CHAPEL HILL HOUSING 6102 RENAUD ROAD OTTAWA, ONTARIO

TRANSPORTATION IMPACT ASSESSMENT REVISED

January 23, 2020

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Prepared for:

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CHAPEL HILL HOUSING 6102 RENAUD ROAD OTTAWA, ONTARIO

TRANSPORTATION IMPACT ASSESSMENT - REVISED

STEP 1 - SCREENING

A Screening Form has been prepared which is included as Exhibit 1.1 in the Appendix. The Screening Form was submitted to the City of Ottawa on September 21, 2018 which determined that the requirement for a Transportation Impact Assessment (TIA) report was not triggered. Since the submission, the Site Plan has been revised to reduce the number of dwelling units and to add an access onto Renaud Road. The access would be located within the auxiliary lane of the Renaud/Saddleridge intersection and would therefore satisfy the Safety Trigger requiring the TIA Study to continue onto the next stage. 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

The owner of lands at the southeast corner of Renaud Road and Saddleridge Drive have proposed the construction of a mixture of 44 townhouses and stacked townhouses. The property is 5,774.2 m² in size and currently contains one residential house which will be demolished. Figure 2.1 shows the location of the site.

The land is currently zoned "DR" Development Reserve Zone. The Plan of Subdivision Application will include the rezoning of the land to a "R4M" Residential Fourth Density Zone allowing the construction of townhouses, stacked townhouses and a planned unit development (PUD), which will support the proposed development.

The development will contain four blocks of housing units which would be a mixture of 28 townhouses in Blocks 1 to 3 and 16 stacked townhouses in Block 4 for a total of 44 dwelling units. The site will provide 16 parking spaces for Block 4 and 4 visitor spaces. The site will have four access points. Three of the accesses will be onto Saddleridge Drive and one access onto Renaud Road. The Renaud Road access will be restricted to right-in/right-out turning movements. Five of the townhouse units located at the south portion of the site (Block 1) will have private driveways directly onto Rolling Meadow Crescent. The development is expected to be completed and occupied by the year 2022. Figure 2.2 provides a conceptual site plan of the development.

FIGURE 2.1 SITE LOCATION PLAN



NOT TO SCALE



FIGURE 2.2 CONCEPTUAL SITE PLAN

Transportation Impact Assessment REVISED

Chapel Hill Housing

6102 Renaud Road, Ottawa

Element 2.1.2 – Existing Conditions

The site is located along the south side of Renaud Road. Renaud Road is under the jurisdiction of the City of Ottawa and is designated in the *Ottawa 20/20 – Transportation Master Plan* (TMP) as an east-west two lane collector road. The speed limit along Renaud Road is 50 km./h. There are sidewalks along both the north and south sides of Renaud Road. On-street parking is prohibited within the influence of the Renaud/Saddleridge intersection from a point 50 m west of the intersection to the Renaud/Navan intersection. Renaud Road in the vicinity of the site is not designated as an "On-road Cycling Route" in the City's TMP, but cycling lanes exist along both sides of the roadway.

Saddleridge Drive is a north-south road which is adjacent to the west limit of the site development. Saddleridge Drive between Renaud Road and Joshua Street is designated as a collector road in the City's TMP. The speed limit is unposted at 50 km/h. Sidewalks exist along both the east and west sides of the road. Saddleridge Drive is not designated as an "On-road Cycling Route". On-street parking is allowed along both sides of Saddleridge Drive. Saddleridge Drive south of Joshua Street is designated as a local road.

Adjacent to the south limit of the site is Rolling Meadow Crescent. Rolling Meadow Crescent is designated as a local street in the City of Ottawa TMP.

The intersection of Renaud Road and Saddleridge Drive is a "T" intersection with Renaud Road forming the eastbound and westbound approaches, and Saddleridge Drive the northbound approach. The intersection is controlled by two-way stop signs with the stop sign placed at the northbound Saddleridge Drive approach. The intersection has the following lane configuration:

Northbound Saddleridge Drive Approach	One exclusive left turn lane (20 m storage)
	One exclusive right turn lane
Eastbound Renaud Road Approach	One shared through/right lane
Westbound Renaud Road Approach	One exclusive left turn lane (75 m storage)
	One through lane

Figure 2.3 shows the weekday peak AM and PM hour traffic counts obtained from the City of Ottawa at the intersection of Renaud Road and Saddleridge Drive. The traffic counts were taken on November 2, 2016 with the count sheets provided in the Appendix as Exhibit 2.1.

Collision reports were obtained from the City of Ottawa through Open Data Ottawa for the five year time period between the years January 1, 2014 and December 31, 2018. The collision reports were for the intersection of Renaud Road and Saddleridge Drive. Over the five year period there were 4 collisions at the Renaud/Saddleridge intersection. Table 2.1 summarizes the type and year of each collision.

FIGURE 2.3 2016 WEEKDAY PEAK AM AND PM HOUR TRAFFIC COUNTS



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TABLE 2.1 COLLISION SUMMARY – Renaud/Saddleridge

VEAD	COLLISION TYPE					TOTAL	
YEAR	REAR END	ANGULAR	TURNING	SIDESWIPE	OTHER (SMV)	IUIAL	
Renaud Road and Saddleridge Drive							
2014						0	
2015	1					1	
2016						0	
2017					1	1	
2018	1	1				<u>2</u>	
TOTAL	2	1	0	0	1	4	

Element 2.1.3 – Planned Conditions

The City of Ottawa *Transportation Master Plan 2013* was reviewed to identify transit and roadway projects in the vicinity of the development. The document identified the extension of Brian Coburn Boulevard. Phase 1 has already been completed between Mer Bleue Road and Navan Road which was identified in the TMP to take place between 2014 and 2019. Phase 2 will be the continuation of the extension of Brian Coburn Boulevard from Navan Road to Innes Road and is identified in the TMP to take place between 2020 and 2025. The alignment options are still under review.

The TMP has also identified in the "2031 Network Concept" Plan the construction of the Cumberland Transitway between Blair Road and Frank Kenny Road. The Transitway will follow the alignment of Brian Coburn Boulevard with a transit station planned at Navan Road. The TMP also identified the widening of Navan Road and reconstruction of the Renaud/Navan intersection in the "2031 Network Concept" Plan with construction dependent on roadway capacity. The alignment options are still under review.

MODULE 2.2 – Study Area and Time Periods

Element 2.2.1 – Study Area

The number of site generated trips would be low with the TIA triggered by the proximity of the Renaud Road site access to the Renaud/Saddleridge intersection. Following discussions with City of Ottawa staff, the study area for the TIA would be confined to the the right-in/right-out access onto Renaud Road, and the Renaud/Saddleridge intersection.

The study will examine the intersection geometry and roadway segments in accordance with the City of Ottawa *Transportation Impact Assessment Guidelines (2017).*

Element 2.2.2 – Time Periods

The time periods for the analysis would be determined from the background traffic for the Renaud/Saddleridge intersection. The peak hours for the analysis would be the weekday peak AM and PM hours which would coincide with the trips from a residential development.

Element 2.2.3 – Horizon Years

The residential development would be constructed in one phase with the site expected to be completed and substantially occupied by the year 2022. The TIA study will also examine the impact of the development traffic at five years beyond completion at the year 2027.

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 from Renaud Rd. will be examined			
4.1 Development Design	4.1.3 New Street Networks	Yes – The development does not propose any new municipal streets.			
4.2 Dorking	4.2.1 Parking Supply	Yes – The development will provide sufficient parking conforming to City parking Bylaws.			
4.2 Parking	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 Compone	nt				
4.5 Transportation Demand Management	All Elements	No – The study will examine the site for TDM program measures.			
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	No – City staff have requested that neighbourhood traffic management and calming be examined.			
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 development will consist of a mixture of 44 townhouses and stacked townhouses. The number of expected site generated trips utilized the trip statistical data documented in the *2009 TRANS Trip Generation Study* report. The analysis used the Blended Vehicle Trip Generation Rates from Table 3.16, of the TRANS document for ITE Land Use 224 "Semi-detached dwellings, townhouses, rowhouses". The number of site generated trips was proportioned inbound/outbound to the directional distribution shown in Table 3.17 of the document. The trips rates and distribution are shown in Table 3.1.

TABLE 3.1VEHICLE TRIP GENERATION RATES AND DIRECTIONAL SPLITS

Peak Hr.	Peak A	M Hour	Peak P	M Hour
Blended Trip Rate	0.52 T/Dwe	elling Units	0.61 T/Dw	elling Units
Directional Distribution	37% Entering	64% Exiting	53% Entering	47% Exiting

The modal split of trips was determined from the City of Ottawa document, *2011 NCR Household Origin-Destination Survey*, January 2013. The modal share used the demographic characteristics for the Orleans area, and the location of the development with respect to amenities, pedestrian and cycling facilities, and transit routes. Table 3.2 presents the modal share summary which will be used in the TIA study.

TABLE 3.2 MODE SHARE SUMMARY (Person-Trips)

Future Mode Share Targets for the Development					
Travel Mode AM PM			Rationale		
Auto Driver	55%	64%	Consistent with modal share targets		
Auto Passenger	8%	21%	and proximity to employment areas		
Transit	35%	12%			
Bicycle	1%	0%	Consistent with the 2009 TRANS and 2011 TRANS-OD reports		
Walk/Other	2%	3%			

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OC Transpo Local Route 34 and Connexion Route 225 travel along Renaud Road and Saddleridge Drive with service to the Blair Transit Station, and Connexion Route 228 along Renaud Road providing service to the Blair Transit Station and the downtown core. Although not designated as a Spine Route in the TMP, Renaud Road has cycling lanes along both sides of the road. All modes of transportation are consistent with the transportation network in the area and location of the proposed residential development.

The site generated trips were determined by the product of the number of housing units (44 dwelling units) and the trip rates during the peak hour as shown in Table 3.1. The total number of auto-trips is shown in Table 3.3. The person-trips were determined by the number of auto-trips divided by the mode share for the number of vehicle-trips. The mode share used was from Table 3.13 of the 2009 TRANS Trip Generation report for a semi-detached dwelling in a suburban area (outside the green belt). The mode share is 0.52 vehicle-trips for the peak AM hour and 0.62 vehicle-trips for the peak PM hour. Table 3.3 shows the future peak hour person-trips.

TABLE 3.3 TOTAL PEAK HOUR SITE GENERATED TRIPS

Trine	AUTO-TRIP G	GENERATION	FUTURE PERSON-TRIPS		
Trips	PEAK AM HR.	PEAK PM HR.	PEAK AM HR.	PEAK PM HR.	
44 Dwellings	23 veh.	27 veh.	44 per.	44 per.	

The peak hour person-trips per mode were determined by the product of the peak hour future person-trips from Table 3.3 and the future mode share from Table 3.2. The result is shown in Table 3.4.

TABLE 3.4FUTURE DEVELOPMENT GENERATED PERSON-TRIPS

	DEVELOPMENT GENERATED PERSON-TRIPS			
	PEAK AM HR.	PEAK PM HR.		
Auto Driver	24 per./trips	28 per./trips		
Auto Passenger	4 per./trips	9 per./trips		
Transit	15 per./trips	5 per./trips		
Bicycle	0 per./trips	0 per./trips		
Walk/Other	Nalk/Other <u>1 per./trips</u>			
Total Trips	44 per./trips	44 per./trips		

The TIA Guidelines allow for three Trip Reduction Factors that may be applied to the expected development trips. The three trip reductions would consist of trips from existing development on site, pass-by trips, and shared trips within the site between two or more uses. Although there is one residential dwelling on the site, none of the trip reduction factors were applied to the proposed development.

Element 3.1.2 – Trip Distribution

The distribution of site generated vehicle-trips was determined by applying the directional distribution shown in Table 3.1 to the Auto Driver trips shown in Table 3.4. Table 3.5 presents the distribution of vehicle-trips entering and exiting the site.

TABLE 3.5PEAK HOUR DISTRIBUTION OF VEHICLE-TRIPS

	WEEKDAY PEAK AM HR.			WEEKDAY PEAK PM HR.		
BUILDING USE	TOTAL	ENTER	EXIT	TOTAL	ENTER	EXIT
Semi-detached Dwellings	24	9 (37%)	15 (64%)	28	15 (53%)	13 (47%)

Element 3.1.3 – Trip Assignment

The distribution of site generated residential trips was determined from examination of the 2016 traffic counts at the intersection of Renaud Road and Saddleridge Drive, and the surrounding employment areas and travel routes which would represent the origin/destination of commuter trips travelling to and from work. With a large employment area in Orleans and that Navan Road would be a preferred route to major roadways and Ottawa Road 174, the majority of trips were distributed to/from the east. The following shows the origin/destination of trips:

80% To/From the East along Renaud Rd. 20% To/From the West along Renaud Rd.

The development proposes one direct access onto Renaud Road, and three accesses onto Saddleridge Drive. The site access onto Renaud Road would be restricted to right-in/right-out turning movements. Site generated trips from 21 dwelling units in Block 4 and the north half of Block 3 would be able to use the direct site access onto Renaud Road. The distribution of site generated trips was applied to the peak AM and PM hour site generated vehicle-trips presented in Table 3.5. Figure 3.1 shows the assignment of peak AM and PM hour site generated trips.

FIGURE 3.1 PEAK AM AND PM HOUR TRIP ASSIGNMENT



NOT TO SCALE

MODULE 3.2 - Background Network Traffic Demand

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 Network" projects. The TMP did identify the widening of Navan Road and reconstruction of the Renaud/Navan intersection in the "2031 Network Concept" projects which would be dependent on roadway capacity and would be completed outside the horizon year of the TIA study.

Element 3.2.2 – Background Growth

The growth in the background traffic was determined by examining the surrounding road network and the amount of future development in the vicinity of the site. The major routes in the area are Navan Road north to Innes Road and Ottawa Road 174, and east on Renaud Road towards Mer Bleue Road and Tenth Line Road. Brian Coburn Boulevard has been extended to Navan Road in 2018, and is identified in the TMP to be extended further west to Innes Road between the years 2020 and 2025. The extension of Brian Coburn Boulevard would reduce traffic along Renaud Road from future development further east at Mer Bleue Road and Tenth Line Road.

The study analysis has assumed the background traffic along Renaud Road past the site to increase at an annual compounded rate of 2.0 percent to account for development outside the study area which would not include the proposed Chapel Hill Housing Development. The growth would result from the peak hour commuter trips to/from work which would be generated by development of lands along Renaud Road and lands further east. The 2.0 percent annual compounded growth would translate to the following growth factors which were applied to the 2016 traffic counts (Figure 2.3) at all approaches to the Renaud/Saddleridge intersection.

 $2016 \rightarrow 2022 = 1.126$ $2016 \rightarrow 2027 = 1.243$

Element 3.2.3 – Other Developments

Some small residential development is proposed along Renaud Road east of Navan Road including the Trails Edge East residential development. The traffic studies for the developments have been reviewed to ensure that the assumed growth in background traffic accounts for the future development along Renaud Road. Expected site generated trips were accommodated in the assumed 2.0 percent annual growth in background traffic.

Figure 3.2 shows the 2022 peak AM and PM hour background traffic (does not include trips from Chapel Hill Housing Development), and Figure 3.3 the expected 2027 peak hour background traffic which represents five years beyond the completion of the development.

FIGURE 3.2 2022 PEAK AM AND PM HOUR BACKGROUND TRAFFIC



NOT TO SCALE

FIGURE 3.3 2027 PEAK AM AND PM HOUR BACKGROUND TRAFFIC



MODULE 3.3 - Demand Rationalization

The extension of Brian Coburn Boulevard to Navan Road in 2018 would reduce the demand on Navan Road, Renaud Road, and the Renaud/Navan intersection. Traffic along Renaud Road will be further reduced when Brian Coburn Boulevard is extended to Innes Road under Phase 2 of the TMP.

The TMP has identified in the "2031 Network Concept" Plan the widening of Navan Road and reconstruction of the Renaud/Navan intersection. These works will be completed as traffic volumes reach capacity.

The proposed Chapel Hill Housing Development would generate a small number of new trips onto the surrounding roadway network. There would be no requirement to apply measures to reduce travel demand to either background traffic or site related trips.

STEP 4 – ANALYSIS

MODULE 4.1 – Development Design

Element 4.1.1 – Design for Sustainable Modes

The Site Plan provides on-site parking for residents of the development plus 3 visitor parking spaces.

In addition to the storage of bicycles at individual homes, the site will provide a bike rack at the corner of Block 4 next to Saddleridge Drive. The number of bicycle spaces provided would satisfy the City of Ottawa By-laws. Renaud Road has cycling lanes along both sides of the road.

OC Transpo Local Route 34 and Connexion Route 225 travel along Renaud Road and Saddleridge Drive with service to the Blair Transit Station, and Connexion Route 228 along Renaud Road providing service to the Blair Transit Station and the downtown core (may change following the completion of the LRT). Bus stops are provided along Saddleridge Drive adjacent to the site and along Renaud Road at the Renaud/Saddleridge intersection.

Pedestrian sidewalks with boulevards are provided along both Renaud Road and Saddleridge Drive.

Element 4.1.2 – Circulation and Access

The site will have one access directly onto Renaud Road. The access is located approximately 52 m east of the Renaud/Saddleridge intersection (centreline to centreline). With the location placing the access within the influence of the existing westbound Renaud Road left turn lane to the Renaud/Saddleridge intersection, the access will be restricted to right-in/right-out turning movements. The turning

movements would be controlled by a traffic island or pork chop which would control the turning movements but still allow full turning movements to the residential homes along the north side of Renaud Road across from the site.

The site will have three private accesses onto Saddleridge Drive. The first access is located 27 m from the Renaud/Saddleridge intersection (centreline of access to the stop bar at the northbound Saddleridge Drive approach). The northbound Saddleridge Drive approach to the Renaud/Saddleridge intersection comprises of an exclusive left turn lane with 20 m of vehicular storage and a 25 m taper along with a northbound right turn lane. The first access to the site would be outside the storage portion of the left turn lane but within the taper portion. The second access is located 57 m and third access 87 m from the Renaud/Saddleridge intersection, both outside the influence of turning lanes at the Renaud/Saddleridge intersection.

The site will have five private driveways onto Rolling Meadow Crescent from townhouses in Block 1.

Element 4.1.3 – New Street Networks

Exempt as determined in the Scoping Document.

MODULE 4.2 – Parking

Element 4.2.1 – Parking Supply

Exempt as determined in the Scoping Document.

Element 4.2.2 – Spillover Parking

Exempt as determined in the Scoping Document.

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 Renaud Road bordering the north limit of the site, and Saddleridge Drive at the west limit.

Renaud Road is a collector road which provides pedestrian sidewalks with boulevards along both sides of the road and transit routes which access the site. Renaud Road is not designated as an On-road Cycling Route but does contain cycling lanes along both sides of the road.

Saddleridge Drive is a collector road with sidewalks and boulevards along both sides of the road. Transit service travels along Saddleridge Drive with bus stops adjacent to the site. OC Transpo provides Regular service Route 34 and Connexion Routes 225 and 228 past the site. The transit routes provide service to the Blair Transit Station.

The roads and intersections within the study area promote the safe movement of all modes of transportation and satisfy the principles of the Complete Streets document.

Traffic collisions at the Renaud/Saddleridge intersection are shown in Table 2.1 in Element 2.1.2. Over the five year period between January 1, 2014 and December 31, 2018, four collisions were recorded. The pattern of collisions did not identify any measures which could be taken to reduce the number of collisions.

MODULE 4.4 – Access Intersection Design

Element 4.4.1 – Location and Design of Access

The site would have one access onto Renaud Road which would provide an access to the units in Block 4 and half of the units in Block 3. The access would be located 52 m east of the Renaud/Saddleridge intersection (centreline to centreline). Driveways to single family homes are across from the site on the north side of Renaud Road. The access would be 6.0 m in width and would provide a clear throat distance of 6 m. Turning movements at the access onto Renaud Road would be controlled by a traffic island allowing right-in/right-out turning movements.

The three accesses onto Saddleridge Drive are located 27 m, 57 m and 87 m south of the Renaud/Saddleridge intersection (centreline of the access to northbound stop bar). All three intersections would have a width of 6.1 m with private driveways from interior housing units backing onto the access road. The interior street around Block 2 is restricted to one-way traffic with the access at 57 m functioning as an exit, and the access at 87 m functioning as an entrance to the development. There are no streets or private driveways along the west side of Saddleridge Drive across from the site.

Element 4.4.2 – Intersection Control

The access onto Renaud Road would be a right-in/right-out stop controlled access with a stop sign at the northbound access approach. The stop sign would conform to the Stop Sign "Ra-1" as documented in the Ontario Traffic Manual Book 5.

The access onto Saddleridge Drive at 27 m from Renaud Road would provide full movements with a Stop Sign "Ra-1" at the site exit. The access at 57 m from Renaud Road is an exit only with a Stop Sign "Ra-1" at the westbound exit and a Do Not Enter sign "Rb-19" facing Saddleridge Drive. The entrance only access at 87 m from Renaud Road would have a One-Way Sign "Rb-21" controlling traffic entering the development.

The recommended location of the signs is shown in Figure 2.2, Conceptual Site Plan.

Element 4.4.3 – Intersection Design

The analysis of the Renaud Road site access and Renaud/Saddleridge intersections, and Renaud Road and Saddleridge Drive road segments were completed for all modes

using the *Multi-Modal Level of Service (MMLOS) Guidelines* and the *Highway Capacity Manual (HCM) 2010.* Each mode will be addressed in the following sections:

VEHICLE LEVEL OF SERVICE (LoS) – Intersection Capacity Analysis

The analysis of the Site Access onto Renaud Road and the Renaud/Saddleridge intersections will use the *Highway Capacity Software, Version 7.7,* which uses the capacity analysis procedure as documented in the *Highway Capacity Manual (HCM) 2010 and HCM 6th Edition.*

For unsignalized intersections the level of service of each lane movement and approach is determined as a function of the delay of vehicles at the approach. The following relates the level of service of each lane movement with the expected control delay at the approach.

LEVEL OF SERVICE DELAY

Level of Service A	0-10 sec./vehicle	Little or No Delay
Level of Service B	>10-15 sec./vehicle	Short Traffic Delays
Level of Service C	>15-25 sec./vehicle	Average Traffic Delays
Level of Service D	>25-35 sec./vehicle	Long Traffic Delays
Level of Service E	>35-50 sec./vehicle	Very Long Traffic Delays
Level of Service F	>50 sec./vehicle	Extreme Delays – Demand Exceeds Capacity

The expected length of queue at the critical lane movements for an unsignalized intersection was determined by the calculation of the 95th percentile queue at the lane approach. The 95th percentile queue length is the calculated 95th greatest queue length out of 100 occurrences at a movement during a 15-minute peak period. The 95th percentile queue length is a function of the capacity of a movement and the total expected traffic, with the calculated value determining the magnitude of the queue by representing the queue length as fractions of vehicles.

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 2022 and Figure 3.3 for the year 2027). Figure 4.1 presents the total 2022 peak hour vehicular traffic and Figure 4.2 the total 2027 peak hour vehicular traffic.

Site Access and Renaud Road Intersection

The site access onto Renaud Road is a "T" intersection with Renaud Road forming the eastbound and westbound approaches, and the Site Access forming the northbound stop controlled approach. Due to the proximity of the access to the Renaud/Saddleridge intersection, the access is restricted to only right-in/right-out turning movements which would be controlled by a small island of pork chop.

FIGURE 4.1 2022 PEAK AM AND PM HOUR TOTAL TRAFFIC



FIGURE 4.2 2027 PEAK AM AND PM HOUR TOTAL TRAFFIC



The operational analysis for the year 2022 determined that the northbound Site Access right turn movement would function at a Level of Service (LoS) "A: during the peak AM hour and at a LoS "C" during the peak PM hour. The operation of the intersection is summarized in Table 4.1 with the 2022 analysis sheets provided in the Appendix as Exhibit 4.1 for the peak AM hour and Exhibit 4.2 for the peak PM hour.

TABLE 4.1 SITE ACCESS/RENAUD INTERSECTION – LoS & Delay

Intersection Approach	WEEKDAY P YEAR 2	EAK AM HOUR 022 (2027)	WEEKDAY PEAK PM HOUR YEAR 2022 (2027)	
	LoS	Delay (sec.)	LoS	Delay (sec.)
NB Right – Site Access	A (A)	9.8 (10.0)	C (C)	16.4 (18.0)

For the expected traffic at the year 2027 which represents five years beyond completion of the development, the intersection would continue to operate at the same level of service with the northbound right turn movement functioning at a LoS "A" during the peak AM hour and a LoS "C" during the peak PM hour. Table 4.1 summarizes the operation of the intersection with the analysis sheets provided as Exhibit 4.3 and 4.4. For the expected 2027 peak PM hour traffic, the 95th percentile queue at the northbound Site Access right turn movement was 0.1 vehicles. The clear throat distance was determined to be 6.0 m.

There would not be any requirements for modifications to Renaud Road with the exception of the private approach and a small traffic island to control access to the site.

Renaud Road and Saddleridge Drive Intersection

The intersection of Renaud Road and Saddleridge Drive is a "T" intersection with Renaud Road forming the eastbound and westbound approaches and Saddleridge Drive the northbound approach. The intersection is a two-way stop controlled intersection with a stop sign at the northbound Saddleridge Drive approach. The intersection has an exclusive westbound Renaud Road left turn lane and an exclusive northbound Saddleridge Drive left turn lane.

The operational analysis using the November 2, 2016 traffic counts obtained from the City of Ottawa (Exhibit 2.1) determined that all movements functioned at an acceptable level of service with the northbound Saddleridge Drive left turn movement functioning at a LoS "D" during the peak AM and a LoS "C" during the peak PM hour. Table 4.2 summarizes the 2016 operation of the intersection prior to development with the analysis sheets provided as Exhibit 4.5 and Exhibit 4.6.

TABLE 4.2 RENAUD/SADDLERIDGE INTERSECTION – LoS & Delay

Intersection Approach	WEEKDAY P YEAR 201	EAK AM HOUR 6 2022 (2027)	WEEKDAY PEAK PM HOUR YEAR 2016 2022 (2027)		
	LoS	Delay (sec.)	LoS	Delay (sec.)	
WB Left – Renaud	A A (A)	7.9 8.1 (8.2)	<i>A</i> B (B)	9.9 10.6 (11.3)	
NB Left – Saddleridge	<i>D</i> D (E)	26.0 34.3 (44.1)	C D (E)	25.033.1 (41.7)	
NB Right – Saddleridge	<i>A</i> A (B)	9.6 9.8 (10.1)	C C (C)	15.8 18.1 (20.6)	

Following the completion of the site in 2022, the intersection would function at an acceptable level of service with the northbound Saddleridge Drive left turn movement functioning at a LoS "D" during both the peak AM and PM hours. The operation of the intersection is presented in Table 4.2 with the analysis sheets provided as Exhibit 4.7 and Exhibit 4.8.

At the year 2027, the Renaud/Saddleridge intersection is continuing to operate at an acceptable level of service with the northbound Saddleridge Drive left turn lane functioning at a LoS "E" during both the peak AM and PM hours. The decrease in level of service is attributed to the increasing background traffic along Renaud Road. The operation of the intersection is summarized in Table 4.2 with the analysis sheets provided as Exhibit 4.9 and Exhibit 4.10. The maximum 95th percentile queue occurred during the peak AM hour at the northbound left turn movement with a queue of 0.9 vehicles, and during the peak PM hour at the northbound right turn movement a queue of 0.8 vehicles. The length of storage at exclusive turn lanes will accommodate the expected 95th percentile queues at the year 2027.

There would not be any requirements for modifications to intersection of Renaud Road and Saddleridge Drive due to the traffic generated by the proposed Chapel Hill Housing Development.

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 sidewalks along both sides of Renaud Road and Saddleridge Drive. Along both roads there are boulevards between the sidewalk and edge of curb. Renaud Road has a 1.5 m boulevard plus cycling lane. The PLOS analysis has assumed the boulevard and cycling lane along Renaud Road to be equivalent to a boulevard width of >2 m from a pedestrian comfort perspective. Table 4.3 presents the level of service for the street segments adjacent to the site, with the analysis provided in the Appendix.

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

Street Segment		Level of Service	Analysis
Renaud Road	Vicinity of the site	С	Exhibit 4.11
Saddleridge Drive Vicinity of the site		A	Exhibit 4.12
Intersection		Level of Service	Analysis
No signalized inters	ections within the study area	-	-

The Renaud/Saddleridge intersection is a two-way stop controlled intersection with a stop sign placed only at the northbound Saddleridge Drive approach. Traffic counts which were taken at the Renaud/Saddleridge intersection by the City of Ottawa on November 2, 2016, determined that 16 pedestrians crossed the east and west approaches of Renaud Road over the eight hour count. The pedestrian movement was mainly between the community and the bus stop for the westbound OC Transpo route. The volume of pedestrians crossing Renaud Road would not meet the warrants for a pedestrian crossover as documented in the *Ontario Traffic Manual Book 15 - Pedestrian Crossing Treatments*.

BICYCLE LEVEL OF SERVICE (BLOS)

The bicycle level of service (BLOS) was determined utilizing the City of Ottawa MMLOS Guidelines. TMP does not identify Renaud Road or Saddleridge Drive as a Spine Routes in the primary cycling network. There are cycling lanes along both sides of Renaud Road past the site. Table 4.4 presents the level of service for the road segments with the analysis sheets provided in the Appendix.

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

Street	Segment	Level of Service	Analysis
Renaud Road	Vicinity of the site	D	Exhibit 4.13
Saddleridge Drive	Vicinity of the site	В	Exhibit 4.14
Intersection		Level of Service	Analysis
No signalized inters	ections within the study area	-	-

TRANSIT LEVEL OF SERVICE (TLOS)

Transit service is provided along both Renaud Road and Saddleridge Drive. Bus stops are located along the roads adjacent to the site. There are no dedicated transit lanes in the vicinity of the site. Table 4.5 presents the level of service along the Renaud Road and Saddleridge Drive street segments which were determined from the evaluation table provided in the City of Ottawa publication, *Multi-Modal Level of Service (MMLOS) Guidelines*.

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

Street	Segment	Level of Service	Analysis
Renaud Road Vicinity of the site		D	Exhibit 4.15
Saddleridge Drive Vicinity of the site		D	Exhibit 4.16
Intersection		Level of Service	Analysis
No signalized inters	ections within the study area	-	-

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 both the Renaud Road and Saddleridge Drive segments adjacent to the site. Table 4.6 presents the truck level of service with the analysis provided in the Appendix.

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

Street	Segment	Level of Service	Analysis
Renaud Road	Vicinity of the site	В	Exhibit 4.17
Saddleridge Drive	Vicinity of the site	В	Exhibit 4.18
Intersection		Level of Service	Analysis
No signalized inters	ections within the study area	-	-

MODULE 4.5 – Transportation Demand Management

Element 4.5.1 – Context for TDM

The site is located in a suburban area well serviced by transit and pedestrian sidewalks. The area is predominantly a residential suburban area with little employment, commercial/retail, or other amenities. The level of service for vehicular traffic in the area determined that the surrounding roadway network would not be impacted by site generated traffic if it were higher than expected.

Element 4.5.2 – Need and Opportunity

The residential development is small and would generate a relatively low number of new trips. The site accesses are onto two collector roads which would have a minor impact on the surrounding residential community. Not meeting the passenger share may increase slightly the number of vehicle trips which would have only a minor impact on the roadway network due to the reserve capacity of the roads and intersections within the study area.

Element 4.5.3 – TDM Program

The TDM measures which would reduce the number of vehicle trips would mainly be the encouragement of transit use and promoting the use of light rail (LRT) from the Blair Transit Station to the downtown core. The LRT will be operational in the fall of 2019.

The study has utilized the TDM-Supportive Development Design and Infrastructure Checklist which examines the implementation of facilities that are supportive of sustainable modes. The following provides the checklist which examines the Site Plan and transportation components for the proposed residential development at 6102 Renaud Road.

TDM Measures Checklist:

Residential Developments (multi-family, condominium or subdivision)

BASIC The measure is generally feasible and effective, and in most cases would benefit the development and its users BETTER The measure could maximize support for users of sustainable modes, and optimize development performance * The measure is one of the most dependably effective tools to encourage the use of sustainable modes

	TDM	measures: Residential developments	Check if proposed & add descriptions
	1.	TDM PROGRAM MANAGEMENT	
	1.1	Program coordinator	
BASIC	★ 1.1.1	Designate an internal coordinator, or contract with an external coordinator	N/A - The 44 dwelling unit development would not warrant the need for a Program Coordinator
	1.2	Travel surveys	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	□ N/A
	2.	WALKING AND CYCLING	
	2.1	Information on walking/cycling routes & dest	tinations
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances (multi-family, condominium)	□ N/A
	2.2	Bicycle skills training	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	□ N/A

	TDM measures: Residential developments		measures: Residential developments	Check if proposed & add descriptions
		3.	TRANSIT	
	3	3.1	Transit information	
BASIC	3	3.1.1	Display relevant transit schedules and route maps at entrances (multi-family, condominium)	 Transit schedules are available online from OC Transpo
BETTER	3	3.1.2	Provide real-time arrival information display at entrances (<i>multi-family, condominium</i>)	□ N/A
	3	3.2	Transit fare incentives	
BASIC	* 3	3.2.1	Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	□ N/A
BETTER	3	3.2.2	Offer at least one year of free monthly transit passes on residence purchase/move-in	□ N/A
	3	3.3	Enhanced public transit service	
BETTER	* 3	3.3.1	Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels <i>(subdivision)</i>	□ N/A
	3	3.4	Private transit service	
BETTER	3	3.4.1	Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	□ N/A
	4	4.	CARSHARING & BIKESHARING	
	4	4.1	Bikeshare stations & memberships	
BETTER	2	4.1.1	Contract with provider to install on-site bikeshare station (<i>multi-family</i>)	N/A - Bike storage is provided on the site or within the dwellings
BETTER	2	4.1.2	Provide residents with bikeshare memberships, either free or subsidized <i>(multi-family)</i>	□ N/A
	4	4.2	Carshare vehicles & memberships	
BETTER	2	4.2.1	Contract with provider to install on-site carshare vehicles and promote their use by residents	□ N/A
BETTER	2	4.2.2	Provide residents with carshare memberships, either free or subsidized	□ N/A
	Ę	5.	PARKING	
	Ę	5.1	Priced parking	
BASIC	* 5	5.1.1	Unbundle parking cost from purchase price (condominium)	✓ Each Townhouse Unit will have their own driveway. One parking space is provided for each Stacked Townhouse Unit
BASIC	* 5	5.1.2	Unbundle parking cost from monthly rent (multi-family)	□ N/A

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

MODULE 4.6 – Neighbourhood Traffic Management

Element 4.6.1 – Adjacent Neighbourhoods

This module reviews the development's access routes and identifies any required neighbourhood traffic management (NTM) or traffic calming measures which would mitigate the impact of development trips on the surrounding streets.

The City of Ottawa has initiated a traffic calming study which will reduce the speed of traffic along Renaud Road. The study is in the initial stages and concepts are being reviewed which will be presented to the community during public consultations. The traffic calming measures are not intended to reduce the volume of traffic, but will reduce the speed of vehicles which will improve the operation of the intersections along Renaud Road and access to the community.

MODULE 4.7 - Transit

Element 4.7.1 – Route Capacity

OC Transpo provides one Local route and two Connexions routes which travel from the site to the Blair Transit Station. With the new LRT line operational in the fall of 2019, the routes should have the capacity to handle the additional transit trips from the Chapel Hill Housing Development.

Element 4.7.1 – Transit Priority

Transit priority measures would not be applicable in the suburban area with the low volume of expected site trips from the development.

MODULE 4.8 – Review of Network Concept

Exempt as determined in the Scoping Document.

MODULE 4.9 – Intersection Design

Element 4.9.1 – Intersection Control

The Renaud/Saddleridge intersection is currently a two-way stop controlled intersection. The 2016 operational analysis, and the 2027 operational analysis with the increase in background traffic and site generated trips, determined the intersection to operate at an acceptable level of service. The low volume of site generated trips would not trigger any changes in the traffic controls for the intersection.

Element 4.9.2 – Intersection Design

The Renaud Road and Saddleridge Drive street segments and intersections were analyzed to determine the level of service and compared to the MMLOS targets for pedestrians, bicycles, transit, autos and trucks. The MMLOS analysis was completed for the road segments, but was not completed for the Renaud/Saddleridge intersection since it is currently controlled by two-way stop control signs and will continue to operate at an acceptable level of service as a stop controlled intersection. The targets are shown in Exhibit 22 of the *Multi-Modal Level of Service (MMLOS) Guidelines*.

The MMLOS analysis determined that the Pedestrian, Bicycle, Transit and Truck level of service met or exceeded the targets provided in MMLOS Guidelines for road segments. Table 4.7 summarizes the MMLOS for the road segments and targets.

SECMENTS	Level of Service (LoS) – 2026				
SEGMENTS	Pedestrian	Bicycle	Transit	Auto	Truck
Renaud Road	С	D	D	-	В
Target	С	D	D	D	D
Saddleridge Drive	А	В	D	-	В
Target	С	D	D	D	D

TABLE 4.7 MULTI-MODAL (MMLOS) SUMMARY TABLE

The operation of the Renaud/Saddleridge intersection was analyzed for the existing, 2022, and 2027 operation as shown in Element 4.4.3 using the procedure documented in the *Highway Capacity Manual (HCM) 2010.* The analysis determined that the intersection functioned at an acceptable level of service and would meet the MMLOS target of a LoS "D" for the 2027 peak AM and PM hours. There would be no requirement for intersection modifications.

SUMMARY

The Site Plan Application proposes the development of a 5,774.2 m² parcel of land at 6102 Renaud Road. The development will replace the existing single family home with a mixture of 44 townhouses and stacked townhouses contained in four housing blocks. The development would have Renaud Road adjacent to the north property limit, Saddleridge Drive the west property limit, and Rolling Meadow Crescent the south property limit. The residential development is expected to be completed by 2022.

The development will have one right-in/right-out access onto Renaud Road which will service Block 4 and half of Block 3, and three accesses onto Saddleridge Drive. The three accesses onto Saddleridge Drive would provide access to all four blocks of dwellings. There would be five single family townhouse driveways onto Rolling Meadow Crescent.

The TIA analysis has examined the modes of transportation along the Renaud Road and Saddleridge Drive road segments, and the Site Access/Renaud and Renaud/Saddleridge intersections for the peak AM and PM hour of operation following development in 2022 and five years beyond completion in 2027. The transportation analysis has determined the following:

- 1. The proposed Chapel Hill Housing Development is expected to generate 9 vehicle trips entering and 15 vehicle trips exiting during the weekday peak AM hour, and 15 vehicle trips entering and 13 vehicle trips exiting during the weekday peak PM hour.
- 2. The site will have one access directly onto Renaud Road. The access is located approximately 52 m east of the Renaud/Saddleridge intersection (centreline to centreline). With the location placing the access within the influence of the existing westbound Renaud Road left turn lane to the Renaud/Saddleridge intersection, the access will be restricted to right-in/right-out turning movements. This would still allow full turning movement access to the single family homes on the north side of Renaud Road.
- 3. The MMLOS analysis of the Renaud Road and Saddleridge Drive road segments determined that the segments met or exceeded MMLOS targets for pedestrian, bicycle, transit and truck modal shares. The operational analysis of the intersections of the Site Access/Renaud and Renaud/Saddleridge determined that they would both operate at an acceptable level of service for the expected year 2027 traffic. There would be no modifications required at the Renaud/Saddleridge intersection. The Site Access/Renaud intersection would be a private approach with a traffic island or pork chop which would control the right-in/right-out turning movements. There would be no modifications to Renaud Road at the proposed Site Access.

- 4. The pedestrian movement crossing Renaud Road at the Renaud/Saddleridge intersection was examined using the November 2, 2016 traffic counts over an 8 hour time period. The analysis determined that a pedestrian crossover did not meet the warrants as documented in the *Ontario Traffic Manual Book 15.*
- 5. Neighbourhood traffic management measures are currently being examined by the City of Ottawa which will address the speed of vehicles along Renaud Road. Various measures are being evaluated which will reduce vehicular speed and increase safety along Renaud Road, as well as improve the operation of intersections which will address some of the concerns of the community.

Prepared by:

David J Walaumy

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



APPENDIX

SCREENING FORM

TRAFFIC COUNTS

TRAFFIC ANALYSIS SHEETS

EXHIBIT 1.1 SCREENING FORM

City of Ottawa 2017 TIA Guidelines Screening Form

1. Description of Proposed Development

Description of Location	
Land Use Classification	"DR" Zoning – Development Reserve Zone
Development Size (units)	52 Townhouse Units
Development Size (m ²)	-
Number of Accesses and Locations	7 single driveways onto Renaud Rd., 7 single driveways onto Rolling Meadow Dr., and 3 accesses onto Saddleridge Dr.
Phase of Development	Single Phase of development
Buildout Year	2021

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
Townhomes or apartments	90 units

	Yes	No
The housing development at 6102 Renaud Road proposes 52 Townhouse Units.		х
52 Townhouse units < 90 Minimum Development Size		

* 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, <u>the Trip Generation</u> <u>Trigger is satisfied.</u>

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?		х
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?*		Х

*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?		Х
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?		Х
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)?		Х
Is the proposed driveway within auxiliary lanes of an intersection?		Х
Does the proposed driveway make use of an existing median break that serves an existing site?		Х
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?		Х
Does the development include a drive-thru facility?		Х

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?		Х
Does the development satisfy the Location Trigger?		Х
Does the development satisfy the Safety Trigger?		Х

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

EXHIBIT 2.1 RENAUD ROAD AND SADDLERIDGE DRIVE 2016 TRAFFIC COUNTS



Comments

Transportation Services - Traffic Services Turning Movement Count - Full Study Peak Hour Diagram RENAUD RD @ SADDLERIDGE DR



Page 4 of 4

Transportation Services - Traffic Services

Work Order 36449

Turning Movement Count - Full Study Summary Report RENAUD RD @ SADDLERIDGE DR

Survey Da	te:	Wedne 2016	esday,	, Nover	nber 0)2,			Total C)bser	ved U	-Turns	5				AAD	T Fact	or
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			SAD	DLERI	DGE D	R						R	ENAL	JD RD					
		Northb	ound		S	outhbo	ound		_		Eastbo	ound			Westbo	ound			
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08:00 09:00	19	0	68	87	0	0	0	0	87	0	175	9	184	44	517	0	561	745	832
09:00 10:00	26	0	38	64	0	0	0	0	64	0	123	5	128	25	205	0	230	358	422
11:30 12:30	11	0	23	34	0	0	0	0	34	0	152	3	155	30	130	0	160	315	349
12:30 13:30	11	0	25	36	0	0	0	0	36	0	130	10	140	29	137	0	166	306	342
15:00 16:00	8	0	45	53	0	0	0	0	53	0	538	20	558	52	201	0	253	811	864
16:00 17:00	13	0	64	77	0	0	0	0	77	0	663	34	697	73	219	0	292	989	1066
17:00 18:00	8	0	41	49	0	0	0	0	49	0	724	29	753	74	208	0	282	1035	1084
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Note: These va	alues	are calcu	lated by	y multiply	ing the	totals by	y the a	ppropriate	e expans	ion fac	tor.			1.39					
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Note: These ve	olume	s are cal	culated	by multip	lying th	e Equiv	alent 1	2 hr. tota	Is by the	AADT	factor.			.90					
AVG 24Hr	188	0	608	796	0	0	0	0	796	0	4367	190	4558	778	3653	0	4431	8989	9785
Note: These v	olume	s are cal	culated	by multip	lying th	e Avera	ge Dai	ly 12 hr. t	totals by	12 to 2	4 expan	sion fac	tor.	1.31					

Comments:

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

EXHIBIT 4.1 YEAR 2022 PEAK AM HOUR TRAFFIC – Site Access/Renaud

Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information Site Information <t< th=""><th></th><th></th><th>Н</th><th>CS7</th><th>Two-</th><th>Way</th><th>Sto</th><th>p-Co</th><th>ntrol</th><th>Rep</th><th>ort</th><th></th><th></th><th></th><th></th><th></th><th></th></t<>			Н	CS7	Two-	Way	Sto	p-Co	ntrol	Rep	ort												
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Three Analyzed Peak AM Hour Peak Hour Factor 0.92 Interaction Orientation East-West Analysis Time Period (Irs) 0.25 Project Description Chapel Hill Housing U V V Service Ser	Analysis Year	2022						North	/South	Street		Site A	Access										
Intersection Orientation East-West Analysis Time Period (hrs) 0.25 Project Description Chapel Hill Housing Lanes Section Collection Colspan="4">Section Colspan="4">Colspan="4">Section Colspan="4">Section Colsp	Time Analyzed	Peak	AM Hou	r				Peak	Hour Fa	ctor		0.92											
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Lanes Verifie (1) (2 + 1) (1) (1 + 1	Project Description	Chape	el Hill Ho	ousing																			
INTERFIGURATION OF CONTRIBUTION OF CONTRILINO OF CONTRIBUTION OF CONTRIBUTION OF CONTRIBUTION OF CONTRIBUTI	Lanes	1																					
Vertical Properties Vertical Properties Vertical Properties Vertical Properties Approach Vertical Properties Vertical Properties Movement V Vertical Properties Priority U I Vertical Properties Movement U Vertical Properties Movement U O <th <="" colspan="6" th=""><th></th><th></th><th></th><th></th><th>J 4 1 4 4 1 4</th><th>n fi Maje</th><th>r • v or Street: Ea</th><th>t P C st-West</th><th>2412420</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></th>	<th></th> <th></th> <th></th> <th></th> <th>J 4 1 4 4 1 4</th> <th>n fi Maje</th> <th>r • v or Street: Ea</th> <th>t P C st-West</th> <th>2412420</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>										J 4 1 4 4 1 4	n fi Maje	r • v or Street: Ea	t P C st-West	2412420								
ApproachEast-sumUUUIRQLTRULTRULTRULTRULTRUIRIRIRIRIIRIRIIRIIRIIRIIRIIRIIRIRIRIRIIRIIRIIRIIRIIRIIRIIIRIIIRIII <td colspan="15">ahicle Volumes and Adjustments</td> <td></td>	ahicle Volumes and Adjustments																						
MovementULTRULTRULTRULTRULTRPriority1U1234U4561078910101112Number of Lanes0010010	Approach		Eastb	ound			West	bound			North	bound			South	bound							
Priority1U1U234U45678910101112Number of Lanes00100101001001001001001001001000100 </td <td>Movement</td> <td>U</td> <td>L</td> <td>Т</td> <td>R</td> <td>U</td> <td>L</td> <td>T</td> <td>R</td> <td>U</td> <td>L</td> <td>Т</td> <td>R</td> <td>U</td> <td>L</td> <td>T</td> <td>R</td>	Movement	U	L	Т	R	U	L	T	R	U	L	Т	R	U	L	T	R						
Number of Lanes001001001001000	Priority	10	1	2	3	4U	4	5	6		7	8	9		10	11	12						
Configuration I I I I I I I I R I R I	Number of Lanes	0	0	1	0	0	0	1	0		0	0	1		0	0	0						
Volume (veh/h) I 262 1 863 I 5 I I I Percent Heavy Vehicles (%) I <t< td=""><td>Configuration</td><td></td><td></td><td></td><td>TR</td><td></td><td></td><td>T</td><td></td><td></td><td></td><td></td><td>R</td><td></td><td></td><td></td><td></td></t<>	Configuration				TR			T					R										
Percent Heavy Vehicles (%) Image: Control File (%) Image: Con	Volume (veh/h)			262	1			863					5										
Proportion Time Blocked I <thi< th=""> I I <thi< td="" th<=""><td>Percent Heavy Vehicles (%)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>0</td><td></td><td></td><td></td><td></td></thi<></thi<>	Percent Heavy Vehicles (%)												0										
Percent Grade (%) Image: Second	Proportion Time Blocked																						
No No Median Type Storage Undivide State State <td>Percent Grade (%)</td> <td></td> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td>	Percent Grade (%)											0											
Median Type Storage Undivided Critical and Follow-up Headway (sec) Image: Construct of the adway (sec)	Right Turn Channelized										1	lo											
Critical and Follow-up Headway (sec) Image: Critical	Median Type Storage				Undi	vided																	
Base Critical Headway (sec) Image: Critical Headway (sec)	Critical and Follow-up He	adwa	ys																				
Critical Headway (sec) Image: Critical Headway (sec) <	Base Critical Headway (sec)												6.2										
Base Follow-Up Headway (sec) Image: Constraint of Cons	Critical Headway (sec)												6.20										
Follow-Up Headway (sec) Image: Second Se	Base Follow-Up Headway (sec)												3.3										
Delay, Queue Length, and Level of Service Flow Rate, v (veh/h) Image: Colspan="6">Service Capacity, c (veh/h) Image: Colspan="6">Service V/c Ratio Image: Colspan="6">Service Service Service <td>Follow-Up Headway (sec)</td> <td></td> <td>3.30</td> <td></td> <td></td> <td></td> <td></td>	Follow-Up Headway (sec)												3.30										
Flow Rate, v (veh/h) Image: Constraint of the symbol o	Delay, Queue Length, and	d Leve	l of S	ervice																			
Capacity, c (veh/h) Image: Capacity (veh/h)	Flow Rate, v (veh/h)												5										
v/c Ratio Image: Constraint of the con	Capacity, c (veh/h)												758										
95% Queue Length, Q ₉₅ (veh) Image: Control Delay (s/veh)	v/c Ratio												0.01										
Control Delay (s/veh) Image:	95% Queue Length, Q ₉₅ (veh)												0.0										
Level of Service (LOS) A	Control Delay (s/veh)												9.8										
Approach Delay (s/veh) 9.8 Approach LOS A	Level of Service (LOS)												A										
Approach LOS A	Approach Delay (s/veh)								-		9	.8					-						
	Approach LOS											A											

EXHIBIT 4.2 YEAR 2022 PEAK PM HOUR TRAFFIC – Site Access/Renaud

		Н	CS7	Two-	Way	Stop	p-Co	ntrol	Rep	ort						
General Information							Site	Inforr	natio	ı						
Analyst							Inters	ection		-	Site A	Access/R	enaud			
Agency/Co.							Jurisd	liction			City c	of Ottawa	а			
Date Performed	8/27/	2019					East/	West Str	eet		Rena	ud Road	8			
Analysis Year	2022						North	/South	Street		Site A	Access				
Time Analyzed	Peak	PM Hou	r				Peak	Hour Fa	ctor		0.92					
Intersection Orientation	East-V	Vest					Analy	sis Time	Period (hrs)	0.25					
Project Description	Chape	el Hill Ho	ousing													
Lanes																
				J 4 1 4 4 1	n s Majr	C + Y 1 or Street: Ea	t + r sst-West	4124500								
(ehicle Volumes and Adjustments Approach Eastbound Westbound Northbound Southbound																
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	T	R	U	L	T	R	U	L	Т	R	U	L	T	R
Priority	10	1	2	3	40	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	1		0	0	0
Configuration				TR	-		1				-	R				-
Volume (veh/h)			866	1	-		329		_	-		5		-	-	
Percent Heavy Vehicles (%)						-						0				
Proportion Time Blocked																
Percent Grade (%)											0		<u> </u>			
Right Turn Channelized				Und	i de d						10					
Critical and Fallow up Ha				Unai	vided											
Critical and Follow-up He	adway	ys				r										
Base Critical Headway (sec)												6.2				
Critical Headway (sec)										-		6.20				
Base Follow-Up Headway (sec)						-						3.3				
Follow-Up Headway (sec)		La Superior										3.30				
Delay, Queue Length, and	Leve	l of S	ervice													
Flow Rate, v (veh/h)												5		-		-
Capacity, c (veh/h)												322				
v/c Ratio												0.02				
95% Queue Length, Q ₉₅ (veh)												0.1				
Control Delay (s/veh)					_							16.4			_	
Level of Service (LOS)												C				
Approach Delay (s/veh)										16	5.4					
Approach LOS										(с					

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EXHIBIT 4.3 YEAR 2027 PEAK AM HOUR TRAFFIC – Site Access/Renaud

		Н	CS7	Two-	Way	Sto	p-Co	ntrol	Rep	ort						
General Information							Site	Inforr	natio	n						
Analyst	T						Inters	ection		_	Site A	Access/R	enaud			
Agency/Co.							Jurisd	liction			City o	of Ottawa	а			
Date Performed	8/27/	2019					East/	West Str	eet		Rena	ud Road				
Analysis Year	2027						North	/South	Street		Site A	Access				
Time Analyzed	Peak	AM Hou	r				Peak	Hour Fa	ctor		0.92					
Intersection Orientation	East-\	Vest					Analy	sis Time	Period (hrs)	0.25					
Project Description	Chape	el Hill Ho	ousing													
Lanes																
				141745C	D Maje	۲ ۹۳۲۲ or Street: Ea	t ۲ ۲ ist-West	4 1 7 4 1 1								
ehicle Volumes and Adjustments Approach Eastbound Westbound Northbound Southbound																
Approach	-	Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	10	1	2	3	40	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	1		0	0	0
	-		200	IK			052				-	ĸ				
Volume (ven/n)			289	1	-		952			-		5			-	
Percent Heavy vehicles (%)		_					-					0		-		
Proportion Time Blocked	-															
Percent Grade (%)	-															
Median Type Storage				Undi	vided						10					
Critical and Follow-up He	adway	vs		Und	videu											
Raco Critical Headway (sec)	1	,-			-	r					1	62				
Critical Headway (sec)												6.20				
Base Follow-Up Headway (sec)		_										3.2				
Follow-Up Headway (sec)				-		-						3.30				
Delay Queue Longth and	d Love	lofe	onvice													
Flow Rate v (veb/b)		1013										5				
Capacity c (veh/h)												720				
v/c Ratio	-											0.01				
95% Oueue Length, Over (veh)	-											0.0				
Control Delay (s/veh)	-	-		_								10.0	-			
Level of Service (LOS)										-		A			-	
Approach Delay (s/yeb)										10	0.0					
Approach LOS										1	A					
rippiouci cos		2.11									•					

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EXHIBIT 4.4 YEAR 2027 PEAK PM HOUR TRAFFIC – Site Access/Renaud

		Н	CS7	Two-	Way	Sto	p-Co	ntrol	Rep	ort						
General Information							Site	Inforr	natio	n						
Analyst	1						Inters	ection			Site A	Access/R	enaud			
Agency/Co.	-						Jurisd	liction			City o	of Ottaw	a			
Date Performed	8/27/	2019					East/	West Str	eet		Rena	ud Road	1			
Analysis Year	2027						North	/South	Street	-	Site A	Access				
Time Analyzed	Peak	PM Hou	r				Peak	Hour Fa	ctor		0.92					
Intersection Orientation	East-\	Nest	A.				Analy	sis Time	Period (hrs)	0.25					
Project Description	Chape	el Hill Ho	ousing													
Lanes																
				J 4 1 4 4 4 4	n si Maje	۲ ۲۰۲۰ Treet Ea	t + r ist-West	4 1 7 4 1 6								
Pehicle Volumes and Adjustments Approach Eastbound Westbound Northbound Southbound																
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	T	R	U	L	Т	R	U	L	T	R
Priority	10	1	2	3	40	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	1	<u> </u>	0	0	0
Configuration				TR			T					R				-
Volume (veh/h)			956	1			363					5	<u> </u>			-
Percent Heavy Vehicles (%)												0	<u> </u>			
Proportion Time Blocked													<u> </u>			
Percent Grade (%)											0					
Right Turn Channelized										N	10					
Median Type Storage	<u> </u>			Undi	vided											
Critical and Follow-up He	adwa	ys											201			
Base Critical Headway (sec)												6.2				
Critical Headway (sec)												6.20				
Base Follow-Up Headway (sec)												3.3				
Follow-Up Headway (sec)												3.30				
Delay, Queue Length, and	d Leve	l of S	ervice													
Flow Rate, v (veh/h)												5				
Capacity, c (veh/h)												282				
v/c Ratio												0.02				
95% Queue Length, Q ₉₅ (veh)												0.1				
Control Delay (s/veh)												18.0				
Level of Service (LOS)												С				
Approach Delay (s/veh)		_		-						1	8.0					
Approach LOS										1	с					
		2.45	-													

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EXHIBIT 4.5 YEAR 2016 PEAK AM HOUR TRAFFIC – Renaud/Saddleridge

		Н	CS7	Two-	Way	Stop	o-Co	ntrol	Rep	ort						
General Information							Site	Inform	natio	n						
Analyst							Inters	ection			Renau	ud/Sadd	leridge			
Agency/Co.							Juriso	liction			City o	of Ottawa	3			
Date Performed	8/27/	2019					East/	Nest Stre	eet		Renau	ud Road	1			
Analysis Year	2016						North	/South S	Street	-	Saddl	leridge D	Drive			
Time Analyzed	Peak	AM Hou	r				Peak	Hour Fac	ctor		0.92					
Intersection Orientation	East-\	Vest					Analy	sis Time	Period (hrs)	0.25					
Project Description	Chape	el Hill Ho	ousing													
Lanes																
Vehicle Volumes and Adjustments																
/ehicle Volumes and Adjustments																
Approach		Eastb	ound			West	oound			North	bound			South	bound	
Movement	U	L	T	R	U	L	T	R	U	L	Т	R	U	L	T	R
Priority	10	1	2	3	40	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	Т			L	-	R				
Volume (veh/h)			160	6	-	148	612		_	19		67				
Percent Heavy Vehicles (%)						2				0		5				
Proportion Time Blocked																
Percent Grade (%)											0					
Right Turn Channelized										N	lo					
Median Type Storage				Undi	vided											
Critical and Follow-up He	adwa	ys														
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.40		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.50		3.35				
Delay, Queue Length, and	l Leve	l of S	ervice													
Flow Rate, v (veh/h)						161				21		73				
Capacity, c (veh/h)						1395				192		858				
v/c Ratio						0.12				0.11		0.08				
95% Queue Length, Q ₉₅ (veh)						0.4				0.4		0.3				
Control Delay (s/veh)					-	7.9				26.0		9.6				
Level of Service (LOS)						A				D		A				
Approach Delay (s/veh)						1	.5	-		13	3.2					
Approach LOS										1	В					

EXHIBIT 4.6 YEAR 2016 PEAK PM HOUR TRAFFIC – Renaud/Saddleridge

		Н	CS7	Two-	Way	Stop	o-Co	ntrol	Rep	ort						
General Information							Site	Inforn	natio	n						
Analyst		_	_	_	_		Inters	ection	_		Rena	ud/Sadd	leridge	_	_	
Agency/Co.							Jurisd	liction			City o	of Ottawa	3			
Date Performed	8/27/.	2019					East/	Nest Stre	eet		Rena	ud Road				
Analysis Year	2016						North	/South S	Street		Sadd	leridge D	Drive			
Time Analyzed	Peak	PM Hou	r				Peak	Hour Fac	ctor		0.92					
Intersection Orientation	East-V	Nest					Analy	sis Time	Period (hrs)	0.25					
Project Description	Chape	el Hill Ho	ousing													
Lanes																
				J 4 1 J 4 1 U	n M Maju	ጉ ጦ ቀጥ 1 or Street: Ea	st-West	1 4 1 7 4 7 6 0								
ehicle Volumes and Adjustments																
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	Т	R	U	L	Т	R	U	L	Т	R	U	L	T	R
Priority	10	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	Т			L		R				
Volume (veh/h)			724	29		74	208			8		41				
Percent Heavy Vehicles (%)						1				0		5				
Proportion Time Blocked																
Percent Grade (%)											0					
Right Turn Channelized										N	lo					
Median Type Storage				Undi	vided											
Critical and Follow-up He	adway	ys														
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.40		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.50		3.35				
Delay, Queue Length, and	l Leve	l of S	ervice													
Flow Rate, v (veh/h)						80				9		45				
Capacity, c (veh/h)					-	814				189		379				
v/c Ratio						0.10				0.05		0.12				
95% Queue Length, Q ₉₅ (veh)						0.3				0.1		0.4				
Control Delay (s/veh)						9.9				25.0		15.8				
Level of Service (LOS)						A				С		С				
Approach Delay (s/veh)						2	.6			17	7.3					
Approach LOS										(с					

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EXHIBIT 4.7 YEAR 2022 PEAK AM HOUR TRAFFIC – Renaud/Saddleridge

		Н	CS7	Two-	Way	Stop	o-Co	ntrol	Rep	ort						
General Information							Site	Inforr	natio	ı						
Analyst		_	_	_	_		Inters	ection	_		Renau	ud/Sadd	leridge	_	_	
Agency/Co.							Juriso	liction			City o	of Ottawa	3			
Date Performed	8/27/	2019					East/	Nest Str	eet		Renau	ud Road	1			
Analysis Year	2022						North	/South	Street	-	Saddl	leridge [Drive			
Time Analyzed	Peak	AM Hou	r				Peak	Hour Fa	ctor		0.92					
Intersection Orientation	East-\	Vest					Analy	sis Time	Period (hrs)	0.25					
Project Description	Chape	el Hill Ho	ousing													
Lanes																
Vehicle Volumes and Adjustments																
/ehicle Volumes and Adjustments																
Approach		Eastb	ound			West	oound			North	bound			South	bound	
Movement	U	L	T	R	U	L	T	R	U	L	Т	R	U	L	Т	R
Priority	10	1	2	3	40	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			181	8	-	174	689		_	24		82			_	
Percent Heavy Vehicles (%)						2				0		5				
Proportion Time Blocked																
Percent Grade (%)									-	3	0					
Right Turn Channelized											lo					
Median Type Storage				Undr	vided											
Critical and Follow-up He	adwa	ys														
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.40		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.50		3.35				
Delay, Queue Length, and	l Leve	l of S	ervice													
Flow Rate, v (veh/h)						189				26		89				
Capacity, c (veh/h)						1366				149		832				
v/c Ratio						0.14				0.18		0.11				
95% Queue Length, Q ₉₅ (veh)						0.5				0.6		0.4				
Control Delay (s/veh)						8.1				34.3		9.8				
Level of Service (LOS)						A				D		A				
Approach Delay (s/veh)						1	.6			15	5.4					
Approach LOS										(C)					

EXHIBIT 4.8 YEAR 2022 PEAK PM HOUR TRAFFIC – Renaud/Saddleridge

HCS7 Two-Way Stop-Control Report																
General Information							Site	Inforn	natio	n						
Analyst							Inters	ection		_	Renau	ud/Sadd	leridge			
Agency/Co.							Jurisd	liction			City o	of Ottawa	3			
Date Performed	8/27/	2019					East/West Street Renaud				ud Road	1				
Analysis Year	2022						North/South Street Saddleridg				leridge D	Drive				
Time Analyzed	Peak	PM Hou	r				Peak	Hour Fac	ctor		0.92					
Intersection Orientation	East-\	West					Analy	sis Time	Period (hrs)	0.25					
Project Description	Chape	el Hill Ho	ousing													
Lanes																
Major Street East-West																
Vehicle Volumes and Adjustments																
Approach		Eastb	ound			West	oound	_		North	bound		-	South	bound	
Movement	U	L	T	R	U	L	T	R	U	L	Т	R	U	L	T	R
Priority	10	1	2	3	40	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR	-	L	1			L	-	R		_		-
Volume (veh/h)			816	35	-	95	234		-	12		51			-	
Percent Heavy Vehicles (%)						1				0		5		_		
Proportion Time Blocked					_											
Percent Grade (%)										3						
Right Turn Channelized										N	10					
Median Type Storage				Undi	vided											_
Critical and Follow-up He	adwa	ys														
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.11				6.40		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.21				3.50		3.35				
Delay, Queue Length, and	l Leve	l of S	ervice													
Flow Rate, v (veh/h)						103				13		55				
Capacity, c (veh/h)						743				141		330				
v/c Ratio						0.14				0.09		0.17				
95% Queue Length, Q ₉₅ (veh)						0.5				0.3		0.6				
Control Delay (s/veh)						10.6				33.1	· · · ·	18.1				-
Level of Service (LOS)						В				D		С				
Approach Delay (s/veh)						3	.1			21	L.O					
Approach LOS										(C)					

EXHIBIT 4.9 YEAR 2027 PEAK AM HOUR TRAFFIC – Renaud/Saddleridge

HCS7 Two-Way Stop-Control Report																
General Information							Site	Inforr	natio	n						
Analyst		_	_	_	_		Inters	ection	_		Rena	ud/Sadd	leridge	_	_	
Agency/Co.							Jurisd	liction		_	City o	of Ottawa	3			
Date Performed	8/27/	2019					East/	Nest Str	eet		Rena	ud Road	1			
Analysis Year	2027						North/South Street Saddleric				leridge [Drive				
Time Analyzed	Peak	AM Hou	r				Peak	Hour Fa	ctor		0.92					
Intersection Orientation	East-\	Vest					Analy	sis Time	Period (hrs)	0.25					
Project Description	Chape	el Hill Ho	ousing													
Lanes																
Major Street East-West																
Vehicle Volumes and Adjustments																
Approach		Eastb	ound			West	oound			North	bound			South	bound	
Movement	U	L	т	R	U	L	Т	R	U	L	Т	R	U	L	т	R
Priority	10	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Configuration				TR		L	T			L		R				
Volume (veh/h)			200	8		191	761			27		90				
Percent Heavy Vehicles (%)						2				0		5				
Proportion Time Blocked																
Percent Grade (%)											0					
Right Turn Channelized										N	10					
Median Type Storage				Undi	vided											
Critical and Follow-up He	adwa	ys														
Base Critical Headway (sec)						4.1				7.1		6.2				
Critical Headway (sec)						4.12				6.40		6.25				
Base Follow-Up Headway (sec)						2.2				3.5		3.3				
Follow-Up Headway (sec)						2.22				3.50		3.35				
Delay, Queue Length, and	l Leve	l of S	ervice													
Flow Rate, v (veh/h)						208				29		98				
Capacity, c (veh/h)						1342				121		810				
v/c Ratio						0.15				0.24		0.12				
95% Queue Length, Q ₉₅ (veh)						0.5				0.9		0.4				
Control Delay (s/veh)						8.2				44.1		10.1				
Level of Service (LOS)						A				E		В				
Approach Delay (s/veh)						1	.6			17	7.9					
Approach LOS										(с					

EXHIBIT 4.10 YEAR 2027 PEAK PM HOUR TRAFFIC – Renaud/Saddleridge

HCS7 Two-Way Stop-Control Report																
General Information							Site	Inform	natio	n						
Analyst							Inters	ection		_	Rena	ud/Sadd	leridge		_	
Agency/Co.							Jurisd	liction			City c	of Ottawa	3			
Date Performed	8/27/	2019					East/\	West Stre	eet		Rena	ud Road	0			
Analysis Year	2027						North/South Street Saddleridge				leridge [Drive				
Time Analyzed	Peak	PM Hou	r				Peak Hour Factor 0.92									
Intersection Orientation	East-	West					Analy	sis Time	Period (hrs)	0.25					
Project Description	Chap	el Hill Ho	ousing													
Lanes																
Vehicle Volumes and Adjustments																
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	10	1	2	3	40	4	5	6		/	8	9		10	11	12
Number of Lanes	0	0	1	0	0	1	1	0		1	0	1		0	0	0
Volume (ush (h)	-		001	18	-	104	250			12		R FC			-	
Persent Liener Vehicles (%)			901	50		104	239			15		50			-	
Percent Heavy vehicles (%)	-	_				1				0		5		-		
Proportion Time Blocked					-											
Percent Grade (%)	-										U Io					
Median Type Storage				Undi	vided						10					
Critical and Follow up He	adwa	ve		Und	videu											
Rate Critical Meadway (see)	auwa	ys				41				71		62		· · · ·		r
Critical Headway (sec)					-	4.1		_		6.40		6.25				-
Race Follow Up Headway (sec)	-				-	4.11				2.5		2.2				
Follow-Up Headway (sec)	-					2.21				3.50		3,35				
Deley Overse Length and		1.065								5.50		5.55				
Delay, Queue Length, and	Leve	1 01 5	ervice	1	-	112				14		61				
Flow Rate, V (ven/h)	-					113				14		61				
Capacity, c (ven/h)			_		-	084				0.12		291		_	_	
95% Queue Length Q., (uph)	-					0.17				0.13		0.21				
Control Delay (c/ush)	-	-		_		11.2				41 7		20.6			-	
Level of Service (LOS)					-	P 11.5			-	-41./ E		20.0			-	
Approach Delay (c/ueb)	-				-	2	2				16					
Approach LOS						5				2.	c					
Approach LOS																

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EXHIBIT 4.11 RENAUD ROAD - PLOS Segment Evaluation

STREET	Renaud Road
FROM	West of Renaud/Saddleridge
ТО	East of Renaud/Saddleridge
YEAR	2027
DIRECTION	Eastbound-Westbound
MMLOS MODE	PLOS

SEGMENT SCORE $\,\, C$

		Motor Vohiclo	otor Vehicle affic Volume (AADT) Presence of On- street Parking ≤30 >30 or 50>50	nt PLOS			
Sidewalk Width	Boulevard Width	Traffic Volume	Presence of On-		Operating S	Speed (km/h)	
(III)	(11)	(AADT)	Succuraiking	≤30	>30 or 50	>50 or 60	>60 1
		≤ 3000	N/A	A	A	A	В
	> 2	> 2000	Yes	A	В	В	N/A
		> 3000	No	A	В	С	D
		≤ 3000	N/A	A	A	A	В
2.0 or more	0.5 to 2	> 3000	Yes	А	В	С	N/A
		> 3000	No	A	С	D	E
		≤ 3000	NA	А	В	С	D
	0	> 3000	Yes	В	В	D	N/A
		> 3000	No	В	С	E	F
		≤ 3000	N/A	A	А	A	В
> 2	> 2	> 3000	Yes	A	В	С	N/A
		> 3000	No	А	С	D	E
		≤ 3000	N/A	А	В	В	D
1.8	1.8 0.5 to 2	> 3000	Yes	А	С	С	N/A
		> 3000	No	В	С	E	E
		≤ 3000	N/A	А	В	С	D
	0	> 3000	Yes	В	С	D	N/A
		> 3000	No	С	D	F	F
		≤ 3000	N/A	С	С	С	С
	> 2	> 3000	Yes	С	С	D	N/A
		> 5000	No	С	D	E	E
1.5		≤ 3000	N/A	С	С	С	D
	0.5 to 2	> 2000	Yes	С	С	D	N/A
		> 3000	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 4.12 SADDLERIDGE DRIVE - PLOS Segment Evaluation

STREET	Saddleridge Drive
FROM	Renaud/Saddleridge Intersection
ТО	South of Renaud/Saddleridge
YEAR	2027
DIRECTION	Northbound—Southbound
MMLOS MODE	PLOS

SEGMENT SCORE A

		Motor Vehicle			Segme	nt PLOS	
Sidewalk Width	Boulevard Width	Traffic Volume	Presence of On-		Operating S	Speed (km/h)	
(11)	(11)	(AADT)	Succer arking	≤30	>30 or 50	>50 or 60	>60 ¹
		≤ 3000	N/A	A	A	А	В
	> 2	~ 2000	Yes	A	В	В	N/A
		> 3000	No	A	В	С	D
		≤ 3000	N/A	A	A	A	В
2.0 or more	0.5 to 2	> 2000	Yes	A	В	С	N/A
		> 3000	No	A	С	D	E
		≤ 3000	NA	A	В	С	D
	0	> 2000	Yes	В	В	D	N/A
		> 3000	No	В	С	E	F
		≤ 3000	N/A	A	А	A	В
> 2	> 2	> 3000	Yes	A	В	С	N/A
		> 3000	No	A	С	D	E
	1.8 0.5 to 2	≤ 3000	N/A	A	В	В	D
1.8		> 3000	Yes	А	С	С	N/A
		> 2000	No	В	С	E	Е
		≤ 3000	N/A	A	В	С	D
	0	. 2000	Yes	В	С	D	N/A
		> 3000	No	С	D	F	F
		≤ 3000	N/A	С	С	С	С
	> 2	. 2000	Yes	С	С	D	N/A
		> 2000	No	С	D	E	Е
1.5		≤ 3000	N/A	С	С	С	D
	0.5 to 2	> 2000	Yes	С	С	D	N/A
		> 3000	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 4.13 RENAUD ROAD - BLOS Segment Evaluation

STREETRenaud RoadFROMWest of Renaud/SaddlebridgeTOEast of Renaud/SaddlebridgeYEAR2027DIRECTIONEastbound-WestboundMMLOS MODEBLOS

SEGMENT SCORE D

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, bol	lards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).	A
Bike Lanes Not Adjacent Parking La	ne - Select Worst Scoring Criteria	
	1 travel lane in each direction	A
	2 travel lanes in each direction separated by a raised median	В
No. of Travel Lanes	2 travel lanes in each direction without a separating median	С
	More than 2-travel lanes in each direction	D
	> 1.8 m wide Doke lave includes marked buffer and pavee of the width	A
Bike Lane Width	≥1.5 m to <1.8 m wide bike lane (includes marked buffer and paved gutter width)	В
	≥1.2 m to <1.5 m wide bike lane (includes marked buffer and paved gutter width)	C
	≤ 50 km/h operating speed	A
Operating Speed	60 km/h operating speed	C
	> 70 km/h operating speed	E
Bike lane blockage	Rare	A
(commercial areas)	Frequent	C
Bike Lanes Adjacent to curbside Pa	king Lane - Select Worst Scoring Criteria	
	1 travel lane in each direction	A
No. of Travel Lanes	2 or more travel lanes in each direction	
	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	A
	4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	B
Bike Lane and Parking Lane Width	4.0 m wide bike lane plue parking lane (includes marked buffer and paved guter width)	
	S 4.0 m we bike rare prosparking rare (includes marked builer and paved guiler wour)	
	< 40 km/h operating speed	A
Operating Speed	50 km/h operating speed	- <u>–</u> –
	60 km/h operating speed	D
	≥ 70 km/h operating speed	
Bike lane blockage	Rare	A
(commercial areas)	Frequent	C
Mixed Traffic		
	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential	A
	2 to 3 travel lanes; ≤ 40 km/h	В
	2 travel lanes; 50 km/h; no marked centerline or classified as residential	В
No. of Travel Lanes and Operating	2 to 3 travel area (5) kn/h APPL, ICABL, F	D
Speed	4 to 5 travel Tanès; \$ 40 km/h	D
	4 to 5 travel lanes; ≥ 50 km/h	E
	6 or more travel lanes; ≤ 40 km/h	E
	≥ 60 km/h	F
Unsignalized Crossing along Route:	no median refuge	
	3 or less lanes being crossed; ≤ 40 km/h	A
	4 to 5 lanes being crossed; ≤ 40 km/h	В
	3 or less lanes being crossed; 50 km/h	В
	4 to 5 lanes being crossed; 50 km/h	C
No. of Travel Lanes on Side Street	3 or less lange being orgested; 60 pp pr IC A RI F	C
and Operating Speed	4 to 5 lanes being corssid; 64 min/L L LICADLLL	D
	6 or more lanes being crossed; ≤ 40 km/h	E
	3 or less lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed; ≥ 50 km/h	F
	4 to 5 lanes being crossed; ≥ 65 km/h	F
Unsignalized Crossing along Route:	with median refuge (> 1.8 m wide)	
	5 or less lanes being crossed; ≤ 40 km/h	A
	3 or less lanes being crossed; 50 km/h	A
	b or more lanes being crossed; ≤ 40 km/h	В
		8
No. of Travel Lanes on Side Street		В
and Operating Speed	o or more lanes being crossed; 50 km/h	U C
,	4 to 5 lanes being crossed; 60 km/n	U D
	3 or less lanes being crossed; ≥ 65 km/h	0
	o or more lanes being crossed; bu km/n	E
	4 to 5 lanes being crossed; ≥ 65 km/h	E
	to or more lanes being crossed; ≥ 55 km/n	E E

EXHIBIT 4.14 SADDLERIDGE DRIVE - BLOS Segment Evaluation

STREET	Saddlerid
FROM	Renaud/S
ТО	South of
YEAR	2027
DIRECTION	Northbou
MMLOS MODE	BLOS

Saddleridge Drive Renaud/Saddlebridge Intersection South of Renaud/Saddlebridge 2027 Northbound-Southbound BLOS

SEGMENT SCORE B

Type of Bikeway		LOS
Physically Separated Bikeway (cycle	e tracks, protected bike lanes and multi-use paths). Physical separation refers to, but is not	^
limited to, curbs, raised medians, bol	lards and parking lanes (adjacent to the bike lane along the travelled way i.e. not curbside).	A
Bike Lanes Not Adjacent Parking La	ne - Select Worst Scoring Criteria	
	1 travel lane in each direction	A
	2 travel lanes in each direction separated by a raised median	В
No. of Travel Lanes	2 travel lanes in each direction without a separating median	С
	More than 2 travel lanes in each direction	D
	> 1.8 m wide okkulare includes marked buller in pavee guilter vidth	A
Bike Lane Width	≥1.5 m to <1.8 m wide bike lane (includes marked buffer and paved gutter width)	В
	≥1.2 m to <1.5 m wide bike lane (includes marked buffer and paved gutter width)	C
	< 50 km/h operating speed	A
Operating Speed	60 km/h operating speed	C
operating operation	> 70 km/h operating speed	F
Rike lane blockage	Rare	Δ
(commercial areas)	Frequent	C .
Riko Lanos Adiacent to curbside Da	rking Lang. Solect Moret Scoring Critoria	0
bike Lalles Aujacent to curbside Fa	1 travel less is each direction	٨
No. of Travel Lanes	2 es mere terrel lesse is seek direction	A .
	2 or more travel lanes in each direction	0
	4.5 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	A
Bike Lane and Parking Lane Width	4.25 m wide bike lane plus parking lane (includes marked buffer and paved gutter width)	В
0	≤ 4.0 m wide No (a) and Tus patin Par Par Lud s marker b Brind, Bred gutter width)	С
	≤ 40 km/h operating speed	A
Operating Speed	50 km/h operating speed	В
Operating Speed	60 km/h operating speed	D
	> 70 km/h operating speed	F
Bike lane blockage	Rare	A
(commercial areas)	Frequent	С
Mixed Traffic		
	2 travel lanes; ≤ 40 km/h; no marked centerline or classified as residential	A
	2 to 3 travel lanes: < 40 km/h	B
	2 travel lanes: 50 km/h: no marked centerline or classified as residential	В
No. of Travel Lanes and Operating	2 to 3 travel lanes: 50 km/h	
Sneed	4 to 5 travel lanes; < 40 km/h	D
opeed	4 to 5 travel lanes: > 50 km/h	F
	6 or more travel lanes: < 40 km/h	F
Unsignalized Crossing along Pouter	2 00 Killin	Г
Unsignalized Crossing along Roule.	2 estess less heirs errored of 40 km/h	٨
	A to E longe being crossed, < 40 km/h	
	2 or less losse being crossed, 5 40 kin/h	B
	4 to 5 lance being crossed, 50 km/h	
No. of Travel Lenge on Cide Otract	4 to 5 talles being crossed, 50 km/h	
No. of Travel Lanes on Side Street	A to 5 longs to compare di 66 m	
and operating speed	6 or more longe being crossed; < 40 km/b	F
	2 or loss loss being crossed; > 40 km/h	
	3 or less lanes being crossed; ≥ 65 km/n	E .
	b or more lanes being crossed; ≥ 50 km/n	
	4 to b tanes being crossed; ≥ 65 km/h	F
Unsignalized Crossing along Route:	: with median refuge (> 1.8 m wide)	
	b or less lanes being crossed; ≤ 40 km/h	A
	3 or less lanes being crossed; 50 km/h	A
	b or more lanes being crossed; ≤ 40 km/h	В
		B
No. of Travel Lanes on Side Street		B
and Operating Speed	6 or more lanes being crossed; 50 km/h	C
and openang opera	4 to 5 lanes being crossed; 60 km/h	C
	3 or less lanes being crossed; ≥ 65 km/h	D
	6 or more lanes being crossed; 60 km/h	E
	4 to 5 lanes being crossed; ≥ 65 km/h	E
	6 or more lanes being crossed: > 65 km/h	F

EXHIBIT 4.15 RENAUD ROAD - TLOS Segment Evaluation

STREET	Renaud Road
FROM	West of Renaud/Saddleridge
ТО	East of Renaud/Saddleridge
YEAR	2027
DIRECTION	Eastbound-Westbound
MMLOS MODE	TLOS

SEGMENT SCORE D

	Level/exposu frictio	ire to conge on and incid	Quantitative	1.05		
		Congestion Friction		Incident Potential	Measurement	LUS
	Segregated ROW	No	No	No	N/A	А
	No/limited parking/driveway friction	No	Low	Low	$C_f \le 60$	В
Busiane	Frequent parking/driveway friction	No	Medium	Medium	$\label{eq:constraint} \begin{array}{c} Quantitative\\ Measurement\\ \hline \\ N/A\\ \hline \\ C_f \leq 60\\ \hline \\ C_f > 60\\ \hline \\ V/Vp \geq 0.8\\ \hline \\ V/Vp \leq 0.6\\ \hline \\ V/Vp < 0.4 \end{array}$	С
	Limited parking/driveway friction	Yes	Low	Medium	$Vt/Vp \ge 0.8$	D
Mixed Traffic	Moderate parking/driveway friction	Yes	Medium	Medium	$Vt/Vp \le 0.6$	E
	Frequent parking/driveway friction	Yes	High	High	Vt/Vp < 0.4	F

Notes:

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

Vt/Vp is the ratio of average transit travel speed to posted speed limit

EXHIBIT 4.16 SADDLERIDGE DRIVE - TLOS Segment Evaluation

STREET	Saddleridge Drive
FROM	Renaud/Saddleridge Intersection
ТО	South of Renaud/Saddleridge
YEAR	2027
DIRECTION	Northbound-Southbound
MMLOS MODE	TLOS

SEGMENT SCORE D

Facility Type		Level/exposure to congestion delay, friction and incidents			Quantitative	1.05
		Congestion	Friction	Incident Potential	Measurement	LUS
	Segregated ROW	No	No	No	N/A	А
Dua lana	No/limited parking/driveway friction	No	Low	Low	$C_f \le 60$	В
F	Frequent parking/driveway friction	No	Medium	Medium	C _f > 60	С
Mixed Traffic	Limited parking/driveway friction	Yes	Low	Medium	$Vt/Vp \ge 0.8$	D
	Moderate parking/driveway friction	Yes	Medium	Medium	$Vt/Vp \le 0.6$	E
	Frequent parking/driveway friction	Yes	High	High	Vt/Vp < 0.4	F

Notes:

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

Vt/Vp is the ratio of average transit travel speed to posted speed limit

EXHIBIT 4.17 RENAUD ROAD - TkLOS Segment Evaluation

STREET	Renaud Road		
FROM	West of Renaud/Saddleridge		
ТО	East of Renaud/Saddleridge	SEGMENT SCORE	B
YEAR	2027		
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	В	А
≤3.5	С	А
≤3.3	D	С
≤3.2	E	D
≤3	F	E

EXHIBIT 4.18 SADDLERIDGE DRIVE - TkLOS Segment Evaluation

Saddleridge Drive		
Renaud/Saddleridge Intersection		
South of Renaud/Saddleridge	SEGMENT SCO	DRE B
2027		
Northbound-Southbound		
TkLOS		
	Saddleridge Drive Renaud/Saddleridge Intersection South of Renaud/Saddleridge 2027 Northbound-Southbound TkLOS	Saddleridge Drive Renaud/Saddleridge Intersection South of Renaud/Saddleridge SEGMENT SCC 2027 Northbound–Southbound 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	В	А
≤3.5	С	А
≤3.3	D	С
≤3.2	E	D
≤3	F	E