DILLON CONSULTING

OTTAWA CATHOLIC SCHOOL BOARD

Transportation Impact Assessment

Proposed Elementary School and Childcare in Barrhaven

March 2022– 21-2355

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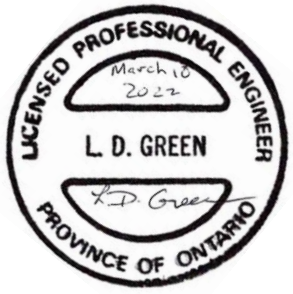
Certification

1. I have reviewed and have a sound understanding of the objectives, needs, and requirements of the City of Ottawa's Official Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the presentation of transportation impact assessment reports, including multimodal 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 or registered professional in good standing, whose field of expertise is either transportation engineering or transportation planning.

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



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1.0 Screening

1.1 Summary of Development

Municipal Address	135 Main Halyard Lane
Description of Location	The site is located within the Glenview Homes development area, west of the Half Moon Bay West development. The site is located on the north side of Flagstaff Drive on the east side of Main Halyard Lane, approximately 350 metres west of Apolune Street.
Land Use Classification	Institutional
Development Size	1 storey elementary school and childcare centre. The single storey school is 4,630 m^2(49,837 sq. ft.) and provides a 276 m^2 (2,970 sq. ft) childcare facility. The school provides 22 class rooms capable of accommodating 524 students. The preliminary site plan also shows the potential for 12 portable classrooms capable of accommodating an additional 276 students. The childcare facility will accommodate up to 40 students.
Number of accesses and locations	The staff parking lot and school bus layby would access from Main Halyard Lane, and the parent drop-off/pick-up layby would be located on Flagstaff Drive. The childcare drop-off is located within the staff parking lot.
Phases of development	1
Build-out year	September 2023

1.2 Trip Generation Trigger

The proposed elementary school is anticipated to generate over 60 person trips during the peak hour, therefore the trip generation trigger has been satisfied and a transportation impact assessment is required.

Land Use Type	Minimum Development Size	Yes	No
Single-family homes	40 units		x
Townhomes or apartments	90 units		x
Office	3,500 sq.m.		x
Industrial	5,000 sq.m.		x
Fast-food restaurant or coffee shop	100 sq.m.		x
Destination retail	1,000 sq.m.		x
Gas station or convenience market	75 sq.m.		x
Other	60 person trips or more during weekday peak hours	x	

Since the development satisfies the Trip Generation Trigger, both the Design Review and Network Impact Components will be addressed in the TIA study.

2.0 Scoping

2.1 Existing and Planned Conditions

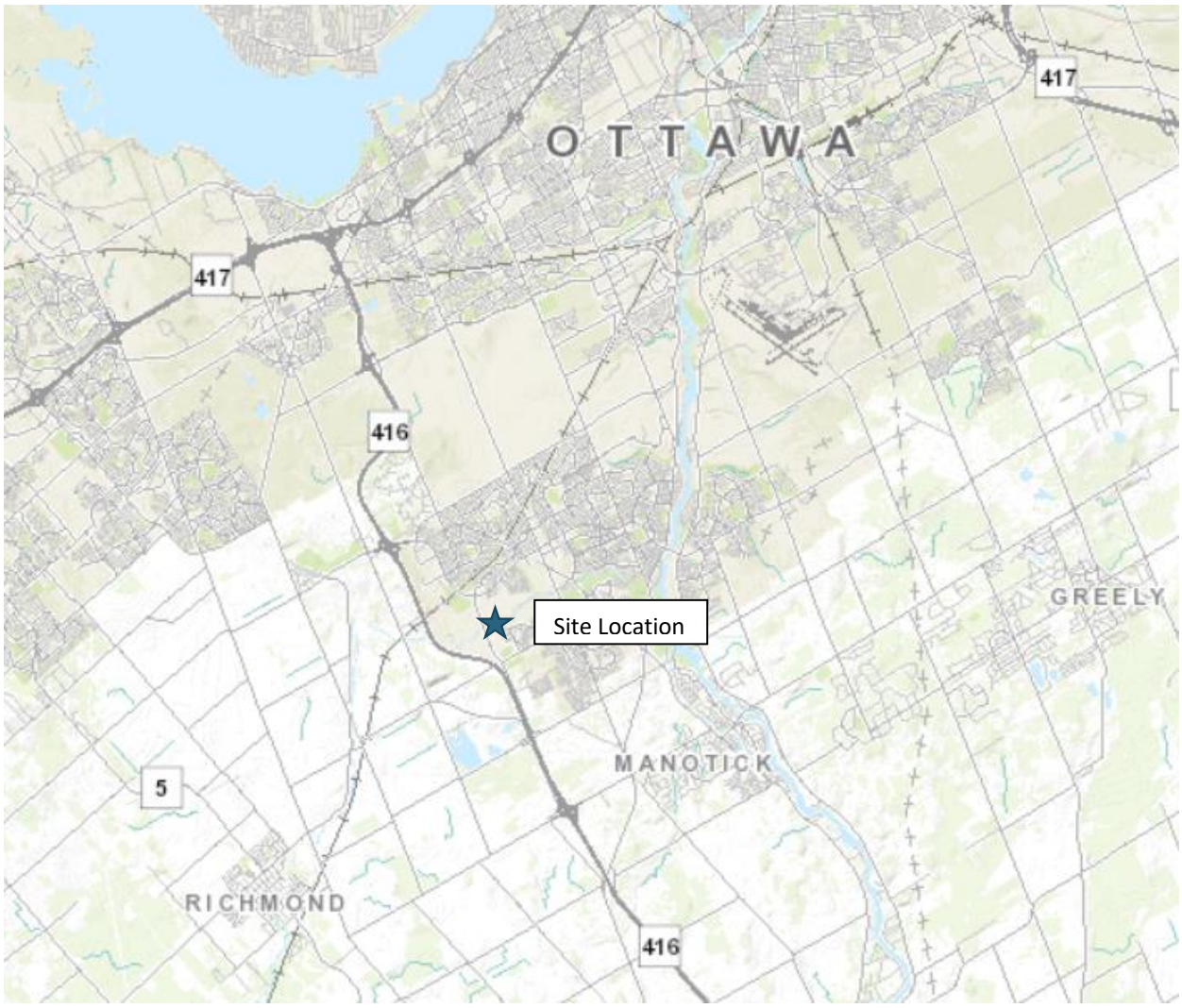
2.1.1 Proposed Development

The proposed development is located within the Glenview Homes development area, west of the Half Moon Bay West development. A Community Transportation Study was undertaken in 2016, and updated in 2017, for the entire Glenview Homes development site which was identified as 3387 Borrisokane Road. The proposed school site is located on the north side of Flagstaff Drive on the east side of Main Halyard Lane, approximately 350 metres west of Apolune Street. **Figure 1** illustrates the site location. **Figure 2** illustrates the study area intersection to be considered within this TIA. City staff has scoped the study to the Flagstaff intersection at Main Halyard Lane, plus the school frontages.

The site is currently zoned as R3YY (1909) / I1A Minor Institutional Zone which permits a school and daycare among other types of developments. The site is anticipated to open in September 2023.

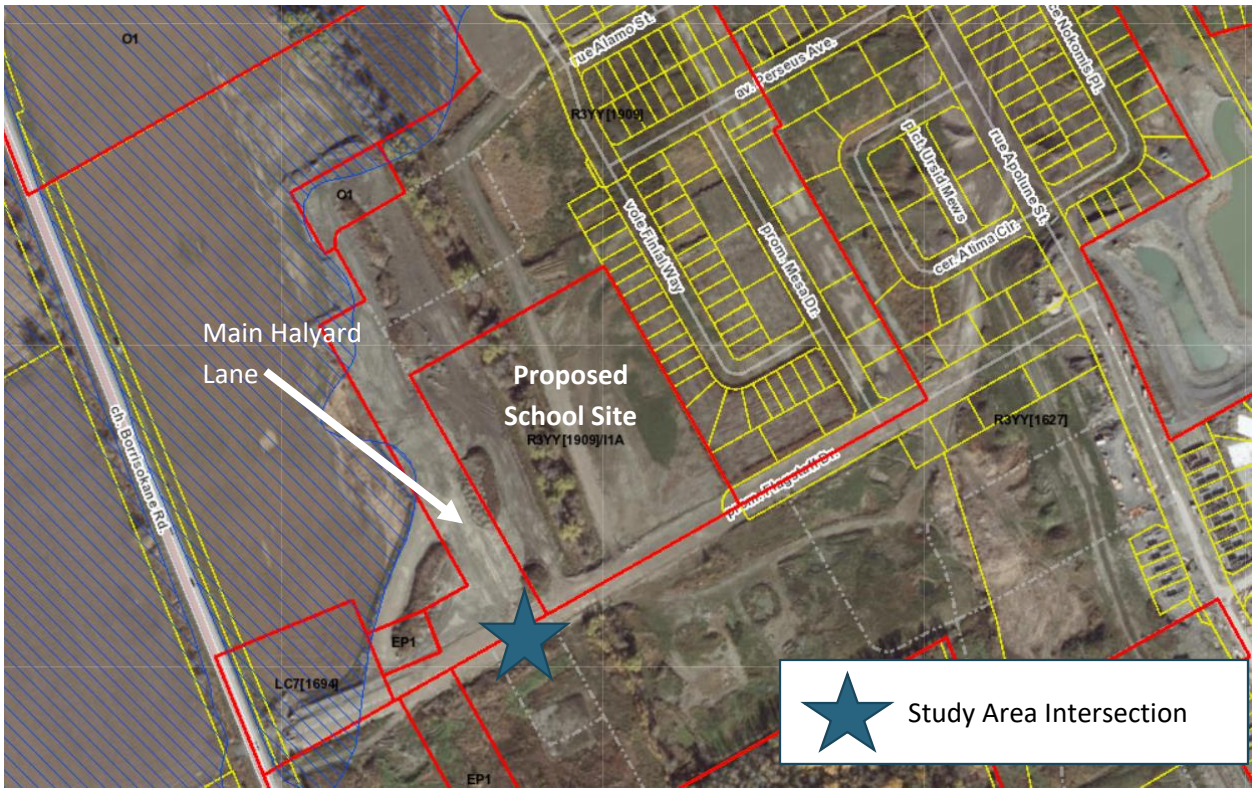
The proposed site plan provides a parking lot for staff and childcare drop-off/pick-ups. Access to the parking lot would be via an entrance on Main Halyard Lane. The site plan also proposes two on-street lay-bys, one dedicated for school buses (Main Halyard Lane), and one for student drop-off & pick-ups (Flagstaff Drive). The Main Halyard Lane school bus lay-by area provides space for ten school buses (approximately 140 metres), one school bus may need to stage during the PM pickup period on Flagstaff Drive until space becomes available in the Main Halyard Lane bus bay. The site plan proposes a 75 metre plus a 33 metre drop-off lay-by area on Flagstaff Drive.

Figure 1: Site Location



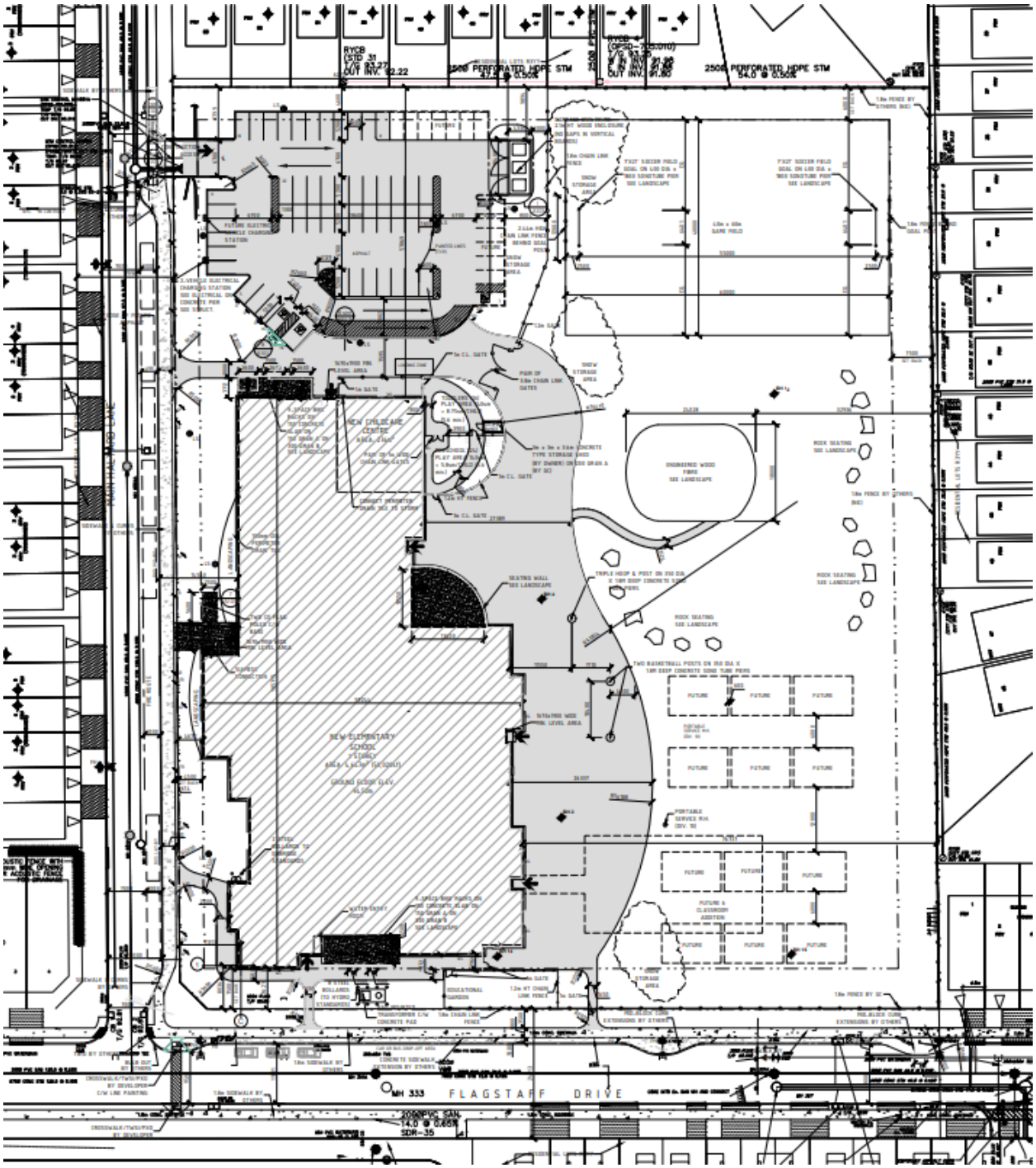
Background map source: geoOttawa, accessed July 2021

Figure 2: Study Area Intersection



Background map Source: geoOttawa, accessed July 2021

Figure 3: Proposed Site Plan



Source: Site plan provided by PRTY Architect, dated March 10, 2022

2.1.2 Existing Conditions

2.1.2.1 Roads and Traffic Control

The roadways under consideration in the study area are described as follows:

Flagstaff Drive	Flagstaff Drive is a proposed municipally-owned, two-lane collector road running east-west from Borrisokane Road to Apolune Street within the Half Moon Bay West community. The right of way of Flagstaff Drive is 24 metres. The roadway is to be designed according to the City's collector guidelines.
Main Halyard Lane	Main Halyard Lane is a proposed local street running north-south, connecting the local streets of the development to Flagstaff Drive. The right of way of Main Halyard Lane is 18 metres. The roadway is to be designed according to the City's 30 km/h design toolbox.

2.1.2.2 Walking and Cycling

Flagstaff Drive and Main Halyard Lane do not currently exist. The developer is working towards providing the plan of subdivision.

2.1.2.3 Transit

There is no existing transit operations in the immediate area.

2.1.2.4 Traffic Management Measures

There are no traffic management measures in the study area.

2.1.2.5 Traffic Volumes

As the streets adjacent to the proposed school site are not yet in place, there are no existing traffic volumes within the study area.

2.1.2.6 Collision History

As the streets adjacent to the development are not yet in place, there are no existing collision history.

2.1.3 Planned Conditions

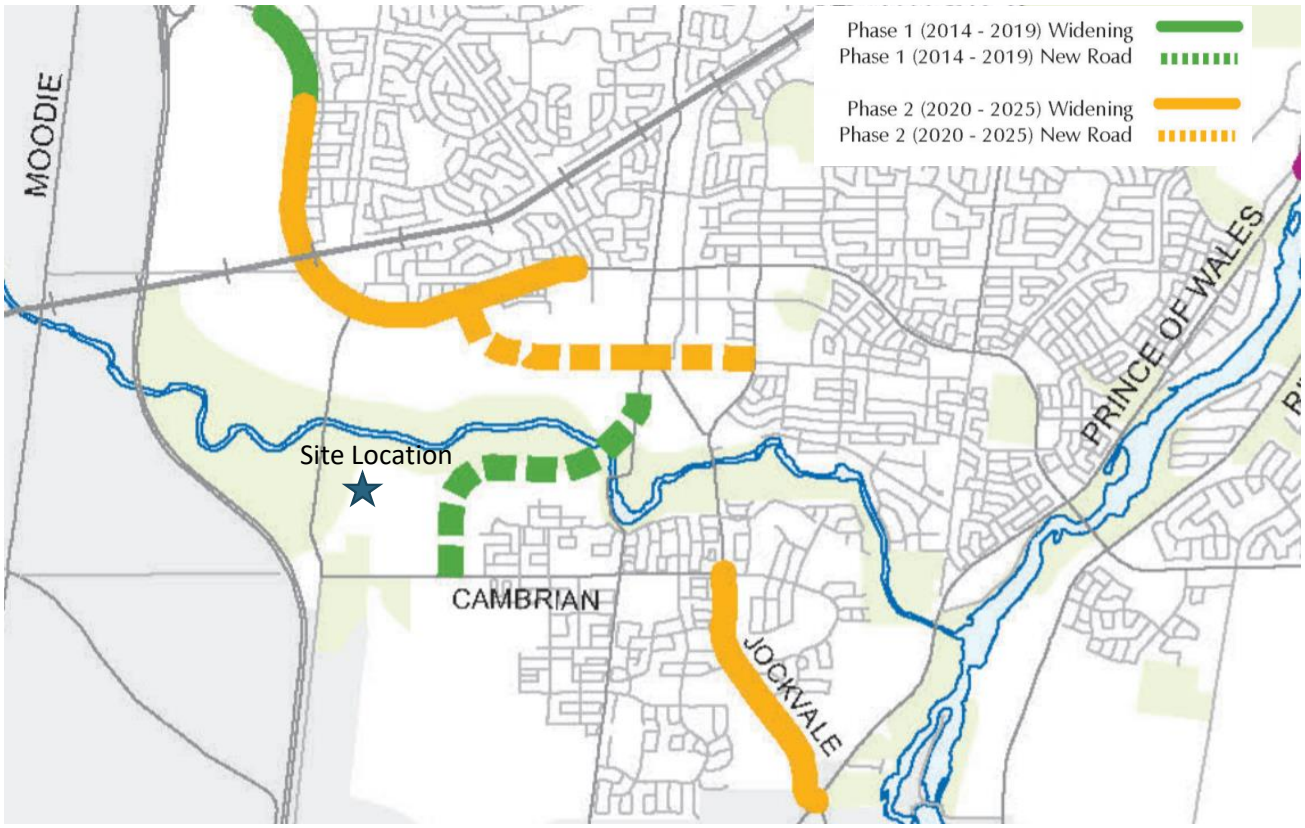
2.1.3.1 Road Network Improvements

Figure 4 shows the 2031 'affordable' road network as proposed in the 2013 TMP for the Barrhaven and Half Moon Bay areas. Notable proposed road network changes include the Greenbank Road realignment between Cambrian Road and the Jockvale Road. The realignment was scheduled to occur between 2014 and 2019 however due to funding, will likely occur after 2031.

Figure 5 shows the 2031 road network concept that considered the Greenbank Road realignment as a new arterial roadway from the Jockvale River to Cambrian Road in the south, continuing to the south as a conceptual arterial roadway. Cambrian Road was also identified to be widened to a four-lane roadway

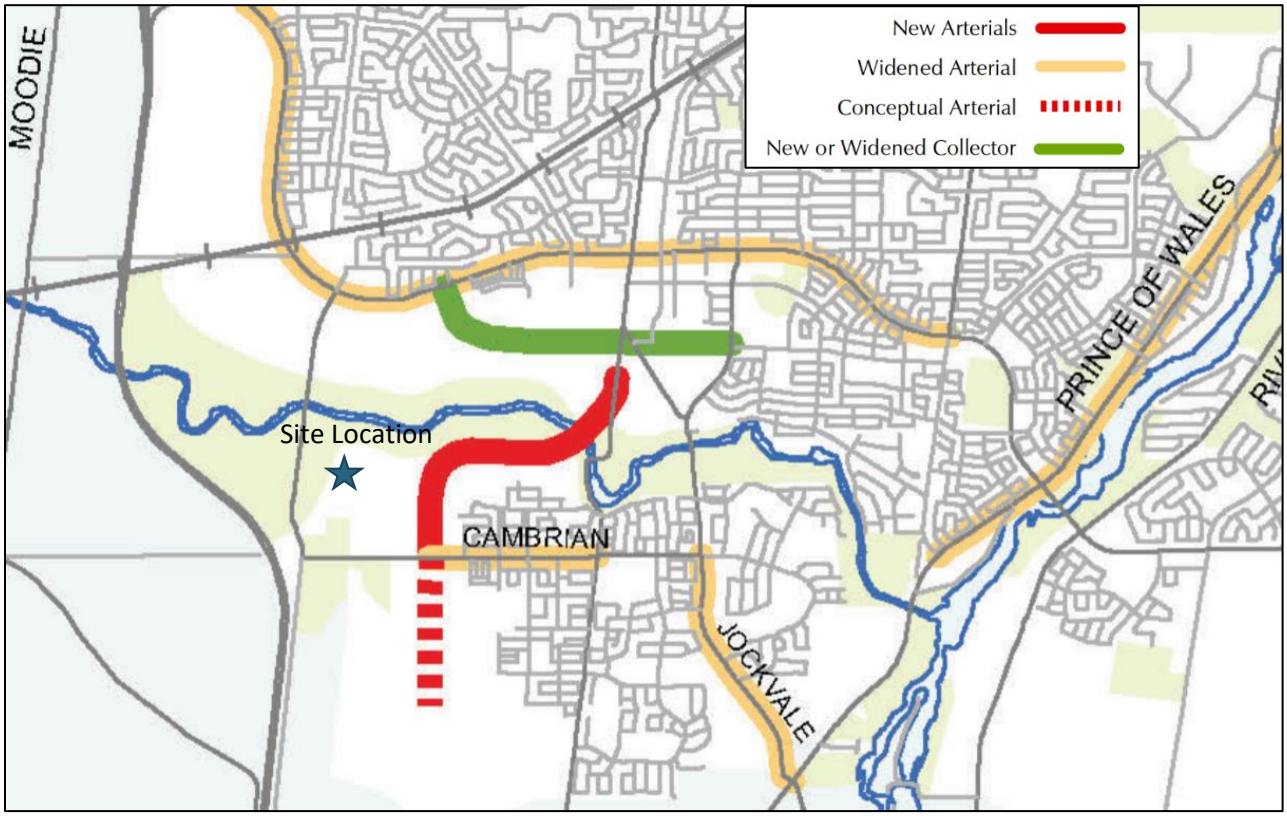
between the Greenbank Road extension and Jockvale Road. The timing for these projects is currently unknown.

Figure 4: 2031 Affordable Road Network



Source: City of Ottawa 2013 TMP, 2031 Affordable Road Network

Figure 5: 2031 Road Network Concept

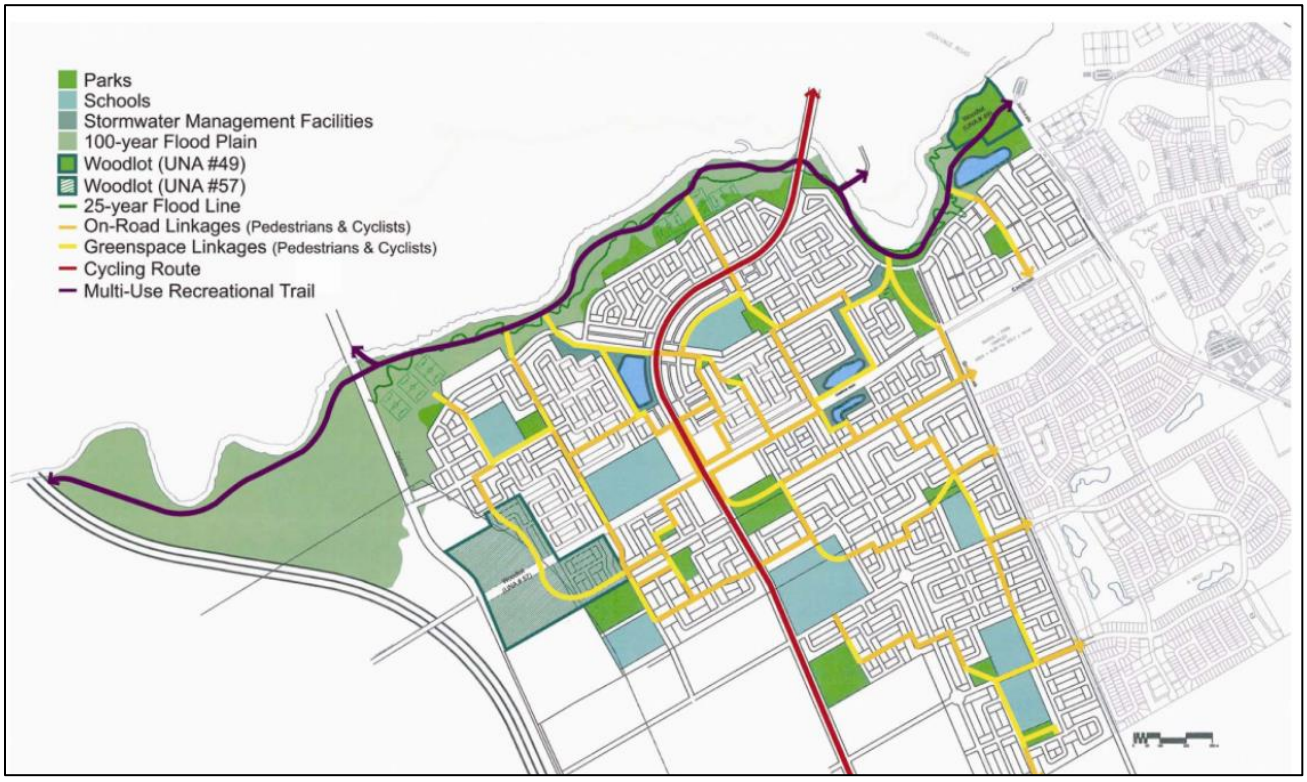


Source: City of Ottawa 2013 TMP, 2031 Road Network Concept

2.1.3.2 Walking and Cycling

Figure 6 illustrates the planned walking and cycling facilities from the Barrhaven South Community Design Plan (CDP), 2006. The CDP shows a multi-use trail along the Jock River, and on-road linkages on Flagstaff Drive, and along Main Halyard Lane. The site plan indicates a sidewalk on the north and south sides of Flagstaff Drive and on the east side of Main Halyard Lane.

Figure 6: Planned Walking and Cycling Facilities (Barrhaven South Community Design Plan)



Source: Barrhaven South Community Design Plan, Sept 2006

2.1.3.3 Transit

Figure 7 illustrates the Affordable Transit Network from the City's 2013 TMP. The Affordable Transit Network includes the existing Bus Rapid Transit to Barrhaven Centre and the Chapman Mills transit priority corridor. There are no plans to provide higher order transit in proximity to the planned school site. In the Ultimate Rapid Transit Network (not shown), the Bus Rapid Transit to Barrhaven Centre is to be upgraded to Light Rail Transit, with a Bus Rapid Transit connection to the Park and Ride lot located to the south of Cambrian Road along the Greenbank Road extension corridor.

Figure 7: Rapid Transit and Transit Priority Network - 2031 Affordable Network

2.1.3.4 Future Background Developments

Figure 8 illustrates the location of the background developments, specifically the Half Moon Bay West and Glenview Homes developments.

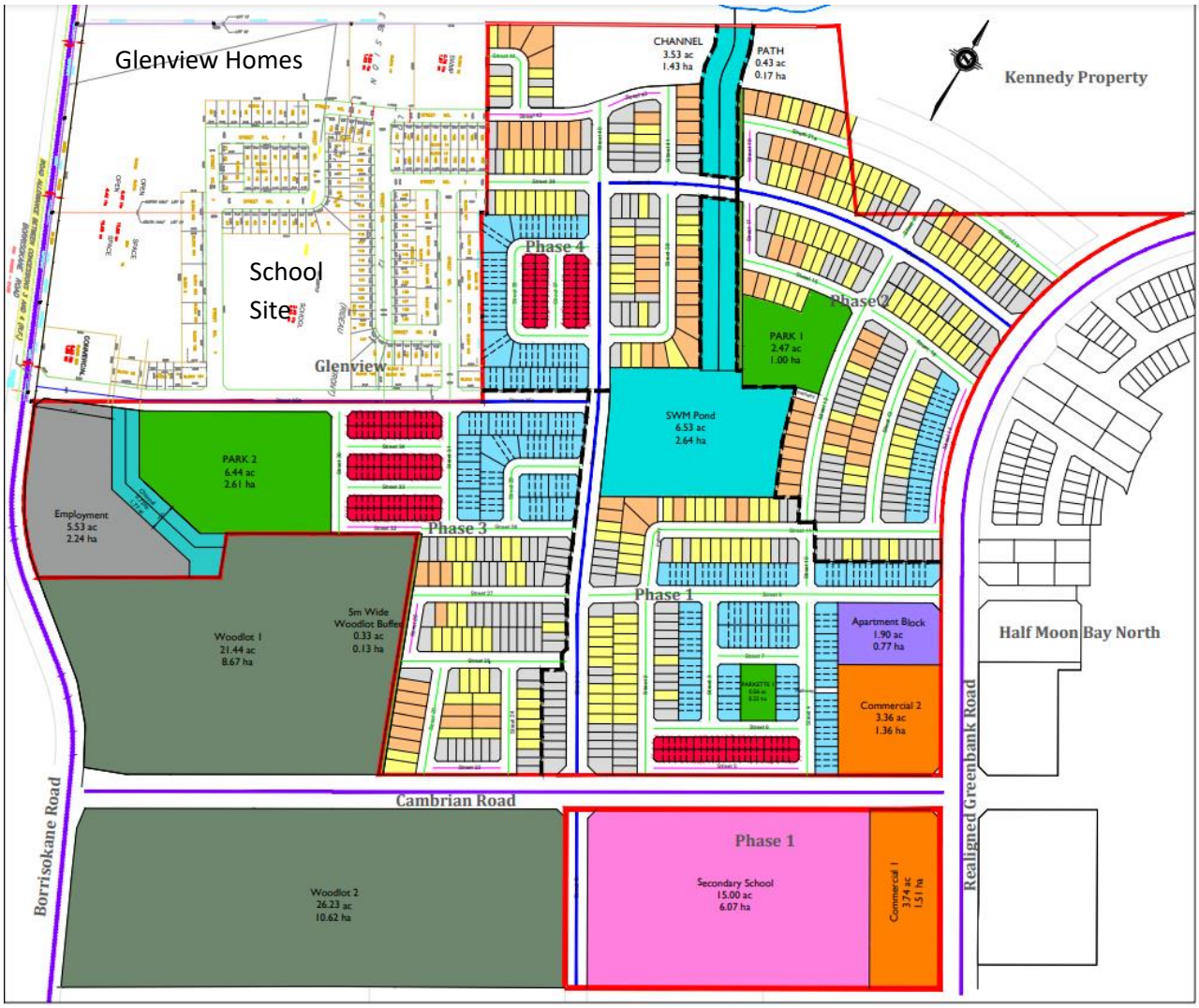
The Community Transportation Study (CTS) for Glenview Homes (3387 Borrisokane Road, May 2017), identified and accounted for various background developments. The report included the subject elementary school site, assuming a size of 30,000 sq. ft. The 2027 (buildout plus five year) horizon included additional background traffic from Half Moon Bay West on Flagstaff Drive, as it was assumed that the Greenbank Road extension would not occur within the 2027 horizon year.

The Half Moon Bay West development is located to the east and south of the Glenview Homes development site. A CTS completed in November 2016, and an update in 2019 indicated the proposed development as illustrated in **Figure 8.**

Table 1: Background Developments

Development	Location	Development Size	Assumed Build-Out
Glenview Homes (Cedarview) Ltd. Addendum 2017	3387 Borrisokane Road	116 Single Family Units 92 Condo Units Elementary School	2022
Mattamy's Half Moon Bay West	North of Cambrian Road between Cedarview Road and Realigned Greenbank Road	1,006 Residential Units	2021
Mattamy's Half Moon Bay North	North and South of Cambrian Road, west of Greenbank Road	471 Residential Units	2019
Mattamy's Half Moon Bay South Phase 4	South of Half Moon Bay south Phase 3 between Realigned Greenkank and Existing Greenbank	265 Residential Units	2017

Figure 8: Background Developments (Half Moon Bay West, October 2019)



2.2 Study Area and Time Periods

The study area for this report is limited to the intersection of Flagstaff Drive at Main Halyard Lane, and to the transportation operations adjacent the proposed school site.

The selected time periods for analysis are the weekday AM and PM peak hours of adjacent street traffic (i.e. the AM and PM rush hours), since these are often the time periods that govern roadway design. Notably, many elementary school days end before the PM rush hour and therefore the impact of the school will be governed by the AM peak hour.

The proposed development is anticipated to be open for the 2023 school year. Therefore, this analysis will examine the build-out 2023 and build-out plus five year (2028) future horizon years.

2.3 Exemptions Review

Table 2 summarizes the exemptions review table from the City of Ottawa's 2017 *Transportation Impact Assessment Guidelines*. **Module 4.2.2** is not included since the parking supply meets the zoning bylaw requirement. The site plan proposes 50 parking spaces for the initial 22 classrooms. In the future when the 12 portables are added, an additional 15 parking spaces will be provided within the parking lot. The future total parking supply is 65 parking spaces. The zoning bylaw requires an ultimate parking supply of 57 parking spaces, therefore the site exceeds the parking requirement.

Table 2: Exemptions Review

Module	Element	Exemption Consideration	Status
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Included
	4.1.3 New Street Networks	Only required for plans of subdivision	Not included
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Included
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Not included
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	Included
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	Included
4.8 Network Concept		Only required when proposed development generates more than 200 person trips during the peak hour in excess of the equivalent volume permitted by established zoning	Not included
4.9 Intersection Design	All Elements	Not required if site generation trigger is not met	Included

3.0 Forecasting

3.1 Development-Generated Travel Demand

Traffic volumes within the study area will consist of trips generated by the school and trips generated by background land uses. The background land use trips will consist of trips generated by the lands contained within the Half Moon Bay West subdivision and the surrounding Glenview Subdivision.

3.1.1 School Trips

The school and childcare facility trip generation can be calculated using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 11th edition methodology or by using a first principles approach. In this case, we have calculated the trips using both approaches for comparison purposes and have applied the TRANS Trip Mode Share adjustments to the first principles approach as deemed appropriate.

The trip generation and mode share for the proposed school was calculated using the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 11th edition.* **Table 3** summarizes the vehicle trip generation for the proposed elementary school based on ITE Trip Rates.

Table 3: ITE Trip Generation – Vehicle Trips

Land Use (ITE Land Use Code)	Size	AM Peak Hour of Adjacent Street Traffic (i.e. 7-9 AM)			PM Peak Hour of Adjacent Street Traffic (i.e. 4-6 PM)		
		Inbound	Outbound	Total	Inbound	Outbound	Total
Elementary school (520)	800 Students	320	272	592	59	69	128
Daycare (565)	2,970 sq. ft	17	16	33	15	18	33
Total Auto Trips		**337**	**288**	**625**	**74**	**87**	**161**

A first principles approach was also undertaken to forecast the number of vehicle and person trips that will be generated by the site. When fully constructed, the school is anticipated to ultimately have 36 staff members with the 12 proposed future portables, with a maximum population of 800 students. It is anticipated that nine school buses will be used initially, with up to 11 buses in the future. The childcare facility is anticipated to accommodate 40 childcare spaces. The numbered items below illustrate the assumptions and information gathered to form the trip generation approach.

1. The Trans Trip Generation Manual, 2020, indicates typical student travel mode share as observed within the City of Ottawa, see **Table 4**. The TRANS manual notes that each site exhibits its own unique characteristics, and may differ from site to site.

Table 4: Elementary School Transportation Mode Share - TRANS Trip Generation Manual, 2020

School Type	Mode Share					
	Auto Passenger	School Bus	Transit	Walk	Bike	Other
Elementary	22%	48%	6%	20%	2%	2%

2. The school will ultimately be capable of supporting up to 800 students with 36 staff members, for a total of 836 person trips to the school.
3. Assume that on any given day, five percent (5%) of students will be absent. Assume that 100% of all staff members are present. Therefore, 796 persons will attend the school on a daily basis.
4. Using the TRANS rates for Auto Passenger, the site will generate 175 auto passenger trips. Of these trips, staff represent 36 trips. Therefore, 139 students are forecast to arrive by automobile. Canada census data indicates 44% of households have one child, while 56% of households have 2 or more children. We have assumed 1.4 students per automobile, therefore approximately 100 automobiles will arrive carrying 139 students.
5. The elementary school will be serviced by 11 school buses. Assuming the TRANS bus rate is 54%, the school is expected to generate 432 student trips by bus, for an average of 39 students per bus. A school bus occupancy of 39 students is conservative and takes into account the potential for long and short buses. A typical long school bus can carry up to 72 elementary students, assuming three students per seat.
6. Assuming the walking and cycling modes maintain the TRANS rates, active modes will account for the following:
    a. Walking (20%) – 160 trips
    b. Cycling (2%) – 16 trips (cycling trips will likely be higher during fair weather)
7. During the AM peak period, the 36 elementary school staff are anticipated to generate one vehicle trip per employee. Of the proposed 36 staff members, it is assumed that 26 will arrive during the peak hour and the other 10 will arrive before or after the peak hour. The proposed school is located in a developing suburban area far from rapid transit; therefore, to be conservative it has been assumed that all employee trips are made by automobile.
8. During the PM peak hour, there are anticipated to be 59 inbound vehicle trips to the school and 69 outbound vehicle trips (per ITE calculations), which represents 59 student pick-ups and 10 staff leaving. The elementary school pick-up trips were assumed to be for an after-school program.
9. During the AM and PM peak hours, approximately 50% (18/40) of childcare drop-offs or pick-ups are anticipated to occur by vehicle during the peak hour. Childcare drop-offs and pick-ups are likely to occur over a two hour window as arrival and departure patterns are based on parent schedules. The childcare facility staff members will arrive before the peak hour of the school and depart after the afternoon peak hour.

Table 5 summarizes the trip generation of the school in terms of person trips based on the first principles approach and TRANS mode shares identified above. The trip generation first principles approach during the AM peak hour has been carried forward within this report as it more accurately reflects the anticipated operation of the site as compared to the ITE trip generation methodology.

Table 5: Trip Generation – Persons Trips

Location / Activity	AM Peak Hour of Roadway Traffic			PM Peak Hour of Roadway Traffic		
	Inbound	Outbound	Total	Inbound	Outbound	Total
Staff Parking Lot						
Staff parking (vehicles)	26	0	26	0	10	10
Childcare drop-off / pick-up (vehicles)	18	17	35	15	18	33
On-Street Laybys						
School bus trips (vehicles)	11	11	22	0	0	0
School bus trips (students)(63% of students)	432	0	432	0	0	0
Student pick-up/drop-off trips (15% of students)	100	100	200	59	59	118
Active Transportation[1]						
Walking (assume 20% of students)	160	0	160	0	0	0
Cycling (assume 2% of students)	16	0	16	0	0	0
Total Person Trips	763	128	891	74	87	161

3.1.1.1 Trip Distribution for Vehicle Trips

The distribution of staff trips and student pick-up/drop-off trips have been treated separately. School staff typically live across the region, whereas student will live close to the school in the nearby residential areas.

The proposed school is located in the southern part of Ottawa and therefore the majority of staff are anticipated to live east and north of the site. Based on the Trans OD survey, it has been assumed that staff trip distribution would follow the South Nepean District travel patterns. As such, it was assumed that staff would travel as follows:

- 40% to/from the north;
- 40% to/from the east;
- 10% from the west; and,
- 10% from the south.

[1] Walking & cycling are anticipated to very low or negligible during the PM peak hour (of adjacent roadway traffic) since the school day is long over by the afternoon rush hour. Students participating in the after-school program were assumed to be picked-up.

Childcare pick-up and drop-off trips were assumed to originate from within South Nepean, specifically internal to the Glenview and Half Moon Bay West developments. It was assumed that 70% of all student trips would originate within the Glenview and Half Moon Bay West subdivisions, with 30% of trips following a similar trip distribution as the staff, however more local to South Nepean.

Table 6 summarizes the assumed distribution for vehicle trips based on the above assumptions. **Appendix A** contains the Trans Trip Distribution data for the South Nepean area.

Table 6: Assumed Trip Distribution – Vehicle Trips

Direction Relative to Site	Staff	Student & Childcare drop-off / pick-up (Internal Trips)
North	40%	30%
East	40%	40%
South	10%	30%
West	10%	0%
Total	**100%**	**100%**

3.1.1.2 Trip Assignment

Vehicle trips were assigned to the road network in accordance with Table 6.

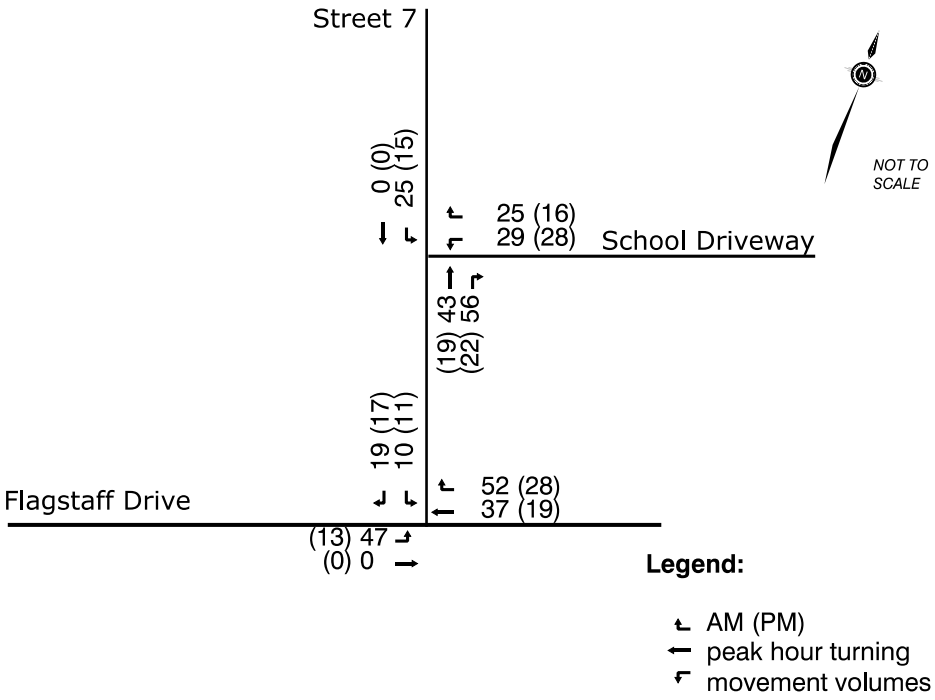
School bus trips were assigned to the bus bay along Main Halyard Lane. The bus bay is approximately 166 metres in length and has capacity to store 11 school buses, although only nine buses are anticipated. The buses are anticipated to exit the school by circulating around the local street network to the north, back to the Flagstaff Drive at Apolune Street intersection.

Student drop-off and pickup is expected to occur primarily on Flagstaff Drive; however, trips from the north on Main Halyard Lane and trips from Borrisokane Road are anticipated to access the main entrance from Main Halyard Lane. The site plan proposes dedicated parking bays which provide approximately 110 metres of parking area, providing parking/drop-off area space for 18 vehicles. It is expected that these spaces will be used for very short-term parking/stopping.

The childcare drop-offs are expected to occur within the staff parking lot where the childcare is located, located off Main Halyard Lane.

Figure 9 illustrates the school site generated trips for the weekday AM and PM peak hours based on the above assumptions.

Figure 9: Site Generated Trips



3.1.2 Background Network Travel Demand

3.1.2.1 Transportation Network Plans

The City's 2013 Transportation Master Plan identified the realignment of Greenbank Drive south of the Jock River, through Half Moon Bay West as illustrated in Figure 8; however, the realignment is currently on hold pending funding. The City has indicated that the realignment is not likely to occur within the time horizon of this study. As such, northbound trips to/from Half Moon Bay West that would normally have been assigned to Greenbank Road, will use Flagstaff Drive to access Borrisokane Road to the north or use Cambrian Road to travel east, then north.

3.1.2.2 Background Growth

All traffic generated along Flagstaff Drive and Main Halyard Lane will be a directly attributed to development within the Glenview and Half Moon Bay West subdivisions. As such, no background traffic growth is expected on these roadways.

3.1.2.3 Other Developments

As noted in **Section 2.1.3.4**, there are several background developments in the study area. The Glenview and Half Moon Bay West developments are expected to generate all traffic volumes on Flagstaff Drive and Main Halyard Lane.

Half Moon Bay West

The Half Moon Bay West Community Transportation Study, November 2016, evaluated the impact of the community site trips on the arterial road network, limiting the analysis to the four community access intersections, located at the intersections of Borrisokane Road and Flagstaff Drive; Cambrian Road and Apolune Street; and, two access points to the realigned Greenbank Road to the east.

An Addendum was undertaken in 2017, which modified the land use slightly and removed commercial lands in favour of apartment dwelling units. The City was not able to provide the 2017 addendum; however, it was our understanding that the addendum report also adjusted the trip assignment by eliminating trips to/from the north on Greenbank Road.

A 2019 addendum letter was produced which further modified the draft plan, and reduced the number of dwelling units. The 2019 land uses were:

- 446 Single Family Houses;
- 455 Residential Town Homes; and,
- 72 Apartments.

Since the 2017 addendum was unavailable and the 2019 addendum did not provide traffic volume forecasts, the 2019 proposed land uses were used to generate trips based on the Trans Trip Manual, October 2020 edition methodology. Refer to **Appendix B** for further information.

The number of vehicle trips generated by the Half Moon Bay West subdivision is summarized in **Table 7**. Additional person trip generation rates for the background development are contained in **Appendix B**.

Table 7: Half Moon Bay Vehicle Trip Generation

Land Use	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Single Family	67	157	224	160	98	258
Townhouse	43	101	144	96	59	155
Apartment	5	11	16	9	6	15
Total	**115**	**269**	**384**	**265**	**163**	**428**

Trips were assigned to the road network in keeping with the November 2016 CTS; however, adjustments were made to reflect the delayed status of the Greenbank Road extension. Given that the Greenbank

Road realignment will not be in place within the time horizon of this study, trips that would have been assigned to Greenbank Road north were either assigned to Borrisokane Road or to Greenbank Road via Cambrian Road. The trip distribution of the background trips are indicated in **Table 8**.

Table 8: Half Moon Bay West Trip Assignment

Cardination Direction (relative to site)	Percentage
North via Borrisokane Road	59.5%
South via Borrisokane Road	5%
East via Cambrian Road	17.5%
Other via Greenbank Road and Cambrian Road	18%
Total	**100%**

Glenview Developments

The 3387 Borrisokane Road CTS, Addendum 1, May 2017 anticipated that the Glenview Subdivision would develop with 116 single family homes, 92 townhomes and a school site (the subject development).

The current subdivision plan includes 132 single dwelling units and 95 townhomes. The Glenview Development trip generation has been updated to reflect the updated unit count and the Trans Trip Manual, October 2020 methodology; refer to **Appendix C for further information**. The development trips were assigned to the local road network in keeping with the May 2017 report trip distribution.

Table 9 indicates the number of trips anticipated to be generated by the Glenview Subdivision.

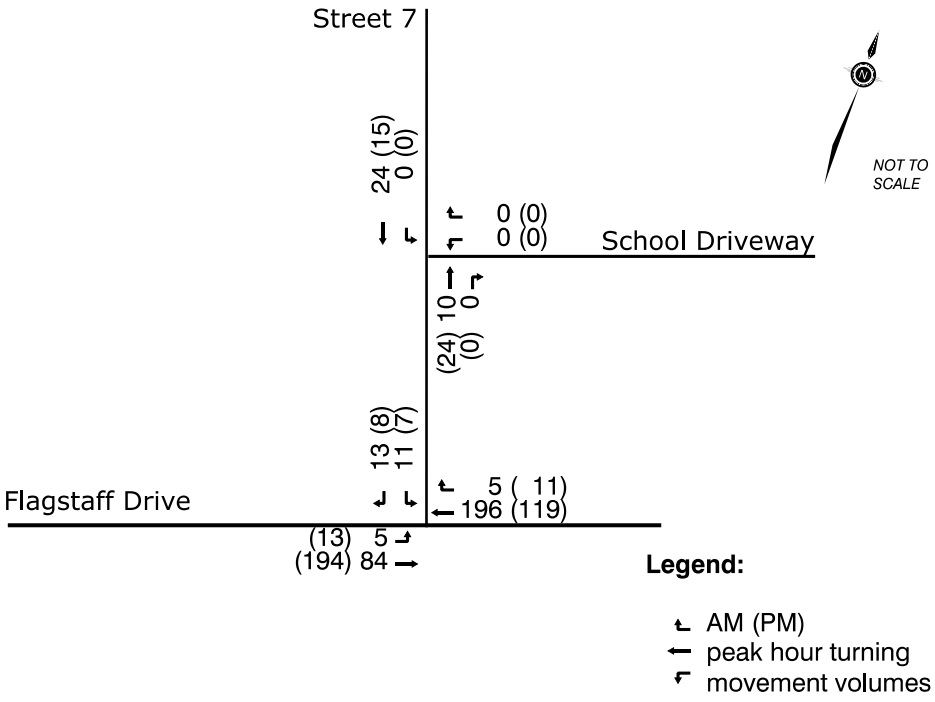
Table 9: Glenview Developments Vehicle Trip Generation

	AM Vehicle Trips			PM Vehicle Trips		
Land Use	In	Out	Total	In	Out	Total
Single Family	20	46	66	47	29	76
Townhomes	9	21	30	20	13	33
Total Trips	29	67	96	67	42	109

3.1.3 Traffic Volumes

Figure 10 illustrate the 2023 background traffic volumes on Flagstaff Drive and Main Halyard Lane.

Figure 10: 2023 Background Traffic Volumes



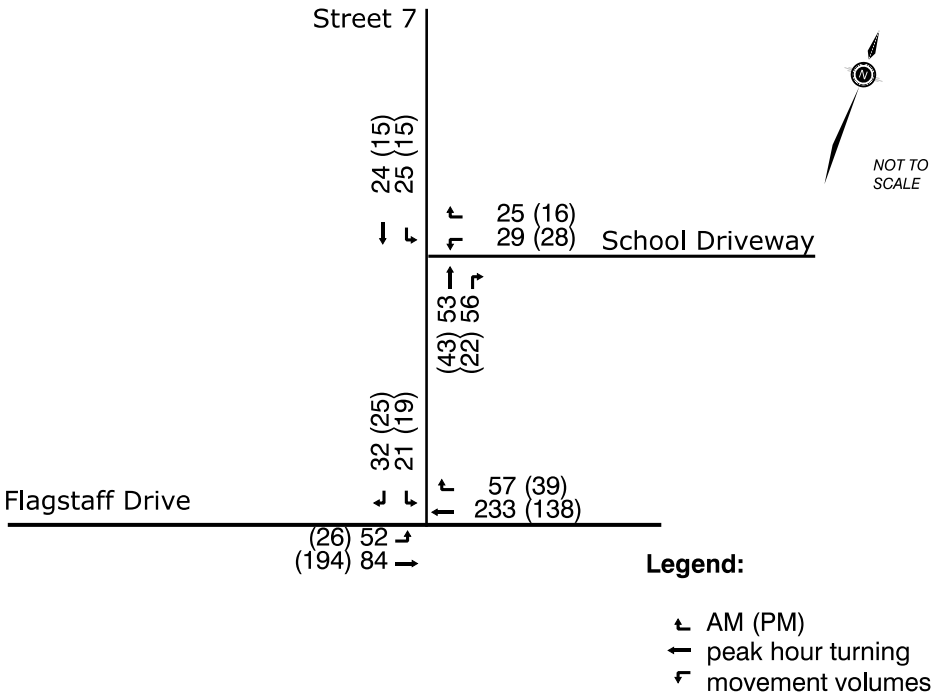
3.2 Demand Rationalization

The proposed development is not anticipated to increase traffic volumes significantly. Traffic volumes along Flagstaff Drive are not anticipated to exceed capacity. For these reasons demand rationalization was not completed.

3.3 Total Traffic Forecasts

Figure 11 illustrates the forecasted 2023 total traffic volumes, which include the school site traffic, and the Glenview and Half Moon Bay West developments. A "build-out-plus-5-years" analysis (as per the TIA guidelines) was not performed since the 2023 and 2028 traffic volumes are anticipated to be the same; the surrounding subdivisions will be built out and no further traffic volume growth is anticipated. It is noted however that Flagstaff Drive traffic volumes will ultimately will be lower in the future when the Greenbank Road extension is open.

Figure 11: 2023 Total Traffic Volumes



4.0 Analysis

4.1 Development Design

4.1.1 Design for Sustainable Modes

Bicycle facilities: several bike racks are proposed on the north and south sides of the school. There are direct and convenient paved surfaces to access all other areas of the school. A total of six bike racks are proposed, providing 54 bicycles bike parking spaces.

Pedestrian access and circulation: there are five (5) access doors to the school. The sidewalk and paved surfaces around the school provide direct access from the school bus layby to the main school entrance. Paved surfaces around the school also provide direct and convenient access from the staff parking lot, bicycle parking areas, childcare centre, and drop-off / pick-up layby area to the school and childcare entrances.

Transit facilities: Transit stops are expected on Flagstaff Drive; however, the final design plans were not available at the time of producing this document. The location of transit facilities should be identified in the overall Glenview Development subdivision plan. Sidewalks are to be provided on both sides of Flagstaff Drive, and will provide high quality connections to the school site.

4.1.2 Circulation and Access

There will be an on-street layby on Main Halyard Lane for school buses and an on-street layby on Flagstaff Drive for parents dropping off and picking up students. The school will have one driveway to Main Halyard Lane, for access to the staff parking lot. The staff parking lot also contains the waste bins and will function as a drop-off / pick-up area for the childcare facility.

School bus layby: the school bus layby will provide approximately 140 metres of storage space, capable of servicing 10 full size school buses at one time. The school board indicated there will nine (9) school buses when the school opens and up to 11 school buses in the future when portables are added. If the buses sizes are mixed or if not all buses are present at the same time, the layby will adequately service the future bus layby demands. If all buses are full sized and present at one time, an additional space will be required within the parent drop-off/pickup layby along Flagstaff Drive.

Parent drop-off / pick-up layby: the parent drop-off / pick-up layby on Flagstaff Drive will provide approximately 112 metres between the Flagstaff Drive and Main Halyard Lane intersection and the eastern edge of the school property. The parking bay provides storage space for approximately 18 vehicles. During the morning drop-off period it is forecast up to 100 vehicles will be using the drop-off parking spaces over a 20-minute period, requiring each drop-off space to process (turnover) 5.5 vehicles

(100/18) in the 20-minute period in advance of the bell time. Therefore, an average drop-off duration of less than 4 minutes (20/5.5) per vehicle is required, which is achievable.

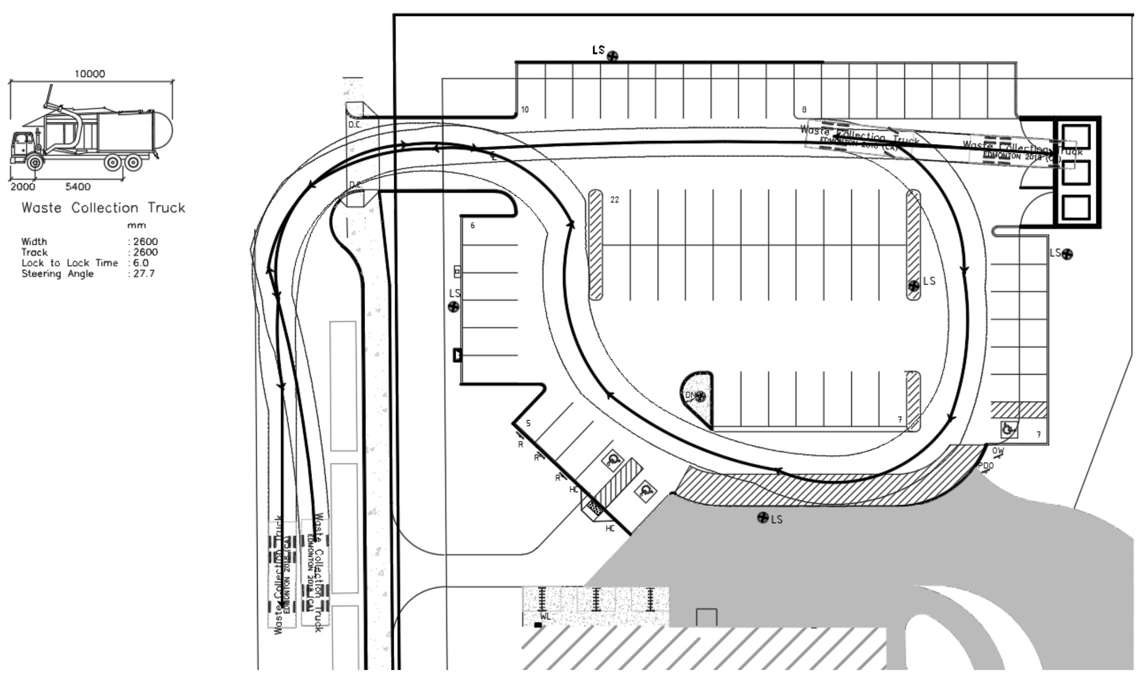
During the PM peak hour of the street, pick-ups are forecast to occur over a 20-minutes interval. The after school pickup demand is 59 vehicles, requiring each pickup space to process (turnover) 3.2 vehicles (41/18) in a 20-minute period. The average pickup duration should not exceed approximately 6 minutes. During the PM peak hour, parents picking up may also using the school parking lot.

The Flagstaff Drive on-street layby extends across the school frontage. The subdivision design will incorporate the Neighbourhood Collector Streets design philosophy which will extend the parking bay design providing additional vehicle parking area. In addition, the bus layby area along Main Halyard Lane may be longer than required for the school buses servicing the site, and a portion of this length could be allocated to parent drop-off/pickup activity once busing needs are confirmed.

Waste collection: the staff parking lot will be marked using painted lines. Parking end isles will be painted, therefore waste collection vehicles will be able to easily maneuver through the parking lot on weekends or after the school day has finished.

Figure 12 illustrates the waste collection truck easily manoeuver in and out of the site, which was produced using AutoTURN software.

Figure 12: Waste Collection Truck Turning Templates



Childcare drop-off / pick-up area: the childcare drop-off / pick-up area is located within the staff parking lot and has approximately 30 metres designated for a drop-off/pick-up area, which can accommodate approximately five (5) vehicles at a time. There are up to 18 drop-offs/pick-ups that may need to occur within an hour, which would require that each drop-off/pick-up parking space to process three (3) vehicles per hour (18/5). The drop-offs and pick-ups would therefore need to be less than 17 minutes (60/3.6). There is adequate short-term parking space for the childcare drop-off and pick-up activity.

4.2 Parking

4.2.1 Parking Supply

Automobile Parking – As per City of Ottawa Zoning By-law 2008-250 (Sections 101 and 102), the minimum parking space rate is 1.5 parking spaces per classroom and one parking spaces per 50 m^2 of childcare space. Initially there will be 22 classrooms with up to 12 portables in the future. Therefore, 39 parking spaces[2] are required at school opening and 57 parking spaces[3] may be required if the school expands. The site plan shows that 50 parking spaces will be provided at build-out and 65 parking spaces could be provided if the school expands. The site plan shows that the parking supply is adequate for build-out and for possible future expansion.

Bicycle Parking – As per City of Ottawa Zoning By-law 2016-249 (Section 111), the minimum bicycle parking rate is 1 bicycle parking space per 100 m^2 of school gross floor area and 1 bicycle parking space per 250 m^2 of childcare space. Therefore, 47 bicycle parking spaces[4] are required, the site plan provides 54 spaces with six (6) bicycle parking racks. Therefore the site plan meets the zoning bylaw requirements.

4.3 Boundary Street Design

The design of the boundary streets are the responsibility of the Glenview Subdivision. The site and the adjacent road network are currently undeveloped greenfields. The road network has not been constructed and the Glenview Subdivision has not received final approval. The subdivision design is being undertaken by others.

City staff have indicated that Flagstaff Drive is to be designed in accordance with the City of Ottawa *Designing Neighbourhood Collector Streets* policy, which requires the use of parking layby lanes, narrow roadways, streetscaping, and boulevard bike lanes and sidewalks on both sides of the roadway.

[2] 22 classrooms x 1.5 spaces/classroom + 275 sq.m. daycare x 1 parking space / 50 sq.m daycare = 39 spaces
[3] (22 classrooms + 12 portables) x 1.5 spaces/classroom + 275 sq.m. daycare x 1 parking space / 50 sq.m daycare = 57 spaces
[4] 4,647 sq.m gross school floor area x 1 bicycle parking space / 100 sq.m + 275 sq.m. daycare x 1 bicycle parking space / 250 sq.m. daycare = 47 bicycle parking spaces

4.3.1 Mobility

The Multi-Modal Level of Service (MMLOS) was evaluated for Flagstaff Drive to assist with developing a concept that maximizes the achievement of the MMLOS objectives. Since the development is within 300 metres of a school (the site itself), it is subject to MMLOS targets of the school policy area. Note that there are no targets for trucks on a Collector roadway within the school policy area, and there are no targets for auto traffic between intersections (there are targets for auto traffic at signalized intersections only).

Table 10 presents the MMLOS conditions for roadway segments meeting the City 24-metre right-of-way Collector Road design standard. This MMLOS analysis is based on assumed conditions at build-out, which includes a boulevard bike lane and sidewalk on both sides of Flagstaff Drive. We have assumed that Flagstaff Drive would have a posted speed limit of 40 km/h.

The analysis shows that all MMLOS targets are met for cycling and transit modes if Flagstaff Drive is designed in accordance with the Designing Neighbourhood Collector Streets policy. The MMLOS targets for pedestrians is not met and could only be met if the traffic operating speed were less than 30 km/h.

It is recommended that the intersection of Flagstaff Drive and Main Halyard Lane include lane narrowing bulb-outs to reduce the pedestrian crossing distances and to act as a traffic calming measure. It is also recommended that a pedestrian crossover be provided at the intersection crossing Flagstaff Drive.

Table 10: MMLOS Conditions - Segments

Travel Mode	Criteria	Target	Flagstaff Drive Collector Road (24 A or B)
Pedestrian LOS	Sidewalk width Boulevard width AADT > 3000	A	2 metres 0.5 – 4 metres Yes (assume 10x multiplier for AM peak hour volumes)
	On-Street Parking Operating Speed **Level of Service**		Yes > 30 or 50 km/h **B**
Cycling LOS	Type of facility Number of travel lanes Bike lane width	B	Physically Separated 2 ~ 2.0 m
	Operating speed Centreline (yes/no) Bike lane blockage frequency		< 50 km/h No Low
	Level of Service		**A**
Transit LOS	Type of facility Parking/driveway friction **Level of Service**	D	Mixed traffic Limited / Low **D**

4.3.2 Road Safety

The roadways have not been constructed, there is no existing collision history within the study area.

4.4 Access Intersection Design

4.4.1 Location and Design of Driveway

The site driveway is located on Main Halyard Lane providing a single lane in and out of the site. The site driveway is 6.7 metres wide and provides a clear throat distance of 10 metres from the property line. This meets the requirements of the City of Ottawa Private Approach Bylaw (#2003-447).

4.4.2 Intersection Control

The site driveway will be located on a low-volume Local roadway; therefore Stop-Control (TWSC) facing traffic exiting the site driveway is appropriate.

4.4.3 Intersection Design

Table 11 summarizes the traffic operational results for the intersection of Main Halyard Lane and the Site Driveway for the 2023 full buildout weekday AM and PM peak hours. **Appendix D** contains the intersection performance worksheets. Assuming single lane approaches and a Stop sign facing traffic exiting the school, the driveway intersection will operate at a LOS A.

Table 11: Site Driveway and Main Halyard Lane Intersection Operations

Approach/ Movement	Volume	Delay (s)	LOS	V/C	Q95th (m)
WB LR	54 (44)	9.4 (9.1)	A (A)	0.07 (0.05)	1.7 (1.3)
NB TR	109 (65)	0.0 (0.0)	A (A)	0.07 (0.04)	0.0 (0.0)
SB LT	49 (30)	3.9 (3.7)	A (A)	0.02 (0.01)	0.4 (0.3)

Note: Results are presented in the format AM (PM) peak hour; Q95th (m) indicates the 95th percentile queues, LOS is an abbreviation for Level-of-Service, EB = eastbound, WB = westbound, SB = southbound; LTR = left, through, right movements for single lane

4.5 Transportation Demand Management

The proposed school will have 36 staff and up to 800 students if an when all 12 portables are in operation; 20% of students are anticipated walk to school, approximately 2% of students are anticipated to bike to school (likely will be higher during fair weather). The majority of students will take the school bus. Students are expected to arrive between 8:30 AM and 9:00 AM and leave at 3:30 PM.

The majority of staff are expected to drive to school due to free parking, its location in a developing neighbourhood, and the lack of rapid transit facilities. Staff are expected to arrive at least half an hour before school starts and leave shortly after school ends. It is likely that some staff may ride transit; however, it is not likely to be a significant mode share.

Appendix E contains the TDM checklists. From the TDM checklists, some recommendations are as follows: display relevant transit schedules and route maps at entrances, provide links to OC Transpo and STO information on the school board website, and provide shower and lockers for staff use (these measures are provided). The school board should also consider offering preloaded PRESTO cards to encourage commuters to use transit, or provide reimbursement of monthly transit passes for employees.

4.6 Neighbourhood Traffic Management

Main Halyard Lane is a local street and therefore the design of the roadway must consider the City's *Local Residential Street 30 km/h Design Toolbox* policy. The forecast weekday AM peak hour total traffic volumes between Flagstaff Drive and the school driveway is 162 vehicles per hour. During the PM peak hour, the traffic volume is 109 vehicles per hour.

To the north of the school driveway, the AM and PM peak hour traffic volumes are forecast below the hourly threshold of 120 vehicles per hour for a local roadway.

Given that the school activity is concentrated, neighbourhood traffic management is not deemed necessary.

4.7 Transit

The proposed school is anticipated to generate a small number of transit trips and therefore transit service will not be impacted.

Transit service and stop locations will be addressed through the overall plan of the subdivision, by others.

4.8 Review of Network Concept

Most of the trips are internal to the subdivision. The site is not expected to generate more than 200 person trips in excess of the equivalent volume permitted by established zoning.

4.9 Intersection Design – Flagstaff Drive and Main Halyard Lane

The appropriate intersection traffic control provides free flow movements along Flagstaff Drive and Stop control facing Main Halyard Lane. The lane geometry should provide a single approach lane in each direction.

4.9.1 Intersection Design

The intersection of Flagstaff Drive and Main Halyard Lane is forecast to operate at a very good LOS in 2023 when the subdivision is completely built-out. **Table 12** provides the results of the intersection

traffic operational analysis. The southbound shared movements approach is forecast to operate at LOS B, while the eastbound and westbound shared movement approaches are forecast to operate at LOS A during the weekday AM and PM peak hours.

Table 12: Flagstaff at Main Halyard Lane Intersection Operations

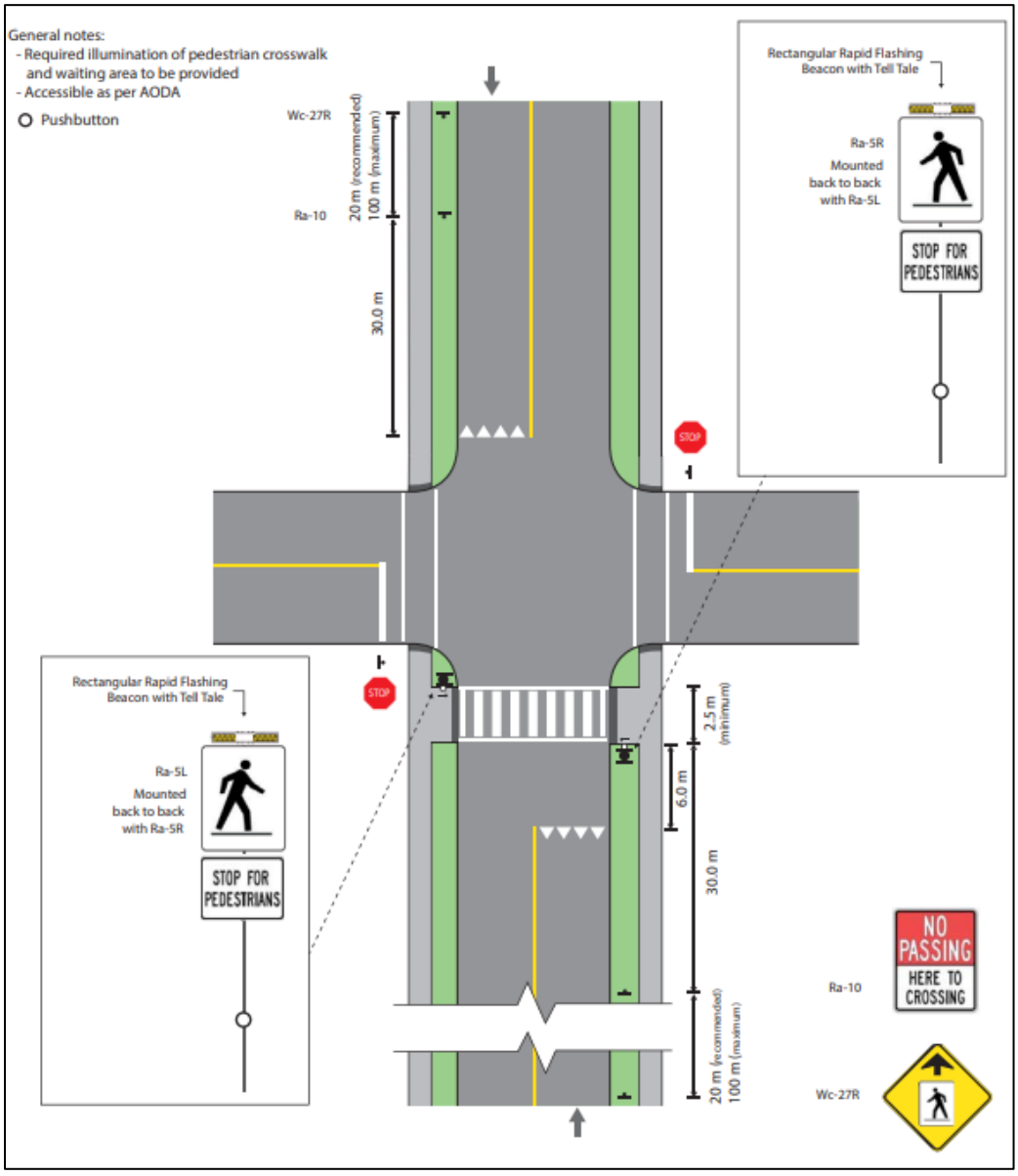
Approach / Movement	Volume	Delay (s)	LOS	V/C	Q95th (m)
EB LT	136 (220)	3.3 (1.1)	A (A)	0.05 (0.02)	1.2 (0.5)
WB TR	290 (177)	0.0 (0.0)	A (A)	0.19 (0.11)	0.0 (0.0)
SB LR	53 (44)	11.2 (10.5)	B (B)	0.09 (0.07)	2.4 (1.8)

Note: Results are presented in the format AM (PM) peak hour; Q95th (m) indicates the 95th percentile queues, LOS is an abbreviation for Level-of-Service, * EB = eastbound, WB = westbound, SB = southbound; LTR = left, through, right movements for single lane

4.9.2 Pedestrian Crossing

The school site is forecast to generate 160 students walking trips each day. Some of these trips will travel north from the site; however, a large portion can be expected to travel south and cross Flagstaff Drive. Based on the pedestrian activity related to the school and the overall demands of the subdivision and future recreational facilities, it is recommended that a pedestrian crossover (PXO) be included at the Flagstaff Drive and Main Halyard Lane intersection. The crossing type should be confirmed through the subdivision process; however, our initial assessment indicates a Level 2, Type C intersection crossing is an appropriate treatment, as illustrated in **Figure 13**. The PXO should include appropriate school crossing signage and pavement markings. The need for a school crossing guard should be evaluated once the school is open and the warrant process should be updated over time as the subdivision builds out.

Figure 13: Pedestrian Crossover Level 2 Type C - Intersection



Source: Ontario Traffic Manual Book 15

5.0 Summary/Conclusions

The Ottawa Catholic School Board is proposing to construct a new elementary school and childcare facility to be located in the Glenview Homes development area, west of Half Moon Bay West. The site is located on the north side of Flagstaff Drive on the east side of Main Halyard Lane, approximately 350 metres west of Apolune Street. The proposed single storey elementary school is 4,630 m^2 (49,837 sq. ft.) and will provide a 276 m^2 (2,970 sq. ft) childcare facility. The site plan includes the potential for 12 future portable classrooms. The school is planned to be open in September 2023. The site zoning permits a school and childcare facility.

The site plan provides appropriate bicycle parking facilities, a total of six bike racks are proposed, each capable of supporting 9 bikes, for a total of 54 bike parking spaces. Pedestrian access from the public sidewalks are well defined and lead to the school accesses doors. Adequate parking is provided to address the school parking demands and the short-term parking needs of the childcare centre.

The design of the boundary streets, Flagsaff Drive and Main Halyard Lane, are the responsibility of the others. Main Halyard Lane is a local street and therefore the design must consider the City's *Local Residential Street 30 km/h Design Toolbox* policy. The proposed site plan includes a defined parking layby area on Main Halyard Lane to accommodate up to 10 school busses. Flagstaff Drive is a proposed collector roadway, City policy is to design collector roadways in accordance with the *Designing Neighbourhood Collector Streets* policy which requires in boulevard cycling facilities, parking bays, and other features to calm traffic. The site plan proposes drop-off/pickup parking layby lanes on Flagstaff Drive adjacent the school frontage, which is in keeping with these policies.

Assuming that the boundary roadways are designed according to City policy, it is forecast that Flagstaff Drive will meet the MMLOS targets for cycling and transit, however will only achieve a pedestrian LOS B. The site driveway and Main Halyard Lane intersection is forecast to operate at LOS A with very little delay during the weekday AM and PM peak hours. The school driveway should be Stop sign controlled. Main Halyard Lane should be operate with free flow traffic conditions.

The intersection of Flagstaff Drive and Main Halyard Lane is forecast to operate at a very good LOS, with the eastbound and westbound shared movement lanes operating under free flow conditions at LOS A. The southbound shared lane approach with Stop sign control is forecast to operate at LOS B during the AM and PM peak hours. It is recommended that the intersection of Flagstaff Drive and Main Halyard Lane include lane narrowing bulb-outs to reduce the pedestrian crossing distances and to act as a traffic calming measure. It is recommended that a PXO be provided on the east leg of Flagstaff Drive at Main Halyard Lane, by others. The PXO should include appropriate school crossing and crossing ahead signage. The crossing type should be confirmed through the subdivision process. The need for a school crossing guard should be evaluated once the school is open and the warrant process should be updated over time as the subdivision builds out.

The following TDM measures are to be provided:

- Display relevant transit schedules and route maps at school entrances;
- Provide links to OC Transpo and STO information on the school board website
- Provide shower and lockers for staff use (these measures are provided); and,
- Consider offering preloaded PRESTO cards to encourage commuters to use transit, or provide reimbursement of monthly transit passes for employees.

Appendix A

Trans Trip Generational Manual Data – October 2020

3.2 Recommended Residential Trip Generation Rates

A blended trip rate was developed from the three data sources through application of a rank-sum weighting process, considering the strengths and weaknesses of each dataset for the dwelling type in question. The recommended blended **residential person-trip rates** are presented in **Table 3**. All rates represent person-trips per dwelling unit and are to be applied to the **AM or PM peak period.**

Table 3: Recommended Residential Person-trip Rates

ITE Land Use Code	Dwelling Unit Type	Period	Person-Trip Rate
210	Single-detached	AM	2.05
		PM	2.48
220	Multi-Unit (Low-Rise)	AM	1.35
		PM	1.58
221 & 222	Multi-Unit (High-Rise)	AM	0.80
		PM	0.90

3.3 Adjustment Factors – Peak Period to Peak Hour

The various trip generation data sources require some adjustment to standardize the data for developing robust blended trip rates. The peak period conversion factor in **Table 4** may be used where applicable to develop trip generation rate estimates in the desired format.

Table 4: Adjustment Factors for Residential Trip Generation Rates

Factor	Application	Apply To	Period	Value
Peak Period Conversion Factor	**Peak period to peak hour conversion.** Because the 2020 TRANS Trip Generation Study reports trip generation rates by peak period, factors must be applied if the practitioner requires peak hour rates. In practice, the conversion to peak hour trip rates should occur **after** the application of modal shares.	Person-trip rates per peak period	AM	0.50
			PM	0.44
		Vehicle trip rates per peak period	AM	0.48
			PM	0.44
		Transit trip rates per peak period	AM	0.55
			PM	0.47
		Cycling trip rates per peak period	AM	0.58
			PM	0.48
		Walking trip rates per peak period	AM	0.58
			PM	0.52

Table 6: Residential Mode Share for Single-Detached Housing

District	Period	Mode				
		Auto Driver	Auto Pass.	Transit	Cycling	Walking
Ottawa Centre	AM	37%	13%	17%	9%	25%
	PM	36%	12%	13%	8%	30%
Ottawa Inner Area	AM	36%	13%	17%	9%	25%
	PM	35%	12%	13%	9%	30%
Île de Hull	AM	46%	13%	13%	0%	28%
	PM	53%	12%	11%	0%	24%
Ottawa East	AM	45%	15%	20%	9%	11%
	PM	48%	15%	17%	9%	12%
Beacon Hill	AM	51%	15%	20%	2%	12%
	PM	52%	21%	16%	4%	8%
Alta Vista	AM	49%	15%	21%	4%	11%
	PM	52%	18%	16%	3%	12%
Hunt Club	AM	48%	15%	29%	1%	7%
	PM	51%	19%	23%	1%	7%
Merivale	AM	52%	16%	21%	3%	8%
	PM	54%	18%	17%	3%	9%
Ottawa West	AM	43%	15%	19%	6%	16%
	PM	43%	13%	15%	6%	23%
Bayshore/Cedarview	AM	49%	15%	27%	2%	7%
	PM	52%	18%	21%	2%	7%
Hull Périphérie	AM	49%	17%	22%	4%	8%
	PM	51%	18%	18%	4%	9%
Orleans	AM	48%	14%	27%	1%	9%
	PM	54%	17%	22%	1%	6%
South Gloucester / Leitrim	AM	54%	24%	12%	1%	9%
	PM	55%	25%	9%	1%	10%
South Nepean	AM	51%	14%	25%	1%	9%
	PM	53%	19%	18%	1%	10%
Kanata - Stittsville	AM	52%	15%	20%	1%	12%
	PM	56%	19%	14%	1%	9%
Plateau	AM	47%	17%	24%	4%	7%
	PM	49%	19%	21%	3%	9%
Aylmer	AM	53%	17%	23%	2%	6%
	PM	55%	21%	17%	2%	5%
Pointe Gatineau	AM	55%	15%	22%	2%	7%
	PM	55%	17%	19%	2%	7%
Gatineau Est	AM	54%	16%	20%	0%	10%
	PM	60%	18%	14%	1%	7%
Masson-Angers	AM	62%	13%	13%	11%	1%
	PM	62%	18%	12%	8%	1%
Other Rural Districts	AM	60%	14%	24%	2%	0%
	PM	67%	17%	14%	2%	0%

Table 7: Residential Mode Share for Low-Rise Multifamily Housing

District	Period	Mode				
		Auto Driver	Auto Pass.	Transit	Cycling	Walking
Ottawa Centre	AM	27%	9%	25%	9%	30%
	PM	31%	10%	20%	9%	30%
Ottawa Inner Area	AM	27%	8%	26%	9%	30%
	PM	31%	9%	20%	9%	31%
Île de Hull	AM	27%	9%	25%	9%	30%
	PM	34%	22%	16%	5%	22%
Ottawa East	AM	36%	11%	38%	7%	8%
	PM	39%	16%	29%	5%	11%
Beacon Hill	AM	45%	9%	35%	1%	10%
	PM	48%	16%	24%	1%	11%
Alta Vista	AM	38%	15%	35%	1%	10%
	PM	38%	19%	31%	2%	10%
Hunt Club	AM	44%	11%	38%	1%	6%
	PM	47%	15%	29%	1%	8%
Merivale	AM	44%	11%	32%	6%	7%
	PM	44%	12%	29%	4%	11%
Ottawa West	AM	36%	12%	24%	10%	19%
	PM	35%	12%	16%	10%	27%
Bayshore/Cedarview	AM	43%	11%	31%	1%	13%
	PM	44%	14%	25%	1%	15%
Hull Périphérie	AM	46%	22%	22%	4%	6%
	PM	46%	17%	22%	3%	11%
Orleans	AM	47%	15%	29%	1%	9%
	PM	51%	19%	24%	1%	6%
South Gloucester / Leitrim	AM	59%	20%	16%	1%	4%
	PM	62%	18%	17%	1%	3%
South Nepean	AM	49%	13%	26%	2%	9%
	PM	49%	13%	24%	2%	12%
Kanata - Stittsville	AM	52%	14%	22%	0%	11%
	PM	58%	17%	17%	0%	8%
Plateau	AM	44%	18%	28%	4%	6%
	PM	47%	17%	26%	2%	8%
Aylmer	AM	52%	18%	23%	0%	7%
	PM	52%	16%	20%	1%	12%
Pointe Gatineau	AM	46%	17%	23%	0%	14%
	PM	52%	16%	19%	1%	12%
Gatineau Est	AM	54%	17%	20%	1%	8%
	PM	56%	21%	16%	0%	7%
Masson-Angers	AM	60%	15%	21%	4%	1%
	PM	63%	15%	17%	3%	1%
Other Rural Districts	AM	66%	13%	21%	1%	0%
	PM	62%	19%	16%	3%	0%

Table 8: Residential Mode Share for High-Rise Multifamily Housing

District	Period	Mode				
		Auto Driver	Auto Pass.	Transit	Cycling	Walking
Ottawa Centre	AM	18%	2%	26%	1%	52%
	PM	17%	9%	21%	1%	52%
Ottawa Inner Area	AM	26%	6%	28%	5%	34%
	PM	25%	8%	21%	6%	39%
Île de Hull	AM	27%	3%	37%	12%	21%
	PM	26%	8%	27%	11%	28%
Ottawa East	AM	39%	7%	38%	2%	13%
	PM	40%	14%	28%	3%	15%
Beacon Hill	AM	48%	9%	30%	3%	10%
	PM	52%	16%	28%	0%	4%
Alta Vista	AM	38%	12%	42%	2%	7%
	PM	45%	16%	28%	2%	9%
Hunt Club	AM	39%	6%	44%	1%	9%
	PM	44%	11%	35%	2%	9%
Merivale	AM	41%	6%	42%	2%	8%
	PM	41%	11%	33%	2%	13%
Ottawa West	AM	28%	11%	41%	3%	16%
	PM	33%	11%	26%	7%	23%
Bayshore/Cedarview	AM	40%	12%	38%	2%	8%
	PM	40%	15%	33%	1%	11%
Hull Périphérie	AM	48%	11%	30%	1%	10%
	PM	47%	15%	23%	3%	13%
Orleans	AM	54%	7%	29%	0%	10%
	PM	61%	13%	21%	0%	6%
South Gloucester / Leitrim	AM	50%	15%	25%	1%	9%
	PM	53%	17%	21%	1%	9%
South Nepean	AM	58%	6%	30%	2%	4%
	PM	54%	15%	25%	0%	7%
Kanata - Stittsville	AM	43%	26%	28%	0%	4%
	PM	55%	19%	21%	0%	5%
Plateau	AM	53%	9%	35%	3%	1%
	PM	65%	7%	25%	2%	1%
Aylmer	AM	45%	17%	25%	0%	13%
	PM	31%	21%	23%	4%	20%
Pointe Gatineau	AM	44%	15%	24%	3%	14%
	PM	52%	15%	20%	2%	11%
Gatineau Est	AM	53%	10%	25%	0%	12%
	PM	61%	10%	25%	0%	4%
Masson-Angers	AM	63%	15%	19%	0%	3%
	PM	64%	18%	16%	0%	1%
Other Rural Districts	AM	63%	15%	19%	0%	3%
	PM	64%	18%	16%	0%	1%

5 RESIDENTIAL DIRECTIONAL SPLITS

After calculating the total person trips generated by the development and applying the appropriate modal shares, directional factors can be applied to estimate the number of inbound and outbound trips by vehicle. The vehicle trip directional splits were developed for both the AM and PM peak periods[2]. The vehicle trip directional splits, as shown in **Table 9**, have been developed for the NCR based on a review of the local trip generator surveys as well as the latest published data in the ITE *Trip Generation Manual* (10th Edition).

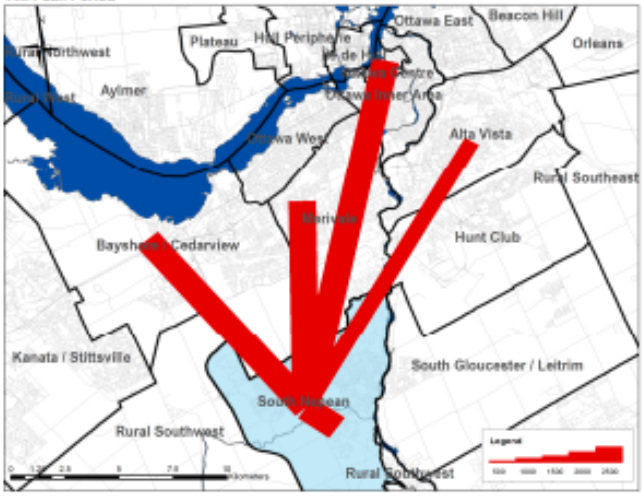
Table 9: Recommended Vehicle Trip Directional Splits (Peak Period)

ITE Land Use Code	Dwelling Unit Type	Period	Inbound	Outbound
210	Single-detached	AM	30%	70%
		PM	62%	38%
220	Multi-Unit (Low-Rise)	AM	30%	70%
		PM	56%	44%
221 & 222	Multi-Unit (High-Rise)	AM	31%	69%
		PM	58%	42%

Travel Patterns

Top Five Destinations of Trips from South Nepean

AM Peak Period



Summary of Trips to and from South Nepean

AM Peak Period (6:30 - 8:59)

Districts	Destinations of Trips From District	% Total	Origins of Trips To District	% Total
Ottawa Centre	3,820	9%	30	0%
Ottawa Inner Area	2,270	5%	340	1%
Ottawa East	630	2%	50	0%
Beacon Hill	370	1%	50	0%
Alta Vista	2,360	6%	460	2%
Hunt Club	920	2%	440	2%
Merivale	4,310	10%	790	3%
Ottawa West	1,830	4%	160	1%
Bayshore / Cedarview	3,230	8%	700	3%
Orléans	330	1%	200	1%
Rural East	20	0%	60	0%
Rural Southeast	250	1%	580	2%
South Gloucester / Leitrim	100	0%	310	1%
South Nepean	17,260	42%	17,260	74%
Rural Southwest	580	1%	970	4%
Kanata / Stittsville	1,800	4%	690	3%
Rural West	80	0%	30	0%
Île de Hull	840	2%	50	0%
Hull Périphérie	260	1%	40	0%
Plateau	0	0%	40	0%
Aylmer	60	0%	40	0%
Rural Northwest	40	0%	40	0%
Pointe Gatineau	0	0%	0	0%
Gatineau Est	0	0%	20	0%
Rural Northeast	10	0%	20	0%
Buckingham / Masson-Angers	20	0%	0	0%
Ontario Sub-Total:	40,160	97%	23,120	99%
Québec Sub-Total:	1,230	3%	250	1%
Total:	41,390	100%	23,370	100%

Trips by Trip Purpose

24 Hours	From District		To District		Within District	
Work or related	25,640	41%	5,290	8%	4,680	6%
School	5,310	8%	1,430	2%	10,610	13%
Shopping	4,940	8%	4,220	7%	12,840	16%
Leisure	6,960	11%	4,020	6%	5,760	7%
Medical	1,720	3%	900	1%	840	1%
Pick-up / drive passenger	4,040	6%	3,920	6%	7,530	9%
Return Home	11,460	18%	40,960	65%	34,630	43%
Other	2,640	4%	2,090	3%	3,020	4%
Total:	62,710	100%	62,830	100%	79,910	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Work or related	18,160	75%	2,890	47%	2,120	12%
School	3,280	14%	1,170	19%	9,180	53%
Shopping	180	1%	70	1%	720	4%
Leisure	350	1%	230	4%	220	1%
Medical	400	2%	60	1%	100	1%
Pick-up / drive passenger	1,060	4%	770	13%	2,860	17%
Return Home	210	1%	640	10%	1,070	6%
Other	520	2%	290	5%	990	6%
Total:	24,160	100%	6,120	100%	17,260	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Work or related	410	5%	290	1%	410	2%
School	250	3%	0	0%	50	0%
Shopping	900	11%	1,090	5%	2,090	11%
Leisure	1,420	17%	790	3%	1,840	10%
Medical	190	2%	230	1%	90	0%
Pick-up / drive passenger	820	10%	1,700	7%	1,610	9%
Return Home	3,800	47%	18,990	81%	11,810	64%
Other	360	4%	490	2%	540	3%
Total:	8,150	100%	23,580	100%	18,440	100%

Peak Period (%)	Total:	% of 24 Hours	Within District (%)
24 Hours	205,450		39%
AM Peak Period	47,540	23%	36%
PM Peak Period	50,170	24%	37%

Trips by Primary Travel Mode

24 Hours	From District		To District		Within District	
Auto Driver	41,340	66%	41,280	66%	39,110	49%
Auto Passenger	9,400	15%	10,030	16%	15,320	19%
Transit	9,990	16%	9,520	15%	2,260	3%
Bicycle	310	0%	320	1%	960	1%
Walk	80	0%	170	0%	13,060	16%
Other	1,600	3%	1,520	2%	9,210	12%
Total:	62,720	100%	62,840	100%	79,920	100%

AM Peak (06:30 - 08:59)	From District		To District		Within District	
Auto Driver	14,570	60%	4,360	71%	5,800	34%
Auto Passenger	1,930	8%	780	13%	3,210	19%
Transit	6,610	27%	330	5%	730	4%
Bicycle	80	0%	50	1%	320	2%
Walk	20	0%	10	0%	3,000	17%
Other	930	4%	590	10%	4,200	24%
Total:	24,140	100%	6,120	100%	17,260	100%

PM Peak (15:30 - 17:59)	From District		To District		Within District	
Auto Driver	5,840	72%	14,640	62%	8,420	46%
Auto Passenger	1,730	21%	2,680	11%	3,930	21%
Transit	350	4%	5,770	24%	650	4%
Bicycle	80	1%	110	0%	150	1%
Walk	30	0%	0	0%	3,680	20%
Other	100	1%	380	2%	1,590	9%
Total:	8,130	100%	23,580	100%	18,420	100%

Avg Vehicle Occupancy	From District	To District	Within District
24 Hours	1.23	1.24	1.39
AM Peak Period	1.13	1.18	1.55
PM Peak Period	1.30	1.18	1.47

Transit Modal Split	From District	To District	Within District
24 Hours	16%	16%	4%
AM Peak Period	29%	6%	7%
PM Peak Period	4%	25%	5%

South Nepean

Demographic Characteristics

Population	72,750	Actively Travelled	57,830
Employed Population	35,540	Number of Vehicles	44,130
Households	26,260	Area (km²)	54.8

Occupation

Status (age 5+)	Male	Female	Total
Full Time Employed	17,630	14,730	32,350
Part Time Employed	620	2,570	3,190
Student	9,910	9,420	19,340
Retiree	3,420	4,200	7,620
Unemployed	720	500	1,220
Homemaker	180	2,390	2,570
Other	270	540	810
Total:	32,750	34,350	67,100

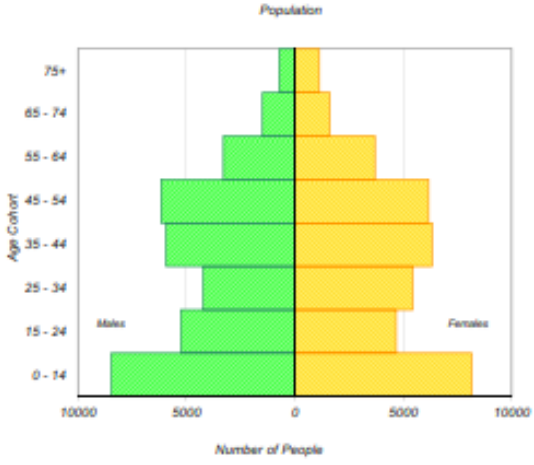
Traveller Characteristics	Male	Female	Total
Transit Pass Holders	5,590	6,100	11,700
Licensed Drivers	24,480	25,260	49,740
Telecommuters	60	310	370
Trips made by residents	88,180	97,380	185,550

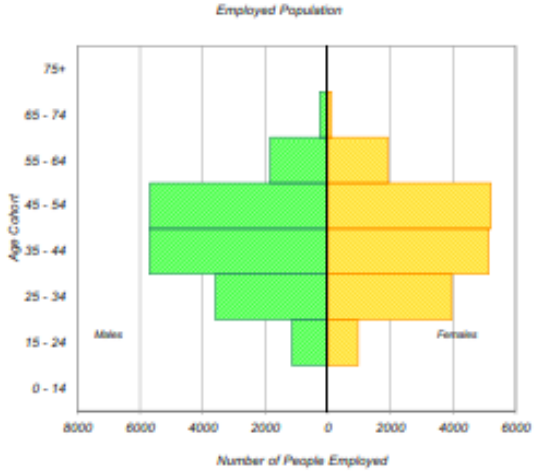
Selected Indicators	
Daily Trips per Person (age 5+)	2.77
Vehicles per Person	0.61
Number of Persons per Household	2.77
Daily Trips per Household	7.07
Vehicles per Household	1.68
Workers per Household	1.35
Population Density (Pop/km2)	1330

Household Size		
1 person	3,560	14%
2 persons	7,300	28%
3 persons	5,500	21%
4 persons	6,320	24%
5+ persons	3,590	14%
Total:	26,260	100%

Households by Vehicle Availability		
0 vehicles	810	3%
1 vehicle	9,500	36%
2 vehicles	13,800	53%
3 vehicles	1,730	7%
4+ vehicles	410	2%
Total:	26,260	100%

Households by Dwelling Type		
Single-detached	14,530	55%
Semi-detached	3,090	12%
Townhouse	7,770	30%
Apartment/Condo	870	3%
Total:	26,260	100%





* In 2005 data was only collected for household members aged 11' therefore these results cannot be compared to the 2011 data.

Appendix B

Half Moon Bay Development Trip Generation Calculations

Table 4 from Half Moon Bay West Community Transportation Study, 2016

3.3.5 Traffic Distribution and Assignment

The distribution of traffic to / from the study area was determined through examination of the TRANS Committee's *2011 Origin-Destination (O-D) Survey* for the South Nepean District.

Table 4 and **Table 5** provide a summary of the estimated distribution for the traffic generated by the proposed development.

The anticipated site traffic generated by the proposed development was assigned to the boundary road network using a logical pattern of primary roads (i.e. along arterials and collectors) and in consideration of the future road network (i.e. the future Realigned Greenbank Road) which can be seen in both tables below.

Table 4 Residential Traffic Distribution from the South Nepean District

Cardinal Direction	Via (to / from)				
	% Distribution	Borrisokane North	Borrisokane South	Cambrian Road East	Realigned Greenbank North
North	25%	10%			15%
East	25%	12.5%		7.5%	5%
South	5%		5%		
West	5%	4.5%			0.5%
Internal (South Nepean)	40%	10%		10%	20%
Total	100%	37%	5%	17.5%	40.5%

Trip Generation Calculations

		Trans Person Trips (Peak Period)		Peak Period Trips	
	Dwelling Units	AM	PM	AM	PM
Single Family	446	2.05	2.48	914	1106
TownHouse	455	1.35	1.58	614	719
Apartments	72	0.8	0.9	58	65

Single Family	Time Period		Peak Period Person Trips Generated		Peak Hour Adjustment		Peak Hour Trips		Directional Split		Single Family Trips					
	AM	PM	AM	PM	AM	PM	AM	PM	AM In	PM In	AM In	AM Out	AM Total	PM In	PM Out	PM Total
Auto Mode Share	0.51	0.53	466	586	0.48	0.44	224	258	0.3	0.62	67	157	224	160	98	258
Auto Passenger	0.14	0.19	128	210	0.48	0.44	61	92	0.3	0.62	18	43	61	57	35	92
Transit	0.25	0.18	229	199	0.55	0.47	126	94	0.3	0.62	38	88	126	58	36	94
Cycling	0.01	0.01	9	11	0.58	0.48	5	5	0.3	0.62	2	4	6	3	2	5
Walking	0.09	0.1	82	111	0.58	0.52	48	58	0.3	0.62	14	34	48	36	22	58
Total			914	1117			464	507								

Town Homes	Time Period		Peak Period Person Trips Generated		Peak Hour Adjustment		Peak Hour Trips		Directional Split		Townhouse Trips					
	AM	PM	AM	PM	AM	PM	AM	PM	AM In	PM In	AM In	AM Out	AM Total	PM In	PM Out	PM Total
Auto Mode Share	0.49	0.49	301	352	0.48	0.44	144	155	0.3	0.62	43	101	144	96	59	155
Auto Passenger	0.13	0.13	80	93	0.48	0.44	38	41	0.3	0.62	11	27	38	25	16	41
Transit	0.26	0.24	160	173	0.55	0.47	88	81	0.3	0.62	26	62	88	50	31	81
Cycling	0.02	0.02	12	14	0.58	0.48	7	7	0.3	0.62	2	5	7	4	3	7
Walking	0.09	0.12	55	86	0.58	0.52	32	45	0.3	0.62	10	22	32	28	17	45
Total			608	718			309	329			92	217	309	203	126	329

Apartments	Time Period		Peak Period Person Trips Generated		Peak Hour Adjustment		Peak Hour Trips		Directional Split		Apartment Trips					
	AM	PM	AM	PM	AM	PM	AM	PM	AM In	PM In	AM In	AM Out	AM Total	PM In	PM Out	PM Total
Auto Mode Share	0.58	0.54	34	35	0.48	0.44	16	15	0.3	0.62	5	11	16	9	6	15
Auto Passenger	0.06	0.15	3	10	0.48	0.44	1	4	0.3	0.62	0	1	1	2	2	4
Transit	0.3	0.25	17	16	0.55	0.47	9	8	0.3	0.62	3	6	9	5	3	8
Cycling	0.02	0	1	0	0.58	0.48	1	0	0.3	0.62	0	1	1	0	0	0
Walking	0.04	0.07	2	5	0.58	0.52	1	3	0.3	0.62	0	1	1	2	1	3
			57	66			28	30								

Total Trips	AM In	AM Out	AM Total	PM In	PM Out	PM Total
Auto Mode Share	115	269	384	265	163	428
Auto Passenger	29	71	100	84	53	137
Transit	67	156	223	113	70	183
Cycling	4	10	14	7	5	12
Walking	24	57	81	66	40	106
Total	239	563	802	535	331	866

Appendix C

Glenview Subdivision Trip Generation Calculations

Table 4 from 3387 Borriskoane Road Community Transportation Study - Addendum 1, 2017

3387 BORRISOKANE ROAD
COMMUNITY TRANSPORTATION STUDY / TRANSPORTATION IMPACT STUDY
ADDENDUM 1
MAY 2017

FUTURE TRANSPORTATION ENVIRONMENT

Table 4 Traffic Distribution from the South Nepean District

CARDINAL DIRECTION	VIA (TO / FROM)			
	% Distribution	Borrisokane North	Borrisokane South	Existing Greenbank North
North	25%	20%		5%
East	25%	12.5%		12.5%
South	5%		5%	
West	5%	5%		
Internal (South Nepean)	40%	12%		28%
Total	**100%**	**49.5%**	**5%**	**45.5%**

Figure 8 illustrates the assignment of total site traffic volumes to the boundary road network.

		Trans Person Trips (Peak Period)		Peak Period Trips	
	Dwelling Units	AM	PM	AM	PM
Single Family	132	2.05	2.48	271	327
TownHouse	95	1.35	1.58	128	150

Single Family	Time Period		Peak Period Person Trips Generated		Peak Hour Adjustment		Peak Hour Trips		Directional Split		Single Family Trips					
	AM	PM	AM	PM	AM	PM	AM	PM	AM In	PM In	AM In	AM Out	AM Total	PM In	PM Out	PM Total
Auto Mode Share	0.51	0.53	138	173	0.48	0.44	66	76	0.3	0.62	20	46	66	47	29	76
Auto Passenger	0.14	0.19	38	62	0.48	0.44	18	27	0.3	0.62	5	13	18	17	10	27
Transit	0.25	0.18	68	59	0.55	0.47	37	28	0.3	0.62	11	26	37	17	11	28
Cycling	0.01	0.01	3	3	0.58	0.48	2	1	0.3	0.62	1	1	2	1	0	1
Walking	0.09	0.1	24	33	0.58	0.52	14	17	0.3	0.62	4	10	14	11	6	17
Total			271	330			137	149								

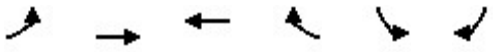
Town Homes	Time Period		Peak Period Person Trips Generated		Peak Hour Adjustment		Peak Hour Trips		Directional Split		Townhouse Trips					
	AM	PM	AM	PM	AM	PM	AM	PM	AM In	PM In	AM In	AM Out	AM Total	PM In	PM Out	PM Total
Auto Mode Share	0.49	0.49	63	74	0.48	0.44	30	33	0.3	0.62	9	21	30	20	13	33
Auto Passenger	0.13	0.13	17	20	0.48	0.44	8	9	0.3	0.62	2	6	8	6	3	9
Transit	0.26	0.24	33	36	0.55	0.47	18	17	0.3	0.62	5	13	18	11	6	17
Cycling	0.02	0.02	3	3	0.58	0.48	2	1	0.3	0.62	1	1	2	1	0	1
Walking	0.09	0.12	12	18	0.58	0.52	7	9	0.3	0.62	2	5	7	6	3	9
Total			128	151			65	69			19	46	65	44	25	69

Single Family + Town Homes	AM In	AM Out	AM Total	PM IN	PM Out	PM Total
Total Vehicles	29	67	96	67	42	109

Appendix D

Intersection Performance Worksheets

DILLON CONSULTING



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	52	84	233	57	21	32
Future Volume (Veh/h)	52	84	233	57	21	32
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	57	91	253	62	23	35
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	315				489	284
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	315				489	284
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	95				96	95
cM capacity (veh/h)	1245				514	755

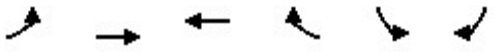
Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	148	315	58
Volume Left	57	0	23
Volume Right	0	62	35
cSH	1245	1700	636
Volume to Capacity	0.05	0.19	0.09
Queue Length 95th (m)	1.2	0.0	2.4
Control Delay (s)	3.3	0.0	11.2
Lane LOS	A		B
Approach Delay (s)	3.3	0.0	11.2
Approach LOS			B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	29	25	53	56	25	24
Future Volume (Veh/h)	29	25	53	56	25	24
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	27	58	61	27	26
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	168	88			119	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	168	88			119	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	97			98	
cM capacity (veh/h)	807	970			1469	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	59	119	53
Volume Left	32	0	27
Volume Right	27	61	0
cSH	874	1700	1469
Volume to Capacity	0.07	0.07	0.02
Queue Length 95th (m)	1.7	0.0	0.4
Control Delay (s)	9.4	0.0	3.9
Lane LOS	A		A
Approach Delay (s)	9.4	0.0	3.9
Approach LOS	A		

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	19.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	26	194	138	39	19	25
Future Volume (Veh/h)	26	194	138	39	19	25
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	211	150	42	21	27
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	192				438	171
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	192				438	171
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				96	97
cM capacity (veh/h)	1381				564	873

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	239	192	48
Volume Left	28	0	21
Volume Right	0	42	27
cSH	1381	1700	704
Volume to Capacity	0.02	0.11	0.07
Queue Length 95th (m)	0.5	0.0	1.8
Control Delay (s)	1.1	0.0	10.5
Lane LOS	A		B
Approach Delay (s)	1.1	0.0	10.5
Approach LOS			B

Intersection Summary			
Average Delay		1.6	
Intersection Capacity Utilization		35.8%	ICU Level of Service A
Analysis Period (min)		15	

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	28	16	43	22	15	15
Future Volume (Veh/h)	28	16	43	22	15	15
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	30	17	47	24	16	16
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	107	59			71	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	107	59			71	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	98			99	
cM capacity (veh/h)	881	1007			1529	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	47	71	32
Volume Left	30	0	16
Volume Right	17	24	0
cSH	923	1700	1529
Volume to Capacity	0.05	0.04	0.01
Queue Length 95th (m)	1.3	0.0	0.3
Control Delay (s)	9.1	0.0	3.7
Lane LOS	A		A
Approach Delay (s)	9.1	0.0	3.7
Approach LOS	A		

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	18.4%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix E

TDM Checklists

TDM-Supportive Development Design and Infrastructure Checklist:
Non-Residential Developments (office, institutional, retail or industrial)

Legend

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

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

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

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	2.	**WALKING & CYCLING: END-OF-TRIP FACILITIES**	
	2.1	**Bicycle parking**	
REQUIRED	2.1.1	Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible *(see Official Plan policy 4.3.6)*	☒ Bicycle parking is located at north and south ends of school.
REQUIRED	2.1.2	Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas *(see Zoning By-law Section 111)*	☒
REQUIRED	2.1.3	Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored *(see Zoning By-law Section 111)*	☒
BASIC	2.1.4	Provide bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met), plus the expected peak number of customer/visitor cyclists	☒
BETTER	2.1.5	Provide bicycle parking spaces equivalent to the expected number of commuter and customer/visitor cyclists, plus an additional buffer (e.g. 25 percent extra) to encourage other cyclists and ensure adequate capacity in peak cycling season	☐
	2.2	**Secure bicycle parking**	
REQUIRED	2.2.1	Where more than 50 bicycle parking spaces are provided for a single office building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers *(see Zoning By-law Section 111)*	☐ N/A for school
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met)	☐ N/A for school
	2.3	**Shower & change facilities**	
BASIC	2.3.1	Provide shower and change facilities for the use of active commuters	☒ Shower provided for staff.
BETTER	2.3.2	In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters	☒
	2.4	**Bicycle repair station**	
BETTER	2.4.1	Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐ N/A for school

	TDM-supportive design & infrastructure measures: *Non-residential developments*		Check if completed & add descriptions, explanations or plan/drawing references
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐ N/A, shelter already provided
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐ N/A, shelter already provided
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐ N/A for school
	4.	**RIDESHARING**	
	4.1	**Pick-up & drop-off facilities**	
BASIC	4.1.1	Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☐ N/A for school
	4.2	**Carpool parking**	
BASIC	4.2.1	Provide signed parking spaces for carpools in a priority location close to a major building entrance, sufficient in number to accommodate the mode share target for carpools	☐ N/A for school
BETTER	4.2.2	At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	☐ N/A for school
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Carshare parking spaces**	
BETTER	5.1.1	Provide carshare parking spaces in permitted non-residential zones, occupying either required or provided parking spaces *(see Zoning By-law Section 94)*	☐ N/A for school
	5.2	**Bikeshare station location**	
BETTER	5.2.1	Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☐ N/A for school

		TDM-supportive design & infrastructure measures: *Non-residential developments*	Check if completed & add descriptions, explanations or plan/drawing references
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☐ N/A parking meets zoning requirements
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☐ N/A for school
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐ N/A for school
BETTER	6.1.4	Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking *(see Zoning By-law Section 111)*	☐ N/A for school
	6.2	**Separate long-term & short-term parking areas**	
BETTER	6.2.1	Separate short-term and long-term parking areas using signage or physical barriers, to permit access controls and simplify enforcement (i.e. to discourage employees from parking in visitor spaces, and vice versa)	☐ N/A for school
	7.	**OTHER**	
	7.1	**On-site amenities to minimize off-site trips**	
BETTER	7.1.1	Provide on-site amenities to minimize mid-day or mid-commute errands	☐ N/A for school

TDM Measures Checklist:
Non-Residential Developments (office, institutional, retail or industrial)

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: *Non-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	☐ N/A for school
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐ N/A for school
	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	☐ N/A for school
	2.2	**Bicycle skills training**	
		Commuter travel	
BETTER ★	2.2.1	Offer on-site cycling courses for commuters, or subsidize off-site courses	☐ N/A for school
	2.3	**Valet bike parking**	
		Visitor travel	
BETTER	2.3.1	Offer secure valet bike parking during public events when demand exceeds fixed supply (e.g. for festivals, concerts, games)	☐ N/A for school

		TDM measures: *Non-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	☒ Recommended
BASIC	3.1.2	Provide online links to OC Transpo and STO information	☒ Recommended
BETTER	3.1.3	Provide real-time arrival information display at entrances	☐ N/A for school
		3.2 Transit fare incentives	
		Commuter travel	
BETTER	3.2.1	Offer preloaded PRESTO cards to encourage commuters to use transit	☒ Recommended
BETTER ★	3.2.2	Subsidize or reimburse monthly transit pass purchases by employees	☒ Recommended
		Visitor travel	
BETTER	3.2.3	Arrange inclusion of same-day transit fare in price of tickets (e.g. for festivals, concerts, games)	☐ N/A for school
		3.3 Enhanced public transit service	
		Commuter travel	
BETTER	3.3.1	Contract with OC Transpo to provide enhanced transit services (e.g. for shift changes, weekends)	☐ N/A for school
		Visitor travel	
BETTER	3.3.2	Contract with OC Transpo to provide enhanced transit services (e.g. for festivals, concerts, games)	☐ N/A for school
		3.4 Private transit service	
		Commuter travel	
BETTER	3.4.1	Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for shift changes, weekends)	☐ N/A for school
		Visitor travel	
BETTER	3.4.2	Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for festivals, concerts, games)	☐ N/A for school

		TDM measures: *Non-residential developments*	Check if proposed & add descriptions
	4.	**RIDESHARING**	
	4.1	**Ridematching service**	
		Commuter travel	
BASIC ★	4.1.1	Provide a dedicated ridematching portal at OttawaRideMatch.com	☐ N/A for school
	4.2	**Carpool parking price incentives**	
		Commuter travel	
BETTER	4.2.1	Provide discounts on parking costs for registered carpools	☐ N/A for school
	4.3	**Vanpool service**	
		Commuter travel	
BETTER	4.3.1	Provide a vanpooling service for long-distance commuters	☐ N/A for school
	5.	**CARSHARING & BIKESHARING**	
	5.1	**Bikeshare stations & memberships**	
BETTER	5.1.1	Contract with provider to install on-site bikeshare station for use by commuters and visitors	☐ N/A for school
		Commuter travel	
BETTER	5.1.2	Provide employees with bikeshare memberships for local business travel	☐ N/A for school
	5.2	**Carshare vehicles & memberships**	
		Commuter travel	
BETTER	5.2.1	Contract with provider to install on-site carshare vehicles and promote their use by tenants	☐ N/A for school
BETTER	5.2.2	Provide employees with carshare memberships for local business travel	☐ N/A for school
	6.	**PARKING**	
	6.1	**Priced parking**	
		Commuter travel	
BASIC ★	6.1.1	Charge for long-term parking (daily, weekly, monthly)	☐ N/A for school
BASIC	6.1.2	Unbundle parking cost from lease rates at multi-tenant sites	☐ N/A for school
		Visitor travel	
BETTER	6.1.3	Charge for short-term parking (hourly)	☐ N/A for school

		TDM measures: *Non-residential developments*	Check if proposed & add descriptions
	7.	**TDM MARKETING & COMMUNICATIONS**	
	7.1	**Multimodal travel information**	
		Commuter travel	
BASIC ★	7.1.1	Provide a multimodal travel option information package to new/relocating employees and students	☐ N/A for school
		Visitor travel	
BETTER ★	7.1.2	Include multimodal travel option information in invitations or advertising that attract visitors or customers (e.g. for festivals, concerts, games)	☐ N/A for school
	7.2	**Personalized trip planning**	
		Commuter travel	
BETTER ★	7.2.1	Offer personalized trip planning to new/relocating employees	☐ N/A for school
	7.3	**Promotions**	
		Commuter travel	
BETTER	7.3.1	Deliver promotions and incentives to maintain awareness, build understanding, and encourage trial of sustainable modes	☐ N/A for school
	8.	**OTHER INCENTIVES & AMENITIES**	
	8.1	**Emergency ride home**	
		Commuter travel	
BETTER ★	8.1.1	Provide emergency ride home service to non-driving commuters	☐ N/A for school
	8.2	**Alternative work arrangements**	
		Commuter travel	
BASIC ★	8.2.1	Encourage flexible work hours	☐ N/A for school
BETTER	8.2.2	Encourage compressed workweeks	☐ N/A for school
BETTER ★	8.2.3	Encourage telework	☐ N/A for school
	8.3	**Local business travel options**	
		Commuter travel	
BASIC ★	8.3.1	Provide local business travel options that minimize the need for employees to bring a personal car to work	☐ N/A for school
	8.4	**Commuter incentives**	
		Commuter travel	
BETTER	8.4.1	Offer employees a taxable, mode-neutral commuting allowance	☐ N/A for school
	8.5	**On-site amenities**	
		Commuter travel	
BETTER	8.5.1	Provide on-site amenities/services to minimize mid-day or mid-commute errands	☐ N/A for school