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November 13, 2023

Mr. Dan Ilkiewicz
County of Peterborough
470 Water St.
Peterborough, ON
K9H 3M3

Reference: Proposed Residential Units
Edwards Drive, Keene
Traffic Brief
Project Nº 2304-23

Dear Mr. Ilkiewicz,

Asurza Engineers Ltd. was retained by the developer to conduct a Traffic Brief in support of the proposed residential subdivision situated on Edwards Drive within the Community of Keene, Township of Otonabee-South Monaghan, County of Peterborough.

The purpose of this analysis is to assess whether the proposed development will have any significant impacts on the traffic operations of the adjacent road.

Subject Site

Currently, the site is an undeveloped parcel of land in Keene. As per the received information, the applicant intends to build 16 to 23 detached homes while preserving the existing vegetation on the lot as parkland.

Access to the development will be facilitated through the extension of Edwards Drive, with further details provided in *Appendix A – Draft Site Plan*.

Existing Traffic Conditions

Heritage Line (County Road 34) is a north-south two lane (one lane per direction) roadway, shows a rural cross-section with shoulders, ditches, and culverts for water drainage. This road serves Keene as one of the community's central roadways. A posted speed of 50 km/h was identified on Heritage Ln within the study area, which increases to 80 km/h outside of the community.

Edwards Drive is a two-lane (one lane per direction) local road showing a rural cross-section, intersecting Heritage Ln to form a stop-controlled "T" type intersection. No speed limit was identified on Edwards Dr; therefore, 50 km/h is adopted in accordance with the Ontario Highway Traffic Act. The developer intends to extend Edwards Dr, which will serve as the access to the development.

Figure 1: *Location of The Site.*

Video-based traffic movement counts at the Heritage Ln / Edwards Dr intersection were conducted on October 12, 2023, during the morning and afternoon peak periods. The following exhibits present the existing traffic volumes at the intersection for both the AM and PM peak hours.

Existing AM Peak Hour Volumes, 2023

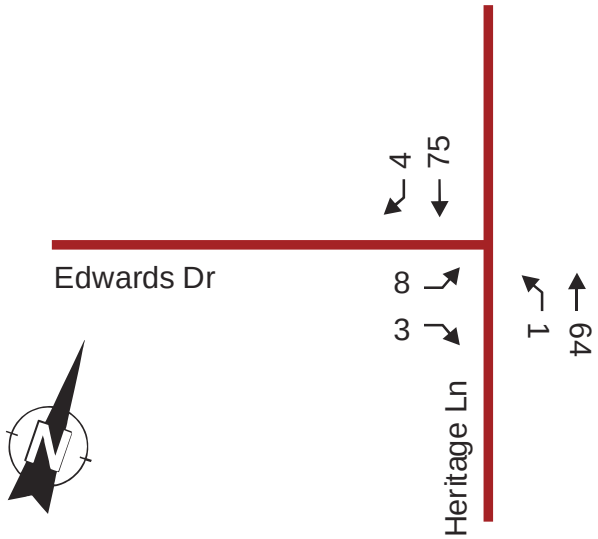


Exhibit 2: *Existing AM Peak Hour Volumes, 2023.*

Existing PM Peak Hour Volumes, 2023

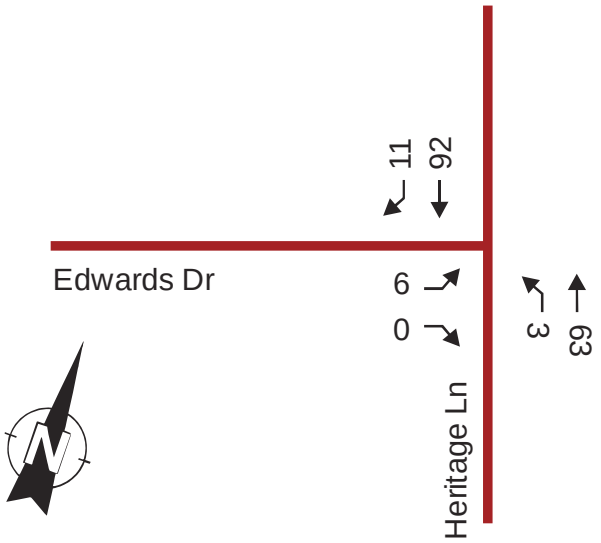


Exhibit 3: *Existing PM Peak Hour Volumes, 2023.*

During typical peak hours, results show that all movements at the intersection are operating at the best with level of service "A."

		Existing Volumes 2023							
		AM Peak Hour				PM Peak Hour			
		V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS
Heritage Ln / Edwards Dr	EB	0.01	9.2	0.3	A	0.01	9.5	0.2	A
	NB	0.00	0.1	0.0	A	0.00	0.3	0.0	A
	SB	0.05	0.0	0.0	A	0.07	0.0	0.0	A

Table 1: *Intersection Capacity, Existing Volumes, 2023.*

Trip Generation and Trip Distribution

The estimation of trips generated by the proposed development were derived from the Trip Generation Manual, 11th Edition, published by the Institute of Transportation Engineers (ITE). "Single Family Detached Housing - Land Use 210" has been selected as the land use for the proposed development.

The trip rates and the estimated number of trips to be generated by the proposed development are shown in the following table:

TRIP GENERATION RATES BY LAND USE								
ITE Code	ITE Land Use	Unit of Measure	AM Peak Hr. of Adj. Street			PM Peak Hr. of Adj. Street		
			Rate	In	Out	Rate	In	Out
210	Single Family Detached Housing	Dwellings	0.7	25%	75%	0.94	63%	37%

TRIPS GENERATED BY PROPOSED DEVELOPMENT								
ITE Code	ITE Land Use	Total Units	AM Peak Hr. of Adj. Street			PM Peak Hr. of Adj. Street		
			Trips	In	Out	Trips	In	Out
210	Single Family Detached Housing	23	16	4	12	22	14	8

Table 2: *Estimated Trips Generated by the Proposed Development.*

According to the ITE trip generation rates, it is estimated that the proposed development will generate a total of 16 new trips during the AM peak hour, and a total of 22 new trips during the PM peak hour.

The number of vehicles entering and leaving the site were distributed proportional to the existing traffic patterns. The directional traffic patterns were estimated from the turning movement counts. The new trips are shown in the following exhibits:

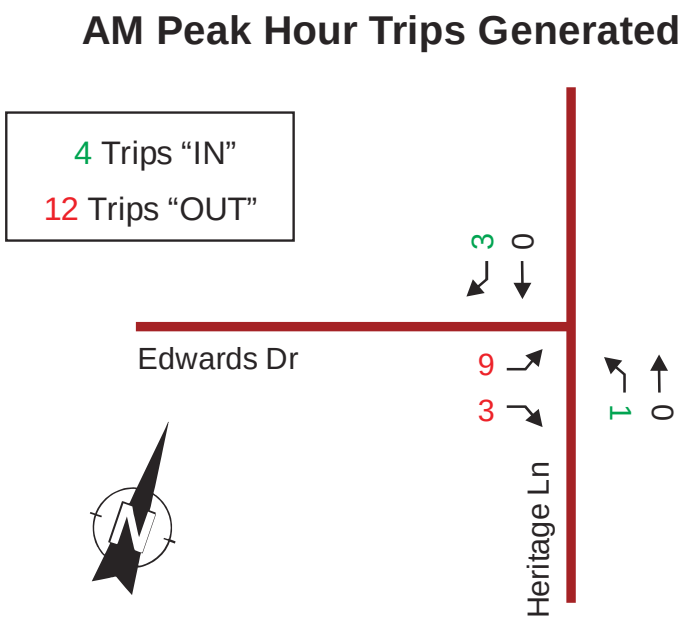


Exhibit 4: *AM Peak Hour Trips Generated, 2023.*

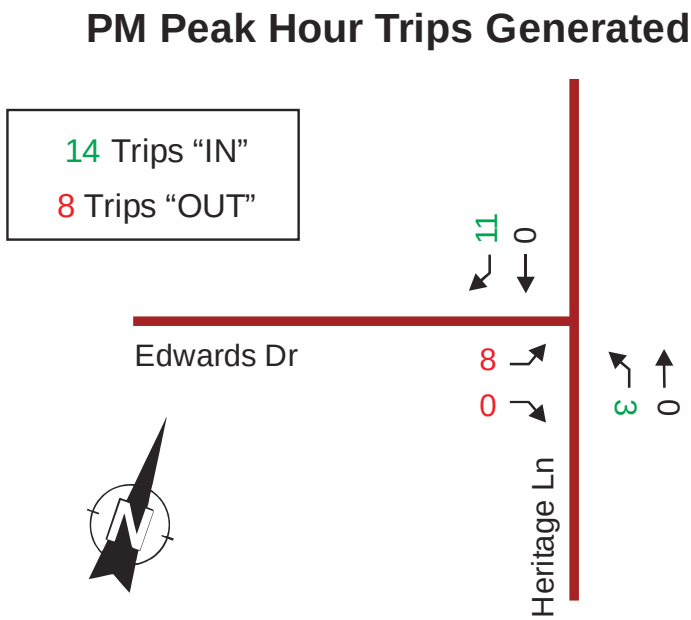


Exhibit 5: *PM Peak Hour Trips Generated, 2023.*

Future Traffic Operations

The analysis assesses intersection operations for the build-out year, assumed to be 2025, as well as for the subsequent five years, until 2030. An annual growth rate of 2.5% per year, compounded annually, was used to project existing volumes into the future. This estimate of future traffic volumes, without considering the proposed development, is referred to as background traffic volumes.

When considering the total traffic volumes for the future years, we add the background traffic volumes to the new trips generated by the proposed development. The total traffic volumes are shown in the following exhibits:

Total AM Peak Hour Volumes, 2025

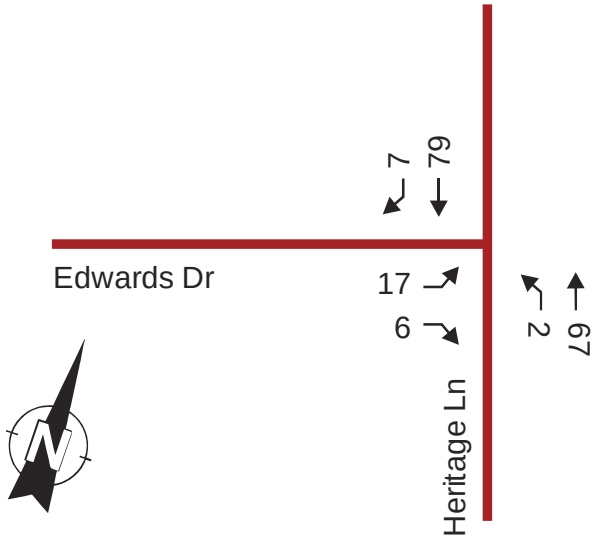


Exhibit 6: *Total AM Peak Hour Volumes, 2025.*

Total PM Peak Hour Volumes, 2025

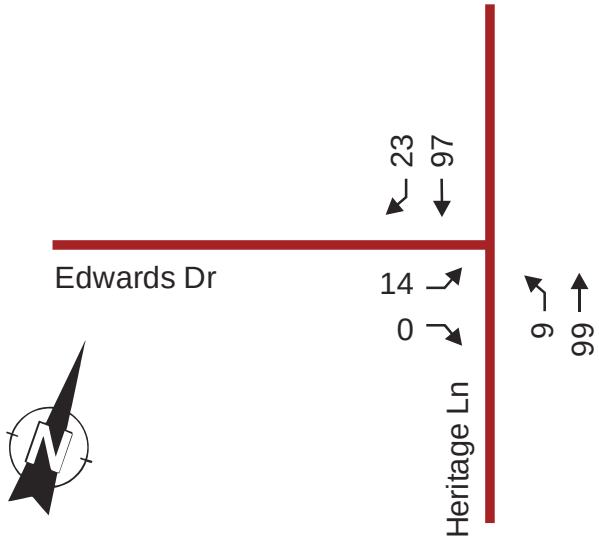


Exhibit 7: *Total PM Peak Hour Volumes, 2025.*

Total AM Peak Hour Volumes, 2030

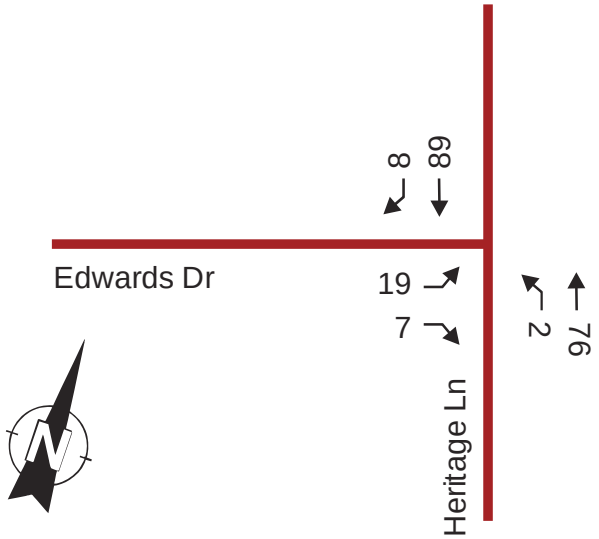


Exhibit 8: *Total AM Peak Hour Volumes, 2030.*

Total PM Peak Hour Volumes, 2030

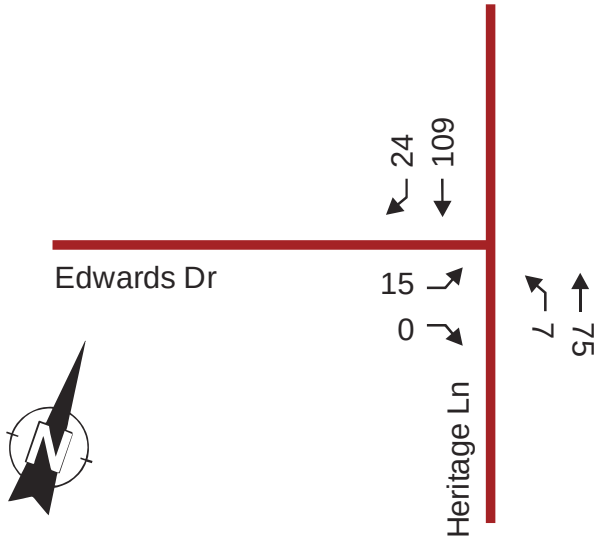


Exhibit 9: *Total PM Peak Hour Volumes, 2030.*

The total volumes capacity analysis results for the years 2025 and 2030 are shown in the following tables.

		Total Volumes 2025							
		AM Peak Hour				PM Peak Hour			
		V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS
Heritage Ln / Edwards Dr	EB	0.03	9.3	0.7	A	0.02	9.7	0.5	A
	NB	0.00	0.2	0.0	A	0.00	0.7	0.1	A
	SB	0.06	0.0	0.0	A	0.08	0.0	0.0	A

Table 3: *Intersection Capacity, Total Volumes, 2025.*

		Total Volumes 2030							
		AM Peak Hour				PM Peak Hour			
		V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS
Heritage Ln / Edwards Dr	EB	0.03	9.4	0.9	A	0.02	9.8	0.5	A
	NB	0.00	0.2	0.0	A	0.01	0.7	0.1	A
	SB	0.06	0.0	0.0	A	0.08	0.0	0.0	A

Table 4: *Intersection Capacity, Total Volumes, 2030.*

Over time, it becomes evident that the traffic operations at Heritage Ln / Edwards Dr, including the new trips, remain largely consistent with the parameters observed without the development. It is clear that the trips generated during peak hours have a minimal impact, and the level of service "A" is expected to be maintained throughout the study period.

Discussion

According to the "Transportation Impact Analyses for Site Development – an ITE Recommended Practice," a publication from ITE, one guideline suggests that the generation of an additional 100 vehicles per hour by any proposed development could potentially lead to traffic issues such as reduced capacity, extended queues, and lower levels of service.

The publication also notes that the 100-vehicle threshold is not a strict requirement for initiating a transportation impact analysis. In densely populated areas with diverse urban characteristics, jurisdictions often use lower thresholds, and these thresholds may vary among agencies to address specific local conditions and priorities.

Considering the minor nature of the proposed development and its location outside of densely populated areas, it is evident that the number of generated trips does not reach a threshold necessitating an in-depth traffic analysis. Nonetheless, this process has been undertaken to demonstrate that no significant traffic impacts are expected from this minor development.

Auxiliary Lanes Review at Entrance

The need for auxiliary lanes (right turn taper and left turn lane) on Heritage Ln at Edwards Dr was reviewed.

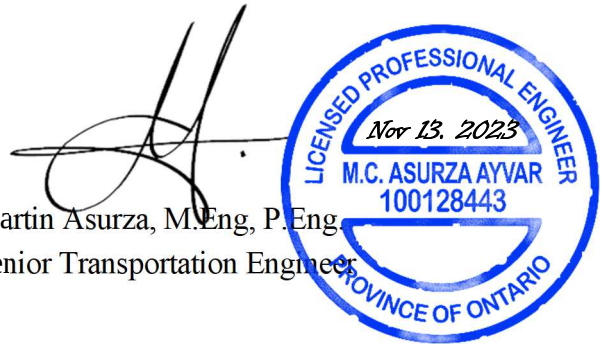
The Ministry of Transportation Ontario (MTO) Design Supplement for the TAC Manual was consulted to evaluate the need for a left turn lane. The methodology for two-lane highways is based on the volumes advancing with the left turns, the proportion of left turns, and the volumes opposing the left turns. The results show that a left turn lane is not warranted (see *Appendix F* for further details).

According to the TAC Manual, right turn tapers are suggested when the volume of right turning vehicles is approaches the channelization criteria, which indicates that a right turn taper should be considered when right turning volumes approach 60 veh/h for the peak hour. The estimated right turn volumes into the site are below this threshold, and as such, a right turn taper is not required.

Conclusion

Given the limited scale of the proposed development, the additional trips will impose virtually no impact on the nearby road network. Any minor change in the traffic volumes as a result of the new trips will be negligible to the current traffic operations.

Should you require any further information in consideration of the above, do not hesitate to contact the undersigned.



Martin Asurza, M.Eng, P.Eng.
Senior Transportation Engineer

Appendix A

Traffic Data and Volume Projections

Heritage Ln / Edwards Dr			Eastbound			Northbound			Westbound			Southbound			Volume Type
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT	
	2023	AM	8	0	3	1	64	0	0	0	0	0	75	4	Registered Volumes
	2023	PM	6	0	0	3	63	0	0	0	0	0	92	11	
Annual Growth Rate 2.50%															
	2023	AM	8	0	3	1	64	0	0	0	0	0	75	4	Existing Volumes
	2023	PM	6	0	0	3	63	0	0	0	0	0	92	11	
Annual Growth Rate 2.50%															
	2025	AM	8	0	3	1	67	0	0	0	0	0	79	4	Background Volumes
	2025	PM	6	0	0	3	66	0	0	0	0	0	97	12	
	2025	AM	9	0	3	1	0	0	0	0	0	0	0	3	Site Generated Trips
	2025	PM	8	0	0	3	0	0	0	0	0	0	0	11	
	2025	AM	17	0	6	2	67	0	0	0	0	0	79	7	Total Volumes
	2025	PM	14	0	0	6	66	0	0	0	0	0	97	23	
Annual Growth Rate 2.50%															
	2030	AM	10	0	4	1	76	0	0	0	0	0	89	5	Background Volumes
	2030	PM	7	0	0	4	75	0	0	0	0	0	109	13	
	2025	AM	9	0	3	1	0	0	0	0	0	0	0	3	Site Generated Trips
	2025	PM	8	0	0	3	0	0	0	0	0	0	0	11	
	2030	AM	19	0	7	2	76	0	0	0	0	0	89	8	Total Volumes
	2030	PM	15	0	0	7	75	0	0	0	0	0	109	24	

Appendix B

Synchro Reports

Existing Volumes 2023

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	8	3	1	64	75	4
Future Volume (Veh/h)	8	3	1	64	75	4
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	3	1	70	82	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	156	84	86			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	156	84	86			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	840	981	1523			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	12	71	86
Volume Left	9	1	0
Volume Right	3	0	4
cSH	871	1523	1700
Volume to Capacity	0.01	0.00	0.05
Queue Length 95th (m)	0.3	0.0	0.0
Control Delay (s)	9.2	0.1	0.0
Lane LOS	A	A	
Approach Delay (s)	9.2	0.1	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	6	0	3	63	92	11
Future Volume (Veh/h)	6	0	3	63	92	11
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	0	3	68	100	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	180	106	112			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	180	106	112			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	813	954	1490			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	7	71	112
Volume Left	7	3	0
Volume Right	0	0	12
cSH	813	1490	1700
Volume to Capacity	0.01	0.00	0.07
Queue Length 95th (m)	0.2	0.0	0.0
Control Delay (s)	9.5	0.3	0.0
Lane LOS	A	A	
Approach Delay (s)	9.5	0.3	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	15.8%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C

Synchro Reports

Total Volumes 2025

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	17	6	2	67	79	7
Future Volume (Veh/h)	17	6	2	67	79	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	18	7	2	73	86	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	167	90	94			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	167	90	94			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	99	100			
cM capacity (veh/h)	827	973	1513			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	25	75	94
Volume Left	18	2	0
Volume Right	7	0	8
cSH	863	1513	1700
Volume to Capacity	0.03	0.00	0.06
Queue Length 95th (m)	0.7	0.0	0.0
Control Delay (s)	9.3	0.2	0.0
Lane LOS	A	A	
Approach Delay (s)	9.3	0.2	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	15.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	14	0	6	66	97	23
Future Volume (Veh/h)	14	0	6	66	97	23
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	15	0	7	72	105	25
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	204	118	130			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	204	118	130			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	100			
cM capacity (veh/h)	786	940	1468			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	15	79	130
Volume Left	15	7	0
Volume Right	0	0	25
cSH	786	1468	1700
Volume to Capacity	0.02	0.00	0.08
Queue Length 95th (m)	0.5	0.1	0.0
Control Delay (s)	9.7	0.7	0.0
Lane LOS	A	A	
Approach Delay (s)	9.7	0.7	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	18.4%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix D

Synchro Reports

Total Volumes 2030

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	19	7	2	76	89	8
Future Volume (Veh/h)	19	7	2	76	89	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	8	2	83	97	9
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	188	102	106			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	188	102	106			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	97	99	100			
cM capacity (veh/h)	804	959	1498			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	29	85	106
Volume Left	21	2	0
Volume Right	8	0	9
cSH	842	1498	1700
Volume to Capacity	0.03	0.00	0.06
Queue Length 95th (m)	0.9	0.0	0.0
Control Delay (s)	9.4	0.2	0.0
Lane LOS	A	A	
Approach Delay (s)	9.4	0.2	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	15.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	0	7	75	109	24
Future Volume (Veh/h)	15	0	7	75	109	24
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	0	8	82	118	26
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	229	131	144			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	229	131	144			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	99			
cM capacity (veh/h)	759	924	1451			

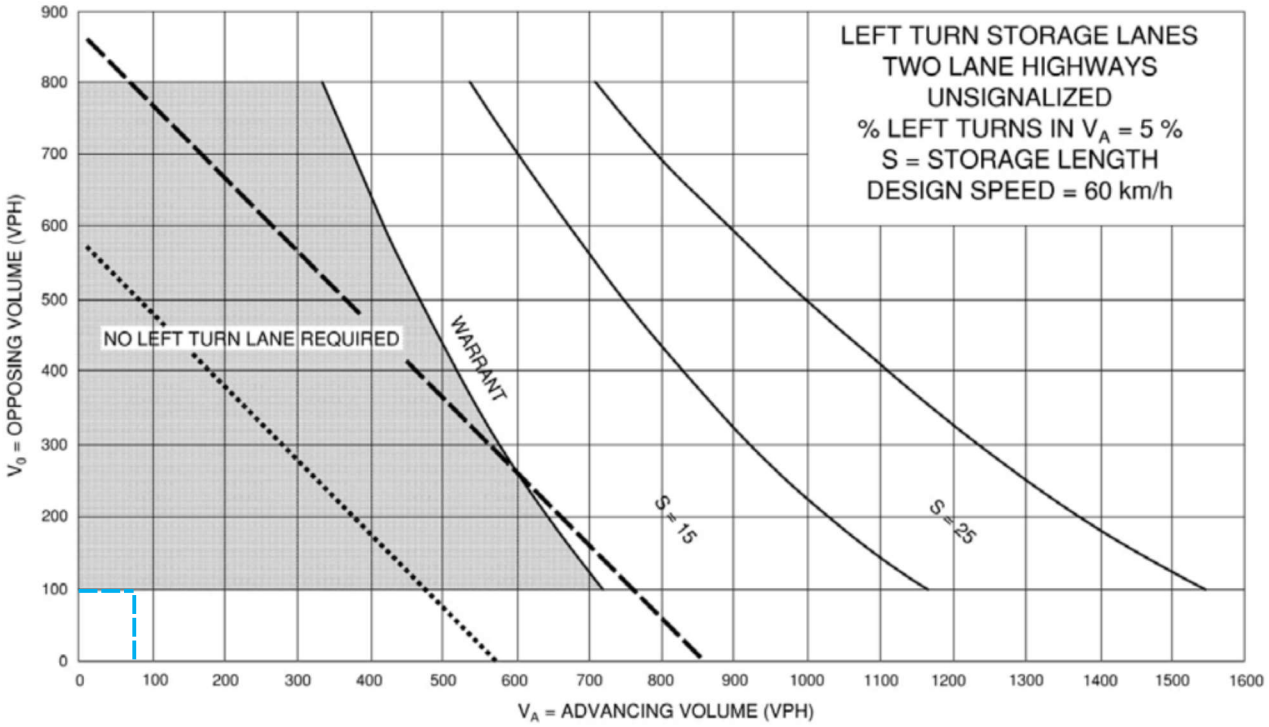
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	90	144
Volume Left	16	8	0
Volume Right	0	0	26
cSH	759	1451	1700
Volume to Capacity	0.02	0.01	0.08
Queue Length 95th (m)	0.5	0.1	0.0
Control Delay (s)	9.8	0.7	0.0
Lane LOS	A	A	
Approach Delay (s)	9.8	0.7	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	19.8%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix E

Left Turn Lane Review

Left Turn Lane Review for
NBL at Heritage Ln / Edwards Dr



	Total Volumes 2030	
	AM	PM
Advancing Volume (V_O)	78	82
Left Turn Volume (V_L)	2 (3%)	7 (9%)
Opposing Volume (V_O)	97	133