R.W. TOMLINSON EAST OXFORD PIT, MUNICIPALITY OF NORTH GRENVILLE, ONTARIO

TRAFFIC IMPACT STUDY

Presented to:

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Project No. 7312

CASTLEGLENN CONSULTANTS LTD.

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The following Traffic Impact Study (TIS) report has been produced, reviewed, and is respectfully submitted for consideration to whom it has been addressed.

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1.0 INTRODUCTION

Castleglenn Consultants Inc. was retained to undertake a Traffic Impact Study (TIS) in support of a sand and gravel pit proposed by R.W. Tomlinson within East Oxford.

The extraction site is proposed to be located along County Road 20 (CR-20) within the Municipality of North Grenville and the United County of Leeds and Grenville. The site is bounded by O'Neill Road and Pattersons Corners Road (See Exhibit 2-1).

This TIS includes the following components:

- Traffic count information that was manually collected on Thursday, December 18th, 2025 during the two 3-hour morning and afternoon peak periods (between 6:30-to-9:30 AM and 3:30-to-6:30 PM) at the following three intersections:
  - Pattersons Corners Road and O'Neill Road (2-Way STOP Controlled),
  - CR-20 and Pattersons Corners Road (2-Way STOP Controlled); and
  - CR-20 and Limerick Road (All-Way STOP Controlled).
- The above study area intersections and current (2025) traffic volumes were analyzed using intersection capacity analysis software to determine traffic operational measures. (This included levels, of service, (v/c) volume-to-capacity ratios, queue length and delay estimates),
- A description of the proposed facility, its size, anticipated haul vehicle type, and other relevant characteristics that were documented,
- The maximum extraction limit associated with the application of the proposed site, in terms of annual tonnage were documented. This was used to determine a "worst-case" traffic impact associated with the proposed pit,
- The above adjacent study area intersections and forecast (2027) traffic volumes were then analyzed to determine forecast traffic operational performance measures. (This included levels, of service, (v/c) volume-to-capacity ratios, queue length and delay estimates.),
- A review of sightlines along the proposed site access to/from the extraction site, and
- Warrants for right-turn and left-turn auxiliary lanes were undertaken for the proposed site access.

2.0 EXISTING CONDITIONS STUDY AREA AND SITE LOCATION

The proposed extraction site is located within the Municipality of North Grenville, about 10 km southwest of the former Town of Kemptville.

- The proposed primary haul route would involve travelling along CR-20 towards Highway 416 (located around 7 km east of the proposed site).
- An existing licenced pit (approx. 240 acres in size) is located east of the CR-20/Pattersons Corners intersection.

Exhibit 2-1 illustrates the general location of the proposed R.W. Tomlinson's East Oxford Extraction Site.

Exhibit 2-1: Study Area Context

2.1 STUDY AREA ROADWAYS AND INTERSECTIONS

The following sub-sections serve to characterize the primary municipal roadways and intersections within the vicinity of the proposed quarry expansion.

The Municipality of North Grenville's (MNG) Transportation Master Plan (TMP)[1] was reviewed to determine the classification of the study area roadways.

2.1.1 Roadways

COUNTY ROAD 20 (LEEDS AND GRENVILLE):

- CR-20 is an east-west two-lane undivided roadway running between CR-18 and Boundary Road in the United Counties of Leeds and Greenville. (Boundary Road is the boundary between the United County of Leeds and Grenville and the United Counties of Stormont, Dundas and Glengarry.)
- The roadway is classified as a "County Road Collector" as per the MNG TMP.
- The roadway runs through the settlements of East Oxford, Oxford Station, Millars Corners and Heckston and provides access to the Highway 416 corridor.
- The posted speed limit varies along the corridors length from 80 km/h within the rural areas and 50 km/h within the Village of East Oxford. urban areas. The posted speed fronting the proposed site access is 80 km/h.

PATTERSONS CORNERS ROAD:

- Pattersons Corners Road is a north-south two-lane undivided roadway with an unposted speed limit of 50 km/hr. The roadway is classified as "Rural" within the municipal TMP.
- The southern terminus of Pattersons Corners Road connects to CR-20. A secondary (emergency) access to the extraction site is proposed from this roadway.

O'NEILL ROAD:

- O'Neill Road is an east-west two-lane undivided roadway with a speed limit of 50 km/hr.
- The roadway is classified as "Rural" within the municipal (MNG) TMP.

LIMERICK ROAD:

- Limerick Road is a north-south two-lane undivided roadway with a speed limit of 50 km/hr. The roadway is classified as "Rural" within the municipal (MNG) TMP.
- The northern terminus of Limerick Road connects to CR-20.

1. "*Municipality of North Grenville Transportation Master Plan*" (TMP), WSP, November 2019

2.1.2 Intersections

Pattersons Corners Road & O'Neill Road

Exhibit 2-2 illustrates the 4-leg Pattersons Corners Road & O'Neill Road intersection.

- Pattersons Corners Road runs north-south and operate as free-flow,
- O'Neill Road runs east and west and both approaches are STOP-controlled, and
- Each approach effectively has a single shared lane that accommodates through, right, and left turn movements.
- There are no auxiliary turning lanes.

Exhibit 2-2: Pattersons Corners Road and O'Neill Road

County Road 20 & Pattersons Corners Road

Exhibit 2-3 illustrates the County 20 and Pattersons Road intersection.

- CR-20 is aligned along the west and south legs of the intersection and are free flow,
- Pattersons Corners Road is the north leg of the intersection which is STOP-controlled,
- The intersection function very much like a "T" intersection as the east leg is a gated entrance to an adjacent licensed pit, and
- Each approach of the intersection provides a single lane for shared through-right-left turn movements.
- There are no auxiliary turning lanes.

Exhibit 2-3: County Road 20 and Pattersons Corners Road Intersection

County Road 20 & Limerick Road

Exhibit 2-4 illustrates the CR-20 & Limerick Road intersection which functions as a 3-leg "T" configuration.

- CR-20 makes up the north and east legs of the intersection.
- All approaches are configured as a single lane accommodating shared thru-left-right turn movements; and
- All approaches are STOP controlled.

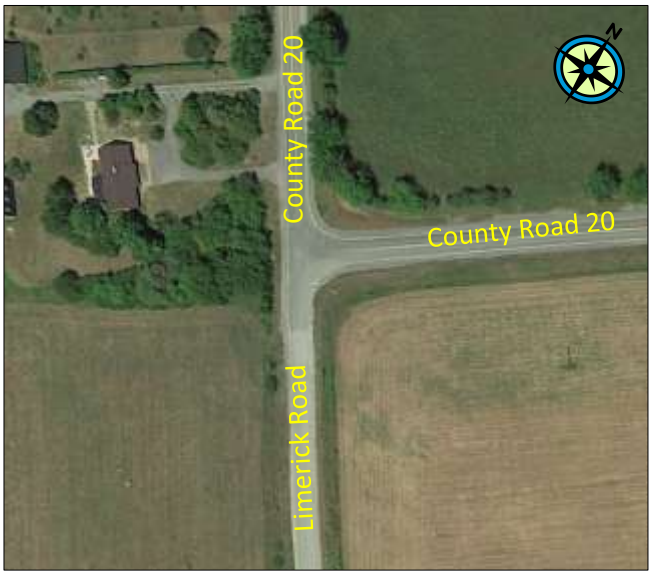


Exhibit 2-4: County Road 20 and Limerick Road Intersection

2.2 Study Horizons

This TIS project has been structured to address the following two-time horizons which, for the purposes if this traffic impact study (TIS), was assumed to be:

- the existing travel demand - 2025, and
- a future travel demand, associated with the potential commencement of operations of the proposed extraction site - 2027.

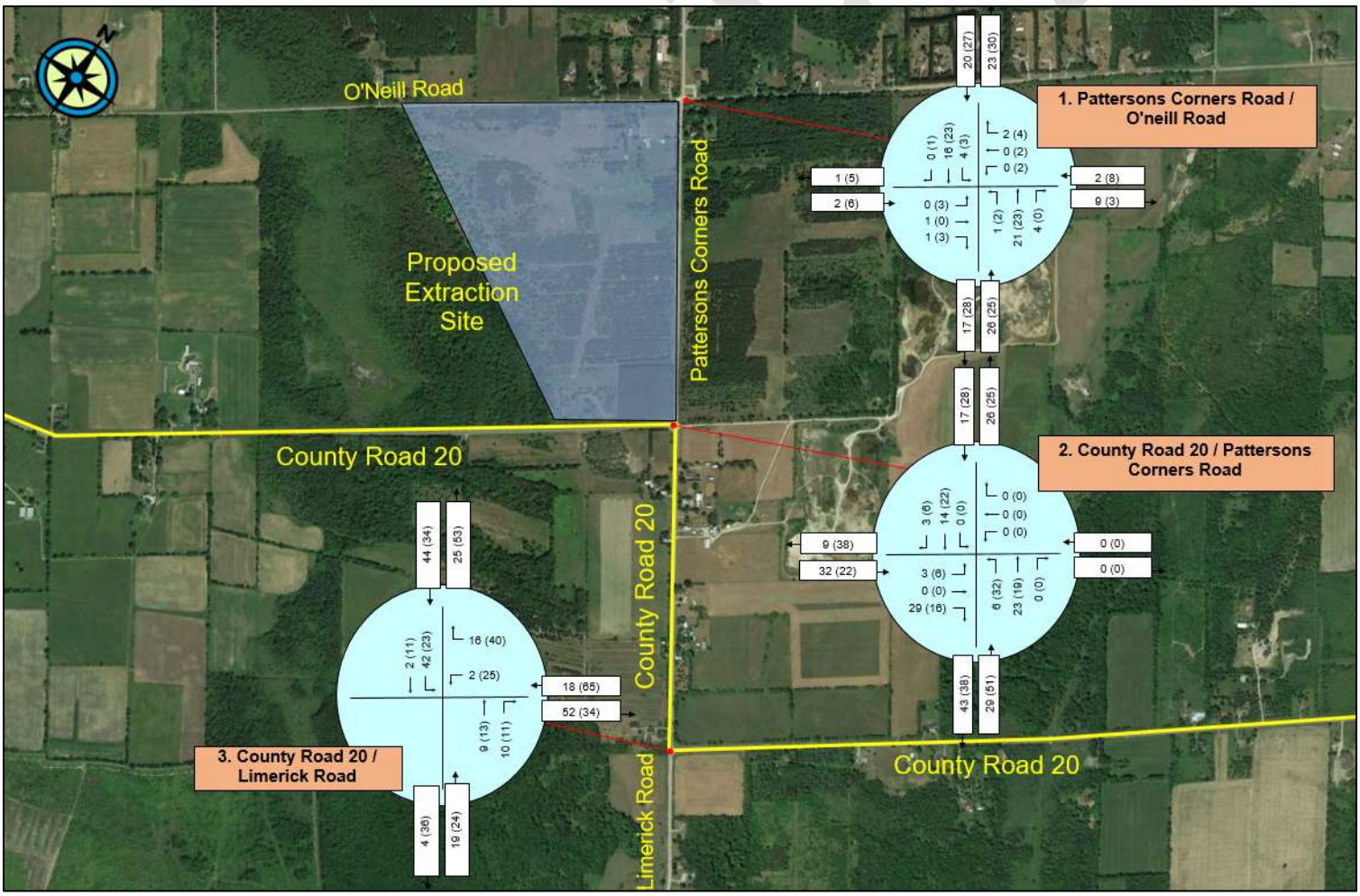
3.0 EXISTING TRAFFIC ANALYSIS

3.1 EXISTING TRAFFIC VOLUMES (2025)

Section 1.0 indicated that traffic count information was collected on Thursday, December 18th, 2025, during the morning and afternoon peak periods (6:30-to-9:30 AM and 3:30-to-6:30 PM) of travel demand. The traffic counts recorded for each turning movements at the study area intersections:

- the number of passenger vehicles,
- the number of heavy vehicles, and
- the number of pedestrians and cyclists (none were recorded).

Exhibit 3-1 illustrates the existing balanced (2025) intersection traffic volumes indicating morning and afternoon peak hour travel demands and when the peak hours of traffic occurred at each intersection.



Morning (Afternoon)

Exhibit 3-1: Existing 2025 Volumes
(Vehicles-per-Hour)

3.2 EXISTING TRAFFIC ANALYSIS

Intersection capacity analysis was undertaken utilizing Synchro™ 10 analysis software. The software incorporates Highway Capacity Manual (HCM) 6th edition methodologies to determine level-of-service (delay-based) and volume-to-capacity (v/c) performance metrics. The analyses assumed a peak hour factor of 0.95 which simulates the busiest 15-minute-period of the overall peak hour.

Appendix "B" contains the resulting Synchro output sheets that indicate existing operational performance measures for each turning movement.

Table 3-1 summarizes the intersection capacity analyses results that assume the existing traffic count information illustrated in Exhibit 3-1 and the existing intersection configurations.

Table 3-1: Existing Intersection Capacity Analysis

Intersection		Control Type	Critical Approach/ Movement	Weekday Morning Peak Hour (Afternoon Peak Hour)			
				Average Delay per Vehicle (seconds)	Level of Service	95th Percentile Queue (m)	Volume-to-Capacity Ratio (v/c)
1.	Pattersons Corner Road / O'Neill Road	Minor Leg STOP-controlled	EB-LT	8.9 (8.7)	A (A)	0.0 (0.0)	0.004 (0.006)
		Free Flow	SB-LT	7.3 (7.3)	A (A)	0.0 (0.0)	0.002 (0.002)
		Free Flow	NB-LT	7.3 (7.3)	A (A)	0.0 (0.0)	0.001 (0.001)
2.	CR-20 / Pattersons Corners Road	Minor Leg STOP-controlled	SB-TH	8.8 (8.7)	A (A)	0.0 (0.75)	0.02 (0.03)
		Free Flow	EB-LT	7.3 (7.3)	A (A)	0.0 (0.0)	0.01 (0.01)
3.	CR-20 / Limerick Road	All Way STOP-controlled	SB	7.4 (7.4)	A (A)	1.5 (0.75)	0.05 (0.04)
			WB	6.6 (7.1)	A (A)	0.75 (1.5)	0.02 (0.07)
			NB	6.8 (6.9)	A (A)	0.75 (0.75)	0.02 (0.03)

Table 3-1 indicates that all study area intersection:

- operate at excellent level-of-service 'A' assuming the existing lane configurations,
- indicate that the length of queues approaching each intersection are low (less-than-2-meters or a single passenger vehicle in length), and
- result in average delays that are less than 9 seconds, which is considered to be satisfactory.

4.0 TRAFFIC FORECASTING

4.1 PROPOSED OPERATIONS

- *Assumed Operations:* Table 4-1 outlines the anticipated operational characteristics of the proposed sand and gravel extraction site. For the purposes of this traffic impact study, it was assumed that:
  - the initial operation of the proposed extraction site was assumed to take place sometime in 2027,
  - employees arrive to the site prior to the peak periods of travel demand,
  - the proposed site will be operational year-round,
  - transportation of excavated material was assumed to primarily involve 40- tonne heavy haul vehicles,
    - The entire 1M tonnes requested under the permit would be achieved within a single year of operation.
    - This is a very conservative assumption and represents a "worst-case" scenario in terms of forecast traffic, as the permitted tonnage represents an ultimate threshold that could only be achieved by the proposed site securing a significant proportion of construction activity within the greater region. and
    - Achieving an annual 1M tonne excavation threshold using 40-tonne heavy haul vehicles would require an average of 25,000 heavy vehicle loads-per-year (assuming 18 hour days and 250 working days in a year.).
- *The Scenarios:* The various columns within Table 4-1 indicate the following operational scenarios that were developed to determine possible weekday traffic generation associated with the proposed extraction site.
  - "*Scenario 1*" represents a "worst case" traffic volume scenario where operations occur only on weekdays (18-hour weekday shifts), and the piy must supply the permitted 1M tonnes in a single year. This scenario is forecast to generate 26 two-way heavy vehicle trips-per-hour (13 inbound (empty) and 13 outbound (full) heavy vehicle trips). This "worst-case" scenario was carried forward.
  - "*Scenario 2*" represents loading activities including weekend 12-hour shift days. This scenario is forecast to generate 20 two-way heavy vehicle trips-per-hour.
  - "*Scenario 3*" represents loading activities including weekend 18-hour shift days. This scenario is forecast to generate 18 two-way heavy vehicle trips-per-hour.
- Table 4-1 indicates that all traffic scenarios were subjected to a peak hour factor conversion rate that was applied to the estimated average daily weekday trucks (Row "H") to simulate peak-hour traffic (Row "I") associated with the extraction site.
- A conservative assumption was adopted that the peak-hour of quarry demand would coincide with the peak hour of travel demand on the adjacent roadway which likely will not occur. Quarry site traffic is more likely to peak in the very early morning hours as supplies/materials must be transported and ready for on-site construction to commence.

Table 4-1: Extraction Site Operational Characteristics

Characteristics	Scenario 1 "Worst-Case"	Scenario 2	Scenario 3
a) Annual Hauling:	**1,000,000 tonnes**		
b) Primary hauling vehicle:	40-tonne tractor trailers		
c) Number of Trucks Required to Achieve Permitted Annual 1M Tonne Haul Threshold	25,000 trucks per year[1]		
d) Partial or Year-Round Operations?	Year-Round Operation: Excludes Holidays and 2 inclement weather days		
e) Operations:	• Excludes weekend operations	• 18 hours on weekdays • Reduced to 12 hours on weekends	• 18 hours every day Including Weekends
Total Annual Hours of Operation	• Weekdays: 4,500 hours[2] • Weekend days: 0 • **Total: 4,500 hours**	• Weekdays: 4,500[2] hours • Weekend: 1,248[3] • **Total: 5,748 hours**	• Weekdays: 4,500[2] hours • Weekend: 1,872[4] hours • **Total: 6,372 hours**
f) Percents of Weekday Hours over Total Hours	• 100%	• 78%[5]	• 71%[5]
g) No of Annual Weekday Truck Loads	• 25,000 Truck Loads	• 19,572 Truck Loads[6]	• 17,655 Truck Loads[6]
h) Average No. of Trucks per Weekday	100 Truck Loads/weekday	79 Truck Loads/weekday	70 Truck Loads/weekday
i) "Adjusted" trucks-per-hour:	**13 trucks inbound** **13 trucks outbound**	10 trucks inbound 10 trucks outbound	9 trucks inbound 9 trucks outbound
j) "Adjusted" two-way truck trips-per-hour:	**26 truck trips (13 empty, 13 full)**	**20 truck (10 empty, 10 full)**	**18 truck (9 empty, 9 full)**

1. 1M tonnes divided by 40 tonne heavy tractor trailer vehicles
2. 250 working days x 18 hours-per-day = 4,500 hours
3. 2 weekend days x 12 hours-per-weekend day x 52 weeks/year = 1,248 weekend hours-per-year
4. 2 weekend days x 18 hours-per-weekend day x 52 weeks/year = 1,872 weekend hours-per-year
5. 4,500 hours divided by 5,748 hours = 78% / 4,500 hours divided by 6,372 hours = 71%
6. 25,000 truck loads* 78% = 19,572 annual truck loads / 25,000 truck loads* 71% = 17,655 annual truck loads

4.2 Background Traffic Growth

Exhibit 4-1 was referenced from the "*North Grenville Transportation Master Plan*"[2] that permitted a comparison of 2016 traffic levels to 2031 forecast traffic levels. The traffic in the direct vicinity of the study area can be seen to have little to no increase (0-to-5 vehicles) over the forecast 8-year period.

As well, inquiries were made to the staff of the Municipality of North Grenville concerning any upcoming or proposed development initiatives that should be considered within this study. Municipal staff were unable to identify any other known developments.

Given that …

- the existing traffic volumes along the CR-20 and Pattersons Corner Road corridors are low (less than 80 vph (2-way) during the peak hours of travel demand),
- Future growth estimates are negligible (as indicated above), and
- No adjacent development initiatives could be identified …

this study did not apply a background traffic growth factor as a component in determining forecast traffic volumes. It's noted that even if 1% annual growth had been applied to a five-year forecast, it would make a negligible difference to the general travel demand forecast results.

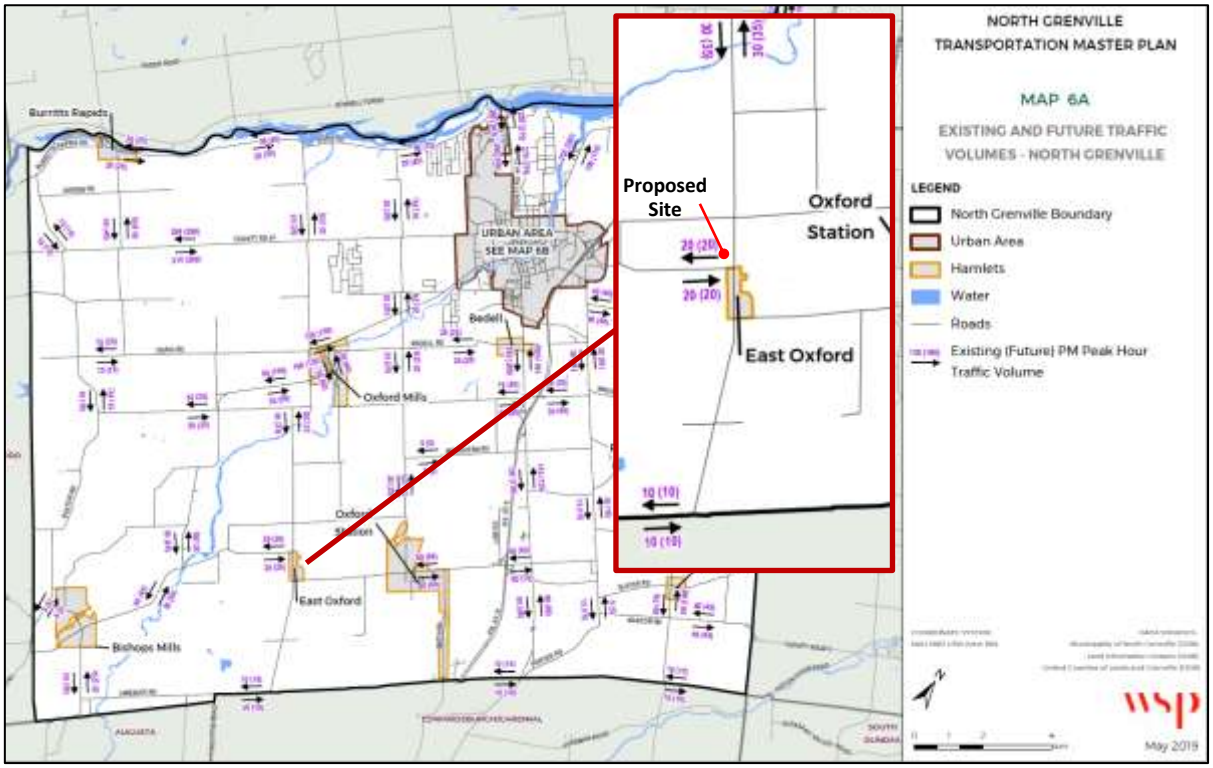


Exhibit 4-1: North Grenville Background Volume Growth

2. "*Municipality of North Grenville Transportation Master Plan*" page 35, WSP, November 2019

4.3 SITE TRAFFIC GENERATION

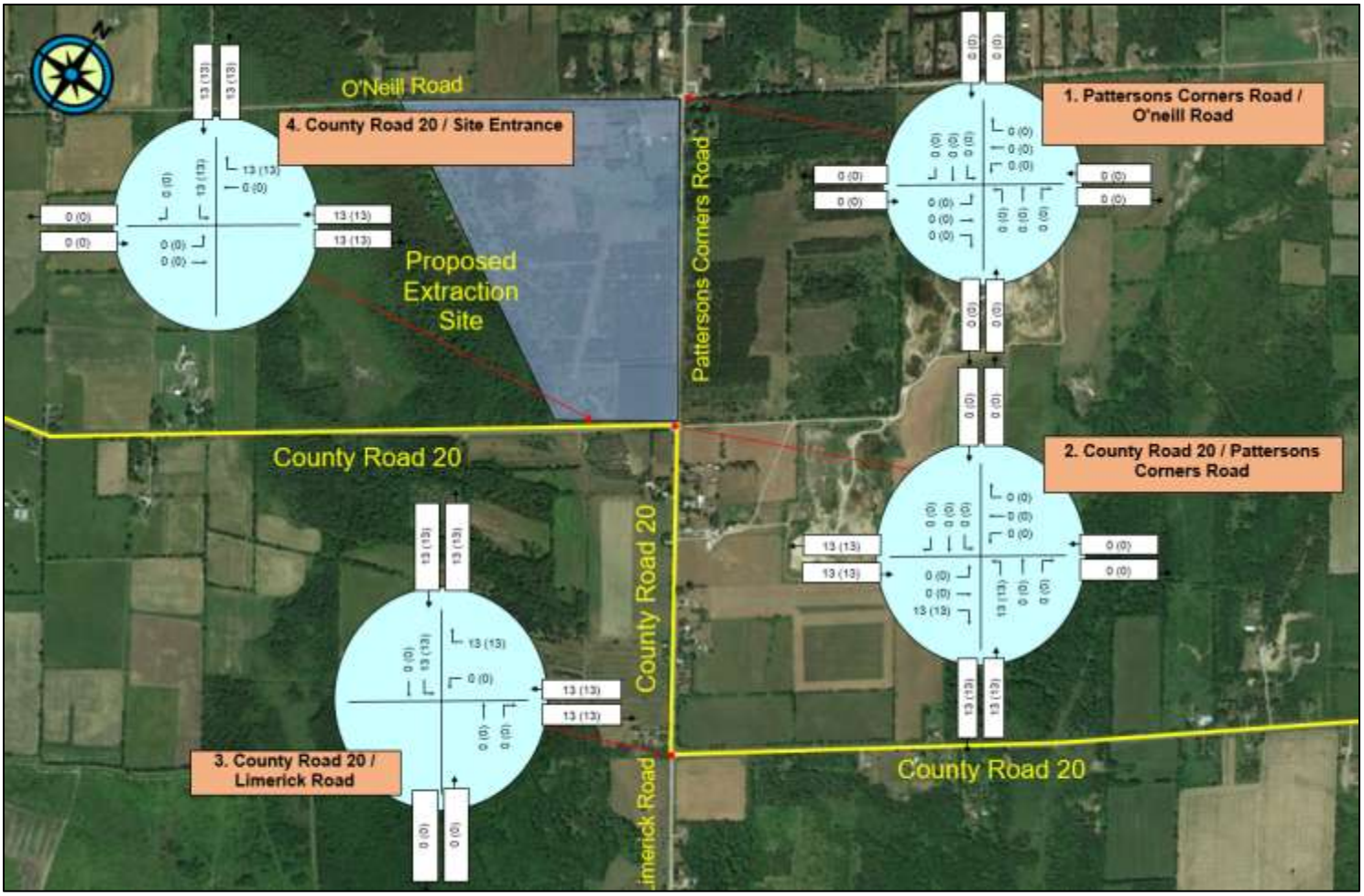
Table 4-2 summarizes the "worst-case" Scenario 1 peak hour traffic volumes associated with the proposed excavation site which is forecast to produce 26 two-way trips (13 inbound / 13 outbound) during the morning and afternoon peak hours of travel demand.

Table 4-2: Traffic Generated by Site: 2025 Horizon Year (Vehicles-per-Hour)

Site	*Morning Peak Hour*			*Afternoon Peak Hour*		
	In	**Out**	**Total**	**In**	**Out**	**Total**
R.W. Tomlinson East Oxford Sand/Gravel Extraction Site	13	13	26	13	13	26

* Assumes Max Annual Extraction of 1M tonnes of material

Exhibit 4-2 illustrates the "worst-case" site generated morning and afternoon peak hour traffic volumes assuming the maximum permitted annual extraction limit of 1M tonnes of material is achieved assuming no weekend operations of the proposed site.



Morning (Afternoon)

Exhibit 4-2: Site Generated Traffic Volumes
(Vehicles-per-Hour)

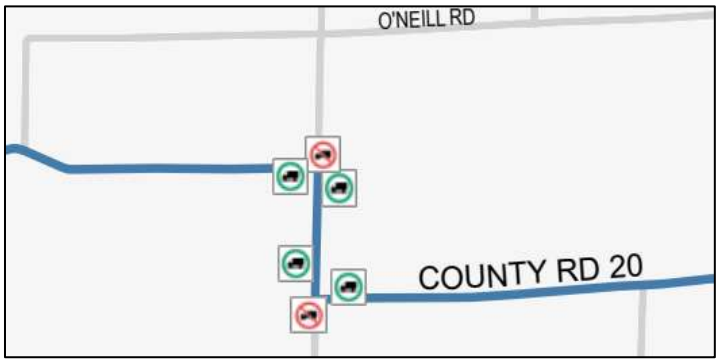
4.4 SITE TRIP DISTRIBUTION

Exhibit 6-1 illustrates the general location of the proposed main access to the extraction site which is envisioned to connect with CR-20. Discussions with staff from R.W. Tomlinson Limited indicated that most of the inbound traffic coming to the site, and outbound traffic leaving the site, is anticipated to originate from, and be destined to, the Highway 416 corridor.

For the purposes of this traffic impact study, the following traffic distribution trends were assumed:

- 95% of the vehicles traffic is anticipated to originate from, and be destined to areas to the north and south of the site (which is easiest to access by way of the CR-20 to the Highway 416 corridor) – This represents the primary haul route for heavy vehicles to access the extraction site,
- The other 5% of the vehicles are forecast to originate from, and be destined to areas west of the the site along the CR-20 corridor, and
- A 5% traffic distribution component was assumed to originate from, and be destined to, areas west of the site which would equate to perhaps to a single heavy vehicle. This would have a negligible impact on traffic operations.

Exhibit 4-3 was referenced from the Municipality of North Grenville's truck route policy[3] and illustrates CR-20 as a "*preferred truck route*" within its truck route network. However, the Unitied Counties of Leeds and Grenville's Spring Load Restriction[4,5] (By-Law No. 14-10) indicates that:



Source: "*Municipality of North Grenville Transportation Truck Route*

Exhibit 4-3: Truck Routes

- CR-20 between CR-18 (to the east of the site) and the Railroad Crossing in Oxford Station (to the west of the site) are limited load corridors.
- load restrictions are in effect during the 3-month early Spring period (Feb. 15-to-May 15), and
- hauls are limited to a maximum of 5-tonne-per-axle, and
- The proponent (Tomlinson) would be required to abied by municipal load restrictions in effect at the time of operation of the extraction site.

The haul limit on CR-20 was simulated by assuming that the number of truck trips carrying lighter loads using smaller trucks would almost double during this 3-month spring period to a "worst-case" maximum of 25 vehicles-per-hour inbound (empty) and outbound (full) along the haul route.

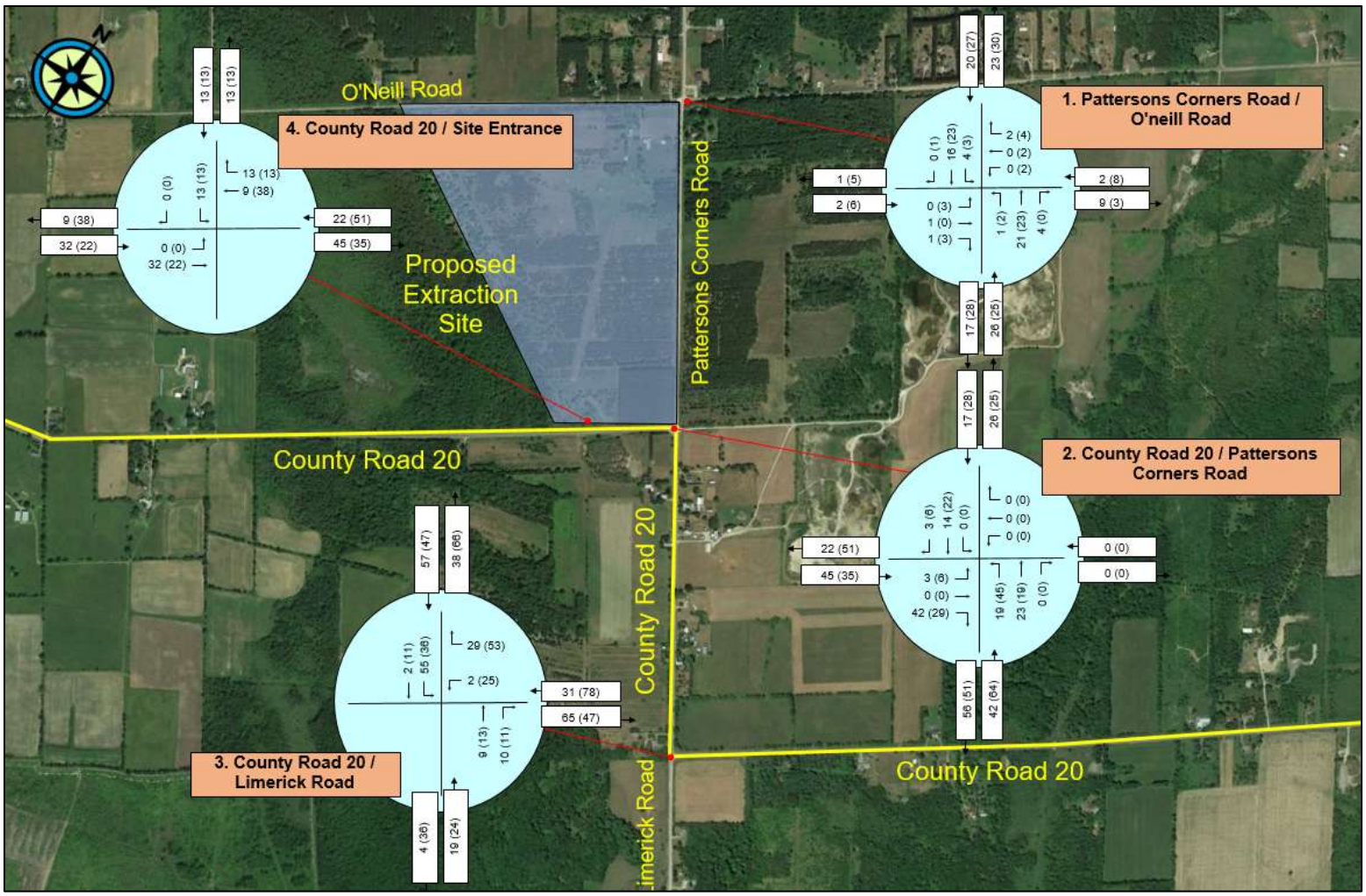
3. "*Municipality of North Grenville Transportation Truck Roue Policy*" page 66, Paradigm and Lura, Dec. 2021, Figure 2.2
4. Ibid, Page Section 2.3.2 United Counties of Leeds and Grenville
5. "*Municipality of North Grenville Transportation Master Plan*" page 66, WSP, November 2019

5.0 OPERATIONAL (2027) TRAFFIC ANALYSIS

Exhibit 5-1 illustrates the resulting "worst-case" 2027 morning and afternoon peak hour turning movements at each of the four intersections in the vicinity of the proposed extraction site.

Forecast traffic operational analysis was undertaken utilizing Synchro™ 10 analysis software and a peak hour factor of 0.95 was adopted that simulates the operational effects associated with the busiest 15-minute-period of the overall peak hour. The resulting output sheets documenting the traffic operational performance metrics are provided within Appendix "B".

Table 5-1 summarizes the intersection capacity analyses results assuming no changes to the intersection configurations and existing approach traffic controls for the forecast 2027 traffic volumes with the proposed extraction site in place (See Exhibit 5-1).



Morning (Afternoon)

Exhibit 5-1: 2027 Operation Volumes
(Vehicles-per-Hour)

Table 5-1: Operational (2027) Intersection Capacity Analysis

Intersection		Control Type	Critical Approach/ Movement	Weekday Morning Peak Hour (Afternoon Peak Hour)			
				Average Delay per Vehicle (seconds)	Level of Service	95th Percentile Queue (m)	Volume-to-Capacity Ratio (v/c)
1.	Pattersons Corner Road / O'Neill Road	Minor Leg STOP-controlled	EB-LT	8.9 (8.7)	A (A)	0.0 (0.0)	0.002 (0.01)
		Free Flow	SB-LT	7.3 (7.3)	A (A)	0.0 (0.0)	0.003 (0.002)
		Free Flow	NB-LT	7.3 (7.3)	A (A)	0.0 (0.0)	0.001(0.001)
2.	CR-20 / Pattersons Corners Road	Minor Leg STOP-controlled	SB-TH	8.9 (9.1)	A (A)	0.75 (0.75)	0.02 (0.03)
		Free Flow	EB-LT	7.3 (7.4)	A (A)	0.0 (0.0)	0.002 (0.01)
3.	CR-20 / Limerick Road	All Way STOP-controlled	SB	7.5 (7.5)	A (A)	1.5 (1.5)	0.07 (0.06)
			WB	6.7 (7.1)	A (A)	0.75 (2.25)	0.03 (0.09)
			NB	6.8 (7.0)	A (A)	0.75 (0.75)	0.02 (0.03)
4.	CR-20 / Site Entrance	Minor Leg STOP-controlled	SB-LT	8.8 (8.9)	A (A)	0.0 (0.0)	0.01 (0.02)
			EB-LT	0.0 (0.0)	A (A)	0.0 (0.0)	- (-)

As noted in Section 4.4 the UCLG has a Spring load restriction in place on CR-20 between County Road 18 and the Railroad Crossing in Oxford Station (between February 15-to-May 15) that limits hauls to a maximum of 5-tonne-per-axle. The effect of this load restriction was simulated by assuming during this 3 month Spring period a "worst-case" maximum of 25 vehicles-per-hour (vph) inbound and outbound (or 50 vph in total) along the haul route during the Spring-time.

Table 5-2 indicates the impacts associated with seasonal load limits being in place.

Table 5-2: Comparative Operations (2027) Assuming Seasonal Load Limits

Intersection		Critical Approach/ Movement	Weekday Morning Peak Hour (Afternoon Peak Hour)			
			May 16th – February 14th		February 15th -to- May 15th Restrictive Seasonal Limits	
			Average Delay per Vehicle (seconds)	Level of Service	Average Delay per Vehicle (seconds)	Level of Service
1.	Pattersons Corner Road / O'Neill Road	EB-LT	8.9 (8.7)	A (A)	8.9 (8.7)	A (A)
		SB-LT	7.3 (7.3)	A (A)	7.3 (7.3)	A (A)
		NB-LT	7.3 (7.3)	A (A)	7.3 (7.3)	A (A)
2.	CR-20 / Pattersons Corners Road	SB-TH	8.9 (9.1)	A (A)	9.0 (9.2)	A (A)
		EB-LT	7.3 (7.4)	A (A)	7.3 (7.4)	A (A)
3.	CR-20 / Limerick Road	SB	7.5 (7.5)	A (A)	7.6 (7.6)	A (A)
		WB	6.7 (7.1)	A (A)	6.7 (7.2)	A (A)
		NB	6.8 (7.0)	A (A)	6.9 (7.0)	A (A)
4.	CR-20 / Site Entrance	SB-LT	8.8 (8.9)	A (A)	8.8 (9.0)	A (A)
		EB-LT	0.0 (0.0)	A (A)	0.0 (0.0)	A (A)

Tables 5-1 & 5-2 both indicate satisfactory traffic operations with:

- all of the study area intersections continuing to operate at excellent level-of-service ‘A’;
- all average delays at the various intersections being less than 10 seconds;

Table 5-2 indicates that:

- despite the effect of Spring-time load restrictions, the traffic operational effects were determined to be be negligible demonstrating average delays and LOS at each of the study area intersections;and
- the required vehicle queue lengths remaining under 2 meters (or only a single vehicle length) for all approaches at the various intersections.

6.0 SUPPLEMENTAL ANALYSIS

6.1 SIGHTLINE ANALYSIS

Prior to entering an intersection from an access, a motorists must be provided with sufficient sight distance in opposing directions of travel to assure that potential conflicts with approaching/oncoming traffic can be prevented. Conversely, sufficient sight distance must be provided to assure that approaching vehicles have a clear view of vehicles that are entering the intersection/access that would provide sufficient reaction time and vehicle breaking time necessary to assure that the vehicle can come to a complete stop to avoid a collision, allowing for such factors as weather conditions, design speed, surface conditions, (snow, ice, paved/gravel, etc.), typical tire condition, motorist age etc.), design vehicle etc.

In addition, the Ministry of Transportation of Ontario's (MTO's) geometric design guide considers the height of the turning vehicle driver's eye of 1.05 metres to the top of the approaching vehicle 1.3 metres above the road. It is recognized however that trucks are somewhat taller than typical automobiles and thus are more visible upon approach. In this regard, a height of 1.6 metres is often considered as opposed to 1.3 metres (which is still considered to be conservative in that the eye height of a truck driver is typically in the order of 2.6 metres and truck heights are in the order of 4 metres)

Preferred Access Location: The primary access to the proposed quarry would be along CR-20 which can be characterized as a relatively flat vertical profile[6] with short sections where grades are less-than-5 percent. The review of the existing vertical profile indicated that the preferred location of the access was found to be:

- ~285m to the west of the CR-20/Patterson Corners intersection.

This location (between this proposed access and the intersection to the east, provides an elevation difference of ~4m, resulting in an average 1.5% grade difference in advance of the intersection.

Available Sight Distance: Exhibit 6-1 illustrates the proposed location of the quarry access which would provide a clear line of sight ~220 meters to the east, and ~375 meters to the west of the access, in advance of any horizontal or vertical curvatures along CR-20.

6. Profile estimates were determined using GoogleEarth Elevation Profiles

Exhibit 6-1: Site Entrance Sightline Summary

Required Sight Distance: The required sight distance was determined using the Transportation Association of Canada's (TAC) design guide[7], assuming

- a 3% grade,
- a heavy vehicle,
- a paved surface, and
- an 80kph operating speed along the CR-20 corridor.

The required sight distance was determined using the formula below and determined to be 212m.

$$\text{Intersection Sight Distance, } ISD = 0.278(80kph)(9.5\text{s}) \approx 212m$$

Exhibit 6-2 and Exhibit 6-3 provide photographic views of the existing sightlines and illustrate that acceptable sightlines would be present

The 220m and 375m available sight distance on the east and west approaches respectively exceed the ISD required sight-distance of 212m.

7. *"Geometric Design Guide for Canadian Roads Chapter 9 – Intersections",* Page 67, TAC, June 2017

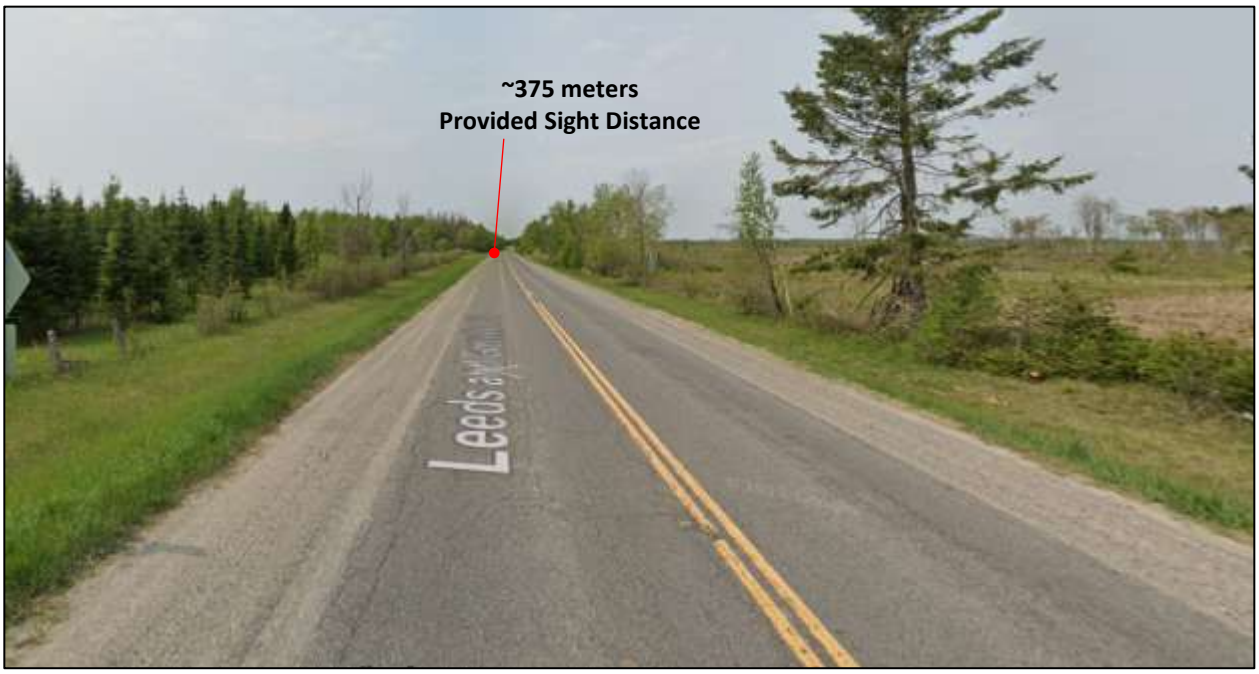


Exhibit 6-3: Google Street View Image of Access Sightlines Looking to the West

Exhibit 6-2: Google Street View Image of Access Sightlines Looking to the East

6.2 LEFT TURN LANE WARRANT ANALYSIS

An auxiliary left turn lane warrant analysis was undertaken for the CR-20/proposed site access following MTO geometric design standards[8] for Ontario highways.

The warrants for an auxiliary left turn lanes are based on:

- the left turn volume: (LT_{vol});
- the volume of opposing vehicles: (V_o); and
- the volume of advancing vehicles: (V_a).

The analysis assumed the horizon year 2027 traffic volumes (See Exhibit 5-1).

The volume of advancing and opposing vehicle traffic never exceed 100 vehicles/hour, hence, the need for an auxiliary left turn lane into the proposed extraction site was **not** triggered.

An auxiliary eastbound left turn lane turning from CR-20 into the Site Entrance is NOT warranted.

6.3 RIGHT TURN LANE / TAPER ANALYSIS

Literature suggested that that the use of a right-turn auxiliary lane is required at an unsignalized intersection when "*the volume of decelerating or accelerating vehicles compared with the through traffic volume causes an undue hazard*" [9].

- The 2027 peak hour traffic volumes for the westbound right turn from CR-20 onto the Site Entrance has been forecast at 13 vehicles-per-hour (which translates to a single vehicle arriving roughly every 4 minutes during the peak hour of operation).
- The access to the extraction site is forecast to operate at an excellent LOS "A" without a dedicated right-turn taper and auxiliary storage lane.
- There is no significant delay or queue forecast to be experienced by the westbound right turn movement.

Given the above, **a dedicated right turn lane and/or taper would not to be warranted**.

6.4 PROPOSED ACCESS LAYOUT

The entrance for the extraction site is to be located along CR-20, approximately 285 meters west of the CR-20/Pattersons Corners Road intersection.

8. "*Geometric Design Guide for Canadian Roads, Chapter 9: Intersections"* TAC, June 2017, *MTO Design Supplement*", *Appendix 9*
9 . ibid, Section 9.14 on tapers and auxiliary lanes.

Section 4-1 indicated that the vehicle used for hauling materials to/from the site has, for the purposes of this traffic impact study, been assumed to be 40 tonne trucks. A WB-20 design vehicle was used to simulate turning movements in, and out, of the site. (The WB-20 configuration represents a tractor-semi-trailer configuration with an overall length of 22.4m with 16.2m representing the semi-trailer length with a typical tractor wheelbase of 6.6m and a trailer wheelbase of 13.2-to-13.8m.)

Appendix "C" displays the conceptual sketch of the proposed access for illustration purposes. The drawing illustrate that a WB-20 vehicle can safely enter and exit the site access, both from the east and west. The required pavement markings and curve radii are also illustrated on the exhibit.

A detailed design of the proposed access would be confirmed at the time of site plan approval of the proposed quarry.

7.0 FINDINGS AND RECOMMENDATIONS

7.1 SUMMARY OF FINDINGS

The Traffic Impact Study analysis resulted in the following findings:

- All study area intersections currently (2025) operate at an acceptable level of service "A" in all directions during the peak hours of travel demand.
- The proposed new Tomlinson sand/gravel pit is expected to be operational by the year 2027.
- Based on the North Grenville TMP, there is no anticipated traffic growth envisioned within the study area until at least 2031, nor could any other adjacent development initiatives be identified. As well traffic is so low along the existing County Road 10 corridor, applying an annual background growth rare over the 2-year horizon (2027) when the site is anticipated to be operational would result in no difference to the traffic operational results. Hence, growth in background traffic was not considered within this traffic impact study in determining forecast traffic volumes.
- During the 9 months of the year when the Counties of Leeds and Grenville's Spring Load Restriction are not in effect the peak hour of operations of the proposed site is estimated, in the "worst-case" scenario adopted for this study, to generate 26 two-way heavy vehicle trips (13 inbound and 13 outbound) with all heavy vehicles (assuming 40-tonne trucks) travelling eastbound toward Highway 416.
- During the 3 months of the year when the Counties of Leeds and Grenville's Spring Load Restriction are in effect the peak hour of operations of the proposed site is estimated, in the "worst-case" scenario, adopted for this study,to generate 50 two-way heavy vehicle trips (25 inbound and 25 outbound) with all heavy vehicles (assuming 20-tonne trucks) travelling eastbound toward Highway 416.
- Assuming a "worst-case" scenario where peak activity of the site would coincide with the peak hour of travel demand on the adjacent roadways, all intersections are forecast to continue to operate with exceptional levels of service (LOS "A"-or-better) at the opening (2027) of the extrction site with delays at the CR-20 intersection being less than 10 seconds.
- *Sight Lines:* The proposed location to the extraction site on CR-20 was determined to satisfy the intersection sight distance requirements on either side of the site entrance.
- *Left Turn Auxiliary Lane:* An eastbound auxiliary left turn lane at the CR-20 /Site Access was found **not to be warranted** by forecast traffic conditions.
- *Right Turn Taper:* A westbound right turn/taper was found **not to be warranted** at the CR-20 /Site Access.
- *Turning Movements:* The conceptual design of the proposed site access at CR-20 addressed within this study assumed a WB-20 heavy vehicle which can safely maneuver in and out of the proposed development,

7.1 RECOMMENDATION

It is recommended that the Municipality of North Grenville, permit Tomlinson to proceed with the proposed East Oxford Sand/Gravel pit, from a transportation/traffic standpoint and support its application to the Ministry of Natural Resources, and other relevant approval authorities.

APPENDIX A: BACKGROUND TRAFFIC COUNTS

1. Pattersons Corners Road / O'neill Road

Morning Peak Hour Results

18-Dec-25

	0:15	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Time Period		Westbound							Northbound							Eastbound							Southbound							Total		All	Peak Hr Totals
		RT		TH		LT			RT		TH		LT			RT		TH		LT			RT		TH		LT						
From	To	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger		
1 6:30	6:45	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	2	4	6	
2 6:45	7:00	0	0	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	7	7	
3 7:00	7:15	0	0	0	0	0	1	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	6	6	
4 7:15	7:30	1	0	0	0	0	0	0	1	0	1	2	0	0	0	1	0	0	0	0	0	0	0	1	0	2	0	0	0	4	5	9	28
5 7:30	7:45	0	1	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	1	0	0	11	11	33
6 7:45	8:00	1	0	0	0	0	0	0	1	1	1	4	0	1	0	0	0	0	1	0	0	0	0	0	1	7	0	2	0	4	16	20	46
7 8:00	8:15	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	9	9	49
8 8:15	8:30	0	0	0	0	0	0	0	0	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	0	1	9	10	50
9 8:30	8:45	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	3	0	1	0	1	6	7	46
10 8:45	9:00	0	1	0	0	0	0	0	0	0	1	9	0	0	0	0	1	1	0	0	0	0	0	0	1	2	0	1	0	3	14	17	43
11 9:00	9:15	1	0	0	0	0	0	0	0	0	0	7	0	1	0	0	1	0	0	0	1	0	0	0	2	3	0	0	0	3	13	16	50
12 9:15	9:30	0	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	1	0	1	9	10	50
5 **7:30**	**8:30**	*<<<Calculated Peak Hour*																															
AM Peak Period		3	2	0	0	0	1	0	2	4	5	53	0	3	0	1	3	1	2	0	1	0	0	2	7	31	0	7	0	19	109	128	
Heavy Vehicle %		60%		#DIV/0!		0%			33%		9%		0%			25%		33%		0%			0%		18%		0%				15%		
AM Peak Hour		1	1	0	0	0	0	0	1	3	1	20	0	1	0	0	1	0	1	0	0	0	0	0	2	14	0	4	0	5	45	50	
Heavy Vehicle %		50%		#DIV/0!		#DIV/0!			25%		5%		0%			0%		0%		#DIV/0!			#DIV/0!		13%		0%				10%		
AM Peak Hr Total		2		0		0			4		21		1			1		1		0			0		16		4						
M Peak Hr Approach To				2					26							2							20										
9 **7:30**	**8:30**	*<<<Calculated Peak Hour*																															
AM Peak Period		3	2	0	0	0	1	0	2	4	5	53	0	3	0	1	3	1	2	0	1	0	0	2	7	31	0	7	0	19	109	128	
Heavy Vehicle %		60%		#DIV/0!		0%			33%		9%		0%			25%		33%		0%			0%		18%		0%				15%		
AM Peak Hour		1	1	0	0	0	0	0	0	0	3	21	0	2	0	0	2	1	1	0	1	0	0	1	3	10	0	3	0	8	42	50	
Heavy Vehicle %		50%		#DIV/0!		#DIV/0!			#DIV/0!		13%		0%			0%		50%		0%			0%		23%		0%				16%		
AM Peak Hr Total		2		0		0			0		24		2			2		2		1			1		13		3						
M Peak Hr Approach To				2					26							5							17										

Afternoon Peak Hour Results

18-Dec-25

	0:15	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Time Period		Westbound							Northbound							Eastbound							Southbound							Total		All	Peak Hr Totals
		RT		TH		LT			RT		TH		LT			RT		TH		LT			RT		TH		LT						
From	To	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger		
1 15:30	15:45	0	3	0	0	0	1	0	0	0	1	3	0	1	0	0	0	0	0	0	0	0	0	0	0	11	1	1	0	2	20	22	
2 15:45	16:00	0	1	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	9	9	
3 16:00	16:15	0	0	0	1	0	1	0	0	0	0	6	0	0	0	0	0	0	0	0	1	0	0	1	1	4	0	1	0	1	15	16	
4 16:15	16:30	0	0	1	0	0	0	0	0	0	0	6	0	1	0	1	2	0	0	0	2	0	0	0	0	2	0	0	0	2	13	15	62
5 16:30	16:45	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	6	0	0	0	0	9	9	49
6 16:45	17:00	0	0	0	0	0	1	0	1	1	1	6	0	1	0	0	1	0	0	0	0	0	0	0	2	4	0	0	0	4	14	18	58
7 17:00	17:15	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	0	0	0	7	7	49
8 17:15	17:30	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0	7	0	0	0	0	12	12	46
9 17:30	17:45	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	6	6	43
10 17:45	18:00	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4	4	29
11 18:00	18:15	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	6	6	28
12 18:15	18:30	0	1	0	0	0	0	0	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	1	0	0	12	12	28
1 **15:30**	**16:30**	*<<<Calculated Peak Hour*																															
PM Peak Period		0	7	1	1	0	3	0	1	2	2	42	0	3	0	1	5	0	0	0	3	0	0	4	3	54	1	3	0	9	127	136	
Heavy Vehicle %		0%		50%		0%			33%		5%		0%			17%		#DIV/0!		0%			0%		5%		25%				7%		
PM Peak Hour		0	4	1	1	0	2	0	0	0	1	18	0	2	0	1	2	0	0	0	3	0	0	1	1	22	1	2	0	5	57	62	
Heavy Vehicle %		0%		50%		0%			#DIV/0!		5%		0%			33%		#DIV/0!		0%			0%		4%		33%				8%		
PM Peak Hr Total		4		2		2			0		19		2			3		0		3			1		23		3						
M Peak Hr Approach To				8					21							6							27										
########	####### **15:45**	*<<<Calculated Peak Hour*																															
PM Peak Period		0	7	1	1	0	3	0	1	2	2	42	0	3	0	1	5	0	0	0	3	0	0	4	3	54	1	3	0	9	127	136	
Heavy Vehicle %		0%		50%		0%			33%		5%		0%			17%		#DIV/0!		0%			0%		5%		25%				7%		
PM Peak Hour		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Heavy Vehicle %		#VALUE!		#VALUE!		#VALUE!			#VALUE!		#VALUE!		#VALUE!			#VALUE!		#VALUE!		#VALUE!			#VALUE!		#VALUE!		#VALUE!				#VALUE!		
PM Peak Hr Total		#VALUE!		#VALUE!		#VALUE!			#VALUE!		#VALUE!		#VALUE!			#VALUE!		#VALUE!		#VALUE!			#VALUE!		#VALUE!		#VALUE!						
M Peak Hr Approach To				#VALUE!					#VALUE!							#VALUE!							#VALUE!										

2. County Road 20 / Pattersons Corners Road

Morning Peak Hour Results

18-Dec-25

	Time Period		Westbound							Northbound							Eastbound							Southbound							Total		All	Peak Hr Totals
			RT		TH		LT			RT		TH		LT			RT		TH		LT			RT		TH		LT						
	From	To	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger		
1	6:30	6:45							0			0	2	1	0	0	0	0			0	0	0	1	1	1	1				3	4	7	
2	6:45	7:00							0			0	3	0	4	0	0	3			0	1	0	0	0	0	3				0	14	14	
3	7:00	7:15							0			1	3	0	2	0	1	7			0	0	0	0	0	0	2				2	14	16	
4	7:15	7:30							0			0	2	0	2	0	0	6			1	0	0	1	0	0	2				2	12	14	51
5	7:30	7:45							0			0	4	0	1	0	1	9			0	1	0	0	0	0	3				1	18	19	63
6	7:45	8:00							0			2	5	1	0	0	0	5			0	1	0	0	2	1	6				4	19	23	72
7	8:00	8:15							0			0	5	0	2	0	0	2			0	2	0	0	0	0	3				0	14	14	70
8	8:15	8:30							0			0	3	1	1	0	0	5			0	2	0	1	0	0	2				2	13	15	71
9	8:30	8:45							0			0	2	0	0	0	0	8			0	1	0	0	1	0	2				0	14	14	66
10	8:45	9:00							0			1	7	1	2	0	0	4			0	2	0	0	0	1	3				3	18	21	64
11	9:00	9:15							0			0	5	0	0	0	0	1			0	1	0	0	2	2	3				2	12	14	64
12	9:15	9:30							0			1	3	0	3	0	1	2			0	2	0	0	1	0	1				2	12	14	63
3	7:00	8:00	<<<Calculated Peak Hour																															
	AM Peak Period		0	0	0	0	0	0	0	0	0	5	44	4	17	0	3	52	0	0	1	13	0	3	7	5	31	0	0	0	21	164	185	
	Heavy Vehicle %		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		10%		19%			5%		#DIV/0!		7%			30%		14%		#DIV/0!				11%		
	AM Peak Hour		0	0	0	0	0	0	0	0	0	3	14	1	5	0	2	27	0	0	1	2	0	1	2	1	13	0	0	0	9	63	72	
	Heavy Vehicle %		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		18%		17%			7%		#DIV/0!		33%			33%		7%		#DIV/0!				13%		
	AM Peak Hr Total		0		0		0			0		17		6			29		0		3			3		14		0						
	AM Peak Hr Approach Tc		0							23							32							17										
7	#N/A	#N/A	<<<Calculated Peak Hour																															
	AM Peak Period		0	0	0	0	0	0	0	0	0	5	44	4	17	0	3	52	0	0	1	13	0	3	7	5	31	0	0	0	21	164	185	
	Heavy Vehicle %		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		10%		19%			5%		#DIV/0!		7%			30%		14%		#DIV/0!				11%		
	AM Peak Hour		0	1	0	0	0	0	0	0	2	2	20	0	1	0	0	2	1	1	0	0	0	0	0	2	8	0	3	0	5	38	43	
	Heavy Vehicle %		0%		#DIV/0!		#DIV/0!			0%		9%		0%			0%		50%		#DIV/0!			#DIV/0!		20%		0%				12%		
	AM Peak Hr Total		1		0		0			2		22		1			2		2		0			0		10		3						
	AM Peak Hr Approach Tc		1							25							4							13										

Afternoon Peak Hour Results (Date)

18-Dec-25

	Time Period		Westbound							Northbound							Eastbound							Southbound							Total		All	Peak Hr Totals
			RT		TH		LT			RT		TH		LT			RT		TH		LT			RT		TH		LT						
	From	To	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger		
1	15:30	15:45							0			1	5	0	6	0	0	5			0	0	0	0	2	1	11				2	29	31	
2	15:45	16:00							0			0	3	0	3	0	1	1			0	0	0	0	2	0	5				1	14	15	
3	16:00	16:15							0			0	6	1	7	0	0	5			0	0	0	0	2	1	3				2	23	25	
4	16:15	16:30							0			0	4	0	9	0	1	3			0	3	0	0	2	1	2				2	23	25	96
5	16:30	16:45							0			0	1	0	5	0	1	0			0	0	0	0	0	0	6				1	12	13	78
6	16:45	17:00							0			0	8	1	9	0	1	5			1	2	0	0	2	2	4				5	30	35	98
7	17:00	17:15							0			0	1	0	8	0	0	3			0	1	0	0	1	0	3				0	17	17	90
8	17:15	17:30							0			0	4	0	7	0	0	4			0	0	0	0	1	0	4				0	20	20	85
9	17:30	17:45							0			0	4	0	12	0	1	5			0	0	0	0	0	0	3				1	24	25	97
10	17:45	18:00							0			0	1	0	3	0	0	2			0	1	0	0	1	0	0				0	8	8	70
11	18:00	18:15							0			0	1	0	0	0	0	2			0	1	0	0	0	0	4				0	8	8	61
12	18:15	18:30							0			0	3	0	4	0	0	2			0	0	0	0	1	0	3				0	13	13	54
3	16:00	17:00	<<<Calculated Peak Hour																															
	PM Peak Period		0	0	0	0	0	0	0	0	0	1	41	2	73	0	5	37	0	0	1	8	0	0	14	5	48	0	0	0	14	221	235	
	Heavy Vehicle %		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		2%		3%			12%		#DIV/0!		11%			0%		9%		#DIV/0!				6%		
	PM Peak Hour		0	0	0	0	0	0	0	0	0	0	19	2	30	0	3	13	0	0	1	5	0	0	6	4	15	0	0	0	10	88	98	
	Heavy Vehicle %		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		0%		6%			19%		#DIV/0!		17%			0%		21%		#DIV/0!				10%		
	PM Peak Hr Total		0		0		0			0		19		32			16		0		6			6		19		0						
	PM Peak Hr Approach Tc		0							51							22							25										
#N/A	#N/A	#N/A	<<<Calculated Peak Hour																															
	PM Peak Period		0	0	0	0	0	0	0	0	0	1	41	2	73	0	5	37	0	0	1	8	0	0	14	5	48	0	0	0	14	221	235	
	Heavy Vehicle %		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		2%		3%			12%		#DIV/0!		11%			0%		9%		#DIV/0!				6%		
	PM Peak Hour		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	
	Heavy Vehicle %		#N/A		#N/A		#N/A			#N/A		#N/A		#N/A			#N/A		#N/A		#N/A			#N/A		#N/A		#N/A				#N/A		
	PM Peak Hr Total		#N/A		#N/A		#N/A			#N/A		#N/A		#N/A			#N/A		#N/A		#N/A			#N/A		#N/A		#N/A						
	PM Peak Hr Approach Tc		#N/A							#N/A							#N/A							#N/A										

3. County Road 20 / Limerick Road

Morning Peak Hour Results

18-Dec-25

	0:15	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Time Period		Westbound							Northbound							Eastbound							Southbound							Total		All	Peak Hr Totals
		RT		TH		LT			RT		TH		LT			RT		TH		LT			RT		TH		LT						
From	To	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger		
1	6:30	6:45	0	0			0	0	0	1	3	0	3			0						0			0	0	1	2	0	2	8	10	
2	6:45	7:00	0	5			0	0	0	0	2	0	2			0						0			0	0	0	6	0	0	15	15	
3	7:00	7:15	0	4			0	0	0	0	2	1	3			0						0			1	0	0	10	0	2	19	21	
4	7:15	7:30	0	4			0	1	0	0	3	0	0			0						0			0	0	0	7	0	0	15	15	61
5	7:30	7:45	0	2			0	1	0	0	4	0	2			0						0			0	0	1	12	0	1	21	22	73
6	7:45	8:00	3	3			0	0	0	0	1	0	3			0						0			1	0	0	12	0	4	19	23	81
7	8:00	8:15	0	4			0	0	0	0	3	0	3			0						0			0	1	0	5	0	0	16	16	76
8	8:15	8:30	0	2			0	1	0	0	1	0	2			0						0			0	2	0	4	0	0	12	12	73
9	8:30	8:45	0	2			0	4	0	0	3	0	1			0						0			0	1	0	7	0	0	18	18	69
10	8:45	9:00	2	5			0	1	0	0	3	0	3			0						0			1	4	1	4	0	4	20	24	70
11	9:00	9:15	0	3			0	0	0	0	0	0	2			0						0			1	0	1	5	0	2	10	12	66
12	9:15	9:30	0	4			0	1	0	0	1	0	2			0						0			0	2	1	0	0	1	10	11	65
3	7:00	8:00	<<<Calculated Peak Hour																														
	AM Peak Period		5	38	0	0	0	9	0	1	26	1	26	0	0	0						0			4	10	5	74	0	16	183	199	
	Heavy Vehicle %		12%		#DIV/0!		0%			4%		4%		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		29%		6%				8%		
	AM Peak Hour		3	13	0	0	0	2	0	0	10	1	8	0	0	0						0			2	0	1	41	0	7	74	81	
	Heavy Vehicle %		19%		#DIV/0!		0%			0%		11%		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		100%		2%				9%		
	AM Peak Hr Total		16		0		2			10		9		0		0		0		0			0		2		42						
	AM Peak Hr Approach Tc				18							19						0							44								
7	#N/A	#N/A	<<<Calculated Peak Hour																														
	AM Peak Period		5	38	0	0	0	9	0	1	26	1	26	0	0	0						0			4	10	5	74	0	16	183	199	
	Heavy Vehicle %		12%		#DIV/0!		0%			4%		4%		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		29%		6%				8%		
	AM Peak Hour		0	1	0	0	0	0	0	0	2	2	20	0	1	0						0			2	8	0	3	0	5	38	43	
	Heavy Vehicle %		0%		#DIV/0!		#DIV/0!			0%		9%		0%		0%		50%		#DIV/0!			#DIV/0!		20%		0%				12%		
	AM Peak Hr Total		1		0		0			2		22		1		2		2		0			0		10		3						
	AM Peak Hr Approach Tc				1							25						4							13								

Afternoon Peak Hour Results

18-Dec-25

	0:15	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Time Period		Westbound							Northbound							Eastbound							Southbound							Total		All	Peak Hr Totals
		RT		TH		LT			RT		TH		LT			RT		TH		LT			RT		TH		LT						
From	To	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger	Heavy	Passenger	Heavy	Passenger	Pedestrians	Heavy	Passenger		
1	15:30	15:45	1	9			2	3	0	0	0	0	1			0						0			0	5	1	9	0	4	27	31	
2	15:45	16:00	0	5			0	3	0	0	1	0	1			0						0			1	0	0	4	0	1	14	15	
3	16:00	16:15	0	13			1	7	0	0	5	1	3			0						0			0	4	0	4	0	2	36	38	
4	16:15	16:30	0	10			0	3	0	0	0	0	2			0						0			0	1	2	4	0	2	20	22	106
5	16:30	16:45	0	6			1	5	0	0	3	0	0			0						0			0	2	1	4	0	2	20	22	97
6	16:45	17:00	1	10			0	8	0	0	3	0	7			0						0			1	3	2	6	0	4	37	41	123
7	17:00	17:15	0	7			0	3	0	0	4	0	2			0						0			0	3	0	2	0	0	21	21	106
8	17:15	17:30	0	13			0	4	0	0	2	0	1			0						0			0	3	0	4	0	0	27	27	111
9	17:30	17:45	0	12			0	5	0	0	2	0	3			0						0			1	2	0	7	0	1	31	32	121
10	17:45	18:00	0	4			0	2	0	0	2	0	0			0						0			0	0	0	2	0	0	10	10	90
11	18:00	18:15	0	3			0	3	0	0	5	0	1			0						0			0	2	0	4	0	0	18	18	87
12	18:15	18:30	0	6			0	3	0	0	1	0	2			0						0			0	1	0	4	0	0	17	17	77
3	16:00	17:00	<<<Calculated Peak Hour																														
	PM Peak Period		2	98	0	0	4	49	0	0	28	1	23	0	0	0						0			3	26	6	54	0	16	278	294	
	Heavy Vehicle %		2%		#DIV/0!		8%			0%		4%		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		10%		10%				5%		
	PM Peak Hour		1	39	0	0	2	23	0	0	11	1	12	0	0	0						0			1	10	5	18	0	10	113	123	
	Heavy Vehicle %		3%		#DIV/0!		8%			0%		8%		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		9%		22%				8%		
	PM Peak Hr Total		40		0		25			11		13		0		0		0		0			0		11		23						
	PM Peak Hr Approach Tc				65							24						0							34								
#N/A	#N/A	#N/A	<<<Calculated Peak Hour																														
	PM Peak Period		2	98	0	0	4	49	0	0	28	1	23	0	0	0						0			3	26	6	54	0	16	278	294	
	Heavy Vehicle %		2%		#DIV/0!		8%			0%		4%		#DIV/0!		#DIV/0!		#DIV/0!		#DIV/0!			#DIV/0!		10%		10%				5%		
	PM Peak Hour	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	Heavy Vehicle %		#N/A		#N/A		#N/A			#N/A		#N/A		#N/A		#N/A		#N/A		#N/A			#N/A		#N/A		#N/A				#N/A		
	PM Peak Hr Total		#N/A		#N/A		#N/A			#N/A		#N/A		#N/A		#N/A		#N/A		#N/A			#N/A		#N/A		#N/A						
	PM Peak Hr Approach Tc				#N/A							#N/A						#N/A							#N/A								

APPENDIX B: SYNCHRO TRAFFIC ANALYSIS
FORECAST EXISTING 2025 AND OPERATIONS 2027

Intersection	
Intersection Delay, s/veh	7.1
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	16	9	10	42	2
Future Vol, veh/h	2	16	9	10	42	2
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	17	9	11	44	2
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	6.6	6.8	7.4
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	11%	95%
Vol Thru, %	47%	0%	5%
Vol Right, %	53%	89%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	19	18	44
LT Vol	0	2	42
Through Vol	9	0	2
RT Vol	10	16	0
Lane Flow Rate	20	19	46
Geometry Grp	1	1	1
Degree of Util (X)	0.02	0.019	0.054
Departure Headway (Hd)	3.686	3.537	4.174
Convergence, Y/N	Yes	Yes	Yes
Cap	973	1010	862
Service Time	1.701	1.566	2.179
HCM Lane V/C Ratio	0.021	0.019	0.053
HCM Control Delay	6.8	6.6	7.4
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.1	0.1	0.2

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	1	1	0	0	2	1	21	4	4	16	1
Future Vol, veh/h	0	1	1	0	0	2	1	21	4	4	16	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	0	0	2	1	22	4	4	17	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	53	54	18	53	52	24	18	0	0	26	0	0
Stage 1	26	26	-	26	26	-	-	-	-	-	-	-
Stage 2	27	28	-	27	26	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	946	837	1061	946	839	1052	1599	-	-	1588	-	-
Stage 1	992	874	-	992	874	-	-	-	-	-	-	-
Stage 2	990	872	-	990	874	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	941	834	1061	941	836	1052	1599	-	-	1588	-	-
Mov Cap-2 Maneuver	941	834	-	941	836	-	-	-	-	-	-	-
Stage 1	991	871	-	991	873	-	-	-	-	-	-	-
Stage 2	987	871	-	985	871	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.9	8.4	0.3	1.4
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1599	-	-	934	1052	1588	-	-
HCM Lane V/C Ratio	0.001	-	-	0.002	0.002	0.003	-	-
HCM Control Delay (s)	7.3	0	-	8.9	8.4	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	2.2

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	3	29	6	23	14	3
Future Vol, veh/h	3	29	6	23	14	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	31	6	24	15	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	30	0	-	0	55	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	37	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1583	-	-	-	953	1061
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	985	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1583	-	-	-	951	1061
Mov Cap-2 Maneuver	-	-	-	-	951	-
Stage 1	-	-	-	-	1003	-
Stage 2	-	-	-	-	985	-

Approach	SE	NW	SW
HCM Control Delay, s	0.7	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	1583	-	969
HCM Lane V/C Ratio	-	-	0.002	-	0.018
HCM Control Delay (s)	-	-	7.3	0	8.8
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	-	0.1

Intersection	
Intersection Delay, s/veh	7.1
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	40	13	11	23	11
Future Vol, veh/h	25	40	13	11	23	11
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	42	14	12	24	12
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	7.1	6.9	7.4
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	38%	68%
Vol Thru, %	54%	0%	32%
Vol Right, %	46%	62%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	24	65	34
LT Vol	0	25	23
Through Vol	13	0	11
RT Vol	11	40	0
Lane Flow Rate	25	68	36
Geometry Grp	1	1	1
Degree of Util (X)	0.027	0.071	0.042
Departure Headway (Hd)	3.806	3.746	4.209
Convergence, Y/N	Yes	Yes	Yes
Cap	939	954	851
Service Time	1.835	1.775	2.233
HCM Lane V/C Ratio	0.027	0.071	0.042
HCM Control Delay	6.9	7.1	7.4
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.1	0.2	0.1

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	0	3	2	2	4	2	23	0	3	23	1
Future Vol, veh/h	3	0	3	2	2	4	2	23	0	3	23	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	0	3	2	2	4	2	24	0	3	24	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	62	59	25	60	59	24	25	0	0	24	0	0
Stage 1	31	31	-	28	28	-	-	-	-	-	-	-
Stage 2	31	28	-	32	31	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	933	832	1051	936	832	1052	1589	-	-	1591	-	-
Stage 1	986	869	-	989	872	-	-	-	-	-	-	-
Stage 2	986	872	-	984	869	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	926	830	1051	931	830	1052	1589	-	-	1591	-	-
Mov Cap-2 Maneuver	926	830	-	931	830	-	-	-	-	-	-	-
Stage 1	985	867	-	988	871	-	-	-	-	-	-	-
Stage 2	979	871	-	979	867	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.7	8.8	0.6	0.8
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1589	-	-	985	957	1591	-	-
HCM Lane V/C Ratio	0.001	-	-	0.006	0.009	0.002	-	-
HCM Control Delay (s)	7.3	0	-	8.7	8.8	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	2.9

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	6	16	32	19	22	6
Future Vol, veh/h	6	16	32	19	22	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	17	34	20	23	6

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	54	0	-	0	73	44
Stage 1	-	-	-	-	44	-
Stage 2	-	-	-	-	29	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1551	-	-	-	931	1026
Stage 1	-	-	-	-	978	-
Stage 2	-	-	-	-	994	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1551	-	-	-	927	1026
Mov Cap-2 Maneuver	-	-	-	-	927	-
Stage 1	-	-	-	-	974	-
Stage 2	-	-	-	-	994	-

Approach	SE	NW	SW
HCM Control Delay, s	2	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	1551	-	947
HCM Lane V/C Ratio	-	-	0.004	-	0.031
HCM Control Delay (s)	-	-	7.3	0	8.9
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	-	0.1

Intersection	
Intersection Delay, s/veh	7.1
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	29	9	10	55	2
Future Vol, veh/h	2	29	9	10	55	2
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	31	9	11	58	2
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	6.7	6.8	7.5
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	6%	96%
Vol Thru, %	47%	0%	4%
Vol Right, %	53%	94%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	19	31	57
LT Vol	0	2	55
Through Vol	9	0	2
RT Vol	10	29	0
Lane Flow Rate	20	33	60
Geometry Grp	1	1	1
Degree of Util (X)	0.021	0.032	0.07
Departure Headway (Hd)	3.72	3.523	4.2
Convergence, Y/N	Yes	Yes	Yes
Cap	963	1011	856
Service Time	1.74	1.562	2.208
HCM Lane V/C Ratio	0.021	0.033	0.07
HCM Control Delay	6.8	6.7	7.5
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.1	0.1	0.2

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	1	1	0	0	2	1	21	4	4	16	0
Future Vol, veh/h	0	1	1	0	0	2	1	21	4	4	16	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	1	1	0	0	2	1	22	4	4	17	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	52	53	17	52	51	24	17	0	0	26	0	0
Stage 1	25	25	-	26	26	-	-	-	-	-	-	-
Stage 2	27	28	-	26	25	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	947	838	1062	947	840	1052	1600	-	-	1588	-	-
Stage 1	993	874	-	992	874	-	-	-	-	-	-	-
Stage 2	990	872	-	992	874	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	942	835	1062	942	837	1052	1600	-	-	1588	-	-
Mov Cap-2 Maneuver	942	835	-	942	837	-	-	-	-	-	-	-
Stage 1	992	871	-	991	873	-	-	-	-	-	-	-
Stage 2	987	871	-	987	871	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.9	8.4	0.3	1.5
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1600	-	-	935	1052	1588	-	-
HCM Lane V/C Ratio	0.001	-	-	0.002	0.002	0.003	-	-
HCM Control Delay (s)	7.3	0	-	8.9	8.4	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	1.7

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	3	42	19	23	14	3
Future Vol, veh/h	3	42	19	23	14	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	44	20	24	15	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	44	0	-	0	82	32
Stage 1	-	-	-	-	32	-
Stage 2	-	-	-	-	50	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1564	-	-	-	920	1042
Stage 1	-	-	-	-	991	-
Stage 2	-	-	-	-	972	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1564	-	-	-	918	1042
Mov Cap-2 Maneuver	-	-	-	-	918	-
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	972	-

Approach	SE	NW	SW
HCM Control Delay, s	0.5	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	1564	-	938
HCM Lane V/C Ratio	-	-	0.002	-	0.019
HCM Control Delay (s)	-	-	7.3	0	8.9
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	-	0.1

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	32	9	13	13	0
Future Vol, veh/h	0	32	9	13	13	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	34	9	14	14	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	23	0	-	0	50	16
Stage 1	-	-	-	-	16	-
Stage 2	-	-	-	-	34	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1592	-	-	-	959	1063
Stage 1	-	-	-	-	1007	-
Stage 2	-	-	-	-	988	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1592	-	-	-	959	1063
Mov Cap-2 Maneuver	-	-	-	-	959	-
Stage 1	-	-	-	-	1007	-
Stage 2	-	-	-	-	988	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1592	-	-	-	959
HCM Lane V/C Ratio	-	-	-	-	0.014
HCM Control Delay (s)	0	-	-	-	8.8
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Intersection Delay, s/veh	7.2
Intersection LOS	A

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	25	53	13	11	36	11
Future Vol, veh/h	25	53	13	11	36	11
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	26	56	14	12	38	12
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	7.1	7	7.5
HCM LOS	A	A	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	32%	77%
Vol Thru, %	54%	0%	23%
Vol Right, %	46%	68%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	24	78	47
LT Vol	0	25	36
Through Vol	13	0	11
RT Vol	11	53	0
Lane Flow Rate	25	82	49
Geometry Grp	1	1	1
Degree of Util (X)	0.027	0.085	0.058
Departure Headway (Hd)	3.841	3.718	4.25
Convergence, Y/N	Yes	Yes	Yes
Cap	929	960	842
Service Time	1.877	1.755	2.279
HCM Lane V/C Ratio	0.027	0.085	0.058
HCM Control Delay	7	7.1	7.5
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.1	0.3	0.2

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	0	3	2	2	4	2	23	0	3	23	1
Future Vol, veh/h	3	0	3	2	2	4	2	23	0	3	23	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	0	3	2	2	4	2	24	0	3	24	1

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	62	59	25	60	59	24	25	0	0	24	0	0
Stage 1	31	31	-	28	28	-	-	-	-	-	-	-
Stage 2	31	28	-	32	31	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	933	832	1051	936	832	1052	1589	-	-	1591	-	-
Stage 1	986	869	-	989	872	-	-	-	-	-	-	-
Stage 2	986	872	-	984	869	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	926	830	1051	931	830	1052	1589	-	-	1591	-	-
Mov Cap-2 Maneuver	926	830	-	931	830	-	-	-	-	-	-	-
Stage 1	985	867	-	988	871	-	-	-	-	-	-	-
Stage 2	979	871	-	979	867	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.7	8.8	0.6	0.8
HCM LOS	A	A		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1589	-	-	985	957	1591	-	-
HCM Lane V/C Ratio	0.001	-	-	0.006	0.009	0.002	-	-
HCM Control Delay (s)	7.3	0	-	8.7	8.8	7.3	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection	
Int Delay, s/veh	2.4

Movement	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Traffic Vol, veh/h	6	29	45	19	22	6
Future Vol, veh/h	6	29	45	19	22	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	6	31	47	20	23	6

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	67	0	-	0	100	57
Stage 1	-	-	-	-	57	-
Stage 2	-	-	-	-	43	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1535	-	-	-	899	1009
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	979	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1535	-	-	-	895	1009
Mov Cap-2 Maneuver	-	-	-	-	895	-
Stage 1	-	-	-	-	962	-
Stage 2	-	-	-	-	979	-

Approach	SE	NW	SW
HCM Control Delay, s	1.3	0	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1
Capacity (veh/h)	-	-	1535	-	917
HCM Lane V/C Ratio	-	-	0.004	-	0.032
HCM Control Delay (s)	-	-	7.4	0	9.1
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0	-	0.1

Intersection	
Int Delay, s/veh	1.3

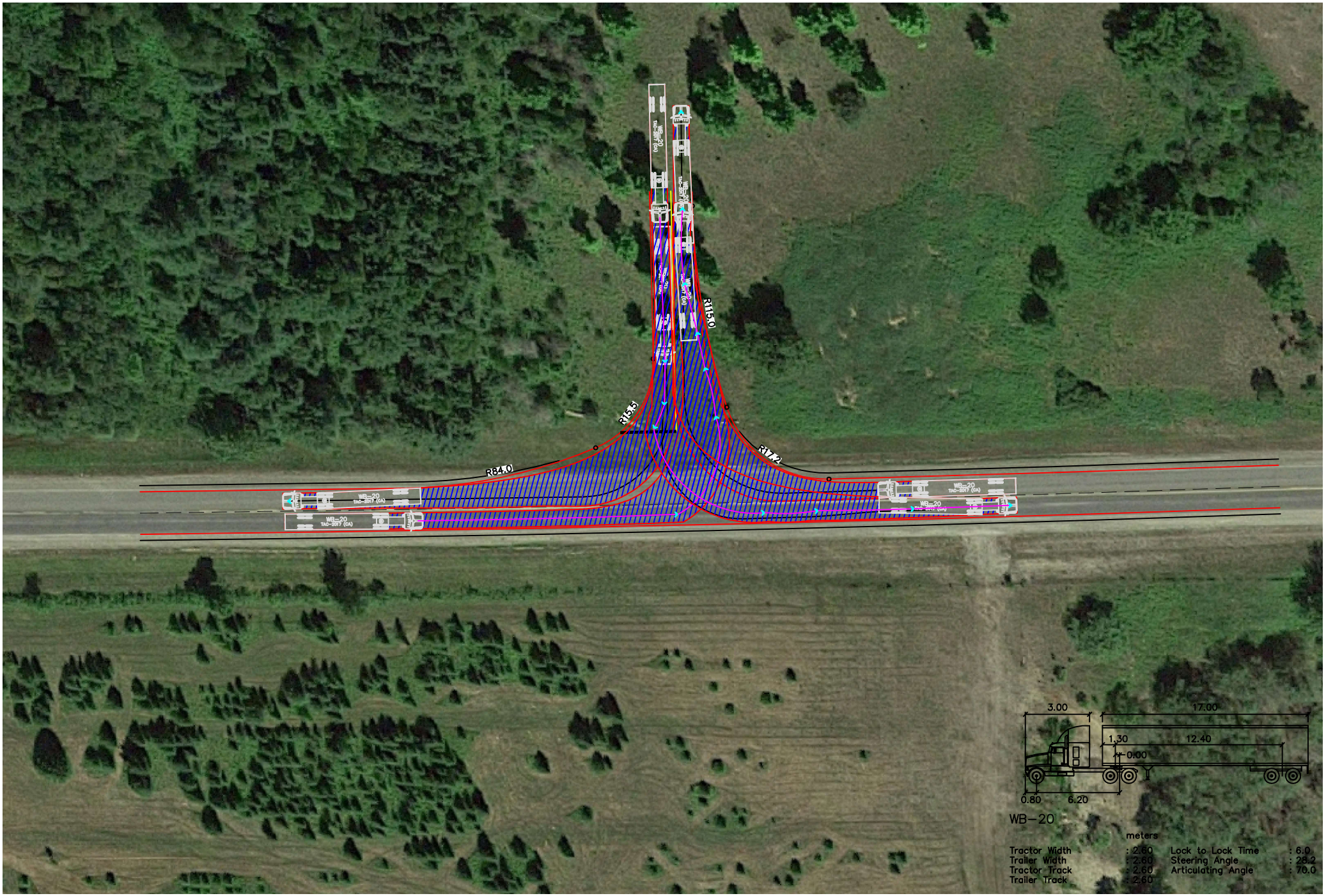
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	22	38	13	13	0
Future Vol, veh/h	0	22	38	13	13	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	23	40	14	14	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	54	0	-	0	70	47
Stage 1	-	-	-	-	47	-
Stage 2	-	-	-	-	23	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1551	-	-	-	934	1022
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	1000	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1551	-	-	-	934	1022
Mov Cap-2 Maneuver	-	-	-	-	934	-
Stage 1	-	-	-	-	975	-
Stage 2	-	-	-	-	1000	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.9
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1551	-	-	-	934
HCM Lane V/C Ratio	-	-	-	-	0.015
HCM Control Delay (s)	0	-	-	-	8.9
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

APPENDIX C: CONCEPTUAL ACCESS CONFIGURATION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R117.2
3.00
17.00
1.30
12.40
0.00
0.80
6.20
WB-20
meters
Tractor Width : 2.60
Trailer Width : 2.60
Tractor Track : 2.60
Trailer Track : 2.60
Lock to Lock Time : 6.0
Steering Angle : 28.2
Articulating Angle : 70.0

CURRICULUM VITAE

Castleglenn Consultants
Engineers, Project Managers & Planners

Arthur E. Gordon

B.A., B.Eng., P.Eng.

Principal

Experience

Mr. Gordon is President of CastleGlenn Consultants Inc. He has served in the capacity as Director and Manager of Transportation Planning within major Canadian consulting engineering firms.

He has been responsible for numerous transportation planning and traffic engineering design studies throughout Canada requiring detailed analysis, establishment of existing and forecast travel patterns and the development of sound rationale and justification for transportation/transit related solutions.

He has participated in numerous exercises involving identifying traffic and transportation issues related to resource extraction initiatives which include transportation infrastructure requirements and preliminary design plans on behalf of municipalities and the private sector.

Mr. Gordon has established a reputation of excellence in communication and presentation skills. This has been displayed through numerous public consultation/outreach exercises, providing expert witness testimony and prepared presentations to municipal councils, tribunals, executive committees and the Ontario Municipal Board. Mr. Gordon is known for insight into engineering processes and having coordinated technical review committees aimed at developing solutions that are both community and policy driven.

Mr. Gordon provides extensive consulting management expertise in major transportation planning and transit engineering studies. He has managed and directed large interchange, highway and municipal transportation infrastructure initiatives inclusive of master planning studies. He offers multi-modal experience incorporating truck, airport, light rail as well as cycling, pedestrian design, traffic management, traffic impact, parking, site evaluation, traffic forecasting and transportation safety studies.

Mr. Gordon is experienced with the development of transportation infrastructure within an urbanized environment involving criteria and approaches to assess mobility, accessibility, level of service, parking circulation, tourism operations and pedestrian circulation patterns within nationally significant campus environments. Also, his background includes life cycle analysis, road inventory, asset inventory, environmental assessment, transportation and transit economics, cost estimating and transportation implementation systems.

Some of his more recent studies have provided an appreciation and understanding of developments which remain sensitive to pedestrian and cyclist demands, environmental concerns, security provisions, special-event accessibility, and circulation requirements in addition to underground parking provisions. His knowledge of environmentally sensitive issues and his direct involvement with large freeway/highway related projects has been beneficial within these areas.

Mr. Gordon's has substantial experience having undertaken numerous provincially significant assignments. He has recently completed the "Highway 43 Functional Planning Study, NW of Edmonton," which assessed the future transportation related impacts and resulting infrastructure requirements associated with the development of 3 interchanges upon the surrounding communities. Mr. Gordon has completed transportation master planning studies (e.g. Both City and County of Leduc, Alberta) Mr. Gordon has been retained to examine the construction lane reduction impacts associated with the Woodroffe Avenue Re-construction (Hwy 417 to Baseline) within the City of Ottawa.

Mr. Gordon has developed, on behalf of the Province of British Columbia, "*Project Evaluation and Prioritization Process*" (British Columbia Financing Authority, BCTFA) that is intended to assign a priority to all provincial transportation capital expenditures. For the Province of Newfoundland and Environment Canada, he undertook the "*Trans-Canada Highway Improvements in the Vicinity of Terra Nova National Park*" (Newfoundland) that was used to assess alternative corridors and their impacts upon a provincially significant national park and the adjacent communities.

Within the field of transportation planning within a municipal setting Mr. Gordon's experience is diverse and multi-faceted. He co-authored the "*Implementing Employer Based Transportation Demand Management (TCM) Programs*" on behalf of the City

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of Ottawa and completed the transportation design requirements for a 4 lane vehicular tunnel under Runway 15L at Lester B. Pearson International Airport involving restricted vehicular access, security requirements and emergency response preparedness strategy. Moreover, he provided transportation planning expertise on the "*Parliamentary Precinct Study*".

In addition, he is thoroughly familiar with various evaluation frameworks which address infrastructure upgrading, safety, road-user benefit / cost analysis, level of service, socio-economic impact analysis, economic justification, and the requirements necessary to meet federal EA processes.

Furthermore, Mr. Gordon offers significant expertise in addressing the impacts of heavy vehicle traffic. He was a co-project manager responsible for the City of Edmonton's "*Truck Route and Regulation Study*" and has undertaken the "*National Capital Area Goods Movement Study*" and the "*Oakville Truck Route and Regulation Study*". He recently completed the City of Timmins Origin-Destination Survey and was recently retained to assess a one-way network for its downtown core.

The planning studies included rigorous technical analysis involving surveys of all heavy registered commercial vehicles, comprehensive community involvement, and a thorough operational comparative impact evaluation and assessment. Variables such as the adjacent area land uses, roadway classification, the number of lanes, geometric features, intensity of pedestrian activity, level of congestion, access density, origin-destination demand, alternate route viability, route continuity and consistency economic simulation. He has developed numerous methodologies for determining forecast travel patterns and the requirements for producing sound justifications for proposed improvements within an urban setting.

Mr. Gordon is former head of traffic modeling and simulation for the Region of Ottawa-Carleton and offers extensive experience in traffic modeling and simulation.

Transportation Planning - Ontario: Resource Extraction -

- Stittsville Quarry (Tomlinson)
- Renfrew Golf Site Quarry (Cavanagh)
- Oxford Mills Quarry (Tomlinson Corp.)
- Joyceville Kingston Quarry (Tomlinson Corp.)
- Highland Pit Quarry, Lanark County (Cavanagh)
- Napanee Asphalt Plant (Tomlinson)
- Storyland Quarry (Tomlinson)
- Rideau Quarry (Tomlinson)
- Brickyards Quarry (Tomlinson)
- Bruce Mines OTR Expansion & Laydown Area (Tomlinson)
- Carp Road Resource Recovery Centre (Tomlinson)
- Moodie Drive Quarry (Hope Side Access (Tomlinson)
- Henderson Asphalt testing Lab ((Cavanagh)
- Lawson Quarry, Athens (Tackaberry)

Transportation Planning - Ontario -

- VE: Bridge Rehabilitation Strategies: Clyde Ave to Parkdale – Traffic Component
- VE: Salmon-Moira Bridge Rehabilitation - Presentation
- Eagleson Road Interchange Value Engineering Component
- Town of Arnprior Master Traffic Study
- City of Kingston (Peer Review Auditor for Several Traffic Studies)
- City of North Bay Infrastructure Needs Backgrounds Study: Transportation Component
- City of Kingston Large Venue Entertainment Facility Impact Assessment
- City of Kingston Downtown Action Plan – Transportation Component
- City of Kingston (Peer Review Auditor for Several Traffic Studies)
- Highway 410 from Highway 401 to Steels Avenue, Traffic Demand and Traffic Operations Component, Ministry of Transportation of Ontario
- Highway 410 PDR – Transportation Systems Management and Traffic Demand Forecast Operations (in progress)
- Highway 417 PDR Traffic Assessment
- Highway 1 Interchange Functional Planning Study
- Greater Toronto Airport Authority - 4 lane vehicular tunnel under

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runway 15L-33R at Lester B. Pearson International Airport
- Southern Ontario Airport Study
- Highway 417 from Highway 17/7 to Highway 416 Traffic Component of Preliminary Design Report, Ministry of Transportation of Ontario
- Brockville Traffic Operations/ Transportation Planning Study
- Perth Transportation Study
- Highway 27 & Dixon Road Interchange Assessment, Metro Toronto
- Oakville Truck Route and Regulation Study
- Preparation for O.M.B. Hearing on Cornwall Residential Community
- Preparation for O.M.B. Peterborough Quarry Application (Kawartha Lakes)

Transportation Planning - Ottawa -

- Ottawa Hospital Parking Management Plan
- University of Ottawa Heart Institute Expansion- Traffic Management and Roadway modifications.
- Prince of Wales Drive Culvert Reconstruction Traffic Management Plan
- Woodroffe Avenue Reconstruction Traffic Management Plan
- Ottawa General Hospital Smyth Road Intersection Modifications
- Eden Park Community Transportation Study
- Cumberland Traffic Calming
- Transportation Demand Management Toolkit for Employer's (City of Ottawa)
- Chaudière Bridge Operational Review (Public Works)
- Portage Bridge Operational Review (Public Works)
- Eagleson Interchange Study
- Coventry Road Plan of Development
- Castlefrank Road Interchange and Transitway Overpass, Ottawa Carleton
- Regional Cycling Network and Comprehensive Cycling Study
- Highway 416 Traffic Diversion Study
- Hazeldean Road Environmental Assessment, City of Ottawa
- Kanata Town Centre Study
- Ottawa-Carleton Cyclist Survey
- Cycling Studies in Ottawa, Gloucester, Cumberland, and Nepean, Ontario
- Champlain Bridge One-Direction Flow Impact Assessment
- Terry Fox Drive Traffic Analysis Component, City of Ottawa
- Highway 417/ Castlefrank Road Interchange Study Region Ottawa
- Merivale Corridor Transportation Study
- Orleans Town Centre: Traffic Analysis of OMB Hearing
- Kanata Roadway Cost-Benefit Prioritization System
- Maitland Avenue - Highway 417 Interchange Rehabilitation Strategy
- Kanata North Urban Expansion Study
- Preparation for O.M.B. Hearing on Vanier Parkway
- Preparation for O.M.B. Hearing on Retail Expansion (Ottawa)

Site Specific Impact Assessments

- Ottawa Hospital Regional Cancer Centre – Transportation Impact
- Ottawa Civic Hospital Parking Garage Evaluation.
- Ottawa General Hospital Critical Care Tower Expansion
- R. W. Tomlinson - Quarry Application (Kawartha Lakes)
- Mondrian Traffic Impact Assessment
- Corel Centre Transportation Study
- Moodie Drive/Richmond Road Impact Study (Nepean)
- Fallowfield Road Plaza Parking Study
- Cyrville Road Traffic Impact Assessment for OMB Hearing
- Innes Road – Mer Bleue Road Retail 500,000 SF Plaza
- Innes Road Snow Disposal Facility Ottawa
- Corel Centre Expansion Ottawa
- Kanata Regional Shopping Centre Study
- Numerous site impact and traffic evaluation studies

Highway Functional Planning Projects – Alberta -

- Blairmore Coal Extraction Site, Hwy 3 Proposed Rail Tunnel, Detour and Mountain Access Road

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- VE Study: Highway 2 & 3 Systems Interchange Design,(Fort Macleod),
- Highway 63 - Functional Planning Study: Interchange and 50km of twinned Highway, (Boyle Alberta)
- Athabasca Truck Route Study and Functional Design.
- Highway 1 Old Banff Coach Rd. (RR-31) Functional Planning Study (Calgary)
- Highway 1 Springbank Interchange (RR-33) Functional Planning Study (Calgary)
- Highway 63 Combined Median Vehicle Inspection Station – Heavy Vehicle Safety Rest Area Design
- Highway 43 Functional Planning Study [Hwy 16-to-Hwy 33] (Onoway)
- Highway 22X Functional Planning Study (88th Street to RR-273) (Indus)
- Hwy 27 Bypass FPS (Olds)
- Safety Rest Area Discussion Paper (Central Region)
- Considerations of Bypass Alignments on Level 2-4 Highway corridors Discussion Paper (Edmonton)
- Highway 28A/28 Functional Planning Study (Gibbons)
- Highway 27 (Olds & Sundre) Functional Planning Study
- Highway 2 (Bowden) Functional Planning Study
- Highway 2&Township Road 265 Partial Interchange (Airdire)
- Highway 3&6 Interchange Functional Planning Study (Pincher Creek)
- Highway 14 Functional Planning Study (Wainwright)
- Highway 63 Functional Planning Study
- Lacombe/Blackfalds Traffic Impact Assessment (Lacombe County)
- Highway 2A Functional Planning Study (Ponoka)
- Highway 27 & Olds Functional Planning Study (Olds)
- Highway 2A Transportation Planning Study (Blackfalds to Lacombe)
- Highway 2 Corridor Management Study (Calgary to Innisfail)
- Highway 2A Transportation Planning Study (Red Deer to Blackfalds)
- Highway 1 Dunmore Functional Planning Study (2 interchanges 7 km divided Highway)
- Highway 3 & 36 Taber Access Management Planning Study (8 km urban Highway environment)
- Highway 2 & 3 Functional Planning Study, Fort Macleod, Alberta Transportation
- Highway 1 Functional Planning Study, Brooks, Alberta Transportation
- Highway Vicinity Access Management Agreement, Highway 11 East of Red Deer, Alberta Functional Planning Study Alberta Infrastructure
- Highway 11 Realignment Study, East of Red Deer, Alberta Transportation
- Highway 34 & Highway 2 Interchange, Grand Prairie, Functional Design, Alberta Transportation & Utilities
- Highway 11 and Highway 2 Interchange Upgradesm Red Deer, (Alberta Transportation & Utilities,
- Highway 11 Twinning (Alberta Transportation & Utilities,
- Review of Ontario Access Management Policies, Alberta Transportation Utilities
- Review of Interstate Highway (FHWA) Access Management Policies, Alberta Transportation and Utilities
- Edmonton Transportation Master Plan: Truck Route Study

Transportation Planning - Other Jurisdictions -

- Project Evaluation and Prioritization Process (British Columbia Financing Authority)
- TransCanada Highway Improvements in the Vicinity of Terra Nova National Park (Newfoundland)
- Transit Project Evaluation and Prioritization Process (British Columbia Financing Authority)
- Kenmount Road and Proposed East-West Arterial (St. John's, Nfld.)

Memberships

- Association of Professional Engineers, Geologists and Geophysicists of Alberta
- Professional Engineers, Ontario
- Association of Professional Engineers & Geoscientists of British Columbia
- Institute of Transportation Engineers, Past President, National Capital Section
- Transportation Association of Canada, Transportation Planning Committee
- Canadian Society for Civil Engineering

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Principal

Education

- B.Eng. Civil Engineering, Carleton University, 1984
- BA. Economics and Law, Carleton University, 1980
- Masters Courses
- Accredited Health and Safety Auditor – Alberta Construction Safety Association

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Konstantin Joulanov

B.ASc M. Eng

Transportation Planner

Mr. Konstantin Joulanov is a Transportation Planner with CastleGlenn Consultants Inc.

Mr. Joulanov joined Castleglenn Consultants Inc. in October 2021, and since then he has undergone an extensive training on transportation planning and analysis.

Mr. Joulanov has developed a diverse set of skills in the fields related to transportation planning and engineering. Mr. Joulanov has knowledge of analyzing multi-modal traffic streams with both macro-and-micro modelling techniques, having been involved primarily in traffic operations studies, and Transportation Impact Assessments (TIA), Transportation Impact Studies (TIS), as well as having had some exposure to functional planning studies (FPS), and Transportation Master Plans.

Transportation Impact Studies

Tomlinson East Oxford Extraction Site (North Grenville, Ontario):

Mr. Joulanov was the lead analyst for this TIS evaluating a proposed sand and gravel extraction site. The analysis dealt with existing and future truck traffic conditions using Synchro. Seasonal road restrictions had to be respected for reduced loads. The study also involved sightline analysis as well as right and left turn lane warrants.

Cavanagh – Highway 60 Renfrew Golf Pit (Horton, Ontario):

Mr. Joulanov led the traffic analysis effort for the proposed sand and gravel pit. The analysis dealt with existing, operational and future traffic conditions using Synchro. The study also involved sightline analysis as well as right and left turn lane warrants. The sightline analysis required the removal of some trees and addition of signage to provide adequate visibility for trucks.

Cavanagh Highland Line Pit (Lanark Highlands, Ontario):

Mr. Joulanov was the lead analyst for this TIS evaluating a proposed mineral extraction site. The analysis dealt with existing and future truck traffic conditions using Synchro. The study involved an assessment of alternative access locations taking into account sight line requirement and heavy vehicle operational characteristics. Mr. Joulanov also assisted with public engagement by attending a public open house and providing answers to questioned made by the local citizens. A peer review was conducted for the TIS document, to which Mr. Joulanov provided response.

Cavanagh Haley Station Pit (Haley Station, Ontario):

This project involved adhering to Ministry of Transportation of Ontario (MTO) guidelines, as the site was located within their zone of control. Mr. Joulanov conducted the traffic analysis of the proposed quarry and its effects on the roadways in its vicinity. The analysis dealt with existing, operational, 5 year and 10 year forecast truck traffic conditions using Synchro. Sightlines at the site access were also analyzed along with a conceptual access configuration. Left and right turn lane warrant analysis concluded that neither were necessary.

Proposed Storyland Quarry (Renfrew, Ontario):

This project involved securing the necessary approvals to establish a quarry operation near a major Provincial highway corridor. Mr. Joulanov conducted the traffic analysis component of this project which required an assessment of alternative access locations and configurations taking into account sight line requirement and heavy vehicle operational characteristics. A total of 3 alternative access arrangements were considered taking into account the traffic impact of the proposed development upon the surrounding roadways.

Key skills

- Excellent verbal communication skills;
- Experienced in planning and problem solving;
- Experienced in engaging with public and stakeholders;
- Proficient in technical writing;
- Strong analytical capacity; and
- Proficient with…
  - Synchro versions 8/10;
  - Sidra Roundabout Analysis;
  - VISTRO
  - HCM 2000/HCM 2010/HCM 6 Traffic Analysis;
  - Google Earth and similar GIS platforms; and
  - Microsoft Word Suite (Word, Excel, PowerPoint, Outlook, etc.)

Education

- Bachelor of Applied Science in Civil Engineering, University of Ottawa,
- Masters of Engineering, Carleton