127	966	1530	186	2	71	259	12	0	21	33	292	1822		
17:00 18:00	39	461	3	503	2	660	93	755	1258	130	0	70	200	10	0	14	24	224	1482		
Sub Total	344	4632	70	5046	112	4433	1250	5795	10841	1156	6	436	1598	56	5	129	190	1788	12629		
U Turns				1				1	2				1				1	2	4		
Total	344	4632	70	5047	112	4433	1250	5796	10843	1156	6	436	1599	56	5	129	191	1790	12633		
EQ 12Hr	478	6438	97	7015	156	6162	1737	8056	15071	1607	8	606	2223	78	7	179	265	2488	17559		
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.														1.39							
AVG 12Hr	478	6438	97	7015	156	6162	1737	8056	15071	1607	8	606	2223	78	7	179	265	2488	17559		
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.														1.00							
AVG 24Hr	626	8434	127	9190	204	8072	2276	10554	19744	2105	11	794	2912	102	9	235	348	3260	23004		
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.														1.31							

Comments:

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

EXHIBIT 2.2

COLLISION REPORTS – January 1, 2013 to December 31, 2017



City Operations - Transportation Services Collision Details Report - Public Version

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

Location: AGES DR @ HAWTHORNE RD									
Traffic Control: Traffic signal									
Total Collisions: 15									
Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuvre	Vehicle type	First Event	No. Ped
2013-Mar-19, Tue, 09:15	Snow	Rear end	P.D. only	Loose snow	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					South	Stopped	Passenger van	Other motor vehicle	
2013-Jun-30, Sun, 14:03	Clear	Angle	P.D. only	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Motorcycle	Other motor vehicle	
2013-Jun-19, Wed, 15:35	Clear	Turning movement	Non-fatal injury	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Pick-up truck	Other motor vehicle	
2013-Oct-02, Wed, 08:10	Clear	Sideswipe	P.D. only	Dry	North	Changing lanes	Truck - closed	Other motor vehicle	
					North	Going ahead	Delivery van	Other motor vehicle	
2014-Jul-09, Wed, 10:49	Clear	Turning movement	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	
					North	Going ahead	Pick-up truck	Other motor vehicle	
2014-Aug-05, Tue, 19:46	Clear	Angle	Non-fatal injury	Dry	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2015-Feb-12, Thu, 06:20	Snow	Angle	P.D. only	Loose snow	South	Turning right	Automobile, station wagon	Skidding/sliding	
					East	Turning left	Truck - closed	Other motor vehicle	
2015-Jun-01, Mon, 11:56	Clear	SMV other	P.D. only	Dry	North	Turning left	Truck - closed	Pole (utility, power)	
2015-Sep-25, Fri, 16:43	Clear	Rear end	P.D. only	Dry	East	Turning right	Pick-up truck	Other motor vehicle	
					East	Turning right	Delivery van	Other motor vehicle	
2016-Feb-25, Thu, 18:15	Snow	Angle	P.D. only	Ice	South	Going ahead	Automobile, station wagon	Other motor vehicle	
					East	Turning left	Automobile, station wagon	Other motor vehicle	
2016-Feb-11, Thu, 13:01	Clear	Sideswipe	P.D. only	Wet	North	Changing lanes	Pick-up truck	Other motor vehicle	
					North	Stopped	Automobile, station wagon	Other motor vehicle	
					North	Unknown	Unknown	Other	
2016-Jul-27, Wed, 11:31	Clear	Turning movement	P.D. only	Dry	North	Turning left	Automobile, station wagon	Other motor vehicle	
					South	Going ahead	Passenger van	Other motor vehicle	

2016-Dec-12, Mon,18:49	Snow	Angle	P.D. only	Wet	West	Going ahead	Automobile, station wagon	Other motor vehicle
					North	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Aug-08, Tue,14:30	Clear	Turning movement	P.D. only	Dry	West	Turning left	Delivery van	Other motor vehicle
					East	Going ahead	Automobile, station wagon	Other motor vehicle
2017-Dec-20, Wed,16:05	Clear	Rear end	P.D. only	Dry	North	Turning left	Pick-up truck	Other motor vehicle
					North	Turning left	Pick-up truck	Other motor vehicle

Location: AGES DR @ LEGACY RD

Traffic Control: Stop sign

Total Collisions: 1

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2014-Jul-25, Fri,13:03	Clear	Turning movement	P.D. only	Dry	West	Turning left	Delivery van	Other motor vehicle	
					East	Going ahead	Automobile, station wagon	Other motor vehicle	

Location: AGES DR btwn LEGACY RD & HAWTHORNE RD

Traffic Control: No control

Total Collisions: 4

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2013-Feb-24, Sun,12:00	Clear	Other	P.D. only	Wet	West	Reversing	Truck and trailer	Other motor vehicle	
					East	Stopped	Automobile, station wagon	Other motor vehicle	
2013-Sep-03, Tue,23:34	Clear	SMV other	Non-fatal injury	Dry	East	Going ahead	Automobile, station wagon	Curb	
2017-Apr-06, Thu,14:27	Rain	Angle	P.D. only	Wet	South	Turning left	Pick-up truck	Other motor vehicle	
					West	Going ahead	Pick-up truck	Other motor vehicle	
2017-Aug-30, Wed,14:24	Clear	Angle	P.D. only	Dry	South	Turning left	Automobile, station wagon	Other motor vehicle	
					West	Going ahead	Truck - closed	Other motor vehicle	

Location: AGES DR btwn SWANSEA CRES & LEGACY RD

Traffic Control: No control

Total Collisions: 3

Date/Day/Time	Environment	Impact Type	Classification	Surface Cond'n	Veh. Dir	Vehicle Manoeuver	Vehicle type	First Event	No. Ped
2017-May-30, Tue,13:43	Rain	Angle	P.D. only	Wet	South	Turning left	Pick-up truck	Other motor vehicle	
					West	Going ahead	Automobile, station wagon	Other motor vehicle	
2017-Jul-06, Thu,10:10	Clear	SMV other	Non-fatal injury	Dry	West	Going ahead	Motorcycle	Other	
2017-Jul-06, Thu,10:23	Clear	Sideswipe	P.D. only	Dry	West	Pulling away from shoulder or curb	Passenger van	Other motor vehicle	
					West	Slowing or stopping	Other emergency vehicle	Other motor vehicle	

EXHIBIT 4.1

TRAFFIC SIGNAL TIMING PLAN – Ages Drive and Hawthorne Road Intersection

Traffic Signal Timing

City of Ottawa, Transportation Services Department

Traffic Signal Operations Unit

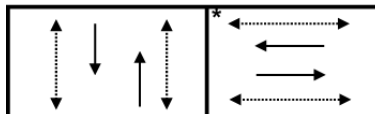
Intersection:	Main: Hawthorne	Side: Ages
Controller:	MS-3200	TSD: 6447
Author:	Yassine Bennani	Date: 27-Sep-2018

Existing Timing Plans†

	Plan					Ped Minimum Time		
	AM Peak 1	Off Peak 2	PM Peak 3	Night 4	Weekend 5	Walk	DW	A+R
Cycle	90	85	95	65	70			
Offset	70	78	48	45	34			
NB Thru	60	55	65	36	40	7	20	4.2+1.7
SB Thru	60	55	65	36	40	7	20	4.2+1.7
EB Thru	30	30	30	29	30	7	16	3.3+3.0
WB Thru	30	30	30	29	30	7	16	3.3+3.0

Phasing Sequence‡

Plan:



Schedule

Weekday		Saturday		Sunday	
Time	Plan	Time	Plan	Time	Plan
0:15	4	0:15	4	0:15	4
6:30	1	6:30	2	6:30	2
9:30	2	11:00	5	21:00	4
15:00	3	19:30	2		
18:30	2	22:00	4		
21:30	4				

Notes

†: Time for each direction includes amber and all red intervals
‡: Start of first phase should be used as reference point for offset
Asterisk (*) Indicates actuated phase
(fp): Fully Protected Left Turn
←-----→ Pedestrian signal

Cost is \$56.50 (\$50 + HST)

EXHIBIT 4.2

EXISTING 2017 PEAK AM HOUR TRAFFIC ANALYSIS – Ages/Hawthorne Intersection

HCS7 Signalized Intersection Results Summary																			
General Information								Intersection Information											
Agency								Duration, h		0.25									
Analyst				Analysis Date		10/29/2018		Area Type		Other									
Jurisdiction		City of Ottawa		Time Period		Peak AM Hour		PHF		0.92									
Urban Street		Ages Drive		Analysis Year		2017		Analysis Period		1> 7:00									
Intersection		Ages/Hawthorne		File Name		2017_ex_am.xus													
Project Description		899-903 Ages Drive Industrial																	
Demand Information				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h				83	0		7	0	11	55	765	12	16	396					
Signal Information																			
Cycle, s	90.0	Reference Phase	2	Green	68.4	9.4	0.0	0.0	0.0	0.0									
Offset, s	0	Reference Point	End	Yellow	4.2	3.3	0.0	0.0	0.0	0.0									
Uncoordinated	No	Simult. Gap E/W	On	Red	1.7	3.0	0.0	0.0	0.0	0.0									
Force Mode	Fixed	Simult. Gap N/S	On																
Timer Results				EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase						4				8				2				6	
Case Number						6.0				6.0				5.0				6.0	
Phase Duration, s						15.7				15.7				74.3				74.3	
Change Period, (Y+R c), s						6.3				6.3				5.9				5.9	
Max Allow Headway (MAH), s						3.7				3.7				0.0				0.0	
Queue Clearance Time (g s), s						9.9				2.6									
Green Extension Time (g e), s						0.2				0.2				0.0				0.0	
Phase Call Probability						0.94				0.94									
Max Out Probability						0.00				0.00									
Movement Group Results				EB			WB			NB			SB						
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement				7	4		3	8	18	5	2	12	1	6					
Adjusted Flow Rate (v), veh/h				90	0		8	12		60	832	13	17	430					
Adjusted Saturation Flow Rate (s), veh/h/ln				1091	1800		1046	1525		874	1486	1525	508	1486					
Queue Service Time (g s), s				7.2	0.0		0.6	0.6		1.8	8.0	0.2	1.0	3.5					
Cycle Queue Clearance Time (g c), s				7.9	0.0		0.6	0.6		5.2	8.0	0.2	9.0	3.5					
Green Ratio (g/C)				0.12	0.12		0.12	0.12		0.77	0.77	0.77	0.77	0.77					
Capacity (c), veh/h				198	208		201	176		720	2293	1176	427	2293					
Volume-to-Capacity Ratio (X)				0.455	0.000		0.038	0.068		0.083	0.363	0.011	0.041	0.188					
Back of Queue (Q), ft/ln (50 th percentile)				58.1	0		5	5.7		6.7	39.5	0.8	3.1	16.9					
Back of Queue (Q), veh/ln (50 th percentile)				1.9	0.0		0.1	0.2		0.2	1.4	0.0	0.1	0.6					
Queue Storage Ratio (RQ) (50 th percentile)				0.45	0.00		0.11	0.13		0.03	0.11	0.01	0.01	0.05					
Uniform Delay (d 1), s/veh				39.0	0.0		35.5	35.5		3.5	3.3	2.4	4.7	2.8					
Incremental Delay (d 2), s/veh				0.6	0.0		0.0	0.1		0.2	0.4	0.0	0.2	0.2					
Initial Queue Delay (d 3), s/veh				0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0					
Control Delay (d), s/veh				39.6	0.0		35.5	35.5		3.7	3.7	2.4	4.9	2.9					
Level of Service (LOS)				D			D	D		A	A	A	A	A					
Approach Delay, s/veh / LOS				39.6		D	35.5		D	3.7		A	3.0		A				
Intersection Delay, s/veh / LOS				6.1						A									
Multimodal Results				EB			WB			NB			SB						
Pedestrian LOS Score / LOS				2.45		B	2.30		B	1.84		B	1.84		B				
Bicycle LOS Score / LOS				0.64		A	0.52		A	1.23		A	0.86		A				

EXHIBIT 4.3

EXISTING 2017 PEAK PM HOUR TRAFFIC ANALYSIS – Ages/Hawthorne Intersection

HCS7 Signalized Intersection Results Summary															
General Information								Intersection Information							
Agency								Duration, h		0.25					
Analyst				Analysis Date		10/29/2018		Area Type		Other					
Jurisdiction		City of Ottawa		Time Period		Peak PM Hour		PHF		0.92					
Urban Street		Ages Drive		Analysis Year		2017		Analysis Period		1> 7:00					
Intersection		Ages/Hawthorne		File Name		2017_ex_pm.xus									
Project Description		899-903 Ages Drive Industrial													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				187	0		10	0	19	35	527	8	17	846	
Signal Information															
Cycle, s	95.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green				65.8	17.0	0.0	0.0	0.0	0.0						
Yellow				4.2	3.3	0.0	0.0	0.0	0.0						
Red				1.7	3.0	0.0	0.0	0.0	0.0						
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					4		8		2		6				
Case Number					6.0		6.0		5.0		6.0				
Phase Duration, s					23.3		23.3		71.7		71.7				
Change Period, (Y+R _c), s					6.3		6.3		5.9		5.9				
Max Allow Headway (MAH), s					3.1		3.1		0.0		0.0				
Queue Clearance Time (g _s), s					16.7		3.1								
Green Extension Time (g _e), s					0.2		0.4		0.0		0.0				
Phase Call Probability					1.00		1.00								
Max Out Probability					0.02		0.00								
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7	4		3	8	18	5	2	12	1	6	
Adjusted Flow Rate (v), veh/h				203	0		11	21		38	573	9	18	920	
Adjusted Saturation Flow Rate (s), veh/h/ln				1367	1800		1445	1523		535	1553	1499	740	1580	
Queue Service Time (g _s), s				13.6	0.0		0.6	1.1		3.0	6.4	0.2	0.9	11.6	
Cycle Queue Clearance Time (g _c), s				14.7	0.0		0.6	1.1		14.7	6.4	0.2	7.3	11.6	
Green Ratio (g/C)				0.19	0.19		0.19	0.19		0.70	0.70	0.70	0.70	0.70	
Capacity (c), veh/h				320	341		350	289		387	2184	1054	546	2221	
Volume-to-Capacity Ratio (X)				0.635	0.000		0.031	0.072		0.098	0.262	0.008	0.034	0.414	
Back of Queue (Q), ft/ln (50 th percentile)				113.4	0		5.7	9.4		10.3	43.6	1.1	3.8	79.6	
Back of Queue (Q), veh/ln (50 th percentile)				4.4	0.0		0.2	0.4		0.4	1.6	0.0	0.1	2.9	
Queue Storage Ratio (RQ) (50 th percentile)				0.87	0.00		0.13	0.21		0.04	0.12	0.01	0.02	0.21	
Uniform Delay (d ₁), s/veh				37.6	0.0		31.4	31.6		9.0	5.1	4.2	6.5	5.9	
Incremental Delay (d ₂), s/veh				0.8	0.0		0.0	0.0		0.5	0.3	0.0	0.1	0.6	
Initial Queue Delay (d ₃), s/veh				0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh				38.4	0.0		31.4	31.7		9.5	5.4	4.2	6.6	6.5	
Level of Service (LOS)				D			C	C		A	A	A	A	A	
Approach Delay, s/veh / LOS				38.4		D	31.6		C	5.7		A	6.5		A
Intersection Delay, s/veh / LOS				10.3						B					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.45		B	2.30		B	1.86		B	1.86		B
Bicycle LOS Score / LOS				0.82		A	0.54		A	1.00		A	1.26		A

EXHIBIT 4.4

TOTAL 2019 PEAK AM HOUR TRAFFIC ANALYSIS – Ages/Hawthorne Intersection

HCS7 Signalized Intersection Results Summary															
General Information								Intersection Information							
Agency								Duration, h		0.25					
Analyst				Analysis Date		10/29/2018		Area Type		Other					
Jurisdiction		City of Ottawa		Time Period		Peak AM Hour		PHF		0.92					
Urban Street		Ages Drive		Analysis Year		2019		Analysis Period		1> 7:00					
Intersection		Ages/Hawthorne		File Name		2019_tot_am.xus									
Project Description		899-903 Ages Drive Industrial													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				85	0		7	0	11	75	796	12	16	412	
Signal Information															
Cycle, s	90.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
				Green	68.2	9.6	0.0	0.0	0.0	0.0					
				Yellow	4.2	3.3	0.0	0.0	0.0	0.0					
				Red	1.7	3.0	0.0	0.0	0.0	0.0					
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					4		8		2		6				
Case Number					6.0		6.0		5.0		6.0				
Phase Duration, s					15.9		15.9		74.1		74.1				
Change Period, (Y+R _c), s					6.3		6.3		5.9		5.9				
Max Allow Headway (MAH), s					3.7		3.7		0.0		0.0				
Queue Clearance Time (g _s), s					10.1		2.6								
Green Extension Time (g _e), s					0.2		0.2		0.0		0.0				
Phase Call Probability					0.94		0.94								
Max Out Probability					0.00		0.00								
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7	4		3	8	18	5	2	12	1	6	
Adjusted Flow Rate (v), veh/h				92	0		8	12		82	865	13	17	448	
Adjusted Saturation Flow Rate (s), veh/h/ln				1091	1800		1046	1525		860	1486	1525	492	1486	
Queue Service Time (g _s), s				7.4	0.0		0.6	0.6		2.6	8.5	0.2	1.1	3.7	
Cycle Queue Clearance Time (g _c), s				8.1	0.0		0.6	0.6		6.2	8.5	0.2	9.6	3.7	
Green Ratio (g/C)				0.12	0.12		0.12	0.12		0.77	0.77	0.77	0.77	0.77	
Capacity (c), veh/h				201	212		203	180		706	2285	1173	412	2285	
Volume-to-Capacity Ratio (X)				0.460	0.000		0.037	0.066		0.115	0.379	0.011	0.042	0.196	
Back of Queue (Q), ft/ln (50 th percentile)				59.5	0		5	5.6		9.9	42.9	0.9	3.3	18.5	
Back of Queue (Q), veh/ln (50 th percentile)				1.9	0.0		0.1	0.2		0.4	1.5	0.0	0.1	0.7	
Queue Storage Ratio (RQ) (50 th percentile)				0.46	0.00		0.11	0.13		0.04	0.11	0.01	0.01	0.05	
Uniform Delay (d ₁), s/veh				38.9	0.0		35.3	35.3		3.7	3.4	2.4	4.9	2.8	
Incremental Delay (d ₂), s/veh				0.6	0.0		0.0	0.1		0.3	0.5	0.0	0.2	0.2	
Initial Queue Delay (d ₃), s/veh				0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh				39.5	0.0		35.3	35.3		4.0	3.9	2.4	5.1	3.0	
Level of Service (LOS)				D			D	D		A	A	A	A	A	
Approach Delay, s/veh / LOS				39.5		D	35.3		D	3.9		A	3.1		A
Intersection Delay, s/veh / LOS				6.2						A					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.45		B	2.30		B	1.84		B	1.84		B
Bicycle LOS Score / LOS				0.64		A	0.52		A	1.28		A	0.87		A

EXHIBIT 4.5

TOTAL 2019 PEAK PM HOUR TRAFFIC ANALYSIS – Ages/Hawthorne Intersection

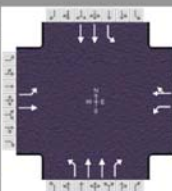
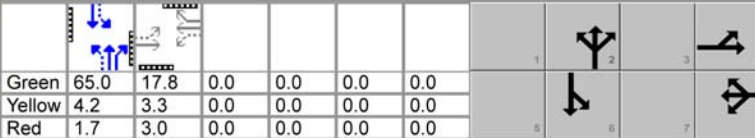
HCS7 Signalized Intersection Results Summary															
General Information						Intersection Information									
Agency						Duration, h		0.25							
Analyst				Analysis Date		10/29/2018		Area Type		Other					
Jurisdiction		City of Ottawa		Time Period		Peak PM Hour		PHF		0.92					
Urban Street		Ages Drive		Analysis Year		2019		Analysis Period		1> 7:00					
Intersection		Ages/Hawthorne		File Name		2019_tot_pm.xus									
Project Description		899-903 Ages Drive Industrial													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				198	0		10	0	19	37	548	8	17	880	
Signal Information															
Cycle, s	95.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green	65.0			0.0	0.0	0.0	0.0								
Yellow	4.2			0.0	0.0	0.0	0.0								
Red	1.7			0.0	0.0	0.0	0.0								
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					4		8		2		6				
Case Number					6.0		6.0		5.0		6.0				
Phase Duration, s					24.1		24.1		70.9		70.9				
Change Period, (Y+R c), s					6.3		6.3		5.9		5.9				
Max Allow Headway (MAH), s					3.1		3.1		0.0		0.0				
Queue Clearance Time (g s), s					17.5		3.0								
Green Extension Time (g e), s					0.2		0.4		0.0		0.0				
Phase Call Probability					1.00		1.00								
Max Out Probability					0.05		0.00								
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7	4		3	8	18	5	2	12	1	6	
Adjusted Flow Rate (v), veh/h				215	0		11	21		40	596	9	18	957	
Adjusted Saturation Flow Rate (s), veh/h/ln				1367	1800		1445	1523		517	1553	1499	724	1580	
Queue Service Time (g s), s				14.4	0.0		0.6	1.0		3.5	6.9	0.2	0.9	12.6	
Cycle Queue Clearance Time (g c), s				15.5	0.0		0.6	1.0		16.1	6.9	0.2	7.8	12.6	
Green Ratio (g/C)				0.20	0.20		0.20	0.20		0.70	0.70	0.70	0.70	0.70	
Capacity (c), veh/h				331	356		361	301		366	2159	1042	526	2196	
Volume-to-Capacity Ratio (X)				0.649	0.000		0.030	0.069		0.110	0.276	0.008	0.035	0.436	
Back of Queue (Q), ft/ln (50 th percentile)				120.5	0		5.6	9.3		11.7	47.7	1.1	4	88.1	
Back of Queue (Q), veh/ln (50 th percentile)				4.7	0.0		0.2	0.4		0.4	1.7	0.0	0.1	3.3	
Queue Storage Ratio (RQ) (50 th percentile)				0.93	0.00		0.13	0.21		0.05	0.13	0.01	0.02	0.23	
Uniform Delay (d 1), s/veh				37.3	0.0		30.8	31.0		9.9	5.5	4.4	7.0	6.3	
Incremental Delay (d 2), s/veh				1.1	0.0		0.0	0.0		0.6	0.3	0.0	0.1	0.6	
Initial Queue Delay (d 3), s/veh				0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh				38.4	0.0		30.8	31.0		10.5	5.8	4.5	7.1	7.0	
Level of Service (LOS)				D			C	C		B	A	A	A	A	
Approach Delay, s/veh / LOS				38.4	D		31.0	C		6.1	A		7.0	A	
Intersection Delay, s/veh / LOS				10.7						B					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.45	B		2.30	B		1.86	B		1.86	B	
Bicycle LOS Score / LOS				0.84	A		0.54	A		1.02	A		1.29	A	

EXHIBIT 4.6

TOTAL 2024 PEAK AM HOUR TRAFFIC ANALYSIS – Ages/Hawthorne Intersection

HCS7 Signalized Intersection Results Summary															
General Information								Intersection Information							
Agency								Duration, h		0.25					
Analyst				Analysis Date		10/29/2018		Area Type		Other					
Jurisdiction		City of Ottawa		Time Period		Peak AM Hour		PHF		0.92					
Urban Street		Ages Drive		Analysis Year		2024		Analysis Period		1> 7:00					
Intersection		Ages/Hawthorne		File Name		2024_tot_am.xus									
Project Description		899-903 Ages Drive Industrial													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				85	0		7	0	11	75	879	12	16	455	
Signal Information															
Cycle, s	90.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					4		8		2		6				
Case Number					6.0		6.0		5.0		6.0				
Phase Duration, s					15.9		15.9		74.1		74.1				
Change Period, (Y+R c), s					6.3		6.3		5.9		5.9				
Max Allow Headway (MAH), s					3.7		3.7		0.0		0.0				
Queue Clearance Time (g s), s					10.1		2.6								
Green Extension Time (g e), s					0.2		0.2		0.0		0.0				
Phase Call Probability					0.94		0.94								
Max Out Probability					0.00		0.00								
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7	4		3	8	18	5	2	12	1	6	
Adjusted Flow Rate (v), veh/h				92	0		8	12		82	955	13	17	495	
Adjusted Saturation Flow Rate (s), veh/h/ln				1091	1800		1046	1525		824	1486	1525	452	1486	
Queue Service Time (g s), s				7.4	0.0		0.6	0.6		2.7	9.9	0.2	1.2	4.2	
Cycle Queue Clearance Time (g c), s				8.1	0.0		0.6	0.6		6.9	9.9	0.2	11.0	4.2	
Green Ratio (g/C)				0.12	0.12		0.12	0.12		0.77	0.77	0.77	0.77	0.77	
Capacity (c), veh/h				201	212		203	180		675	2285	1173	379	2285	
Volume-to-Capacity Ratio (X)				0.460	0.000		0.037	0.066		0.121	0.418	0.011	0.046	0.216	
Back of Queue (Q), ft/ln (50 th percentile)				59.5	0		5	5.6		10.3	49.9	0.9	3.5	20.7	
Back of Queue (Q), veh/ln (50 th percentile)				1.9	0.0		0.1	0.2		0.4	1.8	0.0	0.1	0.7	
Queue Storage Ratio (RQ) (50 th percentile)				0.46	0.00		0.11	0.13		0.04	0.13	0.01	0.01	0.06	
Uniform Delay (d 1), s/veh				38.9	0.0		35.3	35.3		3.8	3.5	2.4	5.4	2.9	
Incremental Delay (d 2), s/veh				0.6	0.0		0.0	0.1		0.4	0.6	0.0	0.2	0.2	
Initial Queue Delay (d 3), s/veh				0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh				39.5	0.0		35.3	35.3		4.2	4.1	2.4	5.6	3.1	
Level of Service (LOS)				D			D	D		A	A	A	A	A	
Approach Delay, s/veh / LOS				39.5		D	35.3		D	4.1		A	3.2		A
Intersection Delay, s/veh / LOS				6.1					A						
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.45		B	2.30		B	1.84		B	1.84		B
Bicycle LOS Score / LOS				0.64		A	0.52		A	1.35		A	0.91		A

EXHIBIT 4.7

TOTAL 2024 PEAK PM HOUR TRAFFIC ANALYSIS – Ages/Hawthorne Intersection

HCS7 Signalized Intersection Results Summary															
General Information								Intersection Information							
Agency								Duration, h		0.25					
Analyst				Analysis Date		10/29/2018		Area Type		Other					
Jurisdiction		City of Ottawa		Time Period		Peak PM Hour		PHF		0.92					
Urban Street		Ages Drive		Analysis Year		2024		Analysis Period		1> 7:00					
Intersection		Ages/Hawthorne		File Name		2024_tot_pm.xus									
Project Description		899-903 Ages Drive Industrial													
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				198	0		10	0	19	37	606	8	17	972	
Signal Information															
Cycle, s	95.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase					4		8		2		6				
Case Number					6.0		6.0		5.0		6.0				
Phase Duration, s					24.1		24.1		70.9		70.9				
Change Period, (Y+R c), s					6.3		6.3		5.9		5.9				
Max Allow Headway (MAH), s					3.1		3.1		0.0		0.0				
Queue Clearance Time (g s), s					17.5		3.0								
Green Extension Time (g e), s					0.2		0.4		0.0		0.0				
Phase Call Probability					1.00		1.00								
Max Out Probability					0.05		0.00								
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				7	4		3	8	18	5	2	12	1	6	
Adjusted Flow Rate (v), veh/h				215	0		11	21		40	659	9	18	1057	
Adjusted Saturation Flow Rate (s), veh/h/ln				1367	1800		1445	1523		471	1553	1499	683	1580	
Queue Service Time (g s), s				14.4	0.0		0.6	1.0		4.1	7.8	0.2	1.0	14.6	
Cycle Queue Clearance Time (g c), s				15.5	0.0		0.6	1.0		18.7	7.8	0.2	8.9	14.6	
Green Ratio (g/C)				0.20	0.20		0.20	0.20		0.70	0.70	0.70	0.70	0.70	
Capacity (c), veh/h				331	356		361	301		330	2159	1042	494	2196	
Volume-to-Capacity Ratio (X)				0.649	0.000		0.030	0.069		0.122	0.305	0.008	0.037	0.481	
Back of Queue (Q), ft/ln (50 th percentile)				120.5	0		5.6	9.3		12.6	54.4	1.1	4.2	102.1	
Back of Queue (Q), veh/ln (50 th percentile)				4.7	0.0		0.2	0.4		0.4	2.0	0.0	0.1	3.8	
Queue Storage Ratio (RQ) (50 th percentile)				0.93	0.00		0.13	0.21		0.05	0.15	0.01	0.02	0.27	
Uniform Delay (d 1), s/veh				37.3	0.0		30.8	31.0		10.9	5.6	4.4	7.3	6.6	
Incremental Delay (d 2), s/veh				1.1	0.0		0.0	0.0		0.8	0.4	0.0	0.1	0.8	
Initial Queue Delay (d 3), s/veh				0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Control Delay (d), s/veh				38.4	0.0		30.8	31.0		11.7	6.0	4.5	7.5	7.4	
Level of Service (LOS)				D			C	C		B	A	A	A	A	
Approach Delay, s/veh / LOS				38.4		D	31.0		C	6.3		A	7.4		A
Intersection Delay, s/veh / LOS				10.7					B						
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				2.45		B	2.30		B	1.86		B	1.86		B
Bicycle LOS Score / LOS				0.84		A	0.54		A	1.07		A	1.37		A

EXHIBIT 4.8

AGES DRIVE – PLOS Segment Evaluation

STREET FROM TO YEAR DIRECTION MMLOS MODE
Ages Drive
Hawthorne Road
Site Access
2024
Eastbound–Westbound
PLOS

SEGMENT SCORE **C**

Sidewalk Width (m)	Boulevard Width (m)	Motor Vehicle Traffic Volume (AADT)	Presence of On- street Parking	Segment PLOS			
				Operating Speed (km/h)			
				≤30	>30 or 50	>50 or 60	>60 ¹
2.0 or more	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	B	N/A
			No	A	B	C	D
	0.5 to 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0	≤ 3000	NA	A	B	C	D
		> 3000	Yes	B	B	D	N/A
			No	B	C	E	F
1.8	> 2	≤ 3000	N/A	A	A	A	B
		> 3000	Yes	A	B	C	N/A
			No	A	C	D	E
	0.5 to 2	≤ 3000	N/A	A	B	B	D
		> 3000	Yes	A	C	C	N/A
			No	B	C	E	E
	0	≤ 3000	N/A	A	B	C	D
		> 3000	Yes	B	C	D	N/A
			No	C	D	F	F
1.5	> 2	≤ 3000	N/A	C	C	C	C
		> 3000	Yes	C	C	D	N/A
			No	C	D	E	E
	0.5 to 2	≤ 3000	N/A	C	C	C	D
		> 3000	Yes	C	C	D	N/A
			No	D	E	E	E
	0	N/A		D	E	F ²	F ²
<1.5	N/A		F ³		F ³	F ³	F ³
No sidewalk	N/A		C ⁴		F ³	F ³	F ³

EXHIBIT 4.9

AGES/HAWTHORNE – PLOS Signalized Intersection Evaluation

MAIN STREET Hawthorne Road
MINOR STREET Ages Drive
APPROACHES All
YEAR 2024
DIRECTION All
MMLOS MODE PLOS

		North Approach		South Approach		East Approach		West Approach	
		Comment	Points	Comment	Points	Comment	Points	Comment	Points
5.1	Crossing Distance & Conditions								
	Median?	Yes		Yes		No		No	
	Total Travel Lanes Crossed	6	60	7	45	3	105	5	75
	Island Refuge	Yes	0	Yes	0	No	-4	Yes	0
5.2	Signal Phasing & Timing Features								
	Left Turn Conflict	Permissive	-8	Permissive	-8	Permissive	-8	Protected	-8
	Right Turn Conflict	Permissive/ or Yield Control	-5	Permissive/ or Yield Control	-5	Permissive/ or Yield Control	-5	Permissive/ or Yield Control	-5
	Right Turns on Red	RTOR Allowed	-3	RTOR Allowed	-3	RTOR Allowed	-3	RTOR Allowed	-3
	Leading Ped Interval	No	-2	No	-2	No	-2	No	-2
5.3	Corner Radius								
	Radius	> 15m to 25m	-8	> 10m to 15m	-6	> 15m to 25m	-8	> 10m to 15m	-6
	Right Turn	Channel With Receiving	-3	No Channelization	0	Channel With Receiving	-3	No Channelization	0
5.4	Crosswalk Treatment	Standard Transverse Markings	-7	Standard Transverse Markings	-7	Standard Transverse Markings	-7	Standard Transverse Markings	-7
TOTAL PETSİ SCORE			24		14		65		44
DELAY SCORE			30		30		29		29
From Signal Timing Plan									
PETSİ SCORE			F		F		C		E
DELAY SCORE			C		C		C		C
OVERALL APPROACH SCORE			F		F		C		E

OVERALL INTERSECTION SCORE **F**

EXHIBIT 4.10

AGES DRIVE – BLOS Segment Evaluation

STREET Ages Drive
FROM Hawthorne Road
TO Site Access
YEAR 2024
DIRECTION Eastbound– Westbound
MMLOS MODE BLOS

SEGMENT SCORE **B**

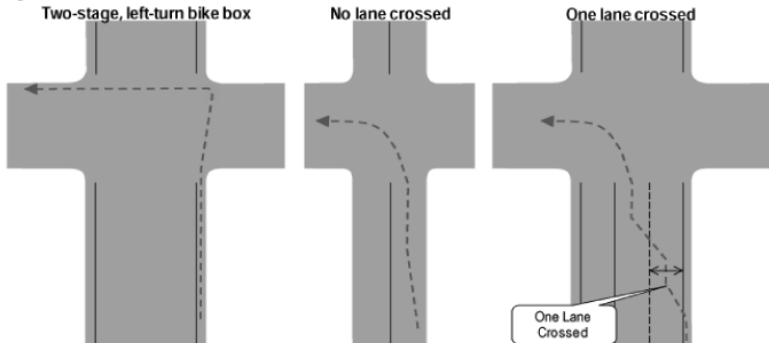
Type of Bikeway	LOS
Physically Separated Bikeway (cycle tracks, protected bike lanes and multi-use paths). Physical separation refers to, but is not limited to, curbs, raised medians, bollards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).	A
Bike Lanes Not Adjacent Parking Lane - Select Worst Scoring Criteria	
No. of Travel Lanes	1 travel lane in each direction 2 travel lanes in each direction separated by a raised median 2 travel lanes in each direction without a separating median More than 2 travel lanes in each direction
Bike Lane Width	> 1.8 m wide bike lane (includes marked buffer and paved gutter width) ≥ 1.5 m to < 1.8 m wide bike lane (includes marked buffer and paved gutter width) ≥ 1.2 m to < 1.5 m wide bike lane (includes marked buffer and paved gutter width)
Operating Speed	≤ 50 km/h operating speed 60 km/h operating speed > 70 km/h operating speed
Bike lane blockage (commercial areas)	Rare Frequent
Bike Lanes Adjacent to curbside Parking Lane - Select Worst Scoring Criteria	
No. of Travel Lanes	1 travel lane in each direction 2 or more travel lanes in each direction
Bike Lane and Parking Lane Width	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width) 4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width) ≤ 4.0 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)
Operating Speed	< 40 km/h operating speed 50 km/h operating speed 60 km/h operating speed > 70 km/h operating speed
Bike lane blockage (commercial areas)	Rare Frequent
Mixed Traffic	
No. of Travel Lanes and Operating Speed	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential 2 to 3 travel lanes; ≤ 40 km/h 2 travel lanes; 50 km/h; no marked centerline or classified as residential 2 to 3 travel lanes; 50 km/h 4 to 5 travel lanes; ≤ 40 km/h 4 to 5 travel lanes; ≥ 50 km/h 6 or more travel lanes; ≤ 40 km/h ≥ 60 km/h
Unsignalized Crossing along Route: no median refuge	
No. of Travel Lanes on Side Street and Operating Speed	3 or less lanes being crossed; ≤ 40 km/h 4 to 5 lanes being crossed; ≤ 40 km/h 3 or less lanes being crossed; 50 km/h 4 to 5 lanes being crossed; 50 km/h 3 or less lanes being crossed; 60 km/h 4 to 5 lanes being crossed; 60 km/h 6 or more lanes being crossed; ≤ 40 km/h 3 or less lanes being crossed; ≥ 65 km/h 6 or more lanes being crossed; ≥ 60 km/h 4 to 5 lanes being crossed; ≥ 65 km/h
Unsignalized Crossing along Route: with median refuge (> 1.8 m wide)	
No. of Travel Lanes on Side Street and Operating Speed	5 or less lanes being crossed; ≤ 40 km/h 3 or less lanes being crossed; 50 km/h 6 or more lanes being crossed; ≤ 40 km/h 4 to 5 lanes being crossed; 50 km/h 3 or less lanes being crossed; ≥ 60 km/h 6 or more lanes being crossed; 50 km/h 4 to 5 lanes being crossed; 60 km/h 3 or less lanes being crossed; ≥ 65 km/h 6 or more lanes being crossed; 60 km/h 4 to 5 lanes being crossed; ≥ 65 km/h 6 or more lanes being crossed; ≥ 65 km/h

EXHIBIT 4.11

AGES/HAWTHORNE – BLOS Signalized Intersection Evaluation

MAIN STREET Hawthorne Road
MINOR STREET Ages Drive
APPROACHES Northbound–Southbound
YEAR 2024
DIRECTION North/South
MMLOS MODE BLOS

INTERSECTION SCORE **F**

Bikeway and Intersection Type		LOS
Bike Lanes or higher order facility on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	No impact on LTS (as long as cycling facility remains to the right of any turn lane - otherwise see pocket bike lanes below)	
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Pocket Bike Lanes on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane introduced to the right of the bike lane and ≤ 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	B
	Right-turn lane introduced to the right of the bike lane and > 50 m long, turning speed ≤ 30 km/h (based on curb radii and angle of intersection)	D
	Bike lane shifts to the left of the right-turn lane, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane with any other configurations	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	C
	1 lane crossed, 50 km/h	C
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	E
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Mixed Traffic on a Signalized Intersection Approach		
Right-turn Lane and Turning Speed of Motorists	Right-turn lane 25 to 50 m long, turning speed ≤ 25 km/h (based on curb radii and angle of intersection)	D
	Right-turn lane 25 to 50 m long, turning speed > 25 km/h (based on curb radii and angle of intersection)	E
	Right-turn lane longer than 50 m	F
	Dual right-turn lanes (shared or exclusive)	F
Cyclist Making a Left-turn and Operating Speed of Motorists (refer to figure)	Two-stage, left-turn bike box; ≤ 50 km/h	A
	No lane crossed, ≤ 50 km/h	B
	1 lane crossed, ≤ 40 km/h	B
	No lane crossed, ≥ 60 km/h	D
	1 lane crossed, 50 km/h	D
	2 or more lanes crossed, ≤ 40 km/h	D
	1 lane crossed, ≥ 60 km/h	F
	2 or more lanes crossed, ≥ 50 km/h	F
	All other single left-turn lane configurations	F
	Dual left-turn lanes (shared or exclusive)	F
Left-turn Configurations		
<div> <div>Two-stage, left-turn bike box</div> <div>No lane crossed</div> <div>One lane crossed</div> </div> 		

Notes:

1. Pocket bike lanes are defined as bike lanes that develop near intersections between vehicular right turn lanes on the right side and vehicular through or left lanes on the left side. All other configurations of bike lanes or separated facility that remain against the edge of the curb/parking lane and require right turning vehicles to yield to through cyclists will not impact the level of traffic stress (i.e. are considered to be LOS A).

EXHIBIT 4.12

AGES DRIVE – TLOS Segment Evaluation

STREET Ages Drive
FROM Hawthorne Road
TO Site Access
YEAR 2024
DIRECTION Eastbound–Westbound
MMLOS MODE TLOS

SEGMENT SCORE **D**

Facility Type		Level/exposure to congestion delay, friction and incidents			Quantitative Measurement	LOS
		Congestion	Friction	Incident Potential		
Segregated ROW		No	No	No	N/A	A
Bus lane	No/limited parking/driveway friction	No	Low	Low	$C_f \leq 60$	B
	Frequent parking/driveway friction	No	Medium	Medium	$C_f > 60$	C
Mixed T traffic	Limited parking/driveway friction	Yes	Low	Medium	$W/V_p \geq 0.8$	D
	Moderate parking/driveway friction	Yes	Medium	Medium	$W/V_p \leq 0.6$	E
	Frequent parking/driveway friction	Yes	High	High	$W/V_p < 0.4$	F

Notes:

C_f , Conflict Factor = (Number of driveways x crossing volume) / 1 km

W/V_p is the ratio of average transit travel speed to posted speed limit

EXHIBIT 4.13

AGES/HAWTHORNE – TLOS Signalized Intersection Evaluation

MAIN STREET Hawthorne Road
MINOR STREET Ages Drive
APPROACHES Eastbound
YEAR 2024
DIRECTION East/West
MMLOS MODE TLOS

INTERSECTION SCORE **E**

Exhibit 16 – TLOS Signalized Intersection Evaluation Table

Delay	Typical Location	LOS
0	Grade Separation	A
≤10 sec	High Level TSP	B
≤20 sec		C
≤30 sec		D
≤40 sec	TSP & long cycle length	E
>40 sec	No TSP & long cycle length	F

Note: Delay includes travel time from end of queue to entering the intersection

EXHIBIT 4.14
AGES DRIVE – TkLOS Segment Evaluation

STREET	Ages Drive		
FROM	Hawthorne Road		
TO	Site Access	SEGMENT SCORE	B
YEAR	2024		
DIRECTION	Eastbound–Westbound		
MMLOS MODE	TkLOS		

Exhibit 20 – TkLOS Segment Evaluation Table

Curb Lane Width (m)	Only two travel lanes (one in each direction)	More than two travel lanes
>3.7	B	A
≤3.5	C	A
≤3.3	D	C
≤3.2	E	D
≤3	F	E

EXHIBIT 4.15
AGES/HAWTHORNE – TkLOS Signalized Intersection Evaluation

MAIN STREET
MINOR STREET
APPROACHES
YEAR
MMLOS MODE

Hawthorne Road
Ages Drive
Northbound–Southbound
2024
TkLOS

INTERSECTION SCORE **A**

Exhibit 21 – TkLOS Signalized Intersection Evaluation Table

Effective Corner Radius	One receiving lane on departure from intersection	More than one receiving lane on departure from intersection
< 10m	F	D
10 to 15m	E	B
> 15m	C	<div>A</div>