STRIK BALDINELLI MONIZ

PLANNING • CIVIL • STRUCTURAL • MECHANICAL • ELECTRICAL

TRAFFIC IMPACT STUDY

583398 HAMILTON ROAD

SOUTH-WEST OXFORD, ONTARIO

PROPOSED BARDOEL GRAVEL PIT

J-AAR MATERIALS LIMITED

OCTOBER 2024

SBM-23-2227

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J-AAR Materials Limited
3003 Page Street
London, Ontario N5V 4J1

October 4, 2024
SBM-23-2227

Attn: Jamie Martelle

Re: Traffic Impact Study
583398 Hamilton Road - Proposed Bardoel Gravel Pit
South-West Oxford, Ontario

Strik, Baldinelli, Moniz Ltd. is pleased to provide you with the enclosed Traffic Impact Study report for the proposed gravel pit at 583398 Hamilton Road in the Township of South-West Oxford, Ontario. The report generally concludes that the proposed pit can be accommodated by the existing transportation network with no significant impact to traffic operations and no road improvements required.

We trust this submission meets your satisfaction and will assist with the approval of the gravel pit. Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

Respectfully submitted,
Strik, Baldinelli, Moniz Ltd.
Planning • Civil • Structural • Mechanical • Electrical

Jonah Lester, P.Eng.
Transportation Engineer

EXECUTIVE SUMMARY

This Traffic Impact Study (TIS) has been prepared by Strik, Baldinelli, Moniz Ltd. (SBM) for J-AAR Materials Limited to identify transportation impacts, or a lack thereof, associated with a proposed gravel pit located on a portion of the property at 583398 Hamilton Road in the Township of South-West Oxford. The gravel pit would occupy approximately 80% of the property with the existing farmhouse and agricultural buildings to be retained. Access to the gravel pit is proposed from the existing driveway location on Hamilton Road.

This study has forecasted traffic volumes for a 2034 horizon year and assessed traffic operations within the vicinity of the subject site for existing, future background, and future total traffic conditions. Site access considerations, left turn lane warrants and traffic signal warrants have also been reviewed. Based on the analysis completed, the following key conclusions and recommendations are made in this TIS:

- With the anticipated extraction rate of 250,000 tonnes per year, it is forecast that the proposed gravel pit will generate up to 32 trips in each of the AM and PM peak hours (16 in and 16 out).
- Under existing conditions, all movements at the study area intersections are operating acceptably, with ample reserve capacity and LOS C or better.
- The Hamilton Road and Line 25 intersection and the site access intersection will continue to operate well throughout the 2034 horizon period with all movements at LOS C or better and v/c ratios below 0.66.
- Under 2034 background traffic conditions, the King Street West and Ingersoll Street intersection will have multiple movements approaching capacity (v/c ratios above 0.91) with considerable delay (LOS F), therefore signalization of the intersection should start to be considered around that time, which is consistent with the timeframe for signalization recommended in the County's TMP. The operational analysis for the 2034 total traffic conditions shows nearly identical results to the background conditions, confirming that the addition of the site traffic will have no significant impact on the intersection operations.
- Traffic signal warrants were analyzed for the King Street West and Ingersoll Street intersection and traffic signals are not warranted throughout the horizon period.
- The existing/proposed site access has sufficient spacing from other intersections and driveways. The site access location meets minimum sight distance requirements, however, it is recommended that the small trees and brush in the Hamilton Road right of way within 10 m of the south edge of pavement along the frontage of the site be removed in order to ensure their foliage does not obstruct the sightline to the east of the site access.
- Left turn lane warrants were checked for Hamilton Road at the site access for future total traffic conditions, and a left turn lane will not be warranted.
- Direct access to the County Road network, which already serves many existing gravel pits in the area, provides ideal haul routes to and from the site with no significant impact expected from the minor additional truck traffic.
- A sensitivity analysis was performed to assess the additional impact if the extraction level were to reach the maximum annual tonnage limit being applied for (500,000 tonnes). This analysis concluded that there would be negligible impact on intersection operations and no change to the previous conclusions about left turn lane and traffic signal warrants (i.e. not warranted), therefore

the extraction of the maximum annual tonnage limit could be accommodated by the existing road network.

- No road network improvements are required to accommodate the proposed gravel pit.

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1 INTRODUCTION

This Traffic Impact Study (TIS) has been prepared by Strik, Baldinelli, Moniz Ltd. (SBM) for J-AAR Materials Limited to identify transportation impacts, or a lack thereof, associated with a proposed gravel pit located on a portion of the property at 583398 Hamilton Road in the Township of South-West Oxford. The gravel pit would occupy approximately 80% of the property with the existing farmhouse and agricultural buildings to be retained. Access to the gravel pit is proposed from the existing driveway location on Hamilton Road. The location of the subject property is illustrated in Figure 1.

Figure 1: Site Location

Map Source: Google Earth

1.1 SCOPE AND METHODOLOGY

The general scope of the analysis was confirmed with the County of Oxford (County) and Township of South-West Oxford (Township) prior to commencing the study and is summarized in Table 1.

Table 1: Study Scope and Parameters

Study Scope and Parameters	
Analysis Intersections (Study Area)	• Hamilton Road (Oxford Road 9) and Line 25 (Meatherall Road) • King Street West (Oxford Road 9) and Ingersoll Street (Oxford Road 10) • Hamilton Road (Oxford Road 9) and Site Access
Analysis Time Periods	• Weekday AM peak hour • Weekday PM peak hour
Analysis Scenarios (Years)	• Existing Traffic • 2034 Background Traffic • 2034 Total Traffic

The intersection operational analysis has been performed using Synchro 11 software based on the Highway Capacity Manual 2000 (HCM 2000) methodology published by the Transportation Research Board National Research Council.

The operational analysis has identified the volume to capacity ratio (v/c ratio) and Level of Service (LOS) for all movements at the study area intersections. 95th percentile queues have also been summarized and queuing problems (queues projected to exceed available lane storage) would also be noted, if applicable.

Level of Service (LOS) is a function of the average control delay for an entire intersection or an individual movement. The relationships between the LOS letters and average delay ranges are defined in Table 2 for signalized and unsignalized intersections.

Table 2: Vehicular Level of Service Designations

LEVEL OF SERVICE (LOS)	CONTROL DELAY PER VEHICLE (s)	
	SIGNALIZED INTERSECTION	UNSIGNALIZED INTERSECTION
A	≤ 10	≤ 10
B	10 to 20	10 to 15
C	20 to 35	15 to 25
D	35 to 55	25 to 35
E	55 to 80	35 to 50
F	> 80	> 50

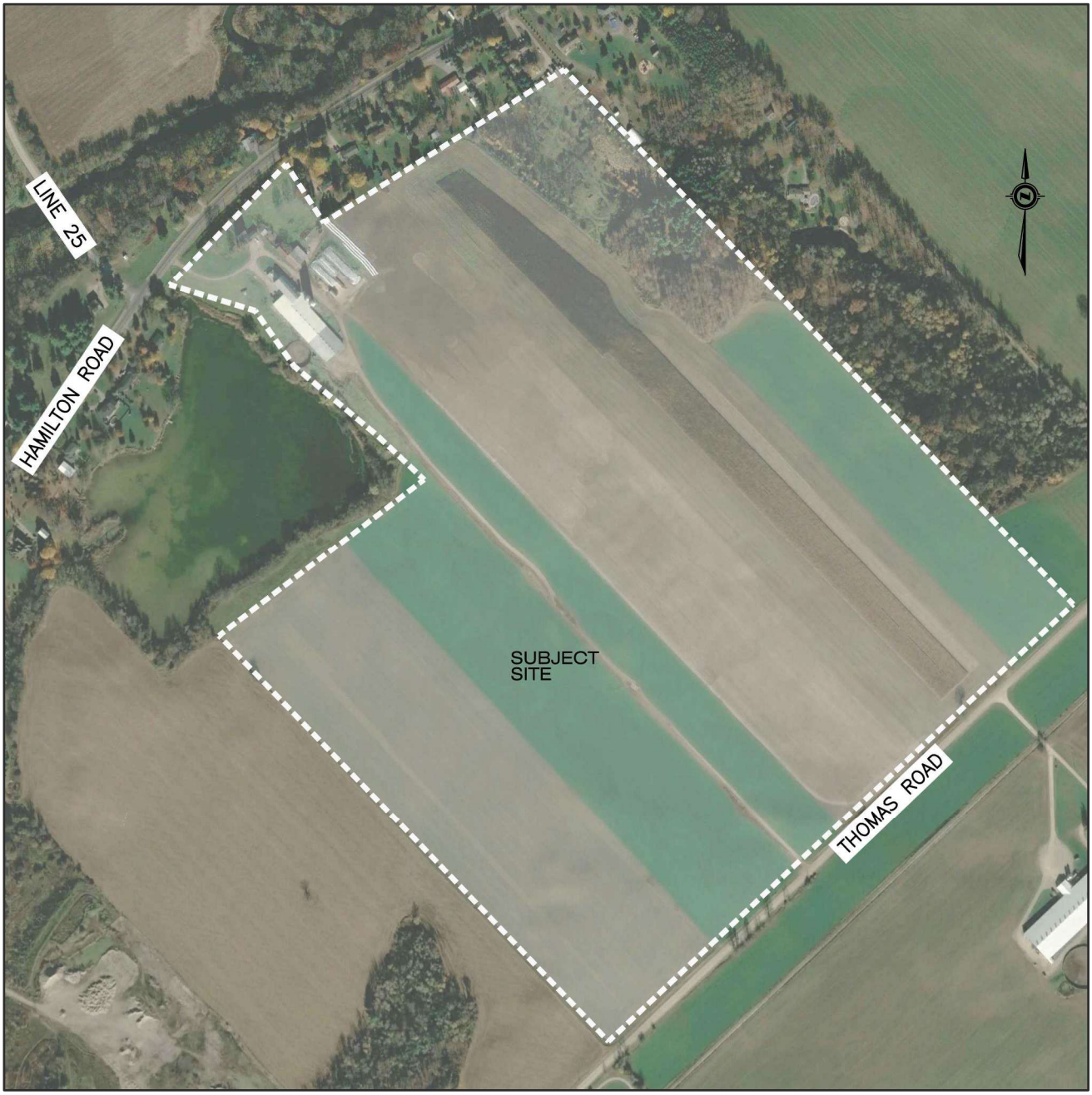
2 EXISTING CONDITIONS

2.1 SITE CONTEXT

The site is located on the south side of Hamilton Road, approximately 50 m east of Line 25. The site is bounded by the Hamilton Road right-of-way (ROW) and some residential properties to the north,

residential/woodlot lands to the east, an existing gravel pit and agricultural land to the west, and the Thomas Road ROW to the south, as shown in Figure 2. The site is currently agricultural land.

Figure 2: Site Area



Map Source: Google Earth (2020 imagery)

2.2 EXISTING ROAD NETWORK

A site visit was carried out on October 25, 2023 to confirm the existing study area conditions. The existing road network related to the study area intersections is described below and the existing lane configurations and traffic control are illustrated in Figure 3.

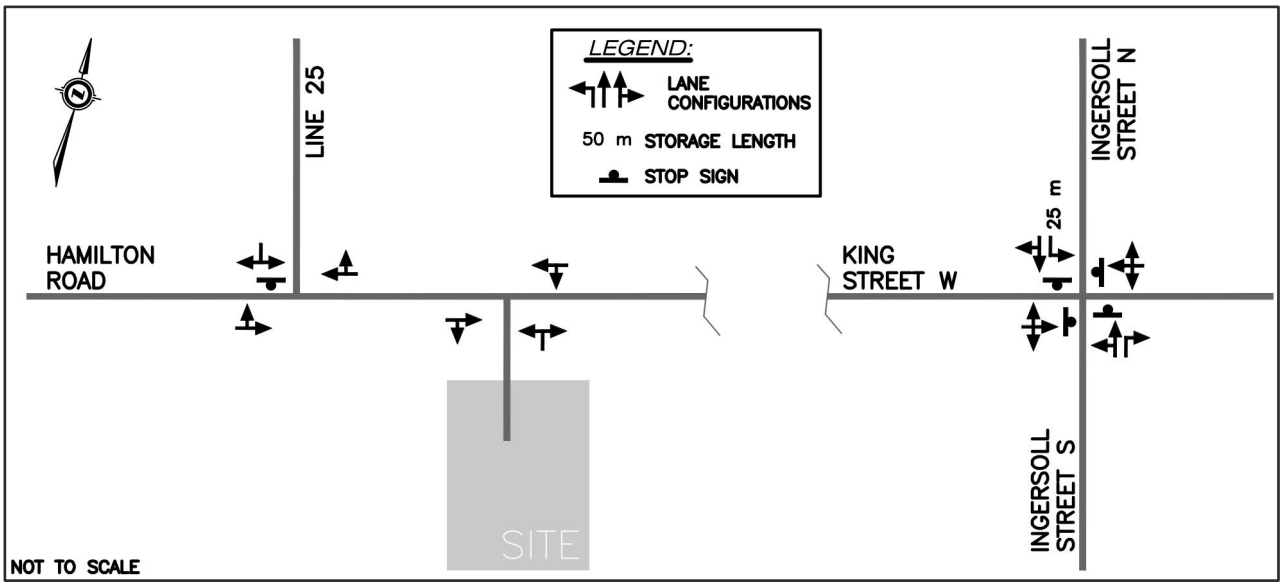
Hamilton Road (Oxford Road 9) is a two-lane County road (arterial) running east-west through the north end of South-West Oxford. In the area of the subject site, Hamilton Road has a rural cross-section with partially-paved and gravel shoulders, ditches, and no sidewalks. The posted speed limit is 60 km/h. Hamilton Road is not a designated cycling route, however, "Share The Road" signage is in place to remind motorists to share the road/shoulder with cyclists. To the west of the subject site, there are several existing gravel pits with direct access to Hamilton Road.

Hamilton Road (Oxford Road 9) continues into Ingersoll to the east, where it becomes King Street West. King Street West is a two-lane arterial road with a posted speed limit of 50 km/h. To the west of Ingersoll Street (Oxford Road 10), King Street West has a semi-rural cross-section with no curb and gutter, no (or very narrow) shoulders and no sidewalk. To the east of Ingersoll Street, King Street West has an urban cross-section with curb and gutter and sidewalk on both sides of the road. The King Street West and Ingersoll Street intersection has all-way stop control.

Ingersoll Street (Oxford Road 10) is an arterial road with a posted speed limit of 50 km/h. To the north of King Street West, Ingersoll Street has a two-lane, urban cross-section with sidewalk on the east side. To the south of King Street West, Ingersoll Street has a four-lane, urban cross-section with a paved multi-use path in the west boulevard. There is an at-grade rail crossing on Ingersoll Street to the south of the King Street West and Ingersoll Street intersection, with approximately 22 m of queuing space between the stop bars/gates, therefore "Do Not Stop On Tracks" signage is installed facing northbound traffic.

Line 25 (Meatherall Line) is a two-lane, Township road running north of Hamilton Road. It has a rural cross-section with an assumed (unposted) speed limit of 80 km/h.

Figure 3: Existing Study Area Traffic Control and Lane Configuration



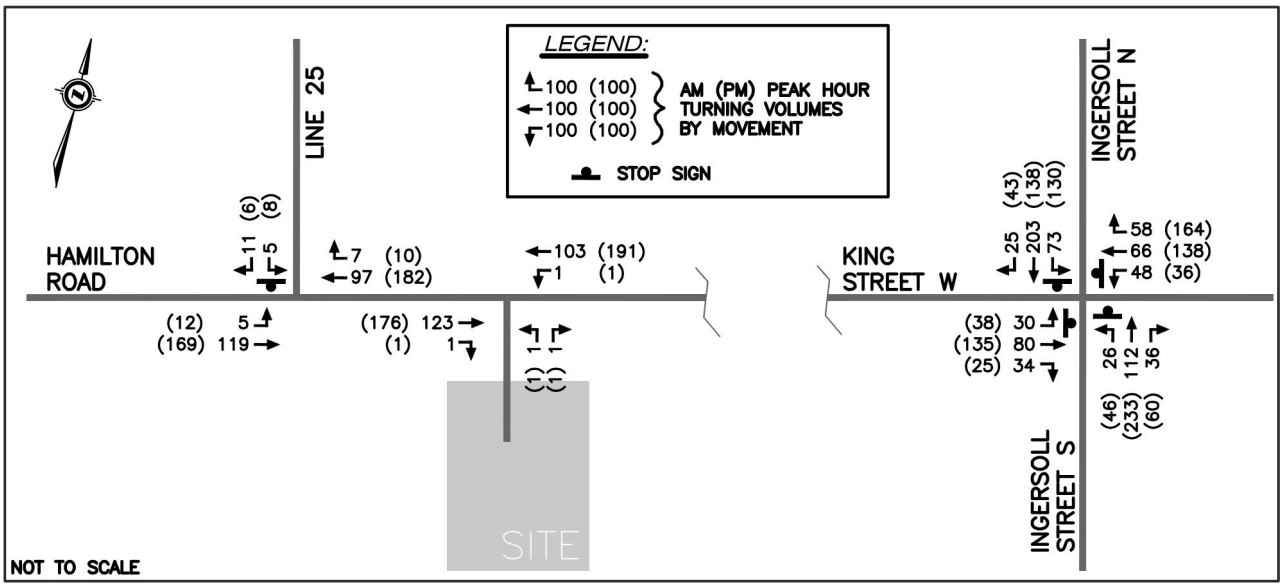
2.3 EXISTING TRAFFIC VOLUMES

Turning movement traffic counts were collected on Tuesday, December 12, 2023 by Pyramid Traffic Inc. at the Hamilton Road and Line 25, and King Street West and Ingersoll Street intersections during the AM and PM peak periods.

Since traffic counts taken in December often do not reflect peak-season volumes, the turning movement volumes at all study area intersections were increased by 20%. One trip in and one trip out in each direction were assumed for the existing site access traffic. The resulting "existing" peak hour traffic

volumes for the study area intersections are illustrated in Figure 4 and the traffic count data is provided in Appendix A.

Figure 4: Existing Peak Hour Traffic Volumes



2.4 EXISTING TRAFFIC OPERATIONS

Existing traffic operations were assessed at the study area intersections based on the existing lane configuration and traffic volumes presented in Sections 2.2 and 2.3.

Table 3 provides a summary of the existing intersection operations and complete Synchro output reports are provided in Appendix B.

Table 3: 2024 Intersection Operations Summary

INTERSECTIONS / MOVEMENTS		2024 TRAFFIC			
		AM PEAK HOUR		PM PEAK HOUR	
		V/C	LOS	V/C	LOS
Hamilton Road and Line 25	EB TR	0.10	A	0.18	A
	WB LT	0.07	A	0.13	A
	SB LR	0.02	A	0.02	B
Hamilton Road and Site Access	EB TR	0.08	A	0.12	A
	WB LT	0.09	A	0.18	A
	NB LR	0.01	A	0.01	B
King Street West and Ingersoll Street	EB LTR	0.26	B	0.41	C
	WB LTR	0.30	B	0.66	C
	NB LT	0.30	B	0.63	C
	NB R	0.06	A	0.12	B
	SB L	0.14	B	0.30	B
	SB TR	0.41	B	0.39	B

Notes: V/C - Volume to Capacity Ratio, LOS – Level of Service
EB – Eastbound, WB – Westbound, NB – Northbound, SB - Southbound
L – Left, T – Through, R – Right

From the results shown, it can be seen that the existing intersections are operating well during the peak hours, with most movements having v/c ratios below 0.3 and LOS B or better. The highest v/c ratios occur for the northbound and westbound movements during the PM peak hour at the King Street West and Ingersoll Street intersection, which have v/c ratios around 0.65 and are at LOS C.

Queuing results were also reviewed by comparing the 95th percentile queue length from the Synchro analysis with the available storage lengths on the stop-controlled approaches in order to determine where queues may cause operational concerns. The results are summarized in Table 4. It is noted that for the all-way stop control (AWSC) at King Street and Ingersoll Street, Synchro's HCM 6th Edition AWSC reports were used, which report queue length in number of vehicles, so those results have been converted to distances (m) assuming a conversion rate of 7.5 m per queued vehicle.

Table 4: 2024 Intersection Queuing

INTERSECTIONS / MOVEMENTS		TURN LANE STORAGE (m)	95th PERCENTILE QUEUE (m) 2024 TRAFFIC	
			AM	PM
Hamilton Road and Line 25	SB LR	-	5	5
Hamilton Road and Site Access	NB LR	-	5	5
King Street West and Ingersoll Street	EB LTR	-	8	15
	WB LTR	-	9	35
	NB LT	-	9	32
	NB R	-	5	5
	SB L	25	5	10
	SB TR	-	15	14

Notes: EB – Eastbound, WB – Westbound, NB – Northbound, SB - Southbound
L – Left, T – Through, R – Right
Queue lengths that were less than 5 m have been rounded up to 5 m to represent a minimum of one car length.

The queuing results show that the existing turning lane storage lengths sufficiently accommodate the 95th percentile queues for the existing traffic volumes and there are no other queuing concerns, however, it is noted that the northbound left-through lane queue on Ingersoll Street at King Street West extends through the at-grade rail crossing in the PM peak hour.

3 FUTURE BACKGROUND TRAFFIC

Future background traffic includes existing traffic with a general growth rate applied, plus traffic anticipated to be generated from other developments surrounding the study area. For the purposes of this study, a 10-year (2034) horizon year was selected for future traffic projections and analysis.

3.1 BACKGROUND GROWTH RATE

As recommended by County staff, a background growth rate of 2.0% per annum was applied to the traffic volumes in the study area.

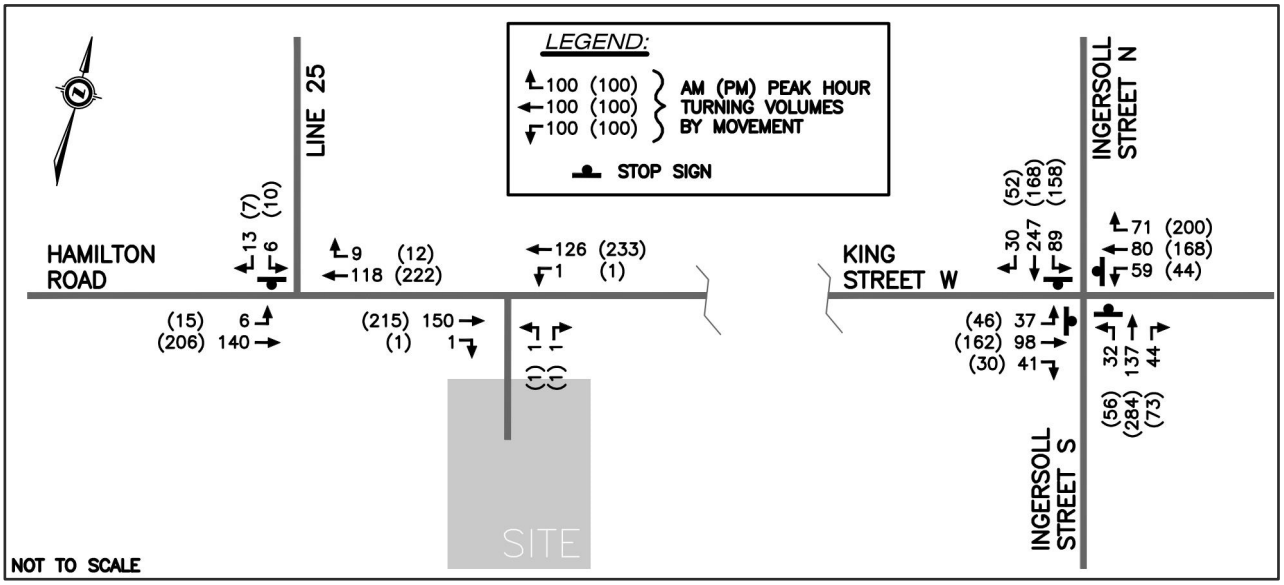
3.2 BACKGROUND DEVELOPMENT TRAFFIC

No background developments in the area were identified by the County or the Township.

3.3 BACKGROUND TRAFFIC VOLUMES

With the background growth rate applied to the existing traffic, the resulting 2034 background traffic volumes for the study area intersections are presented in Figure 5.

Figure 5: 2034 Background Traffic



3.4 FUTURE ROAD NETWORK

No planned improvements were identified by the County or Township for the study area intersections that would affect the operations within the horizon period of this study, however, the following improvements are recommended in the Oxford County Transportation Master Plan (Parsons, 2023):

- Urbanization of King Street West from Ingersoll Street to the Ingersoll town limits (timeframe of 2024 – 2028)
- Signalization of the King Street West and Ingersoll Street intersection (timeframe of 2034 – 2046).

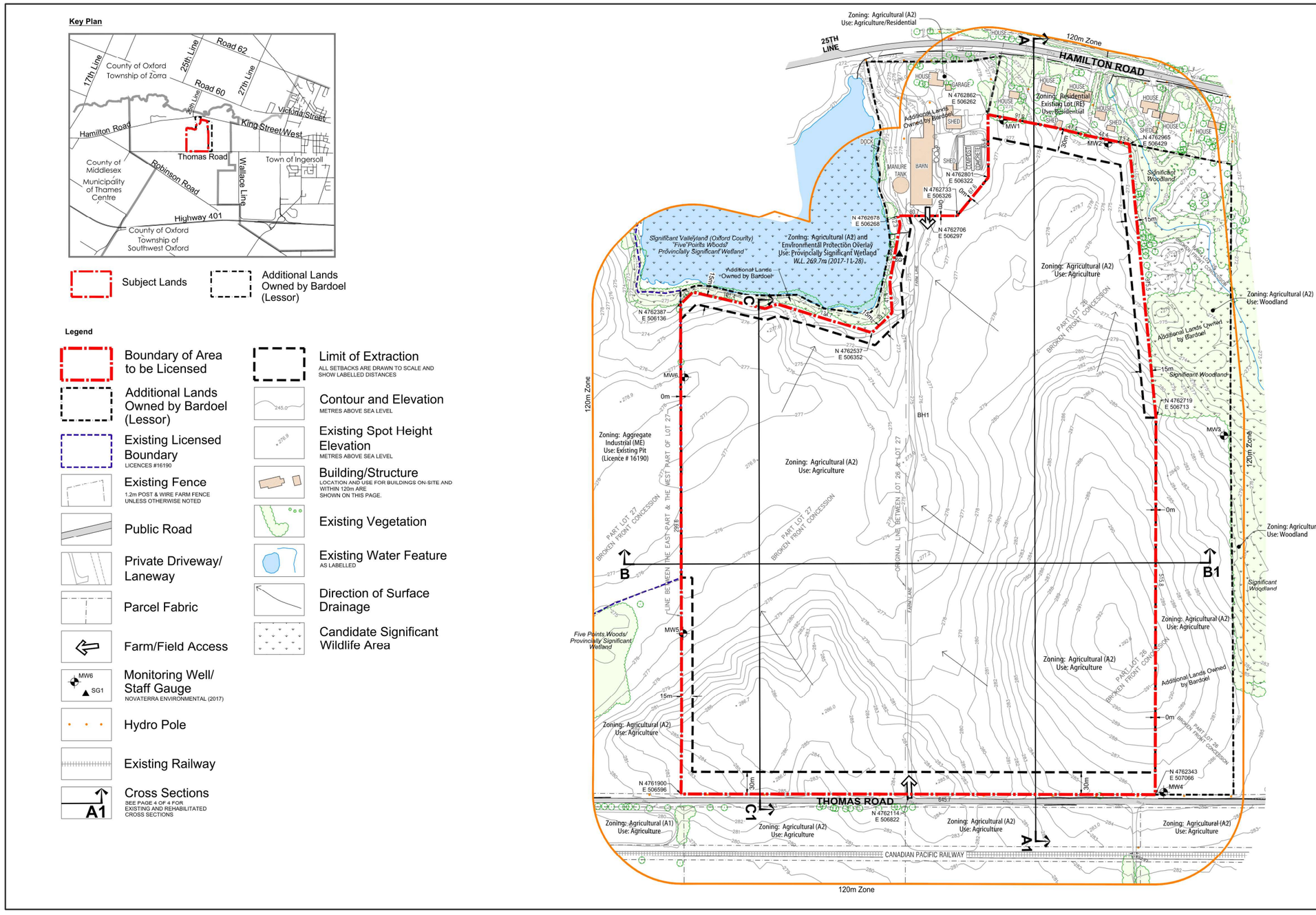
4 PROPOSED GRAVEL PIT

4.1 DEVELOPMENT PLAN

The proposed gravel pit will have an overall area of approximately 49.4 hectares with the area of extraction limited to 44.7 hectares. J-AAR Materials Limited has applied for a maximum annual tonnage limit of 500,000 tonnes, but it is anticipated that a maximum of approximately 250,000 tonnes would be extracted on a yearly basis, therefore 250,000 tonnes per year is the primary extraction scenario that has been considered in this TIS throughout Sections 4 to 6. A sensitivity analysis of the maximum annual tonnage limit extraction scenario (500,000 tonnes per year) has also been assessed to confirm it could be accommodated with little additional impact, which is presented in Section 7.

Access to the pit is proposed to be via the existing driveway for the property (with appropriate driveway and entrance upgrades), which is located near the west limit of the property's frontage along Hamilton Road. Excerpts from the Existing Features plan (by MHBC) showing the subject property and the boundary of the area to be licensed are shown in Figure 6 and the full version of the plan is provided in Appendix C.

Figure 6: Existing Features and Pit Boundary Plan



4.2 SITE TRAFFIC GENERATION AND DISTRIBUTION

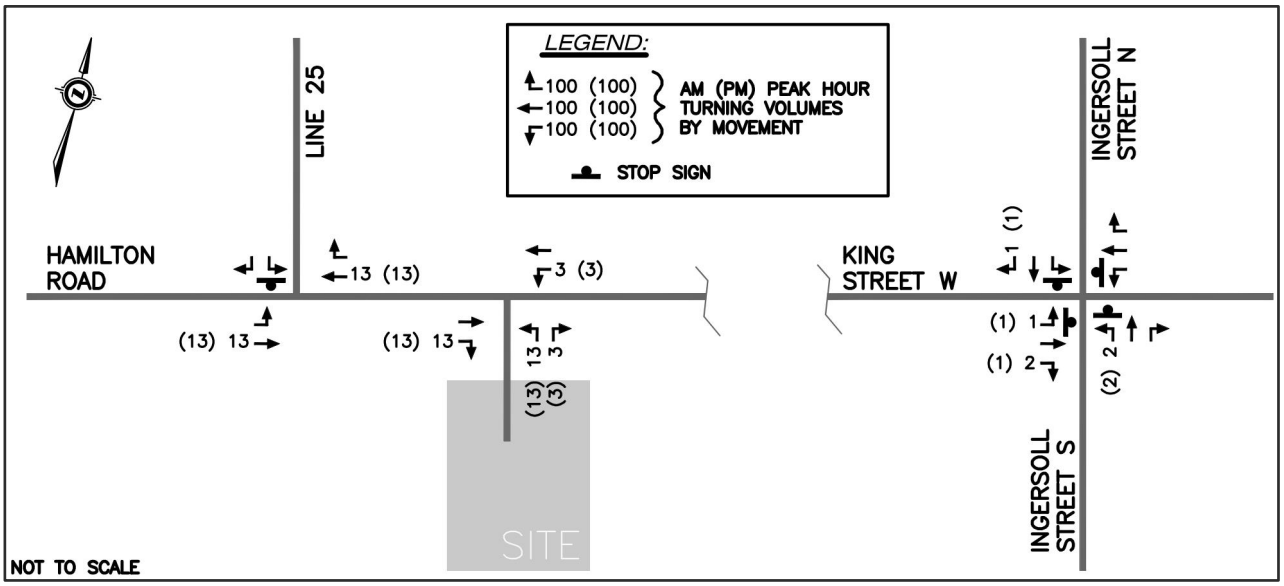
Site generated traffic volumes from the proposed gravel pit have been estimated based on operational forecasts for average daily extraction with conservative assumptions for peak season and peak hour increases. The following outlines the rationale used:

- Maximum of 250,000 tonnes extracted per year.
- Assuming 200 construction days per year, average daily extraction would be 1,250 tonnes per work day.
- Assuming peak season days may have a 100% greater output demand than average, peak daily extraction would be 2,500 tonnes per day.
- Assuming an average load of 30 tonnes per truck, would mean peak daily truck traffic of 84 trucks per day.
- Over a 10-hour workday, the truck traffic would average 8.4 trucks per hour.
- Assuming the peak hour of truck traffic may be approximately twice that of the average hour, the peak truck traffic would be 16 per hour (**16 trips in and 16 trips out**).

While the peak hour for truck traffic is not likely to occur during the AM or PM peak hours of the road traffic, there could also be a few employee trips entering/exiting the site during those peak hours, therefore total site traffic of 16 trips in and 16 trips out have been estimated for both the AM and PM peak hours being assessed in this study.

It is expected that approximately 80% of the truck traffic will be to/from the west. With that distribution applied, the resulting site traffic for the AM and PM peak hours is illustrated in Figure 7.

Figure 7: Site Traffic



4.3 ACCESS CONSIDERATIONS

4.3.1 ACCESS LOCATION

The site access is located at the west end of the property and is approximately 60 m east of Line 25 (measured centerline to centerline). The existing site access is the preferred access location along the frontage of the site due to the topography and configuration of the existing site, plus it maximizes the separation from adjacent residential lots.

The site access location provides sufficient corner clearance from the Line 25 intersection and there are no conflicts with other driveways, therefore we have no concerns with the access location.

4.3.2 SIGHTLINE ANALYSIS

Sightlines at the site access were reviewed in the field during our site visit to confirm acceptable sight distances are available. Sight distance measurements were taken from a point in the site access driveway 4.4 m from the edge of Hamilton Road, using a height of eye of 2.3 m (representing large trucks) and an approaching object height of 0.6 m (headlight height), as per the methodology in the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (GDGCR). For a conservative design speed of 80 km/h, the TAC GDGCR requires a minimum stopping sight distance of 130 m and recommends a minimum intersection sight distance of 215 m to accommodate truck turning movements without causing vehicles approaching in the same direction to have to significantly reduce their speed.

To the east of the site access, the sightline is limited by a horizontal curve on Hamilton Road, but the sight distance was measured to be 215 m, which meets the TAC recommended minimum intersection sight distance. It is noted, however, that there are some small trees and brush in the right of way that may slightly obstruct visibility during the growing season when leaves are present, therefore we recommend that trees and brush within approximately 10 m of the edge of pavement be removed along the frontage of the subject property to maintain optimum sightlines.

To the west of the site access, Hamilton Road is fairly flat with only a slight horizontal curve, so the sightline is unimpeded and the sight distance is over 320 m, which greatly exceeds minimum requirements. The sightlines to the east and west of the site access are illustrated in Figure 8 and Figure 9, respectively.

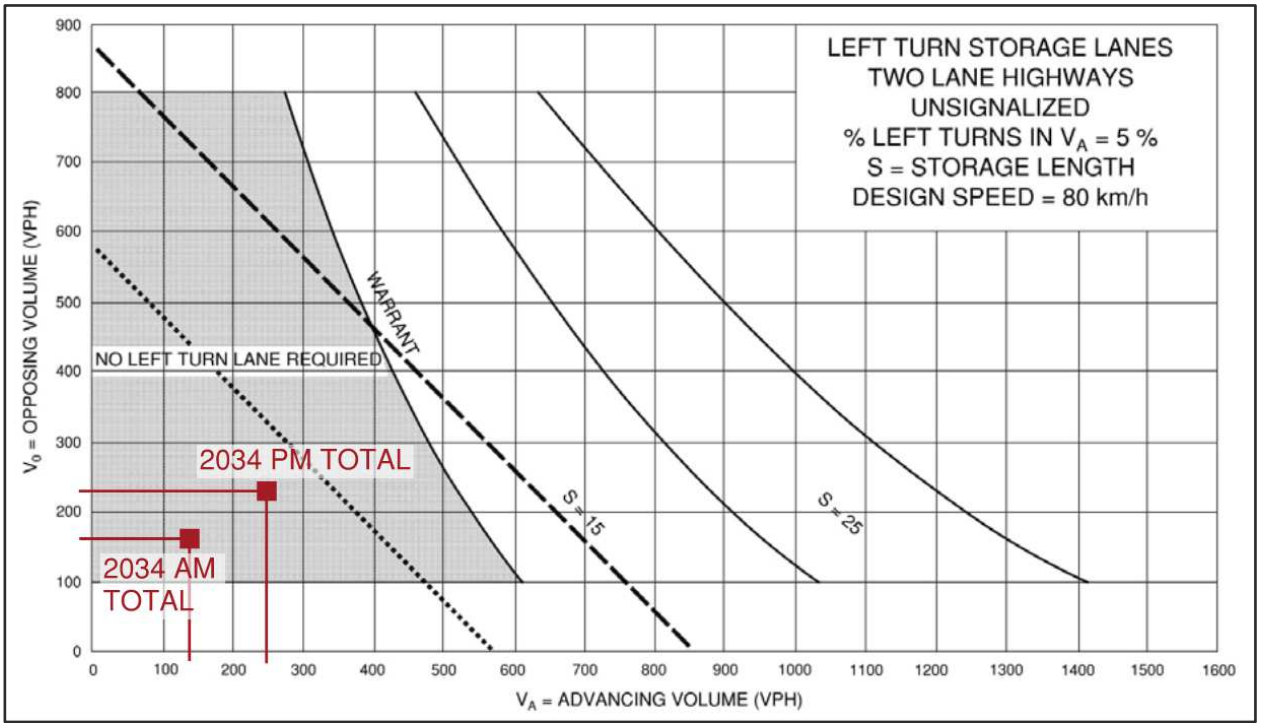
Figure 8: Site Access Sight Distance to East

Figure 9: Site Access Sight Distance to West

4.3.3 LEFT TURN LANE WARRANT ANALYSIS

The potential need for a left turn lane on Hamilton Road at the site access was reviewed based on the left turn lane warrant graphs from the Ministry of Transportation Design Supplement for the TAC Geometric Design Guide for Canadian Roads, June 2017 (MTO Design Supplement). The warrant is based on the hourly percentage of left turning vehicles, the advancing traffic volume and the volume of opposing traffic. Warrants were reviewed for the 2034 total traffic conditions for both the AM and PM peak hours and the results are shown in Figure 10.

Figure 10: Hamilton Road and Site Access Left Turn Lane Warrant



Source: MTO Design Supplement

As shown in the graphs, a left turn lane is not warranted on Hamilton Road at the site access.

4.4 HAUL ROUTE CONSIDERATIONS

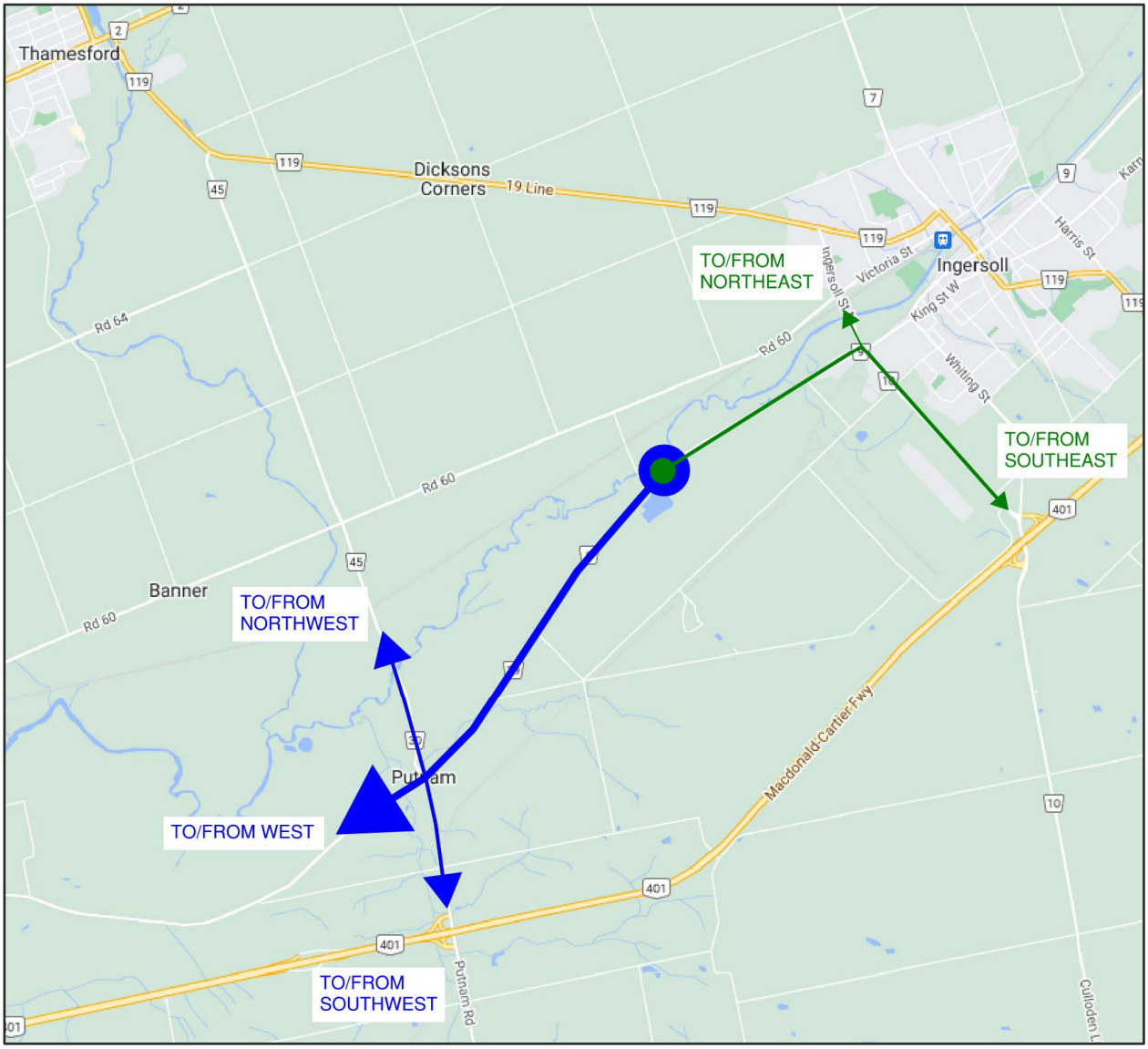
The proposed pit location has direct access to the County Road network, which is designed to accommodate heavy truck traffic and provides acceptable haul routes in all directions.

As previously mentioned, it is expected that at least 80% of the truck traffic will travel to/from the west (towards London), therefore the primary haul route will be west along Oxford Road 9 (becomes Middlesex Road 29 two kilometers west of the site), with some trucks splitting off to the north or south on Middlesex Road 30 (in Putnam), as shown by the blue lines in Figure 11. The Middlesex County roads through Putnam already accommodate truck traffic from the many existing gravel pits in the area, therefore the minor additional truck traffic generated from the proposed gravel pit should not have any noticeable impact, and area residents are already accustomed to heavy truck traffic.

Trucks heading to/from the east are primarily expected to follow Oxford Road 9 (Hamilton Road and King Street West) to Oxford Road 10 (Ingersoll Street), with the majority going to/from the south for access to Highway 401 and some local loads going north, as shown by the green lines in Figure 11. This route travels

through the industrial area in the west end of Ingersoll, which already accommodates significant heavy truck traffic, therefore impact from the site generated traffic is expected to be extremely minimal.

Figure 11: Haul Routes

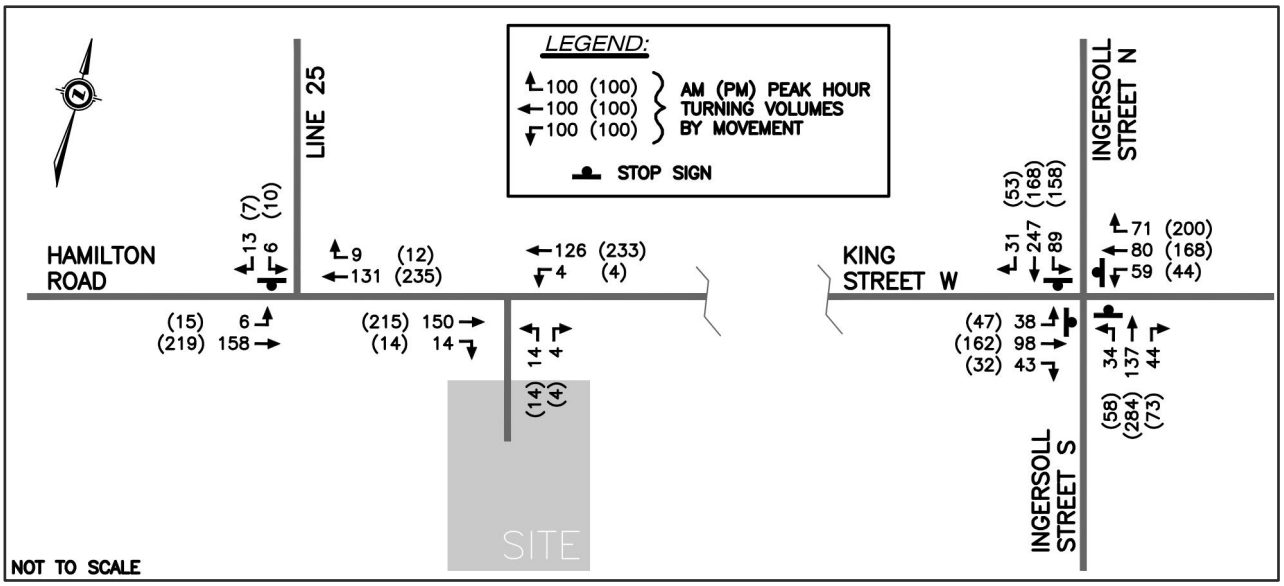


Map Source: Google Earth

5 FUTURE TOTAL TRAFFIC

The total future traffic is determined by combining the development traffic (site traffic) from Section 4.2 with the future background traffic from Section 3.3. The resulting 2034 total traffic volumes for the weekday AM and PM peak hours are shown in Figure 12.

Figure 12: 2034 Total Traffic



5.1 TRAFFIC SIGNAL WARRANT ANALYSIS

As noted in Section 3.4, the Oxford County Transportation Master Plan (TMP) recommends the signalization of the King Street West and Ingersoll Street intersection between 2034 and 2046.

Traffic signal warrant analysis was performed to check whether warrants will be met under 2034 total traffic conditions. The analysis was based on the Ontario Traffic Manual Book 12, Justification 7 for Projected Volumes. Justification 7 uses the AM and PM peak hour traffic volumes, and in the case of forecasted volumes at an existing intersection, it requires that 120% of the warrant threshold be met to satisfy the warrant. It was concluded that traffic signals are not expected to be warranted in 2034 (only 84% warranted). The signal warrant analysis sheets are contained in Appendix D.

6 FUTURE TRAFFIC OPERATIONAL ANALYSIS

Intersection operations were re-assessed for future background and total traffic conditions. The results of the future conditions analysis are summarized in Table 5. Detailed Synchro reports for the future background traffic and future total traffic are available in Appendix E and Appendix F, respectively.

Table 5: 2034 Intersection Operations Summary

INTERSECTIONS / MOVEMENTS		2034 BACKGROUND				2034 TOTAL			
		AM PEAK HOUR		PM PEAK HOUR		AM PEAK HOUR		PM PEAK HOUR	
		V/C	LOS	V/C	LOS (DELAY)	V/C	LOS (DELAY)	V/C	LOS (DELAY)
Hamilton Road and Line 25	EB LT	0.12	A	0.21	A	0.13	A	0.23	A
	WB TR	0.08	A	0.16	A	0.09	A	0.17	A
	SB LR	0.03	A	0.03	B	0.03	A	0.04	B
Hamilton Road and Site Access	EB TR	0.10	A	0.15	A	0.10	A	0.16	A
	WB LT	0.10	A	0.21	A	0.14	A	0.31	A
	NB LR	0.01	A	0.01	B	0.03	B	0.05	B
King Street West and Ingersoll Street	EB LTR	0.34	B	0.62	D	0.35	B	0.62	D
	WB LTR	0.40	B	**0.95**	**F (62)**	0.40	B	**0.95**	**F (62)**
	NB LT	0.39	B	**0.91**	**F (56)**	0.39	C	**0.92**	**F (58)**
	NB R	0.08	A	0.17	B	0.08	A	0.17	B
	SB L	0.19	B	0.44	C	0.19	B	0.44	C
	SB TR	0.53	C	0.57	C	0.54	C	0.58	C

Notes: V/C - Volume to Capacity Ratio, LOS – Level of Service, Delay – Average Delay in Seconds
EB – Eastbound, WB – Westbound, NB – Northbound, SB - Southbound
L – Left, T – Through, R – Right

The results show that both the Line 25 and site access intersections will continue to operate well throughout (and beyond) the horizon period under background and total traffic conditions with all movements having v/c ratios below 0.32 and LOS B or better.

Under 2034 background traffic conditions, the King Street West and Ingersoll Street intersection will operate well in the AM peak hour but will have the northbound left-through lane and westbound lane nearing capacity (v/c ratios of 0.91 and 0.95, respectively) and operating at LOS F (heavy delay) during the PM peak hour. This indicates that signalization should start to be considered around the 2034 timeframe, which is consistent with the recommendation in the County's TMP.

For 2034 total traffic conditions, the results are nearly identical to the background traffic, with only a minor increase to the v/c ratio for two movements, which indicates that the site traffic will have a negligible impact on the King Street West and Ingersoll Street intersection operations.

Queuing results for the 2034 background and total traffic conditions were reviewed from the Synchro analysis to compare 95th percentile queue with the available storage lengths and the results are presented in Table 6.

Table 6: 2034 Intersection Queuing Summary

INTERSECTIONS / MOVEMENTS		AVAILABLE STORAGE (m)	95th PERCENTILE QUEUE (m)			
			2034 BACKGROUND		2034 TOTAL	
			AM	PM	AM	PM
Hamilton Road and Line 25	SB R	-	5	5	5	5
Hamilton Road and Site Access	EB LR	-	5	5	5	5
King Street West and Ingersoll Street	EB LTR	-	11	30	11	31
	WB LTR	-	14	89	14	89
	NB LT	-	14	72	14	74
	NB R	-	5	5	5	5
	SB L	25	5	17	5	17
	SB TR	-	23	26	23	26

Notes: EB – Eastbound, WB – Westbound, NB – Northbound, SB - Southbound
L – Left, T – Through, R – Right
Queue lengths that were less than 5 m have been rounded up to 5 m to represent a minimum of one car length.

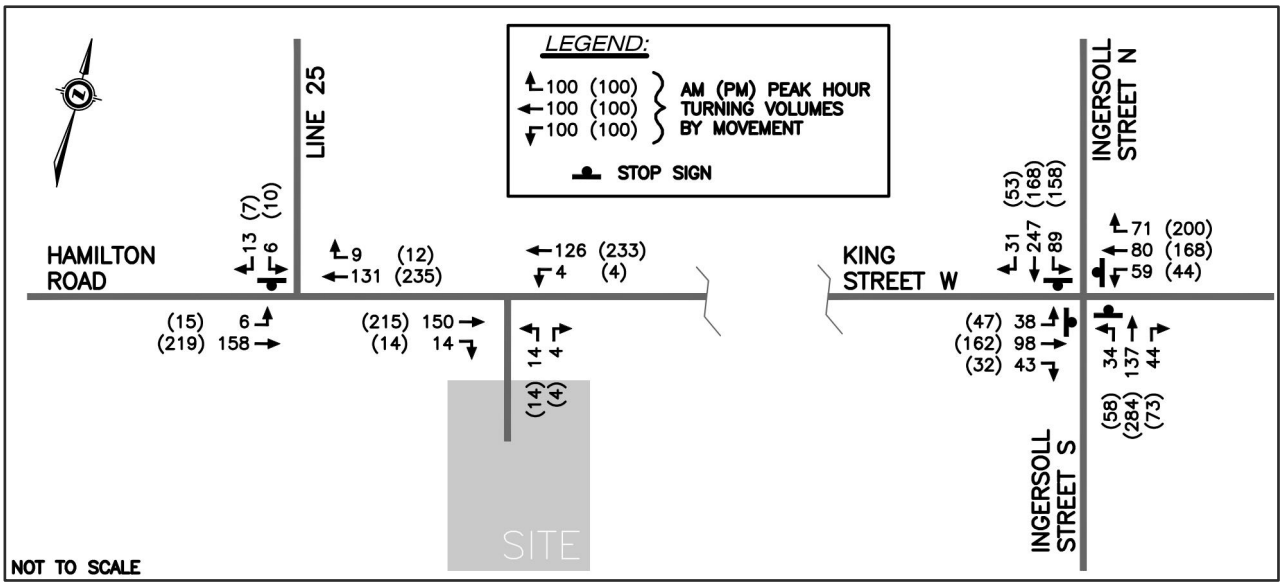
The results in Table 6 indicate that no queuing concerns are expected at the study area intersections.

7 SENSITIVITY ANALYSIS – MAXIMUM ANNUAL TONNAGE LIMIT (MATL) SCENARIO

While the previous analysis has been based on the anticipated extraction of a maximum of 250,000 tonnes per year from the proposed pit, the pit license application is for a maximum annual tonnage limit of 500,000 tonnes, therefore a sensitivity analysis has been conducted to assess the impact if this upper limit of extraction were ever to be reached.

Under this maximum annual tonnage limit (MATL) scenario, the extraction and truck traffic assumptions made in Section 4.2 would effectively be doubled, which would result in site traffic of 32 trips in and 32 trips out during the peak hour. Assuming the same directional distribution applied in Section 4.2, the total 2034 peak hour volumes in the MATL scenario would be as shown in Figure 13.

Figure 13: 2034 Total Traffic – MATL Scenario



Operational analysis of the study area intersections was re-assessed for the MATL scenario and the results are summarized in Table 7 (2034 background operations are also included again for easy reference and comparison). Synchro reports for the MATL scenario are provided in Appendix G.

Table 7: 2034 Intersection Operations Summary – MATL Scenario

INTERSECTIONS / MOVEMENTS		2034 BACKGROUND				2034 TOTAL – MATL			
		AM PEAK HOUR		PM PEAK HOUR		AM PEAK HOUR		PM PEAK HOUR	
		V/C	LOS	V/C	LOS (DELAY)	V/C	LOS (DELAY)	V/C	LOS (DELAY)
Hamilton Road and Line 25	EB LT	0.12	A	0.21	A	0.14	A	0.24	A
	WB TR	0.08	A	0.16	A	0.10	A	0.18	A
	SB LR	0.03	A	0.03	B	0.03	A	0.04	B
Hamilton Road and Site Access	EB TR	0.10	A	0.15	A	0.10	A	0.16	A
	WB LT	0.10	A	0.21	A	0.14	A	0.31	A
	NB LR	0.01	A	0.01	B	0.03	B	0.05	B
King Street West and Ingersoll Street	EB LTR	0.34	B	0.62	D	0.36	B	0.64	D
	WB LTR	0.40	B	**0.95**	**F (62)**	0.40	B	**0.96**	**F (64)**
	NB LT	0.39	B	**0.91**	**F (56)**	0.40	C	**0.93**	**F (61)**
	NB R	0.08	A	0.17	B	0.08	A	0.17	B
	SB L	0.19	B	0.44	C	0.19	B	0.44	C
	SB TR	0.53	C	0.57	C	0.54	C	0.58	C

Notes: V/C - Volume to Capacity Ratio, LOS – Level of Service, Delay – Average Delay in Seconds
EB – Eastbound, WB – Westbound, NB – Northbound, SB - Southbound
L – Left, T – Through, R – Right

The results above show that even under the MATL scenario, there would be very little effect on the intersection operations in the study area, with v/c ratio increases generally of 0.02 or less and hardly any change to the LOS during peak hours.

As most site traffic would continue to be to/from the west, there would be effectively no change to the left turn lane warrant analysis presented in Section 4.3.3 and a left turn would still not be warranted on Hamilton Road under the MATL scenario. Similarly, there would be no significant change to the traffic signal warrant analysis presented in Section 5.1 for the King Street West and Ingersoll Street intersection, with the conclusion remaining that traffic signals would not be warranted for the 2034 traffic volumes.

The overall conclusion of this sensitivity analysis is that the proposed gravel pit could operate at the maximum annual tonnage limit being applied for without any significant impact to road operations or the need for road improvements.

8 CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis completed, the following key conclusions and recommendations are made in this TIS:

- With the anticipated extraction rate of 250,000 tonnes per year, it is forecast that the proposed gravel pit will generate up to 32 trips in each of the AM and PM peak hours (16 in and 16 out).
- Under existing conditions, all movements at the study area intersections are operating acceptably, with ample reserve capacity and LOS C or better.
- The Hamilton Road and Line 25 intersection and the site access intersection will continue to operate well throughout the 2034 horizon period with all movements at LOS C or better and v/c ratios below 0.66.
- Under 2034 background traffic conditions, the King Street West and Ingersoll Street intersection will have multiple movements approaching capacity (v/c ratios above 0.91) with considerable delay (LOS F), therefore signalization of the intersection should start to be considered around that time, which is consistent with the timeframe for signalization recommended in the County's TMP. The operational analysis for the 2034 total traffic conditions shows nearly identical results to the background conditions, confirming that the addition of the site traffic will have no significant impact on the intersection operations.
- Traffic signal warrants were analyzed for the King Street West and Ingersoll Street intersection and traffic signals are not warranted throughout the horizon period.
- The existing/proposed site access has sufficient spacing from other intersections and driveways. The site access location meets minimum sight distance requirements, however, it is recommended that the small trees and brush in the Hamilton Road right of way within 10 m of the south edge of pavement along the frontage of the site be removed in order to ensure their foliage does not obstruct the sightline to the east of the site access.
- Left turn lane warrants were checked for Hamilton Road at the site access for future total traffic conditions, and a left turn lane will not be warranted.
- Direct access to the County Road network, which already serves many existing gravel pits in the area, provides ideal haul routes to and from the site with no significant impact expected from the minor additional truck traffic.

- A sensitivity analysis was performed to assess the additional impact if the extraction level were to reach the maximum annual tonnage limit being applied for (500,000 tonnes). This analysis concluded that there would be negligible impact on intersection operations and no change to the previous conclusions about left turn lane and traffic signal warrants (i.e. not warranted), therefore the extraction of the maximum annual tonnage limit could be accommodated by the existing road network.
- No road network improvements are required to accommodate the proposed gravel pit.

9 LIMITATIONS

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All findings and conclusions presented in this Report are based on information as it appeared during the period of the investigation. This Report is not intended to be exhaustive in scope, or to imply a risk-free development. It should be recognized that the passage of time may alter the opinions, conclusions, and/or recommendations provided herein.

The analysis was limited to the documents referenced herein. Strik, Baldinelli, Moniz Ltd. accepts no responsibility for the accuracy of the information provided by others. All opinions, conclusions, and/or recommendations presented in this Report are based on the information available at the time of the review.

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Appendix A – Traffic Data

Oxford Rd 9 @ Line 25

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:00:00
To: 8:00:00

Municipality: Ingersoll
Site #: 0000000001
Intersection: Oxford Rd 9 & Line 25
TFR File #: 1
Count date: 12-Dec-2023

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Oxford Rd 9 runs W/E

North Leg Total: 23
North Entering: 13
North Peds: 0
Peds Cross: ⋈

East Leg Total: 190
East Entering: 87
East Peds: 0
Peds Cross: ⧖

Heavys	2	0	2
Trucks	1	0	1
Cars	6	4	10
Totals	9	4	

Heavys	1
Trucks	0
Cars	9
Totals	10

Line 25

Heavys	Trucks	Cars	Totals
15	1	74	90

Cars	Trucks	Heavys	Totals
5	0	1	6
68	0	13	81
73	0	14	

Oxford Rd 9

N
W E
S

Heavys	Trucks	Cars	Totals
0	0	4	4
8	1	90	99
8	1	94	

Oxford Rd 9

Cars	Trucks	Heavys	Totals
94	1	8	103

Peds Cross: ⧖
West Peds: 0
West Entering: 103
West Leg Total: 193

Comments

Oxford Rd 9 @ Line 25

Afternoon Peak Diagram

Specified Period
From: 15:30:00
To: 17:30:00

One Hour Peak
From: 16:15:00
To: 17:15:00

Municipality: Ingersoll
Site #: 0000000001
Intersection: Oxford Rd 9 & Line 25
TFR File #: 1
Count date: 12-Dec-2023

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Oxford Rd 9 runs W/E

North Leg Total: 30
North Entering: 12
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	0	0	0
Cars	5	7	12
Totals	5	7	

Heavys	0
Trucks	1
Cars	17
Totals	18

East Leg Total: 308
East Entering: 160
East Peds: 0
Peds Cross: ⧖

Line 25

Heavys	Trucks	Cars	Totals
11	3	143	157

Cars	Trucks	Heavys	Totals
7	1	0	8
138	3	11	152
145	4	11	

Oxford Rd 9

N
W E
S

Heavys	Trucks	Cars	Totals
0	0	10	10
10	0	131	141
10	0	141	

Oxford Rd 9

Cars	Trucks	Heavys	Totals
138	0	10	148

Peds Cross: ⧖
West Peds: 0
West Entering: 151
West Leg Total: 308

Comments

Oxford Rd 9 @ Line 25

Total Count Diagram

Municipality: Ingersoll
Site #: 0000000001
Intersection: Oxford Rd 9 & Line 25
TFR File #: 1
Count date: 12-Dec-2023

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Oxford Rd 9 runs W/E

North Leg Total: 101
North Entering: 47
North Peds: 0
Peds Cross: ⋈

Heavys	2	0	2
Trucks	1	0	1
Cars	25	19	44
Totals	28	19	

Heavys	1
Trucks	1
Cars	52
Totals	54

East Leg Total: 912
East Entering: 465
East Peds: 0
Peds Cross: ⧖

Line 25

Heavys	Trucks	Cars	Totals
54	10	409	473

Oxford Rd 9

Heavys	Trucks	Cars	Totals
0	0	34	34
37	4	387	428
37	4	421	

N
W E
S

Cars	Trucks	Heavys	Totals
18	1	1	20
384	9	52	445
402	10	53	

Oxford Rd 9

Cars	Trucks	Heavys	Totals
406	4	37	447

Peds Cross: ⧖
West Peds: 0
West Entering: 462
West Leg Total: 935

Comments

Oxford Rd 9 @ Oxford Rd 10

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:00:00
To: 8:00:00

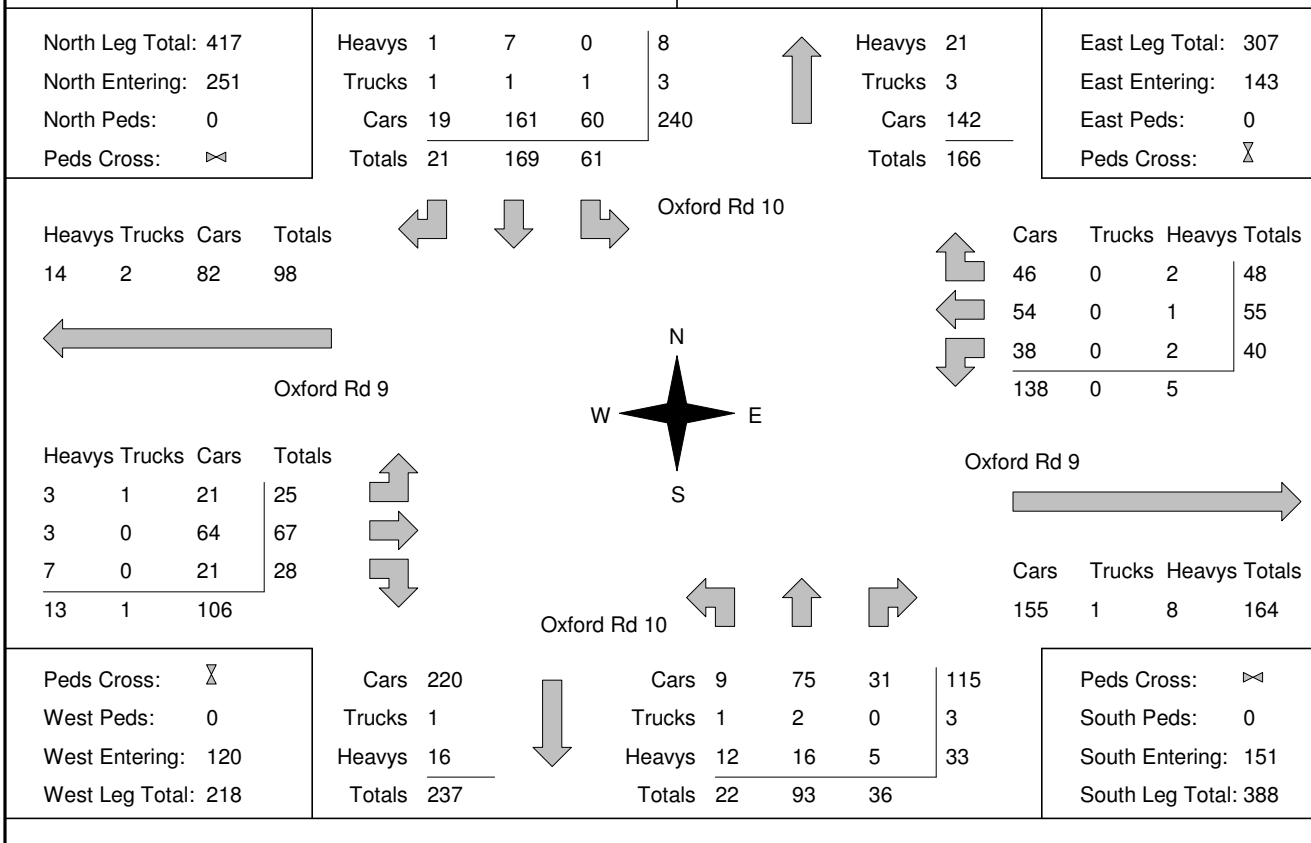
Municipality: Ingersoll
Site #: 0000000002
Intersection: Oxford Rd 10 & Oxford Rd 9
TFR File #: 2
Count date: 12-Dec-2023

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Oxford Rd 10 runs N/S



Comments

Oxford Rd 9 @ Oxford Rd 10

Afternoon Peak Diagram

Specified Period
From: 15:30:00
To: 17:30:00

One Hour Peak
From: 16:00:00
To: 17:00:00

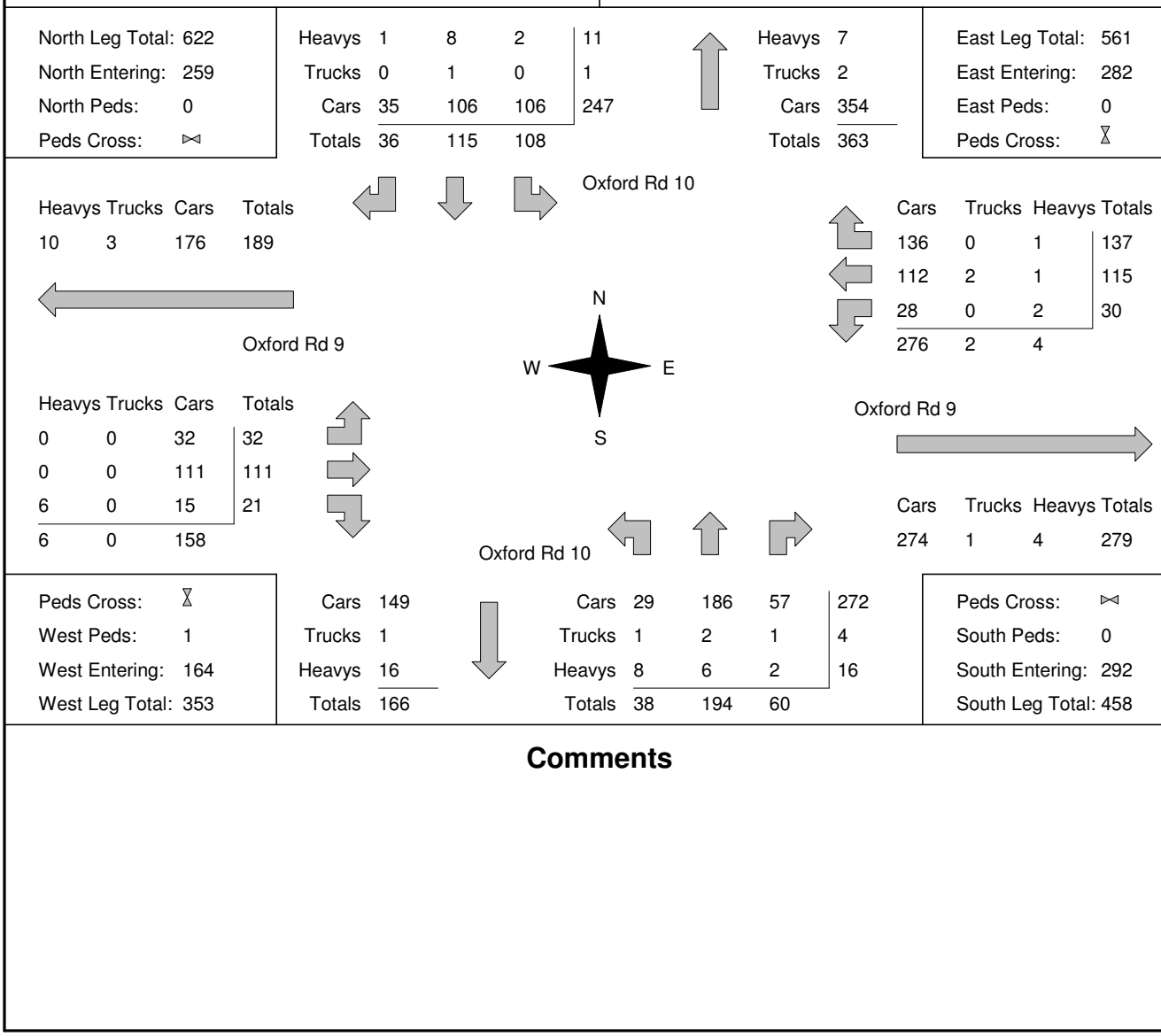
Municipality: Ingersoll
Site #: 0000000002
Intersection: Oxford Rd 10 & Oxford Rd 9
TFR File #: 2
Count date: 12-Dec-2023

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Oxford Rd 10 runs N/S



Comments

Oxford Rd 9 @ Oxford Rd 10

Total Count Diagram

Municipality: Ingersoll
Site #: 0000000002
Intersection: Oxford Rd 10 & Oxford Rd 9
TFR File #: 2
Count date: 12-Dec-2023

Weather conditions:
Clear/Dry

Person(s) who counted:
Cam

**** Non-Signalized Intersection ****

Major Road: Oxford Rd 10 runs N/S

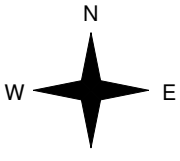
North Leg Total:	1972			
North Entering:	984			
North Peds:	1			
Peds Cross:	⋈			
Heavys	5	36	7	48
Trucks	2	6	1	9
Cars	93	476	358	927
Totals	100	518	366	
Heavys	53			
Trucks	11			
Cars	924			
Totals	988			
East Leg Total:	1678			
East Entering:	828			
East Peds:	0			
Peds Cross:	⧖			

Oxford Rd 10

Heavys	Trucks	Cars	Totals
48	13	469	530

Cars	Trucks	Heavys	Totals
381	2	7	390
308	5	7	320
107	1	10	118
796	8	24	

Oxford Rd 9



Heavys	Trucks	Cars	Totals
6	1	92	99
7	1	310	318
31	1	57	89
44	3	459	

Oxford Rd 9

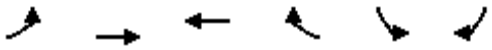
Cars	Trucks	Heavys	Totals
813	5	32	850

Oxford Rd 10

Peds Cross:	⧖			
West Peds:	1			
West Entering:	506			
West Leg Total:	1036			
Cars	640			
Trucks	8			
Heavys	77			
Totals	725			
Cars	68	451	145	664
Trucks	6	8	3	17
Heavys	36	40	18	94
Totals	110	499	166	
Peds Cross:	⋈			
South Peds:	1			
South Entering:	775			
South Leg Total:	1500			

Comments

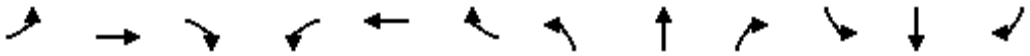
Appendix B – Synchro Output Reports (Existing Traffic)



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	119	97	7	5	11
Future Volume (Veh/h)	5	119	97	7	5	11
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	129	105	8	5	12
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	113				248	109
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	113				248	109
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	100				99	99
cM capacity (veh/h)	1489				742	898

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	134	113	17
Volume Left	5	0	5
Volume Right	0	8	12
cSH	1489	1700	846
Volume to Capacity	0.00	0.07	0.02
Queue Length 95th (m)	0.1	0.0	0.5
Control Delay (s)	0.3	0.0	9.3
Lane LOS	A		A
Approach Delay (s)	0.3	0.0	9.3
Approach LOS			A

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	20.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	30	80	34	48	66	58	26	112	36	73	203	25
Future Volume (vph)	30	80	34	48	66	58	26	112	36	73	203	25
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	33	88	37	53	73	64	29	123	40	80	223	27

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	158	190	152	40	80	250
Volume Left (vph)	33	53	29	0	80	0
Volume Right (vph)	37	64	0	40	0	27
Hadj (s)	0.08	-0.09	0.49	-0.43	0.50	-0.01
Departure Headway (s)	5.7	5.5	6.5	5.6	6.3	5.8
Degree Utilization, x	0.25	0.29	0.27	0.06	0.14	0.40
Capacity (veh/h)	574	599	520	598	539	590
Control Delay (s)	10.7	10.8	10.7	7.7	9.2	11.5
Approach Delay (s)	10.7	10.8	10.1		10.9	
Approach LOS	B	B	B		B	

Intersection Summary				
Delay	10.7			
Level of Service	B			
Intersection Capacity Utilization	44.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	11.5
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	30	80	34	48	66	58	26	112	36	73	203	25
Future Vol, veh/h	30	80	34	48	66	58	26	112	36	73	203	25
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	10	5	25	5	2	4	50	17	16	0	4	5
Mvmt Flow	33	88	37	53	73	64	29	123	40	80	223	27
Number of Lanes	0	1	0	0	1	0	0	1	1	1	1	0

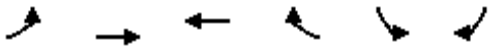
Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	10.8	11	11.8	11.9
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	19%	0%	21%	28%	100%	0%
Vol Thru, %	81%	0%	56%	38%	0%	89%
Vol Right, %	0%	100%	24%	34%	0%	11%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	138	36	144	172	73	228
LT Vol	26	0	30	48	73	0
Through Vol	112	0	80	66	0	203
RT Vol	0	36	34	58	0	25
Lane Flow Rate	152	40	158	189	80	251
Geometry Grp	5	5	2	2	5	5
Degree of Util (X)	0.293	0.061	0.255	0.295	0.141	0.405
Departure Headway (Hd)	6.96	5.584	5.806	5.619	6.34	5.824
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	516	640	617	639	566	619
Service Time	4.705	3.327	3.852	3.663	4.079	3.563
HCM Lane V/C Ratio	0.295	0.063	0.256	0.296	0.141	0.405
HCM Control Delay	12.6	8.7	10.8	11	10.1	12.5
HCM Lane LOS	B	A	B	B	B	B
HCM 95th-tile Q	1.2	0.2	1	1.2	0.5	2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	123	1	1	103	1	1
Future Volume (Veh/h)	123	1	1	103	1	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	134	1	1	112	1	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			135		248	134
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			135		248	134
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1462		744	920

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	135	113	2
Volume Left	0	1	1
Volume Right	1	0	1
cSH	1700	1462	823
Volume to Capacity	0.08	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.1	9.4
Lane LOS		A	A
Approach Delay (s)	0.0	0.1	9.4
Approach LOS			A

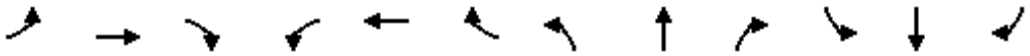
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	16.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	12	169	182	10	8	6
Future Volume (Veh/h)	12	169	182	10	8	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	14	199	214	12	9	7
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	226				447	220
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	226				447	220
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1354				567	825

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	213	226	16
Volume Left	14	0	9
Volume Right	0	12	7
cSH	1354	1700	657
Volume to Capacity	0.01	0.13	0.02
Queue Length 95th (m)	0.2	0.0	0.6
Control Delay (s)	0.6	0.0	10.6
Lane LOS	A		B
Approach Delay (s)	0.6	0.0	10.6
Approach LOS			B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	28.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	38	133	25	36	138	164	46	233	60	130	138	43
Future Volume (vph)	38	133	25	36	138	164	46	233	60	130	138	43
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	40	141	27	38	147	174	49	248	64	138	147	46

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	208	359	297	64	138	193
Volume Left (vph)	40	38	49	0	138	0
Volume Right (vph)	27	174	0	64	0	46
Hadj (s)	0.02	-0.24	0.19	-0.65	0.53	-0.06
Departure Headway (s)	7.0	6.3	7.3	6.5	7.8	7.2
Degree Utilization, x	0.40	0.63	0.61	0.12	0.30	0.38
Capacity (veh/h)	456	526	462	520	429	456
Control Delay (s)	14.6	19.5	19.8	9.1	12.9	13.4
Approach Delay (s)	14.6	19.5	17.9		13.2	
Approach LOS	B	C	C		B	

Intersection Summary				
Delay	16.6			
Level of Service	C			
Intersection Capacity Utilization	57.1%	ICU Level of Service	B	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	18.2
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	38	133	25	36	138	164	46	233	60	130	138	43
Future Vol, veh/h	38	133	25	36	138	164	46	233	60	130	138	43
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	0	0	25	6	1	1	24	3	3	2	7	3
Mvmt Flow	40	141	27	38	147	174	49	248	64	138	147	46
Number of Lanes	0	1	0	0	1	0	0	1	1	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	15.1	21.2	20.6	14.3
HCM LOS	C	C	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	16%	0%	19%	11%	100%	0%
Vol Thru, %	84%	0%	68%	41%	0%	76%
Vol Right, %	0%	100%	13%	49%	0%	24%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	279	60	196	338	130	181
LT Vol	46	0	38	36	130	0
Through Vol	233	0	133	138	0	138
RT Vol	0	60	25	164	0	43
Lane Flow Rate	297	64	209	360	138	193
Geometry Grp	5	5	2	2	5	5
Degree of Util (X)	0.633	0.115	0.41	0.653	0.301	0.388
Departure Headway (Hd)	7.68	6.508	7.085	6.536	7.846	7.248
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	469	548	505	550	456	495
Service Time	5.453	4.28	5.168	4.604	5.624	5.025
HCM Lane V/C Ratio	0.633	0.117	0.414	0.655	0.303	0.39
HCM Control Delay	22.9	10.1	15.1	21.2	14	14.6
HCM Lane LOS	C	B	C	C	B	B
HCM 95th-tile Q	4.3	0.4	2	4.7	1.3	1.8

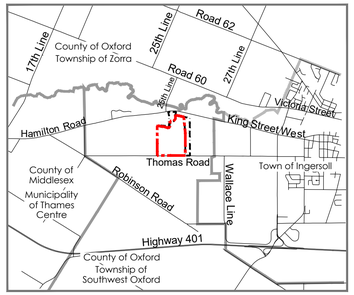
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	176	1	1	191	1	1
Future Volume (Veh/h)	176	1	1	191	1	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	207	1	1	225	1	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			208		434	208
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			208		434	208
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1375		582	838

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	208	226	2
Volume Left	0	1	1
Volume Right	1	0	1
cSH	1700	1375	687
Volume to Capacity	0.12	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.0	10.3
Lane LOS		A	B
Approach Delay (s)	0.0	0.0	10.3
Approach LOS			B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	20.8%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C – Existing Features and Pit Boundary Plan

Key Plan



Subject Lands

Additional Lands Owned by Bardoel (Lessor)

Notes:

A. General

1. This site plan is prepared under the Aggregate Resources Act (ARA) for a Class 'A' Licence for a pit below the ground water table (to 1m of the water table) and follows the Aggregate Resource of Ontario: Site Plan Standards August 2020 (Notes 1-32).
2. Area calculations:
   a. Licence Boundary: 49.4 ha (122.1 acres)
   b. Limit of Extraction: 45.3 ha (111.9 acres)
3. All measurements shown are in metres unless specified otherwise.

B. References

1. Topographic features & parcel information from photogrammetric mapping by first base solutions (JD Barnes), Brampton, Ontario, Utilizing 2015 Air Photography. All Dimensions are in metres. Elevations are geodetic, Above Sea Level (ASL). Contains information licensed under the Open Government Licence - Ontario. Mapping is produced in real world scale and coordinates (NAD83 UTM Zone 17N). Contour interval is 1m. All elevations are geodetic.
2. Property boundary from parcel fabric on vuMap (First Base Solutions).
3. Land use information and structures identified on or within 120 metres of the licence boundary (see schematic on this drawing) was compiled from 2018 Google Satellite imagery.
4. Existing land use designations on and within 120 metres of the licence boundary (see schematic on this drawing) was obtained from the County of Oxford Official Plan, Schedule S-1 - Township of South-West Oxford Land Use Plan, 1995 (updated March 31, 2023).
5. The subject site is zoned Agricultural (A2) Zone in The Township of Southwest Oxford Zoning By-law No. 25-98 (Consolidation September 30, 2022).

C. Drainage

1. Surface drainage on and within 120 metres of the licence boundary is by overland flow in the directions shown by arrows on the plan view or by infiltration.

D. Maximum Predicted Water Table

1. The maximum predicted water table on site ranges between 268.4 masl in the northern portion of the site to 285.6 masl in the eastern portion of the site and is shown on drawing 4 of 4. Elevations provided by Novaterra Environmental Ltd. (June 14, 2024).

E. Site Access and Fencing

1. There are two existing accesses to the site. One from Hamilton Road and the other on Thomas Road. The site will be accessed through the existing site entrance/exit from Hamilton Road shown on the plan view.
2. Post and wire fencing (unless noted otherwise) exists in the locations shown on the plan view.

F. Aggregate Related Site Features

1. There are no existing aggregate operations or features on-site such as processing areas with stationary or portable equipment, stockpiles, recyclable materials, scrap, haul roads, fuel storage, berms or excavation faces.

G. Significant Natural Features Within 120 Metres

1. On Site: None
2. Within 120m: Provincially Significant Wetlands, significant woodlands, and candidate significant wildlife habitat.

H. Significant Human-Made Features and Structures Within 120 Metres

1. There are no known built heritage resources on site or within 120m of the site.
2. There are currently no existing permanent buildings or structures located on the site. Within 120 metres of the site there are 12 houses located on Hamilton Road to the north of the site; one house located to the east of the site with access from Thomas Road; and a barn, manure tank, two sheds, house, and garage on additional lands owned by Bardoel's to the north with access to Hamilton Road.

I. Location of Existing Tree Cover

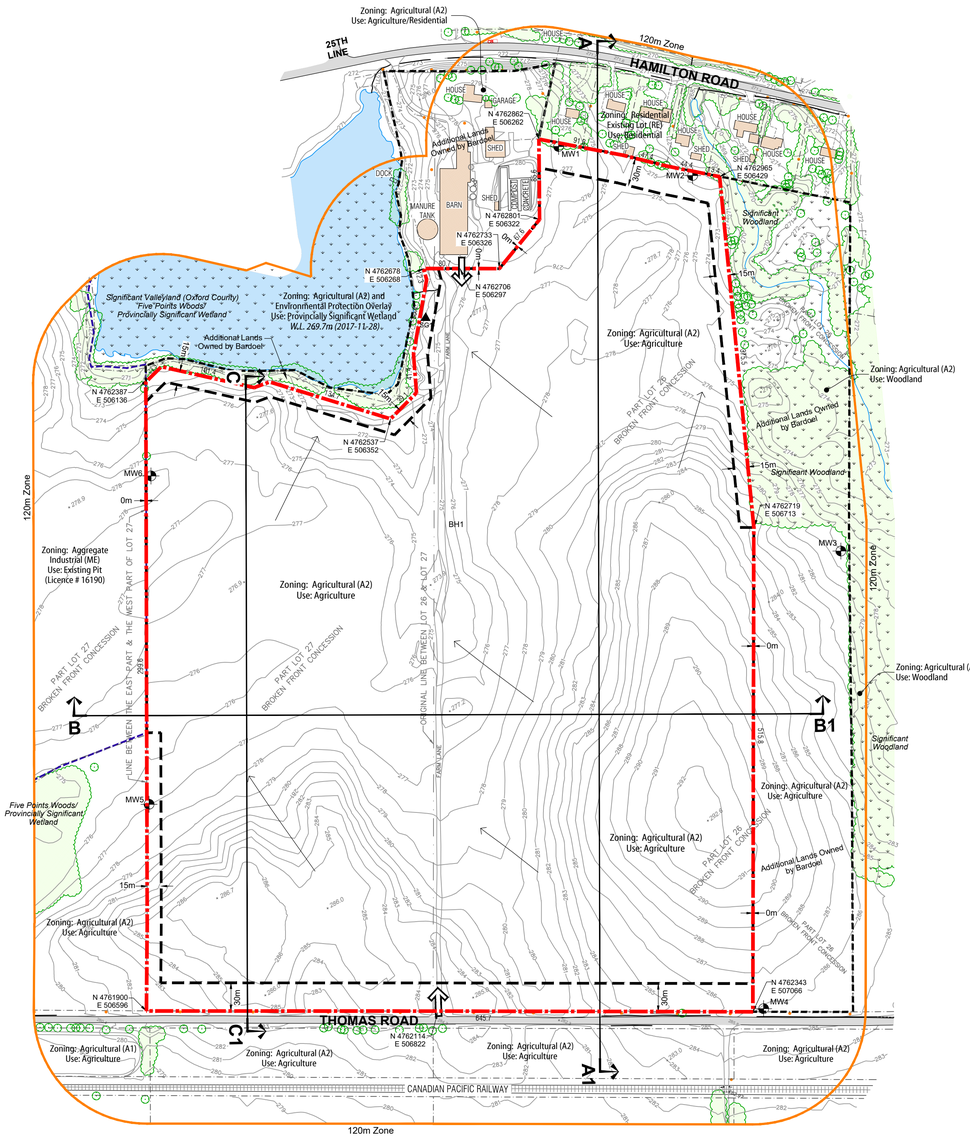
1. The existing off-site tree cover is shown on this plan. Portions of the off-site lands to the northwest, east, west, and south are tree covered.

J. Cross Sections

1. As shown on page 4 of 4
2. Cross section locations are identified on the plan view for each drawing.

K. Technical Reports - References

1. Natural Environment: "Bardoel Pit, Natural Environment Report" June 7, 2024 (Source: MTE Consultants Inc.)
2. Hydrogeology: "Hydrogeological Level 1 and Level 2 Assessment, Proposed Bardoel Pit" June 6, 2024 (Source: Novaterra Environmental Ltd.)
3. Maximum Predicted Water Table Report: "Maximum Predicted Water Table Report, Proposed Bardoel Pit" June 14, 2024 (Source: Novaterra Environmental Ltd.)
4. Noise: "J-AAR Materials Ltd. Bardoel Farm Pit, Acoustic Assessment" August 14, 2024 (Source: RWDI Air Inc.)
5. Archaeology: "Stage 1-2 Archaeological Assessment Proposed Aggregate Pit Bardoel Farm" April 10, 2024 (Source: TMHC Inc.)
6. Traffic: "Traffic Impact Study Proposed Bardoel Gravel Pit" February, 2024 (Source: Strik, Baldinelli, Moniz Ltd.")
7. Agriculture: "Agricultural Impact Assessment" August 2024) Source: MHBC Planning)



Legend

- Boundary of Area to be Licensed
- Additional Lands Owned by Bardoel (Lessor)
- Existing Licensed Boundary — LICENCES #16190
- Existing Fence — 1.2m POST & WIRE FARM FENCE UNLESS OTHERWISE NOTED
- Public Road
- Private Driveway/ Laneway
- Parcel Fabric
- Farm/Field Access
- Monitoring Well/ Staff Gauge — NOVATERRA ENVIRONMENTAL (2017)
- Hydro Pole
- Existing Railway
- Cross Sections — SEE PAGE 4 OF 4 FOR EXISTING AND REHABILITATED CROSS SECTIONS
- Limit of Extraction — ALL SETBACKS ARE DRAWN TO SCALE AND SHOW LABELLED DISTANCES
- Contour and Elevation — METRES ABOVE SEA LEVEL
- Existing Spot Height Elevation — METRES ABOVE SEA LEVEL
- Building/Structure — LOCATION AND USE FOR BUILDINGS ON-SITE AND WITHIN 120m ARE SHOWN ON THIS PAGE.
- Existing Vegetation
- Existing Water Feature — AS LABELLED
- Direction of Surface Drainage
- Candidate Significant Wildlife Area

Legal Description

Pt Lt 26-27 Con Broken Front West Oxford,
Township of Southwest Oxford
Oxford County

Site Plan Amendments

No.	Date	Description	By

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR, KITCHENER, ON, N2B 3X9 | P: 519.576.3650 | WWW.MHBCPLAN.COM

MNR Approval Stamp

Stamp

DRAFT

north

J-AAR Materials Ltd.
3003 Page Street
London, Ontario
N5V 4J1
Tel: (519) 652-2104

Applicant's Signature

DRAFT

Jamie Martelle
J-AAR Materials Ltd.

Project

Bardoel Pit

ARA Licence Reference No.

Pre-approval review:

For Client Review - October 2024

Plan Scale **1:3,000 (Arch D)**

SCALE 50 0 50 100 METRES

Plot Scale 1:3 [1mm = 3 units] MODEL

Drawn By G.C./DGS

Checked By N.D

File No. **18218A**

File Name

EXISTING FEATURES

Drawing No.

1 OF 4

K:\18218A- AAROC Bardoel Pit\A\Bardoel Pit Exfeplan1of4 October2024.dwg

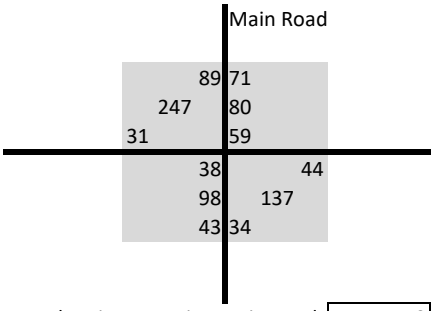
Appendix D – Traffic Signal Warrants

TRAFFIC SIGNAL WARRANT ANALYSIS - PROJECTED VOLUMES

Analysis Year/Condition: 2034 Location: King St (OR 9) / Ingersoll St (OR 10)

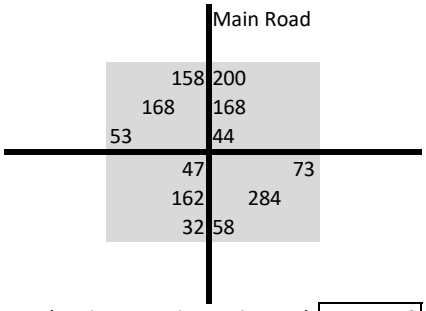
Scenario: Existing Intersection with Future Traffic
Main Road Direction: North / South
Tee Intersection?: No
Number of Lanes on Main Road: 1
Flow Condition: Restricted Flow (Urban)

AM Peak Hour Volumes



Pedestrians crossing Main Road: 0

PM Peak Hour Volumes



Pedestrians crossing Main Road: 0

Ontario Traffic Manual Book 12 - Justification 7 - Projected Volumes:

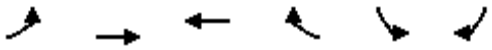
		Lane Condition	1 Lanes		2 or More Lanes		Percent Fullfilled	Minimum Requirement	Signals Warranted?
		Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW			
Justification 1: Minimum Vehicular Volume	1A (All Approaches)	Volume Requirement	480	720	600	900	84%	120%	NO
				x					
		Average Hourly Volume		605					
	1B (Minor Street Approaches)	Volume Requirement	120	170	120	170	154%	120%	
				x					
		Average Hourly Volume		261					

		Lane Condition	1 Lanes		2 or More Lanes		Percent Fullfilled	Minimum Requirement	Signals Warranted?
		Flow Condition	FREE FLOW	RESTR. FLOW	FREE FLOW	RESTR. FLOW			
Justification 2: Delay to Cross Traffic	2A (Main Road Approaches)	Volume Requirement	480	720	600	900	48%	120%	NO
				x					
		Average Hourly Volume		344					
	2B (Traffic Crossing Main Road)	Volume Requirement	50	75	50	75	152%	120%	
				x					
		Average Hourly Volume		114					

Results
Traffic signals are not warranted.

Project: SBM-23-2227

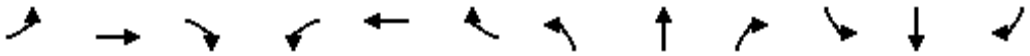
Appendix E - Synchro Output Reports (2034 Background Traffic)



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	145	118	9	6	13
Future Volume (Veh/h)	6	145	118	9	6	13
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	158	128	10	7	14
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	138				305	133
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	138				305	133
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	100				99	98
cM capacity (veh/h)	1458				688	870

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	165	138	21
Volume Left	7	0	7
Volume Right	0	10	14
cSH	1458	1700	800
Volume to Capacity	0.00	0.08	0.03
Queue Length 95th (m)	0.1	0.0	0.6
Control Delay (s)	0.4	0.0	9.6
Lane LOS	A		A
Approach Delay (s)	0.4	0.0	9.6
Approach LOS			A

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	22.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	37	98	41	59	80	71	32	137	44	89	247	30
Future Volume (vph)	37	98	41	59	80	71	32	137	44	89	247	30
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	41	108	45	65	88	78	35	151	48	98	271	33

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	194	231	186	48	98	304
Volume Left (vph)	41	65	35	0	98	0
Volume Right (vph)	45	78	0	48	0	33
Hadj (s)	0.08	-0.09	0.49	-0.43	0.50	-0.01
Departure Headway (s)	6.3	6.0	7.0	6.1	6.8	6.3
Degree Utilization, x	0.34	0.39	0.36	0.08	0.18	0.53
Capacity (veh/h)	510	545	471	541	501	538
Control Delay (s)	12.5	12.8	12.8	8.4	10.1	14.9
Approach Delay (s)	12.5	12.8	11.9		13.8	
Approach LOS	B	B	B		B	

Intersection Summary				
Delay	12.9			
Level of Service	B			
Intersection Capacity Utilization	51.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	13.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	37	98	41	59	80	71	32	137	44	89	247	30
Future Vol, veh/h	37	98	41	59	80	71	32	137	44	89	247	30
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	10	5	25	5	2	4	50	17	16	0	4	5
Mvmt Flow	41	108	45	65	88	78	35	151	48	98	271	33
Number of Lanes	0	1	0	0	1	0	0	1	1	1	1	0

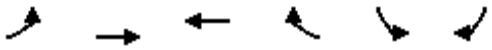
Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	12.7	13.2	13.8	14.8
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	19%	0%	21%	28%	100%	0%
Vol Thru, %	81%	0%	56%	38%	0%	89%
Vol Right, %	0%	100%	23%	34%	0%	11%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	169	44	176	210	89	277
LT Vol	32	0	37	59	89	0
Through Vol	137	0	98	80	0	247
RT Vol	0	44	41	71	0	30
Lane Flow Rate	186	48	193	231	98	304
Geometry Grp	5	5	2	2	5	5
Degree of Util (X)	0.385	0.082	0.341	0.393	0.184	0.53
Departure Headway (Hd)	7.471	6.086	6.341	6.128	6.789	6.272
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	479	584	563	582	525	572
Service Time	5.263	3.878	4.439	4.22	4.571	4.053
HCM Lane V/C Ratio	0.388	0.082	0.343	0.397	0.187	0.531
HCM Control Delay	14.9	9.4	12.7	13.2	11.1	16
HCM Lane LOS	B	A	B	B	B	C
HCM 95th-tile Q	1.8	0.3	1.5	1.9	0.7	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	150	1	1	126	1	1
Future Volume (Veh/h)	150	1	1	126	1	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	163	1	1	137	1	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			164		302	164
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			164		302	164
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1427		693	886

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	164	138	2
Volume Left	0	1	1
Volume Right	1	0	1
cSH	1700	1427	778
Volume to Capacity	0.10	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.1	9.6
Lane LOS		A	A
Approach Delay (s)	0.0	0.1	9.6
Approach LOS			A

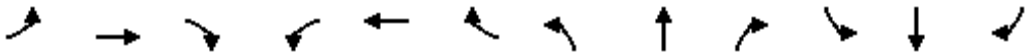
Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	18.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	206	222	12	10	7
Future Volume (Veh/h)	15	206	222	12	10	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	18	242	261	14	12	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	275				546	268
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	275				546	268
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				98	99
cM capacity (veh/h)	1300				495	776

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	260	275	20
Volume Left	18	0	12
Volume Right	0	14	8
cSH	1300	1700	579
Volume to Capacity	0.01	0.16	0.03
Queue Length 95th (m)	0.3	0.0	0.8
Control Delay (s)	0.7	0.0	11.4
Lane LOS	A		B
Approach Delay (s)	0.7	0.0	11.4
Approach LOS			B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	46	162	30	44	168	200	56	284	73	158	168	52
Future Volume (vph)	46	162	30	44	168	200	56	284	73	158	168	52
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	49	172	32	47	179	213	60	302	78	168	179	55

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	253	439	362	78	168	234
Volume Left (vph)	49	47	60	0	168	0
Volume Right (vph)	32	213	0	78	0	55
Hadj (s)	0.02	-0.24	0.19	-0.65	0.53	-0.06
Departure Headway (s)	8.5	7.5	8.7	7.8	9.3	8.6
Degree Utilization, x	0.60	0.92	0.87	0.17	0.43	0.56
Capacity (veh/h)	400	468	402	447	380	408
Control Delay (s)	23.4	51.3	46.4	11.1	17.9	20.9
Approach Delay (s)	23.4	51.3	40.2		19.6	
Approach LOS	C	F	E		C	

Intersection Summary				
Delay	35.2			
Level of Service	E			
Intersection Capacity Utilization	67.4%	ICU Level of Service	C	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	41.4
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	46	162	30	44	168	200	56	284	73	158	168	52
Future Vol, veh/h	46	162	30	44	168	200	56	284	73	158	168	52
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	0	0	25	6	1	1	24	3	3	2	7	3
Mvmt Flow	49	172	32	47	179	213	60	302	78	168	179	55
Number of Lanes	0	1	0	0	1	0	0	1	1	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	25.1	62	48.4	21.4
HCM LOS	D	F	E	C

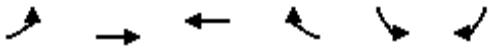
Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	16%	0%	19%	11%	100%	0%
Vol Thru, %	84%	0%	68%	41%	0%	76%
Vol Right, %	0%	100%	13%	49%	0%	24%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	340	73	238	412	158	220
LT Vol	56	0	46	44	158	0
Through Vol	284	0	162	168	0	168
RT Vol	0	73	30	200	0	52
Lane Flow Rate	362	78	253	438	168	234
Geometry Grp	5	5	2	2	5	5
Degree of Util (X)	0.911	0.171	0.617	0.964	0.439	0.572
Departure Headway (Hd)	9.068	7.91	8.767	7.922	9.399	8.792
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	398	454	410	460	383	410
Service Time	6.836	5.647	6.847	5.922	7.175	6.568
HCM Lane V/C Ratio	0.91	0.172	0.617	0.952	0.439	0.571
HCM Control Delay	56.2	12.3	25.1	62	19.4	22.8
HCM Lane LOS	F	B	D	F	C	C
HCM 95th-tile Q	9.6	0.6	4	11.8	2.2	3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	215	1	1	233	1	1
Future Volume (Veh/h)	215	1	1	233	1	1
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	253	1	1	274	1	1
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			254		530	254
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			254		530	254
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1323		513	790

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	254	275	2
Volume Left	0	1	1
Volume Right	1	0	1
cSH	1700	1323	622
Volume to Capacity	0.15	0.00	0.00
Queue Length 95th (m)	0.0	0.0	0.1
Control Delay (s)	0.0	0.0	10.8
Lane LOS		A	B
Approach Delay (s)	0.0	0.0	10.8
Approach LOS			B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	23.1%	ICU Level of Service	A
Analysis Period (min)	15		

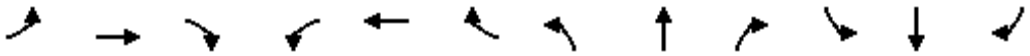
Appendix F - Synchro Output Reports (2034 Total Traffic)



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	158	131	9	6	13
Future Volume (Veh/h)	6	158	131	9	6	13
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	172	142	10	7	14
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	152				333	147
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	152				333	147
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	100				99	98
cM capacity (veh/h)	1441				663	855

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	179	152	21
Volume Left	7	0	7
Volume Right	0	10	14
cSH	1441	1700	779
Volume to Capacity	0.00	0.09	0.03
Queue Length 95th (m)	0.1	0.0	0.6
Control Delay (s)	0.3	0.0	9.7
Lane LOS	A		A
Approach Delay (s)	0.3	0.0	9.7
Approach LOS			A

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	23.2%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	38	98	43	59	80	71	34	137	44	89	247	31
Future Volume (vph)	38	98	43	59	80	71	34	137	44	89	247	31
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	42	108	47	65	88	78	37	151	48	98	271	34

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	197	231	188	48	98	305
Volume Left (vph)	42	65	37	0	98	0
Volume Right (vph)	47	78	0	48	0	34
Hadj (s)	0.08	-0.09	0.50	-0.43	0.50	-0.01
Departure Headway (s)	6.3	6.1	7.1	6.1	6.8	6.3
Degree Utilization, x	0.34	0.39	0.37	0.08	0.19	0.53
Capacity (veh/h)	509	543	469	540	499	537
Control Delay (s)	12.6	12.9	12.9	8.5	10.2	15.1
Approach Delay (s)	12.6	12.9	12.0		13.9	
Approach LOS	B	B	B		B	

Intersection Summary				
Delay	13.0			
Level of Service	B			
Intersection Capacity Utilization	51.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	13.9
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	38	98	43	59	80	71	34	137	44	89	247	31
Future Vol, veh/h	38	98	43	59	80	71	34	137	44	89	247	31
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	10	5	25	5	2	4	50	17	16	0	4	5
Mvmt Flow	42	108	47	65	88	78	37	151	48	98	271	34
Number of Lanes	0	1	0	0	1	0	0	1	1	1	1	0

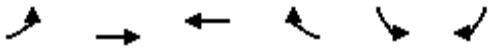
Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	12.8	13.2	13.9	14.9
HCM LOS	B	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	20%	0%	21%	28%	100%	0%
Vol Thru, %	80%	0%	55%	38%	0%	89%
Vol Right, %	0%	100%	24%	34%	0%	11%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	171	44	179	210	89	278
LT Vol	34	0	38	59	89	0
Through Vol	137	0	98	80	0	247
RT Vol	0	44	43	71	0	31
Lane Flow Rate	188	48	197	231	98	305
Geometry Grp	5	5	2	2	5	5
Degree of Util (X)	0.391	0.082	0.347	0.394	0.185	0.534
Departure Headway (Hd)	7.492	6.102	6.354	6.15	6.808	6.288
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	477	582	561	579	524	568
Service Time	5.288	3.897	4.454	4.247	4.591	4.071
HCM Lane V/C Ratio	0.394	0.082	0.351	0.399	0.187	0.537
HCM Control Delay	15.1	9.4	12.8	13.2	11.1	16.1
HCM Lane LOS	C	A	B	B	B	C
HCM 95th-tile Q	1.8	0.3	1.5	1.9	0.7	3.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	150	14	4	126	14	4
Future Volume (Veh/h)	150	14	4	126	14	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	163	15	4	137	15	4
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			178		316	170
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			178		316	170
tC, single (s)			5.0		7.3	7.1
tC, 2 stage (s)						
tF (s)			3.0		4.3	4.1
p0 queue free %			100		97	99
cM capacity (veh/h)			1005		527	689

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	178	141	19
Volume Left	0	4	15
Volume Right	15	0	4
cSH	1700	1005	554
Volume to Capacity	0.10	0.00	0.03
Queue Length 95th (m)	0.0	0.1	0.8
Control Delay (s)	0.0	0.3	11.7
Lane LOS		A	B
Approach Delay (s)	0.0	0.3	11.7
Approach LOS			B

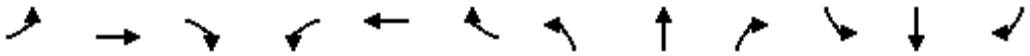
Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	19.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	219	235	12	10	7
Future Volume (Veh/h)	15	219	235	12	10	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	18	258	276	14	12	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	290				577	283
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	290				577	283
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				97	99
cM capacity (veh/h)	1283				475	761

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	276	290	20
Volume Left	18	0	12
Volume Right	0	14	8
cSH	1283	1700	559
Volume to Capacity	0.01	0.17	0.04
Queue Length 95th (m)	0.3	0.0	0.8
Control Delay (s)	0.6	0.0	11.7
Lane LOS	A		B
Approach Delay (s)	0.6	0.0	11.7
Approach LOS			B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	33.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	47	162	32	44	168	200	58	284	73	158	168	53
Future Volume (vph)	47	162	32	44	168	200	58	284	73	158	168	53
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	50	172	34	47	179	213	62	302	78	168	179	56

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	256	439	364	78	168	235
Volume Left (vph)	50	47	62	0	168	0
Volume Right (vph)	34	213	0	78	0	56
Hadj (s)	0.02	-0.24	0.20	-0.65	0.53	-0.06
Departure Headway (s)	8.5	7.6	8.7	7.8	9.3	8.7
Degree Utilization, x	0.61	0.93	0.88	0.17	0.43	0.57
Capacity (veh/h)	400	464	401	445	379	407
Control Delay (s)	23.9	52.5	48.0	11.2	18.0	21.2
Approach Delay (s)	23.9	52.5	41.5		19.9	
Approach LOS	C	F	E		C	

Intersection Summary				
Delay	36.1			
Level of Service	E			
Intersection Capacity Utilization	67.5%	ICU Level of Service	C	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	42
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	47	162	32	44	168	200	58	284	73	158	168	53
Future Vol, veh/h	47	162	32	44	168	200	58	284	73	158	168	53
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	0	0	25	6	1	1	24	3	3	2	7	3
Mvmt Flow	50	172	34	47	179	213	62	302	78	168	179	56
Number of Lanes	0	1	0	0	1	0	0	1	1	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	25.7	62.2	50	21.6
HCM LOS	D	F	E	C

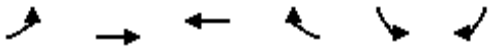
Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	17%	0%	20%	11%	100%	0%
Vol Thru, %	83%	0%	67%	41%	0%	76%
Vol Right, %	0%	100%	13%	49%	0%	24%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	342	73	241	412	158	221
LT Vol	58	0	47	44	158	0
Through Vol	284	0	162	168	0	168
RT Vol	0	73	32	200	0	53
Lane Flow Rate	364	78	256	438	168	235
Geometry Grp	5	5	2	2	5	5
Degree of Util (X)	0.92	0.171	0.627	0.964	0.441	0.577
Departure Headway (Hd)	9.107	7.916	8.803	7.916	9.446	8.836
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	397	453	410	460	382	409
Service Time	6.865	5.673	6.872	5.969	7.21	6.6
HCM Lane V/C Ratio	0.917	0.172	0.624	0.952	0.44	0.575
HCM Control Delay	58	12.3	25.7	62.2	19.5	23.1
HCM Lane LOS	F	B	D	F	C	C
HCM 95th-tile Q	9.8	0.6	4.1	11.8	2.2	3.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	215	14	4	233	14	4
Future Volume (Veh/h)	215	14	4	233	14	4
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	253	16	5	274	16	5
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			269		545	261
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			269		545	261
tC, single (s)			5.0		7.3	7.1
tC, 2 stage (s)						
tF (s)			3.0		4.3	4.1
p0 queue free %			99		96	99
cM capacity (veh/h)			919		375	605

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	269	279	21
Volume Left	0	5	16
Volume Right	16	0	5
cSH	1700	919	412
Volume to Capacity	0.16	0.01	0.05
Queue Length 95th (m)	0.0	0.1	1.2
Control Delay (s)	0.0	0.2	14.2
Lane LOS		A	B
Approach Delay (s)	0.0	0.2	14.2
Approach LOS			B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	25.5%	ICU Level of Service	A
Analysis Period (min)	15		

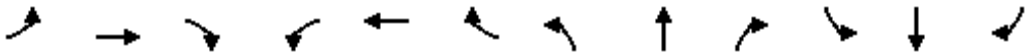
Appendix G - Synchro Output Reports (2034 Total Traffic – MATL Scenario)



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	171	144	9	6	13
Future Volume (Veh/h)	6	171	144	9	6	13
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	186	157	10	7	14
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	167				362	162
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	167				362	162
tC, single (s)	4.1				6.4	6.4
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.5
p0 queue free %	100				99	98
cM capacity (veh/h)	1423				638	838

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	193	167	21
Volume Left	7	0	7
Volume Right	0	10	14
cSH	1423	1700	759
Volume to Capacity	0.00	0.10	0.03
Queue Length 95th (m)	0.1	0.0	0.6
Control Delay (s)	0.3	0.0	9.9
Lane LOS	A		A
Approach Delay (s)	0.3	0.0	9.9
Approach LOS			A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	23.9%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	38	98	46	59	80	71	37	137	44	89	247	31
Future Volume (vph)	38	98	46	59	80	71	37	137	44	89	247	31
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	42	108	51	65	88	78	41	151	48	98	271	34

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	201	231	192	48	98	305
Volume Left (vph)	42	65	41	0	98	0
Volume Right (vph)	51	78	0	48	0	34
Hadj (s)	0.08	-0.09	0.52	-0.43	0.50	-0.01
Departure Headway (s)	6.3	6.1	7.1	6.1	6.8	6.3
Degree Utilization, x	0.35	0.39	0.38	0.08	0.19	0.54
Capacity (veh/h)	508	539	467	538	497	534
Control Delay (s)	12.7	12.9	13.2	8.5	10.2	15.2
Approach Delay (s)	12.7	12.9	12.2		14.0	
Approach LOS	B	B	B		B	

Intersection Summary				
Delay	13.1			
Level of Service	B			
Intersection Capacity Utilization	51.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	14.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	38	98	46	59	80	71	37	137	44	89	247	31
Future Vol, veh/h	38	98	46	59	80	71	37	137	44	89	247	31
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Heavy Vehicles, %	10	5	25	5	2	4	50	17	16	0	4	5
Mvmt Flow	42	108	51	65	88	78	41	151	48	98	271	34
Number of Lanes	0	1	0	0	1	0	0	1	1	1	1	0

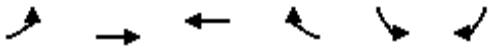
Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	13.1	13.5	14.3	15.3
HCM LOS	B	B	B	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	21%	0%	21%	28%	100%	0%
Vol Thru, %	79%	0%	54%	38%	0%	89%
Vol Right, %	0%	100%	25%	34%	0%	11%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	174	44	182	210	89	278
LT Vol	37	0	38	59	89	0
Through Vol	137	0	98	80	0	247
RT Vol	0	44	46	71	0	31
Lane Flow Rate	191	48	200	231	98	305
Geometry Grp	5	5	2	2	5	5
Degree of Util (X)	0.405	0.084	0.359	0.402	0.189	0.546
Departure Headway (Hd)	7.617	6.219	6.466	6.275	6.95	6.429
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	472	576	556	572	519	565
Service Time	5.355	3.956	4.509	4.316	4.65	4.129
HCM Lane V/C Ratio	0.405	0.083	0.36	0.404	0.189	0.54
HCM Control Delay	15.5	9.5	13.1	13.5	11.3	16.6
HCM Lane LOS	C	A	B	B	B	C
HCM 95th-tile Q	1.9	0.3	1.6	1.9	0.7	3.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	150	27	7	126	27	7
Future Volume (Veh/h)	150	27	7	126	27	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	163	29	8	137	29	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			192		330	178
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			192		330	178
tC, single (s)			5.0		7.3	7.1
tC, 2 stage (s)						
tF (s)			3.0		4.3	4.1
p0 queue free %			99		94	99
cM capacity (veh/h)			992		513	682

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	192	145	37
Volume Left	0	8	29
Volume Right	29	0	8
cSH	1700	992	542
Volume to Capacity	0.11	0.01	0.07
Queue Length 95th (m)	0.0	0.2	1.7
Control Delay (s)	0.0	0.5	12.1
Lane LOS		A	B
Approach Delay (s)	0.0	0.5	12.1
Approach LOS			B

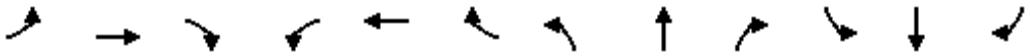
Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	22.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	232	248	12	10	7
Future Volume (Veh/h)	15	232	248	12	10	7
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	18	273	292	14	12	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	306				608	299
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	306				608	299
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				97	99
cM capacity (veh/h)	1266				456	745

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	291	306	20
Volume Left	18	0	12
Volume Right	0	14	8
cSH	1266	1700	540
Volume to Capacity	0.01	0.18	0.04
Queue Length 95th (m)	0.3	0.0	0.9
Control Delay (s)	0.6	0.0	11.9
Lane LOS	A		B
Approach Delay (s)	0.6	0.0	11.9
Approach LOS			B

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	34.5%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	47	162	35	44	168	200	61	284	73	158	168	53
Future Volume (vph)	47	162	35	44	168	200	61	284	73	158	168	53
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	50	172	37	47	179	213	65	302	78	168	179	56

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	259	439	367	78	168	235
Volume Left (vph)	50	47	65	0	168	0
Volume Right (vph)	37	213	0	78	0	56
Hadj (s)	0.01	-0.24	0.20	-0.65	0.53	-0.06
Departure Headway (s)	8.6	7.6	8.7	7.8	9.4	8.7
Degree Utilization, x	0.62	0.93	0.89	0.17	0.44	0.57
Capacity (veh/h)	399	462	401	444	378	401
Control Delay (s)	24.5	53.8	50.1	11.2	18.2	21.4
Approach Delay (s)	24.5	53.8	43.3		20.1	
Approach LOS	C	F	E		C	

Intersection Summary				
Delay	37.1			
Level of Service	E			
Intersection Capacity Utilization	67.8%	ICU Level of Service	C	
Analysis Period (min)	15			

Intersection	
Intersection Delay, s/veh	43.3
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	47	162	35	44	168	200	61	284	73	158	168	53
Future Vol, veh/h	47	162	35	44	168	200	61	284	73	158	168	53
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	0	0	25	6	1	1	24	3	3	2	7	3
Mvmt Flow	50	172	37	47	179	213	65	302	78	168	179	56
Number of Lanes	0	1	0	0	1	0	0	1	1	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	1
HCM Control Delay	26.4	63.8	52.3	21.9
HCM LOS	D	F	F	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1	SBLn2
Vol Left, %	18%	0%	19%	11%	100%	0%
Vol Thru, %	82%	0%	66%	41%	0%	76%
Vol Right, %	0%	100%	14%	49%	0%	24%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	345	73	244	412	158	221
LT Vol	61	0	47	44	158	0
Through Vol	284	0	162	168	0	168
RT Vol	0	73	35	200	0	53
Lane Flow Rate	367	78	260	438	168	235
Geometry Grp	5	5	2	2	5	5
Degree of Util (X)	0.933	0.172	0.638	0.97	0.444	0.581
Departure Headway (Hd)	9.149	7.954	8.843	7.967	9.499	8.889
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	396	450	408	456	378	404
Service Time	6.909	5.713	6.916	6.026	7.268	6.658
HCM Lane V/C Ratio	0.927	0.173	0.637	0.961	0.444	0.582
HCM Control Delay	60.8	12.4	26.4	63.8	19.7	23.4
HCM Lane LOS	F	B	D	F	C	C
HCM 95th-tile Q	10.2	0.6	4.3	12	2.2	3.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	27	14	7	233	27	7
Future Volume (Veh/h)	27	14	7	233	27	7
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	32	16	8	274	32	8
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			48		330	40
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			48		330	40
tC, single (s)			5.0		7.3	7.1
tC, 2 stage (s)						
tF (s)			3.0		4.3	4.1
p0 queue free %			99		94	99
cM capacity (veh/h)			1141		514	828

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	48	282	40
Volume Left	0	8	32
Volume Right	16	0	8
cSH	1700	1141	556
Volume to Capacity	0.03	0.01	0.07
Queue Length 95th (m)	0.0	0.2	1.8
Control Delay (s)	0.0	0.3	12.0
Lane LOS		A	B
Approach Delay (s)	0.0	0.3	12.0
Approach LOS			B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	27.9%	ICU Level of Service	A
Analysis Period (min)	15		