Figure 1

MEMO

DILLON CONSULTING

TO: Peter Valente, Valente Development
FROM: Mike Walters, P.Eng., Dillon Consulting Limited
cc: Karl Tanner, MCIP, RPP, Dillon Consulting Limited
DATE: August 15, 2019
SUBJECT: Nedin Property Municipal Approvals - Transportation Engineering Analysis
OUR FILE: 19-9930

Dillon Consulting Limited (Dillon) is pleased to present this memorandum which documents the transportation assessment of a proposed residential development on Ellis Street north of Serenity Circle and south of Delmar Street in the town of LaSalle, Ontario.

Context

Location

The proposed development is found on the west side of Ellis Street north of Serenity Circle and south of Delmar Street. The land proposed to be developed is currently vacant, and surrounded by various land uses including commercial, institutional and residential.

Figure 1 illustrates the site location.

FIGURE 1: SITE LOCATION

Figure 2 shows the site context.

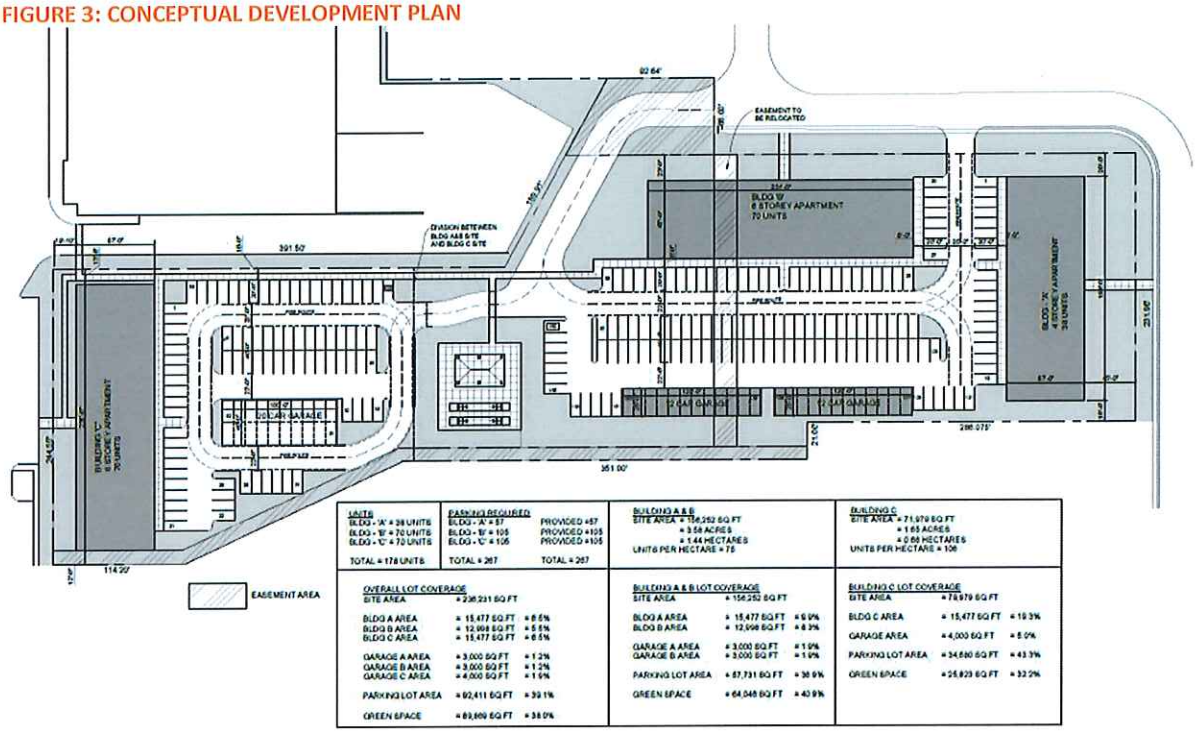
FIGURE 2: SITE CONTEXT

Development

The proposed development is envisioned to contain three multi-storey buildings containing 176 residential units. Access to the site is proposed at two locations. The westerly access is located at the 90-degree bend in Ellis Street south of Delmar Street. The easterly access is located along the east-west portion of Ellis Street between the two north-south segments of Ellis Street. Within the site, connectivity between the two accesses will be provided.

Figure 3 illustrates the conceptual development plan.

FIGURE 3: CONCEPTUAL DEVELOPMENT PLAN



UNITS	PARKING REQUIRED		BUILDING A & B	BUILDING C
BLDG 'A' = 38 UNITS BLDG 'B' = 70 UNITS BLDG 'C' = 70 UNITS	BLDG 'A' = 57 BLDG 'B' = 105 BLDG 'C' = 105	PROVIDED =57 PROVIDED =105 PROVIDED =105	SITE AREA = 156,252 SQ.FT = 3.59 ACRES = 1.44 HECTARES UNITS PER HECTARE = 75	SITE AREA = 71,979 SQ.FT = 1.65 ACRES = 0.66 HECTARES UNITS PER HECTARE = 106
TOTAL = 178 UNITS	TOTAL = 267	TOTAL = 267		

OVERALL LOT COVERAGE			BUILDING A & B LOT COVERAGE			BUILDING C LOT COVERAGE		
SITE AREA	= 295,231 SQ.FT		SITE AREA	= 156,252 SQ.FT		SITE AREA	= 71,979 SQ.FT	
BLDG A AREA	= 15,477 SQ.FT	= 5.2%	BLDG A AREA	= 15,477 SQ.FT	= 9.9%	BLDG C AREA	= 15,477 SQ.FT	= 19.3%
BLDG B AREA	= 12,998 SQ.FT	= 4.4%	BLDG B AREA	= 12,998 SQ.FT	= 8.3%	GARAGE AREA	= 4,000 SQ.FT	= 5.0%
BLDG C AREA	= 15,477 SQ.FT	= 5.2%	GARAGE A AREA	= 3,000 SQ.FT	= 1.9%	PARKING LOT AREA	= 34,680 SQ.FT	= 43.3%
GARAGE A AREA	= 3,000 SQ.FT	= 1.0%	GARAGE B AREA	= 3,000 SQ.FT	= 1.9%	GREEN SPACE	= 25,823 SQ.FT	= 32.2%
GARAGE B AREA	= 3,000 SQ.FT	= 1.0%	PARKING LOT AREA	= 67,731 SQ.FT	= 36.9%			
GARAGE C AREA	= 4,000 SQ.FT	= 1.5%	GREEN SPACE	= 64,048 SQ.FT	= 40.9%			
PARKING LOT AREA	= 92,411 SQ.FT	= 30.1%						
GREEN SPACE	= 83,869 SQ.FT	= 38.0%						

Scope of Analyses

The scope of this review focused on two components:

1. Traffic operations in the vicinity of the site, and the site's impact on traffic operations; and
2. Traffic operations at the Normandy Street and Ellis Street intersection and the Elmdale Avenue and Todd Lane intersection.

The study horizon years that were considered are:

1. 2019 Existing Conditions;
2. 2024 Total Future Conditions.

Traffic data (turning movement count) was collected by Dillon at the Todd Lane and Elmdale Avenue / Third Street intersection as well as at the Normandy Street and Ellis Street intersection.

For all scenarios, traffic projections and analyses considered the weekday AM and PM peak hours.

Existing Conditions

Existing Traffic Volumes

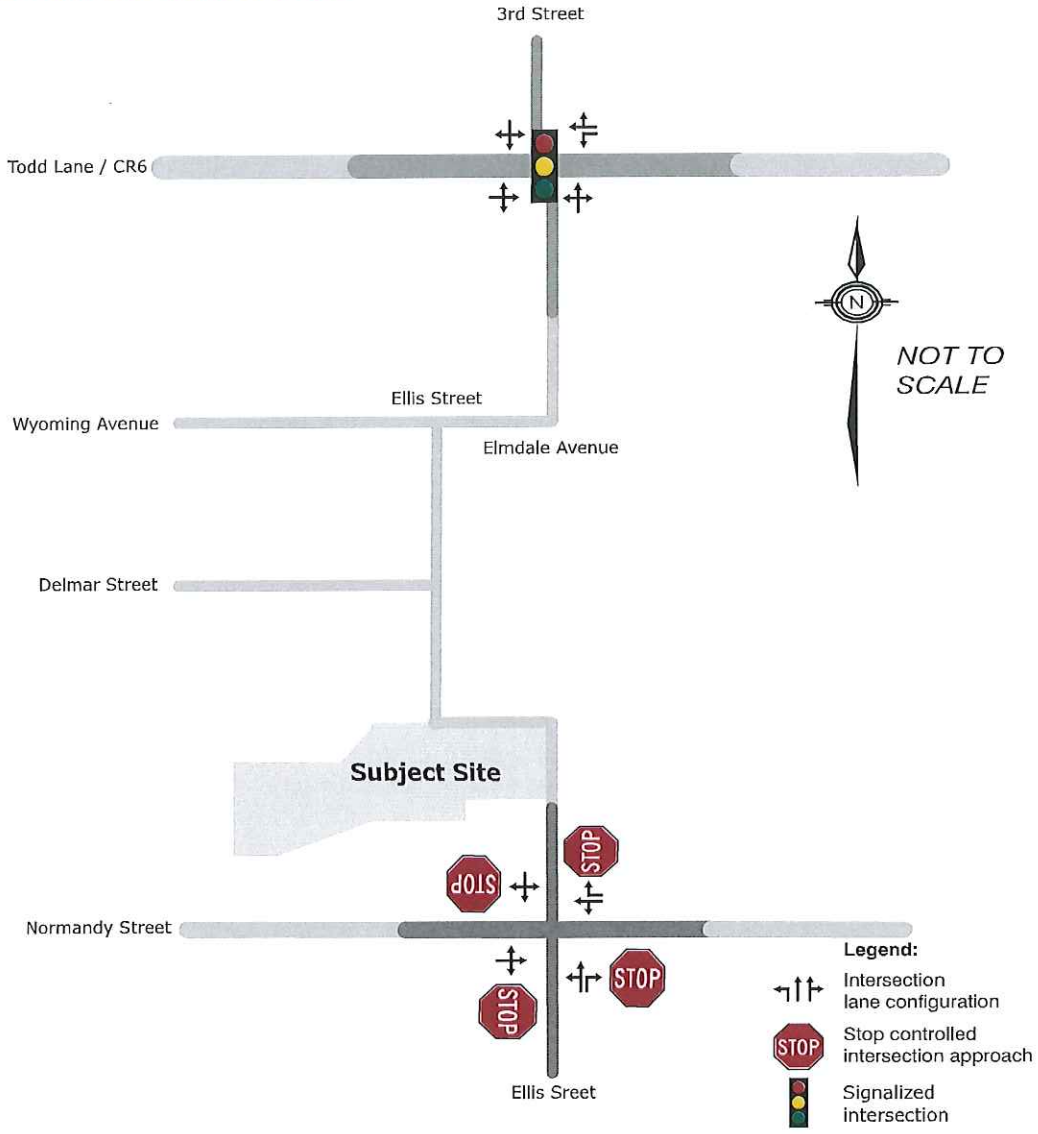
In July 2019, Dillon collected turning movement count (TMC) traffic data during the AM and PM peak hours at two intersections:

1. Todd Lane and Elmdale Avenue / Third Street;

2. Normandy Street and Ellis Street.

Figure 4 shows the laning and traffic control at the two study area intersections as well as the road network within the vicinity of the site.

FIGURE 4: LANING AND TRAFFIC CONTROL

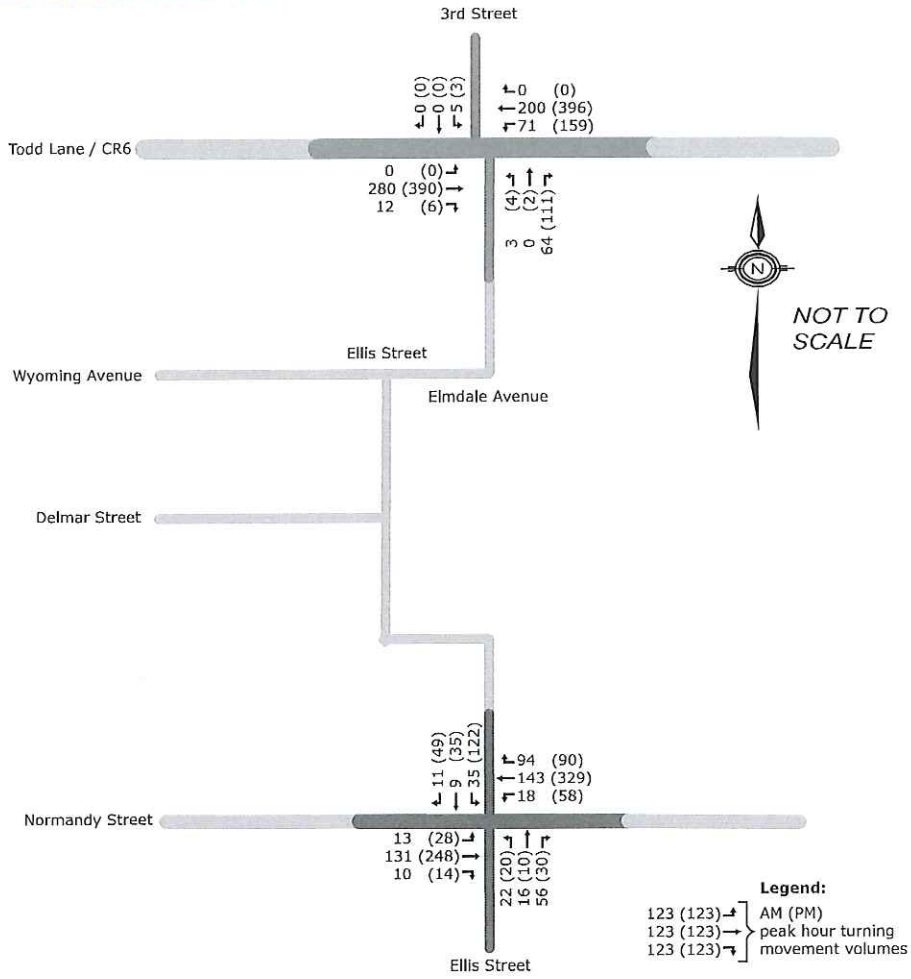


The turning movement count (TMC) data is included in ***Appendix C***. Since the turning movement count data at the two study area intersections was collected in July 2019 (when school is not in session), two sets of adjustments were made. The first of these adjustments utilized a previous count (that was completed in June 2016 at the nearby Todd Lane and Malden Road) to provide representative background volumes (i.e., through volumes) on the road network when school is in session. The second adjustment explicitly considered vehicle trips associated with the nearby Sandwich West Public School

site. These trips were estimated using rates provided within the Institute of Transportation Engineers (ITE) document *Trip Generation Manual, 10th Edition*. A total of 146 trips in the AM peak hour and 37 vehicle trips in the PM peak hour were added to the road network to explicitly account for school traffic.

Figure 5 shows the existing (2019) traffic volumes for the weekday AM and PM peak hours. Weekday AM peak hour volumes are shown first; with weekday PM peak hours volumes following in parentheses.

FIGURE 5: EXISTING (2019) TRAFFIC VOLUMES



Existing Intersection Operations

Traffic operations at the study area intersections were evaluated based on the methodology outlined in the *Highway Capacity Manual* (HCM), using the Synchro (version 10) software package. At the study area intersections, the overall level of service[1] and average vehicle delay are noted. In addition, for each individual movement, the volume-to-capacity ratio, level of service, average delay and 95th percentile

[1] Level of Service (LOS), applied to an intersection, is a measure qualifying the amount of delay experienced by motorists, expressed either for specific turning movements or for the intersection as a whole. A more detailed explanation of LOS is provided in ***Appendix B***.

queue are noted. The results were reviewed to identify any critical movements, which have been defined in this memorandum as follows:

1. Any through lane / movement with a v/c ratio of 0.85 or higher;
2. Any exclusive turning lane / movement with a v/c ratio of 1.00 or higher;
3. Any movement operating at LOS E or F; and
4. Any turning movement with a 95th percentile queue exceeding the available storage.

The signal timing plan for the Todd Lane and Elmdale Avenue / Third Street intersection was utilized for the analysis at this intersection. Synchro analysis worksheets are provided in ***Appendix D*** and ***Appendix E***.

Synchro analysis results for the study area intersections under existing volumes are summarized in ***Table 1***.

TABLE 1: EXISTING (2019) CONDITIONS

Intersection	Movement	Weekday AM peak hour				Weekday PM peak hour			
		v/c	LOS	Delay *(s/veh)*	95th %ile queue *(m)*	v/c	LOS	Delay *(s/veh)*	95th %ile queue *(m)*
Todd Lane and Elmdale Avenue / Third Street *(signalized)*	EB approach	0.31	A	7.3	39	0.42	A	8.6	57
	WB left	0.15	A	7.3	12	0.37	B	10.0	29
	WB thru / right	0.21	A	6.6	27	0.42	A	8.6	57
	NB approach	0.22	A	4.7	4	0.36	A	8.9	13
	SB approach	0.04	C	26.8	3	0.03	C	26.7	3
	Overall	—	**A**	**7.0**	—	—	**A**	**8.9**	—
Normandy Street and Ellis Street *(all-way stop)*	NB thru / left	0.07	A	9.3	2	0.07	B	11.3	2
	NB right	0.09	A	8.3	2	0.06	A	10.0	2
	EB approach	0.26	B	10.2	8	0.57	C	17.8	27
	WB-thru / left	0.28	B	10.1	8	0.74	C	24.2	47
	WB right	0.14	A	7.9	4	0.15	A	9.1	4
	SB approach	0.11	A	9.7	3	0.45	C	15.8	17
	Overall	—	**A**	**9.5**	—	—	**B**	**18.7**	—

At both the study area intersections, operations in both the AM and PM peak hour are functioning in an acceptable manner.

At the signalized intersection of Todd Lane and Elmdale Avenue / Third Street, the intersection operates at an overall LOS A in the AM peak hour and LOS A in the PM peak hour. All approaches and movements operate at LOS C or better. However, the queue length for the westbound left turn movement in the PM peak hour exceeds the existing 20-metre storage lane by 9 metres.

At the intersection of Normandy Street and Ellis Street, the intersection operates at an overall LOS A in the AM peak hour and LOS B in the PM peak hour. All approaches and movements operate at LOS B or better within the AM peak hour and LOS C or better in the PM peak hour. The maximum delay is approximately 24 seconds for westbound vehicles in the PM peak hour. This movement also has the longest queue at approximately six vehicles (47 metres) during the same afternoon period.

Site Traffic Volumes

Trip Generation

The proposed development is envisioned to feature three multi-storey residential buildings with a total of 178 units. The number of trips expected to be generated by the proposed development were estimated using trip generation rates contained within the Institute of Transportation Engineers (ITE) document *Trip Generation Manual, 10th Edition*. The trip generation estimates for the subject development are summarized in ***Table 2***.

TABLE 2: TRIP GENERATION

Land Use	Size	Trip Generation Rate [AM (PM)]	Trip Generation Estimate [AM (PM)]
ITE 221 – Multifamily Housing (Mid-Rise)	178 dwelling units	0.34 (0.43)	60 Trips – 16 in, 44 out (77 Trips – 47 in, 30 out)

The proposed residential development is estimated to generate 60 (16 inbound, 44 outbound) vehicle trips during the weekday AM peak hour and 77 (47 inbound, 30 outbound) vehicle trips during the weekday PM peak hour. No modal split adjustments were applied to the trip generation estimates.

Trip Distribution

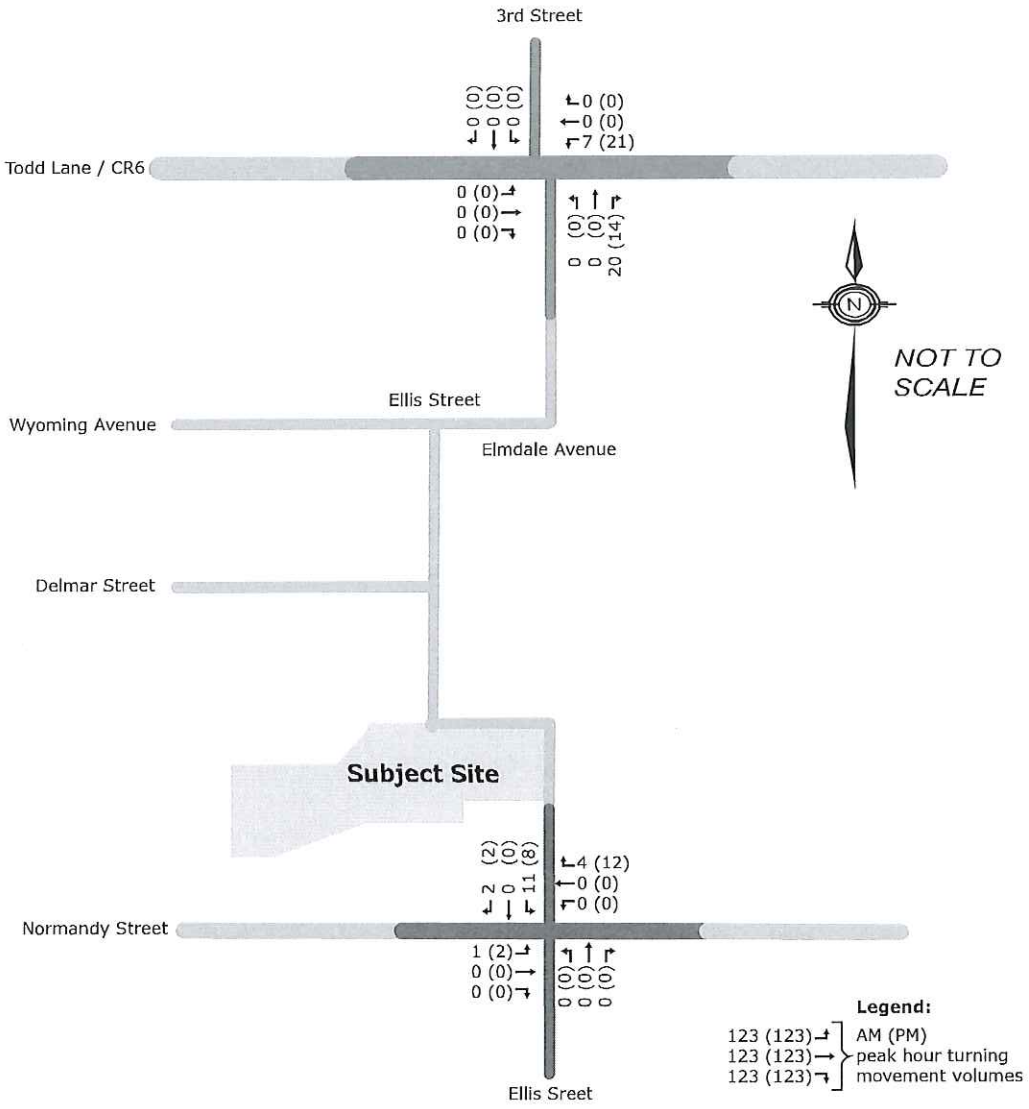
The distribution and assignment of site trips across the study area was carried out using a combination of assumptions and local knowledge of travel behaviour in the area. ***Table 3*** summarizes the trip distribution that was applied in the analysis.

TABLE 3: SITE TRIP DISTRIBUTION & ASSIGNMENT

Orientation	Directional Split	Routing
North	5%	Via Ellis Street and Delmar Street to Malden Road
South	5%	Via Ellis Street and Normandy Street to Malden Road
West	20%	Via Ellis Street and Delmar Avenue to Sprucewood Avenue
East *(Todd Lane)*	45%	Via Ellis Street and Elmdale Street to Todd Lane
East *(Normandy Street)*	25%	Via Ellis Street to Normandy Street
Total	**100%**	

Figure 6 shows the forecast site-generated trips applied to the two study intersections. Weekday AM peak hour volumes are shown first, with weekday PM peak hour volumes following in parentheses.

FIGURE 6: SITE GENERATED TRIPS



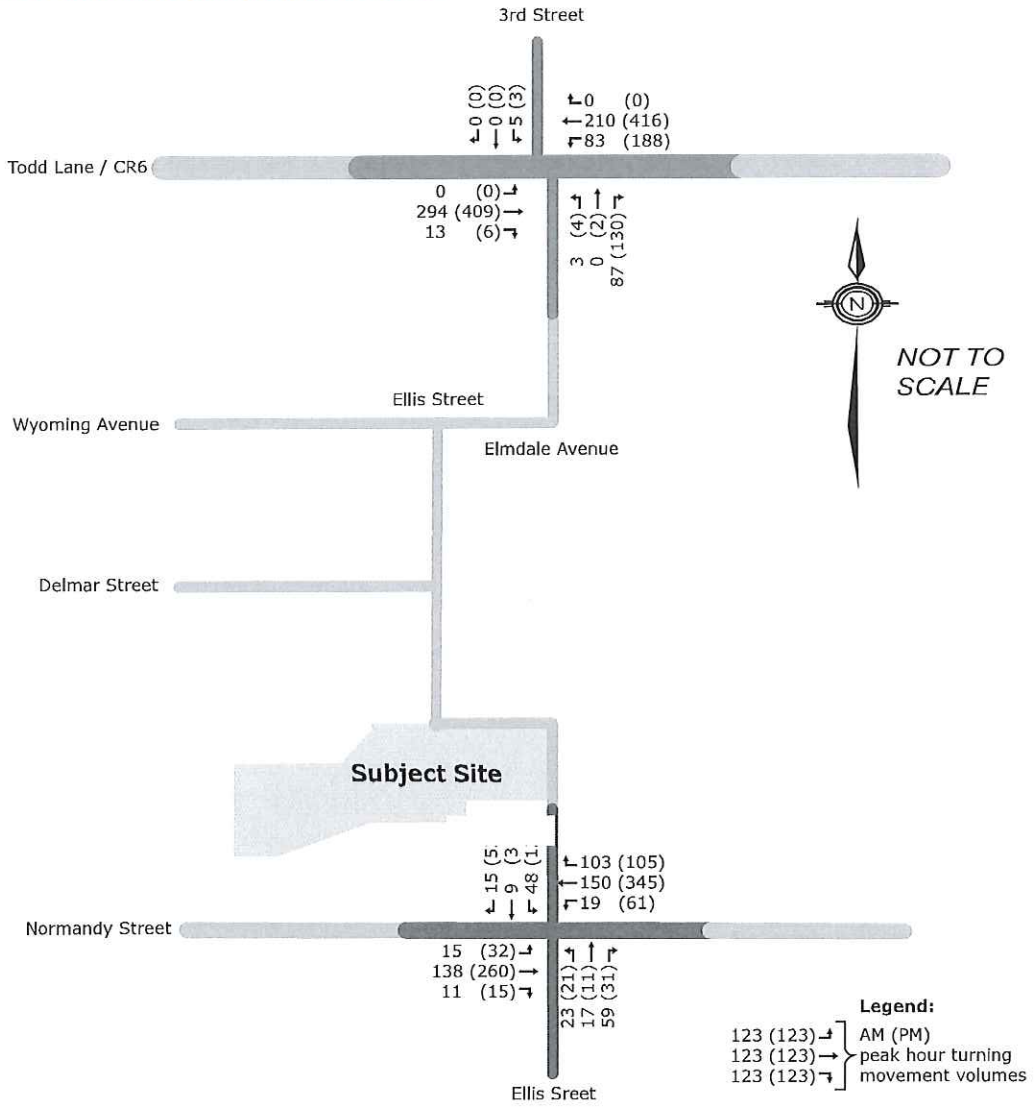
Total Future Conditions

Total Future Traffic Volumes

Total future traffic volumes include the existing (2019) traffic volumes that were increased by a 1.0% annual growth factor as well as the traffic generated by the proposed development.

Figure 7 shows the post-development traffic volumes for the 2024 total future scenario. AM peak hour volumes are shown first, with weekday PM peak hour volumes following in parentheses.

FIGURE 7: TOTAL FUTURE (2024) TRAFFIC VOLUMES



Total Future Intersection Operations

Synchro analysis results for the study area intersections under total future volumes are summarized in ***Table 4.***

TABLE 4: TOTAL FUTURE (2024) CONDITIONS

Intersection	Movement	Weekday AM peak hour				Weekday PM peak hour			
		v/c	LOS	Delay *(s/veh)*	95th %ile queue *(veh)*	v/c	LOS	Delay *(s/veh)*	95th %ile queue *(veh)*
Todd Lane / Elmdale Avenue / Third Street *(signalized)*	EB approach	0.33	A	7.5	41	0.45	A	9.0	60
	WB left	0.18	A	7.7	14	0.47	B	12.2	37
	WB thru / right	0.22	A	6.8	28	0.45	A	9.0	60
	NB approach	0.30	A	7.9	9	0.39	A	8.7	14
	SB approach	0.04	C	26.8	4	0.03	C	26.7	3
	Overall	—	**A**	**7.5**	—	—	**A**	**9.6**	—
Normandy Street / Ellis Street *(all-way stop)*	NB thru / left	0.08	A	9.5	2	0.08	B	11.7	2
	NB right	0.10	A	8.5	2	0.07	B	10.5	2
	EB approach	0.29	B	10.6	9	0.63	C	20.7	33
	WB-thru / left	0.30	B	10.4	9	0.80	D	31.1	60
	WB right	0.15	A	8.1	4	0.19	A	9.7	5
	SB approach	0.14	B	10.1	4	0.51	C	17.8	22
	Overall	—	**A**	**9.8**	—	—	**C**	**22.3**	—

Compared to the existing conditions and analyses, operations at both the AM and PM peak hour are anticipated to continue in an acceptable manner through to the horizon year.

At the signalized intersection of Todd Lane and Elmdale Avenue / Third Street, the intersection continues to operate at an overall LOS A in the AM peak hour and overall LOS A in the PM peak hour. All approaches and movements operate at LOS C or better. Similar to the existing conditions, the 95th percentile queue for the westbound left turn movement exceeds the available storage during the PM peak hour. A 37-metre long queue is forecast which exceeds the available 20-metre storage lane. However, this movement continues to operate at LOS B and well under capacity (v/c of 0.47). Further, this is based on the fact that volumes at the Todd Lane and Elmdale Avenue were adjusted to account for school not being in session. It is possible that these queues may not necessarily materialize.

At the intersection of Normandy Street and Ellis Street, the intersection continues to operate at an overall LOS A in the AM peak hour, but has reduced to LOS C in the PM peak hour. Most approaches and movements continue to operate at LOS C or better. However, the westbound approach is now forecast to operate at LOS D in the PM peak hour. For this movement, the maximum delay is forecast to increase by seven seconds to a total of 31 seconds for westbound vehicles in the PM peak hour. This movement also has the longest queue, forecast to extend by two vehicles to eight vehicles (approximately 60 metres) during the same afternoon period.

Todd Lane and Elmdale Avenue / Third Street Mitigation

At the signalized intersection of Todd Lane and Elmdale Avenue / Third Street, the westbound left turn movement may be currently exceeding the 20-metre storage in the PM peak hour under existing

conditions. In the future, this westbound queue will increase. Some potential mitigation for this is to adjust the signal timings at this intersection.

Introduction of a Westbound Left Turn Signal Phase

In order to improve operations and reduce queuing of the westbound left turn movement, a protected left turn phase may be implemented during the PM peak hour.

With the addition of the protected left turn phase in the PM peak hour, the signal timing was adjusted as follows:

1. The northbound phase maximum split length was reduced from 29.3 seconds to 20 seconds;
2. The southbound phase maximum split length was reduced from 20 seconds to 12 seconds;
3. The eastbound phase maximum split length was increased from 39.7 seconds to 42 seconds;
4. The new westbound left turn phase was introduced with a maximum 15 second split length; and
5. The westbound phase maximum split length was increased from 39.7 seconds to 52 seconds.

Existing (2019) Mitigation

Synchro analysis results for the Todd Lane and Elmdale Avenue / Third Street intersection with the signal timing adjustments under existing traffic volumes are summarized in ***Table 5***.

TABLE 5: EXISTING (2019) CONDITIONS - ADDED LEFT TURN PHASE DURING PM PEAK HOUR

Intersection	Movement	Weekday AM peak hour[2]				Weekday PM peak hour			
		v/c	LOS	Delay *(s/veh)*	95th %ile queue *(veh)*	v/c	LOS	Delay *(s/veh)*	95th %ile queue *(veh)*
Todd Lane and Elmdale Avenue / Third Street *(signalized)*	EB approach	0.31	A	7.3	39	0.47	B	13.6	81
	WB left	0.15	A	7.3	12	0.30	A	4.9	18
	WB thru / right	0.21	A	6.6	27	0.37	A	6.6	53
	NB approach	0.22	A	4.7	4	0.42	B	11.6	15
	SB approach	0.04	C	26.8	3	0.03	D	35.7	4
	Overall	—	**A**	**7.0**	—	—	**A**	**9.6**	—

With the changes to the signal timing to the PM peak hour under existing traffic volumes, the forecast westbound left turn queue would be reduced to approximately 18 metres, with the 95th percentile queue being fully within the available 20-metre storage.

Total Future (2014) Mitigation

Synchro analysis results for the Todd Lane and Elmdale Avenue / Third Street intersection with the same signal timing adjustments under total future traffic volumes are summarized in ***Table 6.***

[2] No adjustments were made to the AM peak hour signal timing for the existing conditions mitigation

TABLE 6: TOTAL FUTURE (2024) CONDITIONS - ADDED LEFT TURN PHASE DURING PM PEAK HOUR

Intersection	Movement	Weekday AM peak hour[3]				Weekday PM peak hour			
		v/c	LOS	Delay *(s/veh)*	95th %ile queue *(veh)*	v/c	LOS	Delay *(s/veh)*	95th %ile queue *(veh)*
Todd Lane / Elmdale Avenue / Third Street *(signalized)*	EB approach	0.33	A	7.5	41	0.50	B	14.6	89
	WB left	0.18	A	7.7	14	0.36	A	5.5	22
	WB thru / right	0.22	A	6.8	28	0.39	A	6.9	58
	NB approach	0.30	A	7.9	9	0.45	B	11.3	16
	SB approach	0.04	C	26.8	4	0.03	D	35.7	4
	Overall	—	**A**	**7.5**	—	—	**B**	**10.0**	—

With the same changes to the signal timing to the PM peak hour under total future traffic volumes, the forecast westbound left turn queue would be reduced to approximately 22 metres, with the 95th percentile queue length being generally the same length as the existing storage lane.

[3] No adjustments were made to the AM peak hour signal timing for the total future conditions mitigation

Summary

The following conclusions have been reached, based on the analysis included herein:

1. The proposed development is expected to generate 60 vehicle trips during the AM peak hour and 77 trips during the PM peak hour.
2. There may be a need to introduce a westbound left turn protected signal phase at the Todd Lane and Elmdale Avenue / Third Street intersection during the PM peak hour to accommodate the westbound vehicle queue in the storage lane.
3. Peak hour traffic operations found there was no need to change the form of traffic control at the Normandy Street and Ellis Street intersection.
4. The proposed development does not create the need for geometric intersection modifications at either of the study area intersections.

Yours sincerely,

DILLON CONSULTING LIMITED

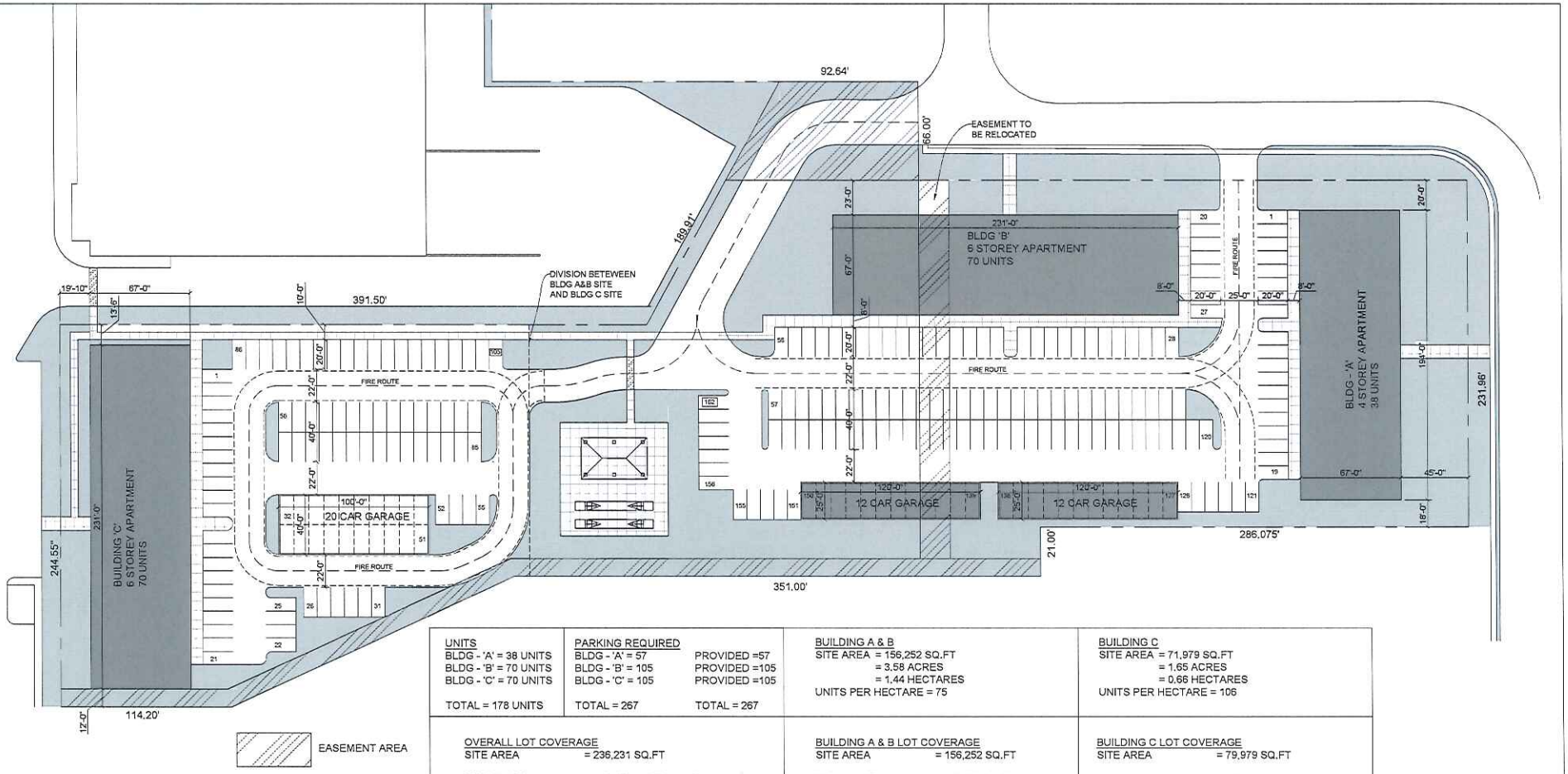
Mike Walters, P.Eng.
Transportation Engineer

MDW:tdk

Attachments
Appendix A – Conceptual Development Plan
Appendix B – Level of Service (LOS) Definitions
Appendix C – Turning Movement Count (TMC) Data
Appendix D – Todd Lane, Elmdale Avenue & Third Street - Synchro Reports
Appendix E – Normandy Street & Ellis Street – Synchro Reports

Appendix A

Conceptual Development Plan



EASEMENT AREA

UNITS	PARKING REQUIRED		BUILDING A & B	BUILDING C
BLDG - 'A' = 38 UNITS	BLDG - 'A' = 57	PROVIDED =57	SITE AREA = 156,252 SQ.FT	SITE AREA = 71,979 SQ.FT
BLDG - 'B' = 70 UNITS	BLDG - 'B' = 105	PROVIDED =105	= 3.58 ACRES	= 1.65 ACRES
BLDG - 'C' = 70 UNITS	BLDG - 'C' = 105	PROVIDED =105	= 1.44 HECTARES	= 0.66 HECTARES
TOTAL = 178 UNITS	TOTAL = 267	TOTAL = 267	UNITS PER HECTARE = 75	UNITS PER HECTARE = 106

OVERALL LOT COVERAGE			BUILDING A & B LOT COVERAGE			BUILDING C LOT COVERAGE		
SITE AREA	= 236,231 SQ.FT		SITE AREA	= 156,252 SQ.FT		SITE AREA	= 79,979 SQ.FT	
BLDG A AREA	= 15,477 SQ.FT	= 6.5%	BLDG A AREA	= 15,477 SQ.FT	= 9.9%	BLDG C AREA	= 15,477 SQ.FT	= 19.3%
BLDG B AREA	= 12,998 SQ.FT	= 5.5%	BLDG B AREA	= 12,998 SQ.FT	= 8.3%	GARAGE AREA	= 4,000 SQ.FT	= 5.0%
BLDG C AREA	= 15,477 SQ.FT	= 6.5%	GARAGE A AREA	= 3,000 SQ.FT	= 1.9%	PARKING LOT AREA	= 34,680 SQ.FT	= 43.3%
GARAGE A AREA	= 3,000 SQ.FT	= 1.2%	GARAGE B AREA	= 3,000 SQ.FT	= 1.9%	GREEN SPACE	= 25,823 SQ.FT	= 32.2%
GARAGE B AREA	= 3,000 SQ.FT	= 1.2%	PARKING LOT AREA	= 57,731 SQ.FT	= 36.9%			
GARAGE C AREA	= 4,000 SQ.FT	= 1.9%	GREEN SPACE	= 64,046 SQ.FT	= 40.9%			
PARKING LOT AREA	= 92,411 SQ.FT	= 39.1%						
GREEN SPACE	= 89,869 SQ.FT	= 38.0%						

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Project Name and Address
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LASALLE ONT

Project: XX
Date: APR 3, 2019
Scale: AS NOTED
Sheet: A2

Appendix B

Level of Service (LOS) Definitions

LEVEL OF SERVICE[1]

Level of Service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream, and their perception by motorists and/or passengers. This concept was introduced in the 1965 *Highway Capacity Manual* as a criteria for interrupted flow conditions. The 2000 *Highway Capacity Manual* changed the basis for measuring Level of Service at intersections to control delay[2].

Six Levels of Service are defined with LOS A representing the best operating conditions, and LOS F the worst (briefly described below). It should be noted that there is often significant variability in the amount of delay experienced by individual drivers.

LOS A: This Level of Service describes the highest quality of traffic flow and is referred to as free flow. The approach appears open, turning movements are easily made and drivers have freedom of operation. Control delay is less than 10 seconds/vehicle.

LOS B: This Level of Service is referred to as a stable flow. Drivers feel somewhat restricted and occasionally may have to wait to complete the minor movement. Control delay is 10-15 seconds/vehicle for unsignalized intersections and 10-20 seconds/vehicle for signalized intersections.

LOS C: At this level, the operation is stable. Drivers feel more restricted and may have to wait, with queues developing for short periods. Control delay is 15-25 seconds/vehicle at unsignalized intersections and 20-35 seconds/vehicle at signalized intersections.

LOS D: At this level, traffic is approaching unstable flow. The motorist experiences increasing restriction and instability of flow. There are substantial delays to approaching vehicles during short peaks within the peak period, but there are enough gaps to lower demand to permit occasional clearance of developing queues and prevent excessive back-ups. Control delay is 25-35 seconds/vehicle at unsignalized intersections and 35-55 seconds/vehicle at signalized intersections.

LOS E: At this level capacity occurs. Long queues of vehicles exist and delays to vehicles may extend. Control delay is 35-50 seconds/vehicle at unsignalized intersections and 55-80 seconds/vehicle at signalized intersections.

LOS F: At this Level of Service, the intersection has failed. Capacity of the intersection has been exceeded. Control delay exceeds 50 seconds/vehicle at unsignalized intersections and exceeds 80 seconds/vehicle at signalized intersections.

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1 *Transportation Research Board: Highway Capacity Manual 1965, 2000*

2 *Control delay is defined as the component of delay that results when a control signal causes a lane group to reduce speed or to stop; it is measured by comparison with the uncontrolled condition.*